

Algal diversity in Deepor Beel of Assam: a Ramsar site of North East India

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उत्तर पूर्वी भारत स्थित एक रामसर स्थल असम के दिपोरबील की शैवाल विविधता

पार्थ प्रतिम बरुआ, बिसमिता बरुआ, सोमिन नाथ, हिमामनी कालिता एवं सास्वती भट्टाचार्य

सारांश

असम राज्य की रामसर स्थल दिपोरबील झील की शैवाल विविधता के अध्ययन के लिये वानस्पतिक सर्वेक्षण का कार्य किया गया। अध्ययनोपरान्त कुल 267 शैवाल जातियों को अभिलेखित किया गया जिनमें क्लोरोफायटा (137), यूग्लिनोफायटा (52) बेसिलेरियोफायटा (27) जैन्थोफायटा (4) पायरोफायटा एवं क्राइसोफायटा (1-1 जाति) क्रमशः सम्मिलित हैं। कुल 267 में से 146 शैवाल जातियों को असम राज्य से प्रथम बार अभिलेखित किया गया है। 27 जातियों के साथ शेनिडेस्मस वंश प्रमुख प्रभावकारी वंश के रूप में स्थापित है इसके बाद फैक्स (19 जातियां), कोस्मोरियम (16 जातियां) ट्रेकियोमोनास (14 जातियां) ओसिलोटेरिया (12 जातियां) एवं पेडिस्ट्रम (9 जातियां) शामिल हैं।

ABSTRACT

Explorations were made to enumerate and document algal diversity of the Deepor beel Ramsar site in Assam. A total of 219 algal species were reported belonging to Chlorophyta (73), Cyanobacteria (41), Charophyta (36), Euglenozoa (35) Bacillariophyta (27) and Ochrophyta (7) respectively. Out of which, around 108 species were reported for the first time from Assam. *Cosmarium* with 12 species was recorded to be the dominant genus which was followed by *Desmodesmus* (10), *Phacus* (10), *Lepocinclis* (8), *Trachelomonas* (8) and *Closterium* (7) respectively.

Keywords: Chlorophyta, New to Assam, Phytoplankton, Systematic enumeration, Taxonomic account.

INTRODUCTION

Lentic water bodies and ox-bow beels associated with the river Brahmaputra and its tributaries in Assam is known for its long association with the livelihood generation of local inhabitants (Gogoi, 2013). These wetlands otherwise considered as the 'kidneys of nature' that recharge and discharge the ground water besides serving an ideal habitat for various aquatic plant diversity. Not only plants, the beel also support a large number of birds and animals (Saikia, 2005; Saikia & Saikia, 2011).

The Deepor beel, covering an area of 7 sq. km is located on the southern bank (26°05' N to 26°11' N latitudes and 91°35' E to 91°43' E longitudes) of the river Brahmaputra near the Guwahati, Assam (Saikia and Bhattacharjee,

1987; Deka and Goswami, 1992). A part of the beel has been declared as Wildlife Sanctuary in the year 1989 and included in the Ramsar list in the year 2002. The climate of the region is monsoonic with a maximum rainfall of 2600 mm per annum (Barman and Goswami, 2019). The average winter temperature ranges from 12°C to 14°C and the average summer temperature ranges from 22°C to 32°C (Chetia & al., 2020).

Occupying at the lowest level of any wetland-based food web, algae are supplying energy to higher trophic levels and thus, performing a sound ecological service to the wetland ecosystem. Algae are the prime food for the fish as well as birds including migratory ones for which the Deepor beel is famous for. The beel houses as many

as 54 indigenous fish species of Assam (Goswami and Kalita, 2012) which support livelihood to around 1700 fisherman families residing in 14 different villages in the vicinity. A few algal species serve as an important and reliable biological indicator of pollution too. Though

study of algae is important, a very meagre work has so far been reported from the beel (Baruah & al., 2013; Sharma, 2015). The present study was therefore undertaken to enumerate and document the diverse group of algae in the Deepor beel Ramsar site of North East India.

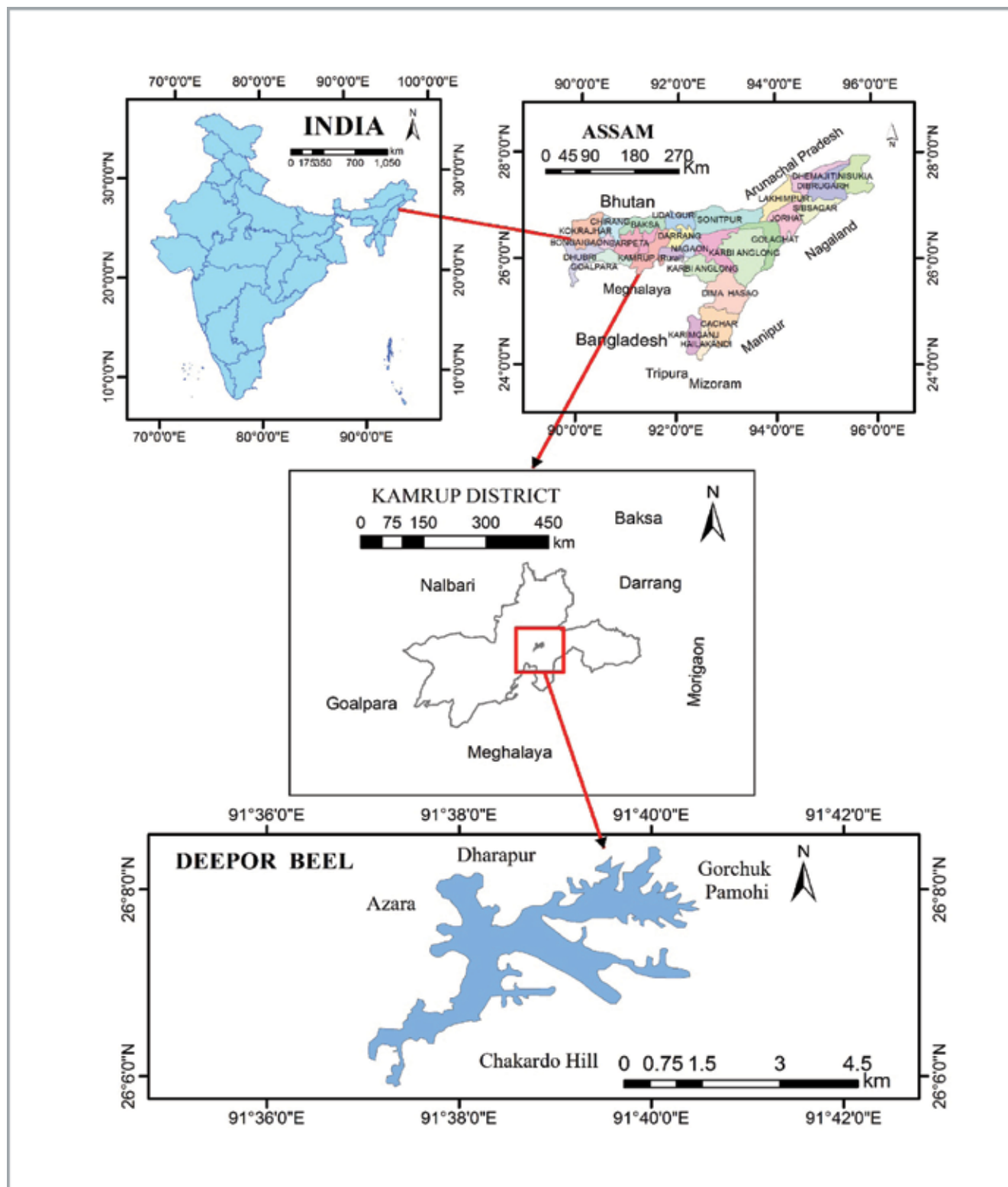


Fig -1: Location map of the study area Deepor Beel, Ramsar site

MATERIALS AND METHODS

As many as 20 algal samples were collected from Deepor beel at monthly intervals from January 2018 to December 2019, particularly in the morning hours between 6 a.m. to 8 a.m. at random stations using filtering plankton net of mesh size 45 µm (Jena & al., 2006). After filtering about 20 L of water through the plankton net, the filtrates were then transferred to the assigned sample bottles and brought to the Plant Ecology Laboratory of Department of Botany, Gauhati University. The samples were observed in fresh condition, the remaining portions were preserved in Lugol's Iodine solution and 4% formaldehyde. Observation of samples were made thoroughly using Euromex DelphiX Observer series microscope with Image View software under different magnifications. Digital photomicrographs were taken using Euromex Digital camera (20 MP). Identification of the species was done following standard monographs and research publications (Desikachary, 1959; Randhawa, 1959; Gandhi, 1960; Komárek & Fott, 1983; Prasad & Srivastava, 1992; Prasad & Mishra, 1992; Kant & Gupta, 1998; Komárek & Anagnostidis, 1998, 2005; Gandhi, 1998; John & al., 2005; Perumal & Anand, 2009; Yamagishi, 2010; Das & Adhikary, 2014; Das & Keshri, 2016).

RESULTS

A total of 219 algal species under 104 genera were collected and documented during the present investigation period (from January 2018 to December 2019) from the Deepor Beel Ramsar site of North East India which were belonging to six taxonomic groups. Chlorophyta was outnumbered with 73 species followed by Cyanobacteria (41 species), Charophyta (36 species), Euglenozoa (35 species), Bacillariophyta (27 species) and Ochrophyta (7 species) respectively. Systematic enumeration of the recorded species was arranged following algaebase (Guiry & Guiry, 2020). Digital photomicrographs of the first reported taxa from Assam were given in Photoplates I-IV.

SYSTEMATIC ENUMERATION

(“*” indicates first reported taxon from Assam)

Phylum-**Bacillariophyta**; Class-**Bacillariophyceae**;
Order-**Bacillariales**; Family-**Bacillariaceae**

Cylindrotheca closterium (Ehrenberg) Reimann & J.C. Lewin 1964: 289, pl. 124: figs 1-4; pl. 125: figs 1-4; Prasad and Srivastava 1992, p. 289, pl. 35, fig. 4. *Ceratoneis closterium* Ehrenberg

(Pl. I, Fig.1)*

Valve spindle shaped at middle and ends are sickle shaped, narrowly rounded and obliquely curved; striation indistinct. Valve 59.06 - 62µm long, 3.9 - 5.5µm broad at middle.

Voucher No: Deepor Beel -865

Order-**Cymbellales**; Family-**Cymbellaceae**

Cymbella affinis Kützinger 1844: 80, pl. 6: fig. 15; Das and Adhikary, 2014; P. 254; pl.19, fig.18

Frustules elliptical, oblong, asymmetrical, biraphid, end obtuse; ventral margin slightly gibbous, dorsal side convex, raphe arcuate or towards the ventral margin; striation distinct, parallel, striae 9-10 in 10 µm; cells are 11.5-13µm broad and 39.6 - 52µm long.

Voucher No. Deepor Beel -856

Previously reported from Assam: Kaziranga National Park (Das & Adhikary, 2014)

Cymbella tumescens A. Cleve 1939; Cleve-Euler 1951-55, p. 157, fig. 1241; Gandhi 1964, p. 270, figs. 64, 65;

(Pl. I, Fig. 2) *

Elliptical lanceolate, asymmetrical valves, convex dorsal and ventral margins, on dorsal side ends constricted, produced and rounded, thick, excentric raphe, linear, narrow, widening towards centre type of axial area, broad somewhat elliptical central area, coarse, lineate, radial becoming close towards the ends striae, length 38-40 µm and breadth 10-13 µm, striae in 10 µm were 11-12 in numbers.

Voucher No: Deepor Beel -858

Cymbella tumida (Brébisson) Van Heurck 1880: 64, pl. 2: fig. 10; S K Rai, 2006; P 17; pl.1 & fig. 4. *Cocconema tumidum* Brébisson in Kützinger

Valves semilanceolate, dorsal margin convex while ventral margin almost straight or slightly convex with a slight expansion in the centre of the valve; axial area narrow, widening into a large round central area with a single pole on the ventral side; apices broadly rounded and rostrate; raphe slightly curved; striae coarse, striae 9-10 in 10 µm. Length of the cell 57.37 -71µm and breadth 20.25 - 23 µm.

Voucher No: Deepor Beel -856,

Previously reported from Assam: Samaguri Lake (Borgohain & al., 2012)

Cymbella turgidula Grunow in A.W.F.Schmidt 1875: pl. 9: figs 23-26; Pal & Santra 1990, p. 74, pl. 1, fig. 6; Das and Adhikary, 2014 p. 208, pl. 16, fig. 12

Frustules biraphid, asymmetrical, slightly lanceolate, end obtuse, dorsiventral, dorsal side more convex than ventral side, striation distinct, transverse, parallel or slightly radial, longer than broad, striae 8 - 9 in 10 µm,

40 - 45 µm long and 15-20 µm broad.

Voucher No: Deepor Beel -814

Previously reported from Assam: Samaguri Lake (Borgohain & al., 2012)

Family-**Gomphonemataceae**

Encyonema gracile Rabenhorst 1853: 25, pl. 10: suppl. fig. 1; Kutzing 1844: 79, pl.6, fig. IX (9)

Valves 25-33 µ long, 4.5-6.5 µm broad, asymmetrical, semi lanceolate with dorsal margin uniformly convex in a large arc; ends very slightly constricted, somewhat acutely rounded; thin and straight raphe, close to the ventral margin with central pores dorsally bent and terminal fissures ventrally curved; 10-12 striae in 10 µm.

Voucher No: Deepor Beel -806

Previously reported from Assam: Samaguri Lake (Borgohain & al., 2012); Sivsagar District, Assam (Phukan & Bora, 2012)

Gomphonema grunowii R.M.Patrick & Reimer 1975: 13, pl. 17, fig. 6; Sarode and Kamat 1984, P. 190, Pl. 22, Fig. 514; Das & Adhikary, 2014, P 203; pt.15, fig 40.

Lanceolate valves 86 µm in length and 22 µm broad, clevate with distinctly rounded apex and base; somewhat narrow base; linear central area slightly unilateral with an isolated stigma on the opposite sides, striae 11-12 in 10 µm; Radial and lineate.

Voucher No: Deepor Beel -861

Previously reported from Assam: Deepor Beel (Das & Adhikary, 2014); Refinery effluent Drains, Assam (Baruah & al., 2009)

Order-**Eunotiales**; Family-**Eunotiaceae**

Eunotia tschirchiana O.Müller 1890: 328, pl. XIX [19]: figs 14-17; Gandhi 1967, p. 257, figs. 19-21.

(Pl. I, Fig. 3) *

Rectangular frustules in girdle view, linear in valve view, dorsal sides arcuate and strongly convex, towards end deep constriction, more or less straight sharply bent towards the extremity ventral side, obliquely truncate or sub truncate ends, nodules terminal and on ventral side small distinct raphe at the ends of the valve, coarse and lineate striae, arranged distantly and irregularly in the middle, length 38-40 µm and breadth 6-8 µm, striae in 10 µm were 11-13 in numbers.

Voucher No: Deepor Beel -858

Order-**Fragilariales**; Family-**Fragilariaceae**

Fragilaria crotonensis Kitton 1869: 110, fig. 81; Das & Adhikary, 2014, P 210; pt.17, fig 2.

Cells linear in girdle view, ends of the cells are slightly swollen, adjacent cells are linked at the center but the ends are free. 86 - 88µm long and 3.5 - 4.84 µm broad.

Voucher No: Deepor Beel - 862

Previously reported from Assam: Deepor beel (Das & Adhikary, 2014)

Order-**Licmophorales**; Family-**Ulnariaceae**

Ulnaria delicatissima (W.Smith) Aboal & P.C.Silva 2004: 361; Prasad & Srivastava 1992, p. 167, pl. 24, fig. 9; Das and Adhikary, 2014 p. 187, pl. 14, fig. 16. *Synedra delicatissima* W.Smith (Pl. I, Fig. 4)*

Frustule linear, elongated, straight, middle area slightly wider, attenuated towards the apices to form rostrate end, 104 -140 µm long and 4 - 5 µm broad, striation not clearly visible in fresh material.

Voucher No: Deepor Beel -829

Ulnaria ulna (Nitzsch) Compère 2001: 100; Hustedt 1930, p. 151, f. 159. *Bacillaria ulna* Nitzsch

Linear to lanceolate valves, 122 µm in length and 10 µm broad, tapering at the ends, ends rounded pseudoraphe narrow, linear, central area absent or present; coarse striae, 9-11 in 10 µm.

Voucher No: Deepor Beel -870

Previously reported from Assam: Deepor Beel (Deb & al., 2019); Oil effluent Drains, Assam (Baruah & al., 2009); Samaguri Lake (Borgohain & al., 2012)

Order-**Naviculales**; Family-**Brachysiraceae**

Brachysira vitrea (Grunow) R.Ross in B.Hartley, R.Ross & D.M.Williams 1986: 607; Sreenivasa and Duthie 1973, p. 188, fig. 105. *Gomphonema vitreum* Grunow

(Pl. I, Fig. 5) *

Frustules lanceolate, apices elliptical, rostrate or capitates, narrow, linear, median axial area, broad central area, thin, straight, median raphe, length 36-39 µm and breadth 9-10.5 µm, unclear striation.

Voucher No: Deepor Beel -856

Family-**Diadesmidaceae**

Diadesmis confervacea Kützing 1844: 109 pl. 30: fig. 8; Das & Adhikary, 2014. P 226, pl.17 & fig. 37

Valve attached side by side to form ribbon shaped colony, colony filamentous, gelatinous and rectangular in girdle view, at the middle slight gap between the valves, end truncate flattened, valve longer than broad, 13.9-18.5µm long and 3.9-5.7 µm long.

Voucher No: Deepor Beel -859

Previously reported from Assam: Deepor Beel (Das & Adhikary, 2014)

Family-**Naviculaceae**

Navicula amphirhynchus Ehrenberg 1843; Kutzing 1865, p. 95, pl. 4, fig. XIII; Das and Adhikary, 2014 p. 196, pl. 15, fig. 13.

(Pl. I, Fig. 6) *

Frustules elliptical, lanceolate, with narrowly rostrate apices, raphe thin, central area slightly widened, 33 - 42.3 μm long and 9.6 - 10.8 μm broad, striation barely visible in fresh material.

Voucher No: Deepor Beel -824

Navicula cryptocephala Kützinger 1844: 95, pl. 3: figs 20, 26; Germain 1981, p. 188, pl. 72, f. 2.

