

Building evidence for conservation globally

Journal of Threatened Taxa

10.11609/jott.2025.17.2.26443-26570

www.threatenedtaxa.org

26 February 2025 (Online & Print)

17(2): 26443-26570

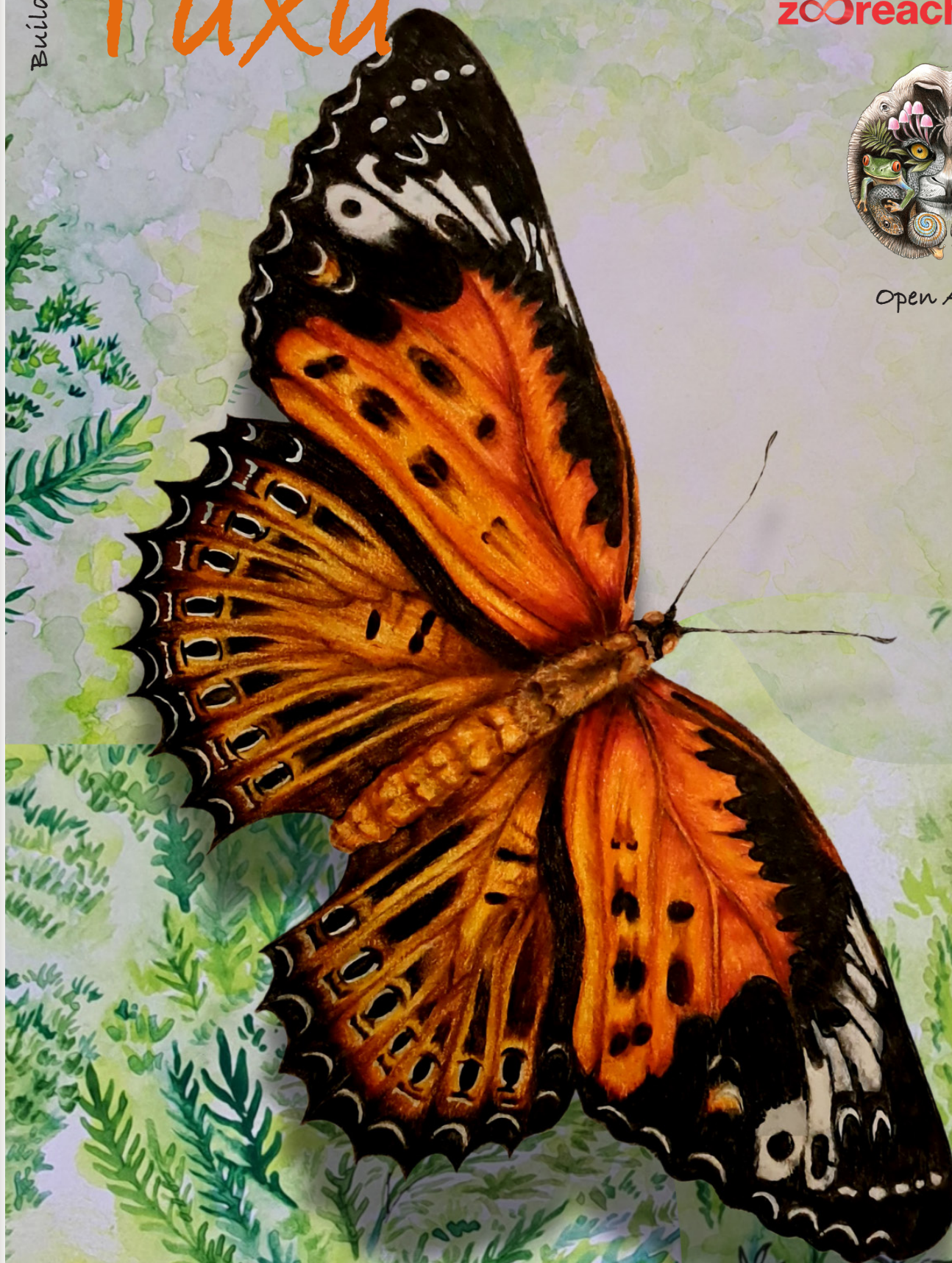
ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)

zooreach@40



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

Srivari Illam, No. 61, Karthik Nagar, 10th Street, Saravanampatti, Coimbatore, Tamil Nadu 641035, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

EDITORS

Founder & Chief Editor

Dr. Sanjay Molur

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),
Coimbatore, Tamil Nadu 641006, India

Assistant Editor

Dr. Chaithra Shree J., WILD/ZOO, Coimbatore, Tamil Nadu 641006, India

Managing Editor

Mr. B. Ravichandran, WILD/ZOO, Coimbatore, Tamil Nadu 641006, 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 641006, India

Board of Editors

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 Illustrator, 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, Mavinahalla PO, Nilgiris, Tamil Nadu 643223, India

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

Copy Editors

Ms. Usha Madgunaki, Zooreach, Coimbatore, India

Ms. Trisa Bhattacharjee, Zooreach, Coimbatore, India

Ms. Paloma Noronha, Daman & Diu, India

Web Development

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

Typesetting

Mrs. Radhika, Zooreach, Coimbatore, India

Mrs. Geetha, Zooreach, Coimbatore India

Fundraising/Communications

Mrs. Payal B. Molur, Coimbatore, India

Subject Editors 2021–2023

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

Dr. Kiran Ramchandra Ranadive, Annasaheb Magar Mahavidyalaya, Maharashtra, 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, Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas, USA.

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. Karthigeyan, 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 Banos, Laguna, Philippines

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

Dr. Afroz Alam, Banasthali Vidyapith (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. A.G. Pandurangan, Thiruvananthapuram, Kerala, India

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

Dr. Kannan C.S. Warriar, 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, Llandudno, North Wales, LL30 1UP

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

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

For Focus, Scope, Aims, and Policies, visit 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

continued on the back inside cover

Cover: Tamil Lacewing *Cethosia nietneri* with colour pencils and watercolours for the background; detailing with fine liners by Elakshi Mahika Molur.



INTRODUCTION

India has been identified as one of the mega biodiversity countries in the world (Mittermeier & Mittermeier 1997) and the northeastern part of India with its unique topography has been considered a biodiversity hotspot in the world (Groombridge & Jenkins 1998). The region's rich biodiversity is attributed to its tectonic placement (Kottelat 1989) and is considered a freshwater fish biodiversity hotspot in the world (Kottelat et al. 1996).

The state of Nagaland, located in the northeastern part of India, is known for its rich biodiversity, including a diverse range of fish species. Nagaland is bounded by beautiful hilly terrain and riverine system and shares boundaries with Assam (northern and western part), Arunachal Pradesh (northeastern part), Myanmar (eastern part), and Manipur (southern) (Kosygin & Vishwanath 1998). The three principal drainages of Nagaland consist of Brahmaputra and Barak of Indian origin and Chindwin drainage of Indo-Burma origin. The Dikhu River, flowing through Nagaland, serves as a prime location to study the ichthyofaunal diversity in the region. This river is characterized by its running waters and hilly terrain, making it an ideal habitat for various fish species. Furthermore, little information exists on the biology of these fish species, emphasizing the need for a comprehensive study of their diversity. The study of fish diversity in the Dikhu River would provide valuable insights into the ecological dynamics and conservation efforts in the region.

