



## **New Report of Four Bacillariophycean Algal Species from West Bengal, India**

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### **Abstract**

The present communication was carried out with morpho-taxonomic descriptions of four bacillariophycean algal taxa belonging to the order pennales of the class bacillariophyceae namely *Fragilaria virescens* Ralfs, *Cymbella turgida* (Greg.) Cleve, *Gyrosigma attenuatum* (Kütz.) Rabenh and *Nitzschia alpina* (Näg.) Hustedt. Among them, *Nitzschia alpina* (Näg.) Hustedt within the family, Nitzschiaceae *Fragilaria virescens* Ralfs included to the family Fragilariaceae, *Cymbella turgida* (Greg.) Cleve and *Gyrosigma attenuatum* (Kütz.) Rabenh. to the family Naviculaceae. During taxonomic survey these algal species were collected from Hooghly district of West Bengal. All the algal species belonging to bacillariophyceae except *Fragilaria virescens* Ralfs were collected as brownish suspended or precipitated forms from water bodies. The physicochemical parameters that favours the algal growth in different water bodies were recorded and found to be congenial for the growth of different members of bacillariophyceae. All four taxa stated above are new reports from the state of West Bengal, India.

**Key words:** New report, bacillariophyceae, West Bengal, India.

### **Introduction**

Geographically, West Bengal is located between 21° 38'- 27° 10' N latitude and 85° 50' -89° 50' E longitude and one of the biodiversity rich states of flora in India. Hooghly district (20°01'- 23°30' N and 87°30' - 80°30'E ) covers a total area of near about 3137.55 sq km which occupies with different types of water resources such as rivers, ponds, lakes, moats and flood plain wetlands (Halder and Sinha, 2013a,b). The district experiences characteristic tropical monsoon and thus, favours the magnificent reserve of plant resources. The air temperature of this district ranges from 14°C to 35°C and the average annual rainfall is 1500 mm.

The members of bacillariophyceae i.e diatoms are the major group of algae. Diatoms are coloured organisms which are single-celled, microscopic, ornamental and cosmopolitan in distribution. Generally diatoms reach their maximum number during monsoon and post monsoon season but in summer they become less in number might be due to higher temperature, lower concentration of phosphate, nitrate and silica in water bodies (Rao, 1955; Venkateswarlu, 1969).

Although a significant taxonomical work had been done on the cyanophycean and chlorophycean algae but comparatively a little attention was paid to explore diatom flora from this state. Previously, Biswas (1949), Das and Santra (1982), Pal *et al.*, (1986), Santra *et al.*, (1989), Pal and Santra (1990) and Banerjee and Santra (2001) reported some diatom algal taxa from West Bengal.

The present work is an outcome of taxonomic investigation of the fresh water algal flora of the class bacillariophyceae from West Bengal. In the present report four bacillariophycean algal taxa which were collected from different fresh water ecosystems of Hooghly district in West Bengal were morpho-taxonomically described with author citation, habitat, collection number, date of collection, ecological notes and significance.

As there was no comprehensive zone wise study for bacillariophycean algal flora, the present study was undertaken from this area. The main objectives of the present work were to explore the biodiversity of diatom flora, make algal data bases and reporting the new diatom species from this state.

### **Material and Methods**

Algal specimens had been collected with the help of plankton net (mesh 55µm) in sterilized glass containers from different places viz. Tribeni (22°.99'N and 88°.40'E), Diara (22°.79'N and 88°.28'E), Kamarkundu (23°.83'N and 88°.20'E) and Ganga river at Kalichar Ghat (23°.03'N and 88°.26'E) of Hooghly district, West Bengal. Detailed study was made by examining specimens with the help of a microscope (Olympus, Model-CH20i) for identification of species. Samples were preserved in 4% formalin. Bacillariophycean taxa were studied after clearing the frustules with sulphuric acid (concentrated) and potassium dichromate following the method of Patrick and Reimer (1966). Identifications of these taxa were accomplished with the help of authentic literatures viz. Gandhi (1959,1960), Sarode and kamat, (1984), Prasad and Srivastava (1992) and Kant and Gupta (1998). The pH and temperature of the water bodies were recorded at the spot immediately after collection with the help of portable pH meter (Model No. PP9046 Philips, India) and Zeal's (UK) mercury thermometers. The other ecological parameters such as nitrate-nitrogen (NO<sub>3</sub>-N), phosphate (PO<sub>4</sub>), silicate, dissolved oxygen (DO) and Biochemical oxygen demand (BOD) of water were determined following the standard methods of APHA (2005).

