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Trentepohlia sundarbanensis sp. nov. (Trentepohliaceae, Ulvophyceae, Chlorophyta), a new chlorophyte species from Indian Sundarbans

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Abstract

Trentepohlia sundarbanensis is proposed new to science and is characterized by its cell dimensions, sporangial structure and branching pattern. The species was collected from the brackish water zone of Cheramatla Island (N 22°00.117', E 088°42.608'), located in the Indian Sundarbans. The species grows on the bark of a halophytic mangrove plant, *Avicennia alba*. In this study the new species' morphology and relationship with morphologically close species are discussed.

Key words: Cheramatla Island, Epiphytic, Indian Sundarbans, New species, *Trentepohlia*

Introduction

Trentepohlia Martius, a common filamentous sub-aerial green alga occurs on tree-bark, leaves, rocks and many artificial substrata (Printz, 1939; Saxena, 1961; Chapman, 1984; Sarma, 1986; Lopez *et al*., 2002; Kumar *et al*., 2013). The presence of *β*-carotene, haematochrome and its unique flagellar apparatus distinguishes the order Trentepohliales from others group of green algae (Christiaan *et al*., 1995; Lopez *et al*., 2002; Kumar *et al*., 2013). The genus includes about 40 species, distributed to tropical and sub-tropical areas (Printz, 1939; Cribb, 1958; Krishnamurthy, 2000; Kumar *et al*., 2013). The representatives of the Trentepohliales are widespread worldwide, both in temperate and tropical regions and there are several reports on taxonomic studies of *Trentepohlia* in relation to diversity and ecology (Cribb, 1963, 1964; Nakano and Handa, 1984; Tracanna, 1989; Rindi and Guiry, 2002; Rindi *et al*., 2003, 2005). In these communications different species of *Trentepohlia*, viz., *T. abietina*, *T. arborum*, *T. umbrina*, *T. aurea* are well illustrated and described. Akiyama (1971) gave an account of some Brazilian species of Trentepohliaceae which includes *T. rigidula*, *T. aurea*, *T. arborum*, *T. calamicola*, *T. abietina*, *T. peruana* and *T. diffracta* on the basis of branching and arrangement of the cells.

The Cheramatla region (N 22°00.117', E 088°42.608') of Indian Sundarbans is characterized by the presence of dense mangrove trees and shrubs with pneumatophores (Satpati *et al*., 2013).

Despite the taxonomic studies of different species of *Trentepohlia* found in the literature from earlier times (Bruhl and Biswas, 1923; Nirmala *et al*., 1990; Krishnamurthy, 2000; Satpati *et al*., 2013; Allali *et al*., 2013), new species and varieties are still being described (Pannikar and Sindhu, 1993). We have reported three species of *Trentepohlia* viz. *T. torulosa* de Wildeman, *T. thevalliensis* Panikkar and Sindhu and *T. abietina* (Flotow) Hansgirg from coastal zone of Indian Sundarbans and described their morphotaxonomy (Satpati *et al*., 2013). In the present study we propose a new species of *Trentepohlia* based on its branching pattern, cell dimensions and sporangial structure.

Material and Methods

Samples were collected during low tide condition using long forceps and scalpel and preserved with a 4% formalin solution and deposited at the Calcutta University Herbarium (CUH) with accession number. The specimen was examined under binocular Carl Zeiss Axiostar plus Microscope (Model no. 1169-149, Gottingen, Germany) and digital photographs were taken by Cannon power shot 500D camera. The *Camera Lucida* drawing was also done by 0.1 Rotring ink pen (Germany) for detail morphology.

Results and Discussion

Trentepohlia sundarbanensis Satpati & Pal sp. nov. (Figs 2A-G, 3A-F & 4A-J)

***Holotype**:* Voucher no. CUH/Al/MW-218, 10 September, 2012, deposited in Calcutta University Herbarium (CUH), Department of Botany, University of Calcutta.

Plants epiphytic, forming orangish red layers on tree trunks; plant body well branched and showing heterotrichous habit i.e. differentiated into clear prostrate and upright system. Cells cylindrical, sometimes swollen or inflated, vegetative cells 30-40 µm wide and 50-80 µm long. Sporangia both terminal and lateral varied in shape from spherical to conical and bilobed, both sessile and stalked, 50-80 µm in diameter; sometimes sporangia formed from many cells and resulting in a linear cluster.

