

Study and first report on the occurrence of six species of coccoidal cyanobacteria - *Merismopedia meyen* 1839 from Bardhaman East and Bardhaman West Districts of West Bengal, India

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ABSTRACT

While working with the diversity of Cyanobacteria of East and West Bardhaman district of West Bengal, India; the author obtained at least six species of *Merismopedia*. Out of those six taxa at least three taxa appeared to be first report from this part of India. The present work concerned with the investigation of diversity of the said taxa and also detailed taxonomic enumeration. The author also noted the concerned ecological data necessary for valid understanding of the taxa.

Key words : *Merismopedia*, Coccoid, Cyanobacteria, First report, Ecology, East Bardhaman, West Bardhaman, West Bengal, India

Introduction

Till date 41 species were flagged as taxonomically accepted under *Merismopedia* (Guiry and Guiry, 2019). In the present investigation the author could obtain at least 06 (six) species under the said genus out of which nine species were recorded for the first time from this part of the country. The collection of samples was made from heavily industrialized parts of "Paschim Bardhaman" district and agriculture rich parts of "Purba Bardhaman". The genus as mentioned earlier is known to occur from diverse habitats. In this present investigation the author also obtained different taxa from diverse habitats of the area concerned. Watery sheathing was obtained in few taxa collected from industrialized Paschim Bardhaman and may be due to polluted environment. The water bodies and land of

the area is heavily effected by accumulation of industrial waste.

The author also attempted to establish the alga in laboratory conditions to study the life cycle pattern and significant success was achieved. The outcome of analysis of life cycle pattern and other experiments with the taxa as obtained in laboratory conditions needs further investigation and thus beyond the scope of incorporation in this report.

The report intended to add valid taxonomical data in the Cyanobacterial diversity of the said region and to the world data on the distribution of the concerned taxa.

Materials and Methods

The specimens were collected from different locations of the Burdwan district (presently Purba

Bardhaman and Paschim Bardhaman) occurring as terrestrial as well as fresh water planktonic forms. A part of the collected materials was established in culture and others were preserved in 5% formalin. For culture the specimens were inoculated in slants using medium [Modified BG-11 (Stanier *et al.*, 1971)] solidified by using 3% agar. The pH of the medium was recorded 7.5, without using any buffer solution. The slants were then kept in the aseptic cultural condition for obtaining optimum growth, under the illumination of two standard PHILIPS tube lights (IS-2418) of 40-Watt capacity for 8 hrs: 4 hrs in normal shady condition: 12 hrs of dark intervals. Temperature was maintained 30 °C throughout. The growth was observed under light microscope (Olympus GB model) after a regular interval of two weeks for the complete understanding of its life cycle pattern. Camera Lucida drawings were made from both natural and cultured specimens. Microphotography was also done using Zeiss Microscope.

Results and Discussion

The following section deals with detailed taxonomical enumeration of the said taxa along with artificial key

MERISMOPEDIA Meyen, 1839

Description of the Genus

Generally 4 – 16 or more in the multiple of even numbers arranged within a tubular colony. Colony usually three dimensional and cubical in appearance. Cells within the colony are without any individual sheath but the colony itself remains within the mucilaginous envelop. The cells are sub-spherical in outline and with deep blue-green content.

Taxonomic Position: Cyanophyceae, Chroococcales, Merismopediaceae.

Artificial Key to the species

1. Colony convoluted.....(2) *M.convoluta*
1. Colony flat..... 2
2. Diameter of each cell within the colony is less than 2 μm 3
2. Diameter of each cell within the colony is more than 2 μm 4
3. Diameter of each cell is 0.5 μm(4) *M.minima*
3. Diameter of each cell is 1.5 μm(6) *M.tenuissima*
4. Diameter of each cell less than 4 μm5
4. Diameter of each cell more than 4 μm(1) *M.aeruginea*
5. Diameter of each cell is 3 μm(5) *M. punctata*

5. Diameter of each cell is 3.9 μm(3) *M. glauca*

Taxonomic Description of each species:

1. *Merismopedia aeruginea* Brébisson 1849

[Geitler 1932, p.264, Fig. – 129d; Desikachary 1959, p.156, Pl. - 20, Fig. – 3, Presently known as *M. glauca*(Ehrenberg) Kützing – Komarek and Anagnostides (1999) pp. 1-548] (Pl. – VI; Fig. – 16) 54 – 64 cells constitutes the colony which is 30 μm broad and 45 μm - 60 μm long. Cells within the colony are 4.5 μm - 5 μm broad with blue-green content.

Habitat – The samples were obtained from a drain within the Medical College camps, carrying polluted waters [Sample No. SC – 15, 45 and 48 (pH 6.5 and Temperature 16°C) dated 12/12/2017] and from Shaktigarh area in a pond nearing a rice field [Sample No. SC – 72 (pH 7 and Temperature 15°C) dated 12/12/2017].

Earlier reports from India: This is the first report of this taxon from this part of India.

