Asian Journal of Agriculture & Life Sciences Vol. 2(1), January 2017: 28-34

Website: www.crsdindia.com/ajals.html e-ISSN: 2455-6149

ORIGINAL ARTICLE

Studies on Diversity of Planktonic Algeae in Fish Tank of Govt. Degree College, Siddipet, Telangana State

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Received: 30th Oct. 2016, Revised: 2nd Dec. 2016, Accepted: 9th Dec. 2016

ABSTRACT

A study was conducted to analyze of phytoplanktons and identify the diversity of algal components of fish tank located in Govt. Degree College Siddipet, Telangana State. 33 algal species were identified and abundant group of algal members belong to the groups of Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae and Dinophyceae. During the period of investigation the dominant class is Chlorophyceae in first position and second position are occupied by Bacillariophyceae and Cyanophyceae.

Key words: *Diversity, Phytoplankton, Algae, Fish tank, Siddipet*

INTRODUCTION

Algae the principle primary producers are photosynthetic thallophytes, usually microscopic, unicellular and colonial or multicellular organisms which perform the maximum quantum of photosynthetic activity than any living organisms in the world. As fixers of carbon and generators of biomass, algae are one of the major groups of photosynthetic organism within the fresh water ecosystem. They are distinguished from higher plants (Macrophytes) in terms of size and taxonomy and from photosynthetic bacteria in term of biochemistry. Planktonic algae are dominant in the main water body of standing water. Occurring as a detained seasonal succession of species in temperate lakes the temporal sequence depends on lake tropic status. The study of aquatic biology can be divided into two major disciplines. The aquatic algae located within continual boundaries where water in typically fresh and where water bodies are of two types standing water (lentic) particularly lakes and wetland running (lotic) water including streams and rivers. Ponds are the part of lentic systems which also include pools, puddles reservoirs lakes and paddy fields. The ponds may contain different types of phyco components like free floating planktons, Benthos (attached to sediments), epiphytic (attached to plants and other objects) etc.

The appearance of algae is most probably seasonal. This tank is located in Govt. Degree College, Siddipet for developing fishes. Occasionally this tank contain the water from ground water, the water profile is changed from day to day. This is the main source for pisciculture.

The aim of the present work is to identify the algal members enriched in the pond water. Obserervations revealed that most of them were from the Chlorophyceae, Bacillriophyceae, Euglenophyceae and Cyanophyceae (Fritsch 1907a, b).

MATERIALS AND METHODS

Siddipet, one of the 31 districts of Telangana State lies between 17^0 27' and 18^0 18' Northern latitude and 77^0 28' and 79^0 10' of Eastern longitude with a total annual rainfall of 50-55 cm and temperature ranging between 30-35^{0}C. Study site is Fish tank was chosen for carrying out the experimental work in identifying the algal members located in Govt. Degree College Siddipet. This college was established in 1956. Since Last twenty years college campus maintains the fish tank for culturing fishes (Fig. 1 & 2).

The study was conducted from September 2016- February 2017. Data has been compiled from, the study of the water samples collected from the pond with monthly intervals with the help of specific mesh net of size of 10 micron. The algal components were filtered from the water. The bottled algal samples were brought to laboratory, Department of PG Botany, Govt. Degree College,

Siddipet and the samples were preserved in 4% Formaldehyde or Lugol's iodine solution. All the samples were deposited in laboratory. Algal samples were then examined immediately using binocular research microscope. The water drops are sucked slowly with help of dropper and kept on a neat sterilized glass slide and mounted by glycerin using cleaned cover slips. Identification was done by using standard literature using alga keys and monographs (Desikachary 1959, Ramanathan, 1964 Prescott 1954, Anand 1945, Fritch 1945, Philipose, 1967). Microphotographs were taken using Sony Digital camera attached with binocular microscope.

Fig. 1&2: Showing the College and Fish Tank

RESULTS AND DISCUSSION

The analysis of water sample from the selected fish tank of Govt. Degree College, Siddipet showed the presence of following planktonic algal forms (Table 1).

