

ISSN 0971-6548

# INDIAN HYDROBIOLOGY

VOLUME

22

NUMBER

2

YEAR

23



# **INDIAN HYDROBIOLOGY**

Volume 22 Number 2

December 2023

**Krishnamurthy Institute of Algology**

9/2 Lady Madhavan I Cross Street,  
Mahalingapuram, Chennai-600 034

# INDIAN HYDROBIOLOGY

9/2 Lady Madhavan I Cross Street  
Mahalingapuram, Chennai-600 034  
krishalg@gmail.com

*Chief Editor*

**Dr. M. Baluswami**

Associate Professor and Head (Rtd.)  
Department of Botany, Madras Christian College, Chennai-600 059  
Email: balumcc@gmail.com

## Editorial Board

**Prof. S.P. Adhikary**

(Ex. Vice-Chancellor  
FM University, Odisha  
Department of Biotechnology  
Visva-Bharati (a Central University)  
Santiniketan-731 235  
Email: adhikarysp@gmail.com

**Prof. B.B. Chaugule**

Retd. Head, Dept. of Botany  
University of Pune  
Pune  
Email: profbbc@gmail.com

**Dr. M.V.N. Panikkar**

Emeritus Professor (UGC)  
S.N.College, Kollam-691 001  
Kerala  
Email: mvnpanikkar@gmail.com

**Dr. Polur Hanumantha Rao**

Department of Microbiology  
Madras Christian College  
Chennai-600 059  
Email: dr.phrao@gmail.com

**Dr. Jai Prakash Keshri**

Professor  
UGC C.A.S. in Botany  
The University of Burdwan  
Golapbag, Burdwan-713 104  
West Bengal, India  
Email: keshrijp@gmail.com  
keshri\_jp@yahoo.com

**Dr. Bakhavachalam Babu**

Department of Botany  
Madras Christian College  
Chennai-600 059  
Email: bbabu2k5@gmail.com

**Dr. J. Logamanya Tilak**

Department of Zoology  
Madras Christian College  
Chennai-600 059  
Email: mcttilak@gmail.com

**Dr. A. Murugan**

Marine Conservation Lab  
P.G. & Research Department of Zoology  
V.O.Chidambaram College  
Tuticorin-628 008  
Email: muruganrsa@gmail.com

**Dr. M. Madhavi**

PG and Research Department of Zoology  
Ethiraj College for Women  
Chennai  
Email: madhavi\_m@ethirajcollege.edu.in

**Dr. M. Nalini**

Assistant Professor  
PG & Research Dept. of Zoology  
Poompuhar College (Autonomous)  
Melaiyur-609 107, Nagapattinam District  
Email: madannalini@gmail.com

---

Printed copy of *Indian Hydrobiology* is supplied free to all members of Krishnamurthy Institute of Algology, Chennai. Annual subscription/membership fees is Rs.3000/-. For Institutions, the subscription rate per annum is Rs.5,000/-. Applicable from *Indian Hydrobiology*, vol. 23, no. 1. Remittance to be made by D.D. on a Chennai Bank in favour of Krishnamurthy Institute of Algology and mailed to Mr. Vasudevan Krishnamurthy, Vice President, Krishnamurthy Institute of Algology or through online payment to: KRISHNAMURTHY INSTITUTE OF ALGOLOGY, SB A/C NO. 048201000019395, IFSC IOBA0000482, INDIAN OVERSEAS BANK, Mahalingapuram Branch, Chennai-600 034.

---

Visit us at: <https://krishalgology.yolasite.com/> ; <https://indianhydrobiology.yolasite.com/>

## Contents

- 191 Archana Pachath and M. Shamina – A review of secondary metabolites in cyanobacteria as nutraceuticals
- 199 Asha Ramachandran, Rogimon P. Thomas, Salvy Thomas and R. Jithesh Krishnan – An updated review on diversity and distribution of taxa of *Oedogonium* Link in India
- 203 Arjuna Apparao Adari and Ravi Babu Suriseti – Elucidating the ecological richness and Conservation importance of the Coringa Mangrove Conservation Area in the Godavari Delta complex, India
- 211 Thushara James, K.M. Mujeeb Rahiman, Denoj Sebastian, S. Suja Rani and M.D. Dinesh – Growth inhibitory properties of specific anti-A. *hydrophila* IgY antibodies: A promising approach for the prevention of *Aeromonas* infection in farmed fish
- 221 T.K. Dhanya and K. Azeez – Floristic diversity of mangroves in Kadalundi – Vallikkunnu community reserve, Malappuram – Kerala: Special Emphasis on its present status
- 229 Dipty Kumari and D.K. Paul – Seasonal concentration and pollution assessment of heavy metals in sediments of Urban Ponds of Patna
- 239 Chandan Sarkar – Studies on Ichthyofaunal diversity of Bhaluka beel, Nadia in relation with physicochemical properties
- 247 Vinu Thomas, P. Tessa Paul and K.M. Mohammed Nasser – Algal flora of Naranipuzha, Malappuram district, Kerala, India
- 259 Abhijit Chandra Roy, Hrishikesh Choudhury and Shatabdi Biswas – A preliminary study on the Food Preference of Red-tailed Loach *Aborichthys elongatus* Hora in the Aquarium
- 263 Narendra Babu Shakya, Jitendra Mohan and Vishal Saxena – Performance assessment of aquatic macrophyte *Lemna minor* in Municipal Wastewater
- 269 E.P.M. Sruthy and G. Chitra – Monthly variations in physicochemical characters of Thikkodi coastal waters, Northwest coast of Kerala
- 283 K.A.K. Aneesa, B. Hari and S. Jisha – Morphometry and length-weight relationships of *Littoraria undulata* (Gray, 1839) populations inhabiting the rocky shores of Southern Kerala
- 297 Ronak R. Charan, Narendra Kumar and Hitesh A. Solanki – Fostering biomass growth in Godhra’s natural wetlands: A focus on species-specific plantation management
- 315 R. Jithesh Krishnan, M.R. Harikrishnan, Rogimon P. Thomas, Asha Ramachandran and B.S. Sreepriya – New distributional record of *Cosmarium* Corda ex Ralfs and *Euastrum* Ehrenberg ex Ralfs (Desmidiaceae, Zygnematophyceae) from the Peninsular Indian river Kallada, Kerala
- 323 Shalini Singh, D.M. Tripathi and S. Tripathi – An ecological study of phytoplankton ecology in freshwater rivers in the Bundelkhand region
- 333 K.B. Bindhu, N. Nimisha, P.S. Rekha and Adya Shibu – Phytochemical and *in vitro* cytotoxicity analysis of *Caulerpa racemosa*
- 339 Divya T. Dharan and M. Malavika – Occurrence and distribution of Ichthyofauna of Akathumuri backwater, Vakkom, Kerala

