PHYCO-DIVERSITY ASSESSMENT OF BAHUDA RIVER MOUTH AREAS OF EAST COAST OF ODISHA, INDIA

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Abstract
A total of 31 algal samples were collected from 5 sampling sites of various water bodies of Bahuda river mouth areas of Orissa during a collection trip in the month of January 2010. Altogether 36 algal taxa were reported belonging to Cyanobacteria/Cyanoprokaryota, Chlorophyta, Euglenozoa and Bacillariophyta. The species distribution indicates the dominance of green algae followed diatoms and blue green algae. The occurrence of species with respect to trophic status of these water bodies indicate that ditch is more eutrophicated in comparison to mesotrophic pond and oligotrophic river.

Keywords: Phyco-diversity, Bahuda River, Odisha

Introduction
Odisha has a long coastline of 480 km with several major rivers, distributaries and channels which drain into the Bay of Bengal and provides a variety of ecological niches and habitats for rich and diverse algal growth. Bahuda is one of the major rivers of the southern part of India. Though several studies have been carried out on algal diversity of different river systems of India (Biswas 1949, Iyengar & Venkataraman 1951, Singh 1963, Gupta 1964, Prasad 1965, Venkateswarlu 1976, Barhate & Tarar 1981, Rana & Parlia 1988, Habib & Pandey 1990, Nautial et al. 1995, 1996, 1997, Habib & Chaturvedi 1999, 2000, 2001, Habib 2002), assessment of phyco-diversity in this typical location of the tropical east coast region is few (Padhi & Padhi 1999, Adhikary 2000, Jena et al. 2005, 2008). However, the Phyco-diversity assessment of these area not yet been carried out. Hence, the present study was carried out with the future prospective of screening of potential micro-algae for biodiesel production.

Materials and Methods

Study area
Bahuda river which originates in Gajapati district of the Eastern Ghat region of Odisha joins the Bay of Bengal in Odisha-Andhra Pradesh border, spanning a length of 73 km with of 1250 km² catchment area. (Fig 1; site map). The tidal effect and anthropogenic activity made this habitat suitable for the growth of various group of algae in and around this region.

Sampling and observation
Algal samples were collected randomly from 5 sampling sites of Bahuda river mouth and its adjoining areas during January 2010 (Figure-1). The temperature of the water bodies of these collection site varies from 25-28°C and pH ranges from 6.5-8.5 (Table-1). The tidal effect at these areas support the occurrence of algae in various forms e.g. epilithic biofilms, benthic, planktonic, epipelic, epizoic and epiphytic. A total of 31 algal samples were collected from these sites and the voucher numbers were preserved in pre-sterilized specimen bottles with 4% formaldehyde solution. Sample collections were made using forceps and needle and/or plankton net (45 µm pore size). Epilithic samples were scraped using a tooth brush. Planktonic samples were fixed with Lugol’s Iodine on spot and brought to the laboratory at Institute of Minerals and Materials Technology (CSIR), Bhubaneswar for analysis. Measurement of cell dimension was carried out by micrometry and microphotograph of each specimen was taken using a Meiji ML-TH-O5 Trinocular research microscope fitted with Nikon Coolpix 4500 digital camera. The organisms were identified following monographs for various algal groups (Kützing 1865, Turner 1892, Desikachary 1959, 1989, Philipose 1967, Komárek & Anagnostidis 1998, 2005).

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Fig. 1: Site map and respective photographs of each sampling site at Bahuda river mouth and its adjoining areas: 1- Community pond (19°06’35.34"N; 84°46’31.86"E; Altitude-14ft), 2- Boating station (19°06’26.98"N; 84°46’37.34"E; Altitude- 9ft), 3- Temporary ditch (19°06’20.76"N; 84°46’42.11"E; Altitude- 23ft), 4- Sea (19°06’12.61"N; 84°46’49.63"E; Altitude-15ft), 5- River mouth (19°07’32.00"N; 84°47’44.06"E; Altitude-0ft), and Photo no.6- Occurrence of algae on rock and shell surface

Enumeration of algal taxa
Phylum – Cyanobacteria
(Class – Cyanophyceae
Order – Chroococcales
Family - Microcystaceae
Genus – Microcystis Kützing ex Lemmermann

1. *Microcystis aeruginosa* (Kützing) Kützing (Pl. 1, Fig. 4)
   (Basionym – Micraloa aeruginosa Kützing)
   (Synonym – Clathrocystis aeruginosa var. major, Microcystis aeruginosa f. aeruginosa Kützing, Micraloa aeruginosa Kützing, Diplocystis aeruginosa (Kützing) Trevisan, Clathrocystis aeruginosa (Kützing) Henfrey)
   Colonies mucilaginous, microscopic, rounded, mucilage colourless, structureless, diffuent, cells spherical, pale blue green to brown in colour, with numerous aerotopes, 3.5 μm in diameter.
   Habitat –Planktonic in river near estuary; Voucher number – 16; Date of collection – 21.01.2010.

