

Building evidence for conservation globally

Journal of Threatened TAXA

10.11609/jott.2025.17.3.26571-26762

www.threatenedtaxa.org

26 March 2025 (Online & Print)

17(3): 26571-26762

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)



Open Access





Publisher

Wildlife Information Liaison Development Societywww.wild.zooreach.org

Host

Zoo Outreach Organizationwww.zooreach.org

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

EDITORS

Founder & Chief Editor

Dr. Sanjay Molur

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

Assistant Editor

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

Managing Editor

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

Associate Editors

Dr. Mandar Paingankar, Government Science College Gadchiroli, Maharashtra 442605, India**Dr. Ulrike Streicher**, Wildlife Veterinarian, Eugene, Oregon, USA**Ms. Priyanka Iyer**, ZOO/WILD, Coimbatore, Tamil Nadu 641006, India

Board of Editors

Dr. Russel Mittermeier

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

Prof. Mewa Singh Ph.D., FASc, FNA, FNAsc, FNAPsy

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

Stephen D. Nash

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

Dr. Fred Pluthero

Toronto, Canada

Dr. Priya Davidar

Sigur Nature Trust, Chadapatti, 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 Madgunki**, 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, Kuvenpu University, Shimoga, Karnataka, India**Dr. K.R. Sridhar**, Mangalore University, Mangalagangotri, Mangalore, Karnataka, India**Dr. Gunjan Biswas**, Vidyasagar University, Midnapore, West Bengal, India**Dr. Kiran Ramchandra Ranadive**, Annaheb 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. Ferdinand 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, Anantapur, 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 Ranjan Housing Society, Pune, Maharashtra, India**Prof. A.J. Solomon Raju**, Andhra University, Visakhapatnam, India**Dr. Manda Datar**, Agharkar Research Institute, Pune, Maharashtra, India**Dr. M.K. Janarthanam**, Goa University, Goa, India**Dr. K. Karthigeyan**, Botanical Survey of India, India**Dr. Errol Vela**, University of Montpellier, Montpellier, France**Dr. P. Lakshminarasiham**, Botanical Survey of India, Howrah, India**Dr. Larry R. Noblick**, Montgomery Botanical Center, Miami, USA**Dr. K. Haridasan**, Pallavur, Palakkad District, Kerala, India**Dr. Analinda Manila-Fajard**, University of the Philippines Los Banos, Laguna, Philippines**Dr. P.A. Siru**, 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. Warrier**, Institute of Forest Genetics and Tree Breeding, Tamil Nadu, India**Invertebrates****Dr. R.K. Avasthi**, Rohtak University, Haryana, India**Dr. D.B. Bastawade**, Maharashtra, India**Dr. Partha Pratim Bhattacharjee**, Tripura University, Suryamaninagar, India**Dr. Kailash Chandra**, Zoological Survey of India, Jabalpur, Madhya Pradesh, India**Dr. Ansie Dippenaar-Schoeman**, University of Pretoria, Queenswood, South Africa**Dr. Rory Dow**, National Museum of natural History Naturalis, The Netherlands**Dr. Brian Fisher**, California Academy of Sciences, USA**Dr. Richard Gallon**, Ilandudno, North Wales, LL30 1UP**Dr. Hemant V. Ghate**, Modern College, Pune, India**Dr. M. Monwar Hossain**, Jahangirnagar University, Dhaka, BangladeshFor Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scopeFor Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: A bag worm with its beautiful heap of junk. Acrylics on 300 GSM paper by Dupati Poojitha based on a picture by Sanjay Molur.



***Calvatia craniiformis* (Schwein.) Fr. ex De Toni (Agaricomycetes: Lycoperdaceae): a new puffball mushroom record from eastern India**

Asit Mahato¹ , Pritish Mitra² , Sabyasachi Chatterjee³  & Subrata Raha⁴ 

^{1,4} Department of Botany, Sidho-Kanho-Birsha University, Purulia, West Bengal 723104, India.

^{2,3} PG Department of Botany, Ramananda College, Bishnupur, Bankura, West Bengal 722122, India.

¹ asitbotany1996@gmail.com, ² pritishmitramicrobiology@gmail.com, ³ schatterjeebiotech@gmail.com,

⁴ subrata-raha@skbu.ac.in (corresponding author)

Abstract: The present study reports the occurrence of *Calvatia craniiformis*, collected during early monsoon, from the forest floor of Ajodhya Hills, near Teliabhasa village in the Baghmundi Block of Purulia District, West Bengal. The identity of the taxon was revealed through macro- and micro-morphological characterization, followed by nrITS based phylogenetic analyses, representing a first report from eastern India. A detailed description, scanning electron microscopy micrographs and molecular phylogeny are provided.

Keywords: Agaricales, brain puffball, micro-morphology, nrITS phylogeny, SEM, taxonomy.