Biodiversity hotspots under freshwater ecosystems, are increasingly under threat, making their conservation a critical concern. Major factors such as habitat destruction, invasive species, overexploitation, and the impacts of climate change are driving the rapid decline of species populations. Studies have highlighted that approximately 24% of freshwater species are facing a high risk of extinction due to threats including pollution, dam construction, water extraction, agricultural practices, and the introduction of invasive species (Sayer et al. 2025). In the northeastern region of India, studies have provided valuable insights into the conservation status of freshwater fish species, illustrating both the rich diversity and the significant threats they face (Vishwanath 2017). A report presented at COP 28 in the United Arab Emirates further revealed that 25% of freshwater fish species worldwide are at risk of extinction, with climate change directly impacting at least 17% of these species (IUCN 2023). These findings underscore the urgent need for targeted conservation

efforts to safeguard freshwater biodiversity.

The Shannon Index, Simpson Index, and Jacquard's Evenness Index are commonly used to measure biodiversity and community structure in ecological studies. Biodiversity is often astonishingly altered or overused to define the population of a community. It is a measure of the number of species that make up a biological community and is considered one of the most important aspects of community organization or structure (Jewel et al. 2018). Information about ichthyofaunal diversity is scarce in this region and only a few notable works have been done by Hora (1936), Menon (1954), Acharjee et al. (2012), and a few studies have been done on the biodiversity status in Dikhu River individually by Ezung et al. (2022) and Konyak & Limatemjen (2022). The use of these diversity indices would allow researchers to assess the species richness, evenness, and dominance of fish populations in the Dikhu River. By quantifying the diversity indices, researchers can determine the overall health and stability of the fish community in the river. Understanding the fish diversity in the Dikhu River is crucial for several reasons. Firstly, it aids in the conservation and management of fish populations. This information helps in formulating policies for sustainable fisheries management. Though it is considered a significant river in the state, there has been scarce information regarding its status and its habitat ecology and hence this present study is an attempt to identify the current fish species diversity in this river.

MATERIALS AND METHOD

Study area

Dikhu River is one of the tributaries of the Brahmaputra River and six stations were selected for sampling (Table 1). The study was conducted for a period of 12 months from March 2019 to February 2020. The locations of the study sites were taken using GPS (Garmin etrex-10) (Image 1). It originates from the Naruto Hill, Zunheboto, and later confluences towards the Brahmaputra River from Naginimora, Assam. It then channels through most of the Zunheboto and Mokokchung districts of Nagaland, covering a total distance of 170 km. The two major tributaries of the Dikhu River are Yangyu in Tuensang district and Nanung (Langpangkong range) in Mokokchung district (Ao et al. 2008).

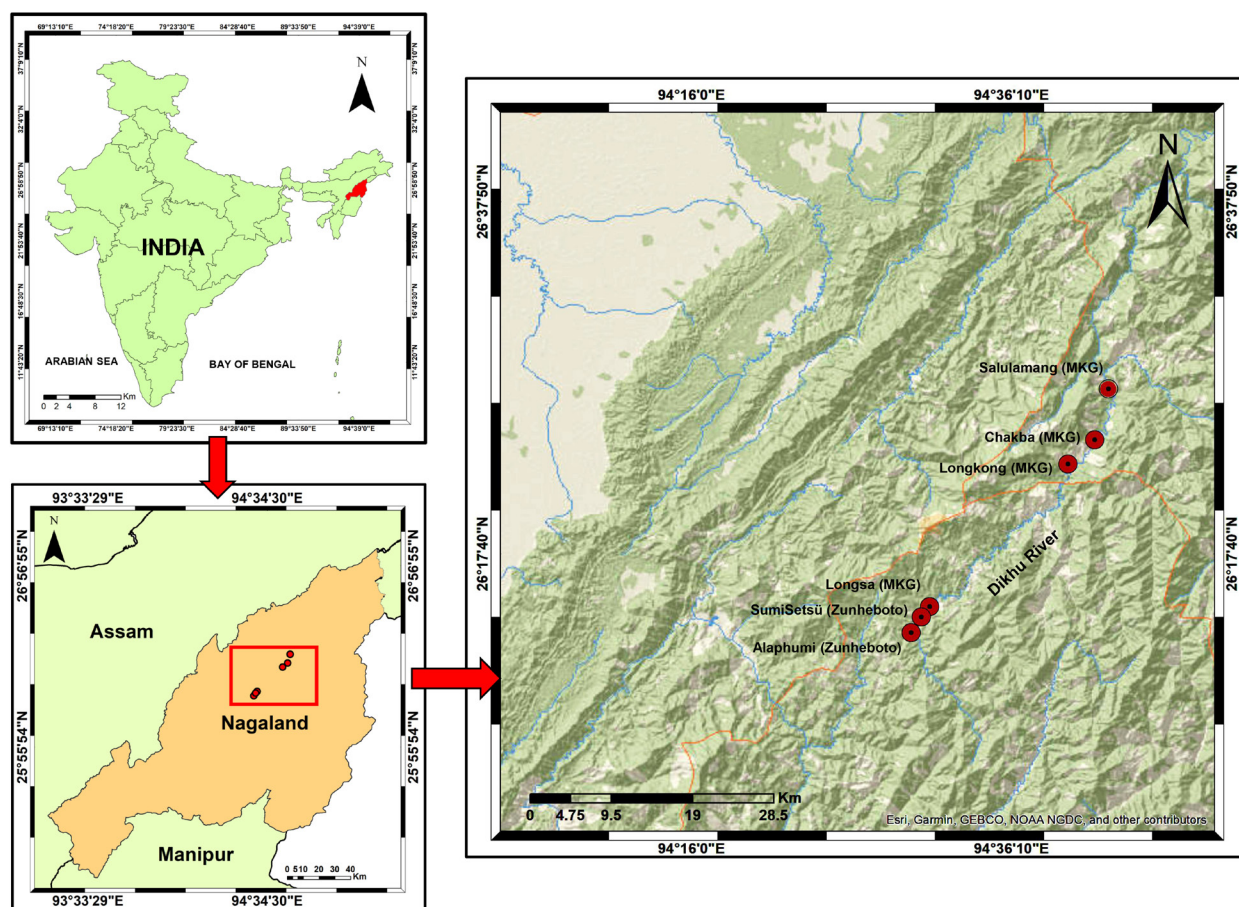


Image 1. Geospatial mapping of study site distribution along the Dikhu River, Nagaland.

Fish sampling

Fish samples were collected from various sampling sites along the course of the river with gears such as cast nets, gill nets, scoop nets, hooks and lines, and locally available indigenous traps. Sampling collection was done on a monthly basis. Collected fish samples were photographed with a Canon EOS 3000D camera and measured using a vernier caliper and graduated ruler (graduations in mm) while excess fishes were released back into the river then a few samples were preserved in 10% formalin solution for further identification. Samples were identified with the help of key identification characters given by Talwar & Jhingran (1991), Menon (1999), Vishwanath et al. (2007), and Jayaram (2010), and the latest nomenclature was based in accordance with the Catalog of Fishes (Fricke et al. 2025). Fish classification was conducted following the guidelines outlined by Nelson et al. (2016).

