

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.



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

Shubham Pradhan<sup>1</sup> , Satyabrata Dash<sup>2</sup> , Bijayananda Sahoo<sup>3</sup> & Biswajit Rath<sup>4</sup>

<sup>1-4</sup> Department of Biotechnology, Maharaja Sriram Chandra Bhanja Deo University, Sriram Chandra Vihar, Takatpur, Baripada, Odisha 757003, India.

<sup>1</sup>shubham9668518446@gmail.com, <sup>2</sup>satya9132@gmail.com, <sup>3</sup>bsahoo41293@gmail.com,

<sup>4</sup>brath\_2000@yahoo.com (corresponding author)

**Abstract:** The lichen diversity of the Similipal Biosphere Reserve in Odisha remains underexplored, particularly for fruticose lichens genus *Cladonia* P. Browne. The present study aims to document a specimen collected from the high-altitude region of the reserve. Morphological observations, chemical analysis, and molecular phylogenetic methods were employed for species identification. Detailed descriptions, illustrations, habitat, and ecology are provided. Previously, no specific fruticose lichen species was reported from Similipal, and the present identification evidence confirms the first record of this species from Odisha.

**Keywords:** Diversity, documentation, fruticose, habitat, high altitude, identification, lichen, morphology, phylogeny, species.

The Similipal Biosphere Reserve (SBR) situated in the northern part of Odisha in eastern India represents a significant centre of biodiversity, characterized by diverse flora and fauna (Sahu et al. 2023). The reserve encompasses heterogeneous vegetation types, high relative humidity, and largely undisturbed forest ecosystems, including stream corridors, woodland patches, valleys, and mountainous terrains. The altitude gradient and microclimatic conditions within the landscape create favourable conditions for lichen colonization and succession (Rinas 2023). Lichens, the symbiotic associations between a mycobiont (fungus)

and a photobiont (green alga and/or cyanobacterium), are widely recognized as reliable bioindicators of air quality and climatic conditions (Nash 2008). The moist tropical climate of Similipal, together with its complex topography and stable forest canopy, supports a rich assemblage of epiphytic, saxicolous, and terricolous lichen taxa (Singh & Sinha 2010; Singh & Kumar 2012). Despite the ecological importance of lichens, systematic studies on lichen diversity in Similipal Biosphere Reserve remain limited, especially for fruticose species of the genus *Cladonia*. Many areas of the reserve, particularly the core forest zones, remain poorly explored for their lichen flora. Considering the diverse habitats and favourable climate, the region may harbour previously unreported lichen taxa. Therefore, the present study aimed to survey lichen diversity in the core zone of the reserve and the fruticose lichen *Cladonia fruticulosa* was recorded from terricolous and muscicolous substrates representing a new addition to the lichen biota of Odisha.

### MATERIALS AND METHODS

#### Study area and lichen collection

The Similipal Biosphere Reserve (SBR), located in

**Editor:** Vishal Chauhan, University of Jammu, Jammu, India.

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

**Citation:** Pradhan, S., S. Dash, B. Sahoo & B. Rath (2026). Range extension of the lichenized ascomycete, *Cladonia fruticulosa* Kremp., 1882 (Lecanoromycetes: Lecanorales: Cladoniaceae), from Similipal Biosphere Reserve of Odisha. *Journal of Threatened Taxa* 18(3): 28594–28599. <https://doi.org/10.11609/jott.9846.18.3.28594-28599>

**Copyright:** © Pradhan et al. 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:** The research work is financially supported by the Science & Technology Department, Govt. of Odisha under Biju Pattnaik Research Fellowship (BPRF) [Grant no. ST-BT-MIS-0026-2023-45/ST dt.04.01.2024].

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





Mayurbhanj District, Odisha, India (21.116°–22.200° N 85.966°–86.700° E), represents a heterogeneous landscape comprising dry and moist deciduous forests, grasslands, riverine systems, valleys, and undulating mountainous terrain. The elevation range is between a minimum of 40 m and a maximum of 1,178 m. The reserve harbours rich and diverse flora and fauna, including a significant assemblage of lichenized fungi. The area experiences a moist tropical climate with annual rainfall ranging 1,200–2,000 mm. The mean maximum temperature reaches 38–44 °C during summer (May–Jun), while minimum temperatures decline to about 08–12 °C in winter (Dec–Jan). Such weather conditions, together with topographic heterogeneity and stable forest cover, provide favourable microhabitats that support lichen colonisation and succession, resulting in varied distribution patterns across substrates.