### **Results and Discussion**

A total number of four bacillariophycean algal taxa belonging to the order pennales of the class bacillariophyceae namely *Fragilaria virescens* Ralfs, *Cymbella turgida* (Greg.) Cleve, *Gyrosigma attenuatum* (Kütz.) Rabenh. and *Nitzschia alpina* (Näg.) Hustedt had been morpho-taxonomically described with author citation, habitat, collection number, date of collection,

ecological notes and significance for the first time from West Bengal. Among them, *Fragilaria virescens* Ralfs included to the family Fragilariaceae, *Cymbella turgida* (Greg.) Cleve and *Gyrosigma attenuatum* (Kütz.) Rabenh. within the family Naviculaceae and, *Nitzschia alpina* (Näg.) Hustedt within the family Nitzschiaceae. Except *Fragilaria virescens* Ralfs all the other three bacillariophycean algal species were collected as brownish suspended or precipitated forms from water bodies. Each currently accepted names had been provided with its author(s)' name. All the limnological parameters except temperature and pH given in ecological notes were expressed as mg/l.

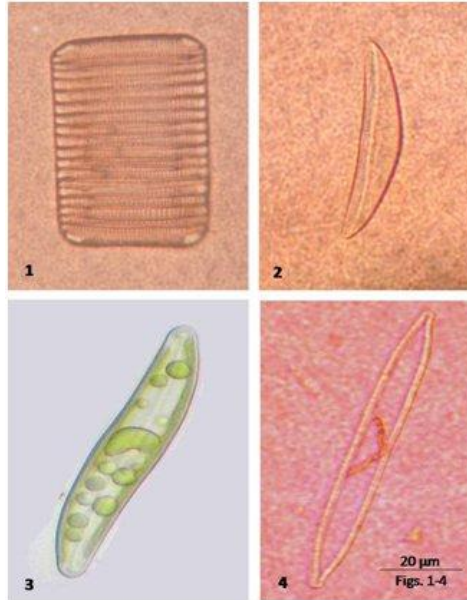


Plate 1. Figs 1-4. 1. *Fragilaria virescens*, 2. *Cymbella turgida*, 3. *Gyrosigma attenuatum*, 4. *Nitzschia alpina*

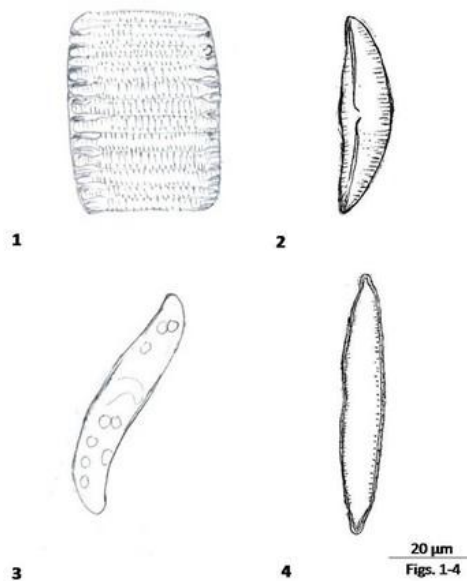


Plate 2. Figs 1-4. 1. *Fragilaria virescens*, 2. *Cymbella turgida*, 3. *Gyrosigma attenuatum*, 4. *Nitzschia alpina*

#### Morphotaxonomic Description

1. *Fragilaria virescens* Ralfs (Plate 1, Figure 1; Plate 2, Figure 1)

Kütz., Tab. Phycol. 14, 1849.

Van Heurck, A Treatise Diatomaceae 323, 1896.

