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Journal of Threatened Taxa

40 **zoo**reach
Zoo Outreach Organisation
Years

10.11609/jott.2025.17.4.26763-26938

www.threatenedtaxa.org

26 April 2025 (Online & Print)

17(4): 26763-26938

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

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continued on the back inside cover

Cover: Nilgiri Large Burrowing Spider *Haploclostus nilgirinus*. Acrylic on canvas. © Aakanksha Komanduri.



Occurrence of a rare desmid *Tetmemorus laevis* Ralfs ex Ralfs from Yumthang Valley, northern Sikkim with a note on the genus in India

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Abstract: The rare desmid genus *Tetmemorus* Ralfs ex Ralfs with a single species *T. laevis* Ralfs ex Ralfs is reported for the first time from the Yumthang Valley of northern Sikkim. This genus is characterized by apical incision apart from the lateral median constriction. Only five species have been reported from different parts of India. This is the first record of the specimen from eastern Himalaya as well as northern part of India. Occurrence of the other species of the genus in India has also been discussed.

Keywords: Algae, eastern Himalaya, new record, Phytoplankton, Sikkim.

Tetmemorus Ralfs ex Ralfs, an interesting desmid genus, was first described by Ralfs (1848) with its three species, viz., *T. brebissonii* Meneghini ex Ralfs, *T. laevis* Ralfs ex Ralfs, and *T. granulatus* Brébisson ex Ralfs. Although having an apical incision like *Euastrum* it differs from the latter in cylindrical body lacking any lobes or sinuation (Ralfs 1848).

Several species of *Tetmemorus* have been reported from different parts of the world but in India it was recorded by only a handful of investigators. First report of this genus was from upper Batong Valley, Sikkim by Dickie (1882). He reported *T. granulatus* Brébisson ex Ralfs from this region. Turner (1892) reported *T. brebissonii* Meneghini ex Ralfs from eastern India. Agarkar

& Agarkar (1977) reported two taxa of *Tetmemorus*, viz., *T. brebissonii* var. *minor* De Bary and *T. laevis* Ralfs ex Ralfs from Pachmarhi, Madhya Pradesh. Later, Agarkar et al. (1983) reported *T. laevis* Ralfs ex Ralfs & *T. laevis* var. *minutus* (De Bary) Willi Krieger from Madhya Pradesh. *T. brebissonii* var. *minor* de Bary has been reported from Tamil Nadu (Suxena 1983). From Kerala *T. euastroides* A.M. Scott & Prescott was reported by Shaji et al. (1988) & *T. laevis* Ralfs ex Ralfs was recorded from Chathanoor (Sindhu & Panikkar 1995). *T. laevis* Ralfs ex Ralfs has been reported from West Bengal (Santra & Pal 2006). Distribution map of the recorded taxa in India is depicted in Figure 1.

During systematic investigations on desmids of eastern Himalaya the authors recorded *T. laevis* Ralfs ex Ralfs from the Yumthang Valley of northern Sikkim.

MATERIALS AND METHODS

Algal samples were collected as algal mass by hand or by forceps and scalpels from different spots of this region at about 0930–1030 h (Das & Keshri 2016). Totally, 12 collections were made. Samples were mainly collected from small streams & wet rocks and immediately fixed on the spot in 5% formaldehyde aqueous solution. Water

Editor: Asheesh Shivam, Nehru Gram Bharati (Deemed to be University), Uttar Pradesh, India.

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

Citation: Das, D., J. Mal & J.P. Keshri (2025). Occurrence of a rare desmid *Tetmemorus laevis* Ralfs ex Ralfs from Yumthang Valley, northern Sikkim with a note on the genus in India. *Journal of Threatened Taxa* 17(4): 26928–26931. <https://doi.org/10.11609/jott.9106.17.4.26928-26931>

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Funding: UGC, New Delhi & Ministry of Environment Forest & Climate Change for funding under AICOPTAX programme (No. F. No. 2018/15/2015-CS (Tax) dated 18th January 2018).

Competing interests: The authors declare no competing interests.