Species diversity

Shannon diversity index, (Shannon & Weaver 1949)

Table 1. Sampling sites of Dikhu River, Nagaland.

Stations	Geographical coordinates	Altitude
Longsa (MKG)	26.244° N 94.517° E	2230 ft or 679.7 m
Longkong (MKG)	26.380° N 94.662° E	1390 ft or 423 m
Chakba (MKG)	26.403° N 94.690° E	1292 ft or 393.8 m
Alaphumi (Zunheboto)	26.219° N 94.497° E	2383 ft or 726.3 m
Salulamang (MKG)	26.452° N 94.704° E	1164 ft or 354.7 m
SumiSetsü (Zunheboto)	26.234° N 94.508° E	2271 ft or 692.2 m

$$H' = - \sum p_i \ln (p_i),$$

Where H' is the Shannon Diversity Index and p_i is the number of individuals in the i^{th} species as a proportion of the total population. $\ln (p_i)$ is the natural log of p_i

The formula used for calculating Simpson's index (Simpson 1949) is:

$$D = 1 - (\sum n^*(n-1)/N^*(N-1))$$

Where n is the number of individuals of a specific species. N is the total number of individuals of all species.

Pielou's Evenness Index (J) is calculated using the Shannon Diversity Index (H) and $\ln(S)$ is the natural logarithm of the total number of species (S) in the community. The formula for Pielou's Evenness Index (Pielou 1966) is:

$$J' = H'/H'\max = H' / \ln(S)$$

The relative abundance (percentage composition) of fish species across the six sampling stations was calculated using the following formula.

Relative Abundance (%) = (Number of individuals of a species \times 100) / Total number of species

Statistical analysis: For data conversion and analysis, Microsoft Excel was used.

RESULTS

Fish assemblage

Fish species composition of Dikhu River showed the presence of 28 fish species belonging to six orders 13 families and three subfamilies (Images 2 & 3). Table 2 provides a detailed checklist of fish species, organized according to their IUCN conservation status (IUCN 2024) and documented population trends. Among the order of fish species, Cypriniformes were observed as the most dominant group with 67.9% followed by Siluriformes (14.3%) and Anabantiformes (7.1%) while the least common order group belonged to Beloniformes, Synbranchiformes, and Anguilliformes with combined (10.7%) in total (Figure 1). Cyprinidae dominated among the families represented by 14 species and among the genus group *Garra*, *Opsarius*, and *Danio* were the most common with three species each. Based on the IUCN red list of threatened species category 71.4% was represented under Least Concern (LC), 7.1% under Near Threatened (NT), 3.6% under Vulnerable (VU), 3.6% under Endangered (EN), 10.7% under Not Assessed (NA) and 3.6% under Data Deficient (DD) status (Figure 2). The population trend of fish species as per IUCN also showed 57.1% as unknown, 10.7% as stable, 10.7% as not accessed, and 21.4% as decreasing population trends (Figure 3). Assessing the species according to its economic value were categorized as 46.4% under food and ornamental, 35.7% under ornamental, 10.7% under food, and 7.1% under food and sport category (Figure 4).

Relative abundance

The relative abundance of small indigenous fish *Devario aequipinnatus* (15.55%), *Opsarius bendelisis*

(11.39%), *Garra naganensis* (9.52%), and *Amblyceps apangi* (7.73%) were found to be high in the river under study indicating its abundance and dominance. Species under different conservation categories like *Neolissochilus hexagonolepis* (NT) showed relatively high RA with values of 4.31%, which indicates the stability of their population despite natural and anthropogenic threats in the sampling sites. While others under the threatened category like *Tor putitora* (EN), *Anguilla bengalensis* (NT), and *Botia rostrata* (VU) indicated decreasing trends with RA values of 0.62%, 0.16%, and 0.08 %. Other species with fairly high RA were *Schistura savona* (6.61%), *Psilorhynchus homaloptera* (5.91%), *Pterocryptis indica* (5.71%) and *Pethia conchonius* (5.25%). The lowest RA was recorded in *Tariqilabeo latius* and *Botia rostrata* with values of 0.08% each. It has been observed that the highest number of catches was recorded during the post-monsoon followed by the pre-monsoon season compared to the other seasons (Figure 5).

Diversity index

Diversity was highest ($H' = 2.912$, $1-D = 0.936$) in post-monsoon season and lowest in monsoon season ($H' = 2.497$, $1-D = 0.892$), and the values of evenness index (J') were recorded highest ($J' = 0.908$) in pre-monsoon season and lowest in monsoon season ($J' = 0.82$). The mean value and standard deviation of species found in each season, Shannon diversity (H'), Simpson's index ($1-D$), and Pielou's evenness (J') indices were recorded as, 23.75 ± 2.217 , 2.716 ± 0.194 , 0.915 ± 0.022 and 0.864 ± 0.044 (Table 3). The study concluded that the Dikhu River supports rich fish diversity, while there is a notable shift in the fish community structure.

DISCUSSION

The spatial distribution of fish species in the Dikhu River is influenced by a complex interplay of ecological factors, including abiotic conditions, biotic interactions, and evolutionary adaptations within the habitat (Pelicice et al. 2015; Bose et al. 2019; Satpathy et al. 2021; Alam et al. 2024). Among these factors, the dominance of Cypriniformes in the fish assemblages of the river is particularly notable. This pattern mirrors findings from other studies across northeastern Indian rivers, indicating a widespread dominance of this order (Taro et al. 2022; Ahmed et al. 2023; Chetry et al. 2023; Singh et al. 2024). The success of Cypriniformes in these ecosystems can be attributed to their evolutionary adaptations, including

Table 2. Comprehensive overview of fish catch composition of Dikhu River, Nagaland: conservation status, population trends, and economic significance.

