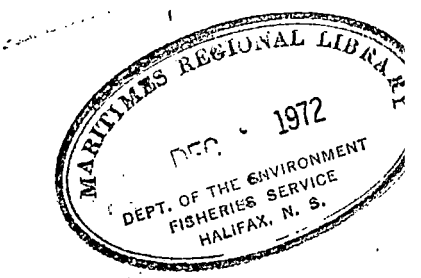
ECOLOGY OF THE SAINT JOHN RIVER HEADPONDS

I. CATALOGUE OF PHYTOPLANKTON

for

the Saint John River Basin Board



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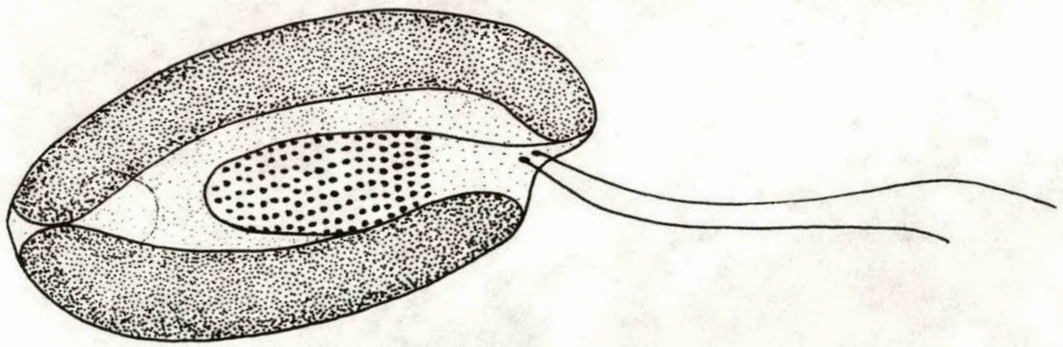

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INTRODUCTION

The first step in the headpond ecology task of the Saint John River Basin Study has been to prepare a systematic catalogue of the headpond phytoplankton communities. This report is incomplete in that additional species will be found as the study progresses; this report should, therefore, be retained in a loose leaf binding so that additions may be inserted.

The detailed study of phytoplankton was undertaken for three reasons:

1. They are the major source of autotrophic activity in the headponds.
2. The species composition of the phytoplankton community is a sensitive ecological indicator.
3. Phytoplankton species composition and population density are the most obvious indicators of eutrophication.

A thorough knowledge of the current composition of the phytoplankton communities in each pond will thus provide an ecological baseline from which to measure the effects of any future changes in the pollution level.

TECHNIQUES

The water samples were taken from the Mactaquac, Beechwood, Grand Falls, and Tobique Headponds, and preserved in 3% glutaraldehyde. Two hundred ml samples (100 ml for Grand Falls) were gravity filtered (no vacuum applied) through

membrane filters of 0.80 µm pore diameter. The filters were then mounted on microscope slides, cleared with a water miscible mounting medium, and covered. The phytoplankton were examined with a phase contrast microscope.

Identification in some species required live material, in which cases the phytoplankton were concentrated with a filtration device, and examined in a Sedgwick-Rafter cell.

PHYTOPLANKTON CLASSES

For taxonomic convenience the algae are divided into eleven classes, of which nine contain planktonic forms. Seven of these classes are represented in the phytoplankton of the Saint John River Headponds; of which the most important both numerically and in number of species are the Bacillariophyceae and the Chlorophyceae.

Bacillariophyceae

The primary feature distinguishing the Bacillariophyceae or diatoms from other algae is that the cell wall is highly silicified and composed of two rigid overlapping halves. Diatoms are readily recognized by the bilateral or radial markings on the walls. Within each cell are one to many variously shaped chromatophores containing the photosynthetic pigments. The predominating colour is yellow-brown.

The diatoms are the most important members of the fresh-water phytoplankton, are nearly always present in significant numbers, and are commonly the dominants. Nevertheless, most diatom genera are predominantly composed of benthic-littoral species. There are two orders: The Centrales exhibiting radial symmetry and the Pennales which are bilaterally

symmetrical. The Centrales contain a number of important planktonic species. To discuss the ecology of the Pennales they must be further sub-divided into the sub-orders Fragilarineae, Achnanthineae, Naviculineae and Surirellineae. The Fragilarineae include a number of planktonic species. The Achnanthineae, Naviculineae and Surirellineae are almost exclusively benthic in temperate waters, though cells may occur pseudoplanktonically; there are a few tropical planktonic species.

Chlorophyceae

The Chlorophyceae or green algae have their photosynthetic pigments localized in chromatophores which are grass-green because of the predominance of chlorophylls a and b. A few of the more primitive Chlorophyceae have naked protoplasts, but in the great majority the protoplast is enclosed within a rigid cell wall composed of an inner layer of cellulose and an outer of pectose. Motile forms have two (rarely four) flagella of equal length. There are more species of fresh-water Chlorophyceae than of all other fresh-water algae combined.

The green algae contain a great number of morphologically diverse organisms of varied ecology. Most planktonic species belong to the Volvocales, Tetrasporales, Chlorococcales, or Zygnematales. The order Volvocales has motile flagellated vegetative phases; the Tetrasporales have pseudocilia (non-functioning flagella) and are sedentary or free-floating; the Chlorococcales chief characteristic is negative, namely their inability to multiply by cell division in the vegetative state. The Volvocales, Tetrasporales, and Chlorococcales all have flagellated gametes and as a group appear to have in common physiological and ecological preferences that mark them off from the order Zygnematales. The Zygnematales are a much more specialized order in which the gametes are amoeboid. The planktonic species of Zygnematales are all unicellular

or loosely colonial forms, and are commonly referred to as desmids.

The planktonic species of the Volvocales, Tetrasporales, and Chlorococcales are usually more characteristic of ponds than of lakes. Many species are facultative heterotrophs and these, when living autotrophically, require higher concentrations of inorganic nutrients than do strictly autotrophic species. They are typically an eutrophic flora.

Desmids, the planktonic forms of the Zygnematales, occur principally in soft water habitats. Lakes rich in organic acids and low in calcium may contain an abundance of these organisms. They are typically an oliogotrophic flora.

Chrysophyceae

A taxonomically complex and probably polyphyletic group. There are many planktonic genera, the most important and common being Mallomonas, Synura, and Dinobryon. Fresh water Chrysophyceae are characterized by the production of siliceous scales or tests, a characteristic shared with the Bacillariophyceae. The colour too resembles that of diatoms, being typically a yellow-brown.

Cryptophyceae

This group is morphologically complex but biochemically rather primitive. Most species are euplanktonic. The group as a whole is probably facultatively heterotrophic and may form heterotrophic populations under winter snow and ice covers. There are usually two chromatophores containing the photosynthetic pigments, the prevailing colour is usually brown but may be blue, blue-green, grass-green, or red.

Dinophyceae

The dinoflagellates are free-swimming unicells with numerous disc or spindle-shaped chromatophores. The predominant pigment is peridinin which gives a brown colour to most autotrophic forms. The class includes strict autotrophs, facultative heterotrophs, and heterotrophs.

There are two flagella attached on the ventral surface in a more or less conspicuous longitudinal furrow. One of these trails behind the cell while the other is wrapped about a transverse furrow in which the flagellum vibrates, causing the organism to rotate as it swims forward. In armoured dinoflagellates the transverse furrow marks the juncture of the anterior epicone covered by epithecal plates and the posterior hypocone covered by hypothecal plates. Epithecal plates adjoining the transverse furrow are precingulars, there may also be anterior intercalary plates and apical plates. Correspondingly the plates of the hypotheca are the postcingulars adjacent to the girdle and 1 or 2 antapicals at the posterior pole. There may also be a ventral plate and rarely a posterior intercalary plate.

Fresh-water dinoflagellates seldom occur in large numbers, except the species Ceratium hirundinella which sometimes forms dense blooms colouring the water brown.

Euglenophyceae

The Euglenophyceae are not likely to be of any quantitative significance in lake phytoplankton. They are typically a heleoplanktonic flora, most commonly encountered in small bodies of water with a high organic content. There are both pigmented and colourless forms, and all autotrophic species are facultative heterotrophs. Ammonia is the preferred and perhaps the only inorganic nitrogen source; organic sources can also be utilized.

The chloroplasts are green in colour, resembling those of the Chlorophyceae. All free-swimming genera have naked cells, and have the exterior portion of the cytoplasm differentiated into a periplast. The periplast may be so rigid that the cell has a fixed shape, or it may be flexible and continually changing in shape (metabolic) as the cell moves through the water. Several genera have a protoplast surrounded by a lorica that may be brownish in colour because of impregnation with iron compounds. There is a single flagellum attached near a narrow gullet, and in forms with a lorica the flagellum projects through an opening at the anterior end.

Myxophyceae

The Myxophyceae or blue-green algae are a distinctive class sharply delimited from all other algae. There are no chromatophores, the photosynthetic pigments are localized in the peripheral portion of the protoplast. The nucleus or central body is quite different, lacking both membrane and nucleolus. The only types of thallus construction possible in the Myxophyceae are those in which immobile cells are solitary or united in filamentous or nonfilamentous colonies.

Most Myxophyceae flourish in warm nutrient-rich waters. In eutrophic temperate lakes massive blooms of these blue-greens tend to develop during the warmest months. Paradoxically, these blooms tend to develop when inorganic fixed nitrogen is low and phosphate is virtually undetectable. The Myxophyceae have a high sodium requirement which may underlie their association with pollution.

Some Myxophyceae possess the ability to fix nitrogen, an ability shared with the nitrifying bacteria. Nitrogen fixers possess an obvious advantage in nitrogen limiting situations. It is probable that nitrogen fixation is limited to those species

possessing heterocysts, a specialized cell which may be the site of reducing power for the reduction of nitrogen gas.