IMPORTANT SALIENT FEATURES OF THE IDENTIFIED ALGAL SPECIES:

- **CHLOROPHYCEAE:**
  1. ***Chlamydomonas* species:-** *Chlamydomonas* is a very large genus with numerous species. Widely distributed in a range of habitats, especially small pools and ditches, often nutrient –rich. The chloroplast is large and cup-shaped, filling much of the cell, with one or more pyrenoids. Two flagella are present inserted at the anterior end, which also has a prominent eyespot. Non-motile palmelloid stages are known to occur. If present in large numbers it can impart odour to drinking water (Palmer, 1962).
  2. ***Eudorina* species:-** colony globular to elliptical compared of 16-32 (sometimes 64) cells. Cells spherical in shape and arranged near to the surface of the mucilaginous matrix. Each cell has two equal length flagella which can point in different directions from the colour edge.
  3. ***Pandorina* species:-** Differ from *Eudorina* in that the cells fit closely together without a large central space. Common in puddles. Ponds, lakes and rivers. Cells 8-20 µm long, colonies up to 50 µm diameters. Chloroplast green and cup-shaped storage product starch cells embedded in mucilage that obviously extends beyond the cells at the colour edge, have two equal length flagella. Colonies swim a tumbling motion through the water. Common in the plankton. Reported to impart a fishy odour to drinking water (Palmer 1962).
  4. ***Chlorella* species:-** Small round or oval cells (2-15 µm diameter) which divide into two or four non-motile daughter cells, enclosed for a little while within the old wall, as shown found everywhere. But sometimes occurring in vast quantities as a green soup in cattle-troughs, and similar places. *Chlorococcum* and its allies differ from *Chlorella* in producing motile spores, each with two flagella (Fogg 1953, Philipose 1967).
  5. ***Ankistrodesmus* species:- S**traight, Curved or spiral needle-shaped cells up to 50µm long or more. Sometimes forming bundles. All types of water-body, common. The cells if this

alga are very similar to *Monoraphidium* (which is used to be included in this genus) but occur in gropes or bundles. A mucilage envelope may be present. Cells (1-5 µm wide, 20-165 µm long) have a narrow spindle shape and may be curved or twisted. Very common in eutrophic lakes and slow flowing rivers. Some species also occur in more acid waters.

6. ***Scenedesmus* species:-** *Scenedesmus* is a very common abundant genus, especially found in eutropic and hypertrophic waters. Some species bear spines, others ridges and other no ornamentation. Cell size varies greatly from species to species. Colonies flat, cells oblong, ellipsoid with ends rounded, arranged in a single linear series, cells, terminal cells with single curved spine each pole (Phlipose1967).
7. ***Coelastrum* species:-** Non-motile rounded cells united closely to form spherical colonies. Hallow spherical colonies of up to 64 closely joined cells arranged in a regular sphere rather like a football. Cells of *coelastrum* are spherical, 8-30 µm in diameter with a parietal chloroplast and pyrenoid. Found in the plankton of eutropic and mesotropic lakes and ponds and slow flowing rivers.
8. ***Spirogyra* species: -** Chloroplast form a distinct spiral band with the cell is *spirogyra. Spirogyra* has cylindrical cells that are joined end to end to form an unbranched filament. Cell walls are firm, with a thin film of mucilage on the outside-often giving them a slimy feel. Chloroplasts (up to 15 per cell) have a helical shape and posses numerous pyrenoids. Cells are 10-160 µm in diameter, up to 590 µm long. Common and widely distributed in shallow ponds and ditches, mostly stagnant waters which are neutral to slightly acid although *S.crassa* is confined to hard waters. Nearly 400 species have been listed worldwide.
9. ***Microspora* species:-** Un branched filaments 5-25 µm diameter. Cells appear to have numerous parietal chloroplasts (though this is not the case), and are somewhat similar in structure to *Tribonema,* with H-pieces (overlapping half-cell walls, thicker and are a more opaque darker green. In running or optical section, the lower two in surface view (Ramanathan 1964 and Gupta 2005).
10. ***Closterium* species:-** Cells slightly or strongly curved with tapering ends is *closterium*. Cells elongate (35-1000 µm long) and tapering towards the ends, the outline may be bow-shaped, sickle-shaped or more or less straight. Cells are divided into two halves (without a median constriction) and contain two chloroplasts-each lying either side of the central side of the central area, with several prominent pyrenoids along each chloroplast. Widespread in waters ranging from acidic nutrient-poor to alkaline nutrient-rich, occurring in plankton or in amongst moss plants (Prasad & Misra 1984).
11. ***Cosmarium* species:-** Median groove very narrow, overall cell shape ovoid to rounded. Sometimes with slightly flattened sides or ends. This is the largest desmid genus and is very widespread. The cells are normally semicells with a narrow groove or isthmus in the centre between the two halves. The semi cells in some species have an angular, polygonal appearance. Over 1000 species with sizes ranging from <10 to 200 µm (Gupta 2005).
12. ***Pediastrum* species:-** Colony free-floating is *Pediastrum*. *Pediastrum* forms characteristic flat circular, plate-like colonies which are common in nutrient-rich lakes, ponds and slow flowing rivers. The cell walls are often quite tough and persist for some time after the contents have disappeared. There are many species, differing in overall colony appearance and the shape of the marginal cells.

