

Building evidence for conservation globally

# Journal of Threatened Taxa

10.11609/jott.2026.18.3.28455-28606  
[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

26 March 2026 (Online & Print)  
18(3): 28455-28606  
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

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](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),  
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, Mavinhalla 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. Karthigeeyan**, 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 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](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: Digital illustration of Smooth-coated Otter *Lutrogale perspicillata* by Dupati Poojitha. Reference from the picture taken by Rana & Sugandhi.



## Distribution of rheophytes in Kopili River Basin, Assam and Meghalaya, India

Jayanta Das<sup>1</sup> & Deepak K. Baruah<sup>2</sup>

<sup>1</sup>AFRY India Pvt. Ltd., Office No. 3, 5<sup>th</sup> floor, Tower-A, Stellar IT Park, C-25, Sector-62, Noida, Uttar Pradesh 201301, India.

<sup>2</sup>Assam Power Generation Corporation Limited, 3<sup>rd</sup> Floor Bijulee Bhawan, Paltan Bazar, Guwahati, Assam 781001, India.

<sup>1</sup>jayanta.das@afry.com (corresponding author), <sup>2</sup>deepakbaruah007@gmail.com

**Abstract:** Rheophytes are plant species that are confined to the beds of swift-running streams and rivers and grow there up to flood level, but not beyond the reach of regularly occurring flash floods. Little is known about this group of plants in Assam. Between 2018 and 2022, the Kopili River Basin in Assam emerged as a hotspot for rheophytic flora with the description of three new species and range extensions of another two species from the Koka–Panimur region of West Karbi Anglong. Subsequent downstream impact assessment (2024–2025) for the Lower Kopili Hydro Electric Project and Kopili basin survey including the tributaries revealed the presence of 16 rheophyte species distributed across upstream reaches of the Kopili River and its tributaries, including Amring / Mynrinag, Borpani, Diyung, Karkar, Mynteng, Umium, Digaru, and Umrong Nala. These species exhibit remarkable ecological adaptations, thriving on riverbanks and rocky substrates under extreme acidic conditions (pH as low as 2.9 in the Karkar River). The Kopili River Basin represents a unique ecological niche for rheophytes in northeastern India as no other river system supports diverse species of this kind. Immediate conservation interventions and policy integration are essential to safeguard these species and their unique habitats from anthropogenic pressures.

**Keywords:** Conservation importance, flora, Koka–Panimur region, northeastern India, range expansion, unique habitat.

**Assamese:** 'ৰিওফাইটছ' (Rheophytes) বুলি জনা উদ্ভিদবোৰ হ'ল এনে উদ্ভিদ প্রজাতি যিবোৰ খৰমোতা, ঝৰ্ণা আৰু নদীৰ পাৰৰ পানীৰ শিলৰ স্তৰৰ মাজত সাধাৰণতে উপলব্ধ হয় ইয়াৰ উপৰিও বানপানীত হোৱা পানীৰ উচ্ছতালৈ ইয়াৰ বৃদ্ধি সম্প্ৰসাৰিত হয়। এই উদ্ভিদবোৰৰ বিষয়ে অসমৰ পৰিবেশিকতাত অতি কমেই তথ্য উপলব্ধ। ২০১৮ ৰ পৰা ২০২২ চনৰ ভিতৰত, পশ্চিম কাৰ্বি আংলং জিলাৰ কোকা - পানিমুৰ অঞ্চলত তিনিটা নতুন প্রজাতিৰ বিৱৰণৰ লগতে আৰু আন দুটা প্রজাতিৰ বিৱৰণৰ সৈতে কপিলী নদী উপত্যকাৰ ৰিওফাইট উদ্ভিদৰ এটা গুৰুত্বপূৰ্ণ 'হটস্পট' ৰূপে পৰিগণিত হৈছে। পৰৱৰ্তী ২০২৪ - ২০২৫ চনৰ নিম্ন কপিলী জলবিদ্যুৎ প্ৰকল্পৰ বাবে উদ্ভৱ হোৱা নিম্নপ্ৰবাহী জলবাহী প্ৰভাৱৰ মূল্যায়ন আৰু ওচৰৰ উপনদী সমূহৰ সমগ্ৰ কপিলী উপত্যকাৰ সমীক্ষাত কপিলী নদীৰ শীৰ্ষ অঞ্চলসমূহত আৰু ইয়াৰ উপনদীসমূহত—যেনে, আমৰিং/মাইনৰিনাগ, বৰপানী, দিয়ং, কাৰ্কাৰ, মইশ্বেঙ, উমিয়াম, ডিগাৰু আৰু উম্ৰং নলা—মুঠ ১৬টা ৰিওফাইট উদ্ভিদ প্রজাতিৰ উপস্থিতি চিনাক্ত কৰা হয়। এই উদ্ভিদসমূহ অত্যন্ত কঠিন পৰিৱেশত খাপ খোৱাকৈ বিকশিত হৈছে - নদীকূল আৰু শিলৰ দ্বাৰা গঠিত স্থলত, অতি অম্লীয় পানীতো (যেনে কাৰ্কাৰ নদীত pH মাত্ৰ ২.৯ পৰ্যন্ত হোৱাৰ দৃষ্টান্ত আছে) ইয়াৰ উপস্থিতি দেখা গৈছে। উত্তৰ - পূৱ ভাৰতত ৰিওফাইটবোৰৰ বাবে কপিলী নদী উপত্যকা এটা অনন্য পৰিবেশগত স্থান, কাৰণ আন কোনো নদী অৱবাহিকাত এনে ধৰণৰ বৈচিত্ৰ্যময় প্রজাতিসমূহ উপলব্ধ নহয়। এই বিশেষ প্রজাতিসমূহ আৰু সেইবোৰৰ অন্য বাসস্থল সমূহ মানৱসৃষ্ট কুপ্ৰবাহৰ পৰা ৰক্ষা কৰিবলৈ তৎক্ষণিক সংৰক্ষণমূলক পদক্ষেপ আৰু নীতি-নিৰ্ধাৰণ অতি প্ৰয়োজনীয়।

**Editor:** K. Haridasan, Palakkad, Kerala, India.

**Date of publication:** 26 March 2026 (online & print)

**Citation:** Das, J. & D.K. Baruah (2026). Distribution of rheophytes in Kopili River Basin, Assam and Meghalaya, India. *Journal of Threatened Taxa* 18(3): 28564–28572. <https://doi.org/10.11609/jott.10337.18.3.28564-28572>

**Copyright:** © Das & Baruah 2026. 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:** There were no funding agencies for this study. During normal execution of the downstream and back water assessment of Lower Kopili Hydro Electric Project under Assam Power Generation Corporation Limited this study was carried out.