Frustules 29.7 μm in length and 5.95 μm broad at the middle; raphe occupying the apical axis; polar and central nodules are elongated at the apical direction and

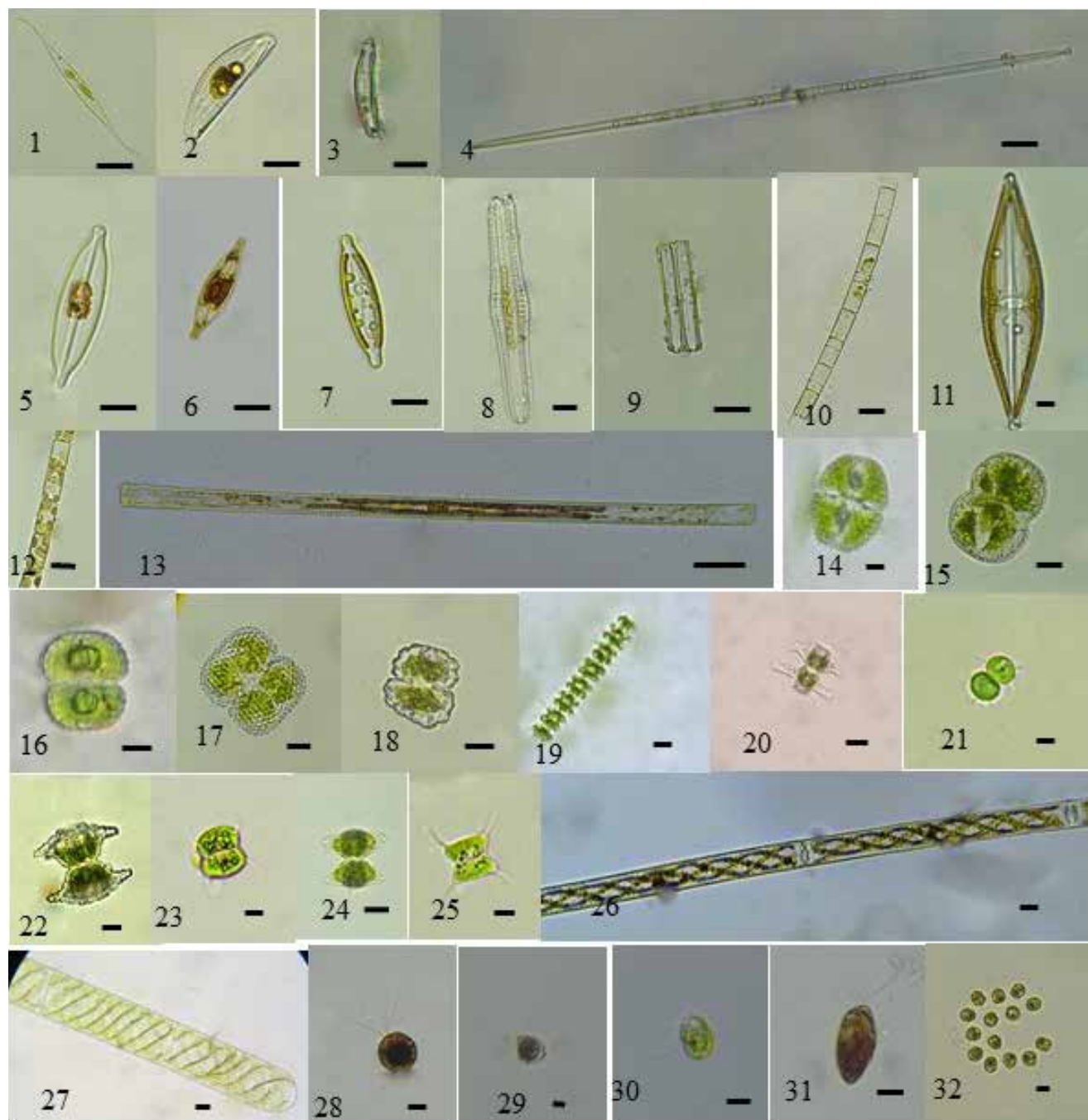


Plate-I: Fig.(1-32): 1. *Cylindrotheca Closterium* 2. *Cymbella tumescens* 3. *Eunotia tschirchiana* 4. *Ulnaria delicatissima* 5. *Brachysira vitrea* 6. *Navicula amphirhynchus* 7. *Neidium affine* var. *amphirhynchus* 8. *Pinnularia acrosphaeria* var. *tumidula* 9. *Pinnularia borealis* 10. *Aulacoseira islandica* 11. *Stauroneis pusilla* 12. *Melosira varians* 13. *Ardissonaea crystallina* 14. *Cosmarium miscellum* 15. *Cosmarium moniliforme* var. *sikkimicum* 16. *Cosmarium subcrenatum* 17. *Cosmarium quadrum* var. *minus* 18. *Cosmarium undulatum* var. *minutum* 19. *Onychonema uncinatum* 20. *Staurastrum crenulatum* 21. *Staurastrum egregium* 22. *Staurastrum manipurens* 23. *Staurodesmus bulnheimii* 24. *Staurodesmus patens* 25. *Staurodesmus validus* 26. *Spirogyra neglecta* var. *fuellerborni* 27. *Spirogyra oblata* 28. *Carteria pseudoglobosa* 29. *Chlamydomonas ehrenbergii* 30. *Chlamydomonas lundii* 31. *Chlamydomonas reinhardtii* 32. *Gonium pectorale* (Scale bar = 10 μm)

enclosed along the raphe, fully differentiated raphe at both the valves.

Voucher No: Deepor Beel -862

Previously reported from Assam: Deepor Beel (Deb & al., 2019); Refinery effluent Drains, Assam (Baruah & al., 2009)

Navicula rhynchocephala Kützing 1844: 152, pl. 30: fig. 35; Hustedt 1930, p. 296, f. 501.

Valves oblong slender, 50.24 µm in length and 12.2 µm broad, with capitate ends slightly dilated, thin and straight raphe; axial area narrow, linear, central and rounded, somewhat rhombic, striae 14-16 in 10 µm; denser towards the ends, radial in the middle and convergent at the ends.

Voucher No: Deepor Beel -865

Previously reported from Assam: Oil effluent Drains, Assam (Baruah & al., 2009)

Family-**Neidiaceae**

Neidium affine var. **amphirhynchus** (Ehrenberg) Cleve 1894: 68; Kützing 1865, p. 95, pl.4, fig. XIII; *Navicula amphirhynchus* Ehrenberg.

(Pl. I, Fig. 7)*

Elliptical, lanceolate with narrowly rostrate apices frustules, thin raphe with slightly widened central area, in length 33-42.3 µm and in breadth 9.6-10.8 µm, barely visible striation in fresh material.

Voucher No: Deepor Beel -860

Family-**Pinnulariaceae**

Pinnularia acrosphaeria var. **tumidula** Krammer 2000: 55, 214, pl. 21: figs 8, 9; Krammer 2000, p. 214, pl. 21, fig 8, 9;

(Pl. I, Fig. 8)*

Valve linear with plane surface; tumid at the middle part, apices are subcapitate; axial area is linear and broad about one-third as wide as the valve; striation distinct, marginal, number of striae in 10 µm are 12; length of the cell is 134.51 µm and breadth 17.46 µm.

Voucher No: Deepor Beel -857

Pinnularia borealis Ehrenberg 1843: 420; pl.4: fig.I.5[1.5]; pl.4: fig.V.4 [5.4]; Kützing 1865,p.96,pl.28, fig.68

(Pl. I, Fig. 9)*

Linear frustules, in valve view rectangular and in girdle view lanceolate, length 30-40 µm and breadth 7-12 µm, towards apices slightly obtuse, marginal chloroplast.

Voucher No: Deepor Beel -856

Pinnularia viridis (Nitzsch) Ehrenberg 1843: 305, 315 (adnot.), 385; Das & Adhikary, 2014. P. 233; pt.18, fig.12

Bacillaria viridis Nitzsch

Frustules rectangular, linear and oblong in valve view, slightly attenuated towards the apex, apices rotundatus, striation transverse, striae 8-12 in 10µm, 29.54µm long and 6.71µm broad.

Voucher No: Deepor Beel -860

Previously reported from Assam: Deepor Beel (Das & Adhikary, 2014)

Family-**Stauroneidaceae**

Aulacoseira islandica (O.Müller) Simonsen 1979: 60; Gonzalves & Gandhi 1952, p. 120, fig. 4; *Melosira islandica* O.Müller.

(Pl. I, Fig. 10)*

Cylindrical frustules, in chains, united, thin valves with parallel margins, neck ring like, clearly punctate wall, length 25-27 µm and breadth 4.5-5 µm.

Voucher No: Deepor Beel -856

Craticula cuspidata (Kützing) D.G.Mann in Round, R.M.Crawford & D.G.Mann 1990: 666; Kützing 1865, p. 94, pl. 3, fig. XXIV; Das and Adhikary, 2014 p. 197, pl. 15, fig. 17. *Frustulia cuspidata* Kützing

Frustules lanceolate, wide at the middle, axial area broad, attenuated towards apices and obtuse end, raphae at the middle, straight, striation barely distinct in fresh material, longer than broad, 121 - 132 µm long and 23 - 25 µm broad.

Voucher No: Deepor Beel -801

Previously reported from Assam: Deepor Beel (Deb & al., 2019); Assam University, Silchar campus (Deb & al., 2013).

Stauroneis pusilla Grunow in Cleve 1883: 475; Rath and Adhikary 2005, p. 82, pl. 12, figs. 217, 173.

(Pl. I, Fig. 11)*

Linear, lanceolate with short protracted rostrate end frustules, raphe straight, at middle, axial area narrow, towards central area gradually widening, slightly transversely short lineate margins at the central area, striae undeveloped or barely distinct, 205-209 µm in length and 45-47 µm in breadth.

Voucher No: Deepor Beel -858

Order-**Rhopalodiales**; Family-**Rhopalodiaceae**

Epithemia gibba (Ehrenberg) Kützing 1844:35, pl. 4, fig. 22; Desikachary 1989, p. 4, pl. 669, fig. 2; Das and Adhikary, 2014 p. 193, pl. 15, fig. 4. *Navicula gibba* Ehrenberg

Frustules linear, slightly gibbous in the middle, end broad and rounded, striation radial in the middle and striae 8 -10 in 10 µm, 46 - 48 µm long and 7.7 -10 µm broad.

Voucher No: Deepor Beel -858

Previously reported from Assam: Samaguri Lake (Borgohain & al., 2012); Kaziranga National park

(Yasmin & al., 2015)

Order-**Thalassiophysales**; Family-**Catenulaceae**

Amphora ovalis (Kützing) Kützing 1844: 107, pl. 5: figs 35, 39; Kützing 1865, p. 107, pl. 5, fig. XXXV and XXXIX; Das and Adhikary, 2014 p. 210, pl. 16, fig. 19. *Frustulia ovalis* Kützing

Frustules in girdle view oval, strongly biconvex dorsal valves, ventral valve margin weakly concave, apex rotundus, truncated, striae transverse at the dorsal valves margin, striae 10 -13 in 10 µm at the centre, 31.5 - 42.5 µm in length and 20.7 - 30.6 µm broad.

Voucher No: Deepor Beel -821

Previously reported from Assam: Deepor Beel (Das and Adhikary, 2014); Samaguri Lake (Borgohain & al., 2012); Kaziranga National park (Yasmin & al., 2015); Assam University, Silchar campus (Deb & al., 2013).

Class-**Coscinodiscophyceae**; Order-**Melosirales**;

Family-**Melosiraceae**

Melosira varians C.Agardh 1827: 628; Huber-Pestalozzii 1942, p. 377, pl. CVIII, fig.447

(Pl. I, Fig. 12)*

Cells cylindrical, forming chain; round in valve view and square to rectangular in girdle view; valve face is slightly convex; frustule loculate; chloroplast numerous, discoidal, golden brown in color; frustule 5-11µm in diameter and 11-18 µm in height.

Voucher No: Deepor Beel -860

Class-**Mediophyceae**; Order-**Toxariales**;

Family-**Ardissoneaceae**

Ardissonea crystallina (C.Agardh) Grunow in Cleve & Grunow 1880: 108; Kützing 1865, p. 69, pl. 16, fig. (I) 2; Das and Adhikary, 2014 p. 186, pl. 14, fig. 15; *Diatoma crystallina* C.Agardh

(Pl. I, Fig. 13)*

Valve slender, long, linear, straight, end rounded, obtuse, apices truncate, striation not clearly visible, longer than broad, 75 – 79 µm long, 12 -13 µm broad.

Voucher No: Deepor Beel -820

Phylum-**Charophyta**; Class-**Zygnematophyceae**; Order-**Desmidiaceae**; Family-**Closteriaceae**

Closterium acerosum Ehrenberg ex Ralfs 1848: 164, pl. XXVII [27]: fig. 2 a, b, d-e; Pal & Santra 1993, p. 148, pl. 1, fig. 2; Das & Adhikary 2014, p. 86, pl. 4, fig. 13.

Cells solitary, green, cylindrical, attenuated towards the end, chloroplast constricted at the middle and divided into 2 parts, an axile series of about 10 pyrenoids; cells 340-380 µm long, 36- 40 µm broad and pole is 6-9 µm broad.

Voucher No: Deepor Beel -963

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013; Das & Adhikary, 2014)

Closterium acutum Brébisson in Ralfs 1848: 177, pl. XXX [30]: figs 5a, 5b, 5d, 5f; pl. XXXV: fig. 5; Ralfs 1848, p. 177, pl. 30, fig. 5 (a,b,d,f).

Semi straight cells, slightly curved at poles, cell wall smooth; dorsal margin convex and nearly straight; chloroplast with 6-8 pyrenoids in a central series, cells 72-83 µm long, 3.75-4.5 µm broad.

Voucher No: Deepor Beel -964

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Closterium decorum Brébisson 1856: 151, pl. 2: fig. 39; West & West 1904, p. 184, pl. 17, fig. 7, 8.

Cells small to medium sized, solitary, central part cylindrical and slightly bent; cell wall smooth; chloroplast ridged with an axile row of 10-14 pyrenoids, cells 130-150 µm long, 3-8 µm broad.

Voucher No: Deepor Beel -964

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Closterium diana Ehrenberg ex Ralfs 1848: 168, figs 5a, 5c; pl. XXVIII [28]; Ralfs 1848, p. 168, pl. 28, fig. 5 (a, c).

Cells lunate, much longer than broad, accentuated curvature, concave ventral margin; apices smooth, hyaline; yellowish to brownish cell wall; chloroplast with about 4 ridges and 3-4 pyrenoids, cells 147-170 µm long, 12-14 µm broad.

Voucher No: Deepor Beel -968

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Closterium Kützingii Bréb. 1856: 186, figs 6-11; Pl. XXV; Iyengar & Vimala Bai 1941, p. 77, fig. 16; John & al., 2005, p. 523, pl. 130, fig. N.

Cells are 300-550 µm in length, spindle shaped middle region. Ends are attenuating to each extremity to long narrow, incurved, rounded and sometimes slightly swollen, apices are 2.5-3.5 µm wide. End pores are distinct, chloroplasts are present only in the middle region; walls are colourless; vacuoles are sub terminal and they are adjacent to the distal ends of chloroplasts.

Voucher No: Deepor Beel -823

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015)

Closterium leibleinii Kützing ex Ralfs 1848: 167, pl. XXVIII [28]: fig. 4 c-h, k-l; West & West 1904, p. 141, pl. XVI, fig. 9-14.

Cells medium sized, longer than broad, cells strongly curved; smooth cell wall; slightly attenuated towards obtuse apices; chloroplasts with about 6 ridges and 5-6

pyrenoids; cells 115-130 µm 19-24 µm broad.

Voucher No: Deepor Beel -970

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Closterium parvulum Nägeli 1849: 106, pl. VI(c): fig. 2; Kant & Gupta 1998, p. 251, pl. 57, fig. 8; Das & Adhikary 2014, p. 88, pl. 4, fig. 21.

Cells yellowish green, solitary, middle wide and tapering towards the ends; chloroplast with 5-6 ridges, one and axile, pyrenoid not seen, cells 370-380 µm long and 50-80 µm broad.

Voucher No: Deepor Beel -973

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013; Das & Adhikary, 2014)

Family-Desmidiaceae

Cosmarium formosulum Hoff in Nordstedt 1888: 194; John & al., 2005, p. 547, pl. 135, fig. D.

Cells abruptly rounded at basal angle, inflated slightly; sinus deep, widened internally; semicells trapezoid to semicircular; chloroplasts axile, with two pyrenoids, cell 35-50 µm long, 32-40 µm broad.

Voucher No: Deepor Beel -973

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium granatum Brébisson ex Ralfs 1848: 96; pl. XXXII, fig. 6; Prasad & Misra 1992, p. 160, pl. 21, fig. 20; Das & Adhikary 2014, p. 99, pl. 6, fig. 12.

Cells small, slightly longer than broad, sub rhomboid to elliptic, deeply constricted, sinus linear with dilated extremity, semicells truncate, pyramidal, basal angles rounded, sides straight or slightly convex, chloroplast axile with one pyrenoid, 25-35 µm long, 19-25 µm broad, isthmus 6-7 µm broad.

Voucher No: Deepor Beel -971

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium hammeri Reinsch 1866: 115, pl. XXII [22] B 1: figs 1-10; Reinsch 1866, p. 115, pl. 22, fig. 1-10.

Cells medium sized, longer than broad, median constriction deep, linear sinus, deep, cells trapeziform in face view; chloroplasts axile, with one pyrenoid; cells 30-35 µm long, 25-29 µm broad.

Voucher No: Deepor Beel -981

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium miscellum Skuja 1964: 222, pl. XXXIX [39]: fig. 11; Misra & Srivastava 2003, p. 87, pl. 2, fig. 3; Das & Adhikary 2014, p. 153, pl. 6, fig. 22.

(Pl. I, Fig. 14)*

Semi cells compressed semicircular with 23-26 marginal crenulations, cell wall with granules on periphery and a central tumour with vertical series of granules, cell length 75-78 µm and breadth 58-61 µm.

Voucher No: Deepor Beel -823

Cosmarium moniliforme var. **sikkimicum** J.P.Keshri & D.Das in D.Das & J.P.Keshri 2016: 112, pl. V [5]: fig. 147; Das & Keshri, 2016, p. 112, pl. 5, fig. 147.

(Pl. I, Fig. 15)*

Cell large, 1.3- 1.6 times longer than broad; median constriction shallow, sinus widely open, semi cells circular, apex broadly rounded; cell wall finely punctate, chloroplast axile with some small radiating lobes, one in each semi cell; cells 60-65 µm long, 37-40 µm broad, isthmus 30-35 µm.

Voucher No: Deepor Beel -860

Cosmarium obsoletum (Hantzsch) Reinsch 1867: 142; Reinsch 1867, p. 142, pl. 22, fig. 1-4. *Arthrodesmus obsoletus* Hantzsch

Cell walls minutely granulated, median diameter at base of semi cell 55 µm, isthmus 21-29 µm, cell apex 11-14.5 µm; chloroplasts axile, with two pyrenoids; cells 44 µm in length, 35 µm breadth.

Voucher No: Deepor Beel -973

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium quadrum P. Lundell 1871: 25, pl. II [2]: fig. 11; W. & G.S. West 1912, p. 20, pl. 100, fig. 3; Das & Adhikary 2014, p. 104, pl. 6, fig. 29.

Cells as long as broad, yellowish green to deep green, constricted, narrow and linear sinus, semi cells quadrate, flattened, slightly depressed at the middle; Chloroplast axile with two pyrenoids; cells 46-50 µm long and 43-47 µm broad, isthmus 14-15 µm broad.

Voucher No: Deepor Beel -977

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium quadrum var. **minus** Nordstedt 1873: 11; Nordstedt 1873, p. 1-51, pl. 1, fig. 24.