Taxonomic note: This taxon is presently considered by some workers as *Merismopedia glauca* (Ehrenberg) Kützing 1845 (Guiry and Guiry 2012).

2. *Merismopedia convoluta* Brébisson, 1849

[Geitler 1932, p. 262; Desikachary, 1959, p.152, Pl. - 29, Fig. 8, 12, 13; Starmach 1966, p.73, Fig. – 62 as *Pseudoholopedia convoluta* (Brébisson) Elenkin; Whitton 2001, In John *et al* (ed.), p.51]

(Pl. – VI; Fig. 17)

Many sub-spherical to oblong cells constitute the convoluted colony which is very long and flat. Cells within the colony are 3.6 μm –5 μm broad and deep blue-green in colour. Colony as whole almost 40 μm - 100 μm broad.

Habitat – The samples were obtained from the polluted water body near a factory in the Durgapur area [Sample No. SC – 129 and 132 (pH 6.5 and Temperature 27 °C) dated 23/02/2018] and from Andal area in a road side water body amongst *Hydrilla* plants [Sample No. SC – 137 (pH 6.5 and Temperature 35 °C) dated 14/07/2018].

Earlier reports from India: West Bengal (Biswas 1942; Sinha and Mukherjee, 1975b); Jammu (Anand 1979); Allahabad (Pandey and Pandey, 1982); Karnataka (Somashekar and Ramaswamy, 1982; Somashekar, 1983, 1984b); Maharashtra (Bhoge and Ragothaman, 1986).

3. *Merismopedia glauca* (Ehrenberg) Kützing 1845

[Geitler, 1932, p. 264, Fig. 129d; Desikachary, 1959; p.155, Pl. - 29, Fig. - 5; Starmach, 1966, p.71, Fig. - 58; Whitton, 2001, *In John et al* (ed.), p.51, Pl. - 3, Fig. - H]

(Pl. – VI; Fig. - 18)

Colony made up of 60 – 64 or more cells. Cells are oval to sub-spherical in outline and 3.9 μm – 4.5 μm broad. Mucilage of the colony watery, hyaline and the cell content are blue-green in colour.

Habitat – The samples were obtained from the Bhangra Kuthi area in a drain surface [Sample No. SC – 51 (pH 7.5 and Temperature 15 $^{\circ}\text{C}$) dated 12/1/2017]; from Badshahi Road area in a road side canal, carrying irrigation water [Sample No. SC – 54 (pH 7.5 and Temperature 15 $^{\circ}\text{C}$) dated 12/12/2017] and from Gangpur in a rice field on moist soil surface [Sample No. SC – 63 (pH 7 and Temperature 17 $^{\circ}\text{C}$) dated 12/12/2017].

Earlier reports from India: Darbhanga (Rao 1939); Tuwa (Thomas and Gonzalvesm, 1965d).

4. *Merismopedia minima* Beck, 1897

[Geitler, 1932, p.263; Desikachary, 1959; p.154, Pl. - 29, Fig. - 11]

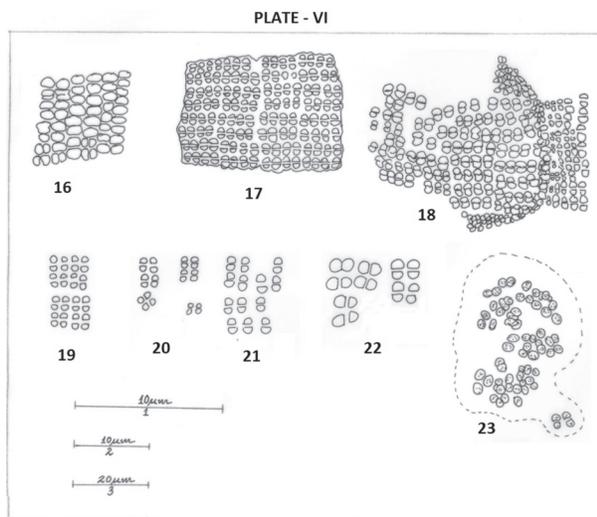


Figure No.	Name of the taxa	Scale
16	<i>Merismopedia aeruginosa</i>	Scale – 2
17	<i>Merismopedia convoluta</i>	Scale – 2
18	<i>Merismopedia glauca</i>	Scale – 2
19	<i>Merismopedia minima</i>	Scale – 1
20, 21	<i>Merismopedia punctata</i>	Scale – 1
22, 23	<i>Merismopedia tenuissima</i>	Scale – 1

(Pl. – VI; Fig. - 19)

Small number (8 – 16) of very small sized cells assemble together to form a colony. The colony 5 μm - 9 μm in diameter and 12 μm – 16.5 μm long. Cells sub-spherical and 0.5 μm - 1 μm broad.

Habitat – The sample was collected as free floating algal mass of thin film type from a drain carrying sewage of domestic origin in Baburbag area [Sample No. SC – 19, 21 and 25 (pH 6.5 and Temperature 16 $^{\circ}\text{C}$) dated 12/12/2017].

Earlier reports from India: Benaras (Rao, 1937).