Acknowledgements: Authors acknowledge to UGC, New Delhi for financial support to carry out this investigation & head of the Department of Botany, The University of Burdwan for laboratory facilities. Special thanks are due to the Home Department, Govt. of Sikkim for various help and Forest Department, Govt. of Sikkim. Support of fund from MoEFCC in AICOPTAX programme is also highly acknowledged.



samples were preserved in 500 ml bottle with 1% Lugol's Iodine to study the microscopic phytoplanktons as well. The water temperature (using non-mercuric alcohol thermometer by Labworld), pH (using standard pH paper by Merck), and habitats were recorded during the study. Initial observations were made in the laboratory under Olympus GB compound microscope using GWF as mount medium (Bando 1988). Photomicrographs were also taken in Zeiss Axioscope plus research microscope with AxioCam-503 attachment.

Study area

Eastern Himalaya including Sikkim is considered as one of the four biodiversity hot spots in India (Hajra &

Verma 1996). Sikkim is the home of several indigenous plant species. Several regions of eastern Himalaya are still unexplored. Most of the parts of northern Sikkim are even inaccessible and hence very little explored. Very few works in phycological investigations have been carried out from northern Sikkim till date. Santra (1984) recorded a few Cyanophyceae from northeastern Sikkim. Das & Keshri (2013) reported several algal taxa from Gurudongmar Lake.

In this work authors investigated an uncommon desmid taxon *Tetmemorus laevis* Ralfs ex Ralfs from Yumthang Valley, northern Sikkim (Figure 1). The extremely scenic Yumthang Valley is situated at an elevation of 3,545 m in the north of Sikkim and is popularly known as 'Valley