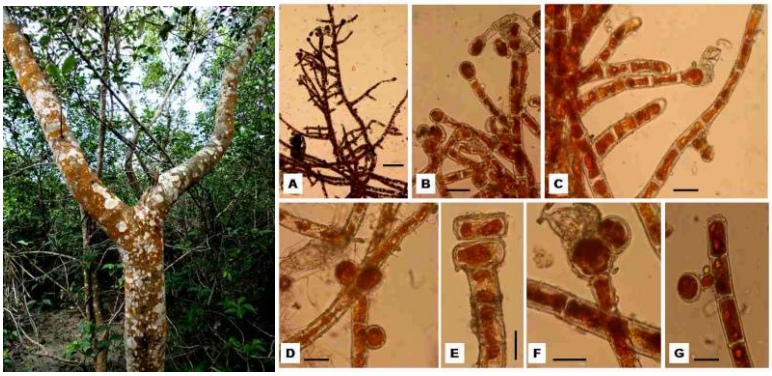
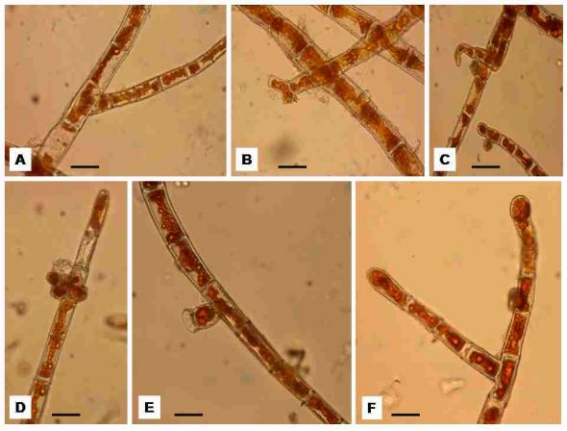


FIG 1 **FIG 2**

Fig. 1. Epiphytic *Trentepohlia sundarbanensis* sp. nov. on tree bark of *Avicennia alba*. Fig. 2. Microphotographs of A. Habit of *Trentepohlia sundarbanensis* sp. nov. B-C. Filaments with terminal sporangium; D. Filaments with globular sessile sporangia; E. Prostrate base of the filament; F. Terminal bilobbed sporangium; G. Stalked sporangium. Scale bar- A, 100 µm; B-G, 50 µm.

***Habitat**:* Epiphytic on halophytic mangrove plant *Avicennia alba* (Fig. 1). ***Etymology**:* The epithet *sundarbanensis* is based on the name of broad region Sundarbans. ***Observations**: Trentepohlia sundarbanensis* differs morphologically from previously described taxa in its unusual branching pattern, cell dimensions and sporangial structure (Figs 2A-G, 3A-F & 4A-J).



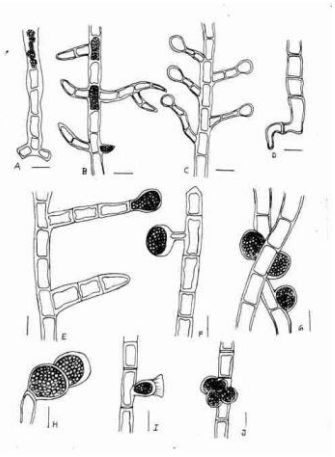


FIG 3 **FIG 4**

Fig. 3. Microphotographs of A-C. Different branching pattern of *Trentepohlia sundarbanensis* sp. nov. D. Aggregation of sporangia; E. Filaments with conical sporangium; F. Branching with terminal sporangium. Scale bar- A-F, 50 µm. Fig. 4. Line drawings of *Trentepohlia sundarbanensis* sp. nov. showing different patterns of branching and sporangia.

Trentepohlia sundarbanensis is characterized by its prostrate and upright system and well irregular branched filaments. In this feature it resembles representatives of the *Trentepohlia aurea* (Linnaeus) Martius but differs in the cell dimensions (both length and width) and stalked sporangia (Table 1). *Trentepohlia abietina* (Flotow) Hansgirg differs from *T. sundarbanensis* by the short size of cells, rare formation of sporangia and copious branching. The cell wall of *T. sundarbanensis* is also much thicker than *T. abietina* (Table 1).

Table 1. Comparative study of *Trentepohlia sundarbanensis sp. nov.*, *T. aurea* and *T. abietina*.

Feature	*T. sundarbanensis sp. nov.*	*T. aurea*	*T. abietina*
Cell length (µm)	50-80	10-60	10-55
Cell breadth (µm)	30-40	7-19	10-20
Type of sporangia	Stalked, spherical, sessile, conical	Sessile, spherical	Rare, cylindrical
Diameter of sporangia (µm)	50-80	20-70	rare, 10-35
Nature of cell wall	thicker	Thinner	much thinner
Branching	extensive, irregular	Less copious	copious
Habitat	epiphytic on mangrove	both epiphytic and metaphytic	epiphytic and epilithic
Distribution	tropical	Worldwide	worldwide

In the present study, the detail morphological observation under bright field microscope was studied, such as unusual branching, sporangia and motile cells within the vegetative body. Both *T. aurea* and *T. abietina* never had their both sessile and stalked spherical or conical sporangia. The presence of *T. sundarbanensis* in brackish water habitat (Salinity: 23.5 ppt) is also a demarcating line of difference than the other two species.

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