## Contents (*Continued*)

- 347** M. Isakkiyammal, V. Sornalakshmi, P.S. Tresina, V.R. Mohan and Venkataraman Kumar – Influence of seaweed extract as biofertilizer on growth, phytochemical and yield parameters of *Vigna radiata*
- 353** S. Silvana Santhini So and D. Deleep Packia Raj – The Water quality assessment of Mukkadal Reservoir in Kanyakumari district, Tamil Nadu
- 359** Najma Khatun, Priyanki Sharma and Nikita Sarmah – Comparative study on nutritional composition of five selected freshwater fish species collected from Uzan Bazar fish market of Guwahati, Assam, India
- 367** G. Rani – A Tribute to Prof. S. Bharathan
- 368** A.S. Ahluwalia – Professor H.D. Kumar: A dedicated Phycologist, Ecologist, and Microbial Biotechnologist
- 370** R. Marimuthu – Dr. A. Balasundaram (13.08.1940 – 29.11.2022) A Teacher to emulate.....
- 372** T.V. Poonguzhali – Tribute to my Mentor- Professor V.N. Raja Rao (13.11.1939 – 30.07.2023)

# New distributional record of *Cosmarium* Corda *ex* Ralfs and *Euastrum* Ehrenberg *ex* Ralfs (Desmidiaceae, Zygnematophyceae) from the Peninsular Indian river Kallada, Kerala

R. Jithesh Krishnan<sup>1,\*</sup>, M.R. Harikrishnan<sup>2</sup>, Rogimon P. Thomas<sup>3</sup>,  
Asha Ramachandran<sup>4</sup> and B.S. Sreepriya<sup>1</sup>

<sup>1</sup>Department of Botany, NSS College, Pandalam, Kerala – 689 501, India

<sup>2</sup>Department of Botany, University of Kerala, Thiruvananthapuram, Kerala, India

<sup>3</sup>Department of Botany, CMS College, Kottayam (Autonomous), Kerala, India

<sup>4</sup>Department of Botany, Govt. College, Kottayam, Kerala, India

\*Corresponding Author – kjith77@gmail.com

## Abstract

Desmids are indicators of the water's quality. They show rich species diversity. The Genus *Cosmarium* Corda *ex* Ralfs is a very common desmid in riverine ecosystems. They are a principal component of the food of many ichthyofauna. Unfortunately, they are inadequately documented and studied in the field biology of Kerala Rivers. The present study is aimed at understanding the Desmid flora of the river Kallada in Kollam District. Six algal samples were collected from three different locations along the river, extending from the upstream to the downstream. A total of 16 taxa of *Cosmarium*, viz., *C. amoenum*, *C. crenatum*, *C. dickii*, *C. hammeri*, *C. humile*, *C. impressulum*, *C. norimbergense*, *C. pseudoornatum*, *C. quadrum*, *C. reniforme*, *C. retusum*, *C. sexnotatum*, *Cosmarium* sp., *C. subprotumidum*, *C. subtumidum*, and 3 taxa of *Euastrum*, viz., *Euastrum binale*, *E. denticulatum*, *E. pulchellum* were reported for the first time from the River.

**Key words:** Peninsular Kallada River; Phytoplankton Flora; Desmids-Zygnematophyceae; *Cosmarium*; *Euastrum*.

## Introduction

Desmids are a unique group of unicellular green algae; they are indicators of the quality of fresh water (Sanilkumar and Thomas, 2002). Most of the Indian freshwater bodies are enriched with a large number of the algae of the Zygnemataceae family. They are significantly contributing to the food web of the rivers. Many fishes are selective feeders of the Zygnemataceae group of algae due to their rich potential for protein and lipids (Coesel, 1997). Around 12,000 species of desmids have been identified so far (Coesel and Krienitz, 2008).

Studies on the Indian Desmidaceae began in the late 18<sup>th</sup> century (Turner, 1892). Meager literature is available on the detailed distribution and diversity of Desmids in India. South Indian Desmid flora was studied by a few scientists (Iyengar and Vimala Bai, 1941;

Iyengar and Ramanathan, 1942; Ramanathan, 1962; Anand, 1998; Arulmurugan *et al.*, 2010; Maheswari and Baluswami, 2018). In Kerala, research on Desmid flora was carried out by Sindhu and Panikkar (1995); Paul and Sreekumar (2007, 2011, 2013); Krishnan (2010); Krishnan *et al.* (2023).

Among the Desmids of South Indian rivers, the genus *Cosmarium* is the most frequently occurring one. This genus has 1024 species (Guiry and Guiry, 2023). *Cosmarium* and *Euastrum* are characterized by individual cells with two bi-cells formed by deep constriction. Many of the species show ornamentation on the cell wall, which makes their identification unique. The semi-cells of all the species are unique in size and shape, making it easy to identify and distinguish them from each other. The semi-cells are rich in chloroplasts and pyrenoids.

Very little literature is available on the diversity of *Cosmarium* and *Euastrum* in India. A few reports available on the diversity are Hegde (1986); Asokakumar and Patel (1990); Habib and Pandey (1990); Jena *et al.* (2006); Shukla *et al.* (2008); Raja and Baluswami (2009); Suseela and Toppo (2007); Toppo and Suseela (2009); Das and Keshri (2013); Mhaske and Talwankar (2018); Nandi *et al.* (2019); Babu and Vasanthakumar (2020) etc. However, Sindhu and Panikkar (1994); Krishnan (2009); Ray *et al.* (2012); Paul and Sreekumar (2013); Krishnan *et al.* (2023) are some of the significant reports that document the diversity of *Cosmarium* in different lotic and lentic water bodies of Kerala. A detailed documentation of *Euastrum* in Kole lands of Thrissur, Kerala was carried out (Paul and Sreekumar, 2015). Maheswari and Baluswami (2017) documented the *Euastrum* of Tamil Nadu.