- **BACILLARIOPHYCEAE:**

13. ***Melosira species:-*** Cell walls with no obvious markings, cells linked in pairs (may be difficult to see without cleaning). Cells of *Melosira* are rectangular (*M.varians*) or ovoid (*M.nummuloides*) in shape with relatively thin walls or rectangular with quite thick walls (*M.dickiei*). Chloroplasts are small disc like or plates and may be golden-brown to dark-brown. *M.varians* (cells 8-35 µm in diameter, 4-14 µm deep) is common and some-times abundant in shallow, frequently smaller eutrophic waters. *M.varians* can grow in water treatment filters open to sunlight and cause clogging problems.

14. ***Aulosira* species:-** Cell walls with granulated markings and often with spines at end (often best seen at end of filament). Forming a continuous filament and not pairs is *Aulosira*. In *aulosira*, the cells are rectangular in shape and are linked together to form long filaments. The surface of the silica cell wall has characteristic markings of rows pf dots(punctuate) and the ends of the cells bear a ring of spines, one or two of which may be quite long that link the cells together. Some are more common in eutrophic lakes, *A.ambigua* cells have 4-17 X 5-13 µm in size. *A.granulata* can cause filter clogging problems in water works.
15. ***Cyclotella* species:- V**alve surface with two distinct areas of marking. The middle area is punctuated and the outer striate or ribbed is *Cyclotella.* Cells of *cyclotella* are disc-shaped with circular-shaped valves having a slightly undulate. Surface. *C.menegheniana* with cells 10-30 µm in diameter and *C.kuetzingiana* with cells 10-40 µm in diameter. The former has 40-50 rows of radiating striae and the latter up to 90 radiating rows. Can be present as large numbers in reservoirs and lakes and may be cause problems of filter blocking in water treatment works (Prasad & Misra 1984, 1992).
16. ***Synedra* species:-** *Synedra* has elongate, linear, Isopolar valves. There is a narrow pseudoraphe and fine transverse striae. Colonies of *synedra* may be stellate or short chains but it can also be present as single cells or as an attached epiphyte cell length from <25µm to >500 µm with cell width ranging from 3 to 10 µm. two chloroplasts are present although only one usually visible in valve view.
17. ***Fragilaria* species:-** Cells without septa is *fragilaria*. In *fragilria*, the pinnate or elongate frustules are joined by the central part of their valve faces to form a ribbon-like chain. Two plate shaped chloroplasts present. *F.capucina* is also widespread occurring in lakes and river, 10-100 µm long, 3.5-4.5 µm wide. Can impart unwanted odour to drinking waters (Palmer 1962).
18. ***Navicula* species:-** Raphae not lying within a thickened ridge is *Navicula*. True *Navicula* species have lanceolate valves with a narrow axial area flanked by fine striae which are slightly radiate at the centre but parallel towards the cell species. The raphae is hooked at the apices with the ends both pointing the same way. Cells are often motile with a gilding motion (naviculoid movement). Two plate like chloroplasts are usually present lying either side of the apical axis. Found in a range of waters often occurring in benthic films in streams and rivers as well as in lakes.
19. ***Cymbella sps*:-** Valves strongly arched on the dorsal margin and nearly straight on the ventral margin giving them the appearance of an orange segment. *Cymbella* cells have convex dorsal margin and a straight, concave or slightly convex ventral margin. Cells (10-260 µm long, 4-50 µm wide) have a H-shaped chloroplast with a single central pyrenoid. Cells can be free floating or attached by means of mucilage pad to a solid substratum. Can grow in open water treatment filters and reach large enough numbers to cause filter-blocking problems.
20. ***Gomphonema* species*:-*** Cells bluntly rounded or rostrate, upper pole at most slightly capitates. *Gomphonema* cells are heteropolar in valve view but cuneate in girdle view. Some species are only slightly heteropolar (*G.angustatum*) whilst others are more strongly heteropolar, somewhat like an Egiptian mummy (*G.truncatum* and *G.acuminatum*)
21. ***Nitzschia* species:-** Two chloroplasts per cell, on either side of central axis. A series of dots (carinal dots) are visible along one margin the cell may be elliptical narrow linear spindle shaped or sigmoid in valve view. Cells (20-250 µm) long 4.5-16 µm wide) are usually solitary but can form stellate colonies or a number can be present in mucilaginous tube (Venkataraman 1939).
22. ***Pinnularia* species:-** Sriae rib-like in appearance is *pinnularia. Pinnularia* is a large genus. Cells linear, lanceolate or even elliptical. The poles are usually rounded, capitates or rostrate. Striae are usually coarse (but may be finer in some species) there is a central raphe whose middle ends bend in the same direction. Cells 20-200 µm long, 4-50 µm wide. Usually two plate- like chloroplasts, one either side of the mid line. Some species have other shaped chloroplasts. Water types range from nutrient poor to nutrient rich and slightly alkaline of mildly acidic (Venkataraman 1939).

