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43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)  
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continued on the back inside cover

Cover: Orange Oakleaf *Kallima inachus* with colour pencils and watercolor wash by Elakshi Mahika Molur adapted from a workshop by Lenin Raj.



## On the occurrence of *Audouinella chalybea* (Roth) Bory, 1823, a rare freshwater red algae (Florideophyceae: Acrochaetiales: Audouinellaceae) from eastern Himalaya, India

Jai Prakash Keshri<sup>1</sup> & Jay Mal<sup>2</sup>

<sup>1,2</sup> Phycology Laboratory, Cas In Botany, The University of Burdwan, Golapbag, West Bengal 713104, India.

<sup>1</sup>keshrijp@gmail.com (corresponding author), <sup>2</sup>jaymal8942@gmail.com

**Abstract:** *Audouinella chalybea* (Roth) Bory has been recorded from Phamrong falls of Sikkim Himalaya. Well developed plants of the alga were found attached to the stones and pebbles in the running outlets of the falls. The plants were found anchored to the substratum by spine like base attachment cells. Such structure has not been recorded in earlier studies. Both monosporangia and tetrasporangia have been recorded in our plants. This is the first report of the species from eastern Himalaya and appears to be the second report from India.

**Keywords:** Himalayan hill alga, new report, Phamrong falls, Rhodophyta, Sikkim.

The genus *Audouinella* Bory is one of the infrequently recorded freshwater red alga known from running waters throughout the globe (Desikachary et al. 1990; Kumano 2002; John et al. 2011; Wehr et al. 2015). The thallus of this alga is tufty in appearance mostly up to 50 mm in height. Although blue coloured species are included in genus *Audouinella* Bory, many authorities doubts it to be “chantransia stage” of Batrachospermales as no carposporangia or gametangia have been observed (Necchi et al. 1993a,b; Necchi & Zucchi 1997; Pueschel et al. 2000; Sheath & Sherwood 2011). On the other hand Desikachary et al. (1990) have considered all freshwater species as *Audouinella* Bory while marine species as *Acrochaetium* Nageli.

The genus in India is represented by 12 species (Ganesan et al. 2018; Koley et al. 2020). During systematic investigations on the freshwater red algae of eastern Himalaya the authors recorded a good population of *Audouinella chalybea* (Roth) Bory from Sikkim Himalaya.

### MATERIAL AND METHODS

The specimens were collected from Phamrong falls of Sikkim. The alga was found growing on rocks under running water along with mosses & blue green algae in the month of April. The pH recorded at the time of collection was acidic (around 4.5–5) & temperature 19°C. The samples were preserved in 4% formalin solution. GWF solution (Glycerine:Water:Formalin::1:1:1) (Bando 1988) was used as mountant for the study. Preliminary observations were made under Olympus GB Microscope & Photomicrographic images were taken using Zeiss Axioscope A1 microscope attached with AxioCam 504 model digital camera.

### Systematic description

*Audouinella chalybea* (Roth) Bory, 1823  
(Kumano 2002, p. 51, pl. 26, figs. 5–6)