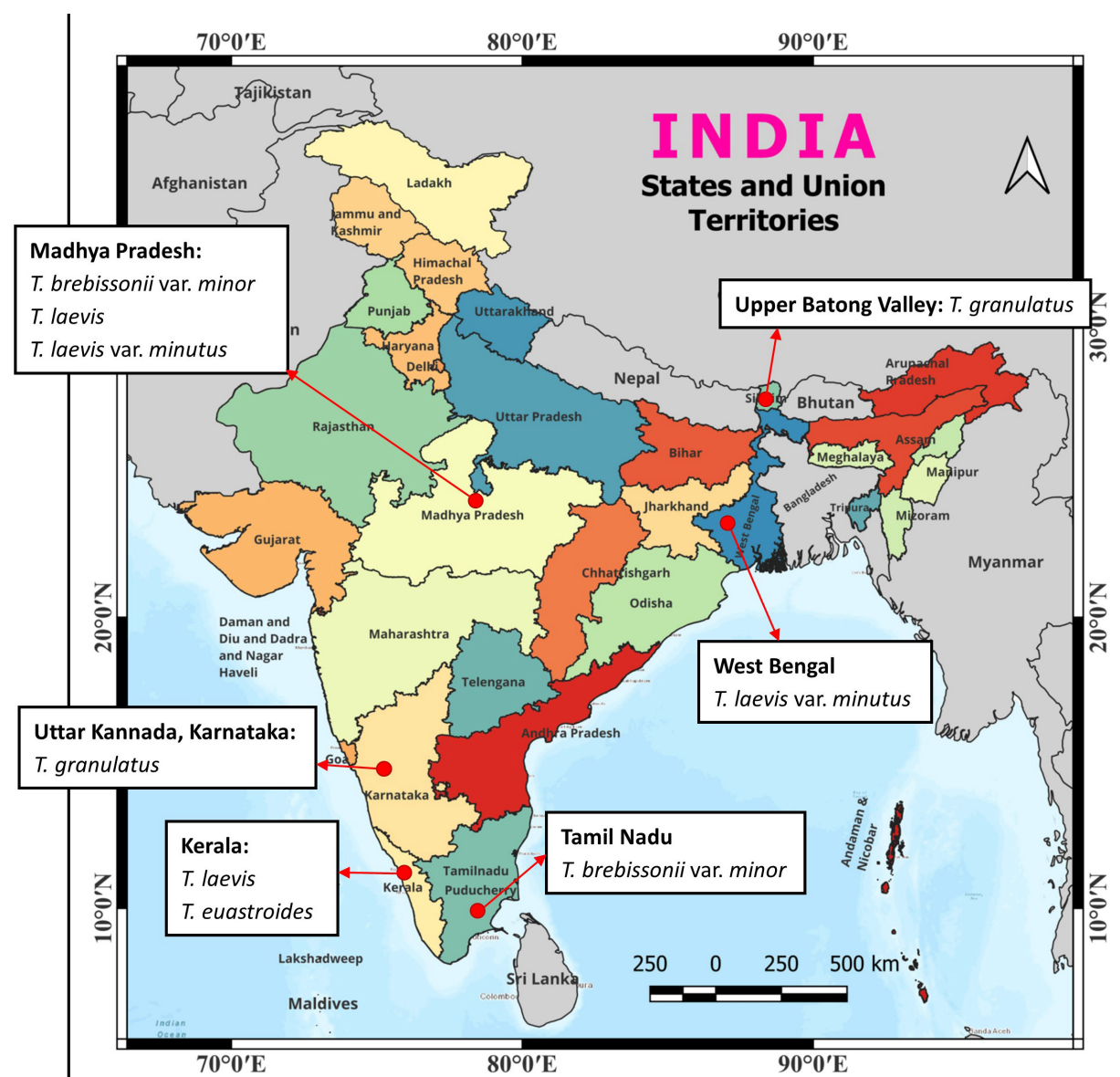


Figure 1. Distribution map of *Tetmemorus* in India (Source: <https://www.geographicalanalysis.com>).

of flowers' due to the intense blossom of *Rhododendron* flowers of various colours. This work has been carried out during the phycological exploration of eastern Himalaya by the authors during 2009–2015. This region is about 150 km away from Gangtok, the capital of Sikkim. The nearby inhabited area is Lachung.

RESULTS

Tetmemorus laevis Ralfs ex Ralfs [Pl. 1, fig. A-C]

Ralfs 1848, p.146, pl. 24, f. 3a–g; Prescott et al. 1975, p. 149, pl. 56, f. 1–3, 6–8; John et al. 2011, p. 727, pl. 180K

Cells cylindrical, 3.87 times longer than broad, with a conspicuous, median constriction, and a deep & narrow apical incision in the broadly rounded apex; semicells in face view slightly tapered, lateral walls slightly concave; cell wall finely punctate; chloroplast axial, with 7–8

radiating longitudinal plates, pyrenoid large, single in each chloroplast.

Length: 85–86 µm, Breadth: 22–23 µm, Isthmus: 19–20 µm, Apex: 11–14 µm.

Distribution: India, Sikkim, northern Sikkim, Yumthang Valley, 27.80493° N, 88.70476° E, 5 May 2010, D. Das & J.P. Keshri.

Habitat: The alga is rare in the study area. It has been recorded as phytoplankton from running water of a small stream. water pH: 6, water temperature 7°C at the time of collection.

DISCUSSION

Desmids are oligotrophic in occurrence, indicators of low pollution level & conductance (Brook 1981; Brook & Johnson 2011). Studies on its biodiversity are not

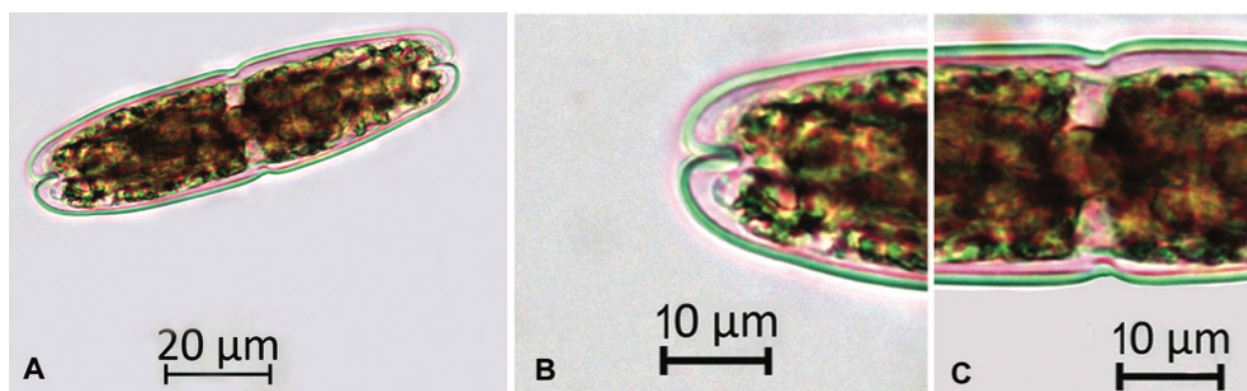


Image 1. *Tetmemorus laevis*: A—Entire view | B—Apical portion | C—Isthmus region. © Jai Prakash Keshri.