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

**Author details:** DR. JAYANTA DAS is working as an environment specialist for AFRY India Pvt. Ltd. since 2021. The current assignment is to see the implementation of environmental stipulations and statutory compliances for the construction of Lower Kopili Hydro Electric Project (LKHEP) under APGCL in Assam. Updating the EIA for the LKHEP including downstream and back water assessment. DR. DEEPAK KUMAR BARUAH is an environment expert of Assam Power Generation Corporation Limited (APGCL) since 2017. Currently he supports APGCL in monitoring the compliance of the environmental and statutory requirements of all the power generating units (hydro, gas based) under APGCL. He also reviews the environmental reports prepared by the consultants before submission to the respective organizations.

**Author contributions:** JD and DKB designed the study for the diverse and unique habitat of rheophytes while updating the EIA of the Lower Kopili Hydro Electric Project. Field study were carried out by JD and DKB with the logistic support from Assam Power Generation Corporation Limited. Data interpretation and distribution maps were prepared by JD. Both the authors reviewed and approved the final manuscript.

**Acknowledgements:** We are thankful to Mr. Akshay Talukder, project director, Lower Kopili Hydro Electric Project of Assam Power Generation Corporation Limited to support this detail study under the downstream Impact assessment for the Lower Kopili Hydro Electric Project. Our sincere thanks go to Dr. Santanu Dey, who has identified the species in the field and with the literature. We also like to thank ADB's environment experts who gave emphasis to include rheophytes in the downstream and back water impact assessment study of Lower Kopili Hydro Electric Project.



## INTRODUCTION

The term 'Rheophyte', coined by van Steenis (1932) and elaborated in later works (1978, 1981), refers to flood-tolerant plants restricted to swift-running rivers and streams. Rheophytes are plants that grow along the margins of swift water currents or sometimes on the streambed or on its rocks (van Steenis 1981, 1987). Rheophytes are morphologically characterized by having narrow, oblanceolate leaves – leaflets (stenophylls) and other features that are adapted to the unique habitat that decreases resistance to the swift-running water (Kato & Imaichi 1992). Due to short petioles, narrow leaves, and tough but flexible stems, the rheophytes can stand firm against swift-running free flowing streams. Survival in or at the edge of a river system can exert extreme and diverse stressors on the plants growing there. At times of high flooding, plants must be able to remain anchored and withstand the power of flowing water. During the long dry period, plants are exposed to hot, rocky, gravelly or sandy areas (Puff & Chayamarit 2011). Rheophytes occur worldwide but are found particularly in evergreen rainforests, where they are the dominant aquatic macrophytes in tropical river systems (van Steenis 1978; Quiroz et al. 1997; Ameka 2000; Hoyos-Gomez & Bernal 2018). The high richness of rheophytic taxa was mostly found in southern Mexico, southern China, Borneo, and northern & eastern Australia. In contrast, the geographical distribution of rheophytes in gymnosperms is restricted to New Caledonia and Tasmania (Costa et al. 2020). Members of this biological group of plants are not necessarily taxonomically related, but they show a common adaptation to a restricted ecological habitat or environmental factors (van Steenis 1981; Ameka 2000; Ameka et al. 2002; Hoyos-Gomez & Bernal 2018).

Rheophytes can be roughly divided into three main groups or life-forms. Hydrophytic rheophytes are permanently submerged herbs. Torrenticolous rheophytes are submerged in a vegetative state, flowering periodically when waters are low. The rheophytic land plants are shrubs or herbs, some mat-rooted on rocks. Two categories of rheophytes are recognized obligate and facultative rheophytes (Ameka et al. 2002). Obligate rheophytes are confined to waterfalls, streams and riverbeds and banks, and below the flood level. Facultative types are found not only in river-beds but also occur in wet places where they are not subjected to fast-flowing water. In the Kopili River Basin, rheophytic plants or rheophytes refer to obligate rheophytes with torrenticolous and rheophytic land plants.

This unique group of plants came to the limelight in Assam during 2018–2022 with the description of three new species (*Carissa kopilii*, *Syzygium nivae*, & *Pavetta puffii*) and range expansion of two species (*Syzygium cyanophyllum* & *Ixora yunnanensis*) from Koka, Panimur area of West Karbi Anglong along the Kopili River. The Kopili River is a southern-bank tributary of the Brahmaputra River, originating in the southwestern slope of the Shillong Peak in Meghalaya. About 76% of the river lies in Assam. The total catchment area is approximately 20,560.5 km<sup>2</sup>. The basin area sees an annual rainfall of 980–1,700 mm with an average annual run-off of the basin at 600 mm, generating an average yearly flow volume of 9,023 million m<sup>3</sup> (MCM). Kopili is often noted as 'mighty' for its volume of water flow and intensity during peak monsoons causing flash floods, landslides, widespread displacement of people in the downstream.

*Pavetta puffii* was first described by Sarma et al. (2018) from Koka, Panimur, West Karbi Anglong District, Assam, on the edges of Kopili riverbed, 25.718° N, 92.822° E, alt. 102 m. *Syzygium nivae* was first reported by Sarma et al. (2019a) from the same locality 25.732° N, 92.822° E, alt. 90 m. Again Sarma et al. (2020) described *Carissa kopilii* from 25.736° N & 92.821° E, alt. 85 m. Associated rheophytic species recorded are *Syzygium cyanophyllum* (recorded after 103 years) by Sarma et al. (2019b), *Ixora yunnanensis* (New to India and range expansion of the species), *Tarenna pumila*, *Eriobotrya angustissima*, and *Syzygium polypetalum*. Moreover, recently *Heptapleuram assamicum* and *Munronia assamica* were described by Dey et.al. 2025 from the same area of the Kopili Basin. These seven species were not recorded from any other localities other than Koka, Panimur area under West Karbi Anglong and Dima Hasao districts of Assam on the banks of the river Kopili (Image 1).

A survey to document and study the rheophytes of Kopili River Basin is important for a number of reasons: (i) rheophytes are poorly known in Assam and Meghalaya, (ii) they are the dominant aquatic macrophytes in rivers; and are useful biological indicators of river health, and (iii) the diversity of rheophytes is threatened and some species are in danger of disappearing by the increased land-use practices adjoining the rivers and in the river courses for mining (e.g., sand & boulder), and also damming of rivers for hydropower (Kuetegue et al. 2019).