Calvatia Fr. is a gasteroid fungus belonging to the family Lycoperdaceae F.Bercht. & J.Presl., commonly known as puffball mushrooms. The genus was established in 1859 by Fries and is typified by *Calvatia craniiformis* (originally described as *Bovista craniiformis* Schwein.). It represents a group that includes some of the largest-sized puffballs. The name *Calvatia* is derived from the Latin word 'calvus' meaning 'bald' (Hedavoo 2020). The specific epithet *craniiformis* is derived from two Latin words: *cranion* meaning 'skull' and *forma* meaning 'form', referring to the resemblance of the puffball to a human brain. Consequently, it is also commonly called

Skull Puffball or Brain Puffball (Marshall 2003; Hard 2009; Hawkeswood 2019; Gogoi & Kumar 2020). The genus *Calvatia* is characterized by a soft, pyriform to globose, turbinate, and epigeous basidiome; cottony to pulverulent gleba; simple and well-developed subgleba, dehiscence by irregular rupturing of peridium rather than by an apical pore; *Calvatia*-type capillitium, and basidiospores smooth to ornamented (verrucose and echinate) (Krüger et al. 2001; Coetze & Wyk 2009).

At present, 47 species of *Calvatia* are accepted. *C. craniiformis* has been reported from various countries, including Australia, China, Indonesia, Japan, Malaysia, South Korea, Thailand, and the United States (Jung 1995; Bates et al. 2009; Hosaka & Uno 2012; Hawkeswood 2019; Gogoi & Kumar 2020; Yuwa-Amornpitak & Yeunyaw 2020; Patel & Rajput 2024). In India, approximately 25 species of *Calvatia* have been reported from different regions. Based on their current taxonomic status, only 15 species are accepted, while several have been synonymised with other genera or species (Patel & Rajput 2024). Few reports on *C. craniiformis* from India have been achieved from southern India (Abrar et al. 2008), northeastern India (Gogoi & Kumar 2020), and northern part of Western Ghats (Kshirsagar et al. 2020). Earlier,

Editor: Vishal Kumar, University of Jammu, Jammu, India.

Date of publication: 26 March 2025 (online & print)

Citation: Mahato, A., P. Mitra, S. Chatterjee & S. Raha (2025). *Calvatia craniiformis* (Schwein.) Fr. ex De Toni (Agaricomycetes: Lycoperdaceae): a new puffball mushroom record from eastern India. *Journal of Threatened Taxa* 17(3): 26721-26726. <https://doi.org/10.11609/jott.9283.17.3.26721-26726>

Copyright: © Mahato et al. 2025. 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: SVMCM Scholarship, GoWB.

Competing interests: The authors declare no competing interests.

Acknowledgements: The authors credit Dr. Kalosona Paul, assistant professor, Department of Geography, Sidho-Kanho-Birsha University, Purulia, West Bengal for preparation of site map.