SPECIES LIST AND HEADPOND OCCURRENCE

October, 1971

	Mactaquac	Beechwood	Grand Falls	Tobique
BACILLARIOPHYCEAE:				
CENTRALES;				
Cyclotella bodanica	X		X	
Cyclotella comta				X
Cyclotella meneghiniana	X	X		X
Cyclotella stelligera	X			X
Melosira crotonensis	X	X	X	
Stephanodiscus astrea	X		X	
PENNALES;				
ACHNANTHINEAE,				
Achnanthes inflata		X		
Achnanthes lanceolata				X
FRAGILARINEAE,				
Asterionella formosa	X	X		X
Diatoma vulgare var grande	X			X
Eunotia parellela			X	
Fragilaria crotonensis	X		X	X
Hannaea arcus	X	X	X	

Synedra acus	X	X	X	
Synedra delicatissima	X	X		X
Synedra ulna var chaseana	X			X
Tabellaria fenestrata	X	X	X	X
Tabellaria flocculosa			X	
NAVICULINEAE,				
Amphipleura pellucida			X	
Caloneis bacillum	X			
Cymbella aequalis			X	
Cymbella affinis				X
Cymbella lanceolata		X		
Cymbella obtusa				X
Cymbella ventricosa		X		X
Gomphonema acuminatum			X	X
Gomphonema augur			X	
Gomphonema constrictum				X
Gomphonema ventricosum				X
Navicula atomus		X		
Navicula cryptocephala		X		
Navicula eleginensis	X			
Navicula gastrum		X		
Navicula pupula var retangularis		X		
Navicula radiosa			X	
Navicula tripunctata var schizonemoides	X			

Pinnularia nobilis			X
Pinnularia sublinearis			X
CHLOROPHYCEAE:			
CHLOROCOCCALES;			
Actinastrum hantzschii var fluviatile	X		
Ankistrodesmus falcatus			X
Ankistrodesmus falcatus var mirabilis	X		X
Chlorococcum humicola	X		X
Crucigenia lauterbornii	X		
Crucigenia quadrata	X		X
Crucigenia tetrapedia	X		X
Dictyosphaerium ehrenbergianum	X		X
Dictyosphaerium pulchellum	X	X	X
Golekinia radiata	X		
Lagerheimia quadriseta	X		
Micratinium pusillum	X		
Pediastrum duplex var reticulatum	X		
Pediastrum tetras			X
Pediastrum tetras var tetraodon	X		X
Scenedesmus bijuga	X	X	X

Scenedesmus dimorphus	X			X
Scenedesmus hystrix	X			
Scenedesmus longus	X			
Scenedesmus opoliensis		X		
Scenedesmus perforatus	X			
Scenedesmus quadricauda	X			
Selenastrum minutum	X			X
TETRASPORALES;				
Astercoccus limneticus		X		
Gloeocystis gigas	X			X
Gloeocystis planctonica				X
Sphaerocystis schroeteri				X
VOLVOCALES;				
Chlamydomonas angulosa	X			
Chlamydomonas epiphytica	X			
Chlamydomonas globosa	X	X		X
Gonium pectorale	X			
Gonium sociale	X			
Haematococcus lacustris	X		X	X
Pandorina morum	X			
ZYGNEMATALES;				
Closterium attenuatum	X			
Closterium lanceolatum	X			

Cosmarium regnesi				X
Penium minutissimum				X
Staurastrum neglectum				X
Staurastrum subgracillimum				X
Xanthidium concinnum var boldtiana				X
CHRYSOPHYCEAE:				
Dinobryon bavaricum	X			
Dinobryon divergens	X			
Dinobryon sertularia	X			X
Mallomonas acaroides	X			
Mallomonas caudata	X			
Mallomonas leboimei	X			
Mallomonas tonsurata				X
Synura sphagnicola	X			
Synura uvella	X			
CRYPTOPHYCEAE:				
Chroomonas acuta				X
Cryptomonas ovata	X	X	X	X
DINOPHYCEAE:				
Ceratium hirundinella	X			

Glenodinium kulczynskii	X			X
Glenodinium pulvisculus		X		
Glenodinium quadriens	X			X
EUGLENOPHYCEAE:				
Euglena proxima	X			
Lepocinclis marssonii	X			
Trachelomonas granulosa				X
MYXOPHYCEAE:				
Anacystis cyanea	X			
Anacystis marina	X			
Anacystis thermalis	X			
Agmenellum quadruplicatum	X			X
Arthrospira khannac	X			
Gomphosphaeria aponina	X			
Gomphosphaeria aponina var cordiformis	X			
Oscillatoria rileyi				X
Oscillatoria tenuis	X		X	
TOTALS	68	19	18	49

ECOLOGICAL GLOSSARY

Autotrophic	:	Capable of supporting life by photosynthesis.
Benthos	:	Organisms associated with the solid-liquid interface.
Epilimnion	:	In lakes showing thermal stratification; the layer of warmer water between the air-water interface and the thermocline.
Epiphyte	:	An organism attached to a plant.
Euplanktonic	:	Permanently planktonic in all life stages.
Eutrophic	:	A relative term describing the level of biological activity (especially autotrophic) in a body of water. Eutrophic waters are characterized by high nutrient levels, high plant standing crops, large diurnal variations in oxygen concentration, and, if stratified, the hypolimnion becomes anoxic.
Heleoplanktonic	:	Planktonic in small bodies of water; i.e. ponds.
Heterotrophic	:	Supporting life by respiratory oxidation of organic compounds.
Hypolimnion	:	In lakes showing thermal stratification, the layer of cooler water between the thermocline and the sediment.
Limnoplanktonic	:	Planktonic in large lakes.
Meroplanktonic	:	Having temporary planktonic phases or stages.
Mesotrophic	:	A relative term used to describe bodies of water where the level of biological activity is intermediate between eutrophic and oligotrophic.
Oligotrophic	:	Bodies of water with low nutrient levels, low standing crops, and high oxygen levels at all depths.

Periphyton	:	A benthic assemblage of plants, especially algae.
Potamoplanktonic	:	Planktonic in flowing waters.
Pseudoplanktonic	:	Accidentally planktonic, e.g. periphyton washed into suspension.
Thermocline	:	A temperature gradient sharp enough to act as a diffusion barrier.
Tychoplanktonic	:	Planktonic in shallow waters or littoral zones.

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SPECIES DESCRIPTIONS

To allow for future updating as more information is gathered and additional species are found, the organization of the species description section is without page numbers. All species are arranged alphabetically. The largest division employed is class. Within the two largest classes it was necessary to subdivide into orders, and within one of these (the Pennales of class Bacillariophyceae) a further division into sub-orders was required. All taxonomic divisions above the genus and species level are separated by coloured dividers and supplementary species lists.

BACILLARIOPHYCEAE

CENTRALES;

Cyclotella bodanica
Cyclotella comta
Cyclotella meneghiniana
Cyclotella stelligera

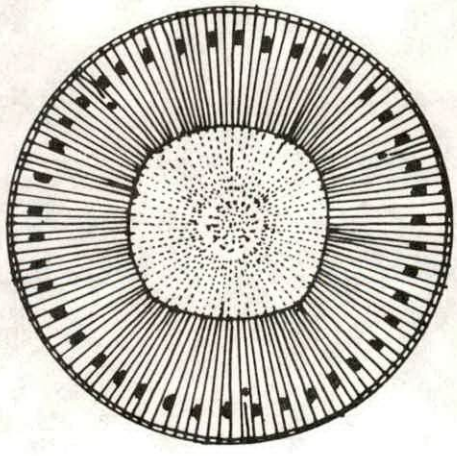
Melosira crotonensis

Stephanodiscus astrea

Cyclotella bodanica

Valve circular, the outer area flat and 1/3 the length of the radius of the valve in width, the inner area convex. The outer is marked with a distinct marginal striated rib and is divided into two radiately striated zones; an outer (marginal) zone with robust striae, 5-6 in 10 µm, and an inner densely striated zone with 12-15 striae in 10 µm. In the latter zone striae from opposite sides of the valve are shortened and terminate in distinct beads. The inner (central) area is densely beaded in closely set rows (12-15 rows in 10 µm), except in the central space where a compact group of beads is segregated. Valve diameter 20-24 µm.

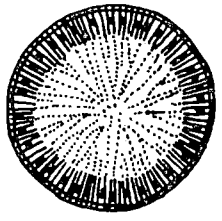
Ecology: Euplanktonic, common.



Cyclotella comta

Frustule plane or slightly undulate. Valve surface separated into two areas, the inner covered with distinct beads irregularly placed or in radiating rows, the outer area containing a marginal striated rib and radiating striae with distinct dark markings on the lower parts. Valve diameter 10-17 µm. Marginal striae 14-15 in 10 µm.

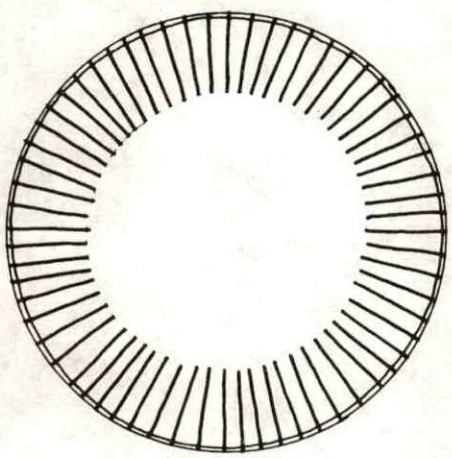
Ecology: Euplanktonic, widely distributed and common.



Cyclotella meneghiniana

Valve surface with inner smooth area in diameter 1/2 that of the valve, and with outer area containing robust radiating striae. Diameter of valve is 10-12 µm. Striae 9 in 10 µm.

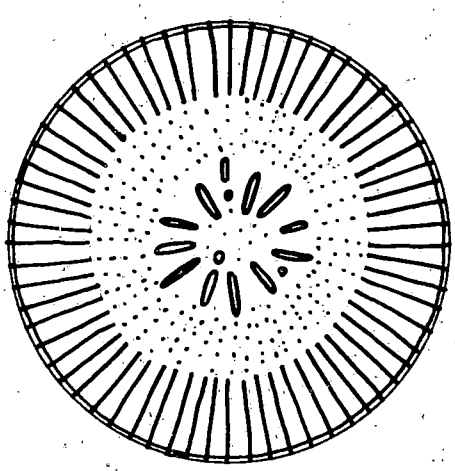
Ecology: Euplanktonic and very common.



Cyclotella stelligera

Frustule strongly convex, minute. Valve surface with marginal striae 1/3 - 1/2 as long as the diameter of the valve. Central area broad with several beads forming a star in the centre. Diameter of valve 6.8 - 13.6 µm. Striae 15-18 in 10 µm.

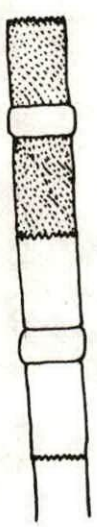
Ecology: Euplanktonic and common.



Melosira crotonensis

Frustules cylindrical, slender, 2-6 times longer than the diameter, and adjoined end to end in long filaments. Furrows near the suture evident. Margin denticulate. Puncti usually in decussate or irregular curved lines. Diameter of valve 5 µm or more.

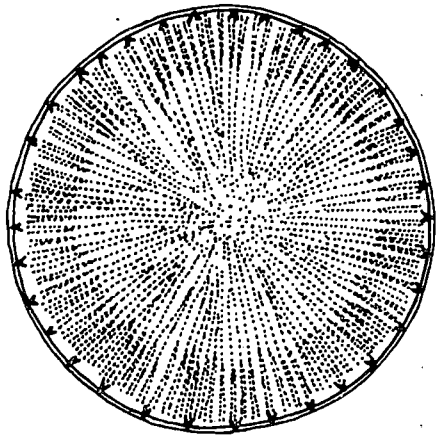
Ecology: Probably meroplanktonic, very common in freshwater lake phytoplankton. Associated with eutrophic waters.



Stephanodiscus astraea

Valve circular, flat up to within 1/3 the radial length from the margin, then strongly convex for half that distance. Marginal spines minute. Radiating rows broad, at the margin composed of 3-5 rows of small beads. Diameter of valve 28-30 µm. Rows 3.5 in 10 µm. Beads 12-16 in 10 µm.

Ecology: Euplanktonic and common.