- **CYANOPHYCEAE:**

23. *Chroococcus* species:- Cells nearly spherical. After division daughter cells occur in groups of 2-4-8-16 in gelatinous sheath which is often homogenous with the surrounding mucilage but may be lamellate in some species is *Chroococcus*. *Chroococcus* usually forms small groups of cells which can either be free-floating or attached. Cells (2-58 µm diameter) have disctinct sheaths which may be reformed after each cell division resulting in multilayered sheath.

24. *Gleocapsa* species:- Cells are spherical (1-17 µm diameter) and are surrounded by a sheath which is usually laminate, can be up to 10 µm thick and colour. Colonies may grow large enough to see with naked eye.

25. *Merismopedia* species:- Cells arranged in a rectangular series, often in groups of four, forming a plate one cell thick, often of many cells are *Merismopedia. Merismopedia* cells are spherical to oval forming a colony of a single layer, shaped as a plate or rectangle within thin structure less mucilage. Cells are arranged in rows, sometimes in groups of four. The cells, often pale blue in colour, are 0.5-5 µm in diameter and 1-6 µm long. Free-floating or resting on bottom sediments.

26. *Microcystis* species:- Cells of colony densely crowded within the mucilage is ***Microcysystis.*** Cell of *microcystis* are spherical to sub-spherical (very slightly elongate) and are usually gas vacuolated. They form large globular to irregular mucilaginous colonies (often containing hundreds of cells) a millimeter or more in size that are planktonic and are often responsible for nuisance water blooms(Sawyer 1947, Prescott 1948, Singh 1953). Colonies may be globular, more elongate or irregular and with holes (clathrate) and the mucilage is distinct and fairly firm. Cells 2.5-6 µm diameters. During the actively growing season eutrophic waters. Frequently reported as producing taste and odours in drinking water (Palmer 1962).

27. *Oscillatoria* species:- Trichome without a sheath is *Oscillatoria*. Trichomes may be straight or bent, single or in groups, free-floating or attached short or quite long, capable of a gliding movement or a gentle waving (oscillatory movement), blue green, plive green,reddish or brownish in colour. Free-floating forms commonly have gas vacuoles. Cells 1-60 µm wide, either longer or usually shorter than broad (Desikachary 1959).

28. *Nostoc* species:- Trichomes embedded in obvious and extensive firm mucilage is *Nostoc*. Cells of nostoc similar to Anabaena but are embedded in firm, extensive, mucilage which may be leathery in texture and coloured straw or brown. Akinetes may be occur in older parts of the colony and are produced between heterocysts (unlike *Anabaena*). The cells are approximately spherical to barrel-shaped 3-6 µm wide. Grow on damp or wet surfaces, shallow waters. Can be free-floating or attached.

