# PHYTOPLANKTON AS NEW TAXA AND REPORT FOR BANGLADESH

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**Abstract**

In the present paper, a total of 12 species of phytoplankton have been described of which one new variety (*Pediastrum duplex* var. *reniformae* var. nov.) and one new forma (*Pediastrum duplex* var. *gracillimum* fa. *rotatus* fa. nov.) from the phytoplankton have been described as new to science. The other 10 species of phytoplanktons have been described as new report from Bangladesh. The systematic account for each of the above-mentioned species and their taxonomic position and photomicrographs are elaborated.

***Key words***: *Pediastrum duplex* var. *reniformae* var. nov; *Pediastrum duplex* var. *gracillimum* fa. *rotatus* fa. nov.; Phytoplankton; Hakaluki Haor; Hail Haor.

## INTRODUCTION

Phytoplankton consisting of mostly the microalgal population growing abundantly in freshwater lakes and seas may sometime be called as 'hidden flora' supporting the primary productivity of the aquatic ecosystems (Bonney 1979). They are so called because their existence in water cannot be recognized via simple microscopical observation rather needs a magnified view ranging 100 - 1000× or more. However, considering their paramount importance towards supporting secondary production as fishes and oxygen production, nutrient cycling, etc. from the aquatic habitats, these tiny organisms are researched (Bonney 1979, Reynolds 1984). A significant fraction of the total algal species (2342) have so far been reported from Bangladesh belonging to phytoplankton and still some more new publications are being made for new reports (Khondker 2022, Nahar and Khondker 2018, Gani *et al.* 2014, 2012). Bangladesh being situated in the humid tropics with enriched alluvium deposition, abundant rainfall, and adequate solar radiation input almost all of her natural surface water bodies are supported by luxuriant flora of phytoplankton. In Bangladesh, research on phytoplankton as pioneered by Begum (1958) and Islam and Khatun (1966) has been continuing in a stronger pace.

Recently, some additions to the list of phytoplankton belonging to the classes Bacillariophyceae and Euglenophyceae of Bangladesh have been done by Nahar and Khondker (2018) and Gani *et al.* (2014, 2012). Bangladesh has a wide diversity of wetlands with luxuriant phytoplankton growth (Khondker 1994). Careful observations on some previously collected phytoplankton samples from the wetland habitats yielded new report and rare species have been added to the floristic list of Bangladesh (Khondker *et al*. 2008, 2009a). Khondker *et al*. (2009b) published one new species *Strombomonas islamii* Khondker from a pond of Bakerganj, Barishal. Recently, in an endeavor to collect the samples of some marine and freshwater planktons following their subsequent systematic analyses, the present author has encountered some species of pelagic planktons as new taxa to science and new report to the list of plankton of Bangladesh.

After a detailed study carried out with the help of standard literatures and compound microscopy the identified species were found to be new addition to the existing floristic list of plankton of Bangladesh. A detailed taxonomic enumeration of the species has been presented below.

## MATERIAL AND METHODS

Samples for the present investigation were collected from Hakaluki Haor, Moulvi Bazar (on 27.10. 2018), Hail Haor, Srimangal, Moulvi Bazar (on 01.11. 2021) and Cox's Bazar (on 23.03. 2022). From each habitat, pelagic phytoplankton were collected by filtering 100 L of water via a plankton net (Nitex, 55 µm pore width) and the concentrates were preserved in Lugol's iodine solution (Wetzel and Likens 2000). Microscopic analyses of the samples were carried out with the help of a compound research microscope Zeiss, Axio, Lab. A1 fitted with Zeiss Axiocam ERc 5s, Germany for taking images. Taxonomic data (cell dimensions and other measurements) were done by mounting a 1.27 µL of plankton concentrate on a Helber Microplankton Counting Chamber, Thoma ruling, Hawksley Technology, UK. Literatures consulted for identifying each taxon have been mentioned at the site of taxonomic enumeration for the concerned species.