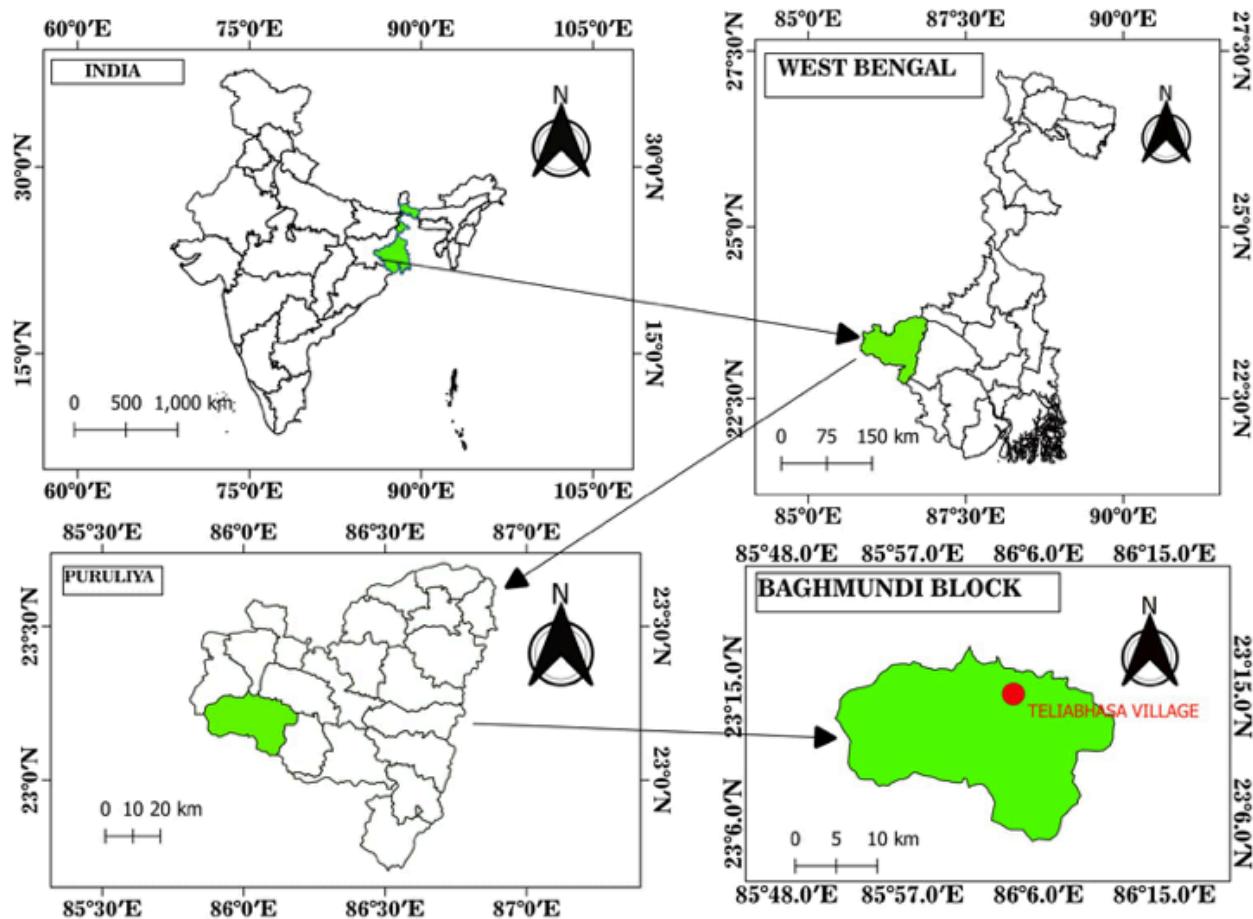


Figure 1. Location of study site on map.

the species has been found growing in humus-rich soil with leaf litter (Hawkeswood 2019), as well as in open ground and meadows (Abrar et al. 2008). Additionally, *C. craniiformis* is recognized as an important source of food and traditional medicine, with reported antifungal properties (Gogoi & Kumar 2020).

In the present investigation, the isolated fungal strain was identified as *Calvatia craniiformis* through combined approach of morpho-taxonomy and molecular phylogenetic characterization and revealed as first report from eastern India.

MATERIALS AND METHODS

Collection site

The specimen was collected from the dry deciduous, humus-rich forest floor of a sacred grove, 'Jaherthan', near Teliabhasa Village in the Ajodhya Hills, Purulia, West Bengal at an altitude of 647 m (Figure 1). The specimens were found growing either in clusters or scattered during June 2023. Fresh fruiting bodies were sampled, dried and preserved for further studies.

Morpho-anatomical analysis

Macro-morphological and substrate details of fresh, young to mature basidiomata were recorded in the field or at the respective basecamps, including colour, odour, texture, substratum, and size of the basidiomata. Images of the basidiomata were captured by Realme 8, 64MP AI quad-camera. The collected specimens were dried overnight in a hot air oven at 60°C and preserved in sealed plastic bags with silica gel. An herbarium record of the collected specimens was deposited in the Department of Botany, Sidho-Kanho-Birsha University, Purulia. Colour code followed the Methuen Handbook of Colour (Kornerup & Wanscher 1967). Micromorphological characters were observed by preparing free hand sections of dried samples, mounted in a mixture of 3% KOH, 2% Congo Red and observed under the microscope (Leica DM 3000 LED). Images were captured using a digital camera (Leica MC 190 HD). SEM analyses were done to study the ornamentation of basidiospores using the model JEOL JCM-6000 Plus Benchtop. Basidiospores were collected from dried gleba, placed in a water

droplet, and mixed gently. The mixture was immediately pipetted onto a cover glass, dried, placed on a stub and coated with the gold (Hansen et al. 1999).

Molecular characterization and phylogenetic tree analysis

Genomic DNA of *C. craniiformis* was extracted from a dried powder sample of basidiomata following Aamir et al. (2015) and amplified using ITS1 and ITS4 as forward and reverse primers, following White et al. (1990). PCR products were purified using the QIAGEN QIA quick PCR Purification Kit and sequenced using the Sanger sequencing method (Kshirsagar et al. 2020). The size of PCR product was estimated by comparing the migration distance of SRAM-220626 to the loaded DNA ladder and confirmed using NEBcutter V1.0 (Vincze et al. 2003). The nBlast program of NCBI (National Centre for Biotechnology Information) database was used to analyze the obtained raw sequences and compare them with available fungal sequences in the database.

The dataset was prepared using partial 18S rRNA gene sequence of SRAM-220626 obtained in this study, along with other retrieved sequences from the GenBank database, with *Termitomyces heimii* Natarajan as an outgroup. Sequences were aligned using the ClustalW program in MEGA11 (Tamura et al. 2021). Molecular phylogeny was determined using the RAxML-HPC2 Workflow on XSEDE programme of RAxML v.8.2.10 with a bootstrap value of 1000 (Kantharaja & Krishnappa 2022) and visualized with FigTree software v 1.4.4 (Rambaut 2018). The newly generated sequence has been submitted to GenBank.

RESULTS

Taxonomy

Calvatia craniiformis (Schwein.)