BACILLARIOPHYCEAE

PENNALES

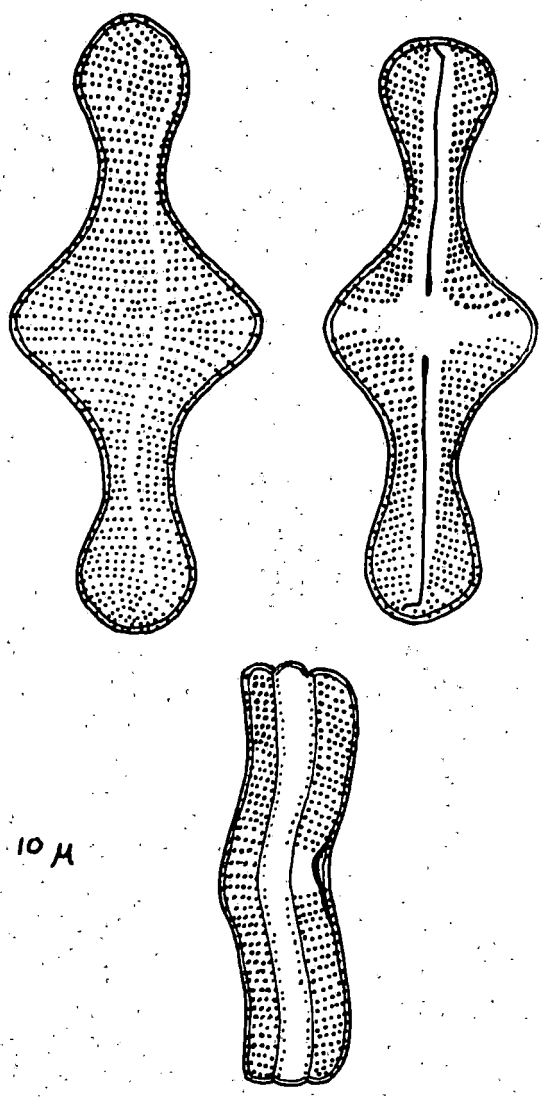
ACHNANTHINEAE;

Achnanthes inflata
Achnanthes lanceolata

Achnanthes inflata

Frustules in girdle view, as normally seen in collections, are double arched. In valve view, which is essential for precise identification, the outline is twice strongly concave forming a gibbous centre with two capitate extremities. The valve surface is highly arched and longitudinally undulate. Raphe valve with linear, slightly sinuous axial area flaring into a widening staurus central area. Raphe sinuous as is the axial area. Striae slightly radiate, composed of large distinct puncta. Pseudoraphe valve with narrow, linear, eccentric pseudoraphe, submarginal to marginal; no central area. Striae parallel except at the ends where they become curved, radiate; composed of large puncta as on the raphe valve. The striae are 9-13 in 10 µm. Frustules are 30-65 µm long and 10-18 µm wide.

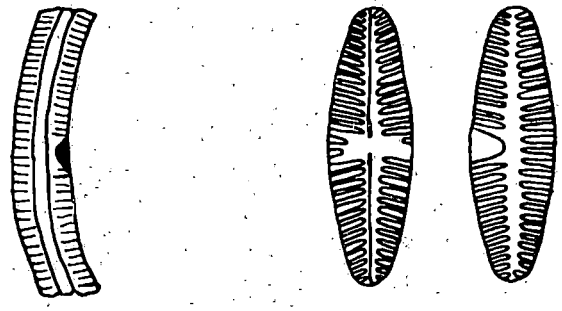
Ecology: Epiphytic and possibly pseudoplanktonic in neutral to alkaline waters.



Achnanthes lanceolata

Frustules in girdle view, as normally seen in collections, bent into a U-shape. The valves are elliptical to lanceolate with broad obtusely rounded extremities. Raphe valve with narrow, linear axial area; central area broad, rectangular. Raphe filiform becoming slightly broader toward rounded proximal ends. Striae slightly radiate; central striae short, marginal, irregular in number and occasionally lacking on one side. Pseudoraphe valve linear to linear-lanceolate, interupted centrally on one side by a horseshoe-shaped clear area. Axial and central areas forming a linear-lanceolate space. The striae are slightly radiate, 11-14 in 10 µm. The frustules are 12-31 µm long and 4.5 - 8 µm wide. This species is very common and polymorphic.

Ecology: Epiphytic and possibly pseudoplanktonic in well-aerated flowing waters of neutral to alkaline pH. This species does not seem to occur in large numbers under conditions of heavy organic enrichment, and so may be a useful indicator species in pollution studies.



BACILLARIOPHYCEAE

PENNALES

FRAGILARINEAE;

Asterionella formosa

Diatoma vulgare var grande

Eunotia parellela

Fragilaria crotonensis

Hannaea arcus

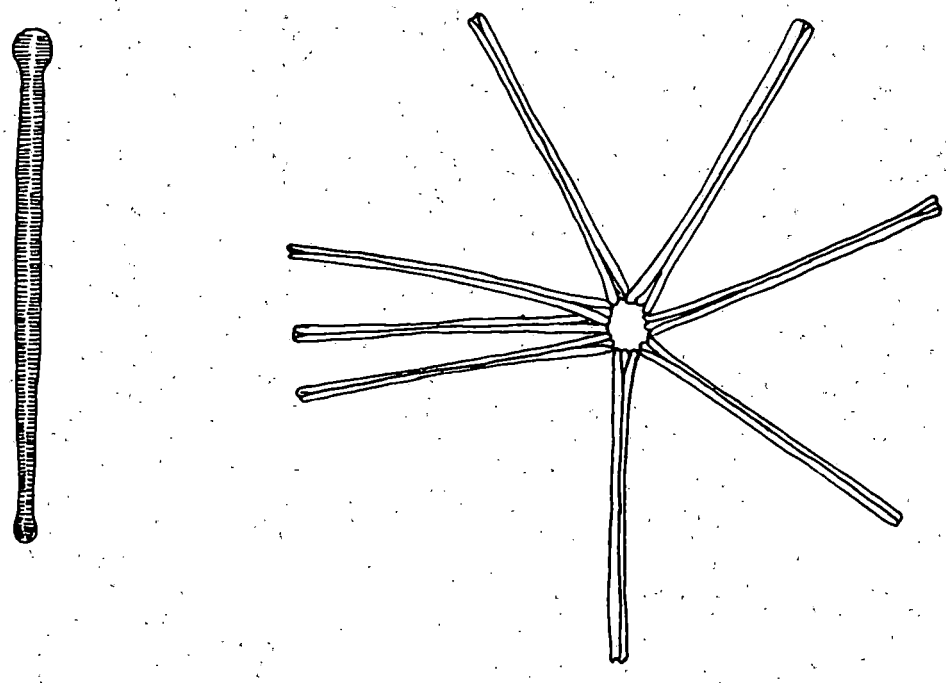
Synedra acus
Synedra delicatissima
Synedra ulna var chaseana

Tabellaria fenestrata
Tabellaria flocculosa

Asterionella formosa

Frustules forming star-shaped colonies. The end of the frustules attached to the other members of the colony broader than the rest of the frustule. Valve linear, a little narrower towards the ends of the valve. Apices of the valve capitate; the end attached to the other frustules of the colony much larger, strongly capitate; the opposite apex much smaller, often not so distinctly capitate. Pseudoraphe very narrow, often indistinct. The striae are fine, 24-28 in 10 µm. Frustules are 40-130 µm long and 1-3 µm in breadth. The taxon is distinguished by the size and shape of the frustules and the distinctive appearance of the colony.

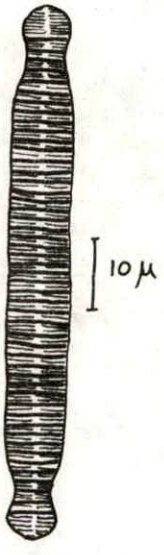
Ecology: Eulimnoplanktonic, very common, associated with mesotrophic to eutrophic conditions.



Diatoma vulgare var grande

Valve linear to slightly linear-lanceolate with distinctly capitate ends. Pseudoraphe narrow, often indistinct. Striae about 16 in 10 µm. Costae 7-10 in 10 µm. The valve is 32-120 µm long and 6-8 µm wide. The taxon is distinguished by its large size and its shape.

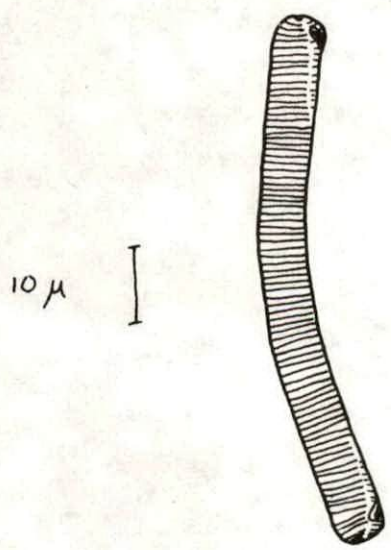
Ecology: Typically potamoplanktonic, associated with eutrophic waters of high nutrient content.



Eunotia parallela

Dorsal and ventral margins of the valve parallel. Valve varying from almost straight to arched; rounded at the apices. Small distinct terminal nodules near the apices of the valve. Striae parallel or slightly radiate over the terminal nodules. The striae vary from 8-16 in 10 µm. The frustules are usually 50-150 µm long and 5-15 µm in breadth. The species is distinguished by the parallel margins of the valve and the rounded ends.

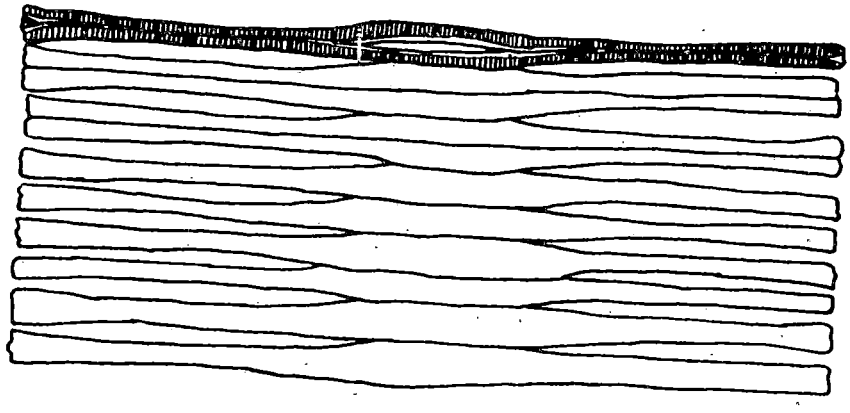
Ecology: Tychoplanktonic in cool waters, often associated with Sphagnum.



Fragillaria crotonensis

Frustules in girdle view linear; swollen at the centre, and to a lesser amount at the ends of the frustule. Frustules attached in the middle portion to form filaments which have a very distinctive appearance. Valve linear; distinctly swollen to a lanceolate shape in the middle portion, and to a lesser extent at the somewhat capitate apices. Pseudoraphe indistinct. Central area usually rectangular in shape, extending to the margins of the valve or with marginal striae. The striae are parallel, 15-18 in 10 µm. The valves are 40-170 µm long and the breadth in the middle portion of the valve is 2-4 µm. This taxon is distinguished by the formation of filaments, and in valve view the swollen, lanceolate middle portion is the most distinctive characteristic.