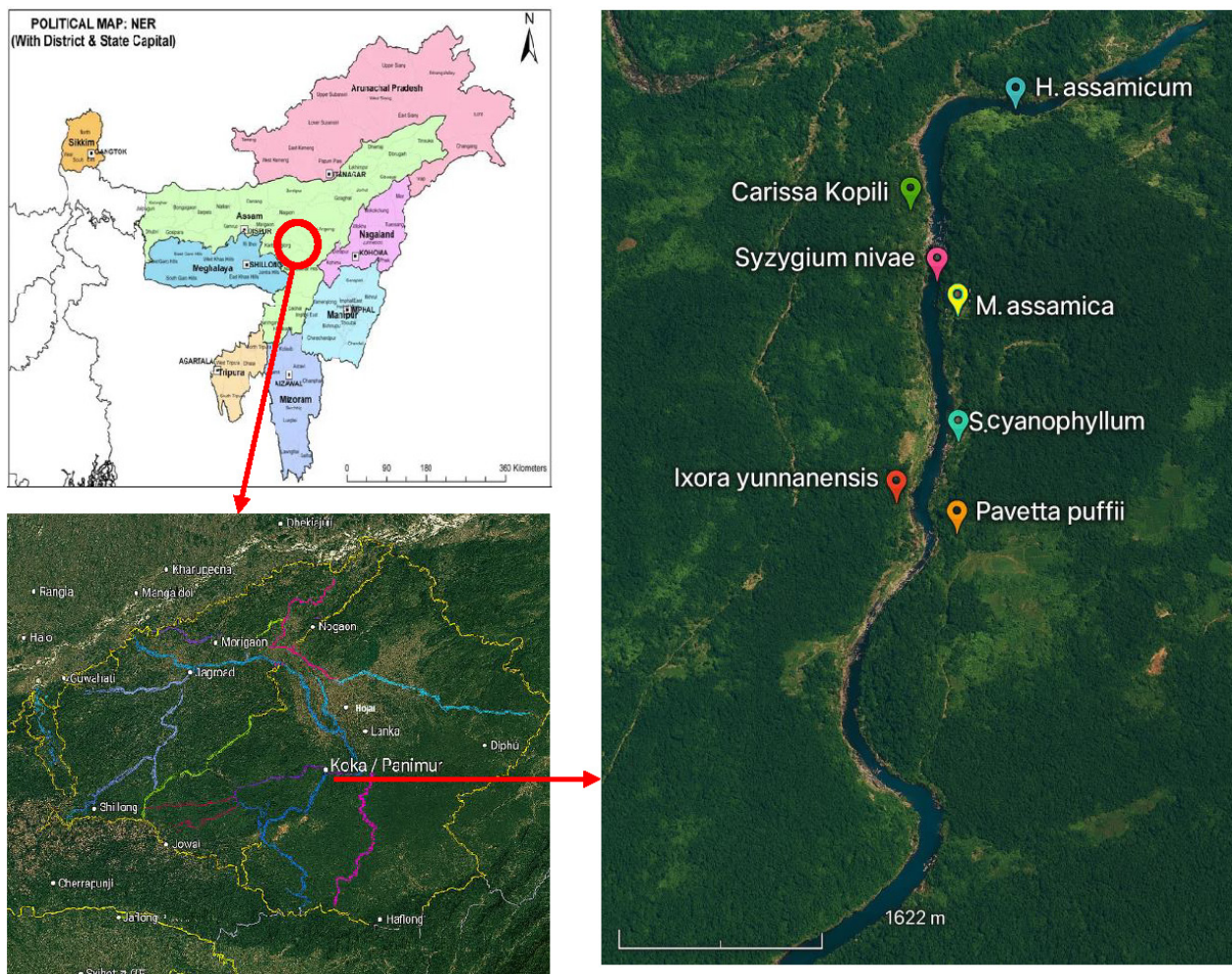
**METHODS**

A survey of rheophytes was carried out along the river and streams, in the Kopili River Basin to document the occurrence of rheophytes during April 2023–April 2025. After identifying an initial set of species based on the available literature, the authors conducted detailed field surveys timed with flowering seasons to ensure accurate documentation of the basin’s rheophyte diversity covering Assam and Meghalaya.

The rheophytes were explored by combining rafting, transect walks, and plot-based recording from water level to the upper flood level, which is a standard ecological approach to survey these unique communities. This option was deemed better than establishing fixed-area plots, as the reach of flooding is different at each point, depending on the physiography.

The rheophytic species were spotted from the boat, and every species found in the area, even those growing

on rocks in the middle of the river were collected. Species were collected, photographed, and identifications were made. Distribution maps of rheophytes of Kopili Basin were prepared using georeferenced specimen data from collected specimen labels, available literature, and from this field survey. Literature consulted were of Flora of Jowai and vicinity, Meghalaya. Vol. 1–2 (Balakrishnan 1981–1983); Forest Flora of Meghalaya. Vol. 1–2 (Haridasan & Rao 1985–1987); The Flora of British India. Vol. 1–7 (Hooker 1872–1897); Flora of Nongpoh and its vicinity. Vol. 1–3 (Joseph 1982); Flora of Assam. Vol. 1 (Kanjilal et al. 1934), Vol. 2 (Kanjilal et al. 1936), Vol. 3 (Kanjilal et al. 1938), and Vol. 4 (Kanjilal et al. 1940). Recent species descriptions of rheophytes from the West Karbi Anglong and Dima Hasao were also consulted, viz., Sarma et al. (2020) for identification of *Carissa kopilii*, Sarma et al. (2019a) for *Syzygium nivae*, Sarma et al. (2018) for *Pavetta puffii*, Sarma et al. (2019b) for *Syzygium cyanophyllum*, Sarma et al.



**Image 1.** Known localities of rheophytes in Kopili Basin in Koka Panimur area till November 2025.

(2019c) for *Ixora yunnanensis*, Dey et al. (2025a) for *Heptapleuram assamicum*, and Dey et al. (2025b) for *Munronia assamica*. Major databases like Kew’s Plants of the World Online (POWO) and the Global Biodiversity Information Facility (GBIF) were also consulted.

Based on their distribution along the river, as documented from our survey and observations, the estimated area of occupancy (EAO) of the rheophytes were calculated as per International Union for Conservation of Nature parameters (IUCN 2017).

**RESULTS**

All the rivers in the Kopili Basin were surveyed and based on the identification of vegetative and phenological stages, rheophytes were identified by consulting the existing literature. Based on the identified plants so far, distribution pattern of the rheophytes in the Kopili River Basin is described.

There are 13 tributaries of the Kopili River (Image 2). Rheophytes are present in eight tributaries in the Kopili Basin, which are Kharkor, Amring, Borpani, Digaru, Mynteng, Diyung, Umium, and Umrong rivers (Image 3). Rheophytes are also found in the main channel of the basin Kopili in the upstream of the confluence of the Amring River.