Fr. ex De Toni, Syll. Fung. 7: 106 (1888)

(Image 1 A–D)

GenBank accession number OR185460

Basidiomata gasteroid, 50–80 mm high and 40–70

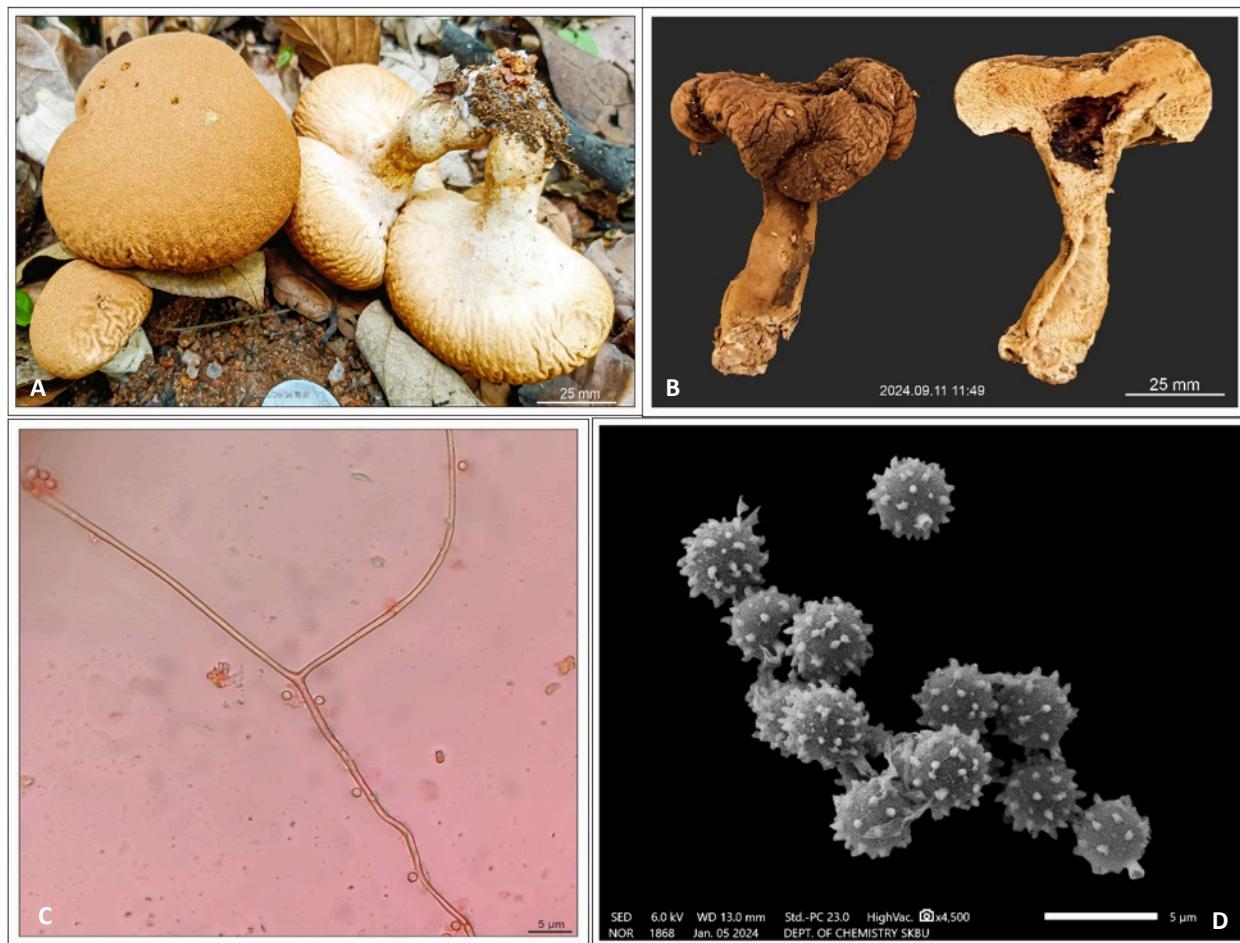


Image 1. Basidiomata, capillitium hyphae and spores of *Calvatia craniiformis*: A—Basidiomata of *Calvatia craniiformis* | B—Gleba of dry fruit body | C—Capillitium thread | D—SEM of spores. © Asit Mahato.