5. *Merismopedia punctata* (Meyen, 1839)

[Geitler, 1932, p. 263, Fig. – 129c; Desikachary, 1959; p.155, Pl. - 23, Fig. – 5 and Pl. – 29, Fig. - 6; Starmach, 1966, p.71, Fig. - 57; Whitton, 2001, *In John et al* (ed.), p.51]

(Pl. – VI; Fig. – 20, 21)

Very small colony made up of 8 – 12 cells, not very compactly arranged and are ovoid to sub-spherical with 3 μm – 3.4 μm in diameter, deep blue-green in colour.

Habitat – The samples were collected from the surface of abandoned plastic containers submerged in the water of the nearby road side water body used for washing purpose by local residents in Baburbag area [Sample No. SC – 33 and 40 (pH 6.5 and Temperature 16 $^{\circ}\text{C}$) dated 12/12/2017].

Earlier reports from India: Delhi (Rao, 1940); Madras (Ganapathi, 1940); Punjab (Singh, 1941); Tuwa (Thomas and Gonzalves, 1965d); Punjab (Sarma and Kanta, 1978).

6. *Merismopedia tenuissima* (Lemmermann, 1898)

[Geitler, 1932, p.263, Fig. – 129a, 129b; Desikachary, 1959, p.154, pl. - 29, Fig. – 7 and pl. – 30, Fig. – 8, 9; Starmach, 1966, p. 70, Fig. - 56; Whitton, 2001, *In John et al* (ed.), p. 52]

(Pl. – VI; Fig. – 22, 23)

Colony made up of 16 – 24 cells. Cells ovoid to sub-spherical in outline with 1.5 μm - 2 μm in diameter, pale blue-green in colour.

Habitat – The algae found to grow as free floating thin film on the waters of the drain carrying medical pollutants from nearby medical college [Sample No. SC – 13, 50 and 56 (pH 6.5 and Temperature 15 $^{\circ}\text{C}$) dated 12/12/2017].

Earlier reports from India: Berhampur (Rao 1938); Ellore (Rao, 1938); Delhi (Rao, 1940); Maharashtra (Kamat, 1963; Nadkar *et al.*, 1983; Barhate and Tarar, 1983; Bhoge and Ragothaman,

1986); Uttar Pradesh (Bendre and Kumar 1975); Hyderabad (Rao, 1977); Jaipur (Trivedy, 1982 In Santra, 1993); West Bengal (Sinha and Mukherjee 1984).

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References

- Desikachary, T.V. 1959. *Cyanophyta*: Indian Council of Agricultural Research, New Delhi, 686 pp.
- Drouet, F. and Daily, W.A. 1956. Revision of the coccoid Myxophyceae. *Butter University Botany studies* 12: 1-218.
- Guiry, M.D. in Guiry, M.D. and Guiry, G.M. 2019. *Algae Base*. World-wide electronic publication, National University of Ireland, Galway. <http://www.algaebase.org>; searched on 18 August 2019.
- Komárek, J. and Anagnostides, K. 1986. Modern approach to the classification system of cyanophytes. 2. Chroococcales. *Arch. Hydrobiol. Suppl.* 73, *Algological Studies*. 43 : 157-226.
- Komárek, J. and Anagnostidis, K. 1999. Cyanopokaryota. 1. Chroococcales. In: *Süßwasserflora von Mitteleuropa. Begründet von A. Pascher. Band 19/1.* (Ettl, H., Gärtner, G., Heynig, H. & Mollenhauer, D. Eds), pp. 1-548. Heidelberg & Berlin: Spektrum, Akademischer Verlag.
- Komárek, J. and Anagnostidis, K. 2005. *Süßwasserflora von Mitteleuropa. Cyanopokaryota: 2. Teil/2nd Part: Oscillatoriales.* 19 : 1-759. München: Elsevier Spektrum Akademischer Verlag.
- Komárek, J. 2013. *Süßwasserflora von Mitteleuropa. Cyanopokaryota: 3rd part: heterocystous genera.* Vol. 19 pp. [i]-xviii, [1]-1130. Heidelberg: Springer Spektrum.
- Meyen, F.J.F. 1839. *Neues system der pflanzen-physiologie.* Dritter band. pp. i-x, 1-627, Plates X-XV. Berlin: Haude und Spenersche Buchandlung (S.J. Josephy).
- Nägeli, C. 1849. Gattungen einzelliger Algen, physiologisch und systematisch bearbeitet. *Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesammten Naturwissenschaften.* 10(7): i-viii, 1-139, pls I-VIII.
- Stanier, R.Y., Kunisawa, R., Mandel, M. and Cohen-Bazire, G. 1971. Purification and properties of unicellular blue-green algae (Order Chroococcales). *Bacteriological Review.* 35 : 171-205.
- Whitton, B. A. and Potts, M. (editors). 2000. Introduction to the Cyanobacteria. In *The Ecology of Cyanobacteria: Their Diversity in Time and Space*, pp. 1-11. Edited by B. A. Whitton & M. Potts. Dordrecht: Kluwer Academic.