River Kallada is one of the major rivers in Kerala, which significantly contributes to the hydroelectricity generation and irrigation requirements of the State. The Phytoplankton flora of this river is not yet documented in detail. Since the river joins with the Ashtamudi backwaters of Kollam, a horizontal migration of unique flora and fauna exists in the River. This river needs to be documented to understand the phytoplankton community structure and related food web architecture. Since Desmids play a significant role in the food chain of freshwater bodies, they should be well documented. No specific literature is available on the Zygnematophyceae of the Kallada River in Kerala. Therefore, the present study was undertaken to document two important genera *Cosmarium* and *Euastrum* of Zygnematophyceae from the Kallada River.

## Materials and methods

Samples were collected on April 3<sup>rd</sup> and 4<sup>th</sup>, 2023, from three river locations (Punalur (K1), Enathu (K2), and Kunnathur (K3)) (Fig. 1). The first two stations are at a distance of 25 km, and the second and third stations are at a distance of 13 km each. The sample number, localities, habits and geographical coordinates are expressed in Table 1. The samples were preserved in lugol's iodine as per standard

procedures (Santhanam *et al.*, 1989) and stored in labeled bottles for further studies. Each sample was observed, and photomicrographs were taken using a MAGCAM DC-5 camera attached to a 100x trinocular microscope. Identification of the taxa was performed using Coesel (1996); Suseela and Toppo (2007); Das and Adhikary (2014); Das and Keshri (2016); Brook and Williamson (2010); Paul and Sreekumar (2015); Lee (2015); Guiry and Guiry (2023). The Samples were deposited in the Research Laboratory, NSS College, Pandalam, Kerala.

## Result and discussion

The bi-cells of *Cosmarium* are rounded and solitary; in outline, they appear rectangular or ellipsoid. A constriction separates the bi-cells. Some species have elliptic cells while others have pyramidal, reniform, semicircular, sub ovate, and sub-rectangular cells. Some species have cells with smooth margins while some others have granulated margins.

The bi-cells of *Euastrum* are solitary, with varied shapes. Some species have rectangular or ellipsoid cells while others with reniform, sub ovate, or pyramidal semi-cells. Strict constriction separates the semi-cells. Most species have cells with smooth margins while some others have pointed appendages.

A total number of 16 taxa of *Cosmarium* were documented during the present study. All of them were reported for the first time from the River, and 3 taxa of *Euastrum*, that were also recorded for the first time. Description of identified taxa of *Cosmarium* and *Euastrum* are given below (Plate 1).

### *Cosmarium amoenum* Brébisson ex Ralfs 1848 (fig. 1)

#### Cell dimensions

Cells longer than broad, cylindroid, cell body 42–67  $\mu\text{m}$  long and 22–30  $\mu\text{m}$  broad, isthmus 13–21  $\mu\text{m}$  broad; cell wall covered with large granules, longitudinally arranging in 7–8 rows forming a cross pattern on the cell wall; 2 pyrenoids in each semi cell.

#### Habitat

Free floating form collected from the River at Punalur near KSRTC Bus Station.

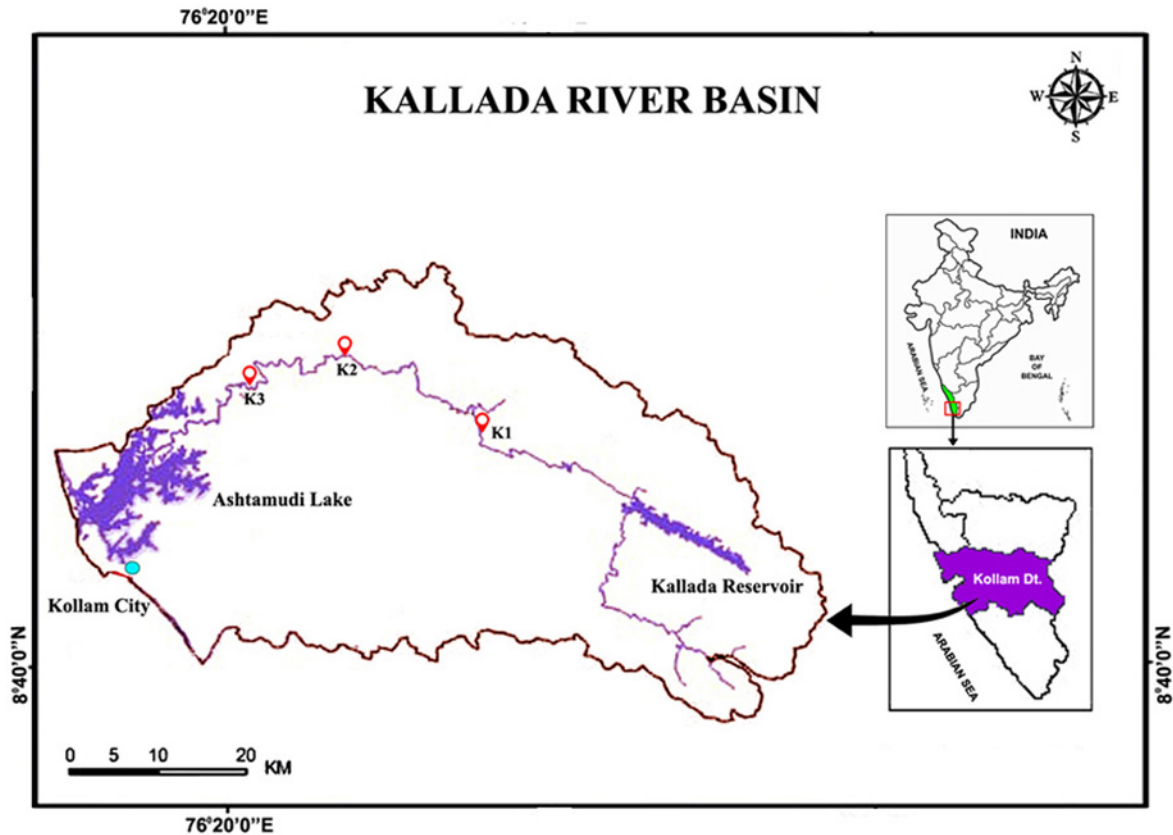


Fig. 1: The course of river showing sampling locations.