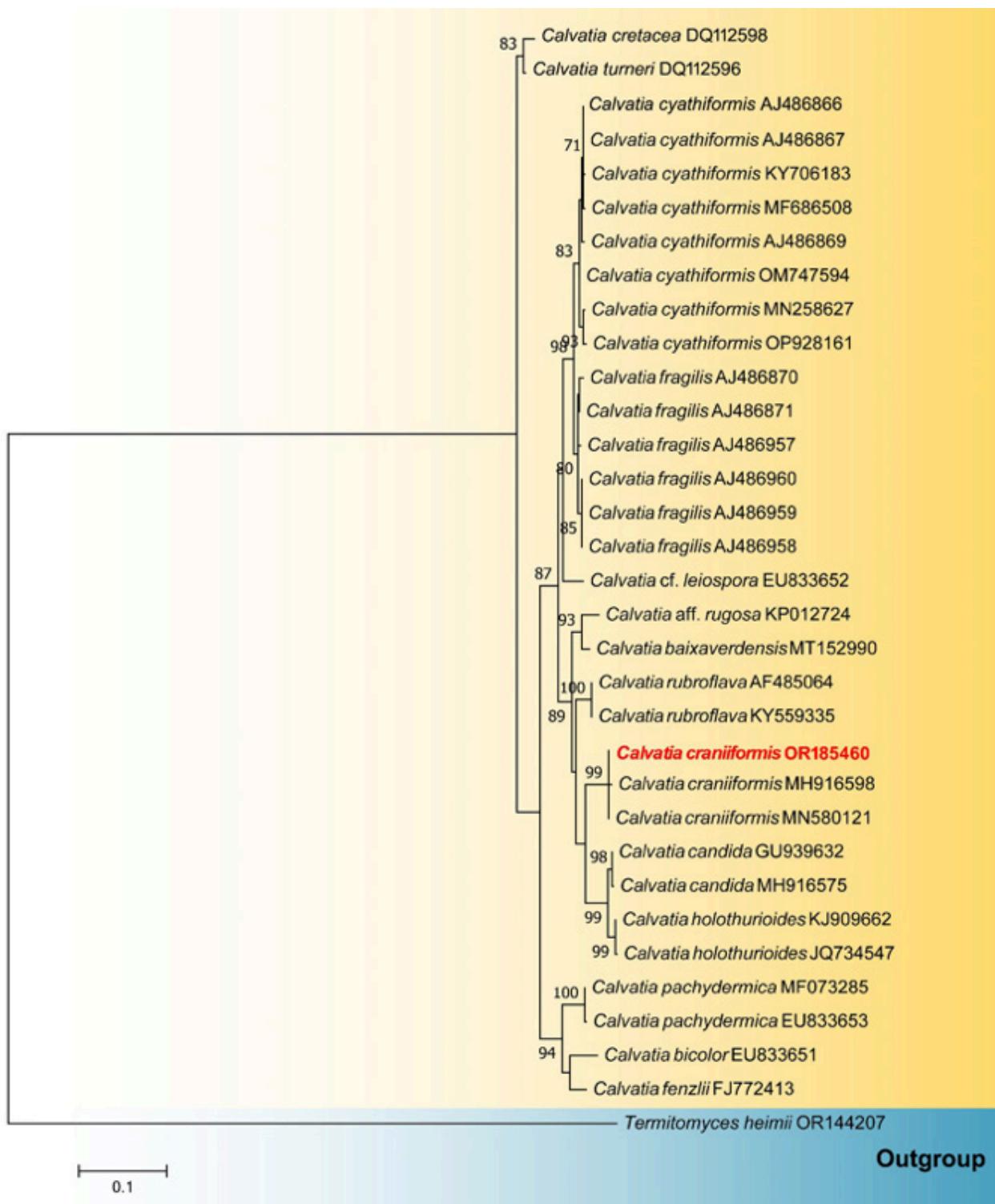


Figure 2. Phylogenetic tree based on 18S rRNA sequence analysis showing genetic relationship among different *Calvatia* species, including isolate *Calvatia craniiformis* SRAM-220626 (OR185460) and *Termitomyces heimii* used as outgroup. The tree was inferred by RAxML programme with 1,000 bootstrap value.

mm broad, epigeous, medium to large-sized, globose to turbinate, dry, low hygrophanous, wrinkled, splitted, lacinate, rivulose, brownish-yellow (5C7) to yellowish-brown (5D8), with an anise-like to unpleasant odor, and a mild taste. Two or more separate fruit bodies arise from a single basal position; ostiole absent. Stipe central, subclavate, glandular-dotted, arid, with moderate basal tomentum, white to brownish, unbranched or branched.

Peridium smooth to wrinkled, folded, and pulverulent. Exoperidium thin, granulose, yellowish-brown, and darker than the endoperidium. Endoperidium papery, white to brownish-white.

Gleba yellowish-white (4A2) to light brown (5D7), solid when young, becoming spongy and cottony at maturity. Capillitia *Calvatia*-type, occasionally branched, light brown, septate 2–4 μm , straight to undulate. Basidia not observed.

Basidiospores (2.3) 2.5–3.5 (3.8) \times (2) 2.2–3.1 (3.3), $3.1 \pm 0.43 \times 2.6 \pm 0.73 \mu\text{m}$, globose to subglobose, echinulate with spinulose to spinose ornamented under SEM, spines measuring 0.65–0.75 μm in length; pedicellate, with hyaline pedicels.