(Pl. I, Fig. 17)*

Small, very slightly longer than broad cells, deep median constriction, narrowly linear sinus with a slightly dilated extremity, sub rectangular semicells, rounded lower angles, broadly rounded upper angles, slightly convex lateral margins, very slightly retuse apex, densely granulated cell wall, arranged in decussating series, at the margins of the semicells 23 granules are shown, in the middle of the apex the size is slightly reduced, axile chloroplasts with pyrenoids 2 in each semicell, cells length 39-41 µm, breadth 38-39 µm and isthmus 12-17 µm.

Voucher No: Deepor Beel -869

Cosmarium sexnotatum Gutwinski 1893: 123, pl. II [2]: fig. 7; Prasad & Misra 1992, p. 182, pl. 24, fig. 16.

Cells small, slightly longer than broad; constriction deep, narrow linear sinus with slightly dilated apex; chloroplast axile with a central pyrenoid in each semi cell; cells 19-24 µm long, 16-20 µm broad.

Voucher No: Deepor Beel -977

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium subcrenatum Hantzsch in Rabenhorst 1868: 164; West & West 1908, p. 274, pl. 65, 95, fig. I.

(Pl. I, Fig. 16)*

Small cells, slightly broader than long, cell length 26-30 µm and breadth 28-34 µm; deep median constriction; narrow and closed sinus; semicircular with truncate apex semi cells; convex lateral margins that are converging to the apex; narrowly rounded basal angles, chloroplasts single in each semi cells with a central pyrenoid; Isthmus 10-11 µm.

Voucher No: Deepor Beel -823

Cosmarium subprotumidum Nordstedt in Nordstedt & Wittrock 1876: 38; Nordstedt & Wittrock 1876, p. 38, pl. 12, fig. 14.

Median diameter at base of semicell 23 µm, width of isthmus 6 µm, apex of cell 11 µm cell without spine or other markings; chloroplast axile with one pyrenoid, cells 30 µm in length.

Voucher No: Deepor Beel -980

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Cosmarium undulatum var. **minutum** Wittrock 1869: 11, pl. I [1]: fig. 3; Wittrock 1869, p. 11, pl. 1, fig. 3.

(Pl. I, Fig. 18)*

Small, 1.2 times longer than broad cells, deep median constriction, closed linear sinus, sub semi-circular semicells with convex lateral margins, flat apex and rounded apical angles, faint undulations at entire margins including apex, each semicells have 9 undulations, smooth cell wall, axile and single chloroplasts, median pyrenoids in each semicells, cells length 16-36 µm, breadth 13-29 µm and isthmus 5-22 µm.

Voucher No: Deepor Beel -860

Desmidium bengalicum W.B.Turner 1893: 147, pl. XIX [19]: figs 1-3; Baruah, Baruah and Thakuria, 201, p.40, pl. I, f. 53

Cells closely united into straight filaments, embedded in thick gelatinous sheath, cells 14.5-18 µm long, 29-33 µm broad.

Voucher No: Deepor Beel -982

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Docidium pleurotaenioides A.M.Scott & Croasdale in Prescott & al. 1975: 103; Baruah, Baruah and Thakuria, 201, p.40, pl. I, f. 54

Cells large, straight, about 12 times longer than broad, apex truncate, cells 380-400 µm long, 29-34 µm broad.

Voucher No: Deepor Beel - 983

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Euastrum coralloides Joshua 1886: 639, pl. 23: fig. 10; Baruah, Baruah and Thakuria, 201, p.40, pl. I, f. 40

Semi-cells 3-lobed, polar lobe short and broad with deep median incision, lateral lobes bilobulate. cells 33.5-39 µm long, 25-27 µm broad

Voucher No: Deepor Beel -961

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Micrasterias foliacea Bailey ex Ralfs 1848: 210, pl. XXXV [35]: fig. 3; Baruah, Baruah and Thakuria, 201, p.40, pl. I, f. 41

Cells rather small, united in the filaments, by interlocking of polar lobes, rectangular in outline, deeply constricted, sinus narrowly linear, semi-cells 5-lobed, polar lobe exerted, basal part of polar lobes with sub-parallel sides, upper part greatly expanded and anvil shaped with an excavation in the median portion, cell wall smooth. Long. cell 53.5-59 µm, lat. cell 6673.5 µm.

Voucher No: Deepor Beel -979

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Micrasterias zeylanica F.E.Fritsch 1907: 246, fig. 4 C; Baruah, Baruah and Thakuria, 201, p.40, pl. I, f. 42

Cell rather small, almost as long as broad, deeply constricted, sinus narrowly linear and slightly open outwards, semicells scarcely 5-lobed, incisions between the lateral and polar lobes, deep and slightly open, incisions between the lateral lobes rather shallow, polar and lateral angles somewhat acuminate, each furnished with a small, inclined and subacute spine, cell wall smooth. Long. cell 51 µm, lat. cell 53.5 µm.

Voucher No: Deepor Beel -963

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Onychonema uncinatum Wallich 1860: 195, pl. VIII [8]: figs 7-11; Turner 1892, p. 138, pl. XVII, fig. 14; Das & Adhikary 2014, p. 155, pl. 7, fig. 20.

(Pl. I, Fig. 19)*

Rectangular cells, interlinked and form chains, cylindrical

cellular extensions called cornua joined cells, obliquely situated to each other, at the outer thirds of the lateral surfaces, between cornua a row of minute teeth present, cells length 18-20 µm, breadth 26-38 µm and isthmus breadth 5.5-8 µm.

Voucher No: Deepor Beel -03

Staurostrum crenulatum (Nägeli) Delponte 1877: 68 [reprint p. 164], pl. 12: figs 1-11; Coesel & Meesters 2013, p. 357, pl. 120, fig. 5. *Phycastrum crenulatum* Nägeli (Pl. I, Fig. 20)*

Three radiate cells, constriction small with shallow and moderately acute sinus, internally rounded; broad cup shaped semicells, angles form short subhorizontal or slightly divergent processes which have truncate ends with 4 short terminal spines; slightly convex apex with intramarginal verrucae of 2 pairs which extends upto upper surfaces of processes; side view is denticulate. Cell length 25-27 µm; median diameter with spines 35-37.5 µm in length, median diameter without spines 28-31 µm, isthmus 8-10 µm.

Voucher No: Deepor Beel -814

Staurostrum egregium West & G.S. West 1897: 177, pl. 369: fig. 12; Perumal & Anand 2009, p. 79, pl. 15, fig. 20; Prasad & Misra 1992, p. 195, pl. 25, fig. 6, 10.

(Pl. I, Fig. 21)*

Dumple shaped cells; in size slightly longer than broader, sinus open and isthmus broad; 4 rings of short, stout and emarginate spines of almost equal size ornamented each semi cell; triangular with sides concave and angles rounded in top view; cells length with spines 31.5 µm and without spines 27.5 µm; with spines lateral cells 22.5 µm and without spines 22 µm, lateral isthmus 8.5 µm.

Voucher No: Deepor Beel -291

Staurostrum gracile Ralfs ex Ralfs 1848: 136, pl. XXII [22]: fig. 12 a-d; John & al., 2005, p. 569, pl. 139, fig. N.

3-radiate cells; constriction moderate with a shallow, sinus open and U-shaped; isthmus width 8-10 µm; broadly basin to cup-shaped semi cells; convex apex and produced angles to moderately long, hollow, tapering and convergent processes with 4 spines; processes furnished with concentric rings which are small granules; 3-evenly spaced pairs of intramarginal granules at the apex; above isthmus granules encircle the body; cells width without processes 23-27 µm and with processes 45-60 µm, length 30-36 µm.

Voucher No: Deepor Beel -291

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015); Raja Pukhuri Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Staurostrum manipurens Brühl & Biswas 1926: 307, pl. 18: figs 132-136; Bruhl & Biswas 1926, p. 307, pl. XII, fig. 132-134 (a, b).

(Pl. I, Fig. 22)*

Broader than longer cells, sub semi-elliptical semicells, widely open sinus, acute internal angle, semicells margin has spines, semicells length 21-29 µm, breadth 30-35 µm and isthmus breadth 6-8 µm.

Voucher No. Deepor Beel -859

Staurostrum orbiculare Meneghini ex Ralfs 1848: 125, pl. XXI [21]: fig. 5; Das & Keshri 2016, p. 168, pl. VIII, fig. 253-254.

Medium sized cells; length very slightly broader than breadth; deep constriction, at the apex sinus slightly dilated, linear and closed; rounded basal angles; punctate cell wall; cell triangular in vertical view, between broadly rounded lobes the margins are concave; cells length 16-17 µm, breadth 17-18 µm and isthmus 6-7 µm

Voucher No: Deepor Beel -293

Previously reported from Assam: Raja Pukhuri Kamrup District (Kakati, 2011).

Staurostrum tetracerum Ralfs ex Ralfs 1848: 137; Ralfs 1848, p. 137, pl. 23, fig. 7 a-f.

Cells small; semi cells triangular to shallow and cup-shaped, length without processes 9 µm, with processes median diameter 18-19 µm, width without processes 8 µm; isthmus 3.8 µm.

Voucher No: Deepor Beel -975

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Staurodesmus bulnheimii (Raciborski) Round & A.J. Brook 1959: 184; John & al., 2005, p. 578, pl. 145, fig. C. *Arthrodesmus bulnheimii* Raciborski

(Pl. I, Fig. 23)*

Biradiated cells; narrow, linear sinus and constriction deep; isthmus width 7.5-10 µm; transversely rectangular semi cells with sides and apex slightly convex; rounded angles and long, stout, divergent spines at apical cells; cells width without spines 30-40 µm and length 32-42 µm, spines length 18-27 µm.

Voucher No: Deepor Beel -223

Staurodesmus patens (Nordstedt) Croasdale 1957: 134, pl. 2: figs 32-34; Das & Keshri 2016, p. 164, pl. 7, fig. 236-238. *Staurostrum dejectum* var. *patens* Nordstedt

(Pl. I, Fig. 24)*

Cell medium sized; median constriction deep, sinus open, semi cells bowl shaped and triangular, angle end up with diverging short spine, lateral and apical margins are convex and straight respectively; cell wall smooth, chloroplast one in each semi cell; cell size 23-27 µm in

diameter and 21-25 µm long, isthmus 5-8 µm.

Voucher No: Deepor Beel -856

Staurodesmus validus (West & G.S.West) Thomasson 1960: 35; Lind & Brook 1980, p. 72, fig. 111; *Staurostrum incus* var. *validus* West & G.S West.

(Pl. I, Fig. 25)*

Biradiated cells with acute sinus widening outside; cup-shaped semi cells, apex flat, stout divergent spines at the angles; cells length 23-40 µm and breadth 21-36 µm.

Voucher No: Deepor Beel -291

Order-**Zygnematales**; Family-**Zygnemataceae**

Spirogyra neglecta var. **fuellerbornei** (Schmidle) Petlovany 2015: 52; Randhawa 1959, p. 316, fig. 291; Das & Adhikary, 2014 p. 148, pl. 4 & fig. 4; *Spirogyra fuellerbornei* Schmidle.

(Pl. I, Fig. 26)*

Long cylindrical cells having; cells 162-243 µm in length and 32-38 µm in breadth, chloroplast 3 in number, turns present 3-4.

Voucher No: Deepor Beel -805

Spirogyra oblata C.-C.Jao 1936: 58, figs 29-31; Randhawa 1959, p. 347, fig. 353; Das & Adhikary 2014, p. 149, pl. 4, fig. 9;

(Pl. I, Fig. 27)*

Cylindrical vegetative cells, length 140-170 µm and breadth 60-70 µm, plane end walls, eight chloroplasts, making 0.5 to 1 turn.

Voucher No: Deepor Beel -29

Phylum-**Chlorophyta**; Class-**Chlorophyceae**;

Order-**Chlamydomonadales**;

Family-**Chlamydomonadaceae**

Carteria pseudoglobosa Ettl 1979: 21; John & al., 2005, p. 305, pl. 80, fig. G;

(Pl. I, Fig. 28)*

Spherical or weakly ellipsoidal cells, papilla absent; cup-shaped chloroplasts, basally thickened with large pyrenoid; eyespot present at anterior and small; cells diameter 14-28 µm.

Voucher No: Deepor Beel -132

Chlamydomonas ehrenbergii Gorozhankin

[Goroschankin] 1891: 34, fig. 3; John & al., 2005, p. 308, pl. 77, fig. D;

(Pl. I, Fig. 29)*

Pear shaped cells, rounded basally and attenuated apically; papilla absent, sometimes protoplast detached from cell wall; cup-shaped chloroplast, thickened irregularly with a basal pyrenoid; median or anterior eyespot; cell width 10-22 µm and length 14-26 µm.

Voucher No: Deepor Beel -133

Chlamydomonas lundii H.Ettl & O.Ettl 1959: 104; John & al., 2005, p. 308, pl. 77, fig. N;

(Pl. I, Fig. 30)*

Ellipsoidal cells, somewhat asymmetrical but rounded basally and apically; papilla absent; parietal chloroplasts, in lateral view either an H-form or sub stellate form; central pyrenoid present; without an eyespot; cells width 5-9 µm and length 11-15 µm.

Voucher No: Deepor Beel - 133

Chlamydomonas reinhardtii P.A.Dangeard 1888: 130, fig. 12; John & al., 2005, p. 311, pl. 77, fig. F;

(Pl. I, Fig. 31)*

Spherical or sub spherical cells, rounded basally, without papilla; cup-shaped chloroplasts, basally thickened and containing a large basal pyrenoid; median or anterior eyespot; cells width 8-22 µm and length 10-22 µm.

Voucher No: Deepor Beel - 540

Family-**Goniaceae**

Gonium pectorale O.F.Müller 1773: 60; John Whitton & Brook 2005, p. 318, pl. 80, fig. Q;

(Pl. I, Fig. 32)*

Slightly curved plate coenobium; 16-celled usually, at periphery 12 with radially directed flagella and rest remaining at the centre, weakly pear shaped or spherical cells; cup-shaped chloroplasts with pyrenoid at basal end and eyespot at anterior; coenobium width 70-100 µm and cells width 18 µm and length 15-20 µm.

Voucher No: Deepor Beel - 133

Family-**Palmellopsidaceae**

Asterococcus superbus (Cienkowski) Scherffel 1908: 762, figs 1-3; John & al., 2005, p. 299, pl. 76, fig. B; *Pleurococcus superbus* Cienkowski

(Pl. II, Fig. 1)*

Solitary cells or in small colonies of 2-4 cells; broad lamellate and mucilaginous envelope, several times the diameter of protoplast; with eyespot; cells diameter 30-43 µm.

Voucher No: Deepor Beel - 171

Sphaerello cystis ampla (Kützing) Nováková 1964: 162, 3, fig. III; Yamagishi, 2010 p. 113, pl. L & fig. 2; *Gloeocapsa ampla* Kützing

(Pl. II, Fig. 2)*

Colonies composed of 8 cells, bounded by a thick colonial envelope but with or without distinct individual cell envelope; cells ellipsoid to ovoid; cells 5 – 10 µm in diameter and 7-11 µm long.

Voucher No: Deepor Beel -859

Family-**Phacotaceae**

Dysmorphococcus coccifer Korshikov 1938: 139, fig. 135; John Whitton & Brook 2005, p. 317, pl. 80, fig. A;

(Pl. II, Fig. 3)*

Flattened cell envelope and ovoid in lateral view; finely

punctate often; deep brown to black in colour; spherical protoplast; cup-shaped, dense chloroplasts, small and numerous pyrenoids present, with lateral eyespot; numerous contractile and scattered vacuoles, cell diameter about 22 µm.

Voucher No: Deepor Beel – 569

Family-Sphaerocystidaceae

Sphaerocystis schroeteri Chodat 1897: 119; John & al., 2005, p. 352, pl. 86, fig. H.

Colonies spherical with groups of 4-8 to 16-32 cells, a mucilaginous envelope present; colonies 41-45 µm in diameter, cells 7-15 µm in width.

Voucher No: Deepor Beel - 953

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Family-Volvocaceae

Pandorina morum (O.F.Müller) Bory 1826: 22; Yamagishi 2010, p. 111, pl. 49, fig. 2. *Volvocis morum* O.F.Müller

Ellipsoidal to spherical colonies; diameter up to 60 µm, cells 16 or 8; by mutual compression in closely packed colony cells ovoid to angular, in face view diameter 20 µm.

Voucher No: Deepor Beel -238

Previously reported from Assam: Pond of Digboi oil field (Bordoloi & Baruah, 2015).

Order-Sphaeropleales; Family-Bracteacoccaceae

Bracteacoccus anomalus (E.J.James) R.C.Starr 1955: 65; John Whitton & Brook 2005, p. 333, pl. 82, fig. C; *Pleurochloris anomala* E.J.James

(Pl. II, Fig. 4)*

Yellow-green or pale green cells, thin walled; chloroplasts in pairs, curved and plate-shaped, single; eyespot lateral and streak-like; cells width 7.5- 16 µm.

Voucher No: Deepor Beel - 521

Family-Dictyochloridaceae

Dictyochloris fragrans Vischer 1945: 42, figs 1, [2]; John Whitton & Brook 2005, p. 348, pl. 82, fig. K;

(Pl. II, Fig. 5)*

Spherical cells, one side protruding sometimes; in older cells net-like chloroplasts; starch present; eyespot present at opposite pole to the flagella, cells width 5-75 µm.

Voucher No: Deepor Beel – 541

Family-Hydrodictyaceae

Monactinus asymmetricus (Yamagishi & E.Hegewald) E.Hegewald 2005: 1051; Yamagishi 2010, p. 154, pl. 62, fig. 1; *Pediastrum asymmetricum* T.Yamagishi & E.Hegewald

(Pl. II, Fig. 6)*

Perforations present at colonies; asymmetric marginal

cells, with long process pointed outward and slightly bent; basal and median parts contacting the marginal cells, perforation present between each other; quadrate to polygonal inner cells, with perforation; marginal cells breadth 5-11 µm and length 15-21 µm; inner cells breadth 4-8 µm and length 8-14 µm.

Voucher No: Deepor Beel - 694

Monactinus simplex (Meyen) Corda 1839: 239; Prescott 1961, p. 227, pl. 50, fig. 2; Das & Adhikary 2014, p. 157, pl. 8, fig. 14. *Pediastrum simplex* Meyen

Coenobia 4 celled; outer free wall of the cells extended to form a single tapering, horn like process with concave margin, cell length 10.4 -11 µm with projections, and breadth 5-6 µm.

Voucher No: Deepor Beel - 711

Previously reported from Assam: Kacho Pukhuri and Jor Pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Monactinus simplex var. **echinulatum** (Wittrock) Pérez, Maidana & Comas 2009: 22, fig. 7a; Krienitz & al. 1998, p. 66, fig. 6 a; Das & Adhikary 2014, p. 157, pl. 8, fig. 15. *Pediastrum simplex* var. *echinulatum* Wittrock

4 celled coenobia, cells arranged in a plate, one elongated outward pointing process at outer cells, polygonal inner cells, cells length 15.4-16.5 µm and breadth 8.4-8.8 µm.

