A new species of the rare chrysophycean alga *Dermatochrysis* (Chrysocapsaceae, Chromulinales) from Eastern Himalayas, India

Sudipta Kumar DAS*, Pritha BASU, Rajendra Kumar GUPTA

Cryptogamic Unit, Central National Herbarium, Botanical Survey of India, Howrah – 711103, West Bengal, India

*Corresponding author’s email: sudiptaalgae@gmail.com

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ABSTRACT: A new species of the rare chrysophycean genus *Dermatochrysis* Entwisle & R.A. Andersen is described from eastern Himalayas (Arunachal Pradesh, India). The comparative morphology of this taxon with allied species showed its uniqueness in thallus structure and cellular arrangements, thus is proposed as a new species, i.e. *Dermatochrysis himalayensis* S. K. Das, P. Basu & R. K. Gupta.

KEY WORDS: Arunachal Pradesh, Chrysophyta, *Dermatochrysis himalayensis*, Himalaya, India.

INTRODUCTION

*Dermatochrysis* Entwisle & R.A. Andersen is a rare coccoid colonial chrysophycean genus (Chrysocapsaceae, Chromulinales) was described while circumscribing *Tetrasporopsis* (De Toni) Lemmerm. by Entwisle and Andersen (1990). It is a rare genus of Chrysophyta morphologically characterized by cells with distinct cell walls, embedded in sac-like mucilagenous colonies, monostromatic thallus and presence of contractile vacuoles. However, there were several contradictions and lack of adequate descriptions by several researchers time to time (Schmidle, 1902; Pascher, 1925; Bourrelly, 1957; Lund, 1960; Tschermak-Woess, 1980). Entwisle and Andersen (1990) elucidated its taxonomic status with extensive revisionary studies on the protologue and type materials of earlier described taxa along with their Australian collections. After thorough phenotypic observations, they segregated all the taxa having naked cells with contractile vacuoles under the genus *Dermatochrysis*, whereas those with cell wall and no contractile vacuoles were placed under *Tetrasporopsis* (Nicholls and Wujek, 2015). The former genus is represented by only three species so far (Guiry, 2019), *D. pelagica* (R.E. Norris) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from coastal New Zealand, *D. pseudoefenestrata* (J.W.G. Lund) Entwisle & R.A. Andersen was recorded from central Nepal, Myanmar, Bhutan and south-east Tibet in China. Popularity, it was regarded as ‘Cradle of flowering plants’ by Takhtajan (1969), as it houses world’s richest alpine flora, out of which one third are endemic to the region (Dhar, 2002). The unique climatic variation and a wide altitudinal range (from 300 m to 8000 m a.s.l.) provide a suitable ambiplace for its rich biodiversity.

Arunachal Pradesh is the north-eastern most state of India sharing its international border with Bhutan, Myanmar and China. Though this place has immense floristic wealth, the history of its phycological exploration is only few decades old (Reddy et al., 1986; Singh et al., 1997; Singh and Gupta, 2000; Gupta et al., 2002; Das and Adhikary, 2012, 2014; Das et al., 2014; Das, 2015, 2016), which were only restricted to some novel distributional records. Recently, Das et al. (2018) described three new freshwater diatoms species from the region, was described.

MATERIALS AND METHODS

The alga was collected as a greenish mucilaginous mass (Fig. 1) attached to the rocks in the feeding stream of Sungester Tso (popularly called as ‘Madhuri lake’) in Tawang district of Arunachal Pradesh (27º43.325’ N; 91º49.631’ E; 3736 m a.s.l. altitude). It was believed that the lake was originated due to a blockage in the feeding stream caused by an earthquake during 1970’s. The pristine lake and its adjoining area comes under Bhagajang High Altitude Wetland (HAW) complex, which is one among the major HAW complexes located near the Indo-China border of Tawang district of Arunachal Pradesh. Due to its unique beauty, the lake is one of the major tourist attractions of the state. The lake is fed by a shallow perennial stream, with boulders and small to medium sized rocks in the catchment area as well as in the base. Due to moderate water flow throughout the year (except peak monsoon), the stones get colonized with adhering mucilaginous algal populations.