**Editor:** Anonymity requested.

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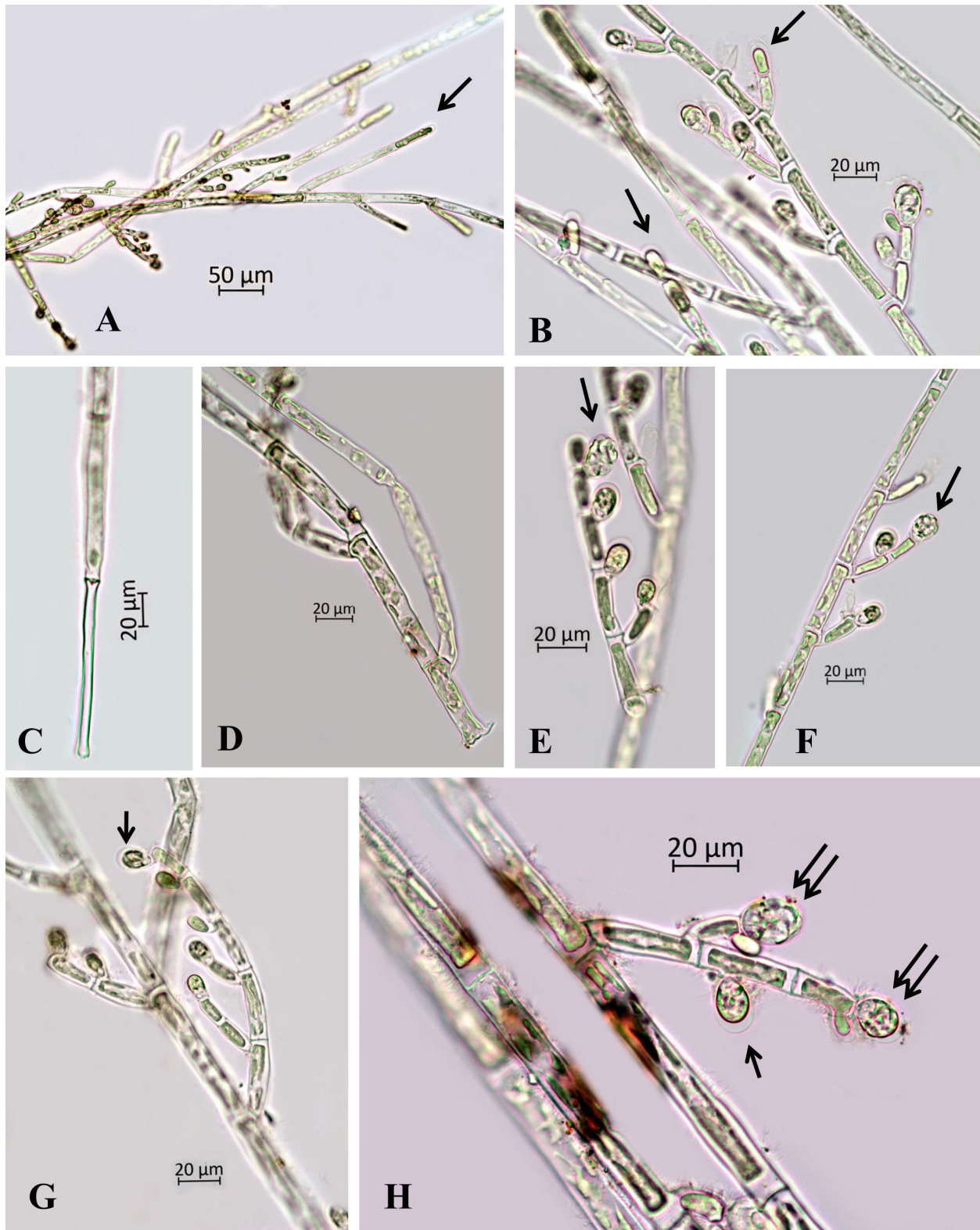
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**Image 1.** *Audouinella chalybea*: A & B—Part of thallus showing apical rounded cell | C—Arrow showing basal cell of the thallus | D—Branching pattern: Enlarged view | E—Part of thallus showing both types of sporangia (tetrasporangia arrow marked) | F & G—Part of thallus showing sporangia | H—Part of thallus showing both monosporangia (single arrow) & tetrasporangia (double arrow). © Jai Prakash Keshri.

Basionym: *Conferava chalybea* Roth, 1806  
 Synonyms: *Trentepohlia pulchella* B *chalybea* C.Agardh, 1824  
*Trentepohlia aeruginosa* C.Agardh, 1824  
*Chantransia chalybea* (Lyngb.) Fries, 1825  
*Pseudochantransia chalybea* (Roth) Brand, 1909

Thallus found growing on pebbles in running water of stream adhered to substratum possibly be spine like hyaline basal cell 107.75 µm long & 7.67–8.18 µm broad (Image 1C); penicillate forming bushy growth up to 3 mm in height, bluish-green in colour; well branched, branching unilateral & alternate both, up to 3<sup>rd</sup> order, mostly approaching height of the main axis; main axis distinct, cells of the main axis 7–13 µm in diameter, 28–80 µm long (4–7 times longer than broad); terminal cells rounded never acuminate; cells uninucleate with parietal chloroplast, dissected in mature cells as spiral ribbons; cell wall thin 1.03–1.30 µm; monosporangia abundant mostly unilaterally inserted towards the main axis on secondary and tertiary branched, globular to ellipsoid 10.05–12.43 µm in diameter and 15.75–16.35 µm long; tetrasporangia 13.37–15.19 µm in diameter and 16.21–21.24 µm long growing mostly at the tip of branches.