2. *Planktothrix compressa* (Utermöhl) Anagnostidis et Komárek (Pl. 1, Fig. 2)
   (Basionym – Oscillatoria compressa Utermöhl, Oscillatoria compressa (Utermöhl) Geitler)
   Filaments solitary, slightly visible sheaths, trichomes cylindrical, sometimes or little complanate from sides, grey green, 4.7 μm wide, slightly constricted at cross walls, not attenuated towards the ends, cells usually shorter than wide, 1.6-2.6 μm long, with membranous aerotopes, apical cell widely rounded.
   Habitat – Planktonic in river; Voucher number –27; Date of collection - 21.01.2010.

3. *Planktothrix planktonica* (Elkenin) Anagnostidis et Komárek (Pl. 1, Fig. 2)
   (Basionym – Oscillatoria ornata f. planctonica Elenkin)
   (Synonym - Oscillatoria ornata f. planctonica Elenkin)
   Trichomes solitary, cylindrical, 12.5 μm wide, fine and distinctly constricted at the cross walls, cells 7.5 μm long, with densely arranged aerotopes which causes a brown to blackish colour of the trichomes, apical cell convex, wide rounded, without calyptra.
   Habitat – Epilithic and planktonic in river; Voucher number – 29, 31; Date of collection - 21.01.2010.
4. *Phormidium chalybeum* (Mertens ex Gomont) Komárek & Anagnostidis (Pl. 1, Fig. 1)
   (Synonym - Oscillatoria princeps Vaucher, Trichophorus princeps (Vaucher) Desvaux, Oscillatoria princeps (Vaucher) Gaillon, Lyngbya princeps (Vaucher) Hansgirg)
   Thallus bluish green, trichomes mostly straight, not constricted at the cross walls, 8.5 µm broad, slightly or briefly attenuated at the apices and bent, cells 3-4 µm long.
   Habitat – Epilithic bluish green biofilms in river; Voucher number – 16; Date of collection - 21.01.2010.

Phylum - Chlorophycophyta
Class - Chlorophyceae
Order - Sphaeropleales
Family - Hydrodictyaceae
Genre – *Pediastrum*

5. *Pediastrum tetras* (Ehrenberg) Ralfs (Pl. 1, Fig. 17)
   (Synonym – Micrasterias tetras Ehrenberg)
   (Synonym – Pediastrum ehrenbergii (Corda) A. Braun)
   Coenobia 8 celled, circular, 22 µm in diameter, cells with intercellular spaces, marginal cells divided into 2 lobes with a deep single linear incision, inner cell with 6 sided with a single linear incision, cells 8.5 µm wide at middle and 10 µm long.
   Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

Family – Scenedesmaceae
Genre – *Desmodesmus*

6. *Desmodesmus armatus* (Chodat) var. *spinosus* (Fritsch et Ritch) Hegewald (Pl. 1, Fig. 16)
   (Synonym: Scenedesmus armatus (Chodat) var. spinosus (Fritsch et Ritch) 1929)
   (Synonym: Scenedesmus armatus var. brevicaudatus (L. Piterfi) Hegewald 1982; Scenedesmus armatus var. bogliarensis f. brevicaudatus L. Piterfi 1961)
   Coenobia 4 celled, radially arranged from a common center, cells spindle shaped, middle of the cell slightly broad to parallel, apices slightly attenuated, lateral cells with spines at both ends, chloroplasts single, parietal with pyrenoid, cell 4. 5 µm broad and 12 µm long.
   Habitat – Planktonic in pond; Voucher number – 18, 21; Date of collection - 21.01.2010.