## RESULTS AND DISCUSSION

In the present investigation, 20 algal samples collected from some freshwater and marine habitats of Bangladesh were analyzed using a high quality research microscope. The photomicrographically scanned images of the specimens were documented with the help of various literatures and 12 taxa were identified belonging to 8 algal families. Among the taxa, one new forma, namely *Pediastrum duplex* var. *gracillimum* fa. *rotatus* Bhuiyan in Bhuiyan *et al.* fa. nov. and one new variety *Pediastrum duplex* var. *reniformae* Bhuiyan in Bhuiyan *et al.* var. nov. are new contribution to science. The other 10 taxa reported are new addition to the flora of Bangladesh phytoplankton: *Myrmecia globosa* Pascher, *Pediastrum duplex* var. *duplex* Meyen, *Bleakeyela notata* (Grunow) Round in Round *et al.* (1990), *Amphiprora ornata* Bailey, *A. constricta* Ehr. *Pleurosigma balticum* W. Sm., *Nitzschia vermicularis* (Kuetz.) Grunow, *Rhaphoneis fluminiensis* Grunow, *Achnanthes lapponica* Hustedt, and *Odontella aurita* (Lyngbye) C. A. Agardh. The new taxa are compared with their closely related forms and for each of them notes have been given. The sources of identification have been attached to the description part of the species. A detailed taxonomic enumeration has been followed in the next.

*Taxonomic enumeration*

**Division: Chlorophyta; Class: Chlorophyceae; Order: Chlorococcales**

**Family: Chlorococcaceae**

***Myrmecia globosa*** Pascher (**Fig. 1a)** (Dillard 1989, p. 51; Pl. 13, Fig. 8)

Unicellular, solitary, spherical to ovoid, pyriform, cell wall mamillated, thickening on one side, median dia. 27.5 µm, length with mamillated tip 32.5 µm.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh

**Family: Hydrodictyaceae**

***Pediastrum duplex*** var. ***gracillimum*** fa. ***rotatus*** *Bhuiyan et al.* fa. nov. **(Fig. b-c)** (Ling and Tyler 2000, p. 93, Pl. 40, Figs. 6-7)

Coenobium 16 celled, peripheral 11, central 5, central area with large perforations; colony 100 µm dia.; peripheral cells 15 µm wide (from one joint to another), upward process 17.5 µm long; cells of central area 12.5 µm wide and upward process 10 µm long.
**Note**: The present specimen looks like typical *Pediastrum duplex* var. *gracillimum* (Ling and Tyler 2000), but varied by the shape of the colony which is accurately wheel like and tip of the process of each peripheral cell is capitate. So, the specimen has been diagnosed as new forma of *Pediastrum duplex* var. *gracillimum* fa. *rotatus* Bhuiyan in Bhuiyan *et al*.
**Habitat:** Pelagic zone, Hail Haor, Srimangal, Moulvi Bazar.

***P. duplex*** var. ***duplex*** Meyen **(Fig. 1d)** (Huber-Pestalozzi 1983, p. 300, Pl. 88, Fig. 2)

Coenobium free living, 16 celled (1 cell centrally located, next tier consists of 5 cells, peripheral tier consists of 10 cells); cell-wall smooth, without any visible ornamentation; coenobium 100 µm in dia., peripheral cells 17.5 µm (joint to joint) in dia., process 17.5 µm long; central cells 17.5 µm dia. (from joint to joint), process 10 µm long.
**Note**: The specimen is a type variety of *P. duplex* var. *duplex* Meyen.
**Habitat:** Pelagic zone, Hakaluki Haor, Moulvi Bazar

