

**NOTES ON *OEDOGONIUM CIRCINATUM* TIFF. (OEDOGONIACEAE)
FROM INDIAN SUNDARBAN**

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The genus *Oedogonium* Link appears as most species-rich genus and unbranched member of the order Oedogoniales distributed worldwide with more than 617 species (Guiry and Guiry, 2023) and found in almost all fresh water habitats of the globe (Gonzalves, 1981). The diversity of the genus in India has been studied by several workers (Kamat, 1963; Sarma *et al.*, 1987, 1990; Mahato, 1999; Mahato and Mahato, 2000; Jawale and Dhande, 2005; Kargupta and Keshri, 2006; Keshri, 2012 and Sahoo *et al.*, 2014). Presently *Oedogonium* is credited with more than 357 species in India (Keshri, 2012).

In a recent algal exploration programme to Sundarban, India few noteworthy specimens of fresh water *Oedogonium* were collected from the ditches near rice field at Sibganj in Basanti Island of Sundarban Delta, West Bengal, India found to be associated with *Bulbochaete* sp., *Oscillatoria* sp., *Spirogyra* sp., *Vaucheria* sp., *Zygnema* sp. and other algal members. Critical examination of the morphology and comprehensive literature study revealed this *Oedogonium* as *O. circinatum* Tiff. (Oedogoniaceae). It was previously described by Tiffany in 1936 based on the specimens collected from a canal of South Acradia, Florida, North America. The specific epithet has been derived from its remarkable crosier-like circinate curvature of the terminal cell of the filament (Tiffany, 1936). Later, this species was recorded only in two places, i.e. one at Congo (Africa) and the other from Portugal (Europe). This is a unique and until now the only species of the genus *Oedogonium* having circinate nature of filament end and thus drawn attention to the phycologists around the globe (Gonzalves, 1981). The taxon is characterized by the depressed globose operculate oogonium usually borne on circinate terminal cell of the filament with 7-9 rounded projections. The species is recorded for the first time in Asia from Indian Sundarban, besides its previous habitats in North America, Africa and Europe.

Primarily, the specimens attract attention by two facts: firstly the tiny size of the filaments and secondly the 'hooked end cell' which is mostly terminating into an oogonium. In depth character analysis reveals its typical terminal depressed-globose oogonium with 7-9 unequal rounded projections arranged in a whorl, which were more prominent in equilateral view. Furthermore, the polar view of the oogonium appears as 'flower' having 7-9 ridges and furrows with a central oospore. Until now, this species has never been recorded in Asia, thus the present collection of the species appears as a new distributional record for the continent in general and India in particular. The collected specimens largely agree with the typical *O. circinatum* with its gross morphological features. Besides, few additional quantitative (e.g. cell size) and qualitative (e.g. coiling of intercalary cells, intercalary oogonia) attributes have been observed and thus the present finding provides an opportunity to circumscribe the species with additional data which will be helpful to understand the species more critically and elaborately.

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The present investigation also helps to understand the taxonomy of the species more precisely with newly observed morphological features, both vegetative and reproductive. Besides, detailed illustrations and microphotographs are also incorporated for easy and correct recognition of the species.

Algal specimens were collected in August 2022 from the road side ditches (Latitude 22°11'53" and Longitude 88°42'49") found to be attached with the dried aquatic plant parts at Sibganj of Basanti Island of Sundarban Delta. Environmental parameters like pH and temperature were recorded.

Slides were prepared from fresh specimens using 10% glycerine and Lactic acid to observe the pores/operculum, division of suffultory cells and especially the ornamentation of oospore wall clearly. Samples were also preserved in FAA (Formaldehyde solution 5ml 4%: Glacial Acetic acid 5ml: Ethanol 90ml 70%) solution for future reference. One per cent glycerine was added to prevent the material from desiccation. On reaching laboratory, critical examination and characterization of the collected specimens were done. Camera lucida drawings were prepared. Photomicrographs were taken by Leica DM750 microscope. All relevant literature (Tiffany, 1936; Gonzalves, 1981; Keshri, 2012) has been consulted to confirm identity as well as the distinctiveness of the species. The illustration published in the protologue (Iconotype) has also been compared to corroborate identity. The specimens are deposited in the Sundarban Hazi Desarat College Herbarium.