7. *Scenedesmus acucae* Comas (Pl. 1, Fig. 19)
   Coenobia slightly curved, 4 celled, arranged in a single linear series, cells oblong-ellipsoid, or long cylindrical with the ends broadly rounded, chloroplasts single, parietal with a pyrenoid at the centre, cells 8.5 µm long and 3.5 µm broad.
   Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

8. *Scenedesmus acutus* f. *alterans* Hortobagyi (Pl. 1, Fig. 7)
   Coenobia 8 celled, arranged in a single linear series, cells ellipsoid with attenuated to both ends, chloroplasts granular, without a pyrenoid, cells 21µm long and 8.5 µm broad.
   Habitat – Planktonic in pond; Voucher number – 19, 20; Date of collection - 21.01.2010.

9. *Scenedesmus dimorphus* (Turpin) Kützing (Pl. 1, Fig. 8)
   (Basionym – Achnantes dimorphus Turpin)
   (Synonym - Achnantes dimorphus Turpin, Scenedesmus antennatus Brébisson in Ralfs, Scenedesmus obliquus var. dimorphus (Turpin) Hansgirg, Scenedesmus costatus Chodat, Scenedesmus acutus var. dimorphus (Turpin) Rabenhorst, Scenedesmus acutus var. obliquus Rabenhorst)
   Colonies 7-8 celled, with the cells arranged in linear way, outer cells more or less lunate with the apices attenuated, cells 22 µm long and 4.4 µm broad.
   Habitat – Planktonic near ferry station of river; Voucher number – 36, 39; Date of collection - 21.01.2010.

10. *Scenedesmus ecornis* (Ehr.) Chodat var. *ecornis* (Pl. 1, Fig. 9)
    Coenobia slightly curved, 4 celled, arranged in a single linear series, cells oblong, with the ends broadly rounded, chloroplasts single, parietal with a pyrenoid at the centre, cells 13 µm long and 7 µm broad.
    Habitat – Planktonic in pond; Voucher number – 21; Date of collection - 21.01.2010.

11. *Scenedesmus quadricauda* (Turpin) Brébisson var. *quadrispina* (Chodat) G.M. Smith (Pl. 1, Fig. 20)
    Coenobia 4 celled, cells 13-16µm long and 4.4-5.5µm broad, obtuse end, short spines are present on both the poles of the terminal cells, cells cylindrical
    Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

Family – Ankistrodesmaceae
Genre – *Monoraphidium*

    Cell solitary, unicellular, elongated, fusiform, sigmoid or twisted, tapering towards both ends, ends are sharply pointed, homogenous, without pyrenoid, cells are 18.5 µm long and 2 µm wide at middle.
    Habitat – Planktonic in river; Voucher number – 39; Date of collection - 21.01.2010.
13. Monoraphidium griffithii (Berkeley) Komárek-Legnerova (Pl. 1, Fig. 13)
   (Synonym – Ankistrodesmus falcatus var. acicularis (Braun) G.S. West, Closterium griffithii Berkeley)
   Straight or moderately bent fusiform cells, gradually tapered from the center towards the ends, pointed end, cells are 71 µm long and 3.5 µm broad.
   Habitat – Planktonic in river; Voucher number – 39; Date of collection - 21.01.2010.

14. Monoraphidium minutum (Nägeli) Komárek - Legnerova (Pl. 1, Fig. 21)
   (Basionym – Raphidium minutum Nägeli, Ankistrodesmus minutissimus Korshikov, Raphidium convolutum var. minutum (Nägeli) Rabenhorst, Selenastrum minutum (Nägeli) Collins, Ankistrodesmus lunulatus Belcher & Swale)
   Cell is solitary, slightly sigmoid or kidney shaped obtuse tip, 11 µm long and 5.5 µm broad, central area is broad.
   Habitat – Planktonic in both pond and river; Voucher number – 21, 29; Date of collection - 21.01.2010.

15. Monoraphidium indicum Hindák (Pl. 1, Fig. 12)
   Cell solitary, bent, cells broader at middle, gradually tapered from the center towards the ends, pointed end with 2 parietal chloroplast, cells are 92 µm long and 6 µm broad.
   Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

16. Kirchneriella rotunda (Koršikov) Hindák (Pl. 1, Fig. 11)
   Cells solitary, twisted, fusiform with attenuated tip, chloroplast single, parietal, without pyrenoid, cells 10-13 µm long and 2.5 µm broad.
   Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

18. Stigeoclonium attenuatum (Hazen) Collins (Pl. 1, Fig. 5)
   (Basionym – Myxornema attenuatum Hazen)
   (Synonym - Myxornema attenuatum Hazen)
   Filaments elongate with upper branching mostly alternate but dichotomously branched below, the branches either short or spine like or long and tapering, terminating in a sharply pointed cell or series of cells forming a hyaline seta, cells cylindrical with little or no connection at the crosswalls, cells in the main axis is 3-8.5 µm, 10-30 µm long.
   Habitat – Epilithic near estuary; Voucher number – 13; Date of collection - 21.01.2010.