Voucher No: Deepor Beel - 741

Previously reported from Assam: Sobhagya Kunda and Kacho Pukhuri, Kamrup District (Kakati, 2011).

Stauridium tetras (Ehrenberg) E.Hegewald in Buchheim & al. 2005: 1051; Komarek & Jankovska 2001, p. 68, fig. 43; Das & Adhikary 2014, p. 116, pl. 8, fig. 17. *Micrasterias tetras* Ehrenberg

8 celled coenobia, colonies 24-26.5 µm diameter, cells 7-9 µm long, cells without intercellular spaces, marginal cells divided into 2 lobes with a deep single linear incision, inner cell 4-6 sided with a single linear incision, lateral cell 8-9 µm.

Voucher No: Deepor Beel - 947

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Stauridium tetras var. **tetraodon** (Corda) J.D.Hall & Karol 2016: 153; Prasad & Misra 1992, p. 12, pl. 1, fig. 10; *Euastrum tetraodon* Corda (Pl. II, Fig. 7)*

Circular to slightly rectangular colonies; cells 8-16, more or less straight; deep incision at outer margins of peripheral cells, projection pronounced; smooth cell wall; cells diameter 32-34 µm (8-celled) and 52-55 µm (16-celled); cell length 10-13.5 µm and 9-11 µm lateral cell.

Voucher No: Deepor Beel – 718

Tetraëdron bifurcatum (Wille) Lagerheim 1893: 160;

Hu & Wei 2006, p. 1-1023, fig. 16. *Polyedrium tetraëdricum* var. *bifurcatum* Wille

Cells tetragonal, pyramidal, sides slightly concave, with ends rounded or truncate, angles bifurcate with sharp and faintly curved spines, cell wall smooth. Cell with spines 42-51 µm, Cell without spines 38-45.5 µm.

Voucher No: Deepor Beel - 948

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Family-Radiococcaceae

Sporotetrax polydermatica (Kützing) Kostikov, Darienko, Lukesová & L.Hoffmann 2002: 48; Desikachary 1959, p. 114, pl. 25, f. 1 *Gloeocapsa polydermatica* Kützing Mucilaginous, compact thallus; spherical cells; sheath less diameter 3-4.5 µm; blue-green in colour; thick as protoplast and colourless sheath; distinct and lamellated many times.

Voucher No: Deepor Beel -120

Previously reported from Assam: Sobhagya Kunda,

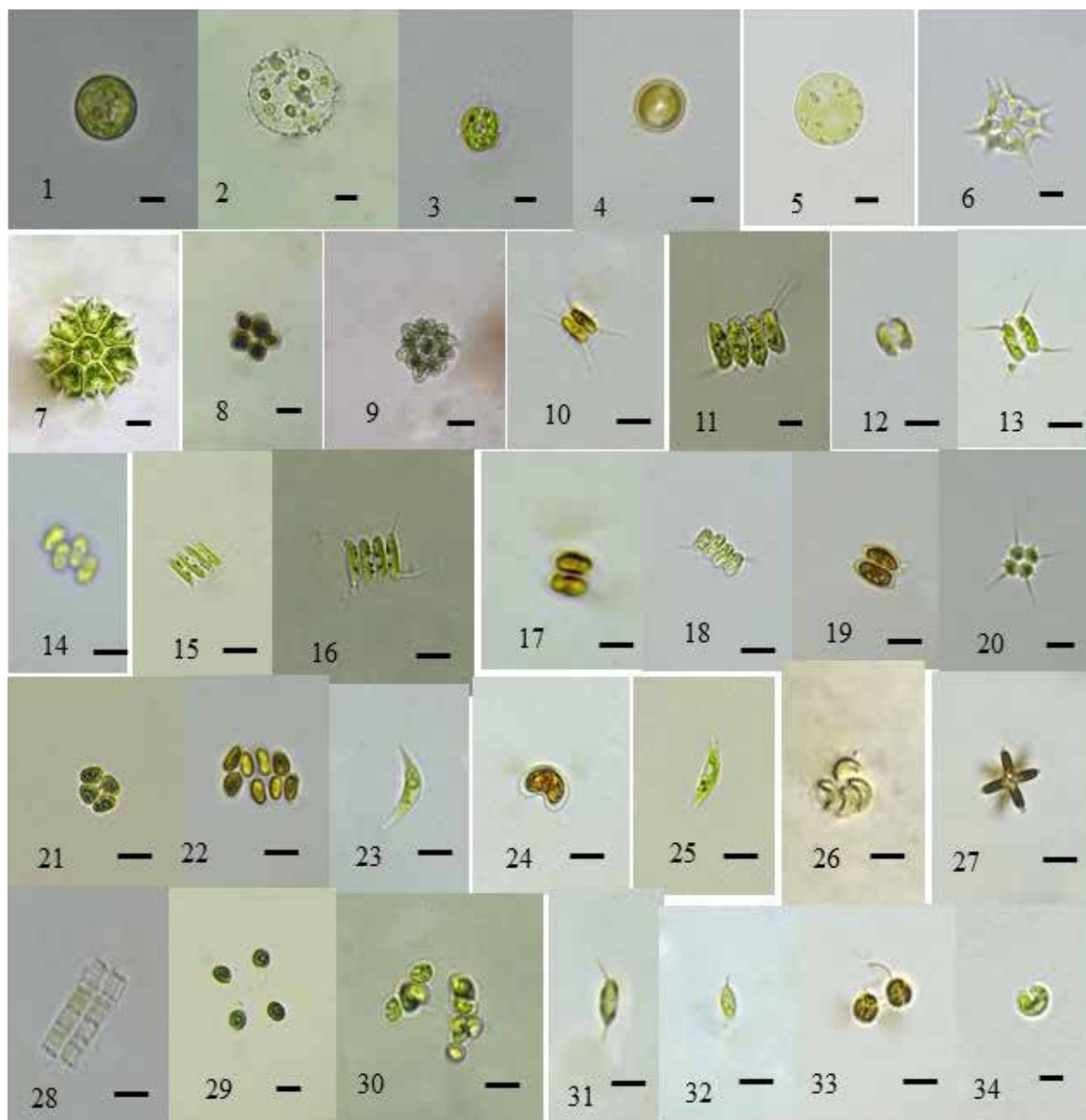


Plate-II: Fig. (1-34): 1. *Asterococcus superbus* 2. *Sphaerello cystis ampla* 3. *Dysmorphococcus coccifer* 4. *Bracteacoccus anomalus* 5. *Dictyochloris fragrans* 6. *Monactinus asymmetricus* 7. *Stauridium tetras* var. *tetraodon* 8. *Coelastrum astroideum* 9. *Coelastrum sphaericum* 10. *Desmodesmus abundans* 11. *Desmodesmus armatus* 12. *Desmodesmus bicellularis* 13. *Desmodesmus flavescens* 14. *Desmodesmus intermedius* 15. *Desmodesmus opoliensis* var. *mononensis* 16. *Desmodesmus protuberans* 17. *Pseudodidymocystis fina* 18. *Scenedesmus quadricauda* var. *bicaudatus* 19. *Scenedesmus similagineus* 20. *Tetrastrum heteracanthum* 21. *Tetrastrum staurogeniiforme* 22. *Verrucodesmus verrucosus* 23. *Chlorolobion braunii* 24. *Monoraphidium minutum* 25. *Monoraphidium pusillum* 26. *Raphidocelis roselata* 27. *Actinastrum gracillimum* 28. *Catena viridis* 29. *Chlorella chlorellioides* 30. *Hindakia tetrachotoma* 31. *Keratococcus bicaudatus* 32. *Keratococcus dispar* 33. *Muriella terrestris* 34. *Nephrochlamys rotunda* (Scale bar = 10 µm)

Kamrup District (Kakati, 2016).

Family-**Scenedesmaceae**

Acutodesmus acutiformis (Schröder) Tsarenko & D.M.John 2011: 421, pl. 104: fig. C; John Whitton & Brook 2005, p. 394, pl. 96, fig. C. *Scenedesmus acutiformis* Schröder

Colonies flat, coenobia 2-4 or 8 celled, linearly or slightly alternately arranged; cells broadly spindle-shaped to narrowly ellipsoidal with an ellipsoidal side cell 15-17 µm long, 4-5 µm broad.

Voucher No: Deepor Beel – 946

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Coelastrum astroideum De Notaris 1867: 80, pl. IX [9]: fig. 93; De Notaris 1867, p. 80, pl. IX, fig. 93;

(Pl. II, Fig. 8)*

Colonial, 8-16 celled coenobium, 35-45 µm in diameter; spherical colony with very minute gelatinous processes leaving smaller intercellular spaces; cells oval smooth cell wall; cup shaped chloroplasts with pyrenoids, cells 10-15 in diameter.

Voucher No: Deepor Beel - 815

Coelastrum microporum Nägeli in A.Braun 1855: 70, adnot.; Philipose 1967, p. 228, fig. 135 a, b; Das & Adhikary 2014, p. 123, pl. 9, fig. 13.

Colonies more or less spherical, cells with small intercellular spaces, cells enclosed by delicate gelatinous sheath and interconnected by almost imperceptible gelatinous processes, diameter of cells 5-10 µm and of the colonies 12-16 µm.

Voucher No: Deepor Beel - 966

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013); Deepor Beel (Das & Adhikary, 2014)

Coelastrum proboscideum Bohlin in Wittrock, Nordstedt & Lagerheim 1896: no. 1240; Yamagishi 2010 p. 145, pl. 52, fig. 12.

Colonies pyramidal or cubical 16-32 celled; cells truncate cone-shaped or tetrahedral; cell connected to one another by the projected truncate corners; diameter of colonies 24µm, cell 6-10.5 µm.

Voucher No: Deepor Beel - 961

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Coelastrum sphaericum Nägeli 1849: 98, pl. V [5]:C: fig. 1; Komarek & Fott, 1983, p. 730, pl. 203, fig. 3; Das & Adhikary 2014, p. 159, pl. 9, fig. 19;

(Pl. II, Fig. 9)*

Ovoid coenobium, with a diameter of 25-29 µm; composed of conical cells, outwards directed narrow end,

adjoined without processes along the lower lateral walls, forming interstices that are equal to or greater than the diameter of the cells, cell 7.5 µm long and 5.8 µm broad.

Voucher No: Deepor Beel - 815

Desmodesmus abundans (Kirchner) E.H.Hegewald 2000: 1; Philipose 1967, p. 278, fig. 184 a-d; Das & Adhikary 2014, p. 159, pl. 9, fig. 27; *Scenedesmus caudatus* f. *abundans* Kirchner

(Pl. II, Fig. 10)*

2 celled coenobia, oblong-ovoid cells, on the outer face of the cells one median lateral spine present, cells length 7.5-8.5 µm and breadth 2.5-3 µm.

Voucher No: Deepor Beel - 934

Desmodesmus armatus (Chodat) E.H.Hegewald 2000: 2; John Whitton & Brook 2005, p. 389, pl. 94, fig. I; *Scenedesmus hystrix* var. *armatus* Chodat

(Pl. II, Fig. 11)*

Linearly to slightly alternately arranged cells, coenobia of 2-8 celled, cells width 3-9.5 µm, length 7-17 µm, cells long cylindrical or ovoid cylindrical, apices narrowing to rounded, small teeth found only in inner cells frequently, continuous or interrupted longitudinal ridges.

Voucher No: Deepor Beel - 861

Desmodesmus armatus var. **bicaudatus** (Guglielmetti) E.H.Hegewald 2000: 4; Philipose 1967, p. 262, fig. 171; Das & Adhikary 2014, p. 159, pl. 9, fig. 36. *Scenedesmus acutiformis* var. *bicaudatus* Guglielmetti

4 celled colonies, a long spine present from one of the poles of the terminal cell only, the spines alternating with each other of the two terminal cells, cells length 11.2-12.7 µm and breadth 2-3.6 µm.

Voucher No: Deepor Beel - 702

Previously reported from Assam: Kacho Pukhuri and Raja Pukhuri, Kamrup District (Kakati, 2011).

Desmodesmus bicellularis (Chodat) S.S.An, T.Friedl & E.Hegewald 1999: 427; Yamagishi 2010, p. 147, pl. 55, fig. 6; *Scenedesmus bicellularis* Chodat

(Pl. II, Fig. 12)*

Broad ellipsoidal cells with rounded ends and outer side slightly swelled; smooth cell wall; cells breadth 2-5 µm and length 5-10 µm.

Voucher No: Deepor Beel - 677

Desmodesmus flavescens (Chodat) E.Hegewald 2000:10; John Whitton & Brook 2005, p. 393, pl. 94, fig. I; *Scenedesmus flavescens* Chodat

(Pl. II, Fig. 13)*

2 or 4 or 8 celled coenobia, cells arranged in linear series; cylindrical to ovoid cells; with parallel marginal cells narrowing to slightly curved apices bearing straight

or slightly curved spines, equal to cell length; on outer side of each marginal cells 2 equatorial spines, shorter; straight inner cells, rounded apices bearing 1-2 spines; cells width 2-7 µm and length 5-13 µm.

Voucher No: Deepor Beel - 321

Desmodesmus intermedius (Chodat) E.Hegewald 2000:11; John Whitton & Brook 2005, p. 395, pl. 95, fig. G; *Scenedesmus intermedius* Chodat

(Pl. II, Fig. 14)*

Coenobium composed of 2-4-8 celled; alternately arranged; cells ovoid, rounded apices and the from outermost edge of marginal cell apices or only on one apex (then diagonally symmetrical) the main spines projects; discontinuous rows of warts; cells width 2-5.5 µm and length 3.5-10 µm.

Voucher No: Deepor Beel - 330

Desmodesmus opoliensis

var. **carinatus** (Lemmermann) E.Hegewald 2000: 15; Chodat 1913, p. 1-266, pl. 9, fig. 201. *Scenedesmus opoliensis* var. *carinatus* Lemmermann

Cells fusiform with beaked ends, arranged in linear series, cells with a distinct longitudinal ridges on each side; cells breadth 3-8µm and length 8-28 µm.

Voucher No: Deepor Beel - 955

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Desmodesmus opoliensis var. **mononensis** (Chodat) E.Hegewald 2000: 15; Hegewald et al., 1990, p. 25, pl. 48-51, fig. 1; *Scenedesmus opoliensis* var. *mononensis* Chodat

(Pl. II, Fig. 15)*

4 celled coenobia, fusiform cells with sub arcuate apices, straight intermediate cells with sides slightly convex, concave terminal cells with two long spines at the ends, cell 11.8-12.4 µm in length and 2.6-3 µm in breadth.

Voucher No: Deepor Beel -856

Desmodesmus perforatus (Lemmermann) E.Hegewald 2000: 15; Das & Adhikary 2014, p. 133, pl. 10, fig. 3. *Scenedesmus perforatus* Lemmermann

Coenobia 4 celled, cells elliptical to cylindrical, slits present between two consecutive cells, spines present at both the ends of the terminal cells, cell 10-20 µm long and 3-19 µm broad.

Voucher No: Deepor Beel -962

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Desmodesmus protuberans (F.E.Fritsch & M.F.Rich) E.Hegewald 2000: 16; Das and Adhikary, 2014, p.158, pl. XII & fig. 28; *Scenedesmus protuberans* F.E.Fritsch & M.F.Rich

(Pl. II, Fig. 16)*

Coenobia made up of 4 cells which arranged in a linear

series, cells are longer than broad, attached laterally except at the ends, single spine arising at each pole of terminal cells, spines are curved and much longer as compared to the length of the cell; chloroplast parietal; length of the cell 10.5-12 µm, breadth 2.5 – 3.5 µm; spines 7.5 – 12 µm long.

Voucher No: Deepor Beel – 860

Pectinodesmus javanensis (Chodat) E.Hegewald, C.Bock & Krienitz 2013: 151; Yamagishi 2010, p. 150, pl. 64, fig. 7. *Scenedesmus javanensis* Chodat

Cells long, curved-fusiform, with narrowly elongated spine-like ends, arranged in a linear series in alternate contact with the apices; cells 4-8 µm broad, 28-50 µm long with spines.

Voucher No: Deepor Beel - 958

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Pseudodidymocystis fina (Komárek) E.Hegewald & Deason 1989: 127; Yamagishi 2010, p. 147, pl. 55, fig. 5; *Didymocystis fina* Komárek 1975: 276, fig. 3

(Pl. II, Fig. 17)*

Cylindric to oblong cells, ends rounded and nearly straight or outer side slightly swelled; smooth cell wall; cells breadth 1.6-2.8 µm and length 4.3-7 µm.

Voucher No: Deepor Beel – 695

Scenedesmus arcuatus (Lemmermann) Lemmermann 1899: 112, pl. I [1]: figs 2-4; Philipose 1967, p. 256, fig. 160 (a-c). *Scenedesmus bijugus* var. *arcuatus* Lemmermann

Coenobia of 4, 8 or 16 cells in 2 rows, sometimes in 3 rows; enclosed within a mucilaginous envelope; cells ovoid and slightly bent, sometimes in 3 rows, cells 3-9.5 µm broad and 7-18 µm long.

Voucher No: Deepor Beel - 952

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Scenedesmus obtusus f. **disciformis** (Chodat) Compère 1977: 265; John Whitton & Brook 2005, p. 327-409. *Scenedesmus bijugatus* var. *disciformis* Chodat

Cells reniform to curved long-ovoid with ends rounded, arranged contacting by the sides, cells in 8-celled colonies; cells 7-12 µm in length, 4-6 µm in breadth.

Voucher No: Deepor Beel - 957

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Scenedesmus prismaticus Brühl & Biswas 1922: 10, pl. III [3]: fig. 21; Hegewald & Silva 1988, p. 404, fig. 650; Das & Adhikary 2014, p. 133, pl. 10, fig. 4.

Coenobia 4 celled, cell oblong ellipsoid, arranged in a single linear series, cell prismatic with pyramidal end,

faces, terminal cell mostly shorter, and slightly convex, single chloroplast, without pyrenoid, cells 11-17 µm long and 4-5 µm broad.

Voucher No: Deepor Beel - 952

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Scenedesmus quadricauda (Turpin) Brébisson in Brébisson & Godey 1835: 66; Philipose 1967, p. 283, fig. 187 a; Das & Adhikary 2014, p. 161, pl. 10, fig. 7. *Achnanthes quadricauda* Turpin

Four celled colonies, linear series arrangement, oblong-cylindrical with rounded ends cells, terminal cells pole with a long, slightly curved, more or less straight spine, a parietal chloroplast of each cell, with one pyrenoid, smooth cell wall, cells length 12-12.8 µm and breadth 4.2-5 µm.

Voucher No: Deepor Beel - 943

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015); Assam University, Silchar campus (Deb & al., 2013); Sobhagya Kunda, Kacho Pukhuri, Jor Pukhuri, Raja Pukhuri, Gopeswar temple pond and Hajo Pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016)

Scenedesmus quadricauda var **bicaudatus**

Hansgirg 1890: 9, no fig.; Philipose 1967, p. 284, fig. 187 k; Das & Adhikary 2014, p. 161, pl. 10, fig. 9;

(Pl. II, Fig. 18)*

Four celled colonies, a long spine from one pole of terminal cells, terminal cells one spine present at an angle opposite to the other spine of the terminal cell, internal cells spine absent, cells length 9-10.7 µm, breadth 2.5 µm and spines length 6-6.5 µm.