Lichen specimens were collected from different substrates using random sampling technique from transition, buffer, and core zones of SBR. The transition zone included Lulung, Sitakund, Kachudahan, Palasibeda, Digdiga, Namtidar, Tunki, Taldiha, Devkund, and Upparbarakamuda. The buffer zone comprised Bhajam, Chandanchaturi, Champajhar, Khadkei, Nigirdha, Tulasibani, Manada, and Brundeiposi. The core zone encompasses Dholabani, Kailani, Jamuani, Andharajuli, Bakua, Ghar Similipal, Jodapal, Dhudruchampa, Kukurbhuka, Hatibandha, Utras, Bariooan, Ektali, Upparbarakamuda, Jenabil, Bhanjabasa, and Meghasani.

### Morphological and chemical characterization

Lichen specimens were critically examined and differentiated based on morphological, anatomical, and chemical characters following Awasthi (2007). Macromorphological characters were analysed under a stereomicroscope (Stemi 305, Carl Zeiss), while anatomical features were analysed using a dissecting microscope (Dewinter, DGI 1000). Routine reagents, i.e., K reagent (Potassium hydroxide, KOH 10%), C reagent (Potassium hypochlorite, KClO, 5.25%) and paraphenylenediamine (PD) were used for spot tests. The voucher specimens are deposited in the National Botanical Research Institute, Lucknow (LWG).

### Molecular characterization

Molecular characterization was carried out through rRNA sequencing, including 18s, 28s, 5.8s, 1.5s, and ITS sequences. Genomic DNA was extracted from 10 mg of lichen thallus following the precipitation method of Park et al. (2014). The thallus was placed in micro vial along with three to four sterile 2.5 mm glass beads, under

liquid nitrogen and disrupted the powder by using a mini-beadbeater-24 for 30 s. This freeze-thaw disruption cycle was repeated until the sample was ground into a fine powder. Subsequently, 300 µL of KCl extraction buffer was added, and the tube was vigorously inverted by hand approximately 20 times to ensure thorough mixing. An equal volume (300 µL) of chloroform was then added, and the sample was gently inverted about 20 times before centrifugation at 12,000 rpm for one minute at room temperature. The upper aqueous phase was transferred to a 1.5 ml microcentrifuge tube, and DNA was precipitated by adding 180 µL of chilled isopropanol (60%), followed by gentle inversion. The mixture was centrifuged again at 12,000 rpm for one minute, and the DNA pellet was washed with 300 µL of chilled 70% ethanol. After drying the pellet at 50–65 °C then resuspended in 100 µL of 1× TE buffer and incubated again at 50–65 °C for five minutes to ensure complete dissolution. The purified DNA was stored at 4 °C for short-term use or at -20 °C for long-term preservation.

### PCR amplification and sequencing

PCR amplification was performed following the protocol of White et al. (1990) using universal fungal primers targeting the small subunit (SSU), large subunit (LSU), and internal transcribed spacer (ITS) regions. For SSU amplification, primers SR1R (5'-TACCTGGTTGATCCTGCCAGT-3') and SR7 (5'-GTTCAACTACGAGCTTTTAA-3') were used. LSU was amplified using primers LS1 (5'-GTACCCGCTGAACCTAAGC-3') and LS5 (5'-TCCTGAGGGAAACTTCG-3'). The ITS region was amplified using ITS5 (5'-GGAAGTAAAAGTCGTAACAAGG-3') and ITS4 (5'-TCCTCCGCTTATTGATATGC-3') (White et al. 1990), along with the fungal-specific primer nu-SSU-1583-59 (5'-CAACGAGGAATTCCTAGT-3') (DePriest 1993). PCR products were electrophoresed on 1.5% agarose gel at 120 V for 25 min to confirm amplicon size and integrity. Amplified products were purified using Exonuclease I and recombinant Shrimp Alkaline Phosphatase, and sequenced bidirectionally on an ABI 3730 Capillary Electrophoresis Genetic Analyzer. Forward and reverse sequences were edited and assembled into a consensus sequence (481 bp) using MEGA 11 and Sequencher v5 software. To align the sequences with other sequences obtained from NCBI GenBank, Clustal W was employed (Tamura et al. 2021) using MEGA 11.