	Systematic position	Local name (Ao)	Common name	IUCN status	Population trends	Economic value	Specimen number
Order: Anguilliformes							
Family: Anguillidae							
1	<i>Anguilla bengalensis</i> (Gray, 1831)	Angulang	Indian Mottled Eel	NT	Unknown	Fd	NUFM 1390
Order: Cypriniformes							
Family: Cyprinidae							
Subfamily: Barbinae							
2	<i>Neolissochilus hexagonolepis</i> (McClelland, 1839)	Seben	Katli or Chocolate mahseer	NT	Decreasing	Fd, Sp	NUFM 1279
3	<i>Tor putitora</i> (Hamilton, 1822)	Tzünger	Golden mahseer	EN	Decreasing	Fd, Sp	NUFM 1285
4	<i>Pethia conchoni</i> (Hamilton, 1822)	Tzünger	Rosy barb	LC	Unknown	Fd, Or	NUFM 1289
Subfamily: Danioninae							
5	<i>Opsarius bendelisis</i> (Hamilton, 1807)	Tawa	Indian hill trout	LC	Stable	Fd, Or	NUFM 1310
6	<i>Opsarius tileo</i> (Hamilton, 1822)	Tawa	Tileo baril	LC	Unknown	Fd, Or	NUFM 1316
7	<i>Opsarius barna</i> (Hamilton, 1822)	Tawa	Barna Baril	LC	Stable	Fd, Or	NUFM 1317
8	<i>Danio dangila</i> (Hamilton, 1822)	Zer	Dangila Danio	LC	Decreasing	Fd, Or	NUFM 1325
9	<i>Danio rerio</i> (Hamilton, 1822)	Zer	Zebra fish	LC	Decreasing	Fd, Or	NUFM 1329
10	<i>Danio assamila</i> (Kullander, 2015)	Zer	Not accessed	Not accessed	Not accessed	Fd, Or	NUFM 1332
11	<i>Devario aequipinnatus</i> (McClelland, 1839)	Zer	Giant danio	LC	Unknown	Fd, Or	NUFM 1319
Subfamily: Labeoninae							
12	<i>Tariqilabeo latius</i> (Hamilton, 1822)	Anget	Gangetic Latia	LC	Unknown	Fd	NUFM 1295
13	<i>Garra lissorhynchus</i> (McClelland, 1842)	Anget	Khasi garra	LC	Unknown	Fd, Or	NUFM 1296
14	<i>Garra birostris</i> (Nebeshwar & Vishwanath, 2013)	Anget	Not accessed	Not accessed	Not accessed	Fd, Or	NUFM 1302
15	<i>Garra naganensis</i> (Hora, 1921)	Anget	Naga garra	LC	Unknown	Fd, Or	NUFM 1304
Family: Psilorhynchidae							
16	<i>Psilorhynchus homaloptera</i> (Hora & Mukherji, 1935)	Mernngo	Homaloptera minnow	LC	Unknown	Or	NUFM 1347
17	<i>Psilorhynchus arunachalensis</i> (Nebeshwar, Bagra & Das, 2007)	Mernngo	Not accessed	DD	Unknown	Or	NUFM 1353
Family: Botiidae							
18	<i>Botia rostrata</i> (Günther, 1868)	Nga-medaktsü	Gangetic loach	VU	Decreasing	Or	NUFM 1356
Family: Nemacheilidae							
19	<i>Paracanthocobitis botia</i> (Hamilton, 1822)	Sangsert	Mottled loach	LC	Decreasing	Or	NUFM 1335
20	<i>Schistura savona</i> (Hamilton, 1822)	Retong	Half-banded Loach	LC	Unknown	Or	NUFM 1341
Order: Siluriformes							
Family: Siluridae							
21	<i>Pterocryptis indica</i> (Datta, Barman & Jayaram, 1987)	Lorong	Siluras Catfish	DD	Unknown	Fd	NUFM 1360
Family: Bagridae							
22	<i>Olyra longicauda</i> (McClelland, 1842)	Nenak	Torrent Catfish	LC	Unknown	Or	NUFM 1357
Family: Amblycipitidae							
23	<i>Amblyceps apangi</i> (Nath & Dey, 1989)	Nenak	Indian Torrent Catfish	LC	Unknown	Or	NUFM 1368
Family: Sisoridae							
24	<i>Glyptothorax indicus</i> (Talwar, 1991)	Jangmu	Catfish	LC	Unknown	Or	NUFM 1366
Order: Anabantiformes							
Family: Channidae							
25	<i>Channa melanostigma</i> (Geetakumari & Vishwanath, 2011)	Alopungo	snakehead	Not accessed	Not accessed	Fd, Or	NUFM 1374

	Systematic position	Local name (Ao)	Common name	IUCN status	Population trends	Economic value	Specimen number
Family: Badidae							
26	<i>Badis badis</i> (Hamilton, 1822)	Akngo	Badis	LC	Unknown	Or	NUFM 1379
Order: Beloniformes							
Family: Belontiidae							
27	<i>Xenentodon cancila</i> (Hamilton, 1822)	Jokli	Freshwater Garfish	LC	Unknown	Or	NUFM 1385
Order: Synbranchiformes							
Family: Mastacembelidae							
28	<i>Mastacembelus armatus</i> (Lacepède, 1800)	Merü	Spiny Eel	LC	Stable	Fd, Or	NUFM 1388

DD—Data Deficient | EN—Endangered | LC—Least Concern | NT—Near Threatened | VU—Vulnerable | Fd—Food | Sp—Sport | Or—Ornamental.

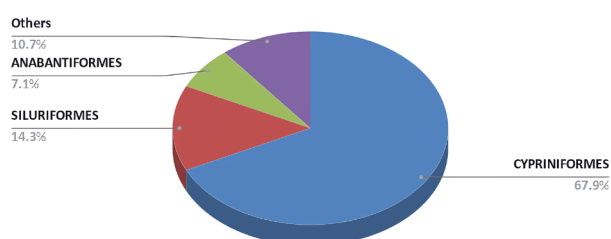


Figure 1. Distribution of fish species by order group.

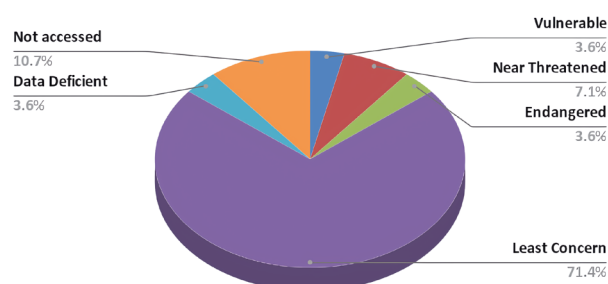


Figure 2. Distribution via IUCN conservation status.

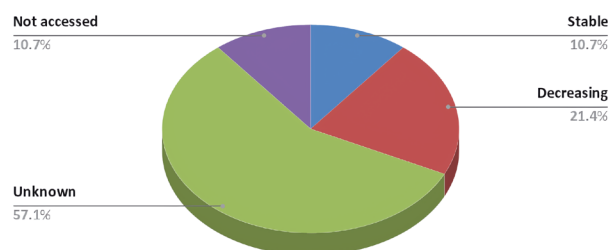


Figure 3. Distribution by population trend.

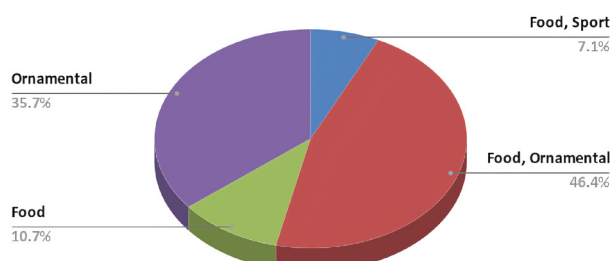


Figure 4. Distribution by economic value.

the ability to thrive in a range of water conditions, their varied feeding strategies, and reproductive behaviors, which have enabled them to outcompete other species in these freshwater habitats. Furthermore, their efficient use of resources has positioned Cypriniformes as central components of the ecological dynamics in these rivers (Mondal & Bhat 2020). Similar patterns of Cypriniformes dominance have been reported in studies conducted in Nagaland, with most species classified by the IUCN as either 'Least Concern' or 'Data Deficient' (Tsurunla et al. 2024), emphasizing the need for more focused studies on the region's ichthyofauna. The present study also identified a significant proportion (21.4%) of species experiencing a declining population trend, which is likely attributable to a combination of natural environmental pressures and anthropogenic influences (Nel et al. 2009; Kechu et al. 2021).

