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Study on the occurrence of algae from Metiabruz, Kolkata, West Bengal, India

Subhra Talai-Mukhopadhyay [1], Nurmohammad Naskar[2]

[1]*Department of Botany, Barasat Govt. College, 10, K.N.C Road, Barasat,Kolkata 700 124, West Bengal, India*

[2]*Department of Life Sciences, Bongaon Ghosh Institution, North 24 Pgs 743235, West Bengal, India*

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Abstract

The present communication deals with 25 algal taxa belonging to Cyanophyceae (18) and Chlorophyceae (7). The algae were found as epiphyte, epipelic and free –floating forms in Metiabruz, Kolkata, West Bengal, India. The study area shows the dominance of cyanophyceae than chlorophyceae and these algal taxa are being reported first time from this area.

***Corresponding Author:** Subhra Talai-Mukhopadhyay ✉ subhramukherjee03@gmail.com

Introduction

Metiabruz is a neighbourhood on the southern fringe of Kolkata city. Metiabruz is an industrial area having power station, pumping station, shipping corporation, textile manufacturing companies etc. The largest producer of non-branded garments in India is Metiabruz and one of the most populous areas of Kolkata which is on the bank of Hooghly river. The area is having much polluted environment for unscientific sanitation and dense population. The area is situated between 22º 33'1" North latitude 88 º18'2" East longitude and covering an area 12 sq km (Fig. 1a). The area experiences tropical moonsonic climate with the significant seasons viz. summer (March – June), monsoon (July – Oct) and winter (Nov – Feb) in a year. The soil is alluvial type and the meteorological records are : average rainfall 137.33 mm, average minimum and maximum temperatures are 10.2˚C and 45˚C respectively.

The algae are the organisms which have rapid dispersal rates, short life cycles and respond quickly to environmental changes (Kovacks, 1992). Documentation of the algal components may give an idea of environmental monitoring process (McCormick and Cairns, 1994).

The exploration of algae in Kolkata is yet to receive much attention. The works on algae in and around Kolkata are scanty. The relevant published works are noticed with Biswas (1925, 1926, 1932a, 1932b), Sen and Gupta (1987, 1993), (2010), Santra (1987) ,Chakraborty *et al.*, and Ghosh *et al.*, (2012). This work will be added a recent study on Kolkata algae.
Our investigation on algal taxa in Metiabruz, Kolkata is an integral part of a research work of the study on algal biodiversity of Kolkata and adjoining areas.

Materials and methods

Algal samples were collected (2009 – 2011) from different spots as epipelic, epiphytic and free-floating forms. The sampling spots were 10 in numbers (Map 1) which was 1 km. distance from one spot to another spot. The samples were preserved in 4% formaldehyde solution. The documentation was made by preparing slides which was observed under compound microscope. The camera lucida drawings and measurements of the algal taxa were made in the P.G Dept of Botany, Barasat Govt. College. Identification have been made upto the species level following the literature and monographs of Desikachary (1959), Suseela and Toppo (2006) and Naskar and Naskar (2010). The identified samples were submitted and stored in the Museum, P.G. Dept. of Botany, Barasat Govt. College.

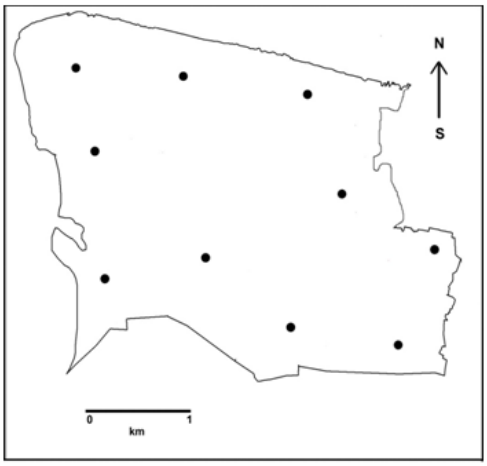

Fig. 1a. Map of Matiabruz area showing samplig sites (solid black circles).

Taxonomic description

Cyanophyceae

1. ***Microcystis protocystis*** Crow
Desikachary 1959, p.91, pl.20, fig.4
Colonies irregular, diffuse, cells numerous with closed packed to generally dissociated, spherical, 3.1-5.7µ diam, gas vacuoles present.

2. ***Aphanocapsa grevillei*** (Hass.) Rabenh.
Desikachary 1959, p.134, pl.21, fig.9.
Thallus spherical mostly, light blue-green, cells spherical 3.4 – 5.9µ diam., finely granular contents in a homogeneous mucilage.

