

A COMPREHENSIVE STUDY ON THE OCCURRENCE OF *CHROOCOCCUS* FROM PURBA & PASCHIM BARDHAMAN DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT

While working with the diversity of Cyanobacteria of Purba and PaschimBardhaman district of West Bengal, India; the author obtained at least ten species of *Chroococcus* [1]. Out of those ten taxa at least nine taxa appeared to be first report from this part of India. The genus is one of the oldest known cyanobacteria and till date 93 validly accepted [2] species have been reported from different parts of the world. The present work concerned with the investigation of diversity of the said taxa and also detailed taxonomic enumeration of the obtained taxa. The author also noted the concerned ecological data necessary for valid understanding of the obtained taxa.

KEY WORDS

Chroococcus, Coccoid, Cyanobacteria, First-Report, Purba & Paschim Bardhaman, West Bengal, India

INTRODUCTION

The first name that comes to mind while speaking of Coccoidal Cyanobacteria is probably *Chroococcus* [1]. The genus could be obtained as freshwater or marine forms. The taxa could be obtained from terrestrial habitat. Brakish water forms were also reported by few workers [3].

Till date 93 species were flagged as taxonomically accepted under *Chroococcus*[1][2]. In the present investigation the author could obtain at least 10 (ten) species under the said genus out of which nine species were recorded for the first time from this part of the country. One species *viz Chroococcus minutus* [1] was previously reported from undivided Bengal.

The collection of samples was made from heavily industrialized parts of “Paschim Bardhhaman” district and agriculture rich parts of “Purba Bardhhaman”. 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. Heavy 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.

MATERIAL & METHODS

The specimens were collected from different locations of the Burdwan district (presently Purba Bardhaman & 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 [4]) 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 30⁰C 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.

TAXONOMIC ENUMERATION & DISCUSSION

CHROOCOCCUS [1]

Two to four spherical to sub-spherical cells present within a gelatinous sheath. Sheath colourless or variously coloured, thin or may be thick, homogenous or lamellated, firm. Cell division in three directions.

Taxonomic Position: Cyanophyceae, Chroococcales, Chroococcaceae.

Artificial Key to the species:

1. Cells solitary or 2 – 4 after division.....2
1. Many cells within single colony.....8
 2. Breadth of cells less than 10 µm.....3
 2. Breadth of cells more than 10 µm.....6
 3. Cells less than 5 µm in diameter.....4
 3. Cells greater that 5 µm but upto 10µm in diameter.....5
 4. Cells upto 3 µm in diameter.....(5) *C.minor*
 4. Cells more than 3µm in diameter.....(2) *C.hansgirgi*
 5. Cells upto 5.5 µm but less than 7µm in diameter...(6) *C.minutus*
 5. Cells more than 7µm but less than 10µm in diameter(9)*C.tenax*
 6. Cells more than 30 µm.....(4)*C.macrococcus*

6. Cells less than 30 μm7
 7. Cells upto 15 μm in diameter.....(8)*C.schizodermaticus*
 7. Cells more than 15 μm but less than 20 μm in diameter.....
(10)*C.turgidus*
 8. Colony with homogenous sheath.....9
 8. Colony with lamellated sheaths.....(7)*C.montanus*
 9. Cells upto 5 μm in diameter.....(3)*C.limneticus*
 9. Cells more than 5 μm but less than 10 μm in diameter....(1)*C.gomontii*

1. *Chroococcus gomontii* [5]

Four to five cells in a group. Each cell having its own envelop, sheath colourless, cell content blue-green, 7.4 μm - 9 μm in diameter based on presence and absence of sheath.

Habitat – Collected from Baburbag area [Sample No. SC – 14 (pH 6.5 & Temperature 21°C) dated 12/12/2018] in a heavily polluted water body near residential area as floating algal mass.