The extent of occurrence (EOO) of the rheophytes in the Kopili River basin is 460,700 ha (4,607 km<sup>2</sup>), and area of occupancy (AOO) of the rheophytes is 155.75 ha

**Table 1. Area of occupancy of rheophytes in Kopili Basin.**

	River	Hectare (ha)
1	Amring	21.76
2	Kopili	22.41
3	Barpani	49.07
4	Mynteng	18.96
5	Karkar	6.51
6	Diyung	35.32
7	Umium	0.78
8	Digarur	0.55
9	Umrong	0.38
	Total	155.75

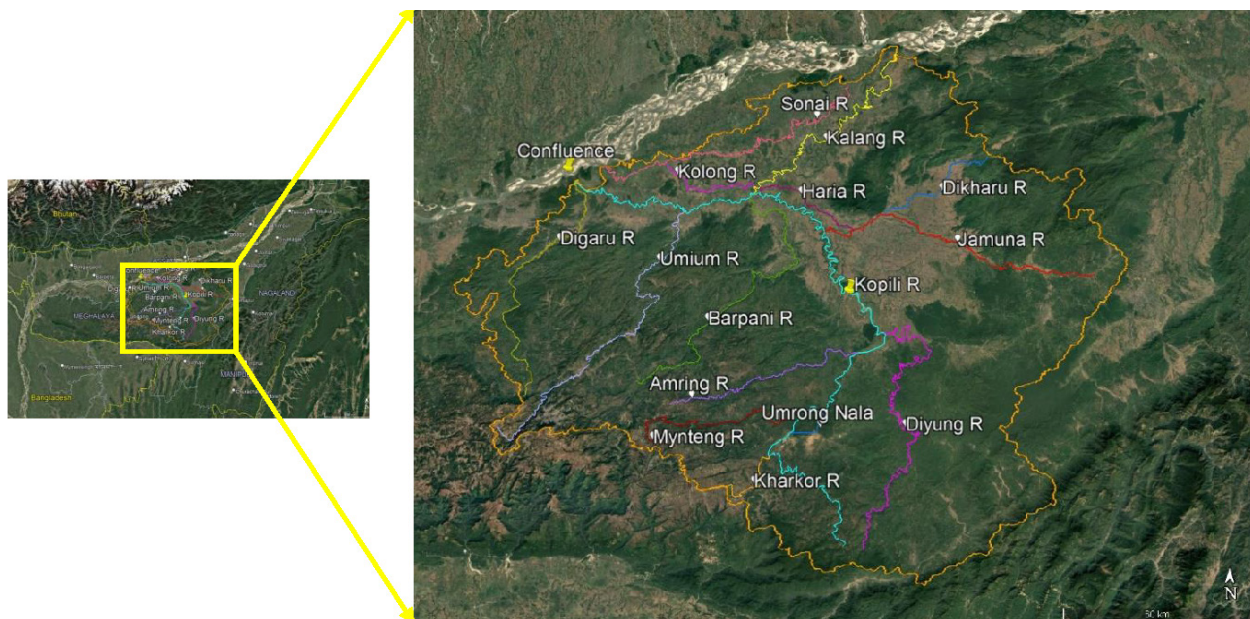
(1.5575 km<sup>2</sup>) (Image 4, Table 1).

After identification, 16 species of rheophytes were confirmed from the Kopili River Basin (Table 2 &3).

*Carissa kopilii*, *Syzygium nivae*, *Pavetta puffii*, and *Munronia assamica* are distributed in the Koka – Panimur area of West Karbi Anglong and Dima Hasao districts only.

*Syzygium cyanophyllum* was first recorded by Kanjilal et al. (1937) as *Eugenia cyanophylla* in the Dehangi area of Dima Hasao and later in 2019, it was described as *Syzygium cyanophyllum* by Sarma et al. (2019a). This species was recorded from Kopili, Amring, Diyung, Mynteng, and Barpani in Assam and Meghalaya.