Table 1. Ecological notes of the samples collected from the field (Yumthang Valley).

Sample number	Co-ordinates	pH	Water temperature (°C)	Habitat
DD-656	27.79265° N 88.70560° E	6.5	6.5	Brown powdery mass with thin filamentous mass on the rock from a small water body.
DD-657	27.79723° N 88.70461° E	6.5	6.5	Brownish filament on the surface of a wet rock.
DD-658	27.79873° N 88.70558° E	6.5	6.5	Powdery mass and filaments along with semi aquatic weeds from a shallow water body.
DD-659	27.79993° N 88.70543° E	6.0	6.5	Green filaments on the surface of the wet soil.
DD-660	27.80493° N 88.70476° E	6.0	7	Phytoplankton sample from running water of a small stream.
DD-661	27.80497° N 88.70476° E	6.5	7	Light green filaments on the water surface along with yellowish green filament and dark powdery mass of a small stream.
DD-662	27.80499° N 88.70476° E	6.5	7	Brownish mass on rock surface under water of a small stream.
DD-663	27.82468° N 88.69596° E	6.9	7.5	Bright green powdery mass on soil under water from a small water body.
DD-664	27.82468° N 88.69596° E	6.9	7	Dark green scum on the surface of a wet rock.
DD-665	27.82609° N 88.69581° E	6.9	7	Brownish powdery mass with wet moss on a tree trunk.
DD-666	27.82626° N 88.69585° E	6.5	7	Bluish scum on the surface of wet rock beside a small waterfall.
DD-667	27.82612° N 88.69564° E	6.5	7	Brownish powdery mass from a small water body beside a small waterfall.

extensive except a few (Turner 1892; Santra & Pal 2006; Das & Keshri 2016). The genus *Tetmemorus* is known to occur abundantly in shallow waters of wetlands and slow flowing streams but infrequent as metaphyton and plankton (Hall & McCourt 2015). This the third report of the species from India and first report from northeastern India. Earlier it was reported from Kerala (Sindhu & Panikkar 1995) and Madhya Pradesh (Agarkar 1977). Dickie (1882) reported *Tetmemorus granulatus* Brébisson ex Ralfs from northeastern India more than 125 years ago. This investigation added one more rare taxon which reveals that extensive investigations are needed in Sikkim. Since desmids are also indicator of low pollution further investigations may help in the typification of habitats (Bellinger & Sigee 2015).

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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



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

April 2025 | Vol. 17 | No. 4 | Pages: 26763–26938

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

DOI: 10.11609/jott.2025.17.4.26763-26938

www.threatenedtaxa.org

Articles

Biodiversity in Garh Panchkot and surroundings (Purulia, West Bengal) of residential and migratory land vertebrates with special reference to endangered species

– Amrita Panja, Biplab Kahar & Sujoy Chattaraj, Pp. 26763–26779

Evaluating wildlife activity and corridor functionality: a study of underpasses in and around Rajaji National Park, India

– Nishant Verma, Saket Badola & Samrat Mondol, Pp. 26780–26788

Avifaunal diversity and conservation status of waterbirds in Pillaimadam Lagoon, Palk Bay, India

– H. Byju, H. Maitreyi, N. Raveendran, S. Ravichandran & Reshmi Vijayan, Pp. 26789–26802

Comments on the systematics and morphology of *Smithophis bicolor* (Blyth, 1855) (Reptilia: Squamata: Natricidae) based on topotypical specimens from Meghalaya, India

– Jayaditya Purkayastha, Bipin Meetei Asem, Hmar Tlawmte Lalremsanga, Madhurima Das, Holiness Warjri, Goldenstar Thongni & Sanath Chandra Bohra, Pp. 26803–26813

Diversity and distribution of fish in rivers Chinnar and Thenar and their tributary, southern Western Ghats, Tamil Nadu, India

– K. Mahesh Kumar, T. Ajayla Karthika & K. Anvar, Pp. 26814–26823

Diversity and habitat preferences of butterflies (Insecta: Lepidoptera) in Dzongu, Mangan, Sikkim, India

– Sonam Wangchuk Lepcha & Monish Kumar Thapa, Pp. 26824–26849

Seasonal study on succession of forensically significant entomofauna under indoor environment in Punjab, India