Voucher No: Deepor Beel - 721

Scenedesmus similagineus Hortobágyi 1960: 350; Yamagishi 2010, p. 152, pl. 65, fig. 8; (Pl. II, Fig. 19)*

Colonial forms, usually two celled colonies; broad-fusiform cells, on each pole a tubular thickening; cells breadth 6-8 µm and length 14-18 µm.

Voucher No: Deepor Beel - 754

Tetradesmus dimorphus (Turpin) M.J.Wynne 2016: 84; Philipose 1967, p. 249, fig. 160; Das & Adhikary 2014, p. 159, pl. 9, fig. 43. *Achnanthes dimorpha* Turpin

7-8 celled colonies, with linear arrangement of cells; more or less lunate with the apices attenuated outer cells, cells length 10-11 µm and breadth 2-4 µm.

Voucher No: Deepor Beel - 941

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015); Raja Pukhuri, Gopeswar temple pond and Hajo Pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Tetradesmus lagerheimii M.J.Wynne & Guiry 2016: 1; Philipose 1967, p. 231, fig. 161; Das & Adhikary 2014, p. 159, pl. 9, fig. 28.

4-8 celled coenobia, entire cells arranged in the same plane, cells fusiform with tips acute, lunate terminal cells, sometimes lunate or disc like internal cells, cells length 16-20 µm and breadth 3-6 µm.

Voucher No: Deepor Beel - 714

Previously reported from Assam: Tinsukia District (Bordoloi, 2016); Pond of Digboi Oil Field (Bordoloi & Baruah, 2015).

Tetradesmus obliquus (Turpin) M.J.Wynne 2016: 84; Meyen 1829, p. 775, pl. 42, fig. 32. *Achnanthes obliqua* Turpin

Colonies of 4-16 cells attached by side, arranged linearly or zigzag; with spiny projections and the end points; cells 12-19 µm in length and 3-7 µm in diameter.

Voucher No: Deepor Beel - 949

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Tetrastrum heteracanthum (Nordstedt) Chodat 1895: 113; Tsarenko Wasser & Nevo 2011, p. 280-355; *Staurogenia heteracantha* Nordstedt

(Pl. II, Fig. 20)*

Mostly 4 celled coenobia; ovoid, triangular or trapezoidal cells; uninucleate in one plane 5-23 µm; tightly joined cells, in the center of coenobium small empty space may be or may not be present; with 1-2 long, 1 short or 3-6 short spines on outer face of the cell; 1-4 chloroplasts, parietal, band or discoid shaped; with or without pyrenoids; the length of the long spines upto 8-24 µm, and that of the short spines 1-9 µm.

Voucher No: Deepor Beel - 756

Tetrastrum staurogeniiforme (Schröder) Lemmermann 1900: 95; Yamagishi 2010, p. 153, pl. 68, fig. 5; *Cohniella staurogeniiforme* Schröder

(Pl. II, Fig. 21)*

Triangular to ovoid cells with basal sides straight; rounded outer sides, short spines 5-6-8 numbers present; cells diameter 3-4-6 µm and spines length 3-5 µm.

Voucher No: Deepor Beel - 529

Verrucodesmus verrucosus (Y.V.Roll) E.Hegewald in Hegewald, Bock & Krienitz 2013: 155; Komarek & Fott, 1983, p. 864, pl. 233, fig. 3; Das & Adhikary 2014, p. 161, pl. 10, fig. 14; *Scenedesmus verrucosus* Y.V.Roll

(Pl. II, Fig. 22)*

8 celled coenobia, broadly elliptical, alternately arranged cells; 10.8-12.5 µm length and breadth 5.8 µm; parietal chloroplast.

Voucher No: Deepor Beel - 752

Willea crucifera (Wolle) D.M.John, M.J.Wynne & P.M.Tsarenko 2014: 213; Philipose 1967, p. 240, fig. 149; Das & Adhikary 2014, p. 161, pl. 10, fig. 18. *Staurogenia crucifera* Wolle

Colony 4 celled, rhomboidal in shape with slightly concave sides and at the centre a small rectangular space, colonies often join together, elongated cells, with concave outer side convex and inner side, cells length 6.3-8.2 µm and breadth 3.1-6 µm.

Voucher No: Deepor Beel - 600

Previously reported from Assam: Tinsukia District (Bordoloi, 2016)

Willea rectangularis (A.Braun) D.M.John, M.J.Wynne & P.M.Tsarenko 2014: 213; Gay 1891, p. 116, pl. XV, fig. 151; Yamagishi 2010, p. 218, pl. 54, fig. 9. *Staurogenia rectangularis* A.Braun

Colonies of 4 celled, rectangular in outline; cells ovoid to long-ovoid; outer ends narrow; cells 5-8µm in length and 3-6 µm in breadth.

Voucher No: Deepor Beel -946

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Family-Selenastraceae

Ankistrodesmus fusiformis Corda 1838: 197, pl. II [2]: fig. 18; Komarek & Fott 1983, p. 686, fig. 192.2; Das & Adhikary 2014, p. 143, pl.11, fig. 6.

Cells needle shaped and intertwined to form a colony, cells fusiform with acute apices, 22-35 µm long and 3-5 µm broad.

Voucher No: Deepor Beel - 947

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013); Silchar (Jena & Adhikary, 2007)

Chlorobolobion braunii (Nägeli) Komárek 1979: 255; Yamagishi 2010, p. 124, pl. 53, fig. 10; *Rhaphidium braunii* Nägeli

(Pl. II, Fig. 23)*

Broad fusiform asymmetric cells; straight or sometimes bent, with inner side nearly straight and outer side swelled, with both ends pointed, breadth 4.5-8 µm and length 13-21 µm.

Voucher No: Deepor Beel - 521

Kirchneriella incurvata J.H.Belcher & Swale 1962: 125, fig. 1: Q-S; John Whitton & Brook 2005, p. 400, pl. 98, fig. G.

Cells lunate to crescent-shaped, moon shaped to almost circular, slightly spiraled; centrally weakly curved and towards apices strongly curved; cells 5-7 µm broad, 10-19 µm long.

Voucher No: Deepor Beel - 946

Previously reported from Assam: Deepor Beel WLS

(Baruah & al., 2013)

Messastrum gracile (Reinsch) T.S.Garcia in T.S.Garcia & al. 2016: 4; Philipose 1967, p. 219, fig. 128; Das and Keshri 2016, p. 194, pl. 16, f. 187 *Selenastrum gracile* Reinsch

Cells sickle shaped, apices acute, chloroplast without a pyrenoid; cells 3.1 – 3.5 µm in breadth and 9–10 µm in length.

Voucher No: Deepor Beel - 805

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015)

Monoraphidium circinale (Nygaard) Nygaard 1979: 212; Komarek & Fott 1983, p. 640, pl. 140, fig. 1; Das & Adhikary 2014, p. 161, pl. 10, fig. 24. *Monoraphidium capricornutum* var. *circinale* Nygaard

Cell spindle shaped, spirally twisted, acute tip of the cell, cells 13.6-15 µm in length and 1.5-2 µm in breadth.

Voucher No: Deepor Beel - 729

Previously reported from Assam: Tinsukia District (Bordoloi, 2016).

Monoraphidium contortum (Thuret) Komárková-Legnerová in Fott 1969: 104, pl. 18: figs 1-5; Komarek & Fott 1983, p. 638, pl. 178, fig. 4; Das & Adhikary 2014, p. 161, pl. 10, fig. 25. *Ankistrodesmus contortus* Thuret

Cells fusiform, sigmoidal and bent, length 33-35 µm and breadth 3-5.5 µm, chloroplast parietal.

Voucher No: Deepor Beel - 743

Previously reported from Assam: Silchar (Jena & Adhikary, 2007); Dighali Pukhuri, Jor Pukhuri and Rani Pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Monoraphidium minutum (Nägeli) Komárková-Legnerová 1969: 109, pl. 22; Komarek & Fott 1983, p. 641, pl. 180, fig. 2; Das & Adhikary 2014, p. 161, pl. 10, fig. 30; *Rhaphidium minutum* Nägeli

(Pl. II, Fig. 24)*

Cells solitary, slightly sigmoidal or kidney shaped with an obtuse tip, length 18.5-21 µm and breadth 9-9.5 µm, broad central area.

Voucher No: Deepor Beel – 744

Monoraphidium pusillum (Printz) Komárková-Legnerová 1969: 102, pl. 16: figs 1-5; Komarek & Fott 1983, p. 638, pl. 179, fig. 2; Das & Adhikary 2014, p. 161, pl. 10, fig. 32; *Ankistrodesmus braunii* var. *pusillus* Printz

(Pl. II, Fig. 25)*

Broad fusiform cells, bent slightly, bluntly pointed, length 22.8-41 µm and breadth 5.4-4.2 µm, chloroplast parietal and absent at the ends.

Voucher No: Deepor Beel – 524

Raphidocelis rosolata (Hindák) Marvan, Komárek & Comas 1984: 387; Yamagishi 2010, p. 127, pl. 57, fig. 8;

Kirchneriella rosolata Hindák

(Pl. II, Fig. 26)*

Arcuately curved cells, gradually narrowed, with pointed ends blunt, arranged in group by 4 cells adjacently, rosette shape in colony with ends close to each other; cells breadth 1.5-2 μm and length 7.5-12 μm .

Voucher No: Deepor Beel – 522

Selenastrum bibraianum Reinsch 1866: 64, pl. IV [4]: fig. 2; Komarek & Fott 1983, p. 688, fig. 194.3; Das & Adhikary 2014, p. 142, pl.11, fig. 4.

Coenobia 4-8-16 celled, cells lunate to sickle shaped, with sharp pointed ends, chloroplast single, parietal, without pyrenoid, 18-30 μm long and 3-7 μm broad.

Voucher No: Deepor Beel - 945

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013)

Class-**Trebouxiophyceae**; Order-**Chlorellales**;

Family-**Chlorellaceae**

Actinastrum gracillimum G.M.Smith 1916: 480, pl. 26: fig. 23; Yamagishi 2010, p. 143, pl. 51, fig. 1; (Pl. II, Fig. 27)*

Straight cells, cylindrical and long, basal ends and outer ends truncately rounded, lateral sides nearly straight and parallel; cells breadth 1.5-4 μm and length 8-20 μm .

Voucher No: Deepor Beel - 231

Actinastrum hantzschii Lagerheim 1882: 70, pl. III [3]: figs 25, 26; Philiposen 1967, p. 216, fig. 125(a-c); Komarek & Fott 1983, p. 742, fig. 207(2).

Colonial thalli, sometimes solitary; 2-8 celled coenobia, cells radiate from center; elongate to linear cells with acute, obtuse or truncate apex; single chloroplast, parietal, pyrenoid present; cells length 7-40 μm and breadth 1-8 μm .

Voucher No: Deepor Beel - 665

Previously reported from Assam: Sobhagya Kunda, Kamrup District (Kakati, 2011); Deepor Beel (Das & Adhikary, 2014)

Catena viridis Chodat 1900: 9, fig. 12; Yamagishi 2010, p. 159, pl. 70, fig. 2; (Pl. II, Fig. 28)*

Short cylindric cells; breadth 3.5-4.5 μm and length 5-10 μm .

Voucher No: Deepor Beel - 500

Chlorella chlorelloides (Naumann) C.Bock, L.Krienitz & T.Proschold 2011: 304; John Whitton & Brook 2005, p. 349, pl. 83, fig. P; *Brachionococcus chlorelloides* Naumann

(Pl. II, Fig. 29)*

Tetrahedral to spherical colonies, of 2-4 celled, 16 celled rarely; spherical young cells but older cells spherical to obovoid; thin and smooth wall; cup-shaped and basal

chloroplasts; colonies width 10-46 μm and cells 3.5-9 μm .

Voucher No: Deepor Beel - 732

Chlorella vulgaris Beyerinck [Beijerinck] 1890: 758, pl. VII: fig. 2 a-d; Komarek & Fott 1983, p. 594, pl. 168, fig. 2; Das & Adhikary 2014, p. 159, pl. 9, fig. 9.

Cells small, unicellular and spherical, chloroplast parietal and cup shaped, pyrenoid single distinct and placed at the center, cells diameter 5-6 μm .

Voucher No: Deepor Beel - 927

Previously reported from Assam: Sobhagya kunda, Gopeswar temple pond, Hajo pond, Kamrup District (Kakati, 2011, Bordoloi, 2016); Refinery Effluent Drains of Assam (Baruah & al., 2009).

Hindakia tetrachotoma (Printz) C.Bock, Proschold & Krienitz 2010: 270, fig. 5; Hindak 1984, p. 93, pl. 32, figs. 8, 9; *Dictyosphaerium tetrachotomum* Printz

(Pl. II, Fig. 30)

Irregular shaped colonies, asymmetrically oval cells, affixed to the stalks by the median portion, upto 16 number of cells in the colony, cells length 5-6 μm and breadth 4-6 μm .

Voucher No: Deepor Beel – 856

Keratococcus bicaudatus (A.Braun ex Rabenhorst)

J.B.Petersen 1928: 429; Yamagishi 2010, p. 158, pl. 56, fig.7; *Dactylococcus bicaudatus* A.Braun ex Rabenhorst

(Pl. II, Fig. 31)*

Broad fusiform to cylindric-fusiform asymmetrical cells, long spiny projection present at both the ends; cells breadth 3-5 μm and length with spiny projection 19-35 μm .

Voucher No: Deepor Beel - 523

Keratococcus dispar (West & G.S.West) Tsarenko & D.M.John in D.M.John & Tsarenko 2002: 360; John Whitton & Brook 2005, p. 360, pl. 91, fig. H. *Dactylococcus dispar* West & G.S.West

(Pl. II, Fig. 32)*

Spindle-shaped, oblique and mostly half-moon shaped cells, sub equally apices developed, cells width 2-5 μm and length 8.5-21 μm .

Voucher No: Deepor Beel - 524

Mucidosphaerium pulchellum (H.C.Wood) C.Bock, Proschold & Krienitz 2011: 642; Prescott 1961, p. 238, pl. 51, fig. 5-7. *Dictyosphaerium pulchellum* H.C.Wood

Colony 16 celled with cells arranged in a series of 4, enclosed in mucilage, cells spherical, attached to the radiating elongated mucilaginous threads from colonial center, 4-10 μm in diameter.

Voucher No: Deepor Beel - 945

Previously reported from Assam: Deepor Beel WLS

(Baruah & al., 2013)

Muriella terrestris J.B.Petersen 1932: 403, fig. 9; John Whitton & Brook 2005, p. 370, pl. 82, fig. M.

(Pl. II, Fig. 33)*

Almost spherical cells; two to several plate-shaped chloroplasts; separated distinctly even in young cells; cells width 3-13 μm .

Voucher No: Deepor Beel – 132

Family-**Oocystaceae**

Nephrochlamys rotunda Korshikov 1953: 311, fig. 279; Hindak 1988, p. 153, pl. 54, fig. 1; Das & Adhikary 2014, p. 159, pl. 9, fig. 8.

(Pl. II, Fig. 34)*

Almost spherical or slightly oval shaped cells, with a small, narrow excision, cell obtuse at the end; cell length 16.5-17 μm and breadth 4.5-5 μm .

Voucher No: Deepor Beel - 546

Oocystis lacustris Chodat 1897: 119; John Whitton & Brook 2005, p. 372, pl. 92, fig. E.

(Pl. III, Fig. 1)*

2-4-8 celled coenobia; cells in tiers sometimes; cells narrow to broadly ellipsoidal or spindle-shaped, asymmetrical, rounded to obtuse apices and twice the length of breadth, distinct thickened wall; single, trough-shaped chloroplasts; pyrenoid single, cells width 1.5-10 μm and length 4-15 μm .

Voucher No: Deepor Beel – 622

Order-**Trebouxiales**; Family-**Botryococcaceae**

Botryococcus braunii Kützing 1849: 892; Philipose 1967, p. 195, fig. 108; Das & Adhikary 2014, p. 118, pl. 8, fig. 22.

Thallus free floating; colonies free floating, irregular, without a conspicuous gelatinous envelope but completely enclosed by a tough, hyaline, orange colored membrane that produced into irregular wrinkles, folds or spines, cells ovoid to ellipsoid and arranged radially at the periphery of the colony, cells 5- 6.4 μm long and 3.3-5 μm broad, colony 50-70 μm in diameter.

Voucher No: Deepor Beel - 948

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013); Jorhat, Assam (Jena & Adhikary, 2007)

Phylum-**Cyanobacteria**; Class-**Cyanophyceae**;

Order-**Chroococcales**; Family-**Chroococcaceae**

Chroococcus cohaerens (Brébisson) Nägeli 1849:46
Pleurococcus cohaerens Brébisson

(Pl. III, Fig. 2)*

Slimy or gelatinous thallus; blue or dark-green colour cells; cells may be found in single or up to 2-8 in groups;

thin, colourless and unlamellated sheath; cells diameter without envelope or sheath 2-5 (-7) μm and with sheath 2.5-7 μm , colony size 7-15 μm .

Voucher No: Deepor Beel - 105

Chroococcus dispersus (Keissler) Lemmermann 1904: 102 (Pl. I, Fig. 5); Prescott 1961, p. 447, pl. 100, fig. 7; Das and Adhikary 2014, p. 79, pl. 1, f. 22 *Chroococcus minor* var. *dispersus* Keissler

(Pl. III, Fig. 3)*

Free floating and flattened, colonies of 8 spherical cells irregularly shaped, arranged in a small cluster, distributed evenly from one another at some distance, individual cell sheath absent, cell contents bright blue green, 3.5 - 4.5 μm in diameter.

Voucher No: Deepor Beel - 48

Chroococcus minutus (Kützing) Nägeli 1849: 46; Komarek & Anagnostidis 1998, p. 296, fig. 391; Das and Adhikary, 2014 p. 61, pl. 1, fig. 26 *Protococcus minutus* Kützing

Eight celled colonies, cells embedded in homogenous gelatinous mass, cells spherical or oval, pale blue green in colour, 4 - 6 μm in diameter.

Voucher No: Deepor Beel - 831

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Chroococcus turgidus (Kützing) Nägeli 1849: 46; Komarek & Anagnostidis 1998, p. 306, fig. 407; Das and Adhikary 2014, p. 79, pl. 1, f. 29 *Protococcus turgidus* Kützing

Colonies four celled, mucilage firm and colourless, blue green cells, hemispherical, with granular content, 12.5 -14 μm in diameter.

Voucher No: Deepor Beel - 116

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015)

Cyanosarcina burmensis (Skuja) Kováčik 1988: 176; Komarek & Anagnostidis, Suesswasserflora 19(1):314, 1999. Syn. *Myxosarcina burmensis* Skuja. Yamagishi, Plankton Alg. Taiwan 12, 1992. *Myxosarcina burmensis* Skuja

Spherical to irregular massive colonies, surrounded by a thin gelatinous envelope, spherical to ovoid cells, colony densely composed of 4 celled group, diameter 2-3 μm .

Voucher No: Deepor Beel - 171

Previously reported from Assam: Tinsukia District (Bordoloi, 2016).