The alga was preserved in 4% formalin solution with voucher number and deposited at the algal collection in Cryptogamic unit, Central National Herbarium, Howrah. The samples were also collected in a glass bottle with
Bold’s Basal medium (Bischoff and Bold, 1963) for isolation into culture and maintained in culture racks in a temperature-controlled room at 25 ± 1 °C under continuous illumination with a light intensity of 2.55 µmole/m²/s which was equipped with day light fluorescent tubes. However, we failed in isolating the organism to culture with repeated trying. Light Microscopic observations and morphological descriptions were done under Nikon microscope Ni–11 fitted with Nikon Digital Camera DS–Ri1–U3 and operated by Nikon Imaging Software NIS–D+EDF. The holotype of the alga is deposited in Central National Herbarium, Howrah (CAL).

**TAXONOMIC TREATMENT**

*Dermatochrysis himalayensis* S.K. Das, P. Basu & R.K. Gupta, *sp. nov.* Fig. 2, 3

**Type:** INdia, Arunachal Pradesh, Tawang, Sungester Tso/Madhuri lake, 62849, 3736 m a.s.l., 27°43.325’N and 91°49.631’E, S.K. Das, 12 March 2014, *Alg. 058* (Holotype CAL!).

**Description:** Thallus was brownish green, thickly mucilaginous, up to 1 mm long and 0.3 mm wide. The mucilaginous colonies were cylindrical to irregular shape, having distinct linearly or palmately branched appearance, which were distinct near the point of adherence (Fig. 2A-B; 3A). However, no holdfast was observed. Sometimes interconnecting network-like appearance was also observed in the main branches with large mucilaginous outgrowths. Light Microscopic observations and morphological descriptions were done under Nikon microscope Ni–11 fitted with Nikon Digital Camera DS–Ri1–U3 and operated by Nikon Imaging Software NIS–D+EDF. The holotype of the alga is deposited in Central National Herbarium, Howrah (CAL).
Fig. 2. Light microscopic photographs of *Dermatochrysis himalayensis* sp. nov.. A-B. Thallus structure showing branching appearance; C. Young colonies; D. Network-like colonies with large vacuolar spaces; E-F. Different shapes of cells. (Scale bar: Fig. 2A = 200 µm, B-D = 50 µm and E-F = 20 µm)
Absences of cell wall and stigma with presence of contractile vacuoles were the identifying features of the taxon under the genus *Dermatochrysis*. The overall morphological features of the species have resemblances to *Phaeosphaera indica* (Ramanathan) Bourrelly and *Dermatochrysis pseudofenestrata* (Table 1). *P. indica* was originally described by Ramanathan (1947) from India as a distinct genus and species, i.e. *Chrysodictyon indicum* Ramanathan. His description misinterpreted the

**Etymology**: The specific epithet is based on the name of the locality, the Himalayas.

**Ecology**: Occurred as greenish gelatinous bio-film on stones in the shallow water of the feeding stream to the lake. The pH of the habitat was 6.8 and temperature was 12.4 °C.

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**Fig. 3.** Line drawings of *Dermatochrysis himalayensis* sp. nov., A. Thallus structure; B. Young colonies; C. Network-like colony showing vacuolar spaces; D-E. Different shapes of cells. (Scale bar: Fig. 3A-C = 50 µm and D-E = 20 µm)
broken cell walls as cysts, which was later clarified (Lund, 1960). The most significant similarity of *D. himalayensis* with *P. indica* was the texture of young colonies, which were thin, cylindrical and single layer of cellular arrangement, but their placement was not exclusively central, with some parietal observations. Our species lacked any finger-like projections as observed in *D. pseudofenestrata* and also smaller cell size. *D. himalayensis* showed distinctness in thallus shape showing some prominent branching like appearance (lineate or palmate) and the shape of young thallus, which were not observed in any *Dermatochrysis* taxa. Due to these phenotypic peculiarities, the taxon can be considered as a new species, i.e. *Dermatochrysis himalayensis* S. K. Das, P. Basu & R. K. Gupta.

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**LITERATURE CITED**


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