– Pawandeep Kaur & Madhu Bala, Pp. 26850–26856

Communications

First photographic record of ferret badger *Melogale* sp. (Mammalia: Carnivora: Mustelidae) from the state of Tripura, India

– Omkar Patil, Ashutosh Joshi & Amey Parkar, Pp. 26857–26863

An update on the status of some Data Deficient bat species from India

– Uttam Saikia, Manuel Ruedi & Rohit Chakravarty, Pp. 26864–26871

Distribution, perception, and conservation challenges of endemic Madras Hedgehog *Paraechinus nudiventris* in Tenkasi District, Tamil Nadu: insights from questionnaire surveys

– Brawin Kumar & Abinash Muthaiyan, Pp. 26872–26878

Notes on the interesting species *Tacca leontopetaloides* (L.) Kuntze

– Sk. Md. Abu Imam Saadi, Meheeb Sarwar Hossain, Debasis Bhunia, Sk. Rasidul Islam, Sayantan Tripathi, Sanjit Sinha & Amal Kumar Mondal, Pp. 26879–26886

Extended distribution of the rare basidiolichen *Sulzbacheromyces yunnanensis* (Lichenized Basidiomycota) from Mizoram, India

– V.L. Thachunglura, Prabhat Kumar Rai, Zohmangaiha Chawngthu, Lallawmkima Bochung, P.C. Vanlalhluna & John Zothanzama, Pp. 26887–26892

Short Communications

First photographic record of a Leopard Cat *Prionailurus bengalensis* (Kerr, 1792) (Mammalia: Carnivora: Felidae) in central India

– Prabhu Nath Shukla, Bilal Habib, Virendra Kumar Mishra, Sumedh Lomesh Bobade, Eshaan Chaitanya Rao & Kanishka, Pp. 26893–26897

New record of Mysore Slender Loris *Loris lydekkerianus* near Puducherry, India

– Shanmugam Mani, P. Aravind Aathi, K. Sivakumar, Aurosyll Bystrom & D. Saravanan, Pp. 26898–26902

The brachypterous endemic genus *Ardistomopsis* (Coleoptera: Carabidae: Panagaeinae) of the Indian subcontinent: first report of *Ardistomopsis batesi* Straneo & Ball, 1989 and *Ardistomopsis marginicollis* (Schaum, 1864) (Coleoptera: Carabidae: Panagaeinae) from the Western Ghats and the biogeographical significance

– V.A. Jithmon, M. Divya & Thomas K. Sabu, Pp. 26903–26907

First report of *Jauravia assamensis* Kapur, 1961 (Coleoptera: Coccinellidae) from West Bengal, India

– Tamoghno Majumder, Aloy Adak & Kusal Roy, Pp. 26908–26911

First record of *Hycleus marcipoli* Pan & Bologna, 2014 (Coleoptera: Meloidae) as a pest of Common Beans in Kashmir Himalaya, India

– Farhana Shafi & Altaf Hussain Mir, Pp. 26912–26916

***Sonerila bababudangiriensis* (Melastomataceae), a new species of herb from the Western Ghats of India**

– Prashant Karadakatti & Siddappa B. Kakkalameli, Pp. 26917–26922

Rediscovery of *Phallus aurantiacus* Mont. from India and new distribution record from Odisha, India

– Malay Prithwiraj Sahoo, Supriya Sahu, Samarendra Narayan Mallick, Prabhat Kumar Das, Yasaswinee Rout, Subrat Dalabehera, Sitaram Prasad Panda & Vinaykumar Hallur, Pp. 26923–26927

Occurrence of a rare desmid *Tetmemorus laevis* Ralfs ex Ralfs from Yumthang Valley, northern Sikkim with a note on the genus in India

– Debjyoti Das, Jay Mal & Jai Prakash Keshri, Pp. 26928–26931

Notes

***Ophiorrhiza japonica* Blume (Rubiaceae): a new record for India**

– Ngasheppam Malemnganbi Chanu, Peimichon Langkan, Thongam Nourenpai Khanganba & Thongam Biseshwori, Pp. 26932–26935

***Isodon neorensis* Ranjan, G. Krishna & Anant Kumar (Lamiaceae): a new record for Sikkim Himalaya, India**

– Pramod Rai, Pp. 26936–26938

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