Relative abundance (RA) is an important metric in

ichthyological studies as it reflects the proportional representation of species within a community. This measure is crucial for understanding species dominance, interspecies competition, and the overall health and stability of aquatic ecosystems (Hubbell 2005). In this study, *Devario aequipinnatus* and *Opsarius bendelisis* were found to have the highest RA, with values similar to those reported by Valentina et al. (2015) in Karbi Anglong district, Assam. Additionally, the post-monsoon season was marked by the highest number of catches, consistent with findings by Ali et al. (2004), who observed that receding water levels during this period tend to concentrate fish in shallower areas, thereby increasing catch rates.

The Shannon Diversity Index is a key tool for assessing the health of aquatic ecosystems. Values below 1

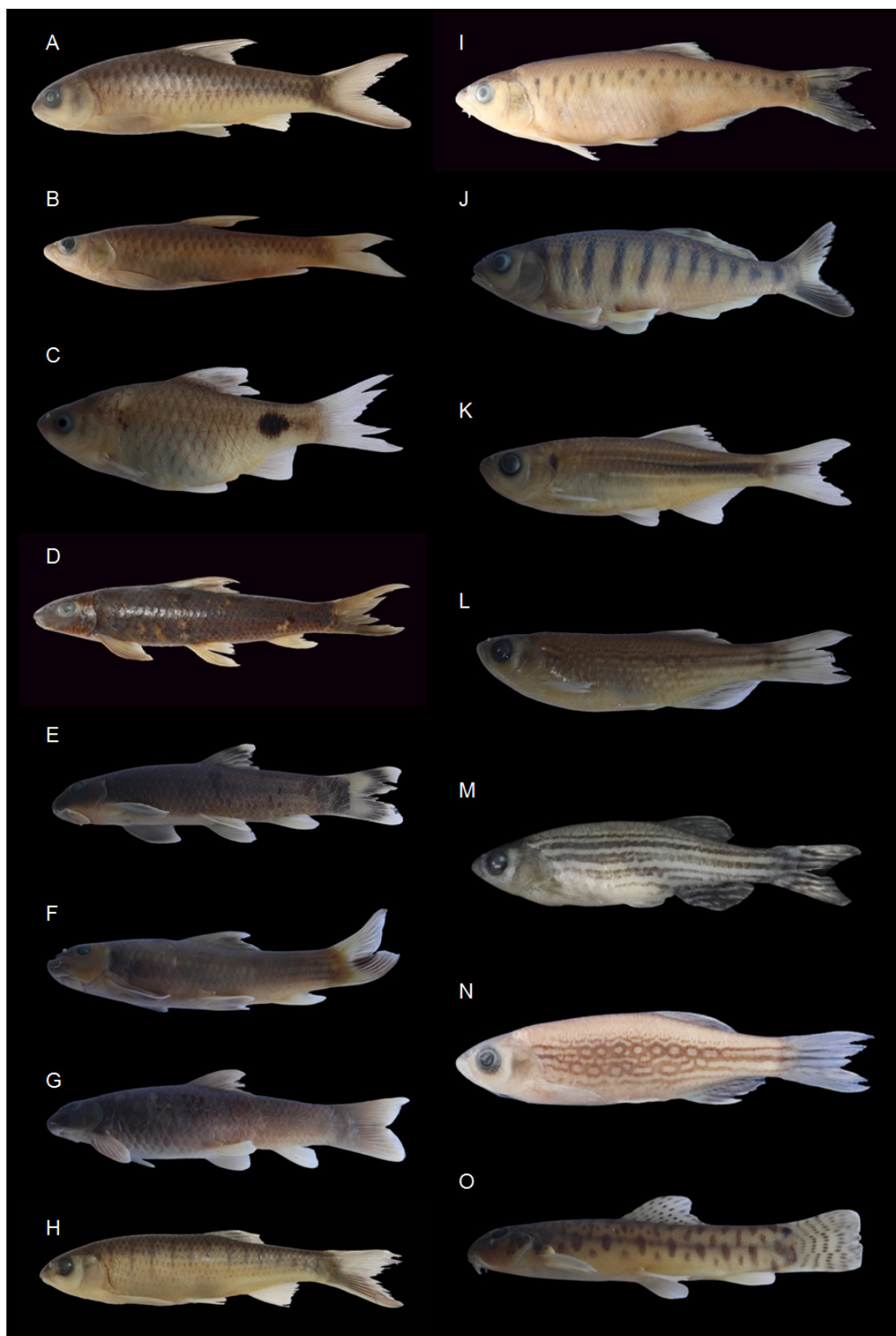


Image 2. Fish species recorded in Dikhu River, Nagaland: A—*Neolissochilus hexagonolepis* | B—*Tor putitora* | C—*Pethia conchoni* | D—*Tariqilabeo latius* | E—*Garra lissorhynchus* | F—*Garra birostris* | G—*Garra naganensis* | H—*Opsarius bendelisis* | I—*Opsarius tileo* | J—*Opsarius barna* | K—*Devario aequipinnatus* | L—*Danio dangila* | M—*Danio rerio* | N—*Danio assamila* | O—*Paracanthocobitis botia*. © Metevinu Kechu.