3. ***Aphanothece stagnina*** (Spreng.) A. Br
Desikachary 1959, p 137, pl.21, fig.10
Thallus gelatinous, spherical, pale blue-green, cells almost ovoid, 3.2-5.9µ broad, 3.9-7µ long.

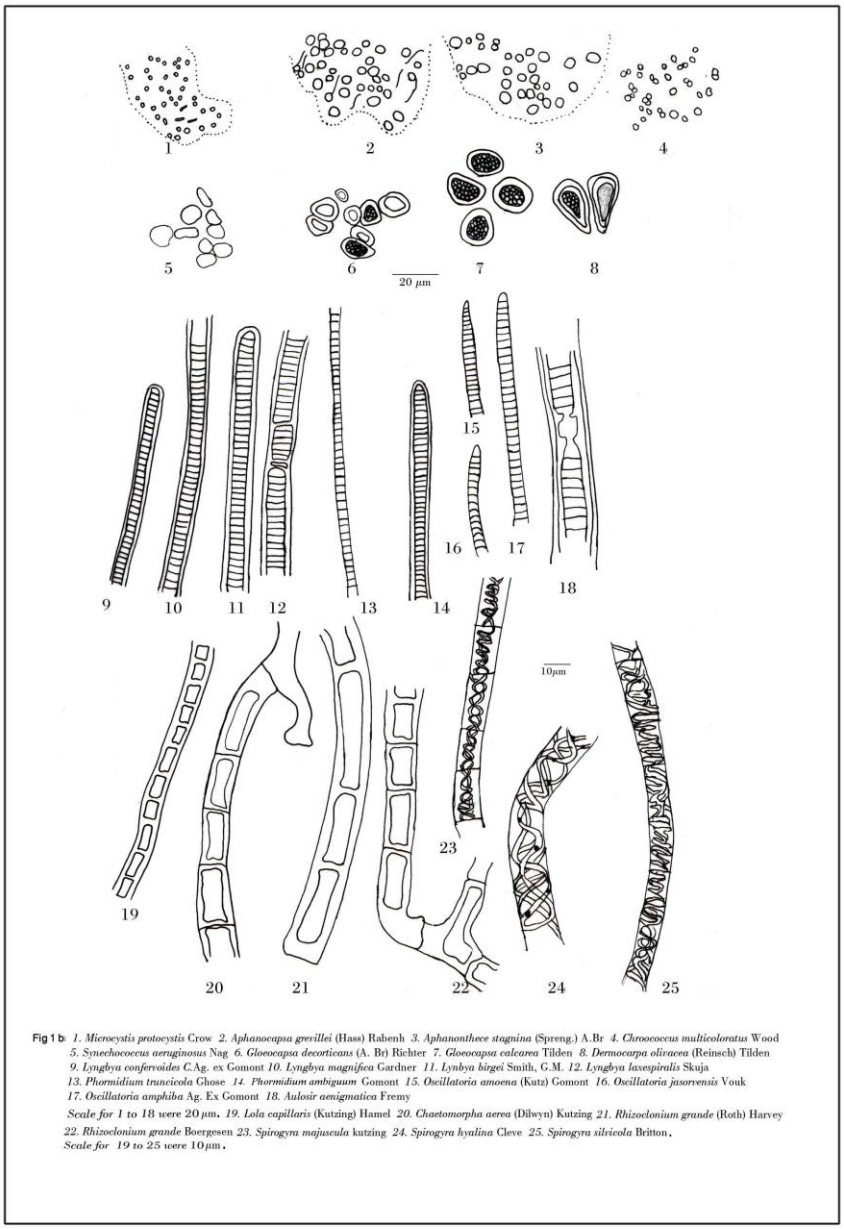

Fig 1 b 1. *Microcystis protocystis* Crow 2. *Aphanocapsa grevillei* (Hass) Rabenh 3. *Aphanonthece stagnina* (Spreng.) A.Br 4. *Chroococcus multicoloratus* Wood 5. *Synechococcus aeruginosus* Nag 6. *Gloeocapsa decorticans* (A. Br) Richter 7. *Gloeocapsa calcarea* Tilden 8. *Dermocarpa olivacea* (Reinsch) Tilden 9. *Lyngbya conferroides* C.Ag. ex Gomont 10. *Lyngbya magnifica* Gardner 11. *Lynbya birgei* Smith, G.M. 12. *Lyngbya laxespiralis* Skuja 13. *Phormidium truncicola* Ghose 14. *Phormidium ambiguum* Gomont 15. *Oscillatoria amoena* (Kutz) Gomont 16. *Oscillatoria jasorvensis* Vouk 17. *Oscillatoria amphiba* Ag. Ex Gomont 18. *Aulosir aenigmatica* Fremy Scale for 1 to 18 were 20 µm. 19. *Lola capillaris* (Kutzing) Hamel 20. *Chaetomorpha aerea* (Dilwyn) Kutzing 21. *Rhizoclonium grande* (Roth) Harvey 22. *Rhizoclonium grande* Boergesen 23. *Spirogyra majuscula* kutzing 24. *Spirogyra hyalina* Cleve 25. *Spirogyra silvicola* Britton, Scale for 19 to 25 were 10 µm.