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

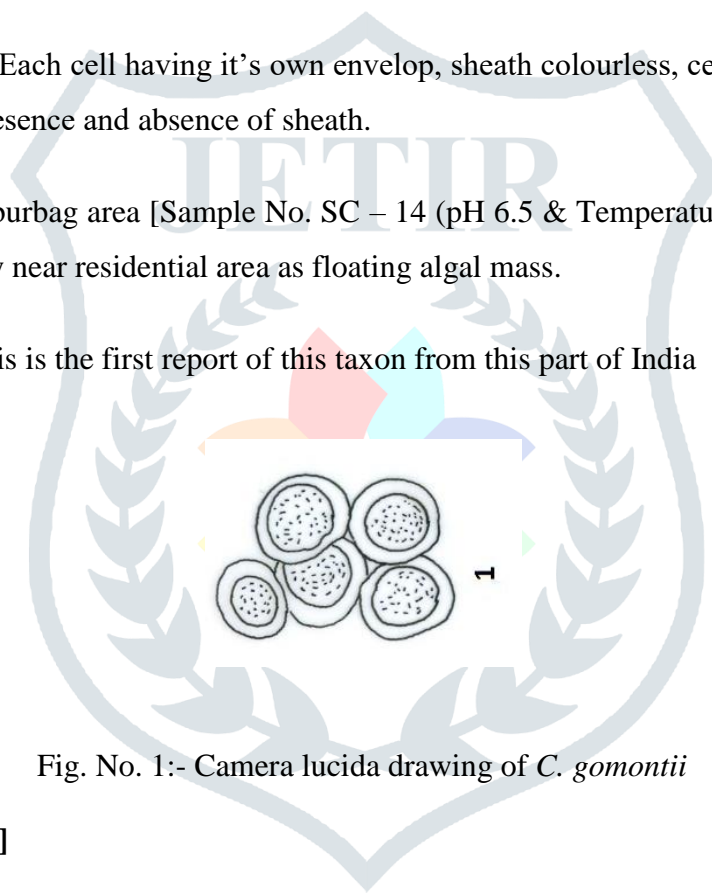


Fig. No. 1:- Camera lucida drawing of *C. gomontii*

2. *Chroococcus hansgirgi* [7]

Cells almost violate in colour, oblong 8.5 μm - 9 μm broad and 9 μm – 9.5 μm long, distinct sheath present. Sheath more or less colourless.

Habitat – Collected from Memari area [Sample No. SC – 87 (pH 7.5 & Temperature 22°C) dated 12/12/2018] on the moist soil surface near a rice field; from the moist surroundings of a shallow water-body near a rice field in Paharhati area [Sample No. SC – 89 (pH 7 & Temperature 18°C) dated 25/12/2017] and from almost similar conditions from Katwa [Sample No. SC – 168 (pH 7.5 & Temperature 28°C) dated 25/10/2017] and Sheyarabazar [Sample No. SC – 212 (pH 7 & Temperature 23°C) dated 04/03/2018].

Earlier reports from India: Puna [7].

This is the first report of this taxa from West Bengal.



Fig. No. 2:- Camera lucida drawing of *C. hansgirgi*

3. *Chroococcus limneticus* [8]

Cells in groups of four or it's multiple forming small colonies. The small colonies are again enveloped with thin and watery sheath, diameter of cells without sheath $4.5\mu\text{m}$ - $6\mu\text{m}$ and with sheath $8\mu\text{m}$ - $9\mu\text{m}$. Sheath hyaline, cell content blue-green.

Habitat – Collected from Paharhati area [Sample No. SC – 90 (pH 7.5 & Temperature 19°C) dated 25/12/2017] as growing on the moist soil surface of rice field.

Earlier reports from India: Tuwa [9]

This the first report of this taxa from West Bengal.

Taxonomic note: This taxon is presently known as *Limnococcus limneticus* [8] [2].

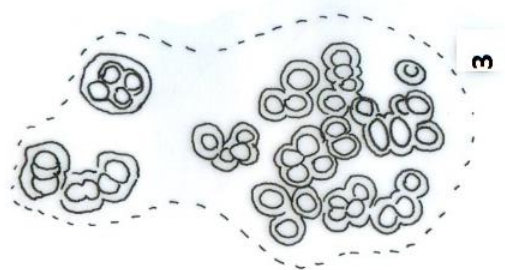


Fig. No. 3:- Camera lucida drawing of *C. limneticus*

4. *Chroococcus macrococcus* [10]

Many individual cells aggregated to form a mucilaginous colony, the sheath is bluish in colour and lamellated. Without sheath the cells are 30µm - 33µm in diameter and with sheath it is 45µm - 48µm in diameter.