29. *Anabaena* species:- Trichomes solitary or in a tangled, sometimes coiled, mass is Anabaena. There are many species of *Anabaena*. The filaments may be straight, curved or coiled depending upon the specie. Some species produce gas vacuoles can form blooms. Cells (3.5-14 µm wide) are rounded or barrel shaped, giving the filament the appearance of a string of pearls*. Anabaena* can occur in lakes, ponds and ditches.*Anabaena* species are also to produce a range of toxins in water-including microcystins,anatoxin-a, saxitoxins and lipopolysacharides (Chorus and Bartrum 1999).

30. *Rivulari* species:- Basal heterocysts present on trichome but no akinetes present. Usually grows as attached globular colonies embedded in firm mucilage are *Rivularia. Rivularia* colonies are sub-spherical to globular and contain numerous filaments that are attached to substratum. The colony consists of tapering filaments each of which has basal heterocyst. Most frequently found in hard waters, possibly where there are periods of higher phosphorus concentrations, and colonies may exhibit some calcification.

- **DINOPHYCEAE:**

31. *Ceratium* species:- Brown armoured and drawn out into characteristic horns as shown. Two flagellate, one longitudinal, the other transverse and in a groove. Up to 400 µm long. Sometimes common in lakes and ponds.

- **EUGLENOPHYCEAE:**

32. *Euglena* species:- Cells roughly cylindrical or fusiform, often showing metaboly is *Euglena*. Euglena cells are solitary and free swimming; they are usually elongated but may be spindle-shaped or twisted. Chloroplasts one or two many and variously shaped, disc-shaped or stellate to band-like, depending upon the species. Sometimes pyrenoids are present. Common to abundant in ponds and other shallow waters.

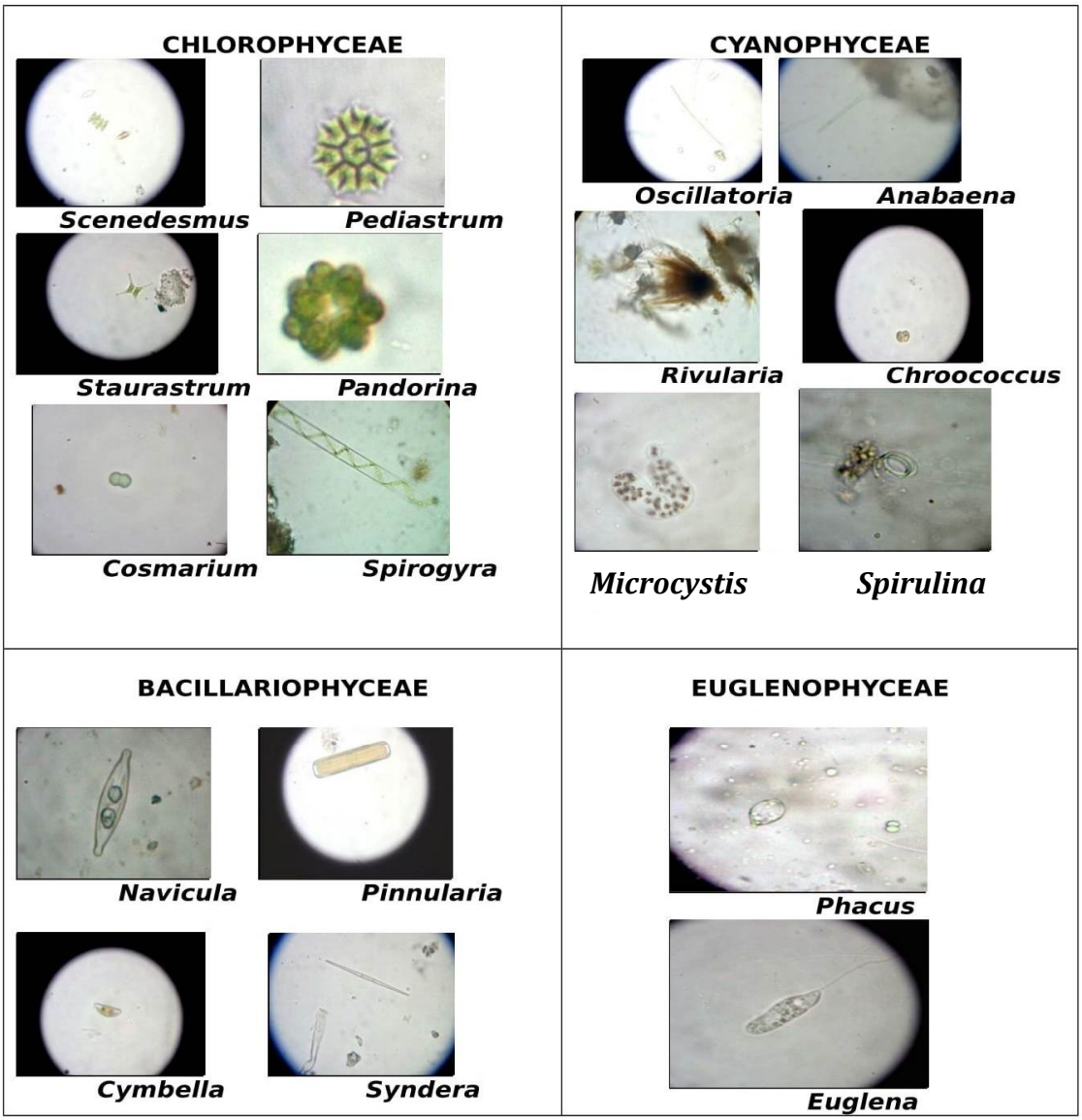
33. *Phacus* species:- cells with pronounced dorsiventral flattening (leaf-like in shape) often with part of the cell twisted is *Phacus*. *Phacus* is solitary and free swimming. Cells are markedly flattend and may be twisted along their length. Wide at the anterior with single emergent flagellum but pointed at the posterior end, the end point being of variable length. There are numerous disc-shaped chloroplasts without pyrenoids, and an eyespot. Common in ponds and other still waters, tychoplanktonic, especially where enriched with organic matter such as swamps.