19. Enteromorpha clathrata (Roth) Greville (Pl. 1, Fig. 6)
   Basionym - Conferva clathrata Roth
   Thallus filamentous, branched, floating in masses, plant body tubular, composed of multiseriate cells with thick cell walls and parietal chloroplasts, cells 8 µm long.
   Habitat- Epilithic, submerged floating in river near estuary, Voucher number- 14, Date of collection- 06.01.2009
   Phylum – Euglenozoa
   Order – Euglenales
   Family – Euglenaceae
   Genus – Euglena Ehrenberg

20. Euglena cuneata Pringsheim (Pl. 1, Fig. 15)
   Cell reniform with ribbon like chloroplasts, radial, arranged around the center, 23.5 µm long and 7 µm broad, narrowed at anterior end with red eye spot and blunt rounded at posterior end.
   Habitat – Planktonic in pond and ditch; Voucher number – 18, 21 and 24; Date of collection - 21.01.2010.

21. Euglena sanguinea Ehrenberg (Pl. 1, Fig. 14)
   (Synonym – Euglena viridis var. sanguinea (Ehrenberg) Playfair, Oscillatoria sanguinea (Ehrenberg) Itzigsohn & Rothe)
   Cells cylindrical to broadly spindle shaped, 97.5 µm long and 15 µm broad, red with haematochrome, chloroplasts numerous, thickly packed, each with pyrenoid.
   Habitat – Bloom in ditch; Voucher number – 22; Date of collection - 21.01.2010.

22. Trachelomonas volvocina Ehrenberg var. punctata Playfair (Pl. 2, Fig. 1)
   Cells reddish brown, lorica oval, membrane thick, cells 22 µm long and 21.3 µm broad
   Habitat – Planktonic in pond and ditch; Voucher number – 20, 26; Date of collection - 21.01.2010.
Phylum – Bacillariophyta
Order – Thallasiosirales
Family – Stephanodiscaceae
Genus – Cyclotella

23. Cyclotella meneghiniana Kützing (Pl. 2, Fig. 2)
Frustules circular out line in valve view, rectangular and undulated in girdle view, rim well defined, striated, large hyaline centre bounded by a circle of cuneate areolae, 18 µm in diameter.
Habitat – Planktonic in river near ferry station;
Voucher number – 32; Date of collection - 21.01.2010.
Order – Striatellales
Family – Striatellaceae
Genus – Grammatophora

24. Grammatophora undulata Ehrenberg (Pl. 2, Fig. 4)
Frustules quadrangular with rounded angles, septa slightly undulate, valves linear oblong, ends capitulate, 42 µm long and 20 µm broad, striation visible at the axial area margin, transverse, but not visible towards end, striae 6-8 in 10 µm.

Habitat – Benthic from ferry station; Voucher number – 37; Date of collection - 21.01.2010.
Order – Fragilariales
Family – Fragilariaceae
Genus – Synedra

25. Synedra ulna (Nitzsch) Ehrenberg var. aequalis (Kützing) Hustedt (Pl. 2, Fig. 5)
Valve slender, linear, straight, end attenuated in valve view, striation linear, parallel almost through out the valve, striation uniformly placed, 14-16 in 10 µm, many times longer than broad, 202 µm long and 5 µm broad.
Habitat – Epilithic, benthic both from ferry station and estuary; Voucher number – 33, 35, 16; Date of collection - 21.01.2010.
Order – Achnanthales
Family – Achnanthaceae
Genus – Achnanthes