Habitat – Collected from Memari area [Sample No. SC – 83 (pH 6.5 & Temperature 18°C) dated 12/12/2018] on the surface of moist soils as gelatinized mass; from Budbud area [Sample No. SC – 112 (pH 6.5 & Temperature 25°C) dated 23/02/2016] on the moist soil near a rice field and from almost similar habitats in Kulti [Sample No. SC – 156 (pH 6.5 & Temperature 36°C) dated 16/08/2017].

Earlier reports from India: Tuwa [9]; Rajpur [11].

This the first report of this taxa from West Bengal.

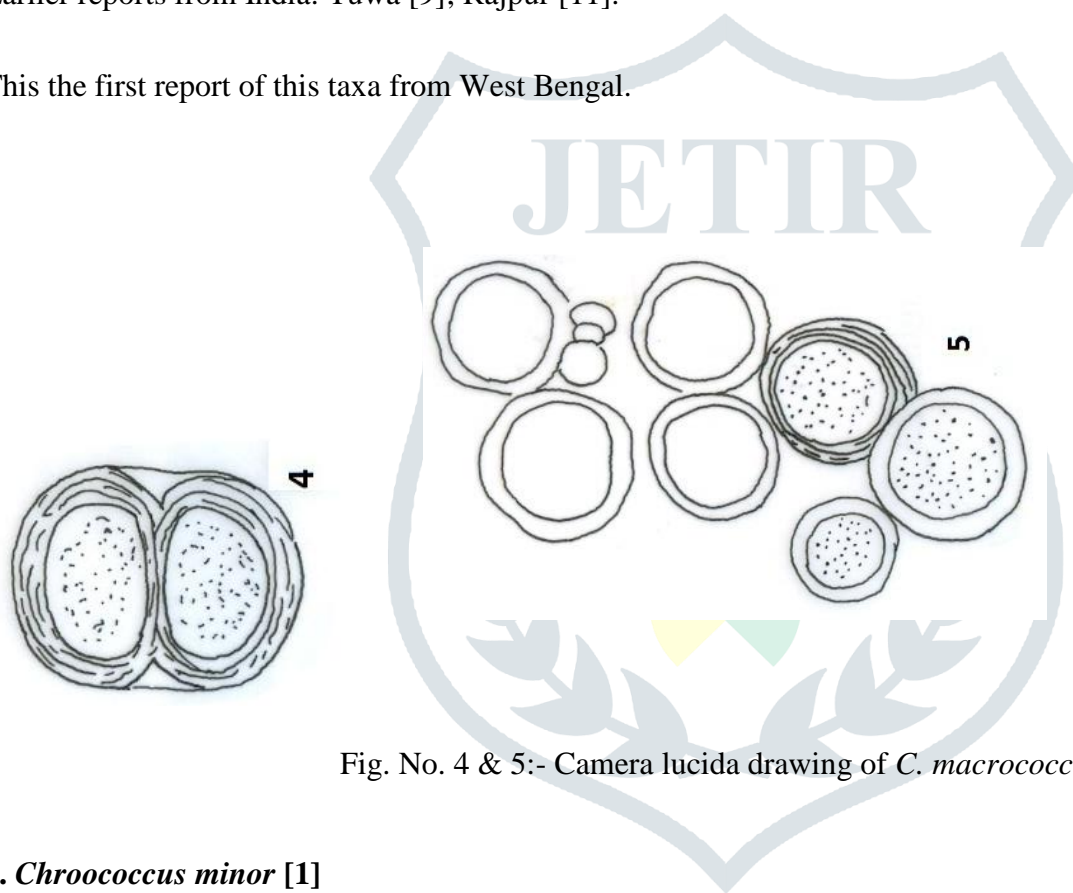


Fig. No. 4 & 5:- Camera lucida drawing of *C. macrococcus*

5. *Chroococcus minor* [1]

Cells assembled together to form a slimy mass. Cells blue-green in colour with thin, watery, colourless sheath. Cells 2.8µm – 3.2µm broad and present in pairs.

Habitat – Collected from Budbud area [Sample No. SC – 113 (pH 6.5 & Temperature 25°C) & 115 dated 23/02/2017] as slimy layer attached with some submerged aquatic plants; from Panagarh area [Sample No. SC – 120 (pH 6.5 & Temperature 23°C) dated 23/02/2017] in a drain near the market area.