## RESULTS

***Cladonia fruticulosa*** Kremp., Verh. Zool.-Bot. Ges. Wien 30: 331 (1880)

Thallus fruticose; basal squamules persistent, 2–4 mm long, 1–2 mm in diam., faintly to deeply laciniate, rarely granular-soresiate on borders or below; podetia growing from basal squamules, 0.5–2 cm rarely 4 cm tall, 0.5–1.0 mm diam., simple, rarely branched, scyphose, often partly squamulose, corticate or upper part ecorticate or almost completely ecorticate; ecorticate area partly granular-soresiate; scyphi 0.5–4 mm in diam., deformed or well defined, often with marginal scyphi; apothecia 1–2 mm in diameter, convex, pedicellate or marginal on scyphi, pale brown to dark brown; pycnidia on scyphi, 0.3–0.5 × 0.2–0.3 mm, flask-shaped, dark brown (Image 1).

Spot tests: K<sup>+</sup> UV<sup>-</sup> C<sup>-</sup>, I<sup>-</sup> (All tests negative).

Specimen examined: India, Odisha, Mayurbhanj District; elevation 1,133 m; substrate-moss, rock and red soil; date of collection 22.ii.2024; collected by Shubham Pradhan, Satyabrata Dash, Bijayananda Sahoo and Biswajit Rath; Accession No-LIC-69571; Herbarium acronym-LWG.

## Phylogenetic analysis

The evolutionary history was inferred by using the maximum likelihood method. The bootstrap consensus tree inferred from 1,000 replicates is taken to represent the evolutionary history of the taxa analysed. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (1,000 replicates) are shown below the branches. Initial tree(s) for the heuristic search were obtained automatically by applying Neighbor-Join and BioNJ algorithms to a matrix of pairwise distances estimated using the Tamura-Nei model. This analysis involved 26 nucleotide sequences. There was a total of 535 positions in the final dataset. Evolutionary analyses were conducted in MEGA11 (Tamura et al. 2021) (Figure 1).

## DISCUSSION

The family Cladoniaceae has been comprehensively investigated in the Indian subcontinent by several authors, notably Upreti (1987) and Awasthi (1988). According to the updated account of Singh & Sinha (2010), the family in India comprises four genera: *Cladia* (one species), *Cladonia* (58 species), *Gymnoderma* (one species), and *Pilophorus* (one species). A significant contribution to the taxonomy of Indian *Cladonia* was made by Ahti et al. (2002), who provided the first detailed account of several species from India, including

the description of *Cladonia singhii* Ahti & Dixit from the eastern Himalayan region. In addition, seven species of *Cladonia corniculata*, *C. kanewskii*, *C. laii*, *C. luteoalba*, *C. mauritiana*, *C. mongolica*, and *C. rei* were newly incorporated into the recent checklist of lichens of the Indian subcontinent. Furthermore, the occurrence of *Cladonia cartilaginea* in India was confirmed by Ahti et al. (2002), thereby refining the known distributional range of the genus in the region. A detailed account of the altitudinal distribution and edaphic preferences of several *Cladonia* species in India was provided by Řídká et al. (2014). *Cladonia furcata* was recorded on soil substratum at 3,250 m from Tungnath (Rudraprayag District), Uttarakhand, whereas *Cladonia rangiferina* occurred on terricolous substrata at 2,553 m between Bogdiyar and Naher Devi in Pithoragarh, Uttarakhand. *Cladonia praetermissa* was collected on soil at 1,665 m in Anuppur District, Madhya Pradesh. *Cladonia scabriuscula* exhibited a broader ecological amplitude, growing on soil substratum at 1,014 m in North Cachar (Assam) and at 1,410 m in Satara (Maharashtra). *Cladonia verticillata* was reported as terricolous at 1,890 m in Champawat, Uttarakhand, while *Cladonia fruticulosa* was documented on soil at 2,607 m in the Nilgiri Hills of Tamil Nadu. These records emphasize the predominance of terricolous (soil-inhabiting) habitats among Indian *Cladonia* species and demonstrate their adaptability across a wide altitudinal gradient from subtropical to alpine ecosystems.

Additional regional records further substantiate the expanding distributional range of *Cladonia* species in India. Reports from Sikkim by Sinha & Ram (2011) contributed to the floristic documentation of the genus in northeastern India. *Cladonia coniocraea* and *C. fruticulosa* were reported from the Mandi District of Himachal Pradesh by Thakur et al. (2020). Subsequently, Gogoi et al. (2022) documented *C. fruticulosa*, *C. scabriuscula*, *C. subradiata*, and *C. cervicornis* from Assam, indicating a broader ecological amplitude of the genus across the Indo-Burma biodiversity region.