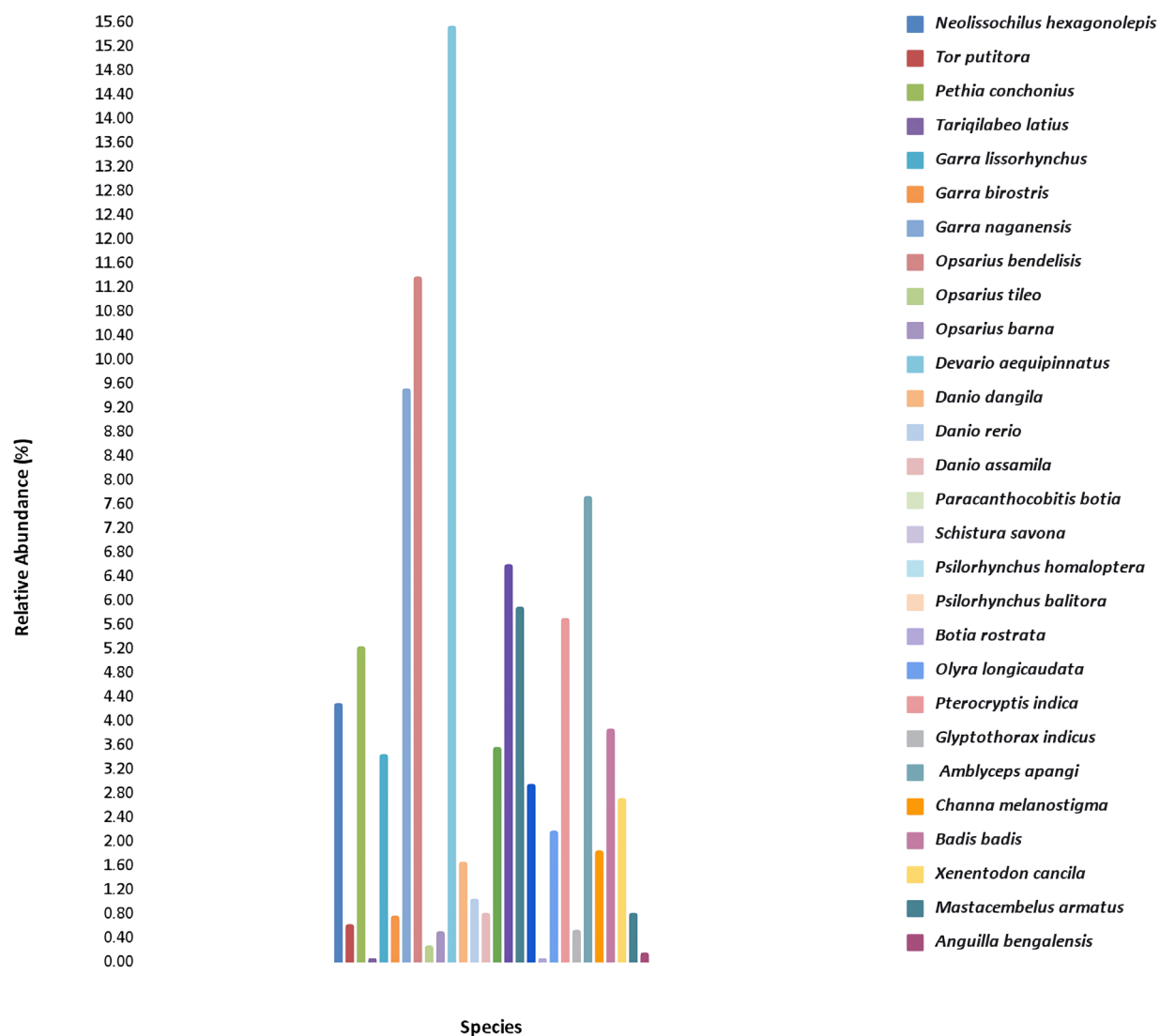


Figure 5. Relative abundance of fish species.

generally indicate high pollution and stress, values between 1 and 2 suggest moderate stability and values above 3 reflect a healthy, stable environment conducive to species survival (Stub et al. 1970). The findings from this study align with those of Dey & Sarma (2018), who reported the highest fish diversity during the post-monsoon season in the Manas River. Similarly, Satpathy et al. (2021) recorded a Shannon diversity value of 2.76 for the Subansiri River, suggesting moderate ecosystem health. Simpson's dominance index, which emphasizes the abundance of species over richness, also contributes to understanding the evenness of fish communities (Islam & Yasmin 2018). In this study, the highest evenness (J') was recorded during the pre-monsoon season, while the lowest value occurred during the monsoon. The average evenness across all seasons was 0.864 ± 0.044 ,

indicating a fairly balanced distribution of species. The post-monsoon season consistently displayed the highest species richness and diversity, likely due to the influx of water from various sources, which brings additional species into the river system and enhances community diversity. Additionally, there is a rise in species richness due to the migration of fish from larger rivers for breeding and spawning. These seasonal dynamics underscore the critical role of water-level fluctuations in shaping fish community composition, with the post-monsoon period supporting the highest levels of biodiversity across the study area.

During field surveys, interviews with local villagers revealed a noticeable decline in fish diversity, primarily attributed to the use of destructive fishing practices. The increasing availability and affordability of such tools have



Image 3. Fish species recorded in Dikhu River, Nagaland: A—*Schistura savona* | B—*Psilorhynchus homaloptera* | C—*Psilorhynchus balitora* | D—*Botia rostrata* | E—*Olyra longicaudata* | F—*Pterocryptis indica* | G—*Glyptothorax indicus* | H—*Amblyceps apangi* | I—*Channa melanostigma* | J—*Badis badis* | K—*Xenentodon cancila* | L—*Mastacembelus armatus*. © Metevinu Kechu.

exacerbated the problem, leading not only to a reduction in fish populations but also negatively affecting the reproductive success of species, thereby causing long-term ecological harm. These observations are consistent with research suggesting that anthropogenic activities, such as overfishing and the use of harmful fishing techniques, are major contributors to fish population

declines in river systems across Nagaland (Kechu et al. 2021).

The lack of comprehensive taxonomic surveys, genetic studies, and an understanding of the impacts of environmental changes poses significant challenges to the conservation of freshwater species in northeastern India. These gaps hinder accurate species identification

Table 3. Diversity indices distribution in four seasons in Dikhu River.

Season	Total individuals	Total species found in each season	Shannon diversity index H'	Simpson's dominance index (D)	Evenness (J)
Pre-monsoon	798	25	2.842	0.930	0.908
Monsoon	407	21	2.497	0.892	0.820
Post-monsoon	891	26	2.912	0.936	0.894
Winter	477	23	2.613	0.901	0.833
Total	2573				
Total no. of fishes	28				
Mean \pm SD		23.75 \pm 2.217	2.716 \pm 0.194	0.915 \pm 0.022	0.864 \pm 0.044

and impede effective conservation planning, particularly for rare or endemic species. Integrating traditional ecological knowledge from local communities can provide valuable insights into fish migration patterns, breeding cycles, and habitat usage, complementing modern scientific research and enhancing conservation efforts (Albuquerque et al. 2021). There is an urgent need for more holistic and integrated conservation strategies, including habitat restoration, the promotion of sustainable fishing practices, and community-based conservation programs. Regular ecological monitoring and biodiversity assessments are crucial for safeguarding the aquatic ecosystems of the Dikhu River and for meeting both local and global biodiversity conservation goals.