Earlier reports from India: North India [12]; Pegu District [13]; Tuwa [9]; Punjab [14]; Madras [15]; Cochin [16].

This the first report of this taxa from West Bengal.



6

Fig. No. 6:- Camera lucida drawing of *C. minor*

6. *Chroococcus minutus* [1]

Many cells packed together to form small colony. The cells present in pairs of two to four. Cells light blue-green in colour, without sheath $5\mu\text{m} - 5.5\mu\text{m}$ in diameter and with sheath $7\mu\text{m} - 7.5\mu\text{m}$ in diameter. Sheath indistinctly lamellated.

Habitat – Collected from Police line area [Sample No. SC – 08 (pH 6.5 & Temperature 23°C) dated 22/11/2017] in submerged condition in a road side water body and from Kalna area [Sample No. SC – 98 (pH 7.5 & Temperature 18°C) dated 28/12/2018] with other sub-merged aquatic plants.

Earlier reports from India: West Bengal [17][18]; Benaras [19]; Basti [20]; Shembagnur [21]; Allahabad [22]; Karnataka [23][24]; Maharashtra [25][26]; Rajpur [11]; Rajasthan [27]; Hyderabad [28]; Bhubneswar [29]; Jammu [30].



7

Fig. No. 7:- Camera lucida drawing of *C. minutus*

7. *Chroococcus montanus* [31]

Many loosely aggregated cells forms a gelatinous colony. The sheath of the colony is thin and brown in colour. Sheath of the individual cells lamellated. Cells blue-green in colour. Cells without sheath $9\mu\text{m} - 9.8\mu\text{m}$ broad and with sheath $11\mu\text{m} - 13.5\mu\text{m}$ broad.

Habitat - Collected from Kalna area [Sample No. SC – 99 (pH 7.5 & Temperature 18°C) dated 28/12/2016] on the moist soil surface of a nearby rice field and from almost similar habitat in Galsi area [Sample No. SC – 101 (pH 7 & Temperature 23°C) dated 23/02/2017].

Earlier reports from India: Benaras [28].

This is the first report of this taxa from West Bengal.

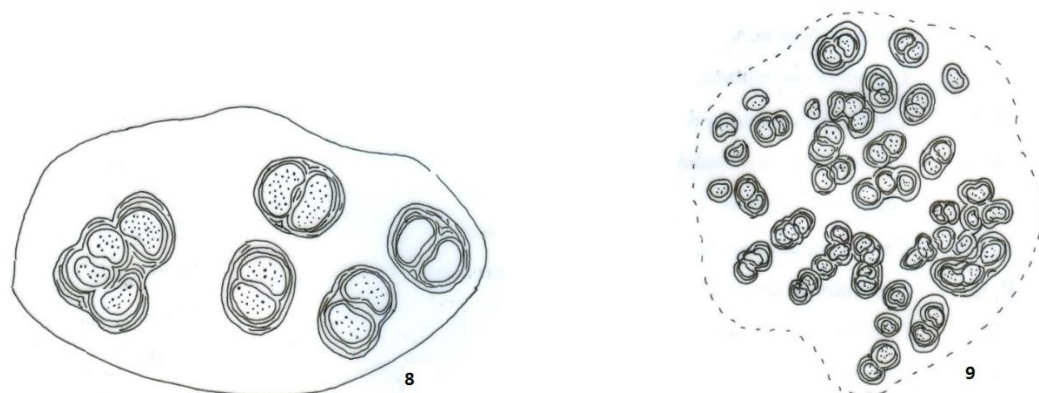


Fig. 8 & 9:- Camera lucida drawing of *C. montanus*

8. *Chroococcus schizodermaticus* [32]

Cells present in groups of two – four. Cells with thick individual sheath. Sheath not lamellated. Cells blue-green in colour with 11 μ m - 15 μ m in diameter without sheath and 18 μ m - 22 μ m in diameter with sheath.

Habitat – The samples were collected from Katwa [Sample No. SC – 167 (pH 7.5 & Temperature 31°C) dated 25/10/2017] as growing on the submerged soil surface of a rice field flooded with excess water; from Nigon-Korzona area [Sample No. SC – 189 (pH 7 & Temperature 26°C) & 190 (pH 7 & Temperature 26°C) dated 07/03/2017] in a rice field.