The present detection of *C. fruticulosa* at 1,133 m altitude on red soil substratum in northern Odisha represents the first confirmed record from this phytogeographical sector. Previous diversity assessments within the Similipal Biosphere Reserve and adjoining habitats by Pradhan et al. (2025, 2026) did not include this species in their respective checklists. Therefore, the present report significantly augments the known distribution of *C. fruticulosa* in India and contributes to a more comprehensive understanding of *Cladonia* diversity in eastern habitats.

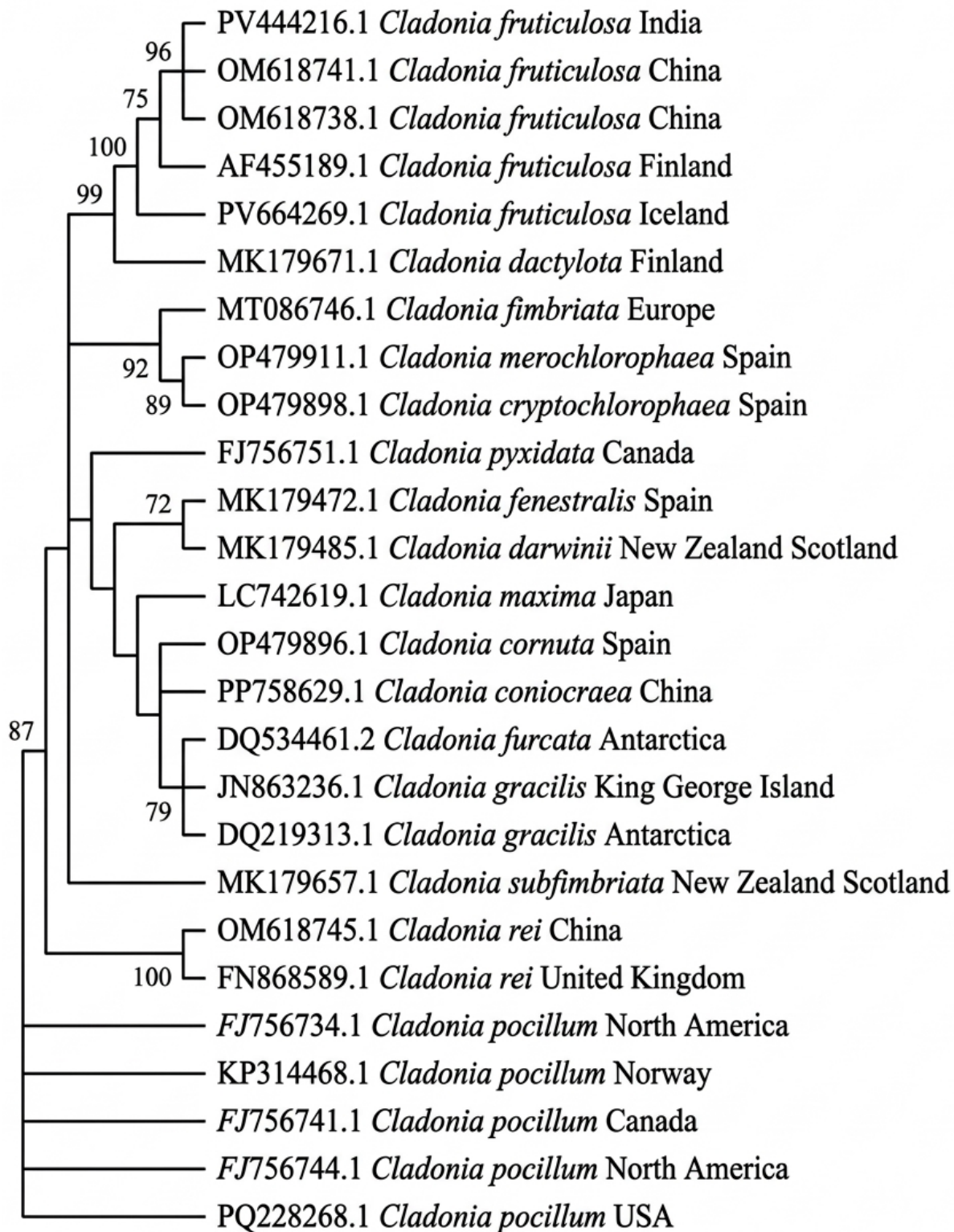


Figure 1. Evolutionary analysis by the maximum likelihood method.