## DISCUSSION

Our specimen possesses notable characteristics of the species that was not mentioned in the plants described by Misra & Dey (1959). They have not observed the tetrasporangia. Moreover, occurrence of spine like hyaline basal cell is a new observation. This species was reported only once by Misra & Dey (1959) from Uttar Pradesh. Numerous sporangia were shown in the plant but no mention of tetrasporangia or other characteristics have been clearly spelt. Although the species is widely distributed recorded but has been recorded mostly from warm temperate regions (Hu & Wei 2006; Eloranta & Kwandras 2007; Eloranta et al. 2011; Ganesan et al. 2018; Guiry & Guiry 2022), it is surprising that no subsequent report of the species have been made from India. We have found well developed plants of the alga. The needle like basal attachment region recorded in present investigation has not been found in any other relevant literature. Therefore the possibility of the plant to be 'Chantransia Stage' comes under question mark because it should have a thalloid structure. Tetrasporangia were also found common. It may be the plant represents the diploid (sporophyte) phase of the plant. It is possible that the plants are maintaining its life cycle only in one stage in

Himalayan streams due to scarcity of opportunities of sexual reproduction. Study of the ploidy level of the plant and detail investigations may put new light in the understanding the taxonomic identity of the taxon.

The authors feel that plenty of freshwater red algae including this species may be obtained from several localities of Indian region specifically from Himalayan streams & rivers.

## CONCLUSION

The authors experienced that Himalayan streams and hills are rich in freshwater algal diversity but they are never abundant on their sites. Only experienced phycologists may locate the plants. So it appears that our knowledge of freshwater red algae is poor possibly due to lack of proper exploration and not due to the scarcity of occurrence. This is because few good papers have come up in last two decades.

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#### Erratum

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There is a mix up in the affiliations for authors two and three.

Correct affiliations are:

**Dimpi A. Patel<sup>1</sup>, Chinnasamy Ramesh<sup>2</sup>, Sunetro Ghosal<sup>3</sup> & Pankaj Raina<sup>4</sup>**

<sup>1,3,4</sup> Department of Wildlife Protection, Leh, Ladakh (UT) 194101, India.

<sup>1,2</sup> Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand 248001, India.

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43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore,  
Tamil Nadu 641006, India  
ravi@threatenedtaxa.org



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## Articles

### Echolocation call characterization of insectivorous bats from caves and karst areas in southern Luzon Island, Philippines

– Renz Angelo Duco, Anna Pauline de Guia, Judeline Dimalibot, Phillip Alviola & Juan Carlos Gonzalez, Pp. 23931–23951

### Seasonality, diversity, and forest type associations of macro moths (Insecta: Lepidoptera: Heterocera) in the Shiwalik landscape of northern India and its conservation implications

– Arun Pratap Singh & Lekhendra, Pp. 23952–23976

### Vertebrate assemblages on fruiting figs in the Indian eastern Himalaya's Pakke Wildlife Sanctuary

– Akangkshya Priya Gogoi, Janmejey Sethy, Awadhesh Kumar, Dipika Parbo, Murali Krishna Chatakonda & Ajay Maletha, Pp. 23977–23989

## Communications

### From the Arabian Peninsula to Indian shores: Crab Plover *Dromas ardeola* Paykull, 1805 (Aves: Charadriiformes: Dromadidae) breeding at Point Calimere, India

– H. Byju, N. Raveendran & K.M. Aarif, Pp. 23990–23995

### Assessing avian diversity and conservation status in Dighal Wetlands, Haryana, India

– Parul & Parmesh Kumar, Pp. 23996–24008

### Studies on the response of House Sparrow *Passer domesticus* to artificial nest-boxes in rural Arakkonam and Nemili taluks, Vellore District, Tamil Nadu, India

– M. Pandian, Pp. 24009–24015

### Threat assessment and conservation challenges for the herpetofaunal diversity of Dampa Tiger Reserve, Mizoram, India

– Sushanto Gouda, Ht. Decemson, Zoramkhuma, Fanai Malsawmdawngliana, Lal Biakzuala & Hmar Tlawmte Lalremsanga, Pp. 24016–24031