Earlier reports from India: Bombay [33]; Tuwa [9].

This is the first report of this taxa from West Bengal.

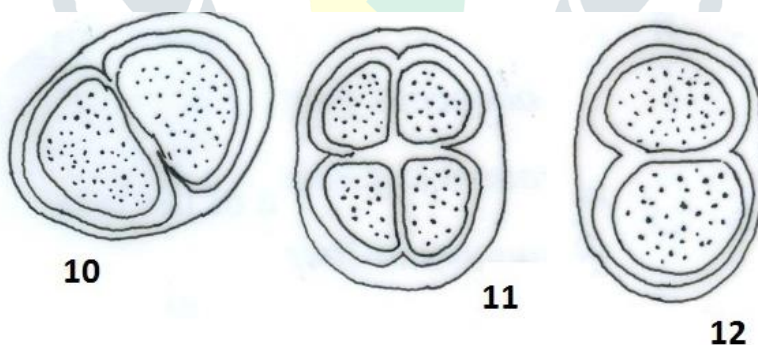


Fig. 10, 11 & 12:- Camera lucida drawing of *C. schizodermaticus*

9. *Chroococcus tenax* [34]

Cells are in groups of two – four, olive-green in colour, 8 μ m – 13.5 μ m in diameter without sheath and 15 μ m - 20 μ m in diameter with sheath. Sheath thick, brownish in colour and lamellated.

Habitat – The samples were collected as slimy mass on the moist soil surface of rocks near a shallow water body in ChotaBoinan area [Sample No. SC – 180 (pH 7 & Temperature 17°C) dated 23/12/2017] and from almost

similar conditions in a rice field in Nigon-Korzona area [Sample No. SC – 188 (pH 7 & Temperature 26°C) dated 07/03/2018].

Earlier reports from India: Madras [35]; Tuwa [9]; Madras (Anand *et al* 1986); Cochin [16].

This is the first report of this taxa from West Bengal.

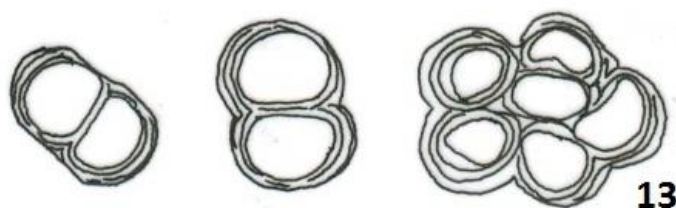


Fig. 13:- Camera lucida drawing of *C. tenax*

10. *Chroococcus turgidus* [1]

Cells remains in groups of 2 – 4 cells, spherical in outline, yellowish-green in colour with granular content. Cells 18µm – 19.5µm in diameter without sheath and 30µm - 32µm in diameter with sheath. Sheath very thick and lamellated.

Habitat – Collected from Soraitikor area [Sample No. SC – 58 (pH 7 & Temperature 16°C) dated 12/12/2016] in a roadside shallow water body in the free floating planktonic form; from Shaktigarh area [Sample No. SC – 78 (pH 7.5 & Temperature 18°C) dated 12/12/2016] and from almost similar conditions in Panagarh area [Sample No. SC – 89 (pH 6.5 & Temperature 14°C) dated 25/12/2016].

Earlier reports from India: Bombay [7]; Faridpur [17]; Calcutta [36]; Benaras [19]; Andhra [38]; Hyderabad [28]; Madras [39].

This is the first report of this taxa from West Bengal.

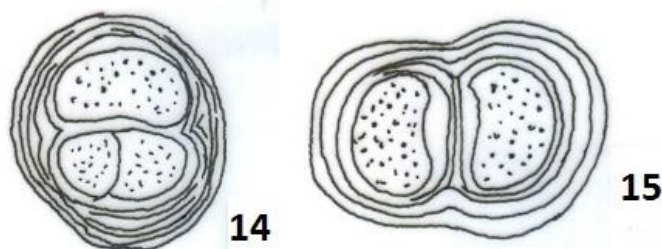


Fig. 14 & 15:- Camera lucida drawing of *C. tenax*

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