REFERENCES

- Acharjee, B.K., M. Das, P. Borah & J. Purakayastha (2012). Ichthyofaunal diversity of Dhansiri River, Dimapur, Nagaland, India. *Check List* 8(6): 1163–1165.
- Ahmed, A.M., R. Dutta, H. Pokhrel, D. Nath, L. Mudoi, R. Sarmah, S.K. Bhagabati & I. Ahmed (2023). Fish species composition, distribution, and community structure of a Himalayan biodiversity hotspot river Diyung, north east India. *Pakistan Journal of Zoology* 1–11.
- Alam, A., J. Kumar, U.K. Sarkar, D.N. Jha, S.K. Sahu, S.C. Sukla Das, S.K. Srivastava, S.K., V. Kumar & B.K. Das (2024). Linking ecological characteristics with fish diversity, assemblage patterns and feeding guilds, and GIS applications along the temporal and spatial gradients in a large subtropical reservoir, India, for sustainable management. *Journal of Water and Climate Change* 15(2): 607–627.
- Albuquerque, U., D. Ludwig, I. Feitosa, J. De Moura, P. Gonçalves, R. Da Silva, T. Da Silva, T. Gonçalves-Souza & W. Júnior (2021). Integrating traditional ecological knowledge into academic research at local and global scales. *Regional Environmental Change* 21: 45. <https://doi.org/10.1007/s10113-021-01774-2>
- Ali, M.Y., G.M. Salim, M.A. Mannan, M.M. Rahman, W. Sabbir & A. Murshida (2004). Freshwater fish fauna of Mymensingh floodplain, Bangladesh. *Journal of Biological Sciences* 4(5): 575–580.
- Ao, S., S.C. Dey & S.K. Sarmah (2008). Fish and fisheries of Nagaland. *Inland Fisheries Society of India* 26: 1–19.
- Bose, R., A.K. Bose, A.K. Das, A. Parashar & K. Roy (2019). Fish diversity and limnological parameters influencing fish assemblage pattern in Chambal River Basin of Madhya Pradesh, India. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences* 89: 461–473. <https://doi.org/10.1007/s40011-017-0958-5>
- Chetry, V., H. Das, P.K. Saikia, M.K. Saikia, B.P. Saikia & K. Sarma (2023). Ichthyofaunal diversity in Jia Bharali River of North Bank Landscape of Assam in eastern Himalaya, northeast India. *Ecology, Environment and Conservation* 29(01): 145–157.
- Dey, A. & D. Sarma (2018). Diversity, distribution and conservation approach of hillstream ornamental fishes in Manas River, India: An eastern hotspot region. *Journal of Coldwater Fisheries* 1(1): 103–112.
- Ezung, S., M. Kechu & P.P. Pankaj (2022). First record of *Garra birostris* Nebeshwar & Vishwanath, 2013 (Cypriniformes: Cyprinidae) from Doyang and Dikhu rivers of Brahmaputra drainage, Nagaland, India. *Journal of Threatened Taxa* 14(7): 21453–21457. <https://doi.org/10.11609/jott.7075.14.7.21453-21457>
- Fricke, R., W.N. Eschmeyer & R. Van Der Laan (eds.) (2025). *Eschmeyer's Catalog of Fishes: Genera, Species, References*. Electronic version accessed 23 January 2025. <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>
- Groombridge, B. & M. Jenkins (1998). *Freshwater Biodiversity: A Preliminary Global Assessment*. World Conservation Monitoring Centre, Cambridge, U.K., 104 pp.
- Hora, S.L. (1936). Fish and fisheries of Manipur with some observations on those of the Naga Hills. *Records of the Indian Museum (Calcutta)* 22: 165–214. [https://doi.org/10.1016/0022-5193\(66\)90133-0](https://doi.org/10.1016/0022-5193(66)90133-0)
- Hubbell, S.P. (2005). The neutral theory of biodiversity and biogeography and Stephen Jay Gould. *Paleobiology* 31(2): 122–132.
- Islam, M. & R. Yasmin (2018). Assemblage, abundance and diversity of fish species in river Dhaleshwari, Bangladesh. *Asian Journal of Fisheries and Aquatic Research* 1: 1–28. <https://doi.org/10.9734/ajfar/2018/v2i126112>
- IUCN (2023). Freshwater fish highlight escalating climate impacts on species: IUCN Red List. Available at: https://iucn.org/press-release/202312/freshwater-fish-highlight-escalating-climate-impacts-species-iucn-red-list?utm_source (Accessed: 22 January 2025).
- IUCN (2024). The IUCN Red List of Threatened Species. Version 2024-2. <https://www.iucnredlist.org> Accessed on 23 January 2025.
- Jayaram, K.C. (2010). *Freshwater Fishes of Indian Region*. 2nd Edition. Narendra Publishing House, New Delhi, 616 pp.
- Jewel, M.A.S., M.A. Haque, R. Khatun & M.S. Rahman (2018). A comparative study of fish assemblage and diversity indices in two different aquatic habitats in Bangladesh: Lakhandaha Wetland and Atari River. *Jordan Journal of Biological Sciences* 11(4): 427–434.
- Kechu, M., S. Ezung, S. Longkumer, A. Jamir & P.P. Pankaj (2021). Progress and prospects for sustainable production and conservation of threatened coldwater fishes of north-east India with special