4. ***Chroococcus multicoloratus*** Wood
Desikachary 1959, p.109

Thallus mucilaginous, cells spherical or angular, single or 2-6 together in a colony, yellow-green.

5. ***Synechococcus aeruginosus*** Nag.
Desikachary 1959, p.143, pl.25, figs.6,12

Cells almost cylindrical, 4-13µ broad, upto 22µ long, single or in a group with 2-4 together, pale blue-green.

6. ***Gloeocapsa decorticans*** (A. Br) Richter
Desikachary 1959, p.114, pl.24, fig.9.
Cells spherical or oval, blue-green, single or in a group with 2-4 together, single cells with 16 X 19 µ without sheath 7x9µ, two celled stage with sheath 22 X 29µ, without sheath upto 13µ long, sheath colourless, thick, lamellated.

7. ***G. calcarea*** Tilden
Desikachary 1959, p.115, pl.24, fig.6; Naskar and Naskar 2010, p. 50 – 51. pl. 1. fig. 7.
Thallus having calcium incrustation, cells with or without sheath, 5-8µ diam., sheath colourles, colonies 20 – 40µ in diam, with 4 – 16 cells.

8. ***Dermocarpa olivacea*** (Reinsch) Tilden
Desikachary 1959, p.174, pl.33, figs.13,14
Plants forming hemispherical layer, sporangia spherical with stalk, 9.2- 16µ broad, 12 – 26µ long, wall thick, many endospores, spherical, epiphytic on blue green alga *Lyngbya*.

9. ***Lyngbya confervoides*** C. Ag. ex. Gomont
Desikachary 1959, p.314, pl.49, fig.9 and pl. 52. fig 13.
Naskar and Nasker 2010. pl. 68-69. pl. 6 fig 41. Suseela and Toppo, 2006, pl. 228 fig 67.
Trichome olive green, not constricted at the cross walls, not attenuated at the apices, 8 -22µ mostly, 10 – 14µ broad, cells 1/3 – 1/6 times as long as broad, 2-6µ long

10. ***L. magnifica*** Gardner
Desikachary 1959, p.320,
Filaments straight, 26 – 38µ broad, sheath 2-2.2µ thick, colourless, trichome 20-33µ broad, cells 3.6-4.8µ long, end cell rounded.

11. ***L. birgei*** Smith, G.M.
Desikachary 1959, p.296, pl.50, fig.7,8. Naskar and Naskar 2010, p. 65, pl. 5, fig 32. Suseela and Toppo 2006, p. 228, fig 60.
Filaments 18-25µ broad, sheath colourless, 0.4 – 3.8µ thick, trichome not constricted at the cross walls, 16 – 21µ broad, cells shorter than broad 1.8 – 2.2µ long.

12. ***L.laxespiralis*** Skuja
Desikachary 1959, p.289, pl.50, fig.4
Filaments 8-12µ broad, spirals 16 – 20µ broad, trichomes 7.9-11µ broad, cells shorter than broad, 4-7µ long, apical cell rotund.

13. ***Phormidium truncicola*** Ghose
Desikachary 1959, p.258, pl.59, fig.9
Thallus yellow-green, sheath diffluent, trichomes 5.7- 8µ broad, constricted at the cross walls, cells mostly as long as broad, attenuated at the apices.

14. ***P. ambiguum*** Gomont
Desikachary 1959, p.266, pl.44, fig.16 and pl. 45, figs 5-8. Naskar and Naskar 2010, p-73. pl.7. fig 50.
Thallus dark green, trichomes constricted at the cross walls, ends not attenuated, 4.2 – 6.3µ broad, cells shorter than broad 1.3 – 2.6µ long, end cell rounded.

15. ***Oscillatoria amoena*** (Kutz.) Gomont
Desikachary 1959, p.230, pl.40, fig.12. Suseela and Toppo 2006, p.227, fig 26.
Thallus blue-green, trichomes straight, end cells attenuated, 2.7 -5.2µ broad, cells as long as broad, 2.6-4.3µ long.