***Pediastrum duplex*** var. ***reniformae*** Bhuiyan *et al.* var. nov **(Fig. 1e)**

Coenobium kidney shaped, narrow median part (constricted part) and one bulged tip 87.5 µm in wide, other bulged tip 95 µm wide; length of whole coenobium 150 µm; cells of peripheral tier regularly arranged, cells of central area haphazardly arranged; peripheral cells 26 in number; central cells 27-30 in number, arranged with irregular spaces. Peripheral cells (from one joint to another) 12.5 µm wide; cell process 10 µm; central cells (joint to joint) 12.5 µm wide, cell process 5.0-7.5 µm.
**Note**: The specimen is *Pediastrum duplex* Meyen like but the colony is distinctly kidney shaped. A central straight tier consisting of 6 cells meeting the peripheral tier, where a notch is created. The last cell of the central tier meets with both the ends of the peripheral tier. Peripheral cells regularly arranged but not the cells which lie on both the sides of the cells of the central tier. Due to these characteristics with varied dimensions of constricted area, and tip area of the coenobium the specimen has therefore been raised to a new variety *Pediastrum duplex* Meyen var. r*eniformae* Bhuiyan in Bhuiyan *et al*. var. nov.
**Habitat:** Pelagic zone, Hakaluki Haor, Moulvi Bazar

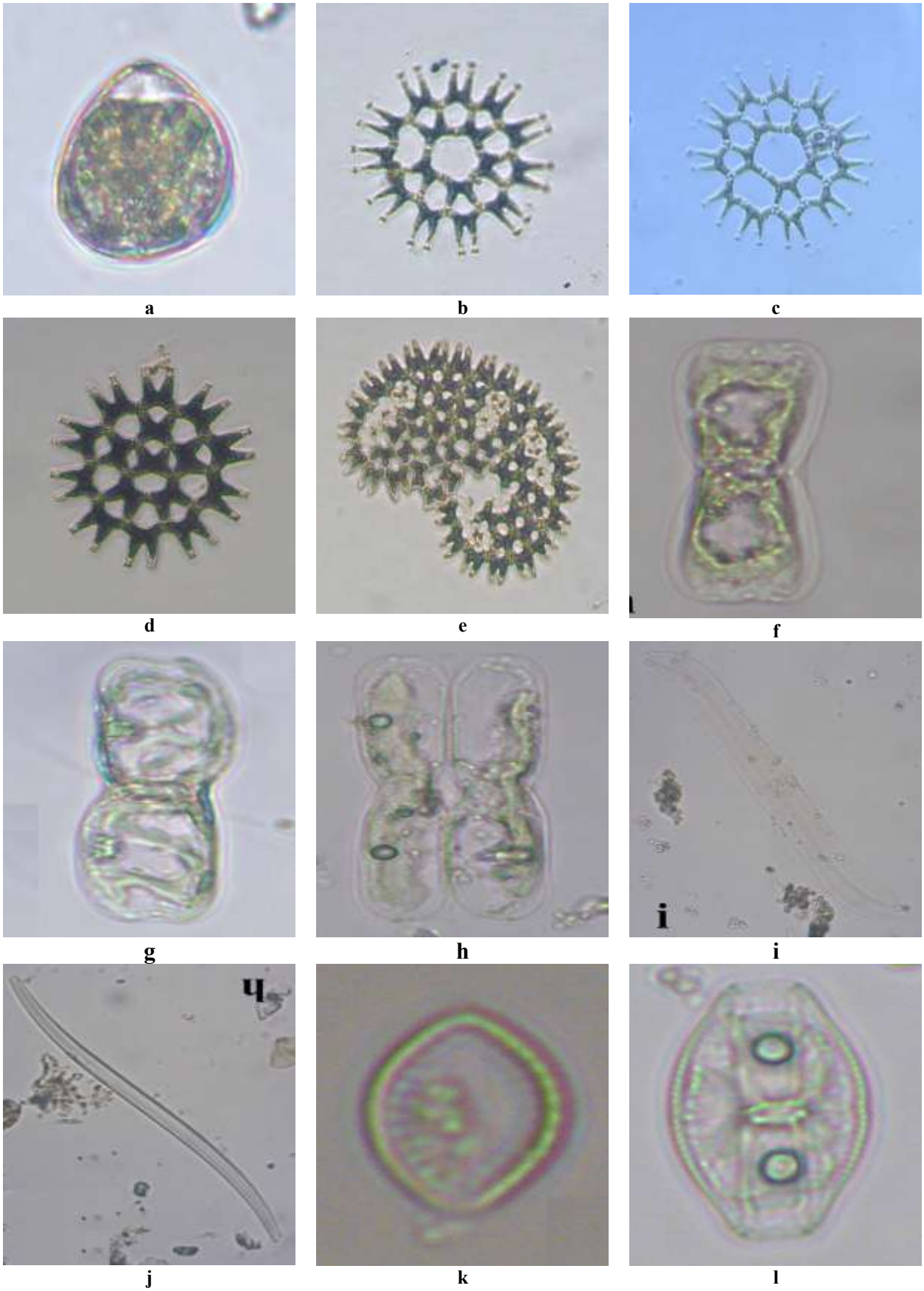
**Division: Chrysophyta; Class: Bacilariophyceae; Order: Pennales**