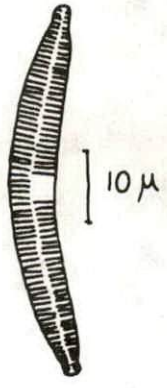
Ecology: Euplanktonic, widely distributed in mesotrophic waters.



Hannaea (Ceratoneus) arcus

Frustules in girdle view bent, forming short bands. Valve curved with a convex dorsal margin. Ventral margin concave except for swelling of the unilateral central area. Apices of the valve attenuate-rostrate to somewhat capitate. Pseudoraphe distinct and narrow. The striae are parallel or sometimes slightly radiate towards the apices of the valve. Striae are 13-14 in 10 µm at the centre to 18 in 10 µm at the ends of the valve. Frustules are 15-150 µm long and the breadth is usually 4-7 µm.

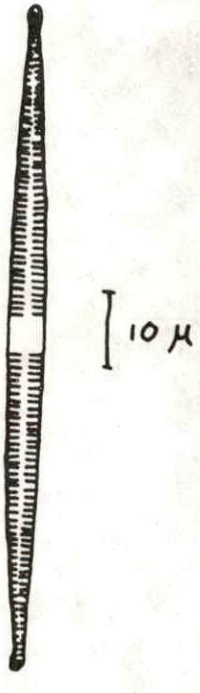
Ecology: Potamoplanktonic, preferring cool waters.



Synedra acus

Valve lanceolate, tapering to rounded or slightly capitate apices. Pseudoraphe narrow, becoming a little wider toward the middle of the valve. Central area distinct, a little longer than broad. Striae parallel, 11-14 in 10 µm. Length, 90-180 µm. Breadth 4.5 - 6 µm. Length-breadth ratio 20 - 130:1.

Ecology: Though typically a benthic species, this organism is frequently found in the phytoplankton of lakes. It may be meroplanktonic.

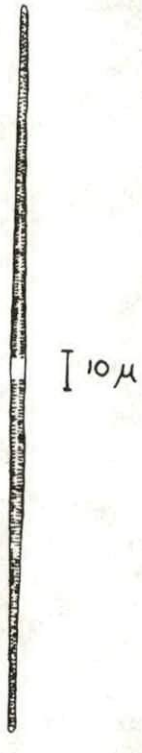


Synedra delicatissima

Valve linear, needle shaped, tapering a little to the rounded ends. Pseudoraphe very narrow, but distinct. Central area usually distinct, longer than broad, not reaching the margins of the valve. On the margins of the valve on each side of the central area are very short striae. Striae throughout the valve parallel. The striae are 11-14 in 10 µm. The valve length is 100-230 µm, and the length to breadth ratio is 30 - 150:1.

This taxon is characterized by its needle-like shape, and the central area which is longer than broad and has very short striae on each margin.

Ecology: Euplanktonic, not common.

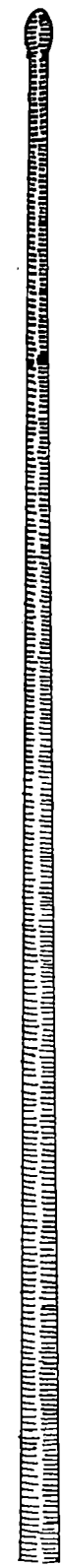


Synedra ulna var chaseana

Valve very long and slender with somewhat capitate ends. Pseudoraphe very narrow. Central area absent. The striae are 7-11 in 10 µm. The valves are 400-700 µm long and 3-5 µm wide. This taxon is characterized by its great length and lack of a central area.

Ecology: Euplanktonic in north temperate lakes.

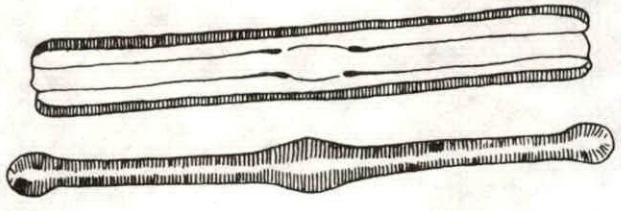
10µ



Tabellaria fenestrata

Frustules joined end to end to form zig-zag filaments. Girdle view with 4 or fewer septa which are bent away from the valve for a short distance below the point of insertion. No rudimentary septa present. In valve view linear; swollen at centre of the valve and with distinctly capitate apices. The width of the valve in the middle portion and at the apices is about the same. Pseudoraphe distinct, sometimes wider at the centre of the valve forming a small central area of variable shape. The striae are parallel, 14-18 in 10 µm. The valves are 25-116 µm long, though usually in the range of 40-75 µm. Breadth in the middle portion of the valve is usually 5-10 µm, but occasionally less.

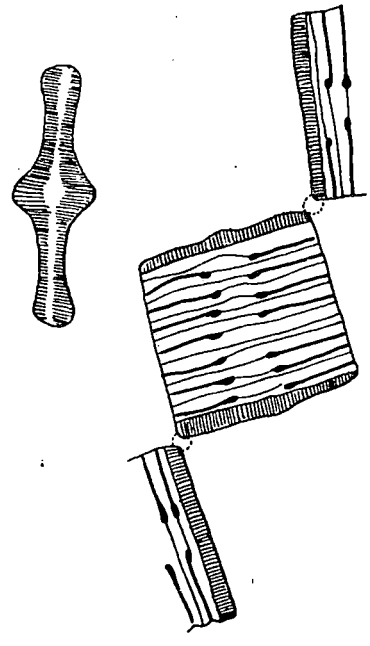
Ecology: This species may be meroplanktonic or tychoplanktonic. It seems to prefer mesotrophic to eutrophic conditions and circumneutral waters.



Tabellaria flocculosa

Colonies composed of zig-zag filaments of frustules. In the girdle view the septa are usually more than 4, usually not straight. Rudimentary septa are usually present. The length-to-breadth ratio of the frustule in girdle view is usually less than 4:1, however, it may be as great as 6:1. Valve with swollen central area often wider than swollen apices which are quite variable in shape. Valve slightly asymmetrical to either the transverse or apical axis, sometimes slightly asymmetrical to both. Pseudoraphe narrow. Striae are 14-18 in 10 µm. The frustules are usually less than 80 µm long but may be as long as 130 µm. Taxon is distinguished in girdle view by its usually numerous septa, and the zig-zag shape of the colonies. In valve view, the taxon is distinguished by the median swelling usually being greater than the apical ones and often asymmetrical appearance of the valve.

Ecology: This species has wide tolerance for different types of water. Specimens with short frustules are associated with soft oligotrophic waters, longer frustules are associated with mesotrophic waters.



BACILLARIOPHYCEAE

PENNALES

NAVICULINEAE;

Amphipleura pellucida

Caloneis bacillum

Cymbella aequalis
Cymbella affinis
Cymbella lanceolata
Cymbella obtusa
Cymbella ventricosa

Gomphonema acuminatum
Gomphonema augur
Gomphonema constrictum
Gomphonema ventricosum

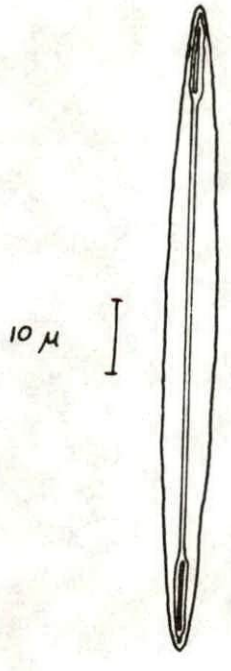
Navicula atomus
Navicula cryptocephala
Navicula elginensis
Navicula gastrum
Navicula radiosa
Navicula pupula var retangularis

Pinnularia nobilis
Pinnularia sublinearis

Amphipleura pellucida

Valve narrow, elongate to linear-lanceolate with rounded, obtuse ends. A thick siliceous rib lies in the apical axis of the valve, bifurcates towards each apex, and ends in a nodule. The raphe is situated between the bifurcations. The siliceous rib connecting branches of the raphe is narrow and not variable in width as in some species. The transverse striae are parallel throughout most of the valve, somewhat radiate at the ends; 37-40 in 10 µm. Longitudinal lines (formed by arrangement of the puncta) are finer and very difficult to count. The valves are 80-140 µm long and 7-9 µm in width.

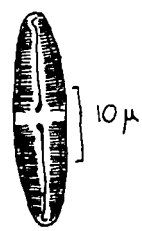
Ecology: Benthic or epiphytic, usually found in fairly hard waters.



Caloneis bacillum

Valve usually linear with parallel sides, sometimes slightly linear-lanceolate; ends rounded or very slightly rostrate. Axial area distinct, narrow; gradually widening towards the center of the valve. Central area distinct, a transverse fascia; usually moderately broad. Striae parallel to slightly radiate, 24-30 in 10 µm. There is a more or less distinct longitudinal line near each margin of the valve. Valves are 15-45 µm long and 4-9 µm wide.

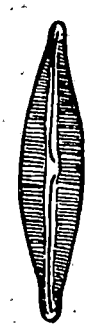
Ecology: Benthic or epiphytic, widely distributed.



Cymbella aequalis

Valves lanceolate to almost naviculoid, with dorsal margins regularly arcuate, slightly produced at apex. Ventral margin rather more strongly arcuate, with apices rostrate and slightly capitate. Raphe and central nodule surrounded by a well-marked hyaline space. Striae delicate about 12-13 in 10 µm. Frustules are 35-60 µm long.

Ecology: Benthic or epiphytic.



Cymbella affinis

Short, ventricose; valves broadly lanceolate, with dorsal margin very convex, ventral margin very slightly convex, not gibbous; apices produced rostrate; raphe very arcuate, parallel to the dorsal side, surrounded by a narrow hyaline zone. Striae 9 (dorsal) to 11 (ventral) in 10 µm. Length of valve about 25 µm.

Ecology: Benthic or epiphytic.

Cymbella lanceolata

Valve cymbiform with dorsal margin strongly convex, ventral margin concave, inflated at the median portion. The apices are obtuse, raphe very arcuate surrounded by a very narrow hyaline zone, scarcely dilated near the central nodule. The central nodule is rather large and elongate. Terminal nodules of median size. The striae are 7-8 in 10 µm and distinctly moniliform. The frustules are stipitate in living state. Valve length 80-150 µm.

Ecology: Benthic or epiphytic, very common.

Cymbella obtusa

Valve lanceolate with dorsal margin inflated, infinitesimally attenuate; ventral margin almost straight, slightly inflated in the middle. The raphe is straight, or a little flexuous, surrounded by a slight hyaline zone, very slightly dilate on the dorsal side round the central nodule. The striae are 12 (median) - 15 (terminal) in 10 µm. Length of valve about 30 µm.

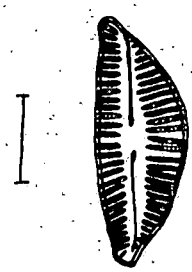
Ecology: Benthic or epiphytic.

Cymbella (Encyonema) ventricosa

Valve cymbiform, somewhat elongated, apices often rather abruptly attenuate. The dorsal margin is rounded, ventral margin straight or almost so. The raphe is straight, surrounded by a narrow hyaline zone, not inflated round the central nodule. The striae are faint, about 10-16 in 10 µm, varying with side of the valve. Length very variable, 12.5 - 25 µm.