ITS Sequences and Phylogeny analysis

NEBcutter V1.0 indicated that the length and GC content of the generated sequence are approximately 600 bp and 44.2%, respectively. The BLAST program of NCBI inferred that the strain, SRAM-220626, is closely clustered with *C. craniiformis* CMIS (MN580121) from Thailand and *C. craniiformis* C2 (MH916598) from India. Phylogenetic tree analysis based on nrITS sequences of 52 different *Calvatia* species, along with the Indian isolate of *C. craniiformis*, was conducted using *Termitomyces heimii* as an outgroup (Figure 2). The analysis revealed that *C. craniiformis* CMIS, *C. craniiformis* SRAM-220626 and *C. craniiformis* C2 cluster together in the same clade with a strong ML bootstrap support (MLbs = 99%).

DISCUSSION

Based on a combined approach of macro- and micro-morphological characterization, along with molecular phylogenetic analyses, the Indian collection was confirmed as *Calvatia craniiformis*. The present collection also shows similarities with other Asian collections of *C. craniiformis* from different regions of India, as reported by Abrar et al. (2008), Gogoi & Kumar (2020), Kshirsagar et al. (2020), and mentioned the size of the mature basidiomata as: 50–150 \times 60–120 mm, 70–200 \times 70–180 mm, and 30–35 \times 20–30 mm, respectively. Notably, the size of the mature basidiomata in the present study is relatively smaller than the specimens examined by Gogoi

& Kumar (2020) and Abrar et al. (2008) but significantly larger than the collections described by Kshirsagar et al. (2020), while the basidiospores are comparatively smaller than those described by Kshirsagar et al. (2020). This investigation represents the first report of *Calvatia craniiformis* from West Bengal and eastern India, contributing to regional mycological knowledge and expanding the distributional range of the species in the Indian subcontinent.

REFERENCES

Aamir, S., S. Sutar, S.K. Sing & A. Baghela (2015). A rapid and efficient method of fungal genomic DNA extraction, suitable for PCR based molecular methods. *Plant Pathology & Quarantine* 5(2): 74–81. <https://doi.org/10.5943/ppq/5/2/6>

Abrar, S., S. Swapna & M. Krishnappa (2008). *Bovista aestivalis* and *Calvatia craniiformis*—new records to India. *Journal of Mycology and Plant Pathology* 38(3): 504–506.

Bates, S.T., R.W. Roberson & D.E. Desjardin (2009). Arizona gasteroid fungi I: Lycoperdaceae (Agaricales, Basidiomycota). *Fungal Diversity* 37(153): 249–259.

Coetzee, J.C. & A.E.V. Wyk (2009). The genus *Calvatia* ('Gasteromycetes,' Lycoperdaceae): A review of its ethnomycology and biotechnological potential. *African Journal of Biotechnology* 8(22): 6007–6015. <https://doi.org/10.5897/AJB09.360>

Gogoi, G. & R. Kumar (2020). *Calvatia craniiformis* (Schwein.) Fr. ex De Toni (Brain Puffball)—New report from north-east India. *Journal Tropical Plant Research* 7(3): 651–652. <https://doi.org/10.22271/tpr.2020.v7.i3.082>

Hansen, K., D.H. Pfister & D.S. Hibbett (1999). Phylogenetic relationships among species of *Phillipia* inferred from molecular and morphological data. *Mycologia* 91(2): 299–314. <https://doi.org/10.1080/00275514.1999.12061020>

Hard, M.E. (2009). *The Mushroom, Edible and Otherwise: Its Habitat and its Time of Growth*. The Ohio Library Company Distributors Columbus, Ohio, 598 pp.

Hawkeswood, T.J. (2019). A record of the brain fungus, *Calvatia craniiformis* (Schwein.) Fr. ex De Toni (1849) (Basidiomycota: Agaricaceae) from Maraylya, New South Wales, Australia. *South Asian Research Journal of Biology and Applied Biosciences* 1(1): 1–3. <https://doi.org/10.36346/sarbab.2019.v01i01.001>

Hedavoo, G.B. (2020). *Calvatia* species: wild edible Puffballs from Amravati Region (MS). *Plantae Scientia* 3(4): 30–34. <https://doi.org/10.32439/ps.v3i4.30-34>

Hosaka, K. & K. Uno (2012). A preliminary survey on larval diversity in mushroom fruit bodies. *Bulletin of the National Museum of Nature and Science, Series B* 391(3): 77–85.

Jung, H.S. (1995). Fungal flora of Ullung Island (VI)—on ascomycetous, auriculariaceous, and gasteromycetous fungi. *The Korean Journal of Mycology* 23(1): 1–9.

Kantharaja, R. & M. Krishnappa (2022). Amanitaceous fungi of central Western Ghats: taxonomy, phylogeny, and six new reports to Indian mycobiota. *Journal of Threatened Taxa* 14(4): 20890–20902. <https://doi.org/10.11609/jott.7801.14.4.20890-20902>

Kornerup, A. & J.H. Wanscher (1967). *Methuen Handbook of Colour*. Eyre Methuen, London, 243pp

Krüger, D., M. Binder, M. Fischer & H. Kreisel (2001). The Lycoperdales. A molecular approach to the systematics of some gasteroid mushrooms. *Mycologia* 93(5): 947–957. <https://doi.org/10.1080/0275514.2001.12063228>

Kshirsagar, Y., A. Baghela & M. Borde (2020). Morphological, ultrastructural and phylogenetic study of *Calvatia candida* and *Calvatia craniiformis* reported from northern Western Ghats of

India. *Current Research in Environmental & Applied Mycology (Journal of Fungal Biology)* 10(1): 103–112. <https://doi.org/10.5943/cream/10/1/11>

Marshall, N.L. (2003). *Mushroom Book*. Kessinger Publishing, Montana, 380 pp.