*Ixora yunnanensis* was recorded in Koka - Panimur



**Image 2. Showing Kopili River Basin with its tributaries.**

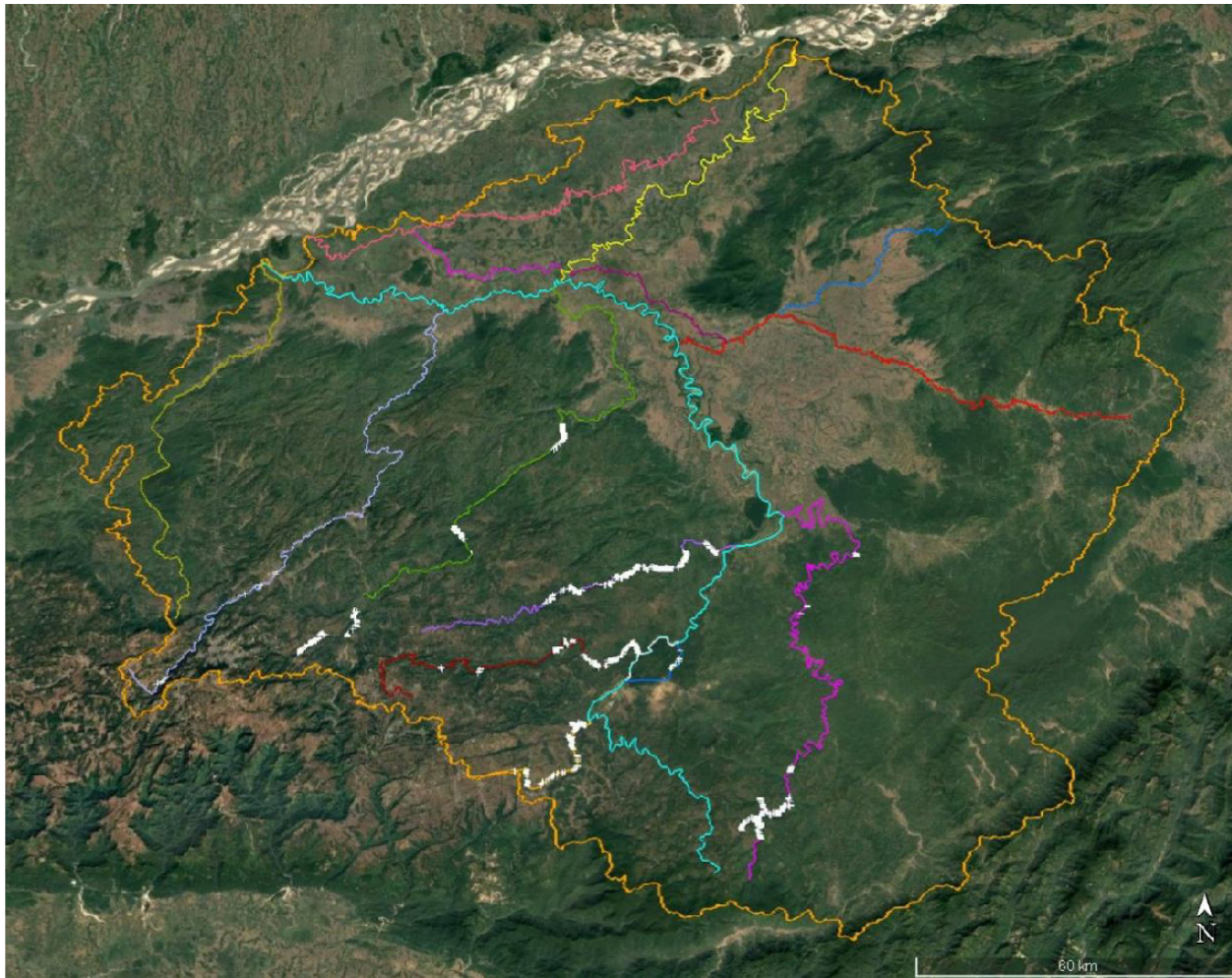


Image 3. Showing the distribution of rheophytes in Kopili Basin (white patches).

area for the first time in India by Sarma et al. (2019 c) as range expansion of the species 760 km westward from Yunnan province.

*Heptapleuram assamicum*, after its first description by Dey et al. (2025) from main stream of Kopili were also recorded from Borpani and Diyung rivers also.

*Syzygium polypetalum* is native to a region encompassing the eastern Himalaya and extending through southeastern Asia. Its primary distribution includes Assam, Arunachal Pradesh the states of India, Bangladesh and Myanmar. This species was recorded from the Kopili, Amring, Diyung, Mynteng, and Barpani rivers.

*Ficus ischnopoda* is widely distributed across tropical and subtropical Asia, native from northeastern India (Assam, Meghalaya) and Bangladesh through southeastern Asia (Myanmar, Thailand, Laos, Vietnam, Malaysia) into southern China (Yunnan, Guizhou). *Ficus ischnopoda* is also widely distributed in the Kopili Basin,

including Kopili, Amring, Barpani, Mynteng, Kharkor, Diyung, Umium, and Umrong rivers.

*Eriobotrya angustissima* is native to tropical Asia, specifically found in Assam, Meghalaya (Khasi Hills) (India) and southern Vietnam, growing in wet tropical environments. This species was recorded from Kopili, Amring, Barpani, Mynteng, Kharkor, Diyung, Umium, and Umrong rivers in the Kopili Basin.

*Phoebe angustifolia* is native to southern and southeastern Asia, specifically the Assam region of India, extending into China (southeastern Yunnan) and Indo-China (Vietnam, Myanmar, Cambodia, Laos), thriving in evergreen forests. Kopili, Amring, Barpani, Mynteng, Diyung, Umium, and Umrong rivers in the basin support the distribution of this species.

*Ficus squamosa* is found across southern and southeastern Asia, naturally distributed from the Himalaya (Nepal, Bhutan, northeastern India) through Myanmar, Thailand, Laos, China (Yunnan), and into parts

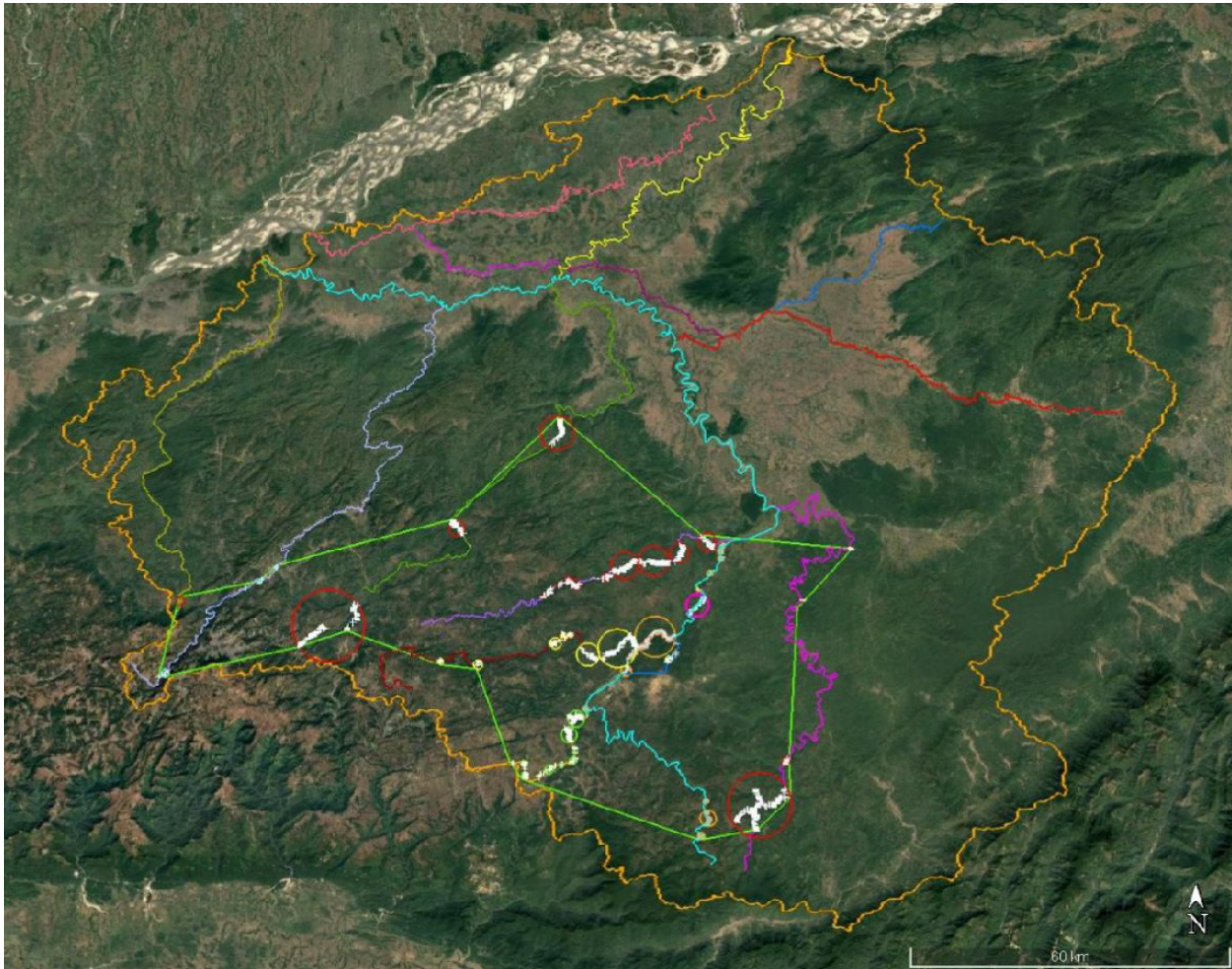


Image 4. Showing extent of occurrence and area of occupancy of rheophytes.

of Vietnam. *F. squamosa* is recorded from Kopili, Amring, Digaru, Barpani, Mynteng, and Diyung rivers.