This species is extremely variable in size and form; the apices are sometimes obtuse, at other times constricted longitudinally or prolonged into points beyond the ventral margin. In living state the frustules are usually enclosed in gelatinous tubes.

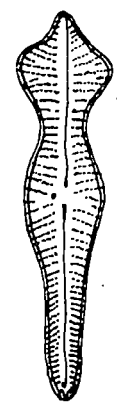
Ecology: Benthic or epiphytic.



Gomphonema acuminatum

Valves clavate or cuneate, with apiculate apex and narrow base, frequently biconstricted. Axial area narrow; central area small, unilateral. The striae are 10 in 10 µm. Stigma on the side opposite the shorter striae. Quite variable in outline. Length of valve 30-70 µm.

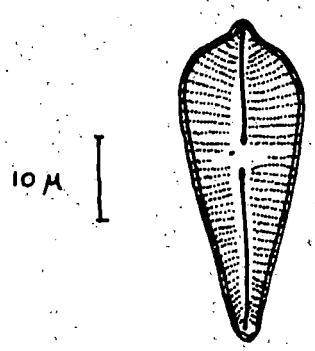
Ecology: Epiphytic, common.



Gomphonema angur

Valves broadly clavate, truncate and apiculate at the apex and subacute at the base. Axial area distinct. Central area small, unilateral, with one stigma. The striae are 10 in 10 µm with distinct puncta. Valves are 30-50 µm long. Variations occur intermediate between this form and G. acuminatum.

Ecology: Epiphytic.



Gomphonema constrictum

Valves clavate, constricted beneath an abruptly rounded apex, gibbous in the middle. The striae radiate, 10-12 in 10 µm, alternately longer and shorter in the middle. The axial area is narrow. The central is unilateral, with one stigma. The valves are 25-70 µm long. The valve outline is quite variable in this space.

Ecology: Epiphytic, and common.

Gomphonema ventricosum

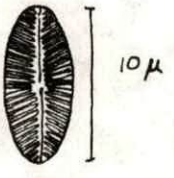
Valve lanceolate-clavate, very inflated at the median portion, with upper apex inflated obtuse; lower apex obtuse, very narrow. The raphe is surrounded by a lanceolate hyaline area enlarged at the median portion and showing in the type form a single stigma. Median striae finely punctate, 11-13 in 10 µm. Valves are 35-55 µm long and about 10 µm wide at the median portion.

Ecology: Epiphytic, a north temperate species.

Navicula atomus

Valve linear-elliptical to elliptical with rounded ends. Valve lightly silicified, with axial area often appearing somewhat thicker. Axial area narrow, slightly widened toward the center of the valve. Central area slightly wider than the axial area. Striae strongly radiate, about 30 in 10 µm. Valves are 4-17 µm long and 2.5 - 5 µm in breadth.

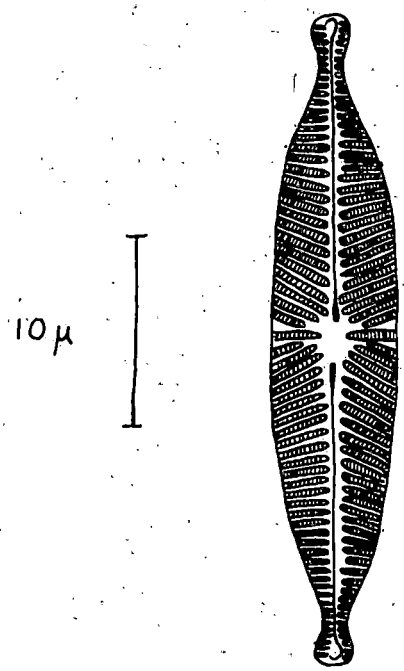
Ecology: Benthic or pseudoplanktonic, widely distributed in circumneutral water of high nutrient content.



Navicula cryptocephala

Valve lanceolate with globose-capitate or rostrate-capitate ends. Axial area narrow; slightly wider at the centre of the valve where it merges with the rounded, transverse central area. Striae radiate throughout most of the valve, parallel or slightly convergent at the ends, 16-18 in 10 µm. Valves are 20-40 µm long and 5-7 µm wide.

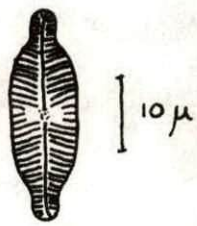
Ecology: Benthic or epiphytic, widely distributed.



Navicula elginensis

Valve broadly linear, sometimes slightly lanceolate, with capitate or rostrate ends. Margins of the valve on each side of the central area usually parallel. Axial area narrow. Central area distinct, transverse. Striae radiate throughout the valve except at the ends where they are parallel or radiate, they are 9-11 in 10 µm at the centre of the valve to 14 in 10 µm at the ends. Valves are 20-40 µm long and 8-14 µm wide.

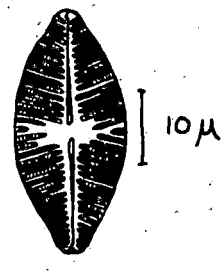
Ecology: Benthic or epiphytic, tolerant of a wide range of conditions.



Navicula gastrum

Valve lanceolate to elliptical-lanceolate with obtuse, slightly protracted ends. Axial area narrow, slightly widened toward the center area. Central area transverse, irregular in shape. Striae radiate throughout the valves; irregular in length at the central area. Striae are 8-10 in 10 µm at the center of the valve to 12 in 10 µm at the ends. Valves are 25-60 µm long and 12-20 µm wide.

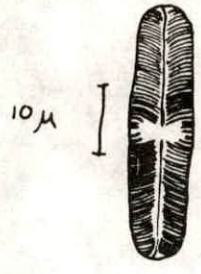
Ecology: Benthic or epiphytic, widely distributed.



Navicula pupula var retangularis

Valve linear in general outline, slightly swollen in the middle portion; ends broadly rounded, sometimes slightly rostrate. Striae are 13-17 in 10 µm at the centre of the valve to 26 in 10 µm at the ends. The length-to-breadth ratio is about 4:1 and valves are 20-40 µm long and 7-11 µm wide.

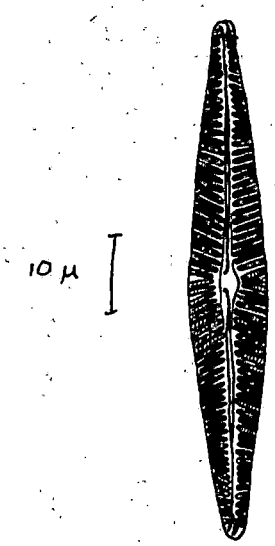
Ecology: Benthic or epiphytic, this form prefers waters of higher mineral content than the nominate variety.



Navicula radiosa

Valve linear-lanceolate with acute, rounded ends. Axial area narrow distinct. Central area variable in size, transversely widened but not reaching the margins of the valve. The striae are radiate throughout most of the valve, convergent at the ends, 10-12 in 10 µm. Valves are 40-120 µm long and 10-19 µm wide.

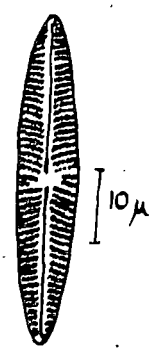
Ecology: Benthic or epiphytic, common in circum-neutral waters.



Navicula tripunctata var schizonemoides

Valve almost linear with obtuse, rounded ends. Axial area narrow, distinct. Central area is small and does not have the rectangular shape of the nominate variety. Striae slightly radiate at the center of the valve, parallel at the ends; distinctly lineate. Striae are 11-12 in 10 µm. Valves are 33-40 µm long and 6-10 µm in breadth.

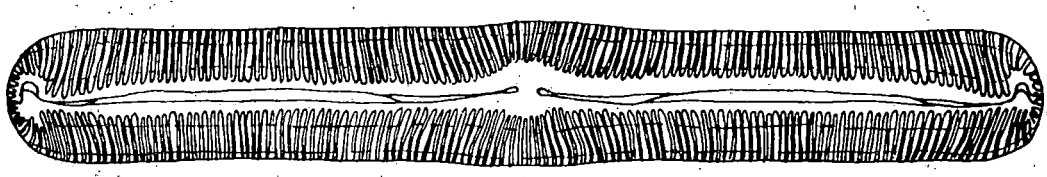
Ecology: Benthic or epiphytic, seems to prefer fairly hard waters.



Pinnularia nobilis

Valve linear, slightly swollen in the central portion; ends broadly rounded. Axial area throughout most of its length 1/4 to 1/3 the breadth of the valve. Central area rounded, usually asymmetrical; central nodule usually evident. Raphe complex; terminal fissures distinct, "?" shaped. Striae radiate in the middle portion of the valve, convergent toward the ends; crossed by a broad band. Striae 4-5 in 10 µm. Valves are 200-350 µm long and 34-50 µm in breadth. This taxon is distinguished by the swelling in the middle portion of the valve and the coarseness of the striae.

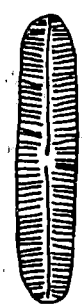
Ecology: Benthic or epiphytic in circumneutral waters.



Pinnularia sublinearis

Valve linear or slightly swollen in the middle portion, with rounded ends. Axial area narrow, becoming wider near the central nodule. Central area not differentiated from the axial area. Striae very fine and their structure not distinct, radiate throughout most of the valve, parallel at the ends, 21-25 in 10 µm. Valves are 20-30 µm long and 4-5 µm wide. This species is distinguished by its narrow axial area, small central area and fine striae. Because of the fineness of the striae, it is difficult to be sure that the striae are of the structure found in the genus Pinnularia.

Ecology: Benthic or epiphytic.



CHLOROPHYCEAE

CHLOROCOCCALES;

Actinastrum hantzschii var fluviatile

Ankistrodesmus falcatus
Ankistrodesmus falcatus var mirabilis

Chlorococcum humicola

Crucigenia lauterbornii
Crucigenia quadrata
Crucigenia tetrapedia

Dictyosphaerium ehrenbergianum
Dictyosphaerium pulchellum

Golenkinia radiata

Lagerheimia quadriseta

Micractinum pusillum

Pediastrum duplex var reticulatum
Pediastrum tetras
Pediastrum tetras var tetraodon

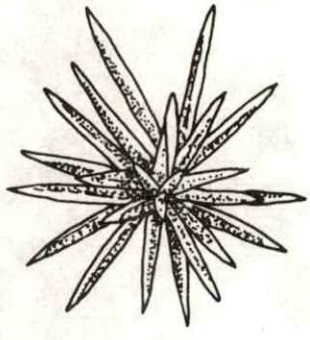
Scenedesmus bijuga
Scenedesmus dimorphus
Scenedesmus hystrix
Scenedesmus longus
Scenedesmus opoliensis
Scenedesmus perforatus
Scenedesmus quadricauda

Selenastrum minutum

Actinastrum hantzschii var fluviatile

Cells spindle-shaped, sharply pointed, occurring in colonies of 4 or 8 cells with the long axis radiating from a common centre; the chloroplast is a parietal plate with one pyrenoid. The cells are 3 - 3.5 µm in diameter and 39-42 µm long.