Hustedt, Bacillariophyta 142. fig. 144, 1930.

Prasad and Srivastava, Freshwater Algal Flora Andaman and Nicobar Islands 166, pl. 24, fig. 15, 1992.

**Description:** Plankton and attached form alga; cells lie side by side, golden-brown, valves linear with parallel margins and attenuated at rostrate ends; pseudoraphe present; axial area narrow, linear; central area absent; valves 77.5 µm long, 6.0 µm broad; lineate, fine striae, parallel throughout the valve; striae 14-17 in 10 µm.

**Habitat:** Pond water at Tribeni.

**Collection No:** 804

**Date:** 03.01.11

**Ecological Notes:** Tribeni, water temperature: 18°C; pH: 7.2; NO<sub>3</sub>-N: 0.08; PO<sub>4</sub>: 0.16; Silicate: 4.2; DO: 7.0; BOD: 4.0.

**Significance:** They are the important constituent of food chain in aquatic habitat and act as primary producer.

2. *Cymbella turgida* (Greg.) Cleve in Quart. J. Microscop. Sci., 4: 5, pl. 1, fig. 18, 1856.

(Plate 1, Figure 2; Plate 2, Figure 2)

Hustedt, Bacillariophyta 358. fig. 660, 1930.

Foged, Freshwater diatoms in Ireland 46, pl. 36, 1977.

Kant and Gupta, Algal Flora Ladakh 163, pl. 72, fig. 10, 1998.

*Encyonema turgidum* Greg. 1875

**Description:** Planktonic and free floating; valves asymmetrical, 18.8 to 25.5 µm long, 8.2 to 10.7 µm broad; dorsal margin convex or strongly curved and ventral margin slightly concave; ends shortly rostrate to acutely sub-capitate; raphe thick, arcuate; axial area sub-linear; central area widens with isolated puncta; striae radial, lineate 10-15 in 10 µm.

**Habitat:** Pond water at Diara.

**Collection No:** 836

**Date:** 15.05.11

**Ecological Notes:** Diara, water temperature: 20°C; pH: 7.1; NO<sub>3</sub>-N: 0.1; PO<sub>4</sub>: 0.12; Silicate: 3.4; DO: 6.6; BOD: 4.4.

**Significance:** Primary producer and an important constituent of food web in water bodies.

3. *Gyrosigma attenuatum* (Kütz.) Rabenh. (Plate 1, Figure 3; Plate 2, Figure 3)

Süssw. Diat. 47, pl. 5, fig. 2, 1853. (Pl. 9, Fig. 3d)

Hustedt, Bacillariophyta 222, fig. 329, 1930.

Foged, Freshwater diatoms in Ireland 71, pl. 19, figs. 5, 1977.

**Description:** Planktonic and free floating; cells solitary, valves sigmoid, lanceolate, gradually tapering towards ends; ends rounded; frustules 102.7 to 104.4 µm long, 11.1 to 12.3 µm broad; raphe sigmoid; axial area narrower; central area elliptical; striae fine 17-18 in 10 µm.

**Habitat:** Pond water at Kamarkundu.

**Collection No:** 1187

**Date:** 11.11.11

**Ecological Notes:** Kamarkundu, water temperature: 21°C; pH: 7.0; NO<sub>3</sub>-N: 0.17; PO<sub>4</sub>: 0.2; Silicate: 3.8; DO: 6.8; BOD: 4.0.

**Significance:** They are the important constituent of food chain in aquatic habitat and act as primary producer.

4. *Nitzschia alpina* (Näg.) Hustedt in Int. Rev. Hydrobiol. u. Hydrogr. 43: 232, 1943.

(Plate 1, Figure 4; Plate 2, Figure 4)

**Description:** Planktonic, solitary; frustules spindle shaped in valve view with capitate-nipple like ends; keeled valve margin linear to a great extent while unkeeled valve margin slightly convex; valves 36.5 to 38.0 µm long, 5.0 to 6.0 µm broad; no constrictions on either valve.