*Homonoia riparia* is widespread across Indo-Malesia and southern China, thriving along riverbanks and flooded plains from India, Sri Lanka, and southeastern Asian nations (of Thailand, Vietnam, Philippines, Indonesia) through to New Guinea and Taiwan. This species was recorded from Kopili and Amring rivers only.

*Tarenna pumila* is a shrub native to the wet tropical biome, specifically found in Assam and Meghalaya in India. The species was recorded from the Kopili and Diyung rivers only.

*Huchimingia piscidia* is native to southern and southeastern Asia, found in India (Assam, Meghalaya, Mizoram), Myanmar, Thailand, Bangladesh, China (Yunnan, Xizang), Laos, and Vietnam. This species was distributed in the Kopili mainstream only.

*Rotala rotundifolia* is native to southern, southeastern, and eastern Asia. It's a common weed in its

native range, found across India (Assam, Andhra Pradesh, Kerala, Sikkim), Nepal, China, Japan, Thailand, and Vietnam. This species is distributed in the Kopili and Amring rivers.

The upstream reaches of the Kopili River Basin, specifically in areas like Umrangso in Assam and the Jaintia Hills of Meghalaya, have historically been and are still known for the practice of illegal rat-hole mining (Nomani et al. 2021). Acidic nature (pH range 2.9–6.0) of river water of Kharkor, Mynteng and Kopili River (up to confluence of Diyung River) makes the river not suitable for the growth of planktons and fishes. But interestingly, these rheophytes flourish in that acidic water also.

## DISCUSSION

The study confirms that the Kopili River basin provides a unique habitat for the rheophytes in Assam

Table 2. Recorded rheophytes from the Kopili River Basin.

	Species	Family	Distribution in the rivers
1	<i>Carissa kopilii</i>	Apocynaceae	Kopili, Diyung, Borpani, Amring, Mynteng
2	<i>Syzygium nivae</i>	Myrtaceae	Kopili
3	<i>Pavetta puffii</i>	Rubiaceae	Kopili
4	<i>Syzygium cyanophyllum</i>	Myrtaceae	Kopili, Amring, Diyung, Mynteng, Barpani
5	<i>Ixora yunnanensis</i>	Rubiaceae	Kopili, Diyung
6	<i>Syzygium polypetalum</i>	Myrtaceae	Kopili, Amring, Barpani, Mynteng, Kharkor, Diyung, Umium, Umrong
7	<i>Ficus ischnopoda</i>	Moraceae	Kopili, Amring, Barpani, Mynteng, Kharkor, Diyung, Umium, Umrong
8	<i>Eriobotrya angustissima</i>	Rosaceae	Kopili, Amring, Barpani, Mynteng, Kharkor, Diyung, Umium, Umrong
9	<i>Phoebe angustifolia</i>	Lauraceae	Kopili, Amring, Barpani, Mynteng, Diyung, Umium, Umrong
10	<i>Ficus squamosa</i>	Moraceae	Kopili, Amring, Digaru, Barpani, Mynteng, Diyung,
11	<i>Homonioia riparia</i>	Euphorbiaceae	Kopili, Amring,
12	<i>Tarenna pumila</i>	Rubiaceae	Kopili, Diyung,
13	<i>Heptapleuram assamicum</i>	Araliaceae	Kopili, Barpani, Diyung,
14	<i>Munronia assamica</i>	Meliaceae	Kopili
15	<i>Huchimingia piscidia</i>	Fabaceae	Kopili
16	<i>Rotala rotundifolia</i>	Lythraceae	Kopili, Amring

and Meghalaya. Sixteen species were recorded from the Kopili River Basin. Range expansion of *Carissa kopilii*, *Syzygium cyanophyllum*, *Ixora yunnanensis*, and *Heptapleuram assamicum* was established. But species like *Syzygium nivae*, *Munronia assamica*, and *Pavetta puffii* were recorded from the type locality only. The remaining nine species of rheophytes were also recorded from different river tributaries in the Kopili Basin (Table 2).

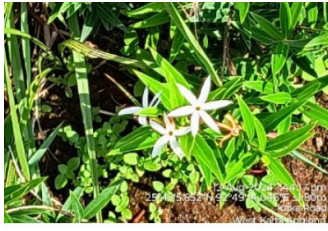
Many rheophytic species are endemic to small areas, sometimes even to a single river (van Steenis 1981, 1987), and they are useful indicators of river health (Ameka et al. 1996). Several studies have documented that rheophyte taxa are often endemic with narrow distributions and fragmented populations, making them range restricted and often threatened (Philbrick et al. 2010; Yoshimura et al. 2019; Costa et al. 2020). Furthermore, due to their particular habitat, they are the first species to become locally extinct when a river is dammed or its flow regime is altered. Rheophytes are often disregarded in the environmental impact studies made for planning dams (Integral 2012). Relocation of individuals of narrowly endemic species is a difficult alternative, which often proves unsuccessful (Zimmermann 2011). This may be particularly true for those species growing on rock crevices, or that are firmly attached to submerged rocks.

This work urges botanists, conservationists, and policy makers to do more to protect the stretches and

habitats in the Kopili River Basin of rheophytes and put in place strategies and action plans for the conservation of this important biological group.