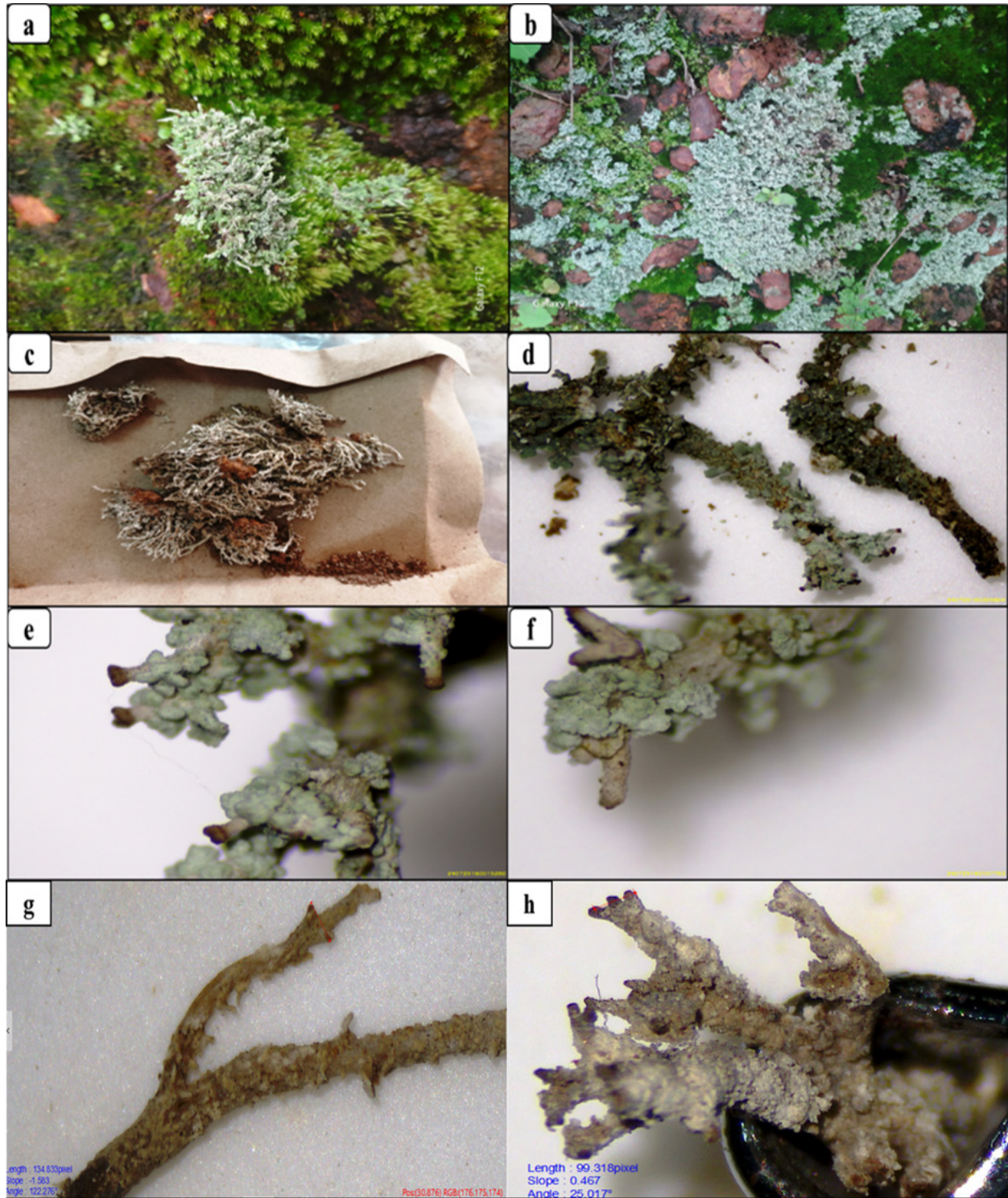


Image 1. *Cladonia fruticulosa* (Kremp): (a & b)—occurrence of lichen in moss and rocky substrate | (c)—dried specimen | (d)—bivalent branching of thallus | (e)—branching tip showing podetia | (f)—barrel-shaped pycnidia on the tip of podetia | (h)—closure view of branching pycnidia. © Shubham Pradhan.

## CONCLUSIONS

The present study records *Cladonia fruticulosa* Kremp. for the first time from the Similipal Biosphere Reserve, extending its known distribution in eastern India. Its occurrence at higher elevations indicates a preference for well-drained, open forest microhabitats with specific edaphic and microclimatic conditions. This record refines the regional species inventory of *Cladonia* and contributes to the taxonomic study of fruticose lichens in tropical forest ecosystems.