### Taxonomy and conservation status of swamp eels (Synbranchiformes: Synbranchidae) of West Bengal, India

– Ram Krishna Das, Pp. 24032–24042

### Sacred river of Pune: boon or bane for the diversity of aquatic beetles (Insecta: Coleoptera)

– Rita Deb, Pallavi Takawane & K.A Subramanian, Pp. 24043–24053

### Fine structure of sensilla on the proboscis of the Indian Honey Bee *Apis cerana indica* Fabricius (Insecta: Hymenoptera: Apidae)

– A.G. Suhas Krishna, Shamprasad Varija Raghu & Rajashekhar K. Patil, Pp. 24054–24062

### A compendium of *Aphelenchoides* (Fischer, 1894) (Nematoda: Tylenchida: Aphelenchoidea) nematodes with the description of a new species from Manipur, India

– Loukrakpam Bina Chanu & Naorem Mohilal, Pp. 24063–24078

### Efficacy of levamisole and oxclozanide treatment on gastrointestinal nematodes of ungulates at the Central Zoo, Nepal

– Pratik Kiju, Amir Sadoula, Parbat Jung Thapa & Chiranjibi Prasad Pokheral, Pp. 24079–24085

### *Ocimum gratissimum* L. ssp. *gratissimum* var. *macrophyllum* Briq. (Lamiaceae: Nepetoideae: Ocimeae) a new record from northeastern India

– Mamita Kalita, Nilakshee Devi & Diganta Narzary, Pp. 24086–24091

### The study of biogeographic patterns of the genus *Parmotrema* in Wayanad District, Kerala with a new record in India

– Bibin Joseph, Edathum Thazhekuni Sinisha, Valiya Thodiyil Jaseela, Harshid Pulparambil & Nediyaarambu Sukumaran Pradeep, Pp. 24092–24103

## Review

### Diversity of Calliphoridae and Polleniidae (Diptera) in the Himalaya, India

– Meenakshi Bharti, Pp. 24104–24115

## Short Communications

### First photographic evidence of mangle manifestation in Panna Tiger Reserve, India

– Supratim Dutta & Krishnamurthy Ramesh, Pp. 24116–24119

### New locality record of Forest Spotted Gecko *Cyrtodactylus* (*Geckoella*) cf. *speciosus* (Beddome, 1870) (Reptilia: Squamata: Gekkonidae) from Thanjavur, in the eastern coastal plains of Tamil Nadu, India

– Gopal Murali, Pp. 24120–24124

### Preliminary observations of moth (Lepidoptera) fauna of Purna Wildlife Sanctuary, Gujarat, India

– Preeti Choudhary & Indu Sharma, Pp. 24125–24130

### On the occurrence of *Audouinella chalybea* (Roth) Bory, 1823, a rare freshwater red algae (Florideophyceae: Acrochaetiales: Audouinellaceae) from eastern Himalaya, India

– Jai Prakash Keshri & Jay Mal, Pp. 24131–24134

### Addition of four invasive alien plant species to state flora of Mizoram, India

– Lal Tlanhlu, Margaret Lalhlupuii, Sanatombi Devi Yumkham & Sandhyarani Devi Khomdram, Pp. 24135–24139

## Notes

### First sighting record of Western Reef-Heron *Egretta gularis* (Bosc, 1792) (Aves: Pelecaniformes: Ardeidae) from Jammu & Kashmir, India

– Parvaiz Yousuf, Semran Parvaiz, Nisheet Zehbi, Sabia Altaf, Showkat Maqbool, & Mudasir Mehmood Malik, Pp. 24140–24143

### Rare desmid genus *Bourrellyodesmus* Compère (Chlorophyceae: Desmidiaceae) in India with description of a new species (*Bourrellyodesmus indicus* Das & Keshri sp. nov.) from eastern Himalaya, India

– Debjyoti Das & Jai Prakash Keshri, Pp. 24144–24147

### Threats faced by *Humboldtia bourdillonii* Prain (Magnoliopsida: Fabales: Fabaceae), an endangered tree endemic to the southern Western Ghats, India

– Jithu K. Jose & K. Anuraj, Pp. 24148–24150

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