Cyanosarcina spectabilis (Geitler) Kováčik 1988: 176; Arch. Hydrobiol. (u. Planktonk.) 12 (4): 624, 1933; Die Cyanophyceen der deutschen limnologischen Sunda Expedition, ihre Morphologic, Systematik, und Ökologie,

Arch. Hydrobiol. (u. Planktonk.), suppl. 14: 387, fig. 14, 1935-36; Desikachary 1959, p. 178, pl. 30, fig. 1-5; pl. 31, fig. 17-22. *Myxosarcina spectabilis* Geitler

Cells in three dimensional colonies, 6.5-10 µm broad; colonial sheath thin, distinct, hyaline, individual sheaths occasionally present, thin, and hyaline; cell-contents blue-green; endospores.

Voucher No: Deepor Beel - 851

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Family-Microcystaceae

Gloeocapsa nigrescens Nägeli in Rabenhorst 1865: 40; Desikachary 1959, p. 117, pl. 24, f. 15, 17

Crustaceous, thin, blackish thallus; spherical cells; sheath less diameter 3.3-6.8 µm and with sheath diameter 12-13.5 µm; colonies diameter 30-125 µm; laterally uniting; broad, non-lamellated sheath, blue-green contents; homogenous sheath present.

Voucher No: Deepor Beel - 42

Previously reported from Assam: Assam University, Silchar campus (Deb & al., 2013).

Microcystis aeruginosa (Kützing) Kützing 1846: 6; Komarek & Anagnostidis 1998, p. 232, fig. 304; Das and Adhikary, 2014 p. 57, pl. 1, fig. 16 *Micraloa aeruginosa* Kützing

Colonies mucilaginous, microscopic, irregular, distinctly elongate, mucilage colourless, structureless, diffluent, cells spherical, pale blue green to brown in colour, with numerous aerotopes, 2.5 - 3.5 µm in diameter.

Voucher No: Deepor Beel - 829

Previously reported from Assam: Deepor Beel (Das & Adhikary, 2014; Sharma, 2015)

Microcystis flosaquae (Wittrock) Kirchner 1898: 56; Komarek & Anagnostidis 1998, p. 228, fig. 300, 30; Das and Adhikary, 2014 p. 58, pl. 1, fig. 17 *Polycystis flosaquae* Wittrock

Microscopic colonies, irregular, more or less spherical, with very densely aggregated cells, mucilage envelope is colorless, cells spherical with aerotopes, 2.5-3 µm in diameter.

Voucher No: Deepor Beel - 844

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Order-Oscillatoriales

Family-Microcoleaceae

Arthrospira gigantea (Schmidle) Anagnostidis 1998; Desikachary 1959, p. 197, pl. 36, f. 12, 14-17 *Spirulina gigantea* Schmidle

Trichomes about 3 µm broad, spirally coiled, deep blue-green in colour, with conically attenuated end, spirals 10-

14 µm broad.

Voucher No: Deepor beel-807

Previously reported from Assam: Goalpara District (Deka & Sarma, 2011)

Family-Oscillatoriaceae

Oscillatoria curviceps C.Agardh ex Gomont 1892: 213, pl. VI/6: fig. 14; Agardh, Syst. Alg., 68, 1824; Gomont, Monogr. Oscillariées, 213, pl. 6, f. 14, 1892; Forti in De Toni, Sylloge Algarum, 5: 157, 1907; Geitler, Kryptogamenflora, 947, fig. 598e, 1932; Desikachary 1959, p. 209, pl. 38, f. 2

Light or dark blue-green thallus; straight trichomes, bent at ends or spirally coiled; not constricted at cross-walls; cells 1/3- 1/6 as long as broad, length 2-5 µm and breadth 10-17 µm.

Voucher No: Deepor Beel - 847

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Oscillatoria limosa C.Agardh ex Gomont 1892: 210, pl. VI/6: fig. 13; Komarek & Anagnostidis 2005, p. 593, fig. 886; Das and Adhikary, 2014 p. 71, pl. 3, fig. 5

Thallus blackish blue green, trichomes bright green, straight, slightly bent, sheath absent, not constricted at the cross-walls, 13.7 -14.3 µm wide, cells shorter than breadth, 2.5 - 3.3 µm long, cell content is granular, apical cell is flatly rounded, without calyptra.

Voucher No: Deepor Beel - 854

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003); Deepor Beel Bird Sanctuary (Das & al., 2003)

Oscillatoria princeps Vaucher ex Gomont 1892: 206, pl. VI/6: fig. 9; Desikachary 1959, p. 210, pl. 37, f. 10, 11

Trichomes blue green, mostly forming a straight thallus, without constrictions at the cross walls, 10-13 µm broad, slightly attenuated at the apices and curved, cells 2-4 µm long, end cells flatly rounded, slightly capitate.

Voucher No: Deepor Beel -813

Previously reported from Assam: Deepor Beel (Deb & al., 2019)

Oscillatoria princeps var. **pseudolimosa** Ghose 1924: 337, pl. 31: fig. 2; Desikachary 1959, p. 210, pl. 39, fig. 15 & 17; Das and Adhikary, 2014 p. 73, pl. 3, fig. 8

Blue-green filament, straight, not constricted at the cross walls, slightly or briefly attenuated at the apices and bent, trichome is 36 - 37 µm broad, cells are 7 - 8 µm long, end cells flatly rounded, slightly capitate.

Voucher No: Deepor Beel - 853

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Oscillatoria subbrevis Schmidle 1901: 243, pl. IV [4]:

fig. 7; Desikachary 1959, p. 207, pl. 37, f. 2; Pl. 40, Fig. 7. Trichomes single, light blue green, nearly straight, apices not attenuated, septa not granulated, indistinct, cells 5.7-6.2 μm broad and 0.9-1.9 μm long, granulated end cell rounded, calyptras absent.

Voucher No: Deepor Beel -862

Previously reported from Assam: Refinery effluent Drains, Assam (Baruah & al., 2009)

Oscillatoria tenuis C.Agardh ex GomoBnt 1892: 220, pl. VII/7: figs 2, 3; Agardh, Alg. Dec. 2 : 25, 1813; Gomont, Monogr. Oscillariees, 220, pi. 7, figs. 2-3, 1892; Forti in Dc Toni, Sylloge Algarum, 5: 166, 1907; Fremy, Myxo. d'Afr. equat. franc., 217, fig. 186, 1929; Geitler, Kryptogamenflora, 959, fig. 611f-g, 1932; Fremy, Cyano, cotes d'Eur., 121, pi. 30, fig. 10, 1933; Desikachary 1959, p. 222, pl. 42, f. 15.

Thin blue-green or olive-green thallus, slimy ; trichome straight, fragile slightly constricted at the cross-walls, 4-10 μm broad, sometimes bent at the ends, not attenuated at the apices; cells up to 1/3rd as long as broad, 3-5 μm long, at the septa mostly granulated; end cell more or less hemispherical with thickened outer membrane.

Voucher No: Deepor Beel -820

Previously reported from Assam: Deepor Beel (Deb & al., 2019)

Phormidium ambiguum Gomont 1892: 178, pl. V [5]: fig. 10; Komarek & Anagnostidis 2005, p. 479, fig. 718; Das and Adhikary, 2014 p. 67, pl. 2, fig. 21

Filaments elongate, straight, trichomes bright blue green to olive green, 7.5 - 8.5 μm broad, slightly constricted at the granulated cross walls, not attenuated at the ends, cells shorter than wide, 2 - 3 μm long, cell content frequently with dispersed large granules, apical cell rounded.

Voucher No: Deepor Beel - 855

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003); Deepor Beel Bird Sanctuary (Das & al., 2003)

Phormidium calcicola N.L.Gardner 1927: 44, pl. 9: fig. 87; New Myxophyceae from Porto Rico, Mem. N. Y. bot. Gdn, 7: 44, pi. 9, fig. 87, 1927; Geitler, Kryptogamenflora, 1013, fig. 646a, 1932; Desikachary 1959, p. 267, pl. 43, fig. 4, 5.

Thallus thick, firm, with densely entangled filaments; filaments 7-8 μm broad; sheath thick, colourless, unlamellated ; trichomes 5-6 μm broad, not constricted at the cross-walls, not attenuated ; cells quadratic or slightly longer than broad, or shorter, blue-green ; end cell truncated rounded, with a thickened outer membrane.

Voucher No: Deepor Beel - 852

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Phormidium chalybeum (Mertens ex Gomont) Anagnostidis & Komárek 1988: 405; Desikachary 1959, p. 218, pl. 38, fig. 3; Das and Adhikary, 2014 p. 71, pl. 3, fig. 2 *Oscillatoria chalybea* Mertens ex Gomont

Thallus blue green, trichomes straight, slightly constricted at the cross walls, attenuated at the apex, and somewhat bent, 8.5 - 9 μm broad, blue green, cells 5-5.5 μm long, septa not granulated, end cell obtuse, not capitate, without calyptra.

Voucher No: Deepor Beel - 851

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Phormidium nigrum (Vaucher ex Gomont) Anagnostidis & Komárek 1988: 405, Hirose 1977, P. 110, Pl. 45, Fig. 12; Prescott 1975, P. 489, Pl. 109, Fig. 18. *Oscillatoria nigra* Vaucher ex Gomont

Trichomes straight or slightly twisted, not tapering towards the apex, straight or curved. Apical cell rounded or capitate. Trichomes constricted at the cross walls, which contains micro-granules. Cells 7.5-9 μm in diameter, 3.5-7 μm long. Trichomes aggregates to form a mucilaginous blackish green plant mass.

Voucher No: Deepor Beel -862

Previously reported from Assam: Refinery effluent Drains, Assam (Baruah & al., 2009)

Phormidium puteale (Montagne ex Gomont) Anagnostidis & Komárek 1988: 408; Montagne, 20 centurie de Plantes cellulaires exotiques, Ann. Sci. nat., 2 ser., Bot., 13: 200, 1840; Gomont, Monogr. Oscillariees, 143, pi. 3, fig. 14, 1892; Forti in De Toni, Sylloge Algarum, 5: 277, 1907; Fremy, Myxo. d'Afr. equat. franc., 193, fig. 159, 1929; Geitler, Kryptogamenflora, 1063, fig. 675, 1932; Desikachary 1959, p. 318, pl. 52, fig. 12 *Lyngbya putealis* Montagne ex Gomont

Thallus caespitose, expanded, penicillate, dull blue-green, when dry sometimes violet ; filaments curved or nearly straight, at the base intricate, above more or less parallel ; thin sheath, papyraceous, colourless; trichome 7.5-13 μm broad, distinctly constricted at the cross-walls; cells quadrate of up to 1 /3 as long as broad, 3-10 μm long; end cell rounded.

Voucher No: Deepor Beel - 855

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Phormidium willei (N.L.Gardner) Anagnostidis & Komárek 1988: 406; Desikachary 1959, p. 217, pl. 38, fig. 4 & 5; pl. 40, fig. 5; Das and Adhikary, 2014 p. 73, pl. 3, fig. 10 *Oscillatoria willei* N.L.Gardner

Filament grayish blue-green, 6 - 7 μm broad, no constriction at the crosswalls, ends not attenuated, not capitate, apical cell slightly acute, cells are longer than

broad, 9-11 µm long.

Voucher No: Deepor Beel - 851

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003)

Family-Microcoleaceae

Kamptonema formosum (Bory ex Gomont) Strunecký, Komárek & J.Smarda 2014: 204; Hirose 1977, P. 102, Pl. 44, Fig. 33; Prescott 1975, P. 489, Pl. 109, Figs. 10-11. *Oscillatoria formosa* Bory ex Gomont

Trichomes straight and rather firm, curved and slightly tapering towards the apex. Apical cell conical, not capitate, without a calyptra. Trichomes constricted at the cross walls, which contains micro-granulars. Cells 4-6 µm in diameter, 2.5-6 µm long. Dark blue-green in colour.

Voucher No: Deepor Beel -861

Previously reported from Assam: Refinery effluent Drains, Assam (Baruah & al., 2009)

Kamptonema okenii (C.Agardh ex Gomont) Strunecký, Komárek & J.Smarda 2014: 203; Agardh, Aufzählung, etc., Flora, 10: 633, 1827; Geitler, Kryptogamenflora, 969, fig. 608a, 1932; Desikachary 1959, p. 231, pl. 38, f. 17 *Oscillatoria okenii* C.Agardh ex Gomont

Thallus dull blue-green; straight trichome, fragile distinctly constricted at cross-walls; cells 1/3 as long as broad, length 3 - 5 µm and at the ends up to 8 µm long; end cells obtuse or sub conical not capitate, without calyptra.

Voucher No: Deepor Beel - 839

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Order-Nostocales; Family-Scytonemataceae

Scytonema hofmanii C.Agardh ex Bornet & Flahault 1886: 97; John, Whitton and Brook, 2003, 2005, p.114, pl. 20, f. J

Cushion like colony, expanded widely; 1-2 mm high, blackish blue-green in colour, wider sometimes; sparse false branches; cells width 3-4 µm; older parts of trichome mostly longer than wide; shorter meristem region; thin, firm, colourless or yellow to yellow brown sheath; single or paired heterocysts, rounded cylindrical in shape.

Voucher No: Deepor Beel - 03

Previously reported from Assam: Assam University, Silchar campus (Deb & al., 2013).

Family-Aphanizomenonaceae

Dolichospermum circinale (Rabenhorst ex Bornet & Flahault) P.Wacklin, L.Hoffmann & J.Komárek 2009: 61; Algen Eur. Exs., no. 209, 1852; Fl. Eur. Alg., 2: 183, 1865; Bornet and Flahault, Revision des Nostocaceae heterocystes, 230, 1888; Forti in De Toni, Syllogc

Algarum, 5: 443, 1907; Geitler, Kryptogamenflora, 981, fig. 572a, 1932; Frey, Cyano. cotes d'Eur., 184, pl. 61, fig. 3, 1933; Desikachary 1959, p. 414, pl. 77, f. 2. *Anabaena circinalis* Rabenhorst ex Bornet & Flahault

Frothy and floating thallus; trichome mostly circinate, seldom straight, mostly without a sheath, 8-14 µm broad; cells barrel-shaped or spherical, somewhat shorter than broad, with gas-vacuoles; heterocysts subspherical, 8-10 µm broad; spores cylindrical, sometimes curved, ends rounded, 16-18 µm broad up to 34 µm long, ordinarily away from the heterocyst epispore smooth and colourless.

Voucher No: Deepor Beel -813

Previously reported from Assam: Nagaon, Assam (Samad & al., 2008)

Family-Nostocaceae

Aulosira fertilissima S.L.Ghose 1924: 342, pl. 31: fig. 9; J. Linn. Soc. Bot., 46: 342, pl. 31, fig. 9, 1924; Geitler, Kryptogamenflora, 675, fig. 435, 1932; Desikachary 1959, p. 431, pl. 80, f. 6

Expanded, dark blue-green stratum, membranous; straight or a little flexuous with parallel or densely intricate trichomes; cells length 5-7 µm and breadth 4-11 µm; cylindrical when young, barrel-shaped later, granular contents; heterocyst intercalary, length 10-14 µm and breadth 8-9 µm.

Voucher No: Deepor Beel - 827

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Cylindrospermum stagnale Bornet & Flahault 1886: 250; Geitler, Kryptogamenflora der Mark Brandenburg, 819, fig. 520c, 1932; Desikachary 1959, p. 363, pl. 65, f. 9

Floccose thallus, expanded, blue-green; trichomes 4 - 5 µm in breadth, constricted at cross-walls; heterocyst subspherical or oblong, breadth 6 - 7 µm and length 7 - 16 µm, spores cylindrical with rounded ends with smooth yellowish-brown outer layer.

Voucher No: Deepor Beel - 828

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Nostoc linckia Bornet ex Bornet & Flahault 1886: 193; Bornet in Bornet and Thuret, Notes algologiques, II, 86, pl. 18, f. 1-12, 1880; Born. Et Flah., Geitler, Kryptogamenflora, 838, fig. 528b, 1932; Desikachary 1959, p. 377, pl. 69, f. 4

Thallus varying in size, sometimes punctiform, sometimes tuberculate, blue-green to violet, or blackish green or brown; trichomes 3-4 µm broad, pale blue-green; heterocyst cells 6-7 µm in breadth and 7-8 µm in length.

Voucher No: Deepor Beel - 840

Previously reported from Assam: Rice fields of Karimganj

district (Thajamanbi & al., 2016); Deepor Beel Bird Sanctuary (Das & al., 2003)

Order-**Pleurocapsales**; Family-**Hyellaceae**

Pleurocapsa minor Hansgirg 1891: 89, l. III [3]: figs 1-10; Das and Adhikary, 2014 p. 49, pt. II & fig.12

(Pl. III, Fig. 4)*

Colonies made up of irregular, short multi- or uniseriate pseudo filaments forming flat aggregations; cells in the colony are small and various shaped, irregularly polygonal rounded, barrel shaped; with blue green content, cell sheath smooth, distinct and colorless, sometimes yellowish; cells are 3-7 μm in diameter.

Voucher No: Deepor Beel -856

Order-**Spirulinales**; Family-**Spirulinaceae**

Spirulina corakiana Playfair 1914: 135, pl. 6: fig. 17; Komárek and Anagnostidis 2005, p. 146, f. 169;

(Pl. III, Fig. 5)*

Solitary trichomes, pale blue-green in colour, width (0.5)0.7-0.8 μm ; regularly spirally coiled, loose and short; no constriction at cross-walls; at the ends slightly attenuated; rotation left handed; length 25-70 μm and coils width 1.5-2.5 μm with height (2.8-3.5) 4-10 μm ; rounded apical cells.

Voucher No: Deepor Beel - 180

Spirulina labyrinthiformis Gomont 1892: 255; Monogr. Oscillariées, 255, 1892; Geitler, Kryptogamenflora, 928, 1932; Desikachary, 195, pl. 36, Fig. 11, 1959; Komárek and Anagnostidis 2005, 146, Fig. 171.

Trichome 1 μm broad, very regularly coiled forming a dark thallus, spirals closed to each other, spirals 2-2.7 μm broad.

Voucher No: Deepor Beel - 855,

Previously reported from Assam: Brahmaputra Valley of Assam (Baruah & al., 2014)

Spirulina major Kützing ex Gomont 1892: 251, pl. VII/7: fig. 29; Komarek & Anagnostidis 2005, p. 148, fig. 173; Das and Adhikary, 2014 p. 63, pl. 2, fig. 6

Trichomes pale to bright blue green, 1-2 μm wide, regularly screw like coiled, coils left- handed, distance between spirals 4 - 4.5 μm .

Voucher No: Deepor Beel - 834

Previously reported from Assam: Deepor Beel Bird Sanctuary (Das & al., 2003)

Spirulina meneghiniana Zanardini ex Gomont 1892: 250, pl. VII/7: fig. 28; Zanardini, Not. Intorno alle Cellul. marine ed elittor. di Venezia, Atti. R. Inst. Veneto, 6:80, 1847; Desikachary, 195, pl. 36, Figs. 4 and 8, 1959; Komárek and Anagnostidis 2005, 147, Fig. 172.

