An Enumeration of Diatom Taxa from Tea Garden of Charaideo District, Assam, India

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ABSTRACT

Study in Diatoms is one of the under explored field in the Assam, even though the land is quite densely occupied with both lentic and lotic water bodies. In this study we have recorded Diatom Taxa found in different locations of three Tea Gardens situated in Charaideo District of Assam. The enumeration consists of species belongs to genera Amphora, Cymbella, Eunotia, Gomphonema, Neidium, Pinnularia and Stauroneis.

Three tea gardens, Sundarpur, Ghorajan and Mahalakhi, present in Charaideo District were visited during the study and samples were collected from both stagnant and running water. All these taxa were studied morphometrically and analysed by microscope OLYMPUS CX21i and camera Magcam-DC5.

Key word: Diatom, Tea Garden, Amphora, Cymbella, Eunotia, Gomphonema, Neidium, Pinnularia, Stauroneis

Introduction

Diatoms are major constituent of planktonic and benthic algal community occupying both marine and freshwater as well as moist terrestrial habitat. The Charaideo District of Assam is an excellent area for aquatic researches that includes freshwater species and their interaction with human being. However, although Diatoms are integral part of algal community and continuously present in freshwater species diversity they are overlooked by explorers. Diatoms are unicellular cosmopolitan microscopic algal species that is responsible for one fifth of the photosynthesis carried out in earth (Armbrust, 2009). Transparent silicified cell wall and sensitivity towards environmental changes makes it a fascinating member of algal taxa (Kroger and Sumper, 1998). The taxon’s sensitivity to environmental and climatic change makes it considerable indicator of environment change (Dixit et al., 1992; Paul et al., 2015; Virta and Teittinen, 2022). Recent works in Diatom suggest that organisms arose in the Triassic period, perhaps 250 million years ago through endosymbiotic action between a heterotroph and red alga and green alga (Armbrust, 2009). The organisation, symmetry and special structures found in the Diatom cell wall have greatest importance in the classification and identification of the Diatom species. Several identification keys are based on the valve structure, ornamentation, margin etc. (Williams and Kociolek, 2011).

Methods and Methodology

Study area and locations

The study areas were Sundarpur Tea Garden (27.1410 N, 95.2196 E), Ghorajan Tea Garden (27.1197 N, 95.1824 E) and Mahalakhi (27.1511 N, 95.2033 E). The Tea Gardens are situated in the Charaideo district, Assam. Sundarpur Tea Garden is 5km away from Dhodar Ali. The Garden covers
approx. 7 km². The Ghorajan Tea Gardens are approx. 3 km² and 6 km away from Dhodar Ali. The Mahalakhi Garden is 1.5 km² and 6 km away from Dhodarali. The gardens have good irrigation system along with lagoon, reservoirs, drains as well as paddy fields.

Sample collection and processing

Samples are collected with net and spatula from moist soil and field channels and stored in the collection tube from July 2022 to June 2023. The cleaning and processing of the field samples were done in the laboratory of D. R. College, Golaghat using KMnO₄-hot HCl method (Taylor et al., 2007). The slide was mounted using Naphrax. The species were identified and analyzed morphometrically with microscope OLYMPUS CX21i and camera Magcam-DC5.

Results

Morphometric description is given for explored species

1. Class: Bacillariophyceae
   Order: Thalassiophysales
   Family: Catenulaceae
   *Amphora ovalis* (Kutz.) Kutz. (Pl 1. Fig. 1)
   (Zelanza-Wieczorek et al., 2010, p. 132, Fig. 2. 1-8).
   Valves are 27.5 μm long and 11.3 μm broad. 11 Striae in 10 μm. Valves are almost elliptic and apices rounded. Dorsal margin is smoothly arched and ventral margin slightly concave. Raphe is linear and present towards the ventral margin. Raphe ledge present. Dorsal striae are radiate throughout.

2. Class: Bacillariophyceae
   Order: Cymbellales
   Family: Cymbellaceae
   *Cymbella cymbiformis* (Ag.) Kutz. v. *nerei* (Pant.) A. Cl. (Pl 1. Fig. 2)
   (Gandhi 1956, p. 204-205, Fig. 21)
   Valves are 78 μm long and 15.4 μm broad. 8 Striae in 10 μm. Valves are lanceolate and dorsiventral. Apices narrowly rounded. Dorsal margin is arched. Ventral margin is flat but gibbous at middle. Axial area narrow and central area large and elliptic. Raphe is lateral.

3. Class: Bacillariophyceae
   Order: Eunotiales
   Family: Eunotiaceae
   *Eunotia cameleus* (Ehr.) A. Berg. v. *venyticosa* v. nov. (Pl 1. Fig. 5)
   (Gandhi, 1957, p. 50, Fig. 15)
   Valves are 34.4 μm long and 5.9-6.1 μm broad. 12 Striae in 10 μm. The apices rostrate and slightly recurved to dorsal side. The dorsal margin four undulations and ventral margin has central inflation. Striae are parallel at the center and radiate in the undulations and apices.

4. Eunotia cf. bidens Ehrenb. (Pl 1. Fig. 6)
   (Pavlov and Levkov 2013, p. 13, pl. 22, Fig. 1-11)
   Valves are 56.2 μm long 7.9-9.7 μm broad. 10 Striae
in 10 µm. Valves are weakly arcuate and dorsal margin is biundulate. Ventral margin is slightly convex. Apices are subcapitate and end is flat towards dorsal margin and round towards the ventral margin. Two gibbous point is observed near the two apices. Striae almost parallel.