26. Achnanthes coarctata Brébisson var. parallela Venkataraman (Pl. 2, Fig. 7)
Valves linear with broad, rounded ends, margin almost parallel in the middle, raphe straight, axial area
broad, reaching the margins, striae fine, 30 μm long and 10 μm broad.
Habitat – Benthic from ferry station; Voucher number – 39; Date of collection - 21.01.2010.
Family – Cocconeidiaceae
Genus – Cocconeis
27. Cocconeis pediculus Ehrenberg (Pl. 2, Fig. 3)
(Synonym – Cocconeis communis f. pediculus (Ehrenberg) Chemilevski, Encyonema caespitosum var. pediculus (Ehrenberg) De Toni)
Frustules ovoid to ellipsoid, with marginal bend, lanceolate outline, rounded end, striaion transverse, fine 10-12 in 10 μm, raphe straight with polar nodule at each end, valve 18.5μm long and 12.5μm broad.
Habitat – Benthic from ferry station; Voucher number – 39; Date of collection - 21.01.2010.
Order – Naviculales
Family – Pinnulariaceae
Genus – Pinnularia
28. Pinnularia microstauron (Ehrenberg) Cleve (Pl. 2, Fig. 6)
(Synonym - Pinnularia viridis var. caudata Boyer)
Valve linear, girdle rectangular, almost parallel, slightly attenuated towards end, obtusely rounded ends, striaion transverse with central area, striae fine, raphe thin, straight, central nodules unilaterally bent, valve 40 µm long and 9 µm broad.
Habitat – Benthic from ferry station; Voucher number – 34; Date of collection - 21.01.2010.

29. Navicula cuspidata Kützing (Pl. 2, Fig. 8)
(Basionym – Frustulia cuspidata Kützing)
Frustules lanceolate, wide at the middle, axial area broad, attenuated towards apices and obtuse end, raphe at the middle, straight, striaion barely distinct in fresh material, longer than broad, 37.5 μm long and 9 μm broad.
Habitat – Benthic from ferry station; Voucher number – 35; Date of collection - 21.01.2010.
Order – Cymbellales
Family – Gomphonemataceaea
Genus - Gomphonema
30. Gomphonema sp (Pl. 2, Fig. 9)
Frustule lanceolate, narrow, linear, isopolar and broadly rounded ends, raphe central, straight, striaion fine, transverse, cells 50 μm long and 14μm broad.
Habitat – Epilithic from both ferry station and estuary; Voucher number – 30,10; Date of collection - 21.01.2010.

31. Gomphonema lanceolatum Ehrenberg (Pl. 2, Fig. 10)
Frustules clubshaped to lanceolate club, shaped with obtuse apex, axial area broad, raphe not clear, striaion coarse, transverse, slightly radial at the ends, striae 8-10 in 10 μm, 40 μm long and 11 μm broad, having long stalk attached to aquatic plant surface.
Habitat – Epilithic from ferry station; Voucher number – 37; Date of collection - 21.01.2010.

32. Gomphonema micropus Kützing (Pl. 2, Fig. 11)
Frustules small, linear, cuneate, asymmetrical, end truncate, but base obtuse, striaion marginal, parallel, 8-10 in 10 μm, 50 μm long, 9 μm broad.
Habitat – Epilithic from ferry station; Voucher number – 37; Date of collection - 21.01.2010.

33. Gomphonema vibrio Ehrenberg (Pl. 2, Fig. 12)
Frustules linear-lanceolate, elongated, attenuated to long, sub acute, rostrate end, raphe thin, median, striaion transverse, parallel, striae 10-12 in10 μm, 45 μm long and 11.5 μm broad.
Habitat – Planktonic in pond; Voucher number – 18; Date of collection - 21.01.2010.

34. Gyrosigma scalproides (Rabenhorst) Cleve var. exima (Thwait) Cleve (Pl. 2, Fig. 13)
Valve lanceolate, sigmoid, wider at middle, attenuated towards acute rounded ends, striaion and raphe not so clear in fresh sample, frustule 65 μm long and 13 μm broad.
Habitat – Planktonic from estuary; Voucher number – 16; Date of collection - 21.01.2010.
Order – Bacillariales
Family – Bacillariaceae
Genus – Nitzschia
35. Nitzschia obtusa Wm. Smith (Pl. 2, Fig. 14)
Frustules linear, with end obliquely truncate obtuse, striaion thin, striae 7-10 in 10 μm, 45 μm long and 7 μm broad.
Habitat – Planktonic from estuary and from ferry station; Voucher number – 12, 35; Date of collection - 21.01.2010.

36. Nitzschia vasnii Gandhi (Pl. 2, Fig. 15)
Valve narrow lanceolate or linear lanceolate, very small, valve margins almost parallel with cuneate ends, valve 40 µm long and 9 µm broad
Habitat – Epilithic from ferry station; Voucher number – 31; Date of collection - 21.01.2010.