Trichome 1.2-1.8 μm broad, flexible, irregularly spirally coiled, forming a thick thallus, spirals 3.2-5 μm broad.

Voucher No: Deepor Beel - 851

Previously reported from Assam: Brahmaputra Valley of Assam (Baruah & al., 2014)

Spirulina princeps West & G.S.West 1902: 205; A contribution to the freshwater algae of Ceylon, Trans. Linn. Soc. (Lond.) Bot., 2 ser., 6: 205, 1902; Desikachary, 197, pl. 36, Fig. 7.

Trichome 4.5-5 μm broad, short, regularly, spirally coiled, spirals 11-12 μm broad.

Voucher No: Deepor Beel - 851

Previously reported from Assam: Brahmaputra Valley of Assam (Baruah & al., 2014)

Spirulina subtilissima Kützing ex Gomont 1892: 252, pl. 118: fig. 3; Kützing, Phyc. gen., 183, 1843; Monogr. Oscillariées, 252, pl. 7, Fig. 30, 1892; Desikachary, 196, pl. 36, Fig. 10, 1959; Komárek and Anagnostidis 2005, 144, Fig. 168.

Trichome 0.6-0.9 μm broad, regularly, bright, spirally coiled, spirals 1.5-2.5 μm broad.

Voucher No: Deepor Beel - 854

Previously reported from Assam: Brahmaputra Valley of Assam (Baruah & al., 2014)

Order-**Synechococcales**; Family-**Leptolyngbyaceae**

Planktolyngbya contorta (Lemmermann) Anagnostidis & Komárek 1988: 394;

Phytoplant. Sachs Teiche in Ploner Forschber., 6: 202, pi. 5, figs. 10-13, 1898; Ford in De Toni, Sylloge Algarum, 5: 288, 1907; Fremy, Myxo. d'Afr. equat. franc., 202, fig. 172, 1929; Geitler, Kryptogamenflora, 1043, fig. 660a, b, 1932; Fremy, Cyano. cotes d'Eur., 109, pi. 29, fig. 2, 1933; Desikachary 1959, p. 290, pl. 48, fig. 5; pl. 50, fig. 5,9. *Lyngbya contorta* Lemmermann

Single filaments, free-floating, regularly spirally coiled, with a delicate, nearly circular coils, 1-1.5 μm broad; sheath narrow, colourless; cells 1-2 μm broad, 3-5 μm long, not constricted at the cross-walls, granulated with a single granule or without them; end cell rounded, not attenuated.

Voucher No: Deepor Beel - 855

Previously reported from Assam: Bordoibum Bilmukh Bird Sanctuary, Lakhimpur Dist (Hazarika & al., 2003); Deepor Beel Bird Sanctuary (Das & al., 2003)

Family-Merismopediaceae

Aphanocapsa litoralis Hansgirg 1892: 229; Desikachary 1959, p.131, pl.21, fig.1

(Pl. III, Fig. 6)*

Indefinite shaped amorphous thallus, thalli mucilaginous; blue-green or yellowish in colour; spherical to sub spherical type cells, found singly or in double (twos), aggregated may be densely or sometimes sparsely; cells

diameter 4-6 µm.

Voucher No: Deepor Beel - 27

Limnococcus limneticus (Lemmermann) Komárková, Jezberová, O.Komárek & Zapomelová 2010: 79; Bot. Central bl. 76:153, 1898. Komárek & Anagnostidis, Suesswasserflora 19(1):290, 1999; Yamagishi, 2010, p.6, pl.1, f.6. *Chroococcus limneticus* Lemmermann

(Pl. III, Fig. 7)*

Colonies are free floating, ovoid in shape and irregular, sometimes upto 40 cells; cells occur within the homogenous mucilaginous envelope in groups of 2-4 distinct outer margin, mucilage is colourless; cells are hemispherical, 6-12 µm in diameter.

Voucher No: Deepor Beel - 801

Merismopedia tenuissima Lemmermann 1898: 154; Komárek & Anagnostidis 1998, p. 174, fig. 219; Das and Adhikary 2014, p. 79, pl. 1, f. 15

Flat colonies, rectangular in shape and aggregation of 32 cells, colourless mucilage, diffuent, cells oval to spherical, after division hemispherical, pale blue green content in the cells, cells 1.8 µm in diameter.

Voucher No: Deepor Beel - 107

Previously reported from Assam: Kacho pukhuri and Dighali pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Merismopedia tranquilla (Ehrenberg) Trevisan 1845: 28; Desikachary 1959, p.155, pl.29, fig.6; Das and Keshri 2016, p. 105, pl. 2, f. 23 *Gonium tranquillum* Ehrenberg

Rectangular plate colony of 32-128 ovate cells, usually arranged loosely, cells breadth 2.2 – 2.8 µm and length 4.31 – 5.34 µm, cells colour blue green and the contents are homogeneous.

Voucher No: Deepor Beel - 104

Previously reported from Assam: Kacho pukhuri, Kamrup District (Kakati, 2011); Tinsukia District (Bordoloi, 2016).

Phylum-**Euglenozoa**; Class-**Euglenophyceae**;

Order-**Euglenida**; Family-**Euglenidae**

Cryptoglena skujae Marin & Melkonian in Marin & al. 2003: 102; Yamagishi 2010, p. 48, pl. 21, fig. 5.

(Pl. III, Fig. 8)*

Coffee- bean like cells, ellipsoid to broad-ellipsoid, on dorsal face along the center a longitudinal furrow present; narrowly rounded anterior ends; truncately rounded posterior ends with a small, nipple- like cauda; 2 paramylon bodies, along lateral sides parietal shell-like laying present; cells diameter 8-13(-19) µm and length 13-17 µm.

Voucher No: Deepor Beel – 411

Euglena viridis (O.F.Müller) Ehrenberg 1830: 39;

Wofowski and Hindak 2005, p. 32, figs. 154-159; John, Whitton and Brook, 2003, 2005, p.158, pl. 37, f. A, B *Cercaria viridis* O.F.Müller

Cell broad and spindle shaped, anterior end broadly rounded, middle portion broader and posterior end tapering and narrow, cells 34 - 39 µm long and 16.2 - 18.6 µm broad at middle, ovoid paramylon bodies.

Voucher No: Deepor Beel - 171

Previously reported from Assam: Dighali Pukhuri and Rani Pukhuri, Kamrup District (Kakati, 2016); Tinsukia District (Bordoloi, 2016).

Euglenaria caudata (E.F.W.Hübner) Karnkowska & E.W.Linton in Linton & al. 2010: 608; John, Whitton and Brook, 2003, 2005, p.150, pl. 36, f. B; *Euglena caudata* E.F.W.Hübner

(Pl. III, Fig. 9)*

Cells spindle shaped or broadly spindle shaped; slightly extended anterior ends with apex truncate; a hyaline tail piece at the posterior end; slightly diagonally striated pellicle; flagellum same as size of cell or shorter; large visible eyespot; numerous saucer-shaped chloroplasts; pyrenoid present, small, numerous, rod-like paramylon bodies, have euglenoid movement; cells width (16-)28-38(-45) µm and length 64-120 µm.

Voucher No: Deepor Beel - 171

Monomorphina minuscula (Conrad) Marin & Melkonian in Marin & al. 2003: 102; Yamagishi 2010, p. 58, pl. 27, fig. 7.; *Phacus pyrum* f. *minusculus* Conrad

(Pl. III, Fig. 10)*

Narrow ovoid to ellipsoid cells; narrowly rounded anterior ends; conically produced posterior ends with a slender cauda; spirally striated periplast; 2 dish-like paramylon bodies, laying along the lateral sides; cells diameter 10-12 µm and length without cauda 16-20 µm, 8-10 µm caudae.

Voucher No: Deepor Beel - 261

Monomorphina nordstedtii (Lemmermann) T.G.Popova 1955: 201; John & al., 2005, p. 166, pl. 40, fig. H, I. *Phacus nordstedtii* Lemmermann

Cells napiform in shape, nearly spherical but have a cauda which is long, straight and have a sharply pointed end; anterior ends broadly rounded; numerous chloroplasts with spirally striated pellicles; cells diameter 18-20 µm and length almost 35-40 µm.

Voucher No: Deepor Beel - 10

Previously reported from Assam: Gopeswar temple pond, Kamrup District (Baruah & Kakati, 2012)

Monomorphina pyrum (Ehrenberg) Mereschowsky 1877: 295, 296, pl. 2: fig. 21; Yamagishi 2010, p. 58, pl. 27, fig. 6. *Euglena pyrum* Ehrenberg

(Pl. III, Fig. 11)*

Ovoid to broad-ellipsoid cells; truncately rounded or shallowly concaved anterior ends; conically rounded posterior ends, produced into a slender cauda; spirally striated periplast; 2 paramylon bodies, dish-like in shape laying along the lateral margins; cells diameter 13-18 μm , length without cauda 21-24 μm and caudae length 10-18 μm .

Voucher No: Deepor Beel - 859

Strombomonas acuminata (Schmarda) Deflandre 1930: 570; John, Whitton and Brook, 2003, 2005, p.169, pl. 41, f. A-H; *Lagenella acuminata* Schmarda

(Pl. III, Fig. 12)*

Lorica triangular or trapezoidal; distinctly narrowed anterior ends, obliquely truncate collar of height 3-4(-5) μm and width 5-7 μm ; a prominent straight or slightly

curved extension at the posterior end, sometimes extension absent and rounded posterior ends; smooth, pointed or irregularly warty walls, colourless or brown in colour; numerous chloroplasts, pyrenoids absent, small, rod-like paramylon bodies, flagellum longer than cell length; lorica width 18-27(-30) μm and length (27-)35-48(-51) μm .

Voucher No: Deepor Beel - 191

Strombomonas borystehniensis (Y.V.Roll) T.G.Popova 1955: 124; Popova & Safonova, Fl. Plant. Crypt. URSS 8(1): 206, 1966. Yamagishi, Plankton Alg. Taiwan 56, 1992. Syn. *Strombomonas verrucosa* (Roll) Deflandre var. *borystehniensis* (Roll) Deflandre, Arch. Protistenkd. 69: 568. 1930; Yamagishi 2010, p.65, pl. 31, f. 2; *Trachelomonas borystehniensis* Y.V.Roll

(Pl. III, Fig. 13)*

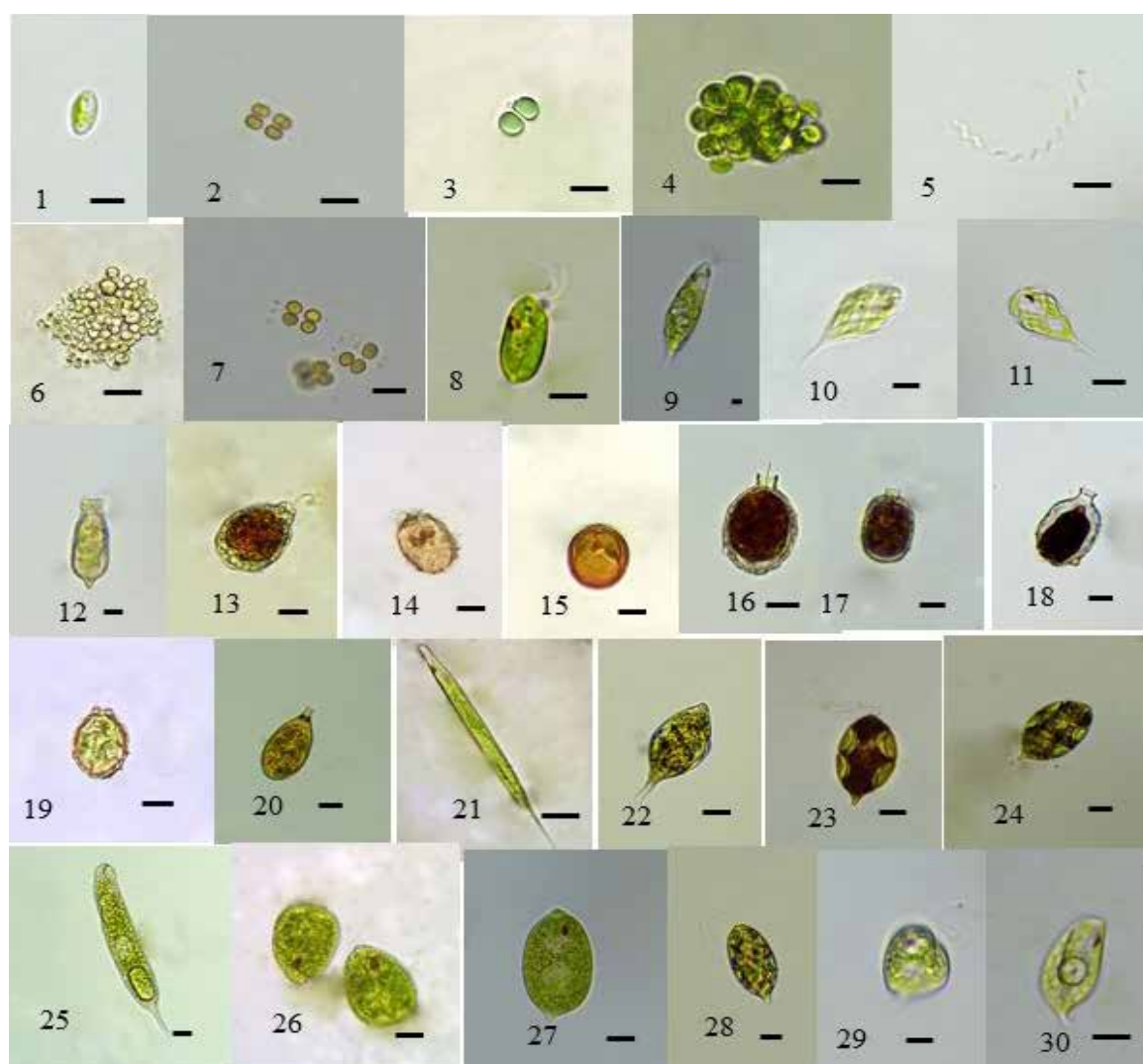


Plate-III (Fig 1-30): 1. *Oocystis lacustris* 2. *Chroococcus cohaerens* 3. *Chroococcus dispersus* 4. *Pleurocapsa minor* 5. *Spirulina corakiana* 6. *Aphanocapsa litoralis* 7. *Limnococcus limneticus* 8. *Cryptoglena skujae* 9. *Euglenaria caudata* 10. *Monomorpha minuscula* 11. *Monomorpha pyrum* 12. *Strombomonas acuminata* 13. *Strombomonas borystehniensis* 14. *Trachelomonas abrupta* var. *arcuata* 15. *Trachelomonas hispida* var. *granulata* 16. *Trachelomonas pavlovskoensis* f. *ellipsoidea* 17. *Trachelomonas planctonica* f. *oblonga* 18. *Trachelomonas reinhardii* 19. *Trachelomonas volvocina* var. *punctata* 20. *Trachelomonas volzii* var. *pellucida* 21. *Lepocinclis acus* var. *minor* 22. *Lepocinclis caudata* 23. *Lepocinclis fusiformis* var. *amphirhynchus* 24. *Lepocinclis hungpanchiaoensis* 25. *Lepocinclis oxyuris* 26. *Lepocinclis salina* f. *pachyderma* 27. *Lepocinclis salina* var. *papulosa* 28. *Lepocinclis steinii* 29. *Phacus anomalus* 30. *Phacus caudatus* var. *minor* (Scale bar = 10 μm)

Broad ellipsoidal test, anterior ends conical and narrowed with short neck; posterior ends rounded and slightly produced; nearly straight lateral sides and parallel at median; low verrucae wall; tests diameter 19-22 µm, length 26-32 µm.

Voucher No: Deepor Beel – 191

Trachelomonas abrupta var. **arcuata** (Playfair) Deflandre 1926: 695 Rev. Gen. Bot. 38:695, 1926. Shi, Euglenophyta, Fl. alg. sinica. aqua. dulc. 6:117, 1999; Yamagishi 2010, p.76, pl. 38, f. 1; *Trachelomonas australis* var. *arcuata* Playfair

(Pl. III, Fig. 14)*

Broad ellipsoidal test; broadly rounded anterior and posterior ends; straight – slightly swelled lateral sides; collar absent, micro punctate wall without spines; tests diameter 14-18 µm and length 20-30 µm.

Voucher No: Deepor Beel – 05

Trachelomonas hispida var. **granulata** Playfair 1915: 21, pl. III [3]: figs 11, 12; Wołoski & Hindak 2005, p. 44, fig. 410, 411; Das and Adhikary 2014, p. 181, pl. 13, f. 15;

(Pl. III, Fig. 15)*

Ellipsoidal lorica, 22.8 - 23 µm long and 17-18 µm broad, reddish brown, lorica punctate with a small number of granules, collar absent at apical pore.

Voucher No: Deepor Beel - 10

Trachelomonas pavlovskoensis f. **ellipsoidea** Popova 1955:93, fig. 25: 5-7; Popova & Safonova, Fl. Plant. Crypt. URSS 8(1): 174, 1966. Yamagishi, Plankton Alg. Taiwan 67, 1992; Yamagishi 2010, p.91, pl. 43, f. 1-2;

(Pl. III, Fig. 16)*

Ellipsoid to oblong ellipsoid tests; narrowly rounded anterior and posterior ends; flagellum apertures with long, cylindric collar; densely punctate walls; tests diameter 20-24 µm and length without collar 29-37 µm, collar 4-6 µm long.

Voucher No: Deepor Beel - 257

Trachelomonas planctonica f. **oblonga** (Drezepolski) T.G.Popova 1966: 171; Rosp. Wiad. Mus. Dziedud. Zykich, 7/8: 15, 1921-1922. Yamagishi in Yamagishi & Akiyama, Photomicrog. Freshw. Alg. 10: 99, 1989; Yamagishi 2010, p.92, pl. 43, f. 4-5; *Trachelomonas planctonica* var. *oblonga* Drezepolski

(Pl. III, Fig. 17)*

Oblong to broad- ellipsoid tests; broadly rounded anterior and posterior ends, straight and parallel lateral sides; flagellum aperture with short, cylindric collar; densely punctate walls; tests diameter 17-20 µm and length without collar 21-28 µm, collars 3-4 µm long.

Voucher No: Deepor Beel - 11

Trachelomonas reinhardii Svirengo 1916: 90, 126, pl.

1: fig. 9, 10; Trav. Soc. Nat. Univ. Imp. Kharkow 48: 90, 1915. Skvortzov, Arbeit. Biol. Sungari-Stat. 1(2): 29, 1925, Yamagishi 2010, p.94, pl. 43, f. 13;

(Pl. III, Fig. 18)*

Broad- ovoid to globose tests; broadly rounded anterior ends; slightly narrowly rounded posterior ends; truncately flattened sometimes, with a hollow at the centre; flagellum aperture collar broad cylindric with a slightly irregular mouth; wall densely punctate all over; tests diameter 21-22 µm, length without collar 23-25 µm and collars length 2-3 µm.