Table 1: List of sample, location, habit, and geographic coordinates.

S. No.	Sample No.	Site Name	Habit	Latitude	Longitude
1	K101042023	Punalur (Near Suspension Bridge)	Epiphyte	9.0217°N	76.9327°E
2	K102042023	Punalur (Near KSRTC Bus Station)	Plankton		
3	K201042023	Enadimangalam (Near Footbridge)	Epiphyte	9.1342°N	76.81125°E
4	K202042023	Enadimangalam (Near the Market)	Plankton		
5	K301042023	Kunnathur (Near the Bridge)	Epiphyte	9.22392°N	76.55721°E
6	K302042023	Kunnathur (Near Karimbipuzha Temple)	Plankton		

### *Cosmarium crenatum* Ralfs ex Ralfs 1848 (fig. 2)

#### Cell dimensions

Variable cell shape, flattened, each semi-cell hemispherical, cell body 30  $\mu\text{m}$  long, 20  $\mu\text{m}$  broad, isthmus 10  $\mu\text{m}$  broad, semi-cells linearly arranged or zigzag; cell body is elliptical or spindle or crescent in shape; marginal cells with ornamentation.

#### Habitat

Free floating form collected from the River at Punalur near KSRTC Bus Station.

### *Cosmarium dickii* Coesel 1989 (fig. 3)

#### Cell dimensions

Bi-cells attached side by side, linearly arranged, cell body with round apex, margins fringed, with projections. Cell body 24–26  $\mu\text{m}$  long and 20–22  $\mu\text{m}$  broad. Distinct two supra isthmal granules present.

#### Habitat

Epiphytic form collected from the River at Punalur near Suspension Bridge.



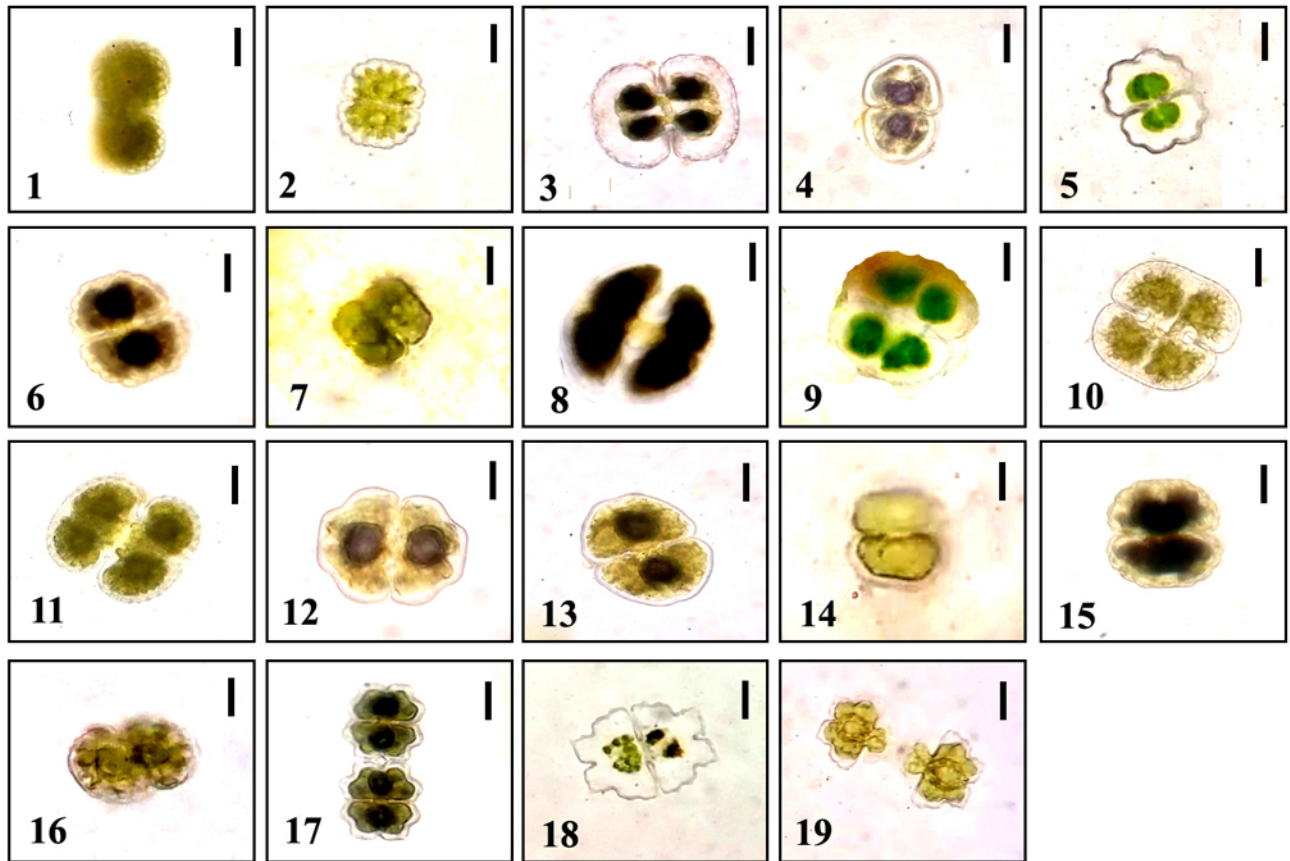


Plate 1: (1) *Cosmarium amoenum*; (2) *Cosmarium crenatum*; (3) *Cosmarium dickii*; (4) *Cosmarium hammeri*; (5) *Cosmarium humile*; (6) *Cosmarium impressulum*; (7) *Cosmarium norimbergense*; (8) *Cosmarium obsoletum*; (9) *Cosmarium pseudoornatum*; (10) *Cosmarium quadrum*; (11) *Cosmarium reniforme*; (12) *Cosmarium retusum*; (13) *Cosmarium sexnotatum*; (14) *Cosmarium sp.*; (15) *Cosmarium subprotumidum*; (16) *Cosmarium subtumidum*; (17) *Euastrum binale*; (18) *Euastrum denticulatum*; (19) *Euastrum pulchellum* (Scale bars: Figs. 1–19=10  $\mu$ m).