## REFERENCES

- Ahti, T., P.K. Dixit, K.P. Singh & G.P. Sinha (2002). *Cladonia singhii* and other new reports of *Cladonia* from the eastern Himalayan Region of India. *The Lichenologist* 34(4): 305–310.
- Awasthi, D.D. (1988). Lichen Flora of Eastern Himalaya. *The Journal of the Hattori Botanical Laboratory* 65: 207–302.
- Awasthi, D.D. (2007). *A Compendium of the Macrolichens from India, Nepal and Sri Lanka*. Bishen Singh Mahendra Pal Singh, Dehradun, India. 580.
- Gogoi, R., D. Devi, S. Nayaka & F. Yasmin (2022). A checklist of lichens of Assam, India. *Asian Journal of Conservation Biology* 11(1): 49–65. <https://doi.org/10.53562/ajcb.73760>
- Nash, T.H. (2008). *Lichen Biology, 2<sup>nd</sup> Edition*. Cambridge University Press, Cambridge, 486 pp. <https://doi.org/10.1017/CBO9780511790478>
- Park, S.Y., S.H. Jang, S.O. Oh, J.A. Kim & J.S. Hur (2014). An easy, rapid and cost-effective method for DNA extraction from various lichen taxa and specimens suitable for analysis of fungal and algal strains. *Mycobiology* 42(4): 311–316. <https://doi.org/10.5941/MYCO.2014.42.4.311>
- Pradhan, S., S. Dash, B. Sahoo & B. Rath (2025). Photobiont diversity in lichen symbiosis from northern Odisha (India). *International Journal on Algae* 27(3): 261–272. <https://doi.org/10.1615/InterJAlgae.v27.i3.40>
- Pradhan, S., S. Dash, B. Sahoo, S. Parida, D.K. Upreti & B. Rath (2026). Thymoquinone from *Dirinaria frostii* (Tuck.): a new promising antimicrobial compound. *Current Microbiology* 83(3): 160. <https://doi.org/10.1007/s00284-026-04746-z>
- Řídká, T., O. Peksa, H. Rai, D.K. Upreti & P. Škaloud (2014). Photobiont diversity in Indian *Cladonia* lichens, with special emphasis on the geographical patterns, pp. 53–71. In: *Terricolous Lichens in India. Diversity Patterns and Distribution Ecology*. Springer, New York, xi+98 pp.
- Rinas, C. (2023). Patterns of lichen and bryophyte diversity and distribution along a temperate to boreal elevation gradient. Ph.D Thesis, Biology Department, faculté des sciences université de sherbrooke, 216 pp.
- Sahu, H.K., B. Rath, B.K. Mohanta & D. Nayak (eds.) (2023). *Past, Present and Future of Similipal*. Newredmars Education Pvt Ltd, 246 pp.
- Singh, K.P. & K. Kumar (2012). A note on the lichens from Similipal Biosphere Reserve. *Indian Journal of Forestry* 35(3): 383–390. <https://doi.org/10.54207/bsmps1000-2012-314ALM>
- Singh, K.P. & G.P. Sinha (2010). *Indian Lichens: An Annotated Checklist*. Botanical Survey of India, Kolkata, 572 pp.
- Sinha, G.P. & T.A.M. Ram (2011). *Lichen Diversity in Sikkim. Biodiversity of Sikkim*. Exploring and Conserving a Global Hotspot, 542 pp.
- Tamura, K., G. Stecher & S. Kumar (2021). MEGA11: Molecular evolutionary genetics analysis version 11. *Molecular Biology and Evolution* 38(7): 3022–3027. <https://doi.org/10.1093/molbev/msab120>
- Thakur, M., G.K. Mishra, S. Nayaka & H. Chander (2020). An assessment of lichen diversity from Mandi District, Himachal Pradesh, India. *International Journal of Plant and Environment* 6(4): 277–282. <https://doi.org/10.18811/ijpen.v6i04.06>
- Upreti, D.K. (1987). Key to the species of lichen genus *Cladonia* from India and Nepal. *Feddes Repertorium*, 98(7–8): 469–473.
- von Krempelhuber, A. (1880). *Cladonia fruticulosa*. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien* 30: 331.
- White, T.J., T. Bruns, S. Lee & J. Taylor (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics, pp. 315–322. In: *PCR Protocols: A Guide to Methods and Applications*. Academic Press, 482 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  
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

**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

#### 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



[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