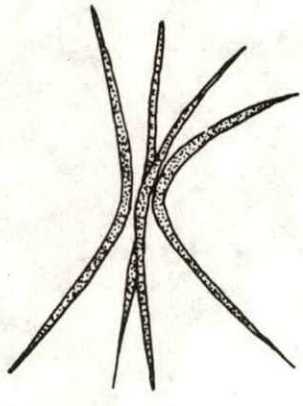
Ecology: Heleoplanktonic, a rare form but common in Mactaquac.



Ankistrodesmus falcatus

Cells needle-like, solitary or in clusters, not enclosed in a sheath. There is a single parietal plate chloroplast without pyrenoids. The cells are 2-6 µm in diameter and 25-100 µm long.

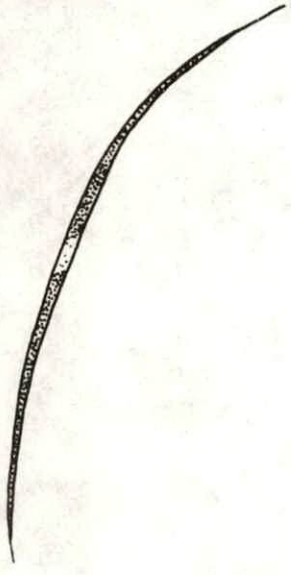
Ecology: Widely distributed, commonly associated with warm ponds of low productivity.



Ankistrodesmus falcatus var mirabilis

Cells solitary, sigmoid or lunate, apices gradually tapering to fine points; diameter 2-3 µm, length up to 150 µm.

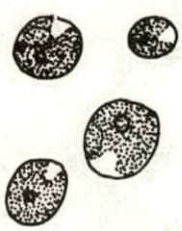
Ecology: Generally distributed in lakes and ponds.



Chlorococcum humicola (?)

The cells are spherical, solitary or in small gelatinous clumps, the chloroplast is a single parietal plate covering the wall or nearly so, and containing one pyrenoid. Cells are variable in size, 8-25 μm in diameter. The taxonomy of this genus is not clear.

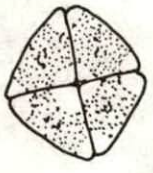
Ecology: This is typically a benthic genus; some aquatic species may occur pseudoplanktonically.



Crucigenia tetrapedia

Free-floating colony of 4 triangular cells cruciately arranged about a minute central space. Outer free wall and lateral adjoining walls straight, the angle acutely rounded. Chloroplast a parietal plate with one pyrenoid. The cells are 4.5 - 9 μm in diameter. Sometimes occurs as four quartets.

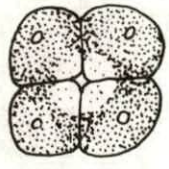
Ecology: Heleoplanktonic, occasionally common in the plankton of small lakes.



Crucigenia quadrata

A circular free-floating plate of 4 triangular cells cruciately arranged about a small central space, the outer free walls of the cells broadly convex, the lateral adjoining walls straight; there are up to 4 disc-shaped chloroplasts. The cells are 2.5 - 6 µm in diameter and 3.5 µm long.

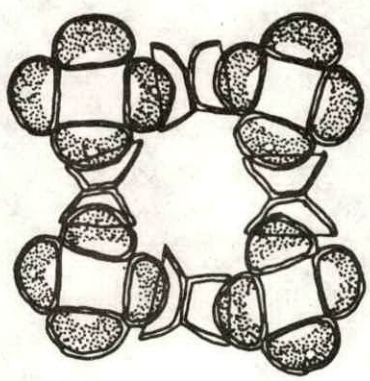
Ecology: Common in Canadian lakes, associated with oligotrophic waters.



Crucigenia lauterbornii

Colony free-floating, consisting of 4 subspherical cells arranged in two opposite pairs about a large square space bounded by the flat inner walls of the cells, cells in contact only at their inner corners; one chloroplast, parietal along the outer convex wall; pyrenoid present; cells 4.5 - 9 µm in diameter, 8-15 µm long. Quartets of cells may be adjoined in mulitples by remains of old mother cell walls.

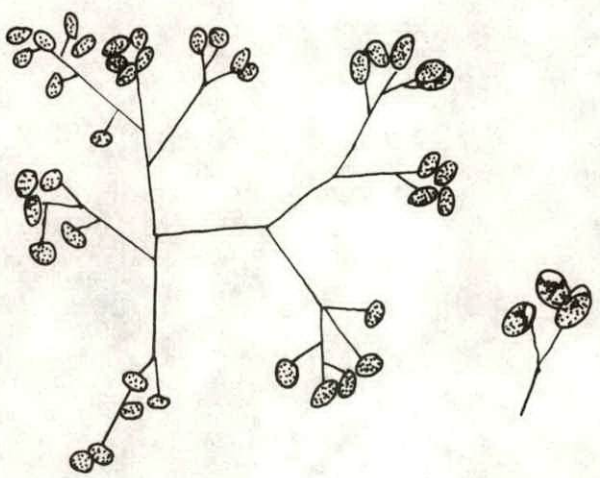
Ecology: Euplanktonic, generally uncommon.



Dictyosphaerium ehrenbergianum

Ovoid colony of 8-30 eliptical cells with 1 or 2 parietal cup-like chloroplasts, the cells being attached in groups of 2 or 4 at the ends of fine branched strands and wholly enclosed in mucilage. The cells are 4-6 µm in diameter, 8-10 µm long.

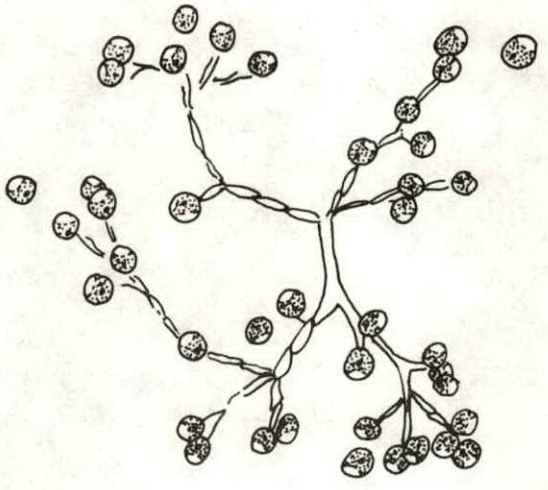
Ecology: Generally distributed, euplanktonic.



Dictyosphaerium pulchellum

Spherical or ovoid colonies of up to 32 spherical cells arranged in groups of 4 on dichotomously branched threads, and enclosed in mucilage. The cells are 3-10 μm in diameter.

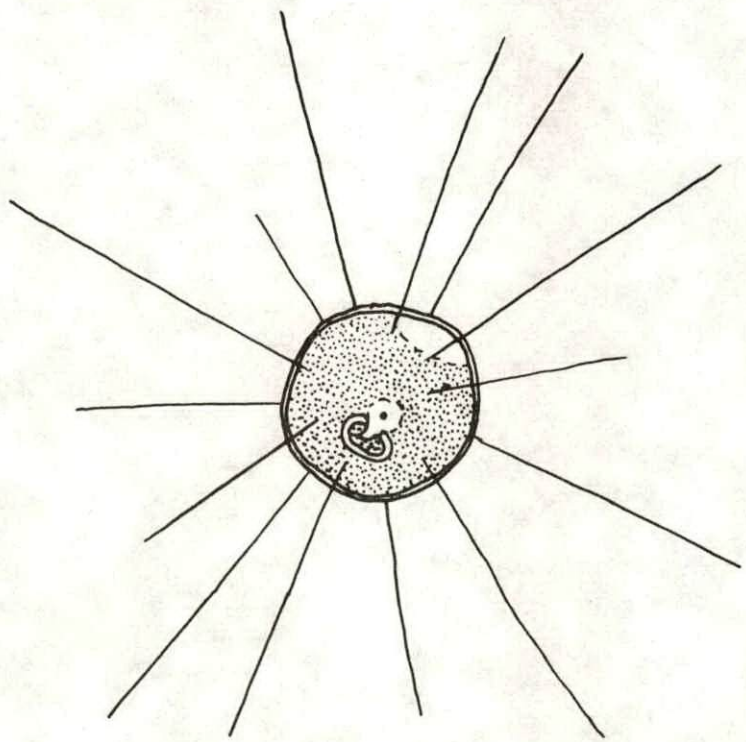
Ecology: Generally distributed but especially common in the plankton of acid bog lakes.



Golenkinia radiata

Spherical, free-floating unicells with long and very slender setae. Cells usually solitary but occasionally clumped by interlocking setae. The cells are 7-15 μm in diameter, setae are 25-45 μm long.

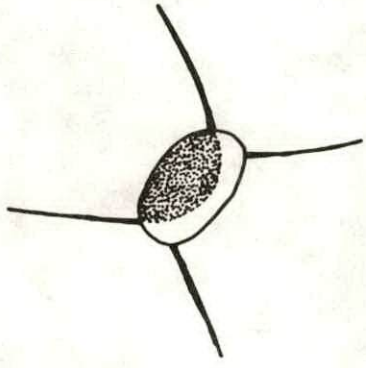
Ecology: Euplanktonic.



Lagerheimia quadriseta

Cells ovate; with 2 long, diverging setae arising near the apices. The cells are 4 - 6.5 µm in diameter and 7.5 - 12 µm long. The setae are up to 22 µm long.

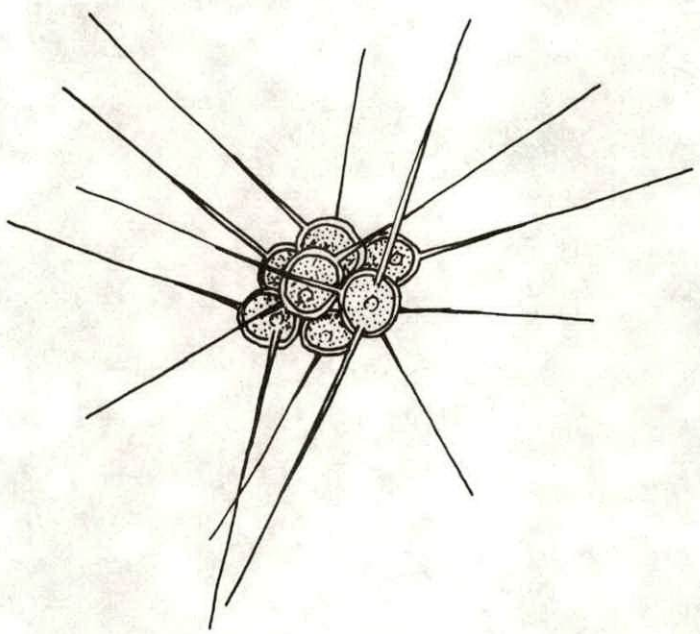
Ecology: Euplanktonic, rare.



Micractinium pusillum

Free-floating colony of 4-16 spherical cells arranged in pyramids or squares in groups of four; the free walls are beset with 1-5 finely tapering setae; the chloroplast is a parietal cup with one pyrenoid. The cells are 3-7 µm in diameter, the setae 20-35 µm long.