### *Cosmarium hammeri* Reinsch 1866 (fig. 4)

#### Cell dimensions

Cells 27  $\mu$ m long, 23  $\mu$ m broad, isthmus 12  $\mu$ m broad. Cells variable in shape; a constriction at the center of the cell body: mostly longer than broad; flattened; each semi-cell hemispherical, spherical, ellipsoidal, rectangular, pyramidal, or kidney-shaped; no apical indentation.

#### Habitat

Epiphytic form collected from the River at Punalur near Suspension Bridge.

### *Cosmarium humile* Nordstedt ex DeToni 1889 (fig. 5)

#### Cell dimensions

Small-sized *Cosmarium*, the cell wall of which is sculptured by both in curvations and granules.

The lateral sides of the semi-cells show a deep sub-apical in curvation dividing the semi-cell in a broad basal part and a smaller rectangular apical part. Apical granules are present on the cell margin. Cell body 15–20  $\mu$ m long, 20–30  $\mu$ m broad.

#### Habitat

Free floating form collected from the River at Punalur near Suspension Bridge.

### *Cosmarium impressulum* Elfving 1881 (fig. 6)

#### Cell dimensions

Cells small, 21–30  $\mu$ m long. 15–20  $\mu$ m broad, isthmus 5–7  $\mu$ m broad, both sides of semi cells with four wavy margins with 8 undulations, 2 at the apex, all waves equal in size, side view elongated ellipsoid; smooth cell wall.

**Habitat**

Epiphytic form collected from the River at Punalur near Suspension Bridge.

***Cosmarium norimbergense* Reinsch 1867 (fig. 7)****Cell dimensions**

Cells rectangular in shape, longer than broad, dorso-ventrally compressed, 17 µm long, 14 µm broad, constriction 5.5 µm broad, unicellular, variable in shape, a constriction at the center of the cell, flattened apex. Semi cells oblong transversely, basal angles broadly rounded, lateral margins ret use and parallel, with truncated apex, circular in lateral view and elliptical in vertical view.

**Habitat**

Epiphytic floating form collected from the River at Punalur near Suspension Bridge.

***Cosmarium obsoletum* (Hantzsch) Reinsch 1867 (fig. 8)****Cell dimensions**

Cells medium in size, broadly elliptical, 34–50 µm long, 42–54 µm broad, and isthmus 15–25 µm broad; deeply constricted at the center, semi-cells semi-elliptical or depressed semicircular, cell wall at basal corner thickened like a papillae, cell wall punctuate and dotted. Semi cells circular in lateral view and elliptical in vertical view; protruding apex end and cell wall sparsely punctate.

**Habitat**

Epiphytic form collected from the River near Enathu Footbridge.

***Cosmarium pseudoornatum* B. Eichler & Gutwinski 1894 (fig. 9)****Cell dimensions**

Medium-sized cells, as long as broad or slightly broader than long. Cells 30–35 µm long and 35–39 µm in broad. Cells deeply constricted at the center, sinus linearly closed, and isthmus 8–10 µm. Semi-cells nearly spherical or inverted, broadly ovoid, both ends broader than the center, two concentric series of granules present on the cell wall.

**Habitat**

Free floating form collected from the River near Enathu Footbridge.

***Cosmarium quadrum* P. Lundell 1871 (fig. 10)****Cell dimensions**

Cells rectangular, 52–70 µm long, 47–80 µm broad; isthmus 20–30 µm broad, cells deeply constricted, sinus narrowly linear, with a slightly dilated proximal end. Semi cells subrectangular, with rounded comers, side view nearly circular, apical view elongated and ellipsoidal, and marginal granules up to 40 in number.

**Habitat**

Free floating form collected from the River near Enathu Footbridge.

***Cosmarium reniforme* (Ralfs) W. Archer 1874 (fig. 11)****Cell dimensions**

Cell body medium in size, slightly longer than broad, 47–57 µm long, 38–40 µm broad, isthmus 15–20 µm broad: semi-cells reniform, side view circular, apical view elliptical and the cell wall is covered with granules.

**Habitat**

Epiphytic form collected from the River near Enathu Footbridge.

***Cosmarium retusum* (Perty) Rabenhorst 1868 (fig. 12)****Cell dimensions**

Cells 160 µm long and 108 µm broad. Slightly constricted at the center. Look similar to *Euastrum* cells. Semi-cells broader at the center and narrow and tapering towards the apex, wavy and smooth margin.

**Habitat**

Epiphytic form collected from the River near Enathu Market.

***Cosmarium sexnotatum* Gutwinski 1892 (fig. 13)****Cell dimensions**

Bi-cells attached side by side, linearly arranged. Cells 90–100 µm long and 100 µm broad.

Broader than long, broad central region and convex margin and blunt apex with a small constriction at the tip.

#### **Habitat**

Epiphytic form collected from the River near Kunnathur Bridge.

#### ***Cosmarium* sp. (fig. 14)**

##### **Cell dimensions**

Cells 15–19  $\mu\text{m}$  long, 19–25  $\mu\text{m}$  broad; variable in shape. A constriction at the center of the cell body, broader than length; each semi cell hemispherical, spherical, ellipsoidal, rectangular, pyramidal or kidney-shaped; flattened at the apex.

#### **Habitat**

Epiphytic form collected from the River near Karimbinpuzha Temple.

#### ***Cosmarium subprotumidum* Nordstedt 1900 (fig. 15)**

##### **Cell dimensions**

Cells 28–40  $\mu\text{m}$  long, 21–33  $\mu\text{m}$  broad, and isthmus 5–7  $\mu\text{m}$  broad. Granulate cell wall and a crenate cell outline. The apex is more flattened.

#### **Habitat**

Epiphytic form collected from the River near Kunnathur Bridge.

#### ***Cosmarium subtumidum* Nordstedt 1878 (fig. 16)**

##### **Cell dimensions**

Cells 30–43  $\mu\text{m}$  long, 21–32  $\mu\text{m}$  broad and isthmus is 7–14  $\mu\text{m}$  broad. Apex flat and broad.

#### **Habitat**

Free floating form collected from the River near Karimbinpuzha Temple.