- reference to Nagaland state. *Journal of Experimental Zoology India* 24(1): 27–33.
- Konyak, S.L. & Limatemjen (2022). Ichthyofaunal diversity of downstream Dikhu River and its tributaries in Mon District of Nagaland, India. *Asian Journal of Fisheries and Aquatic Research* 18(1): 16–22. <https://doi.org/10.9734/ajfar/2022/v18i130427>
- Kosygin, L. & W. Vishwanath (1998). A report on fish diversity of Tizu River, Nagaland with some new records. *Ecology, Environment and Conservation* 4: 243–247.
- Kottelat, M. & T. Whitten (1996). *Freshwater Biodiversity in Asia with Special Reference to Fish: World Bank Technical Paper No. 343*. The World Bank, Washington DC, 59 pp.
- Kottelat, M. (1989). Zoogeography of the fishes from Indochinese inland waters with an annotated check-list. *Bulletin Zoologisch Museum* 12(1): 1–55.
- Menon, A.G.K. (1954). Further observation on the fish fauna of the Manipur State. *Records of the Indian Museum* 52: 21–26.
- Menon, A.G.K. (1999). *Checklist: Freshwater Fishes of India*. Occasional Paper No. 175. Zoological Survey of India, Calcutta, 366 pp.
- Mittermeier, R.A. & C.G. Mittermeier (1997). Megadiversity: earth's biologically wealthiest nations. In: McAllister, M.C., D.E. Hamilton & B. Harvey (eds.). *Global Freshwater Biodiversity*. Sea Wind Cemex, Mexico City, 140 pp.
- Mondal, R. & A. Bhat (2020). Temporal and environmental drivers of fish-community structure in tropical streams from two contrasting regions in India. *PLOS ONE* 15(4): e0227354. <https://doi.org/10.1371/journal.pone.0227354>
- Nel, J.L., D.J. Roux, R. Abell, P.J. Ashton, R.M. Cowling, J.V. Higgins & J.H. Viers (2009). Progress and challenges in freshwater conservation planning. *Aquatic Conservation: Marine and Freshwater Ecosystems* 19(4): 474–485.
- Nelson, J.S., T.C. Grande & M.V.H. Wilson (2016). *Fishes of the World*. 5th Edition. John Wiley & Sons, Hoboken, 707 pp. <https://doi.org/10.1002/9781119174844>
- Pellicice, F.M., P.S. Pompeu & A.A. Agostinho (2015). Large reservoirs as ecological barriers to downstream movements of Neotropical migratory fish. *Fish and Fisheries* 16(4): 697–715. <https://doi.org/10.1111/faf.12089>
- Pielou, E.C. (1966). Species-diversity and pattern-diversity in the study of ecological succession. *Journal of Theoretical Biology* 10(2): 370–383.
- Satpathy, S., K. Sivakumar & J.A. Johnson (2021). Fish communities and associated habitat variables in the upper Subansiri River of Arunachal Pradesh, eastern Himalaya, India. *Journal of Threatened Taxa* 13(1): 17477–17486. <https://doi.org/10.11609/jott.5503.13.1.17477-17486>
- Sayer, C.A., E. Fernando & R.R. Jimenez (2025). One-quarter of freshwater fauna threatened with extinction. *Nature* 1–8. <https://doi.org/10.1038/s41586-024-08375-z>
- Shannon, C.E. & W. Weaver (1949). *The Mathematical Theory of Communication*. The University of Illinois Press, Urbana, IL, 1–117.
- Simpson, E.H. (1949). Measurement of diversity. *Nature* 163: 688. <https://doi.org/10.1038/163688a0>
- Singh, D., J. Rana & J. Tungoe (2024). Impact of prevailing factors on assemblages and status of freshwater fish fauna of river Song in the over Himalaya. *Iranian Journal of Fisheries Sciences* 23(2): 237–254. <https://doi.org/10.22092/ijfs.2024.349403.0>
- Stub, R., J.W. Appling, A.M. Hatstetter & I.J. Hass (1970). The effect of industrial waste of Memphis and Shelby country on primary planktonic producers. *Bioscience* 20: 905–912.
- Talwar, P.K. & A.G. Jhingran (1991). *Inland Fishes of India and Adjacent Countries, Vols. I & II*. Oxford and IBH Co. Pvt. Ltd., New Delhi, 1158 pp.
- Taro, K., L. Tamang & D.N. Das (2022). Ichthyofaunal diversity of Senkhi stream, Itanagar, Arunachal Pradesh: a comparative status between 2004–05 and 2018–19. *Journal of Threatened Taxa* 14(7): 21356–21367. <https://doi.org/10.11609/jott.5738.14.7.21356-21367>
- Tsurunla, K., L. Limatemjen, S.L. Konyak, & V. Chüzho (2024). Fish fauna and their IUCN conservation status of Chessore sub-division of Shamator, Nagaland, India. *World News of Natural Sciences* 56: 58–66.
- Valentina, T., H.T. Singh, A. Tamuli & R. Teron (2015). Assessment of physico-chemical characteristics and fish diversity of hill streams in Karbi Anglong District, Assam, India. *International Research Journal of Environmental Sciences* 4(5): 6–11.
- Vishwanath, W. (2017). Diversity and conservation status of freshwater fishes of the major rivers of northeast India. *Aquatic Ecosystem Health & Management* 20(1–2): 86–101. <https://doi.org/10.1080/14634988.2017.1294947>
- Vishwanath, W., W.S. Lakra & U.K. Sarkar (2007). *Fishes of North East India*. NBFGR, Lucknow, Uttar Pradesh, India, 264 pp.



Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.
Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK
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 D.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. 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. Chandrashekhar 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, SAGON, 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. P.A. Azeez, Coimbatore, Tamil Nadu, India

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, SAGON, 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, SAGON, 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 2021–2023

Due to pausity of space, the list of reviewers for 2021–2023 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.

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore,
Tamil Nadu 641006, India
ravi@threatenedtaxa.org & ravi@zooreach.org

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



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. 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)

February 2025 | Vol. 17 | No. 2 | Pages: 26443–26570

Date of Publication: 26 February 2025 (Online & Print)

DOI: 10.11609/jott.2025.17.2.26443-26570

Articles

Culture and provisioning: the case of Human-Long-tailed Macaque *Macaca fascicularis* (Raffles, 1821) interactions in Sumile, Butuan City, Philippines

– Fritche H. Lapore, Debbie S. Aseñas & Sherryl L. Paz, Pp. 26443–26458

Noteworthy comments on birds for mega-diverse Myanmar

– Swen C. Renner, Saw Moses, Lay Win, Thein Aung, Myint Kyaw, Saw Myat Ohnmar, Thiri Dae We Aung, Kay Thwe Myint, Sai Sein Lin Oo, Paul J.J. Bates & Marcela Suarez-Rubio, Pp. 26459–26467

Ultra-structure of antenna, eye, mouthparts and sensilla of *Cheilomenes sexmaculata* Fabricius, 1781 (Coccinellidae: Coleoptera)

– Prakash Ghagargunde & Mandar S. Paingankar, Pp. 26468–26478

Morphological characterization and ecological insights of *Pseudonapaeus* cf. *candelaris* (L. Pfeiffer, 1846) in the Pir Panjal Range of western Himalaya

– Hilal Ahmed, Imtiaz Ahmed & N.A. Aravind, Pp. 26479–26486

Communications

Diet and nutrient balance of wild Asian Elephants *Elephas maximus* in Nepal

– Raj Kumar Koirala & Sean C.P. Coogan, Pp. 26487–26493

Avian diversity in wetlands of southwestern Kerala of India during COVID

– Vijayakumari Sudhakaran Bindu & S. Sajitha, Pp. 26494–26503

Checklist on the ichthyofaunal resources and conservation status of Dikhu River, Nagaland, India

– Metevinu Kechu & Pranay Punj Pankaj, Pp. 26504–26514

A study on the diversity of butterflies in selected landscapes of the Indian Institute of Technology, Guwahati campus, Assam, India

– Uma Dutta, Sonali Dey & Deepshikha Moran, Pp. 26515–26529

Sphaeroma taborans sp. nov., a new species of wood-boring isopod (Crustacea: Isopoda: Sphaeromatidae) from Munroe Island, Ashtamudi Estuary, Kerala, India

– M.S. Arya, A. Biju & Dani Benchamin, P. 26530–26537

A report on Conidae (Gastropoda) from the Karnataka coast – distribution and shell morphometry

– B.S. Chandan, R. Shyama Prasad Rao & Mohammed S. Mustak, Pp. 26538–26546

New distribution record and DNA barcoding of the steno-endemic plant *Cordia diffusa* (Boraginaceae)

– M. Haritha, D. Leena Lavanya & H. Abinaya, Pp. 26547–26552

Short Communications

First record of the sea slug *Lobiger serradifalci* (Calcara, 1840) (Gastropoda: Sacoglossa: Oxynoidae) from the Indian coast

– Dimpal Dodiya & Paresch Poriya, Pp. 26553–26557

Impatiens damrongii (Balsaminaceae), a new record for the flora of Vietnam

– Ha Van Dang, Leonid Vladimirovich Averyanov & Cuong Huu Nguyen, Pp. 26558–26561

Invasive record of Brazilian Petunia *Ruellia elegans* Poir. (Acanthaceae) from northeastern India

– Mamita Kalita, Pp. 26562–26565

Note

Cuphea carthagenensis (Jacq.) J.F. Macbr. (Lythraceae)

— a new non-native plant record for the Eastern Ghats of India

– Prabhat Kumar Das, Bishal Kumar Majhi, Shashi Sourav Hansda, Samarendra Narayan Mallick, Purnendu Panda & Pratap Chandra Panda, Pp. 26566–26570

Publisher & Host



Threatened Taxa