16. ***O. jasorvensis*** Vouk
Desikachary 1959, p 221 – 222
Thallus yellowish green, straight, trichome 4-4.2µ broad, bent at the ends, cells as long as broad, 2.5 – 3.1µ long, end cells rounded.

17. ***O. amphibia*** Ag. Ex Gomont
Desikachary 1959, p.229, pl.37, fig.6
Thallus dark green, trichome straight, 2-3.4µ broad, cells 2-3 times longer than broad 4.1 – 7.5µ long.

18. ***Aulosira aenigmatica*** Fremy
Desikachary 1959, p.428, pl.81, figs.15,17
Thallus expanded, dark blue-green, filaments intricate, suberect, 6.6 – 8.1µ broad, sheath colourless, trichome 5.3-5.9µ broad, heterocysts broader than the trichome.

Chlorophyceae

19. ***Lola capillaris*** (Kutzing) Hamel
Naskar and Naskar 2010, p.164, pl. 20, fig 134.
Filaments not straight, cells cylindrical, 55.3 – 62.2µ in diameter. 102.3 - 140µ long, swollen at the septum, yellow green colour, rhizoid like growth at the base.

20. ***Chaetomorpha aerea*** (Dilwyn) kutzing
Naskar and Naskar 2010, p.165, pl. 21, fig 136

Bright green filaments, gregarious, thick cell wall, basal cell long, filaments slender at the base, cells 25 – 30µ broad, 70 – 102µ long.

*21.**Rhizoclonium riparium*** (Roth.) Harvey
Naskar and Naskar 2010, p.167 – 168, pl. 22, fig 139.
Filaments yellow green, cells cylindrical, rhizoids present, cells 22 – 32µ in diameter 40 – 44µ long.

22. ***R. grande*** Boergesen
Naskar and Naskar 2010, p.168, pl. 22, fig 140.
Filaments dark green, rhizoid present, cells cylindrical, filaments 83-90µ in diameter cell wall lamellated and thick, knee like growth from the filaments.

23. ***Spirogyra majuscula*** kutzing.
Naskar and Naskar 2010, p.171, pl. 24, fig 146.
Filaments yellow-green, cells much longer than broad, 50 – 53µ broad, 220 – 237µ long, end walls plane, chloroplasts 4 with reticulate appearance.

24. ***S. hyalina*** Cleve.
Naskar and Naskar 2010, p.171, pl. 24, fig 145.
Filaments yellow-green, vegetative cells 45.7 – 52.2µ broad, 92 – 128µ long, chloroplasts 4, making 3 turns.

25. ***S. silvicola*** Britton
Naskar and Naskar 2010, p.174, pl.26, fig 152.
Vegetative cells longer than broad, 32 – 34µ broad, 82 – 102µ long, cells with single chloroplast making upto 3 turns in the cell.

Results and discussion

The study on the occurrence of algae in Metiabruz, Kolkata reveals the groups cyanophyceae and chlorophyceae. A total 25 algal taxa have been reported of which 18 species of blue green algae (cyanophyceae) and 7 species of green algae (chlorophyceae). The investigation of algal taxa was performed in the moist soil, stagnant water as epipelic, floating and attached form with dwelling houses, flower pots, bathroom places etc. The study of such algal taxa may give an idea of environmental condition of such an area where thick population and unplanned dwelling houses are prevalent. Algae are important bioindicators to assess such environmental condition for a variety of reasons (Stevenson and Smol, 2003). The database of such algae may be the important tool as algal species are used to know the tolerance to various kinds of pollution (Kolkwitz and Marsson, 1908). Apart from environmental conditions or pollution such algal assemblages exhibit wider distributions among ecosystems and geographical regions (Round, 1973). This proposition may be supported by the recorded algal taxa *Gloeocapsa calcarea, Lyngbya confervoides, L. birgei, Phormidium ambiguum* under cyanophyceae and *Lola capillaries, Chaetomorpha aerea, Rhizoclonium riparium, R. grande, Spirogyra majuscula, S. silvicola, S, hyalina* under chlorophyceae. The above algal components were also found to grow in brackish water habitat (Naskar and Naskar, 2010), but the present investigation was done in the fresh water habitat. The *Spirogyra* spp. in this studied area is the sign of polluted and turbulent water and indicator of high levels of organic pollution, high concentration of heavy metals as the area is adjacent to sea port (Venkateswarlu and Reddy, 1997). The presence of *Microcystis* sp, *Oscillatoria* sp, *Chroococcus* sp, *Lyngbya* sp, are also noticed in this area which are indicators of toxicity and pollution (Moikehe and Chu, 1971; Omar, 2010; Carmichael, 1981).

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