#### ***Euastrum binale* Ehrenberg ex Ralfs 1848 (fig. 17)**

##### **Cell dimensions**

Cells small, 15–30  $\mu\text{m}$  long and 12–20  $\mu\text{m}$  broad, constriction 3–8  $\mu\text{m}$  broad, semi-cells pyramidal, basal lobes rounded, anterior margin

broad, both corners depressed at the center, both corners slightly pointed, lateral view of semi-cells ovoid, apical view ellipsoid. Both sides convex.

#### **Habitat**

Epiphytic form collected from the River near Punalur Suspension Bridge.

#### ***Euastrum denticulatum* F. Gay 1884 (fig. 18)**

##### **Cell dimensions**

Cells 24  $\mu\text{m}$  long and 17  $\mu\text{m}$  broad. Semi-cells appear to be sub-trapezi form and semi-quadrangular in shape, 3-lobed with tiny spine at each angle as the ornamental features of the cell walls.

#### **Habitat**

Epiphytic form collected from the River near Enathu Footbridge.

#### ***Euastrum pulchellum* Brébisson 1856 (fig. 19)**

##### **Cell dimensions**

Cells 31–40  $\mu\text{m}$  long and 28–33  $\mu\text{m}$  broad, semi-cells with longer apical lobes. Isthmus 7–8  $\mu\text{m}$  broad. The semi-cells are quadrangular in shape with tiny spines at each angle as well. The apical lobes appear broad with a deep narrow median incision straight towards the pyrenoid.

#### **Habitat**

Epiphytic form collected from the River near Karimbinpuzha Temple.

#### **Conclusion**

A total of 16 taxa of *Cosmarium* and 3 taxa of *Euastrum* were recorded in the present study. All the taxa are reported for the first time from the River. As per the present study, it was understood that the freshwater algal biodiversity of river Kallada is rich in Desmids. A good number of the varied species of *Cosmarium* exist in the river. This study serves as baseline data for the diversity of Desmids in peninsular Indian rivers, particularly the rivers in Kerala. This study also pinpoints the importance of a detailed investigation on the beneficial algal flora in

the aquatic food chain as well as their role in the ecosystem. These microalgae play a crucial role in maintaining the balance of the aquatic ecosystem. This may help in the conservation and to explore the ways and means of proper utilization of such bio-resources for human welfare.

## References

- Anand, N. 1998. *Indian Freshwater Microalgae*. Bishen Singh Mahendrapal Singh, 23-A, New Connaught Place, Dehra Dun, p.94 (263 figs).
- Arulmurugan, P., Nagaraj, S. and Ananad, N. 2010. Biodiversity of fresh water algae from temple tanks of Kerala. *Rec. Res. In Sci. and Tech.*, **2(6)**: 58–71.
- Asokakumar, C.K. and Patel, R.J. 1990. Desmids of Gujarat – I. Genus *Cosmarium* Corda. *Phykos*, **29**: 95–101.
- Babu Bhakthavachalam and Vasanthakumar, S. 2020. Diversity and new records of *Cosmarium* Corda ex Ralfs (Desmidiales, Zygnemtophyceae) from Kanyakumari District, Tamil Nadu, India. *Indian Hydro.*, **19(1&2)**: 263–284.
- Brook, A.J. and Willaimson, D.B. 2010. *A Monograph on some British Desmids Vol. 172*. Ray Society Publishers: London, UK, p.364 (157 plates).
- Coesel, P.F.M. 1996. Biogeography of Desmids. *Hydrobiol.*, **336**: 41–53.
- Coesel, P.F.M. 1997. The edibility of *Staurastrum chaetoceras* and *Cosamrium abbreviatum* (Desmidaceae) for *Daphnia galeata/hyaline* and the role of desmids in aquatic food web. *Aquat. Ecol.*, **31**: 73–78.
- Coesel, P.F.M. and Krienitz, L. 2008. Diversity and geographic distribution of desmids and other coccoid green algae, *Biodivers.Conserv.*, **17**: 381–392.
- Das Debjyoti and Keshri Jai Prakash 2013. Desmids of Khechiperi Lake, Sikkim Eastern Himalaya. *Algol. Stud.*, **143**: 27–41.
- Das Sudipta Kumar and Adhikary Siba Prasad 2014. *Freshwater algae of Eastern India*. Daya Publishing House: New Delhi, p.453.
- Das Debjyoti and Keshri Jai Prakash 2016. Desmids of Eastern Himalaya. *Bibliotheca Phycologica, Vol. 119*, J Caramer in Borntraeger Science Publishers: Johannesstr, Germany, p.260 (10 figs).
- Guiry, M.D. and Guiry, G.M. 2023. Algaebase. World-wide electronic publication: National University of Ireland, Galway (<http://www.algaebase.org>; searched on March 22, 2023).
- Habib, I. and Pandey, U.C. 1990. On some taxa of *Cosmarium* Corda. New to Indian Desmids flora. *J. Indian Bot. Soc.*, **69**: 275–276.
- Hegde, G.R. 1986. Records of desmids new to Karnataka state – II Genus *Cosmarium* Corda. *Phykos*, **25**: 123–128.
- Iyengar, M.O.P. and Vimala Bai, V. 1941. Desmids of Kodaikanal, South India. *J. Indian Bot. Soc.*, **20**: 73–103.
- Iyengar, M.O.P. and Ramanathan, K.R. 1942. Triplastrum, a new member of the Desmidaceae from South India, South India. *J. Indian Bot. Soc.*, **21(3-4)**: 225–229.
- Jena, M., Ratha, S.K. and Adhikary, S.P. 2006. Desmids (Zygnematales, Cholophyceae) of Orissa state and neighboring regions, India. *Algol. Stud.*, **122**: 17–34.
- Krishnan, R. Jithesh 2009. New report of phytoplankton's from Mullaperiyar Lake, Periyar Tiger Reserve, Western Ghats, Kerala. *Ind. Forest.*, **135(12)**: 1750–1751.
- Krishnan, R. Jithesh 2010. First report on the Phytoplankton flora of Mullaperiyar-a tropical high altitude Lake in the Western Ghats of Kerala. *In: Proceedings of 22<sup>nd</sup> Kerala Science Congress (28<sup>th</sup> to 31<sup>st</sup> January)*, pp. 624–626.
- Krishnan, R. Jithesh, Ramachandran Asha, Rogimon, P. Thomas and Resmi, A. 2023. First Report on the Phytoplankton of Athirappilly Waterfall Area in Chalakudy River, Kerala Western Ghats, India. *Ind. Hydrobiol.*, **22(1)**: 127–144.
- Lee, O.M. 2015. *Algal flora of Korea. Charophyta: Conjugatophyceae: Desmidiales: Desmidaceae: Cosmarium II and Staurastrum II*. National Institute of Biological Resources, Ministry of Environment, **6(7)**: 105.
- Maheswari, K. and Baluswami, M. 2017. Taxa of Desmidaceae from Tamil Nadu, India – *Euastrum* Ehrenberg Ex Ralfs. *Ind. Hydrobiol.*, **17(1)**: 35–56.
- Maheswari, K. and Baluswami, M. 2018. Filamentous Desmids of Tamil Nadu. *Ind. Hydrobiol.*, **17(2)**: 122–138.
- Mhaske, T.K. and Talwankar, D.S. 2018. Occurrence of *Cosmarium* species in Khadakpurna reservoir, Buldana district–Maharashtra, India. *GSC Biol. Pharm. Sci.*, **5**: 20–24.