**Habitat:** Ganga river water at Kalichar Ghat.

**Collection No:** 1193

**Date:** 25.11.11

**Ecological Notes:** Ganga river, water temperature: 19°C; pH: 7.1; NO<sub>3</sub>-N: 0.18; PO<sub>4</sub>: 0.22; Silicate: 7.6; DO: 6.8; BOD: 3.8.

**Significance:** Primary producer and a constituent of food web in aquatic habitat.

#### Acknowledgements

The author is grateful to University of Kalyani for pursuing research programme. The author is also grateful to Principal of Raja Peary Mohan College, Uttarpara for providing laboratory facilities and to Dr. R. K. Gupta, BSI, Howrah for their guidance and co-operations. Thanks are also due to Dr. Sobhan Kr. Mukherjee, Professor, Department of Botany, University of Kalyani, for his valuable comments regarding manuscript.

## References

- APHA, 2005 Standard methods for the examination of water and waste water (21<sup>st</sup> edn.). American Public Health Association, Washington, DC., New York.
- Banerjee, A., Santra, S.C., 2001 Phytoplankton of the rivers of Indian Sunderban mangrove estuary. *Indian Biologist*. **33**(1): 67-71.
- Biswas, K.P., 1949 Common fresh water and brackish water algal flora of India and Burma. Pt. I. *Rec. Bot. Surv. India*. **15**: 1-105.
- Das, P.R., Santra, S.C., 1982 Diatoms of Sanchal lake, Darjeeling, West Bengal. *Phykos*. **21**: 99.
- Gandhi, H.P., 1959 Freshwater diatoms from Sagar in the Mysore State. *J. Indian bot. Soc.* **38** (3): 305-331.
- Gandhi, H.P., 1960 On the diatom flora of some ponds around Vasna village near Ahmedabad. *J. Indian bot. Soc.* **39** (4): 558-567.
- Halder, N., Sinha, S.N., 2013a Diversity of the genera *Gloeotrichia* Agardh and *Rivularia* (Roth.) Agardh from Hooghly district of West Bengal, India. *Indian J. Fundamental & Applied Life Sci.* **3**(3): 29-35.
- Halder, N., Sinha, S.N., 2013b Some new records of the species of the genera *Aphanothece* Näg and *Merismopedia* Meyen from Hooghly district, West Bengal, India. *Indian J. Plant Sci.* **2** (3): 58-65.
- Kant, S., Gupta, P., 1998 Algal flora of Ladakh. Scientific publisher, Jodhpur, India. pp.1-341.
- Pal, T.K., Adhya, T.K., Santra, S.C., 1986 Algal flora of Murshidabad district, W.B. I. A survey from Berhampore and adjoining areas. *Bull. Bot. Soc. Beng.* **40**: 33-43.
- Pal, U.C., Santra, S.C., 1990 Algae of Midnapore, West Bengal II. Bacillariophyceae. *Phykos*. **29**(1&2): 73-81.
- Patrick, R., Reimer, C.W., 1966 The diatoms of the United States, exclusive of Alaska and Hawaii. *Monograph of the Academy of Natural Sciences, Philadelphia*, No. 13, Vol. I. pp.1-688.
- Prasad, B.N., Srivastava, M. N., 1992 Freshwater algal flora of Andaman and Nicobar Islands. Vol. I. Bishen Singh Mahendra Pal Singh, pp.1-369.
- Rao, C.B., 1955 On distribution of algae in a group of six small ponds. II Algal periodicity. *J. Ecol.* **43**: 291-308.
- Santra, S.C., Pal, U.C., Das, T.M., Sen, S., Saha, R., Datta, S., Ghosh Dastidar, P., 1989. Phytoplanktons of Bhagirathi Hooghly estuary: An illustrative accounts. *Indian Biol.* **21**(1): 1-27.
- Sarode, P.T., Kamat, N.D., 1984 Freshwater diatoms of Maharashtra. SaiKripa Prakashan, Aurangabad, pp.1-338.
- Venkateswarlu, V., 1969 An Ecological study of the algae of the river Moosi, Hyderabad (India) with special reference to water pollution. II-factors influencing the distribution of algae. *Hydrobiol.* **33**: 352- 363.