Voucher No: Deepor Beel - 127

Trachelomonas volvocina (Ehrenberg) Ehrenberg 1834: 315; Srivastava & Odhwani 1990 a, p. 122, pl. 2, fig. 1; Das and Adhikary 2014, p. 181, pl. 13, f. 21 *Microglena volvocina* Ehrenberg

Lorica spherical and collar depressed, yellowish brown in colour, smooth pellicle, lorica 10.3 - 13.8 µm in diameter.

Voucher No: Deepor Beel - 553

Previously reported from Assam: Lake Baskundi anua, Cachar District (Devi & al., 2015)

Trachelomonas volvocina var. **punctata** Playfair 1915: 9, pl. I [1]: fig. 2; Proc. Linn. Soc. N.S. Wales 40: 9, 1915. Yamagishi, plankton Alg. Taiwan 73, 1992; Yamagishi 2010, p.100, pl. 46, f. 4;

(Pl. III, Fig. 19)*

Globose to sub globose tests; flagellum aperture collar absent, but a ring-like thickening of the wall present; *finely punctate wall; tests diameter 16-22 µm (13-15 µm, Playfair, 1915).*

Voucher No: Deepor Beel - 07

Trachelomonas volzii var. **pellucida** Playfair 1915: 14, pl. II [2]: fig. 1; Yamagishi 2010, p. 101, pl. 46, fig. 12;

(Pl. III, Fig. 20)*

Tests long and ovoid, lower part broader than upper part, lateral sides nearly straight, collar long. 17.5-21µm diameter and 39-43µm long with the collar.

Voucher No: Deepor Beel - 858

Family-Phacidae

Lepocinclis acus var. **minor** (Hansgirg) D.A.Kapustin 2011: 138; Prodromous Algalflora Bohemen 2: 173, 1892. Yamagishi, Plankton Alg. Taiwan 26, 1992; Yamagishi 2010, p.37, pl. 15, f. 2; *Euglena acus* var. *minor* Hansgirg

(Pl. III, Fig. 21)*

Long cells, fusiform; anterior ends truncate, posterior end tapered into a long spine like cauda; paramylon bodies numerous, long rod shaped; smaller cells than the typical one, diameter 5-6.5µm and length with the cauda 70-75 µm

Voucher No: Deepor Beel - 02

Lepocinclis caudata (A.M.Cunha) Pascher 1927: 592; John & al., 2005, p. 159, pl. 38, fig. J.; *Crumenula caudata* A.M.Cunha

(Pl. III, Fig. 22)*

Club-shaped to spindle-shaped cells; anterior ends produced to a shortly elongated knob; a narrowing long tail-piece at the posterior end; disc-shaped chloroplasts; 2 large paramylon bodies; striated pellicle with left hand spiral; cells width 15-20 µm and length 45-60 µm.

Voucher No: Deepor Beel - 564

Lepocinclis fusiformis var. *amphirhynchus* Nygaard 1950: 167, fig. 101; Yamagishi 2010, p. 41, pl. 18, fig. 9;

(Pl. III, Fig. 23)*

Broad fusiform cells; conically narrowed anterior cells, with a truncately rounded and shallowly bilobed apex; rounded and conical posterior ends produced into a short caudal process; 2 ring-like paramylon bodies; cells diameter 20-22 µm and length 28-35 µm.

Voucher No: Deepor Beel - 574

Lepocinclis hungpanchiaensis S.P.Chu 1936: 280, fig. 13; Yamagishi 2010, p. 42, pl. 19, fig. 4;

(Pl. III, Fig. 24)*

Fusiform cells; narrowly rounded anterior ends and bilobed just at one side below the end; narrowed posterior end with short, thin cauda; 2 ring-like plate paramylon bodies; cells diameter 22-23 µm and length with the cauda 40-47 µm.

Voucher No: Deepor Beel - 627

Lepocinclis oxyuris (Schmarda) B.Marin & Melkonian in B.Marin & al. 2003: 104; Yamagishi 2010; P 38; pl 16 fig. 1; *Euglena oxyuris* Schmarda

(Pl. III, Fig. 25)*

Cells cylindrical and twisted with a keel-like fold on the dorsal side, posterior end tapered into a long, narrow, pointed cauda, anterior end rounded, slightly oblique, paramylon bodies two, broad and ring like, cells 135µm -165µm long with the cauda and 19-26µm in diameter.

Voucher No: Deepor Beel - 857

Lepocinclis salina f. *pachyderma* (Deflandre) Conrad 1935: 59; Yamagishi 2010, p. 45, pl. 20, fig. 6; *Lepocinclis texta* var. *pachyderma* Deflandre

(Pl. III, Fig. 26)*

Broad ovoid cells; numerous small granular paramylon bodies (a single circular plate not reported in Yamagishi, 1994); cells diameter 17-19 µm and length 22--27 µm.

Voucher No: Deepor Beel - 14

Lepocinclis salina var. *papulosa* W.Conrad; Yamagishi 2010, p. 45, pl. 20, fig. 5.

(Pl. III, Fig. 27)*

Broad ovoid to cylindric ovoid cells; narrowed and

shallowly bilobed anterior ends, with one side projected; broadly rounded posterior, without or with a short obtuse, papillate cauda; nearly straight lateral sides and parallel at mid region; numerous rod-like paramylon bodies, cells diameter 30-36 µm and length 45-50 µm.

Voucher No: Deepor Beel - 421

Lepocinclis steinii (Lemmermann) Lemmermann 1904: 123; John & al., 2005, p. 159, pl. 38, fig. F; *Lepocinclis ovum* var. *steinii* Lemmermann

(Pl. III, Fig. 28)*

Cells width 15-20 µm and length 45-60 µm, cells club-shaped to spindle shaped; elongated knob at the anterior end; narrowing long tail-piece at the posterior end; disc-shaped chloroplasts; 2 large paramylon bodies; striated pellicle with left-handed spiral.

Voucher No: Deepor Beel - 778

Phacus acuminatus A.Stokes 1885: 183, fig. 1; Wofowski & Hindak 2005, p. 34, fig. 219; Das and Adhikary 2014, p. 179, pl. 12, f. 21

Cells broadly ovoid or oval in outline, 21.3 - 24.5 µm long and 17 -19 µm broad, straight lateral margins present, dorsal furrow shallow and extending half to three quarters of the cell length, anterior end incised, short extension at posterior end, longitudinally striated pellicle, chloroplasts parietal, disc shaped, numerous, paramylon bodies ring like, 1 - 2 in number.

Voucher No: Deepor Beel - 455

Previously reported from Assam: Samaguri lake (Buragohain & al., 2012); Tinsukia District (Bordoloi, 2016); Jor Pukhuri, kamrup District (Kakati, 2011); some oil Effluent Drains (Baruah & al., 2009).

Phacus anomalus F.E.Fritsch & M.F.Rich 1929: 73, fig. 24 H-N; John & al., 2005, p. 164, pl. 39, fig. G-I;

(Pl. III, Fig. 29)*

Cells asymmetrical, ovate to pear shaped, cell divide into 2 unequal halves by a deep broad ventral furrow or apical groove of varying length, wing-like, oppositely twisted; sharply bent tail-piece at posterior end; parietal, numerous, disc-shaped chloroplasts; 2 paramylon bodies, flagellum same length as cell; cell width 16-18 µm, thick 19-22 µm and length 23-27 µm.

Voucher No: Deepor Beel - 711

Phacus caudatus var. *minor* Drezepolski 1925: 230, 266, fig. 107; Yamagishi 2010, p. 50, pl. 22, fig. 4;

(Pl. III, Fig. 30)*

Asymmetrical ellipsoid to oblong cells; nearly straight one lateral side whereas the other side is broadly swelled, slightly broader posterior ends, narrowly rounded anterior ends and shallowly bilobed; asymmetrical posterior ends; narrowed into a thin oblique cauda; paramylon bodies with two large circular plate like rings

;cell diameter 10-16 µm and length 21-23 µm.

Voucher No: Deepor Beel - 627

Phacus circulatus Pochmann 1942: 177, fig. 77; Yamagishi 2010, p. 50, pl. 22, fig. 5;

(Pl. IV, Fig. 1)*

Nearly circular cells; slightly narrowed and rounded anterior ends; broadly rounded posterior ends with a short and curved cauda; 1 or 2 circular plate-like paramylon bodies; cells diameter 25-27 µm, length with the cauda 26-29 µm, caudae 3-4 µm in length.

Voucher No: Deepor Beel - 09

Phacus dangeardii Lemmermann 1910: 513; Yamagishi 2010, p. 51, pl. 23, fig. 2;

(Pl. IV, Fig. 2)*

Broad-ellipsoidal to ovoid cells; rounded and bilobed anterior ends; rounded but sometimes narrowly rounded posterior ends; posterior ends without a clear cauda; 2 ring-like or circular plate like paramylon bodies; cells diameter 9-13 µm and length 18-20 µm.

Voucher No: Deepor Beel - 628

Phacus limnophilus (Lemmermann) E.W.Linton & Karnkowska in Linton & al. 2010: 609; John, Whitton and Brook, 2003, 2005, p.153, pl. 34, f. B; *Euglena limnophila* Lemmermann

(Pl. IV, Fig. 3)*

Cells spindle to cylindrical shaped; anterior end slightly

truncate and a sharp tail piece at the posterior end; slightly striated pellicle; numerous, small, disc-shaped chloroplasts; large, few, elongated rings or rod-like paramylon bodies, shorter flagellum, small eyespot; cells width 7.5-12(-13.6) µm and length 40-90 µm.

Voucher No: Deepor Beel - 171

Phacus mariae Deflandre 1930; Yamagishi 2010, p. 56, pl. 26, fig. 4; (Pl. IV, Fig. 4)*

Long- trapezoid cells, rounded corners having high longitudinal ridge on dorsal face; broadly rounded and shallowly bilobed anterior ends; truncately rounded posterior ends with thin, straight cauda; 2 circular-plate like paramylon bodies; cells diameter 22-25 µm and length without cauda 24-28 µm, caudae length 4-9 µm.

Voucher No: Deepor Beel - 700

Phacus ovalis (Woronichin) Popowa 1955: 236; Yamagishi 2010, p. 58, pl. 27, fig. 3; *Phacus longicauda* var. *ovalis* Woronichin

(Pl. IV, Fig. 5)*

Large, long-ovoid cells; gradually narrowed and rounded anterior ends; posterior ends broader than the anterior end, tapering suddenly into thin, long cauda; 1-2 ring-like or circular plate like paramylon bodies; cells diameter 42-46 µm, length with the cauda 87-120 µm; caudae length 20-35 µm.

Voucher No: Deepor Beel - 711

Phacus pleuronectes (O.F.Müller) Nitzsch ex Dujardin



Plate-IV:(Fig 1-12): 1. *Phacus circulatus* 2. *Phacus dangeardii* 3. *Phacus limnophilus* 4. *Phacus mariae* 5. *Phacus ovalis* 6. *Phacus subspiralis* 7. *Gyropaigne kosmos* 8. *Goniochloris mutica* 9. *Mallomonas transsylvanica* 10. *Centritractus belonophorus* 11. *Nephrodiella lunaris* 12. *Tetraplektron laevis* (Scale bar = 10 µm)

1841: 336, pl. 5: fig. 5 a, b; Yamagishi 2010, p. 58, pl. 27, fig. 4. *Cercaria pleuronectes* O.F.Müller

Broad ovoid to sub circular cells; slightly, narrowly rounded anterior ends; broadly, abruptly rounded posterior ends, with an obliquely, curved cauda; 2 ring-like or circular plate like paramylon bodies; cells diameter 35-50 µm and length without cauda 40-55 µm; 5-10 µm caudae.

Voucher No: Deepor Beel - 711

Previously reported from Assam: Raja Pukhuri, Rani Pukhuri, Gopeswar temple Pond Kamrup District (Kakati, 2011).

Phacus subspiralis Z.Shi 1986: 70, fig. 2a,b; Yamagishi 2010, p. 61, pl. 29, fig. 1;

(Pl. IV, Fig. 6)*

Long-fusiform cells in face view, but twisted slightly at anterior part; narrowed anterior ends produced into an obliquely, truncately rounded and bilobed apex; swelled and conical posterior ends tapered into a thin, long, slightly curved cauda; 2 rod-like paramylon bodies; cells diameter 10-12 µm and length with the cauda 30-32 µm.

Voucher No: Deepor Beel - 572

Class-**Peranemea**; Order-**Natomonadida**;

Family-**Astasiidae**

Gyropaigne kosmos Skuja 1939: 113, pl. VII [7]: figs 16-18; Yamagishi 2010, p. 39, pl. 16, fig. 6;

(Pl. IV, Fig. 7)*

Short cylindric cells; rounded anterior and posterior ends, slightly produced center of the posterior end; rigid periplast, with longitudinal ridges 8-10 and have granular row; in top view circular with 8-10 angles of the ridges; cells diameter 22-24 µm and length 32-34 µm.

Voucher No: Deepor Beel - 677

Phylum-**Ochrophyta**; Class-**Eustigmatophyceae**;

Order-**Gonioclhoridales**; Family-**Gonioclhoridaceae**

Gonioclhoris mutica (A.Braun) Fott 1960: 146; John & al., 2005, p. 254, pl. 65, fig. C; *Polyedrium muticum* A.Braun

(Pl. IV, Fig. 8)*

Cells in shape of an equilateral triangle, with concave sides and angles rounded; thin walls, honey-comb like pattern ornamentation of small pits less than 1 µm across and not visible readily; 2-3 disc-shaped chloroplasts; cells size 10-12 µm.

Voucher No: Deepor Beel - 564

Tetraëdriella regularis (Kützing) Fott 1967: 358; Philipose 1967, p. 145, fig. 60 a-d; Das & Adhikary 2014, p. 145, pl. 11, fig. 15. *Tetraëdron regulare* Kützing

Cells tetragonal, pyramidal, sides slightly concave, each

angle produced to form stout lobe tipped with a short blunt spine; cell wall smooth, cell diameter with spines 43.5-48 µm, diameter of cell without spine 40-43 µm.

Voucher No: Deepor Beel - 947

Previously reported from Assam: Deepor Beel WLS (Baruah & al., 2013; Das & Adhikary, 2014)

Tetraëdron tumidulum (Reinsch) Hansgirg 1889: 18; Yamagishi 2010, p. 121, pl. 68, fig. 2. *Polyedrium tumidulum* Reinsch

Pyramidal, triangular, rarely quadrangular cells; concave sides; narrowly rounded angles, spine absent; cells diameter 10-18 µm.

Voucher No: Deepor Beel - 669

Previously reported from Assam: Kaziranga National park (Yasmin & al., 2015).

Class-**Synurophyceae**; Order-**Synurales**;

Family-**Mallomonadaceae**

Mallomonas transsylvanica L.S.Péterfi & Momeu 1976: 52, figs 1-28; Yamagishi 2010, p. 26, pl. 10, fig. 7;

(Pl. IV, Fig. 9)*

Ovoid to long ovoid cells, narrowly rounded anterior ends and broadly rounded posterior ends, entire face covered with long setae, 10-18 µm broad cells and length 20-40 µm, setae length 24-30 µm.

Voucher No: Deepor Beel - 127

Class-**Xanthophyceae**; Order-**Mischococcales**;

Family-**Centritractaceae**

Centritractus belonophorus (Schmidle) Lemmermann 1900: 274; John & al., 2005, p. 248, pl. 67, fig. A; *Schroederia belonophora* Schmidle

(Pl. IV, Fig. 10)*

Ellipsoidal cells when young with apical spines longer than cell, older cells up to 8 times longer than broad; wall visible in 2 parts, separated by a thin walled area as the cell lengthens; reproduction by biflagellate zoospores or alpanospores.

Voucher No: Deepor Beel - 823

Family-**Pleurochloridaceae**

Nephrodiella lunaris Pascher 1937: 429 [key], 433, fig. 299 a-t; John & al., 2005, p. 256, pl. 65, fig. G;

(Pl. IV, Fig. 11)*

Except after reproduction cells solitary; cells kidney-shaped to lunate, rounded or tapered at ends; 1 or 2 chloroplasts; cells width 3-6 µm and length 7-18 µm.

Voucher No: Deepor Beel - 761

Tetraplektron laevis (Bourrelly) Ettl 1977: 561; Yamagishi 2010, p. 29, pl. 11, fig. 6; *Tetraëdriella laevis* Bourrelly

(Pl. IV, Fig. 12)*

Cells pyramidal, in top view slightly concave sides, small papillar like or short spined angles, smooth cell wall, cell sides length 23-24 µm with the spines.

Voucher No: Deepor Beel - 760

DISCUSSION

Result of the present endeavor revealed that the Deepor beel Ramsar site though located just at the outskirts of Guwahati city, it harbours around 219 algal species which could be categorized under Bacillariophyta, Charophyta, Chlorophyta, Cyanobacteria, Euglenozoa and Ochrophyta. The number of the reported species was far higher than that of the earlier records from the Deepor beel itself which was altogether 59 as reported by Baruah & al. (2013), Borgohain & Tanti (2014), Sharma (2015), Nahar & Tanti (2017) and Deb & al. (2019) and Loktak lake of Manipur (75) as reported by Sharma (2009) and Rudrasagar lake of Tripura (35) as reported by Bharati & al. (2020). These three are the Ramsar sites representing North Eastern India. In all the papers mentioned above, either detailed taxonomic descriptions were missing or the species were reported upto genus level only.

Chlorophyta with 73 number of species was revealed to be the most dominant taxa in the Deepor beel during the present investigation. This showed concurrence with the results of Sharma (2015) where Chlorophyta was encountered with maximum number of species. This salient feature of Chlorophyta's dominance might be an indication of a healthy status of the water body which concurred with the reports of Palmer (1980), Descy (1987) and Shivalingaiah & al. (2009).

In terms of genera also, Chlorophyta was outnumbered with 41 genera followed by Cyanobacteria (19), Bacillariophyta (18), Charophyta (10), Euglenozoa (9) and Ochrophyta (7) respectively. In the present study, *Cosmarium* with 12 species was recorded to be the dominant genus which was followed by *Phacus* and *Desmodesmus* with 10 species each, *Trachelomonas* and *Lepocinclis* with 8 species each and *Closterium* with 7 species respectively. The reporting of a number of representatives from Palmer's pollution tolerant genera (Palmer, 1969) with higher index score like *Chlamydomonas*, *Euglena*, *Oscillatoria* and *Scenedesmus* was a reason of concern for enhancement of organic pollution in the beel. This may be attributed due to the input of sewage from the city as well as the solid municipal waste dumping site located in the closest proximity of the beel (Deb & al., 2019). The extent of escalation of organic pollution cannot be compared or confirmed due to lack of previous reports on biomonitoring of the beel using pollution tolerant algal genera.

The present survey in the Deepor beel Ramsar site and

Wildlife Sanctuary however, highlighted its biodiversity value and provided useful information on the composition of diverse algal community of the perennial water body. Several algal taxa recorded in the present study were not found to be reported earlier from the region. Out of the reported 219 species, a total of 108 numbers of algal species were reported for the first time from Assam which were belonging to Bacillariophyta (13), Charophyta (14), Chlorophyta (40), Cyanobacteria (6), Euglenozoa (30) and Ochrophyta (5). Further, considering the appearance of Palmer's genera in the beel, appropriate management interventions are suggested through biomonitoring using algae as a tool.

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