- Nandi, C., Bhowmick, S., Gorain, P.C. and Pal, R. 2019. New and Rare Records of *Cosmarium* (Desmidiaceae, Zygnematales) from India. *Phytomorphol.*, **69**: 41–49.
- Paul, P. Tessa and Sreekumar, R. 2007. Occurrence of desmid *Micrasterias* Agardh from the Kol wetlands of Thrissur, Kerala. *Ind. Hydrobiol.*, **10(2)**: 371–376.
- Paul, P. Tessa and Sreekumar, R. 2011. Desmid *Pleurotaenium* Nageli from the Kole lands of Thrissur (Part of Vembanad Kol, Ramsar site), Kerala, India. *Int. J. of Curr. Res.*, **3(12)**: 59–63.
- Paul, P. Tessa and Sreekumar, R. 2013. Desmid *Euastrum* Ehrenberg from the Kole lands of Thrissur (Part of Vembanad Kol, Ramsar site), Kerala. *Annl. of Plant. Sci.*, **2(8)**: 272–277.
- Paul, P. Tessa and Sreekumar, R. 2015. Genus *Cosmarium* Corda from Thrissur Kole lands, Kerala. *Recnt. Res. in Sci. and Tech*, **7**: 1–9.
- Raja, V.K. Stanley and Baluswami, M. 2009. A first report on occurrence of *Cosmarium* (Zygnematales, Chlorophyceae) in Thirunelveli and Kanyakumari districts of Tamil Nadu, India. In: Krishnan S. and Bhat, D.J. (eds.). *Plant and fungal biodiversity and bioprospecting*, Broadway Book Centre: Goa, pp.41–50.
- Ramanathan, K.R. 1962. Zygosporangium formation in some South Indian Desmids. *Phykos.*, **1**: 38–43.
- Ray, J.G., Krishnan R. Jithesh, Unni, K.S. and Shobha, V. 2012. Nutrients, productivity and pollution of Periyar Lake, Kerala, India. *Ecol. And Noospherol.*, **23(3-4)**: 49–71.
- Sanilkumar, M.G. and Thomas, K. John 2002. Species diversity of desmids in Muriyad wetlands. In: *Proceedings of the National Seminar on Ecology and Conservation of Wetlands*, Organised by Limnological Association of Kerala and Christ College Iringalakuda, Kerala (31<sup>st</sup> January to 2<sup>nd</sup> February, 2002), pp. 89–91.
- Santhanam, R., Velayutham, V. and Jegatheesan, G. 1989. *A manual of Freshwater Ecology*, Daya Publishing House: Delhi, p.134 (101 figs).
- Shukla, S.K., Shukla, C.P. and Misra, P.K. 2008. Desmids (Chlorophyceae, Conjugales, Desmidiaceae) from Foothills of Western Himalaya, India. *Algae*, **23**: 1–14.
- Sindhu, P. and Panikkar, M.V.N. 1994. Desmid flora of Quilon, Kerala. *Cosmarium* Corda. *J. Econ. Tax. Bot.*, **18**: 711–714.
- Sindhu, P. and Panikkar, M.V.N. 1995. Desmids new to Kerala. *Cosmarium* Corda. *J. Econ. Tax. Bot.*, **18**: 711–714.
- Suseela, M.R. and Toppo Kiran 2007. Contribution to the Desmid Flora of Sikkim Himalayas, India. *Cosmarium* Corda. *Bull. Natl. Mus. Nat. Sci.*, Ser. B, **33(3-4)**: 105–114.
- Toppo, K. and Suseela, M.R. 2009. *Cosmarium* diversity of Mani Pokhar Pond of Jashpur District in Chhattisgarh State, India. *Ann. Forestry*, **17**: 117–124.
- Turner, W.B. 1892. The Fresh-Water Algae (Principally Desmidiaceae) of East India. *Kongl. Svenska Vetenskaps-Akademiens Handlingar*. Vol. 25. No. 5. Stockholm: Norstedt, pp. 1–187 (Plates I–XXIII).

## INDIAN HYDROBIOLOGY – INSTRUCTION TO AUTHORS

1. Indian Hydrobiology accepts original research papers and review articles on all aspects of the biology of aquatic organisms in relation to their environment and exploitation of these for the benefit of human welfare. Manuscripts should be submitted with a self-declaration as the present paper is free of plagiarism, not under publication in/has not been sent to, any other journal in India or abroad for publication.
2. Papers are published on the understanding that an article processing charge to be notified to the authors at the time of the approval of first proof is paid on line.
3. Manuscripts should be submitted as soft copy typed in Microsoft Word format, with font no. 12, Times New Roman script, in double line space. Figures and illustrations are to be supplied as separate JPEG/TIFF plates accompanied by legend separately in an M S Word file. The first page of the manuscript should contain the title of the paper and a short running title.
4. The author(s) with address, email ID of author for communication an abstract not exceeding 200 words and a set of keywords numbering five to be given in the second page.
5. Original research papers should be divided into Introduction, Material and Methods, Results, Discussion, Conclusion, Acknowledgements (if any) and References.
6. Tables with proper numbers and formatted properly (referred in the text) to be included at the end of the Text in the manuscript.
7. Figures/images (of high resolution and good quality) should be grouped into one or more plates(JPEG or TIFF format) with clear figure numbers and scales (for photomicrographs wherever applicable) in good contrast to the background.
8. Indicate the position where tables, plates and figures are to be inserted.
9. Indicate clearly the position where tables, plates and figures to be inserted.
10. References in the text should be by the name of author(s) and year of publication. Detailed references giving the name of the author(s), year of publication, the title of the paper, the abbreviated name of the journal, volume, number and inclusive pages should be listed under references in alphabetical order. Books should be cited by title, name of publisher, places of publication and total number of pages.
11. Papers intended for publication in IH should be mailed to the Chief Editor, Indian Hydrobiology <krishalg@gmail.com>
12. A soft copy of the published paper in PDF format and a hard copy of the journal issue (in which their articles are published irrespective of number of papers published) will be sent to the corresponding authors after the release of the hard copy of the journal. Reprints are not supplied.