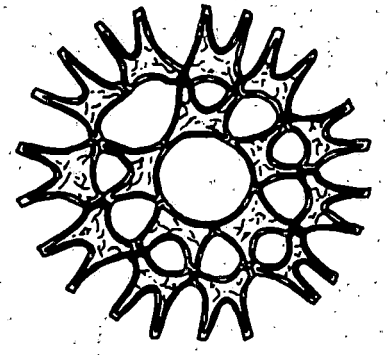
Ecology: Euplanktonic.



Pediastrum duplex var reticulatum

Colonies of 8-128 cells, smooth walls with lens-shaped spaces between the inner cells. The outer margins of the peripheral cells have lobes with subparallel sides; inner cells are almost H-shaped. Cells are 14-18 µm in diameter.

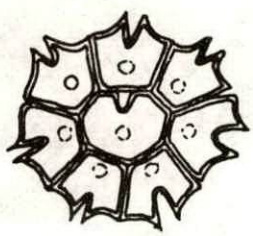
Ecology: Euplanktonic.



Pediastrum tetras

Colony entire; inner cells (frequently none) with 4-6 straight sides with one margin deeply incised; peripheral cells crenate, with a deep incision in the outer free margin, their lateral margins adjoined along 2/3 of their length. The cells are 8-12-(16) µm in diameter.

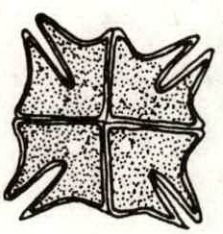
Ecology: Generally distributed in both eu- and tychoplankton.



Pediastrum tetras var tetraodon

Colonies of 4-8 cells, outer margins of the peripheral cells with deep incisions; the lobes horn-like. The cells are 12-14 µm in diameter and 16-18 µm long.

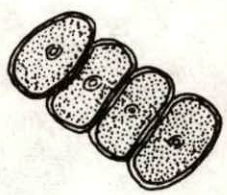
Ecology: Euplanktonic.



Scenedesmus bijuga

Colony of 2-8 cells in a single flat series (occasionally in an indefinitely alternating series). Cells ovate or oblong, no teeth or spines. The cells are 4-8 µm in diameter and 8-16 µm long.

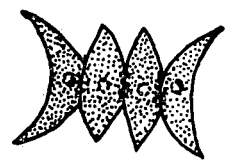
Ecology: Widespread, common in littoral plankton.



Scenedesmus dimorphus

Colony of 4 or 8 fusiform cells in a single or alternating series; the inner cells with straight sides and sharp apices; the outer cells lunate, with sharp apices. The cells are 3-6 µm in diameter, 16-22 µm long.

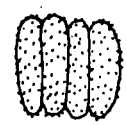
Ecology: Widespread and common, heleoplanktonic.



Scenedesmus hystrix

Colony composed of 2-4-8 oblong cylindrical cells arranged in a single series, apices narrowly rounded; wall uniformly beset with short sharp spines. The cells are 3-5 µm in diameter and 8-18 µm long.

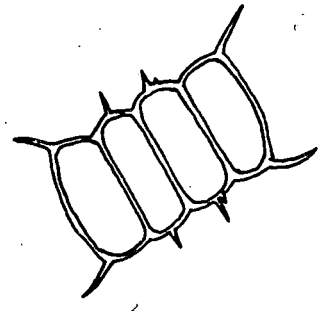
Ecology: Probably heleoplanktonic, rare.



Scenedesmus longus

Colony composed of 2-4-8 oblong cylindrical cells arranged in a single series; the apices of both inner and outer cells bear 1 or 2 sharp spines which are longer on the outer cells. The cells are 4-6 µm in diameter, 8-12 µm long.

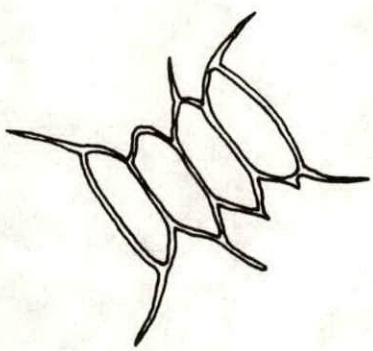
Ecology: Uncertain, a rare species.



Scenedesmus opoliensis

Colony consisting of 4 naviculoid cells arranged in a single series and adjoined along 2/3 of the length of their lateral walls; apices of cells with long spines (inner cells with a spine at one pole only, or sometimes spineless). The cells are 6-8 µm in diameter, 14-26 µm long.

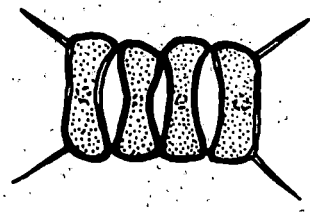
Ecology: Euplanktonic, widely distributed but rare.



Scenedesmus perforatus

Cells subrectangular with convex end walls and concave lateral walls, thus forming biconvex intercellular spaces; end walls of the colony bearing a single curved spine from each pole, the outer lateral walls of end cells are straight or umbonate. The cells are 3-5 μm in diameter, 10-13 μm long.

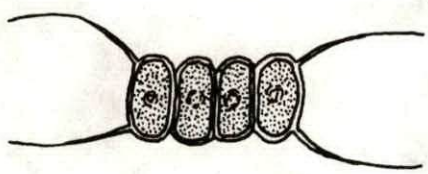
Ecology: Uncertain, probably euplanktonic.



Scenedesmus quadricauda var longispina

Colony of 2-4-8 oblong cylindrical cells in a single series, outer cells with a long spine at each pole. The cells are 3-18 µm in diameter and 9-35 µm long.

Ecology: S. quadricauda is one of the most ubiquitous of algal species, limno- and heleoplanktonic.



Selenastrum minutum

Cells solitary or in small irregularly arranged clumps, crescent shaped, poles bluntly pointed. The cells are 2-3 µm in diameter, 7-9 µm between the apices.

Ecology: Seldom common, but associated with lakes of low productivity.

CHLOROPHYCEAE

TETRASPORALES;

Asterococcus limneticus

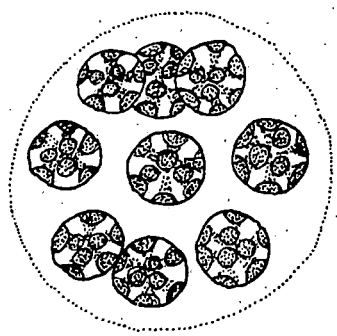
Gloeocystis gigas
Gloeocystis planctonica

Sphaerocystis schroeteri

Asterococcus limneticus

Cells spherical, arranged at some distance from one another in free-floating colonies of 4-16 cells within a colourless homogenous investing mucilage. Chloroplast stellate with 4-16 lobes radiating from a central core, the lobes becoming flattened against the cell wall. Cells are 10-25-(35) µm in diameter; colonies 50-125 µm in diameter.

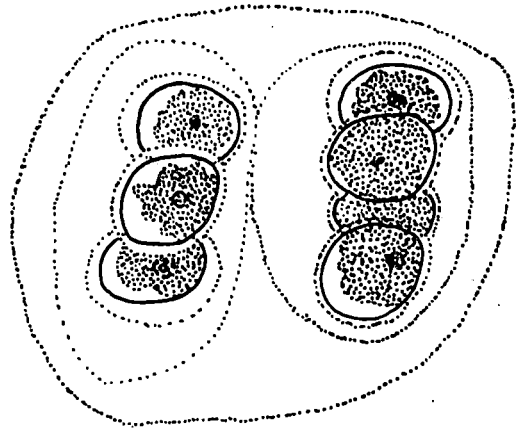
Ecology: Limnoplanktonic, common.



Gloeocystis gigas

Colony of 8 spherical or slightly oblong individuals enclosed in a copius gelatinous lamellate envelope. Cell contents frequently brownish-green due to the presence of oil. The cells are 9-12 µm in diameter.

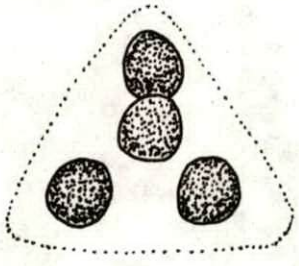
Ecology: Heleoplanktonic.



Gloeocystis planctonica

Cells spherical or oval, united in tetrahedra in free-floating gelatinous colonies. Sheaths of each cell or tetrad are lamellate. The cells are 4-13 μm in diameter.

Ecology: Common in littoral plankton of shallow lakes and ponds.



Sphaerocystis schroeteri

A free-floating colony of 4-32 spherical cells, evenly spaced near the periphery of a non-lamellate gelatinous envelope, sometimes with a sheath about each group of 4 cells within the colony. Chloroplast cup-shaped and covering most of the wall, there is one pyrenoid. Colony often includes recently divided cells forming smaller spherical clusters within the colonial mucilage. The cells are 6-20 µm in diameter; colonies up to 500 µm in diameter.

Ecology: Euplanktonic and widely distributed.

CHLOROPHYCEAE

VOLVOCALES;

Chlamydomonas angulosa
Chlamydomonas epiphytica
Chlamydomonas globosa

Gonium pectorale
Gonium sociale

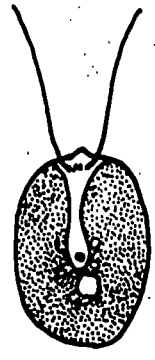
Haematococcus lacustris

Pandorina morum

Chlamydomonas angulosa

Cells ovoid to cylindrical, often truncated anteriorly and with a prominent papilla. There are two anterior contractile vacuoles, and a single massive cup-shaped chloroplast with a large angular pyrenoid in the base. There is an anterior lateral pigment spot. The cells are 11-15 µm in diameter and 15-20 µm long.

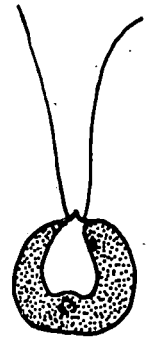
Ecology: Heleoplanktonic.



Chlamydomonas epiphytica

Cells spherical to nearly pyriform, anteriorly narrowed into a papilla-like beak. Cells sometimes becoming non-motile, adherent to the colonial mucilage of Anacystis without losing flagella. Chloroplast a thin parietal cup; no pigment spot. The cells are 7-8 µm in diameter and 8-9 µm long.

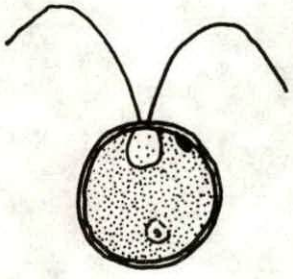
Ecology: Heleoplanktonic or epiphytic on Anacystis.



Chlamydomonas globosa

The cells are ovoid to globose without a papilla. The chloroplast is a dense parietal cup with a basal pyrenoid. There is one contractile vacuole in the anterior end of the cell and a pigment spot in a lateral median position. The cells are 5-7 µm in diameter and 10-19 µm long.