Table 1. Algal taxa collected from river estuaries of Orissa coast, India

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Organisms</th>
<th>Community</th>
<th>Boating station</th>
<th>Temporary ditch</th>
<th>Bay of Bengal</th>
<th>River mouth</th>
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<tbody>
<tr>
<td>1</td>
<td><em>Cyanoprokaryota/ Cyanobacteria</em></td>
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<tr>
<td></td>
<td>Microcystis aeruginosa (Kützing) Kützing</td>
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<td>2</td>
<td><em>Planktothrix compressa</em> (Utermöhl) Anagnostidis et Komárek</td>
<td>-</td>
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<td>3</td>
<td><em>Planktothrix planktonica</em> (Elenkin) Anagnostidis et Komárek</td>
<td>-</td>
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<tr>
<td>4</td>
<td><em>Phormidium chalybeum</em> (Mertens ex Gomont) Anagnostidis et Komárek</td>
<td>-</td>
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<td>5</td>
<td><em>Chlorophyta</em></td>
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<td></td>
<td><em>Pediastrum tetras</em> (Ehr.) Rafts.</td>
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<td>6</td>
<td><em>Desmodesmus armatus</em> (Chodat) var. <em>spinosus</em> (Fritsch et Ritch) Hegewald</td>
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<td>7</td>
<td><em>Scenedesmus acutus</em> f. alterans Hortobagyi</td>
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<td>8</td>
<td><em>Scenedesmus dimorphus</em> (Turpin) Kützing</td>
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<td>9</td>
<td><em>Scenedesmus ecorinis</em> (Ehr.) Chodat var. <em>ecorinis</em></td>
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<tr>
<td>10</td>
<td><em>Scenedesmus quadricauda</em> (Turpin) Brébisson var. <em>quadrispina</em> (Chodat) Smith</td>
<td>+</td>
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<td>11</td>
<td><em>Monoraphidium contortum</em> (Thuret in Brébisson) Komárková-Legnerová</td>
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<td>12</td>
<td><em>Monoraphidium griffithii</em> (Berkeley) Komárková-</td>
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### Discussion

Data analysis revealed that a total of 36 algal taxa includes 4 taxa of Cyanobacteria/Cyanoprokaryota of species *Phormidium chalybeum*, *Planktothrix planktonica*, *Planktothrix compressa* and *Microcystis aeruginosa*, 15 species Chlorophyta of genera, viz., *Pediastrum*, *Desmodesmus*, *Scenedesmus*, *Monoraphidium*, *Coelastrum*, *Kirchneriella*, *Stigeoclonium* and *Enteromorpha*, of which *Scenedesmus* and *Monoraphidium* representing four species each being the dominant genera, 3 Euglenozoa species viz., *Euglena cuneata*, *Euglena cuneata Pringsheim*, *Euglena sanguinea Ehrenberg*, *Trachelomonas volvocina Her. var. subglobosa Lemmermann*, *Cyclotella meneghiniana (Kützing) Lange-Bertalot*, *Cocconeis pediculus Ehrenberg*, *Gramatophora undulata Ehrenberg*, *Synedra ulna (Nitzsch) Ehr. var. aequalis (Kutez.) Hustedt*, *Pinnularia microstauron (Ehrenberg) Cleve*, *Achnanthes coarctata Brébisson var. parallela Venkatraman*, *Navicula cuspidata Kützing*, *Gomphonema sp.* *Gomphonema lanceolatum Ehrenberg*, *Gomphonema micropus Kützing*, *Gomphonema vibrio Ehrenberg*, *Gyrosigma scalpoides (Rabenhorst) Cleve var. exima (Thwait) Cleve*, *Nitzschia obtusa Wm. Smith*, *Nitzschia vasii Gandhi*. 

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Presence</th>
<th>Absence</th>
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<td>Monoraphidium minutum (Nägeli) Komářková-Legnerová</td>
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<td>Monoraphidium indicum Hindák</td>
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<td>Stigeoclonium attenuatum (Hazen)Collins</td>
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<td>Gyrosigma scalpoides (Rabenhorst) Cleve var. exima (Thwait) Cleve</td>
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<td>Nitzschia vasii Gandhi</td>
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sanguine and Trachelomonas volvocina var. subglobosa occurred only in ditch indicating the water body as eutrophic. Bacillariophyta with 14 taxa including genera Cyclotella, Cocconeis, Gramatophora, Synedra, Pinnularia, Achnanthes, Navicula, Gomphonema, Gyrosigma and Nitzschia were found to occur from the boating station and estuary region, thus indicating the oligotrophic status of the water body. Diatoms were found to be the dominant group of algae found in river estuary, sea and boating station, whereas green algae were predominant in community ponds along with few diatoms.

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References