### SAMPLE CITATIONS:

#### **Papers and reports submitted in periodicals:**

Bhattacharjee, Ratul and Keshri, Jai Prakash 2021. Cyanobacterial pigments in bio economy and phycovolarization: A review. *Indian Hydrobiology*, 20(2): 171–182.

#### **Papers in edited books:**

Burns, N.M. and Ross, C. 1972. Oxygen-nutrient relationships within the central basin of Lake Erie. *In*: H.E. Allen and J.R. Karter (eds.). *Nutrients in natural water*, Wiley-Interscience, pp. 193–250.

#### **Books:**

Krishnamurthy, V. 2000. *Algae of India and neighbouring countries: 1, Chlorophycota*. Enfield, NH: Science Publishers, Inc. 2000. ix + 210pp., 3 plates + 38 figs.

## INDIAN HYDROBIOLOGY

## Number 2

Chief Editor: Dr. M. Baluswami

- 191 Archana Pachath and M. Shamina – A review of secondary metabolites in cyanobacteria as nutraceuticals
- 199 Asha Ramachandran, Rogimon P. Thomas, Salvy Thomas and R. Jithesh Krishnan – An updated review on diversity and distribution of taxa of *Oedogonium* Link in India
- 203 Arjuna Apparao Adari and Ravi Babu Suriseti – Elucidating the ecological richness and Conservation importance of the Coringa Mangrove Conservation Area in the Godavari Delta complex, India
- 211 Thushara James, K.M. Mujeeb Rahiman, Denoj Sebastian, S. Suja Rani and M.D. Dinesh – Growth inhibitory properties of specific anti-A. *hydrophila* IgY antibodies: A promising approach for the prevention of *Aeromonas* infection in farmed fish
- 221 T.K. Dhanya and K. Azeez – Floristic diversity of mangroves in Kadalundi – Vallikkunnu community reserve, Malappuram – Kerala: Special Emphasis on its present status
- 229 Dipty Kumari and D.K. Paul – Seasonal concentration and pollution assessment of heavy metals in sediments of Urban Ponds of Patna
- 239 Chandan Sarkar – Studies on Ichthyofaunal diversity of Bhaluka beel, Nadia in relation with physicochemical properties
- 247 Vinu Thomas, P. Tessa Paul and K.M. Mohammed Nasser – Algal flora of Naranipuzha, Malappuram district, Kerala, India
- 259 Abhijit Chandra Roy, Hrishikesh Choudhury and Shatabdi Biswas – A preliminary study on the Food Preference of Red-tailed Loach *Aborichthys elongatus* Hora in the Aquarium
- 263 Narendra Babu Shakya, Jitendra Mohan and Vishal Saxena – Performance assessment of aquatic macrophyte *Lemna minor* in Municipal Wastewater
- 269 E.P.M. Sruthy and G. Chitra – Monthly variations in physicochemical characters of Thikkodi coastal waters, Northwest coast of Kerala
- 283 K.A.K. Aneesa, B. Hari and S. Jisha – Morphometry and length-weight relationships of *Littoraria undulata* (Gray, 1839) populations inhabiting the rocky shores of Southern Kerala
- 297 Ronak R. Charan, Narender Kumar and Hitesh A. Solanki – Fostering biomass growth in Godhra's natural wetlands: A focus on species-specific plantation management
- 315 R. Jithesh Krishnan, M.R. Hari Krishnan, Rogimon P. Thomas, Asha Ramachandran and B.S. Sreepriya – New distributional record of *Cosmarium* Corda *ex* Ralfs and *Euastrum* Ehrenberg *ex* Ralfs (Desmidiaceae, Zygnematophyceae) from the Peninsular Indian river Kallada, Kerala
- 323 Shalini Singh, D.M. Tripathi and S. Tripathi – An ecological study of phytoplankton ecology in freshwater rivers in the Bundelkhand region
- 333 K.B. Bindhu, N. Nimisha, P.S. Rekha and Adya Shibu – Phytochemical and *in vitro* cytotoxicity analysis of *Caulerpa racemosa*
- 339 Diya T. Dharan and M. Malavika – Occurrence and distribution of Ichthyofauna of Akathumuri backwater, Vakkom, Kerala
- 347 M. Isakkiyammal, V. Sornalakshmi, P.S. Tresina, V.R. Mohan and Venkataraman Kumar – Influence of seaweed extract as biofertilizer on growth, phytochemical and yield parameters of *Vigna radiata*
- 353 S. Silvana Santhini So and D. Deleep Packia Raj – The Water quality assessment of Mukkadal Reservoir in Kanyakumari district, Tamil Nadu
- 359 Najma Khatun, Priyanki Sharma and Nikita Sarmah – Comparative study on nutritional composition of five selected freshwater fish species collected from Uzan Bazar fish market of Guwahati, Assam, India
- 367 G. Rani – A Tribute to Prof. S. Bharathan
- 368 A.S. Ahluwalia – Professor H.D. Kumar: A dedicated Phycologist, Ecologist, and Microbial Biotechnologist
- 370 R. Marimuthu – Dr. A. Balasundaram (13.08.1940 – 29.11.2022) A Teacher to emulate.....
- 372 T.V. Poonguzhali – Tribute to my Mentor– Professor V.N. Raja Rao (13.11.1939 – 30.07.2023)