Oedogonium circinatum Tiff., Amer. Micr. Soc. 55: 1, f 1-3, 1936; Tiff., Ame. Mid. Nat. 32 (1): 98-136, p1. 6, f. 111.1944; Gonzalves, Oedo. Gen. Oedo.374.1981. (Figs 1-2)

Nannandrous, heterothallic; Filament short, up to 5mm, vegetative cell slightly capitillate, 3-4.5µm in diameter, 12-21 µm long; upper part of the filament always circinate, some protuberances found at the intercalary positions; *oogonium* mostly single, sometimes two, terminal sometimes intercalary, with 7-9 rounded projections arranged in median whorl, depressed to sub depressed, globose 9-10.5µm in diameter, 7-12µm long; operculate, division median- inframedian, suffultory cell slightly inflated, curved; basal cells 3-3.6µm in diameter, 16-18µm long pointed at base; oospore depressed globose, 6-8 µm in diameter, 5-7µm long; oospore wall smooth, mostly covering the oogonium completely; antheridia not found.

Specimens: MM- SUN: 87, 91; 14.08.2022, Microscopic slide (kept at Sundarban Hazi Desarat College Herbarium)

Water quality: Clean. Temperature: 32°C; PH- 6.4.

Habitat ecology: The alga attached on died aquatic weeds in stagnant water at an elevation c. 6 m amsl, in association with species of *Bulbochaete* sp., *Spirogyra* sp., *Vaucheria* sp. and *Zygnema* sp.

Distribution: Africa (Congo), North America (Florida), Europe (Portugal), Asia (India: Sundarban, West Bengal -present report).

The specimens of *O. circinatum* under present investigation agrees with the key characters of the species, however, the size of oogonium and oospore is smaller which could be considered as morphoplasticity due to different environmental conditions. However, the most significant observation is the presence of intercalary oogonia. Notably, suffultory cells are always circinate.

Furthermore, coiling of filaments is also noticed in few intercalary cells of the filament which could be the initiation of reproductive phase, though more intricate observation is needed with more specimens to confirm this fact.

Notes: The occurrence of *O. circinatum* in Sundarbans is perhaps most significant among all recent findings of India because this 'circinate' member is recorded for the first time in Asia. More importantly, prior to this investigation, only three locations (habitats) of this species are known, one from each continent North America (Florida), Africa (Congo) and Europe (Portugal) (Gonzalves, 1981; Guiry and Guiry, 2023). So, the present finding confirms its occurrence from Indian Sundarban, West Bengal and from Asia for the first time.



Fig. 1. *Oedogonium circinatum*. A. A Filament. B. Filament with terminal oogonium (polar view). C. Intercalary oogonium (equatorial view). D-E. Filament with terminal oogonium (equatorial view).

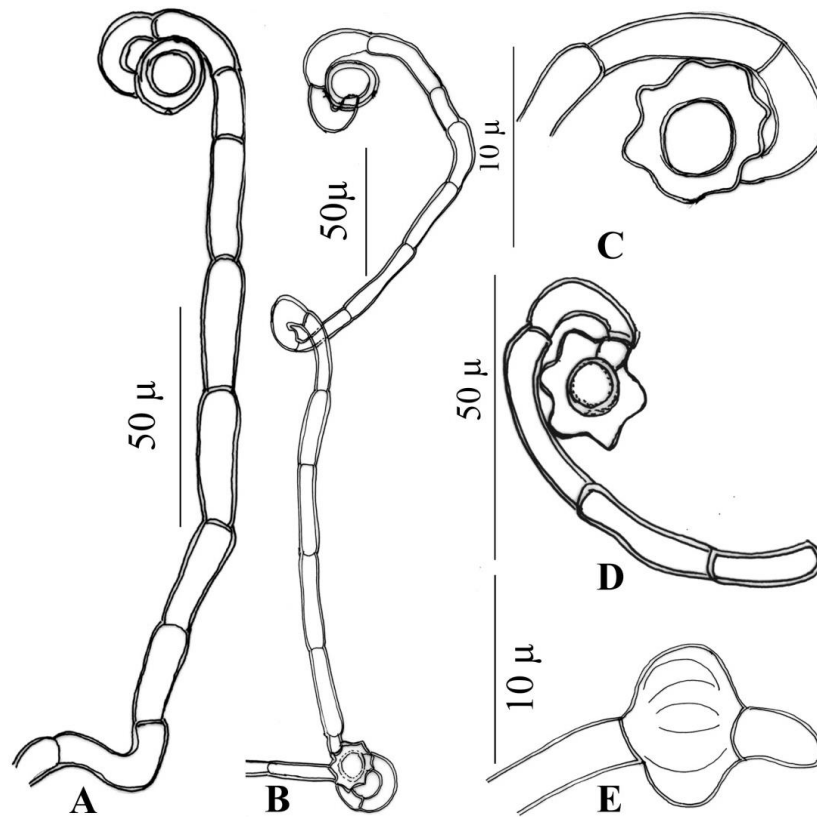


Fig. 2. *Oedogonium circinatum*. A. Filament with circinate terminal oogonium (equatorial view). B. Intercalary and terminal oogonium. C-D. Oogonium (polar view). E. Oogonium with projections.

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