Patel, R.S. & K.S. Rajput (2024). An integrative taxonomic and molecular identification of *Calvatia holothurioides* (Lycoperdaceae): the present status of genus *Calvatia* in India. *Plant Biosystems* 158(6): 1443–1454. <https://doi.org/10.1080/11263504.2024.2421237>

Rambaut, A. (2018). Figtree 1.4.4 software. Institute of Evolutionary Biology, University of Edinburgh, Edinburgh. <http://tree.bio.ed.ac.uk/software/figtree/>. Accessed 7 January 2025.

Tamura, K., G. Stecher & S. Kumar (2021). MEGA11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution* 38(7): 3022–3027. Accessed 7 January 2025. <https://doi.org/10.1093/molbev/msab120>

Vincze, T., J. Posfai & R.J. Roberts (2003). NEBcutter: a program to cleave DNA with restriction enzymes. *Nucleic Acids Research* 31: 3688–3691. Accessed 7 January 2025. <http://tools.neb.com/NEBcutter>

White, T.J., T. Bruns, S. Lee & J. Taylor (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. *PCR Protocols: A Guide to Methods and Applications* 18(1): 315–322. <https://doi.org/10.1016/B978-0-12-372180-8.50042-1>

Yuwa-Amornpitak, T. & P.N. Yeunyaw (2020). Diversity of wild mushrooms in the community forest of Na Si Nuan sub-district, Thailand. *Journal of Biochemical Technology* 11(3): 28–36.



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. Karen 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 Al Kuwait Real Estate. Co. K.S.C., Kuwait
Dr. Himender Bharti, Punjabi University, Punjab, India
Mr. Purnendu Roy, London, UK
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore
Dr. Lional 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. Karen 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. Priyadarshan 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. Priyadarshan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

Fishes

Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India
Dr. Akhilesh KV, 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. Raja Vyas, Vadodara, Gujarat, India
Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey
Prof. Chandrashekher U. Rironker, Goa University, Taleigao Plateau, Goa, India
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

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. Biju, 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 Jayopal, 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 Inskip, Bishop Auckland Co., Durham, UK
Dr. Tim Inskip, 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, The American College, Madurai, Tamil Nadu, India
Dr. Paul Bates, Harison Institute, Kent, UK
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA
Dr. Dan Challender, University of Kent, Canterbury, UK
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India
Prof. Karan Bahadur Shah, Budhanilkantha Municipality, Kathmandu, Nepal
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraya, 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 Helleni 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. Bharat 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

Articles

***Dasymaschalon leilamericanum* (Annonaceae), a new species with evidence of non-monophyly from Mount Lantoy Key Biodiversity Area, Philippines**

– Raamah Rosales, Edgardo Lillo, Archiebald Baltazar Malaki, Steve Michael Alcazar, Bernardo Redoblado, John Lou Diaz, Inocencio Buot Jr., Richard Parilla & Jessica Rey, Pp. 26571–26586

Association analysis of *Castanopsis tungurut* and the neighboring vegetation community in Cibodas Biosphere Reserve, Indonesia

– Dian Ridwan Nurdiana & Inocencio E. Buot, Jr., Pp. 26587–26598

Riparian flora of Haveri District, Karnataka, India

– Ningaraj S. Makanur & K. Kotresha, Pp. 26599–26615

Conservation strategies for *Vatica lanceifolia* (Roxb.) Blume: habitat distribution modelling and reintroduction in northeastern India

– Puranjoy Mipun, Amritee Bora, Piyush Kumar Mishra, Baby Doley & Rinku Moni Kalita, Pp. 26616–26626

Patterns and economic impact of livestock predation by large carnivores in protected areas of southern Kashmir, India

– Lubna Rashid & Bilal A. Bhat, Pp. 26627–26635

People perception on use patterns and conservation of Chinese Pangolin

in and around Yangouopkpi Lokchao Wildlife Sanctuary, Manipur, India

– Yengkham Roamer Zest, Awadhesh Kumar, Om Prakash Tripathi, Rakesh Basnett & Dipika Parbo, Pp. 26636–26647

Communications

Population status, threats, and conservation of *Trachycarpus takil*: an endemic and threatened plant species in western Himalaya, India