## REFERENCES

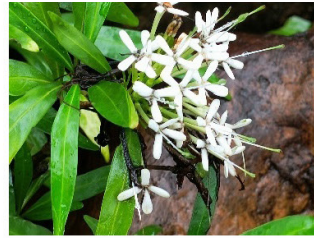
- Ameka G.K. (2000). The biology, taxonomy and ecology of the Podostemaceae in Ghana. PhD Thesis, University of Ghana, Legon.
- Ameka, G., J. Adomako, K.A.A. De Graft-Johnson, M. Cheek & M. Swaine (1996). Rheophytes in Ghana, pp. 780–782. In: van der Maesen, L.J.G., X.M. van der Burgt & J.M. van Medenbach de Rooy (eds.). *The Biodiversity of African Plants*. Wageningen Agricultural University, Netherland.
- Ameka, G.K., J.K. Adomako, K.A.A. deGraft-Johnson, M. Cheek & M.D. Swaine (2002). Rheophytes of Africa - a review. *Journal of Ghana Science Association* 4(1): 83–96.
- Balakrishnan, N.P. (1981–1983). *Flora of Jowai and vicinity, Meghalaya, Vol. 1–2*. Botanical Survey of India, Howrah.
- Costa, L.M.S., M. Goetze, A.V. Rodrigues, G.D. dos Santos Seger & F. Bered (2020). Global rheophytes data set: angiosperms and gymnosperms. *Ecology* 101(8): e03056. <https://doi.org/10.1002/ecy.3056>
- Dey, S., H.A. Barbhuya, J. Das & D. Baruah (2025). *Heptapleurum assamicum* (Araliaceae): a new species from Assam, India. *Feddes Repertorium* 136(4): 1–5. <https://doi.org/10.1002/fedr.70021>
- Dey, S, M.R.R. Layola, J. Das, D.K. Baruah, S. Roy & M. Bhaumik (2025). *Munronia assamica* (Meliaceae), a new species from India. *Gardens' Bulletin Singapore* 77(2): 259–268. [https://doi.org/10.26492/gbs77\(2\).2025-10](https://doi.org/10.26492/gbs77(2).2025-10)
- Haridasan, K. & R.R. Rao (1985–1987). *Forest Flora of Meghalaya, Vol. 1–2*. Bishen Singh Mahendra Pal Singh, Dehradun, 937 pp.
- Hooker, J.D. (1872–1897). *The Flora of British India, Vol. 1–7*. L. Reeve & Co., London.
- Hoyos-Gomez, S.E. & R. Bernal (2018). Rheophytes of the Samana Norte River, Colombia: a hydroelectric project threatens an



*Carissa kopilii*



*Syzygium nivae*



*Pavetta puffii*



*Syzygium cyanophyllum*



*Ixora yunnanensis*



*Syzygium polypetalum*



*Ficus ischnopoda*



*Eriobotrya angustissima*



*Phoebe angustifolia*



*Ficus squamosa*



*Tarenna pumila*



*Homonoia riparia*



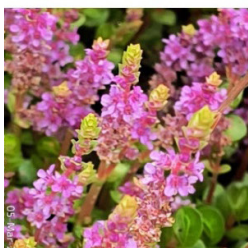
*Heptapleuram assamicum*



*Munronia assamic*



*Huchimingia piscidia*



*Rotala rotundifolia*

Image 5. Rheophytes of the Kopili River Basin. © Jayanta Das.

- Endemic flora. *Tropical Conservation Science* 11: 1–13. <https://doi.org/10.1177/1940082918756816>
- IUCN (2017)**. Guidelines for using the IUCN Red List Categories and Criteria. Version 13, Gland, Switzerland.
- Integral (2012)**. Aprovechamiento hidroeléctrico del río Samaná Norte Proyecto Porvenir II. Estudio de impacto ambiental, Medellín, Colombia: Retrieved on 24.xii.2025. [www.anla.gov.co/documentos/mecanismos\\_participacion/12538\\_AUDIENCIA\\_PUBLICA\\_PORVENIR\\_II.zip](http://www.anla.gov.co/documentos/mecanismos_participacion/12538_AUDIENCIA_PUBLICA_PORVENIR_II.zip).
- Joseph, J. (1982)**. *Flora of Nongpoh and its Vicinity, Vol. 1–3*. Botanical Survey of India, Howrah.
- Kanjilal, U.N., P.C. Kanjilal & A. Das (1936)**. *Flora of Assam, Vol. 2*. Government of Assam, Shillong.
- Kanjilal, U.N., P.C. Kanjilal, A. Das & C. Purkayastha (1934)**. *Flora of Assam, Vol. 1*. Government of Assam, Shillong.
- Kanjilal, U.N., P.C. Kanjilal, A. Das & R.N. De (1938)**. *Flora of Assam, Vol. 3*. Government of Assam, Shillong, 578 pp.
- Kanjilal, U.N., P.C. Kanjilal, R.N. De & A. Das (1940)**. *Flora of Assam, Vol. 4*. Government of Assam, Shillong.
- Kato, M. & R. Imaichi (1992)**. Leaf anatomy of tropical fern rheophytes, with its evolutionary and ecological implications. *Canadian Journal of Botany* 70(1): 165–174. <https://doi.org/10.1139/b92-022>
- Kuetegue F., B. Sonké & G.K. Ameka (2019)**. A checklist of rheophytes of Cameroon. *PhytoKeys* 121: 81–131. <https://doi.org/10.3897/phytokeys.121.29924>
- Nomani, M. Z. M., Osmani, A. R., Salahuddin, G., Tahreem, M., Khan, S. A., & Jasim, A. H. (2021)**. Environmental Impact of Rat-hole Coal Mines on the Biodiversity of Meghalaya, India. *Asian Journal of Water, Environment and Pollution* 18(1): 77–84.
- Philbrick, C.T., G.P. Bove & H.I. Stevens (2010)**. Endemism in neotropical podostemaceae. *Annals of Missouri Botanical Garden* 97: 427–456.
- Puff, C. & K. Chayamarit (2011)**. Living under water for up to four months of the year: observations on the rheophytes of the Mekong River in the Pha Taem National Park area (Thailand / Laos border), *Thai Forest Bulletin (Botany)* 39: 173–205.
- Quiroz F.A., R.A. Novelo & C.T. Philbrick (1997)**. Water chemistry and the distribution of Mexican Podostemaceae: A preliminary evaluation. *Aquatic Botany* 57(1–4): 201–212. [https://doi.org/10.1016/S0304-3770\(96\)01118-7](https://doi.org/10.1016/S0304-3770(96)01118-7)
- Sarma J., H.A. Barbhuiya & S. Dey (2018)**. A new rheophytic species of *Pavetta* (Rubiaceae) from Assam, northeast India. *Nordic Journal of Botany* 37: e02076. <https://doi.org/10.1111/njb.02076>
- Sarma J., H.A. Barbhuiya & S. Dey (2019a)**. A new rheophytic species of *Syzygium* Gaertn (Myrtaceae) from Assam, north east India. *Adansonia*, sér. 3: 41(6): 53–58. <https://doi.org/10.5252/adansonia2019v41a6>
- Sarma J, H.A. Barbhuiya, S. Dey & A. Begum (2019b)**. Rediscovery of *Syzygium cyanophyllum* (Myrtaceae): a threatened rheophytic shrub endemic to Assam, north-east India, *Wentia* 74(2): 301–305 <https://doi.org/10.1080/00837792.2019.1675261>
- Sarma J, H.A. Barbhuiya & S. Dey (2019c)**. First record of a rheophytic species *Ixora* (Rubiaceae) in India. *Acta Phytotax Geobot* 70(1): 57–61. <https://doi.org/10.18942/apg.201816>
- van Steenis, C.G.G.J. (1932)**. Report of a botanical trip to the Anambas and Natoena Islands. *Bull. Jard. Bot. Buitenzorg III*, 12:151
- van Steenis, C.G.G.J. (1981)**. Rheophytes of the World. Sijthoff & Noordhoff, Alphen aan den Rijn, The Netherlands, 470 pp.
- van Steenis, C.G.G.J. (1987)**. Rheophytes of the world: supplement. Rheophytes of the world: supplement. *Allertonia* 4: 267–330.
- Yoshimura, H., S. Arakaki,, M. Hamagawa, Y. Kitamura, M. Yokota & T. Denda (2019)**. Differentiation of germination characteristics in *Scutellaria rubropunctata* (Lamiaceae) associated with adaptation to rheophytic habitats in the subtropical Ryukyu Islands of Japan, *Journal of Plant Research* 132: 359–368.
- Zimmermann, T.G. (2011)**. Conservação e introdução da bromélia *Dyckia distachya* Hassler, uma reófito ameaçada de extinção (M. Sc. theses), Florianópolis, Brazil: Universidade Federal de Santa Catarina, Centro de Ciências Biológicas, Programa de Pós-Graduação em Biologia Vegetal.