The study of the diversity of algae showed the presence of 33 algae in fish pond of Govt. Degree College, Siddipet. In this pond 12 genera belong to Chlorophyceae, 10 genera belong to Bacilloriophyceae, 9 genera belong to Cyanophyceae 2 Euglenophyceae and 1 Dinophyceae members. It was very much clear that Chlorophyceae was the dominant in this pond and then Bacillariophyceae.

Table1: List of Planktonic Algae Present in Fish Pond

S.No.	Scientific Name of algae	Class
1.	*Chalymdomonas*	Chlorophyceae
2.	*Eudorina*	Chlorophyceae
3.	*Pandorina*	Chlorophyeceae
4.	*Chlorella*	Chlorophyeceae
5.	*Ankistrodesmus*	Chlorophyeceae
6.	*Scenedesmus*	Chlorophyeceae
7.	*Coelastrum*	Chlorophyeceae
8.	*Spirogyra*	Chlorophyeceae
9.	*Microspora*	Chlorophyeceae
10.	*Closterium*	Chlorophyeceae
11.	*Cosmarium*	Chlorophyeceae
12.	*Pediastrum*	Chlorophyeceae
13.	*Melosira*	Bacillariophyceae
14.	*Aulosira*	Bacillariophyceae
15.	*Cyclotella*	Bacillariophyceae
16.	*Synedra*	Bacillariophyceae
17.	*Fragilaria*	Bacillariophyceae
18.	*Navicula*	Bacillariophyceae
19.	*Cymbella*	Bacillariophyceae
20.	*Gomphonema*	Bacillariophyceae
21.	*Nitzschia*	Bacillariophyceae
22.	*Pinnularia*	Bacillariophyceae
23.	*Chroococcus*	Cyanophyceae
24.	*Gleocapsa*	Cyanophyceae
25.	*Merismopedia*	Cyanophyceae
26.	*Microcystis*	Cyanophyceae
27.	*Oscillatoria*	Cyanophyceae
28.	*Nostoc*	Cyanophyceae
29.	*Anabaena*	Cyanophyceae
30.	*Rivularia*	Cyanophyceae
31.	*Ceratium*	Dinophyceae
32.	*Euglena*	Euglenophyceae
33.	*Phacus*	Euglenophyceae

Plate 1: Planktonic Algae Present in Fish Pond



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