**Eunotia gracilis** (Ehr.) Rabh. (Pl 1. Fig. 7)

(Gandhi, 1957, p.49, Fig.10)  
Valves are 112.3 µm long and 5.5 µm broad. Striae not visible in LM. Valves narrow and arcuate. Dorsal margin is convex and ventral margin is concave. Apices are slightly rostrate and rounded. Two notch are visible near two apices in the ventral side.

**Eunotia incisadistans** (Pl 1. Fig. 8)

(Pavlov and Levkov 2013, p. 26-27, pl. 44, Fig. 1-24)  
Valves are 45.5 µm long & 6.4 µm broad. 9 Striae in 10 µm. Valves arcuate, dorsal margin convex and ventral margin concave. The striae visible and radiate from ventral margin. Apices are slightly rostrate and rounded. Two notch are visible near two apices in the ventral side.

**Eunotia sibirica** Cleve (Pl 1. Fig. 9)

(Krishnamurthy, 1954, p. 360, Fig. 15)  
Valves are 71.3 µm long and 10.2 µm broad. 10 striae in 10 µm. Apices are rostrate and rounded. Dorsal margin has four weak undulations and ventral margin is linear. Striae are parallel.

**Eunotia tropica** Hustedt (Pl 1. Fig. 10)

( Glushchenko and Kulikovskiy, 2017, p.133, Fig. 2. 19-24)  
Valves are 92.7 µm long and 12.3 µm broad. Striae 10 in 10 µm. Valves are large and arched. Dorsal margin has 6 bluntly pointed equally spaced undulations. Striae almost parallel and slightly radiate at some undulations.

4. Class: Bacillariophyceae  
Order: Cymbellales  
Family: Gomphonemataceae

**Gomphonema subcapitatum** Fritsch and Rich (Pl 1. Fig. 4)

(Gandhi, 1960, p. 564, Fig. 21)  
Valve are 53.7 µm long and 10.2 µm broad. 13 striae in 10 µm. Valves are clavate and apices are rounded. Raphe lateral. Striae are radiate throughout but becomes parallel towards end. Axial areas are rhombic with expanding to amore rounded shape in the central area.

5. Class: Bacillariophyceae  
Order: Naviculales  
Family: Pinnulariaceae

**Neidium iridis** (Ehr.) Cl. (Pl 1. Fig. 13a, 13b, 13c)

(Gandhi, 1959, p. 311, Fig. 4)  
Valves are 115 µm long and 23.6 µm broad. Striae dense and clearly punctate. Valve linear-elliptical and has rounded ends. Raphe thick and central pores bent in opposite direction. Central area larger than axial area.

**Neidium gracile** Hustedt (Pl 1. Fig. 11)

(Gandhi, 1959, p. 311, Fig. 6)  
Valves are 66.5 µm long an 13.8 µm broad. Striae not visible in LM. Valve broad, linear and triundulate with rounded ends. Central area fairly larger than axial area.

6. Class: Bacillariophyceae  
Order: Naviculales  
Family: Pinnulariaceae

**Pinnularia braunii** (Grun.) Cl. (Pl 1. Fig. 14)

(Gandhi, 1960b, p. 81, Fig. 4)  
Valves are 49.2 µm and 11.1 µm broad. 9 Striae in 10 µm. Valves are linear with convex sides. Apices are capitate. Axial area narrow and widens towards the rhombic central area. Proximal raphe has a drop like shape and terminal raphe have question mark shape. Striae radiate at the center and convergent at the apices.

**Pinnularia curdinaliculus** (Cl.) Lund (Pl 1. Fig. 12)

(Gandhi 1959, p.319, fig.18)  
Valves are 100.6 µm long and 15.4 µm broad. 8 Striae in 10 µm. Valves are linear and apices are cu-neate round. Central area rhombic. Axial area linear and 1/3rd of the valve width. Striae radiate at the center and convergent toward apices. Raphe lateral and form a question mark like shape.
Plate 1. Fig. 1. *Amphora ovalis* (Kutz.) Kutz., Fig. 2. *Cymbellacym biformis* (Ag.) Kutz. v. *nerei*, Fig. 3. *Gomphonema subtile* Ehrn v. *malayensis* Hust, Fig. 4. *Gomphonema subcapitatum* Fritsch & Rich, Fig. 5. *Eunotiacameleus* (Ehr.) A. Berg. v. *venyticosa* v. nov., Fig. 6. *Eunotia cf. bidens* Ehrenb., Fig. 7. *Eunotia gracilis* (Ehr.) Rabh., Fig 8. *Eunotia incisadistans*, Fig. 9. *Eunotia sibirica* Cleve, Fig. 10. *Eunotia tropica* Hustedt, Fig 11. *Neidium gracile* Hustedt, Fig. 12. *Pinnularia curdinaliculus* (Cl.) Lund, Fig. 13a, 13b, 13c. *Neidium iridis* (Ehr.) Cl. Fig. 14. *Pinnularia braunii* (Grun.) Cl., Fig. 15. *Pinnularia microstauron* (Ehrenb.) Cleve, Fig. 16. *Pinnularia major* (Kutz.), Fig. 17. *Stauroneis gracilior* Reichardt., Fig. 18. *Stauroneis gracilis* Ehrenb., Fig. 19. *Stauroneis phoenicenteron* Ehr.
Discussion

From this observation, total twenty Diatom species were found from the Tea Gardens of Charaideo District. As the Diatoms are highly sensitive, continuous human interaction due to agricultural purposes as well as the use of chemicals also leads to decrease the number of species in those area. *Eunotia* and *Pinnularia* shows highest number of species where as others were represented by less than 4 species. The reduction of species in the gardens leads to future research approach in sensitivity of Diatoms and its habitat surrounding anthropogenic activities.

Conflict of Interest

There is no conflict of interest

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References


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