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  
Mr. 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. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México  
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore  
Dr. Rajeesh 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 Vyasa, 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, Kalinga Foundation, Agumbe, 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 Sundev, 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, 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, Sri S. Ramasamy Naidu Memorial College, Virudhunagar, 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 paucity 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](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)

March 2026 | Vol. 18 | No. 3 | Pages: 28455–28606

Date of Publication: 26 March 2026 (Online & Print)

DOI: 10.11609/jott.2026.18.3.28455-28606

## Articles

**Predicting the potential habitat of *Tragopan blythii* (Jerdon, 1870) (Aves: Galliformes: Phasianidae) in Mehao Wildlife Sanctuary of Arunachal Pradesh, India**

– Eba Tapo & Gibji Nimasow, Pp. 28455–28467

**Composition and ecological guild structure of birds at Chaudhary Devi Lal University campus, Haryana, India**

– Harkrishan Kamboj, Vijay Singh, Vivek Goyal & Vinay Malik, Pp. 28468–28478

**New record of two natricine snakes, *Hebius gilhodesi* (Wall, 1925) and *Herpetoreas davidi* Nguyen et al., 2024 (Reptilia: Squamata: Colubridae), from India**

– Sourav Dutta, Bitupan Boruah & Abhijit Das, Pp. 28479–28494

**Diversity and distribution pattern of geometrid moths (Insecta: Lepidoptera: Geometridae) along the altitudinal gradient, Kumaun Himalaya, India**

– Narendra Singh Lotani & Chandra Singh Negi, Pp. 28495–28509

**New distribution records and taxonomic studies of ascomycetous fungi *Xylaria* and *Daldinia* (Ascomycota: Xylariales: Xylariaceae) in Karnataka, India**

– S. Bharath Kumar, A. Muthu Kumar & Praveen Kumar Nagadesi, Pp. 28510–28523

**Identification of wildlife crime hotspots in Punjab, India via kernel density estimation analysis**

– Navdeep Sood & Rohan Kumar, Pp. 28524–28533

## Communications

**Assessing nutritional status of Chital *Axis axis* (Erxleben, 1777) (Mammalia: Artiodactyla: Cervidae) through bone marrow condition of predated individuals in Kanha Tiger Reserve, India**

– Shravana Goswami, Ujjwal Kumar & Yadvendra V. Jhala, Pp. 28534–28539

**Smooth-Coated Otter *Lutrogale perspicillata* (Mammalia: Carnivora: Mustelidae) observation near a community reservoir in Bannerghatta National Park**

– Amrita Nair & Avinash Krishnan, Pp. 28540–28545

**Range extension records of Tibetan Snowcock, Tibetan Sandgrouse, and Western Tragopan in Uttarakhand, India**

– Anuj Joshi, Ranjana Pal, Vineet K. Dubey & Sambandam Sathyakumar, Pp. 28546–28551

**Morphological and statistical perspectives on genital sexual dimorphism in Eupterotidae Swinhoe, 1892 (Insecta: Lepidoptera)**

– Sujata Saini & Shabnum Shafi, Pp. 28552–28563

**Distribution of rheophytes in Kopili River Basin, Assam and Meghalaya, India**

– Jayanta Das & Deepak K. Baruah, Pp. 28564–28572

## Short Communications

**First photographic record of Smooth-coated Otter *Lutrogale perspicillata* from the canals in Upper Ganga Ramsar Site, Uttar Pradesh, India**

– Aftab Alam Usmani, Pichaimuthu Gangaiamaran, Ruchi Badola & Syed Ainul Hussain, Pp. 28573–28577

**First camera-trap evidence of a ferret badger *Melogale sp.* (Mammalia: Carnivora: Mustelidae) from the community forests of Manipur, India**

– Chingrisoror Rumthao, Monesh Singh Tomar & Sushanto Gouda, Pp. 28578–28581

**Species composition of butterflies associated with nectar feeding on *Libidibia coriaria* (Jacq.) Schltld (Magnoliopsida: Fabales: Fabaceae)**

– V. Ajay Krishna, M.P. Gopika, S. Adithyan & K.S. Aneesh, Pp. 28582–28589

**New distribution records of five species of freshwater palaemonid prawns (Crustacea: Decapoda) in Nagaland, India**

– K. Valarmathi, Pp. 28590–28593

**Range extension of the lichenized ascomycete, *Cladonia fruticulosa* Kremp., 1882 (Lecanoromycetes: Lecanorales: Cladoniaceae), from Similipal Biosphere Reserve of Odisha**

– Shubham Pradhan, Satyabrata Dash, Bijayananda Sahoo & Biswajit Rath, Pp. 28594–28599

## Notes

**First photographic record of *Chitoria sordida sordida* (Moore, 1866) (Insecta: Lepidoptera: Nymphalidae: Apaturinae) from Arunachal Pradesh, India**

– Roshan Upadhaya, Rajesh Gopinath, R. Mahesh & Gaurav Joshi, Pp. 28600–28603

**Westward range extension of the Greater Bluewing *Rhyothemis plutonia* Selys, 1883 (Insecta: Odonata: Libellulidae) into Uttarakhand, India**

– Omkar Sanjay Damle, Pp. 28604–28606

Publisher & Host



Threatened Taxa