**Family: Fragilariaceae**

***Bleakeleya notata*** (Grunow) Round in Round *et al.* (1990) **(Fig. 1l)** Tomas (ed.) 1997; p. 243-244; Pl. 50, fig. a-b)

Cell linear in both valve and girdle view, ends dissimilar, foot pole in valve view slightly inflated, with a more or less angular or rounded outline. Frustule 75 c long, head pole 3-5 µm wide.
**Note**: The species is marine, Basionym: *Asterionella bleakeleyi* var. *notata* Grunow. The original specimen is colonial as twisted chain but our sample was collected as solitary and mixed with other marine plankton. So, the specimen has tentatively identified as *Bleakeleya notata.*

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh.



**a** **b** **c**

**d** **e** **f**

**g** **h** **i**

**j** **k** **l**

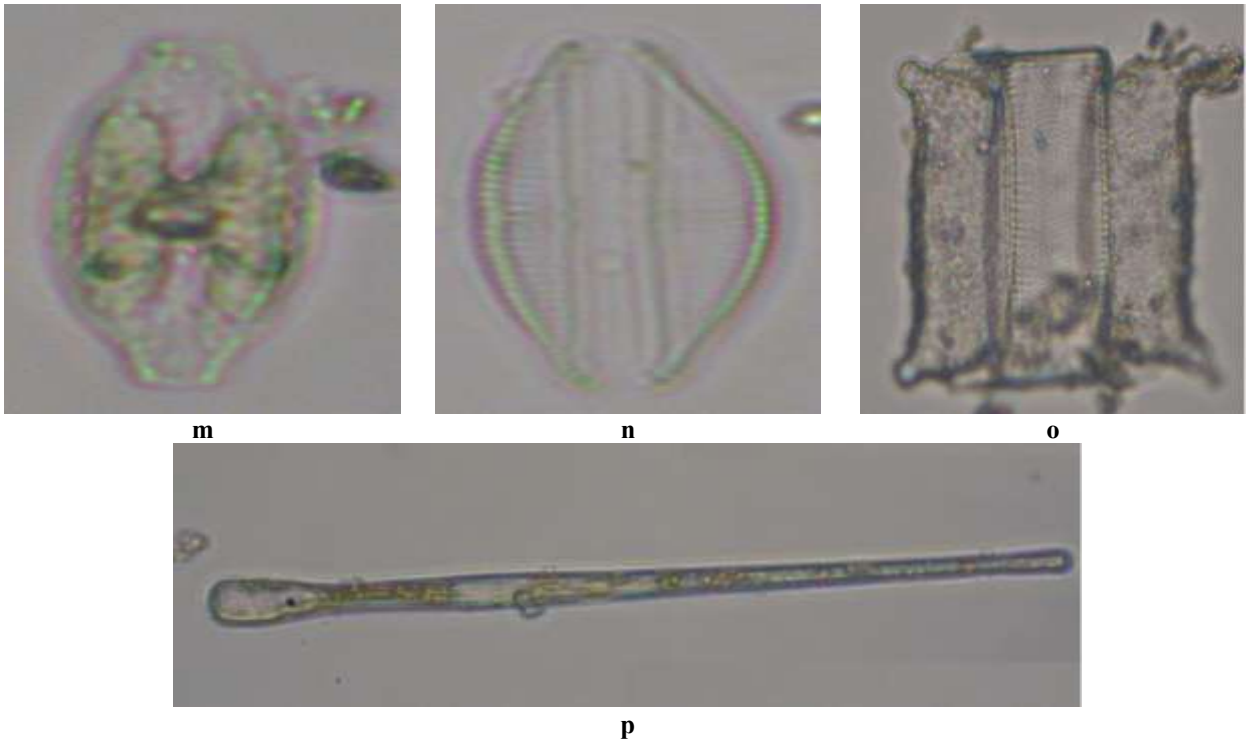



Fig. 1. Presentation of photomicrographically scanned images: **a.** *Myrmecia globosa,* **b-c**. *Pediastrum duplex* var. *gracillimum* fa. *rotatus* fa. nov., **d**. *P. duplex* var. *duplex*, **e**. *P. duplex* var. *reniformae* var. nov., **f-g**. *Amphiprora ornata*, **h**. *A. constricta*, **i.** *Pleurosigma balticum*, **j**. *Nitzschia vermicularis*, **k**. *Raphoneis flaminiensis*, **l-n**. *Achnanthes lapponica*, **o**. *Odontella aurita* and **p**. *Bleakeleya notata*.

**Family: Naviculaceae**

***Amphiprora ornata*** Bailey **(Fig. 1f-g)** (Hustedt 1930, p. 340, Fig. p. 339, no. 626)

Valve view rectangular with slight median constriction, weakly blunt-head, frustule lightly sigmoid, 50-60 µm, 18-20 µm wide; either pole flat to slightly rounded.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh

***A. constricta*** Ehr. **(Fig. 1h)** (Smith 1853, p. 44-45, Fig. 126d)

Frustule hyaline, membranate, straight, elliptical, with a central sinus and transverse line, striae hyaline, 55.00µm long, 20 µm wide.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh

***Pleurosigma* balticum** W. Sm. **(Fig. 1i)** (Smith 1853, p. 66, Pl. XXII, Fig. 207a)

Valve slightly but more accurately sigmoid; linearly attenuated, more gradually towards obtuse pole; raphe prominent but not the striae, weakly silicified. Valve 325 µm long and 32.5 µm broad (medially).

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh.

**Family: Bacillariaceae**

***Nitzschia vermicularis*** (Kuetz.) Grunow **(Fig. 1j)** (Hustedt 1930, p. 419, Fig. 811; Germain 1981, Pl. 138, Figs. 5-7)

Frustule slim, weakly but distinctly sigmoid, tip more or less capitate, 280 µm long, 8 µm broad, keel points 10-12 in 10 µm.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh.

**Family: Rhaphoneidaceae**

***Rhaphoneis fluminiensis*** Grunow 1862 **(Fig. 1k)** (Grunow 1862, p. 382, Plate IV, Fig. 5)

Frustule isopolar, isobilaterally similar, broadly ovoid, valve shortened, central area empty; 109 µm long and 89 µm broad.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh

**Family: Achnanthaceae**

***Achnanthes lapponica*** Hustedt **(Figs. 1l-n)** (Germain 1981, p. 109, Pl. 41, Figs. 10-11)

Cells broadly elliptical to navicular, convex, pseudoraphe present, central nodule distinct, stauros, chromatophore central. Frustule 36-37 µm long, 14-16 µm broad.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh.

**Family: Euphodiscaceae**

***Odontella aurita*** (Lyngbye) C. A. Agardh **(Fig. 1o)** (Tomas 1997, p. 236, Pl. 49, Fig. a)

Cells box shaped, solitary or in chain, valve view elliptical to ellipsoidal, valves produce horns, girdle distinct. Frustule 56 µm and 20 µm wide.

**Habitat:** Littoral zone, Cox's Bazar, Bay of Bengal, Bangladesh.

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