– Himani Tiwari, Dhanji Arya & K. Chandra Sekar, Pp. 26648–26654

A checklist of fishes of Haiderpur wetland, western Uttar Pradesh, India

– Rahul Rana, Jeyaraj Antony Johnson & Syed Ainul Hussain, Pp. 26655–26668

An avifaunal checklist of the Zanskar Region, Ladakh Himalaya, India

– Abid Hussain, Zakir Hussain & Mumtaz Ali, Pp. 26669–26679

Breeding tern colonies on the sandbars of Adam's Bridge, India: new records and significance

– H. Byju, H. Maitreyi, N. Raveendran, D.A. Marshal & S. Ravichandran, Pp. 26680–26689

Assessment of nest and nesting activities of White-bellied Heron *Ardea insignis* Hume, 1878 (Aves: Ardeidae) in the broad-leaved forests of northeastern India

– Himadri Sekhar Mondal & Gopinathan Maheswaran, Pp. 26690–26696

Preliminary checklist of avifauna from All India Institute of Medical Sciences, Guwahati, Assam, India

– Nitul Ali, Vivek Chetry, Prem Kishan Singha & Maina Boro, Pp. 26697–26703

Implementation strategy and performance analysis of a novel ground vibration-based elephant deterrent system

– Sanjoy Deb, Ramkumar Ravindran & Saravana Kumar Radhakrishnan, Pp. 26704–26714

Short Communications

***Blackwellomyces pseudomilitaris* (Hywel-Jones & Sivichai) Spatafora & Luangsa-ard, 2017 (Sordariomycetes: Hypocreales: Cordycipitaceae): first report from Western Ghats of India**

– Anjali Rajendra Patil, Snehal Sudhir Biranje, Mahesh Yashwant Borde & Yogesh Sadashiv Patil, Pp. 26715–26720

Calvatia craniiformis (Schwein.) Fr. ex De Toni (Agaricomycetes: Lycoperdaceae): a new puffball mushroom record from eastern India
– Asit Mahato, Pritish Mitra, Sabyasachi Chatterjee & Subrata Raha, Pp. 26721–26726

Rediscovery of the gypsy moth *Lymantria kanara* Collenette, 1951 (Insecta: Lepidoptera: Erebidae) from Kerala, India, after 73 years and its taxonomic redescription
– P.K. Adarsh & Abhilash Peter, Pp. 26727–26730

Nest predation by *Vespa tropica* (Linnaeus, 1758): observational insights into polistine wasp defense and hornet feeding behavior
– Shantanu Ojha & Vartika Negi, Pp. 26731–26736

The discovery of a male Malay Crestless Fireback *Lophura erythrophthalma* (Raffles, 1822) (Aves: Galliformes: Phasianidae) at Ulu Sat Forest Reserve, Machang, Kelantan, Peninsular Malaysia

– Ainun Hidayah Wahad, Wan Hafizin Idzni Wan Mohammad Hizam, Muhammad Hamirul Shah Ab Razak, Aainaa Amir, Kamarul Hambali, Hazizi Husain, Mohd Saupi Abdullah, Ehwan Ngadi, Mohamad Arif Iskandar Abdul Wahab & Asrulsani Jambari, Pp. 26737–26740

Notes

New distribution record of *Korthalsia rogersii* Becc, a threatened endemic climbing palm of Andaman archipelago

– Paremmal Sarath, Azhar Ali Ashraf, V.B. Sreekumar, Modhumita Ghosh Dasgupta & Suma Arun Dev, Pp. 26741–26743

Clarifying the nomenclature of Roxburgh's pivotal name *Holigarna racemosa* Roxb. (Anacardiaceae)

– Shruti Kasana, Pp. 26744–26746

First confirmed breeding of Brown Noddy *Anous stolidus* in southeastern India: a new record from Adam's Bridge

– H. Byju, H. Maitreyi, N. Raveendran & D.A. Marshal, Pp. 26747–26749

First record of Painted Stork *Mycteria leucocephala* in Indonesia

– Hasri Abdillah, Iwan Febrianto, Cipto Dwi Handono, Fajar Shiddiq, Febryansah Abdillah Harahap & Muhammad Iqbal, Pp. 26750–26752

New sighting and conservation implications of the endemic Sulu Boobook *Ninox reyi* Oustalet, 1880 at Bolobok Rock Shelter, a key archaeological site in the Sulu Archipelago, southern Philippines

– Fauriza J. Saddari, Yennyrriza T. Abduraup, Adzmer A. Juaini, Roger A. Irlis, Khalid D. Adam, Mary Joyce Z. Guinto-Sali & Richard N. Muallil, Pp. 26753–26756

The occurrence of Glossy Ibis *Plegadis falcinellus* Linnaeus, 1766 (Pelecaniformes: Threskiornithidae) in southern Sumatra, Indonesia

– Muhammad Iqbal, Arum Setiawan, Putri Balqis, Exaudi Beatrice Simanullang, Pormansyah, Selamat Robinsa, Winda Indriati & Indra Yustian, Pp. 26757–26760

Book Review

A whisper of silken wings

– Aparna Sureshchandra Kalawate & Pooja Kumar Misal, Pp. 26761–26762

Publisher & Host



Threatened Taxa