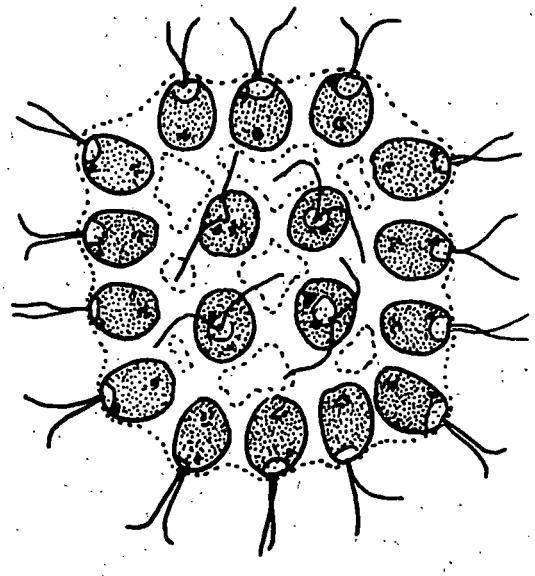
Ecology: Heleoplanktonic, common and perhaps ubiquitous in ponds and shallow lakes of the Saint John River Basin.



Gonium pectorale

Colony of 8-16 elipsoid, subspherical cells closely arranged in a flat, quadrangular plate, usually with 4 inner cells bordered by 12 marginal cells. Cells enclosed in sheaths and connected to neighbouring cells by short processes. The cells are 5-15 µm in diameter.

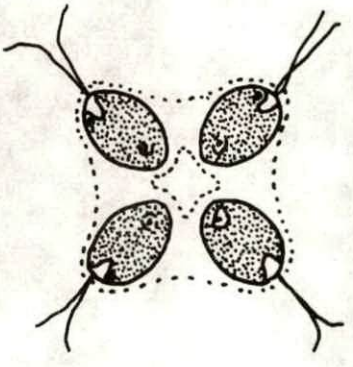
Ecology: Heleoplanktonic, associated with eutrophic waters rich in nitrogen.



Gonium sociale

Colony of 4 ovoid cells arranged in a quadrangular plate and enclosed by colonial mucilage which has a central rectangular perforation. Cells 10-15 µm in diameter, 12-20 µm long.

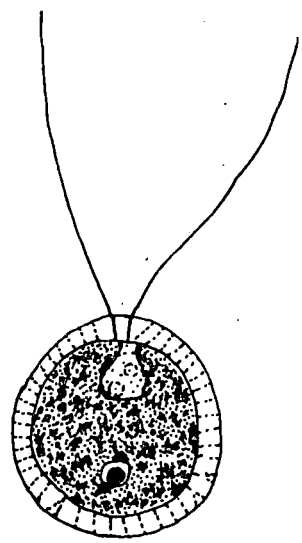
Ecology: This species, like G. pectorale, is often found in barnyard ponds and is associated with high nitrogen content.



Haematococcus lacustris

The protoplast is separated from the cell wall by a layer of fine cytoplasmic strands. Between the wall and protoplast is a layer of mucilage. The cells are ellipsoid to ovoid with two flagella diverging from an anterior papilla. The chloroplast is apparently cup-shaped and usually masked by an abundance of bright red haematochrome. The cell diameter is variable, 10-13 μm.

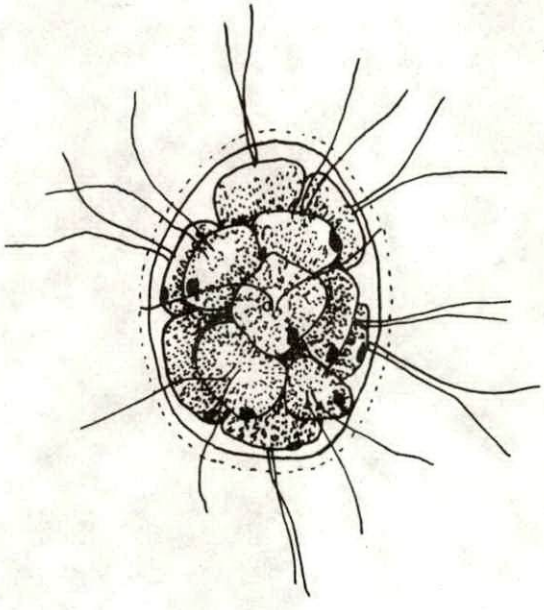
Ecology: Usually found in small ponds.



Pandorina morum

Colony usually ovate up to 220 µm in diameter consisting of (usually) 16 crowded pyriform cells each with a parietal cup chloroplast, a single basial pyrenoid, an anterior lateral pigment spot, and two flagella. The cells are 10-15 µm in diameter and 12-17 µm long.

Ecology: Especially common in waters rich in nitrogenous matter, otherwise widely distributed in the plankton of hard and soft water lakes.



CHLOROPHYCEAE

ZYGNEMATALES;

Closterium attenuatum
Closterium lanceolatum

Cosmarium regnesi

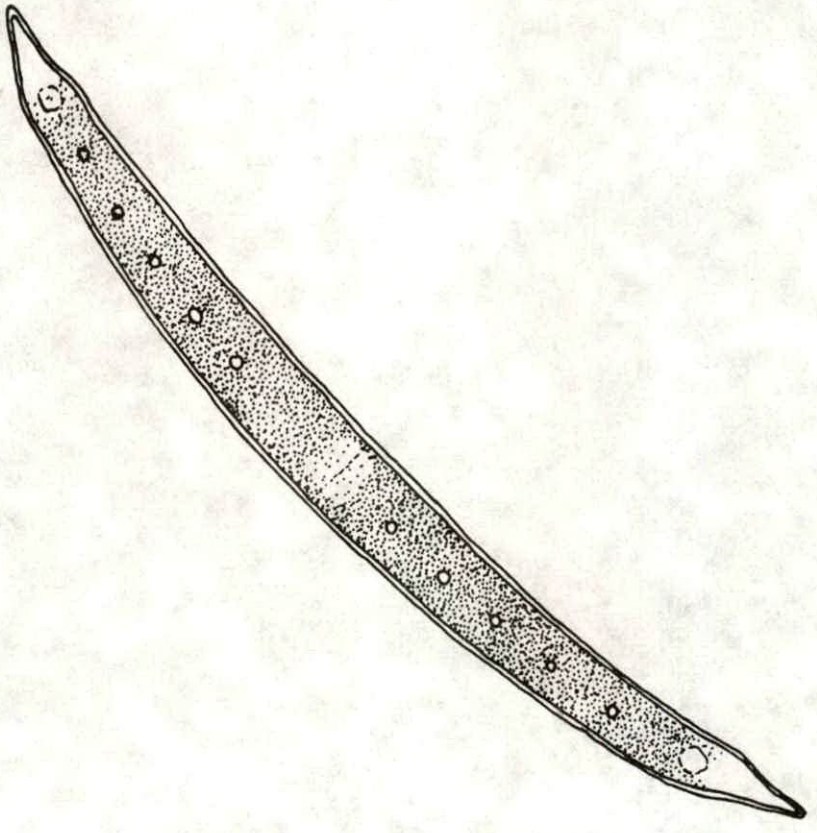
Penium minutissimum

Staurastrum neglectum
Staurastrum subgracillimum

Xanthidium concinnum var boldtiana

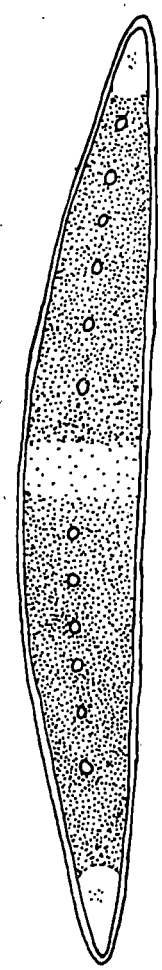
Closterium attenuatum (?)

Frond 8-12 times as long as broad, gently curved, gradually attenuated, upper margin slightly convex, lower concave; extremities suddenly contracted into an obtuse conical point; large granules in a single series; empty frond reddish with numerous close striae, central suture evident. Fronds are 360-420 µm long and 34-42 µm in diameter.



Closterium lanceolatum (?)

Frond 6-10 times longer than broad, semilanceolate, gradually tapering; upper margin convex, lower nearly straight, inclined upwards towards the tapering subacute ends; large granules in a single central series, empty frond colourless, usually without markings, sometimes faintly striate; central suture evident. The recorded size range for this species is 370 µm long and 50-55 µm in diameter, and it is presumably benthic. The form found in Mactaquac is planktonic and much smaller, 50 µm long and 5 µm in diameter.



Cosmarium regnesi var tritum

Very small cells about as long as broad, deeply contricted sinus open, rounded, and widely excavated; semi cells oblong -- rectangular with rounded angles, not toothed. Side view of semicell subcircular -- elliptic. Vertical view elliptic. Cell walls smooth. Chloroplasts axial, with one central pyrenoid. Length 7-9 µm, breadth 7-9 µm; breadth of isthmus 3-5 µm; thickness 4 µm.

Ecology: Heleoplanktonic, widely distributed and associated with oligotrophic waters; sometimes common in soft water ponds and acid bogs.

Penium minutissimum

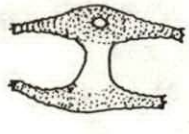
Very minute, about 1 1/2 times longer than broad, subelliptical, scarcely constricted in the middle with broadly rounded slightly attenuated apices. Vertical view circular. The membrane is smooth. Length 10-16 µm, diameter 8-10 µm.

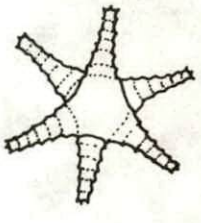
Ecology: Heleoplanktonic, associated with oligotrophic waters.

Staurastrum neglectum

Small cells about 1 1/2 times broader than long, including processes; constriction scarcely visible, apex convex, angles produced to form attenuated processes, provided with minute granules arranged in horizontal series. Vertical view triangular, sides concave, angles produced into fairly long attenuated, straight or slightly curved denticulated processes which dilate slightly towards their apex, and are tipped with 3 minute spines. Cells usually twisted, the processes alternating. Length 23-26 µm; breadth with processes 32-35 µm.

Ecology: Heleoplanktonic, widely distributed but not common, associated with oligotrophic waters.

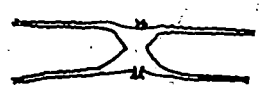


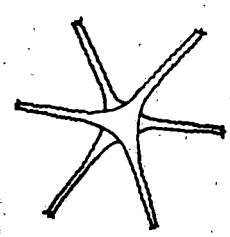


Staurastrum subgracillimum

Small cells, about as long as broad, excluding the processes; semicells broadly cuneate, side straight, apex concave, upper angles produced to form very slender processes, which are nearly horizontal and of the same width throughout their length, with margins minutely undulate. Vertical view triangular (3 processes) or quadrangular (4 processes) sides concave, angles produced to form long processes denticulate, cell wall otherwise smooth. Isthmus commonly twisted. Length 10-16 µm, breadth without processes 5-12 µm, with processes 20-40 µm, breadth of isthumus 2-5 µm.

Ecology: Heleoplanktonic, associated with oligotrophic bogs and ponds.





Xanthidium concinnum var boldtiana

A small desmid with elliptical hemicells bearing minute lateral spines. Length 8-13 µm, breadth without spines 10-14 µm, breadth of isthmus 3-6 µm, thickness 8-10 µm.

Ecology: Heleoplanktonic, associated with oligotrophic waters.

CHRYSOPHYCEAE:

Dinobryon bavaricum
Dinobryon divergens
Dinobryon sertularia

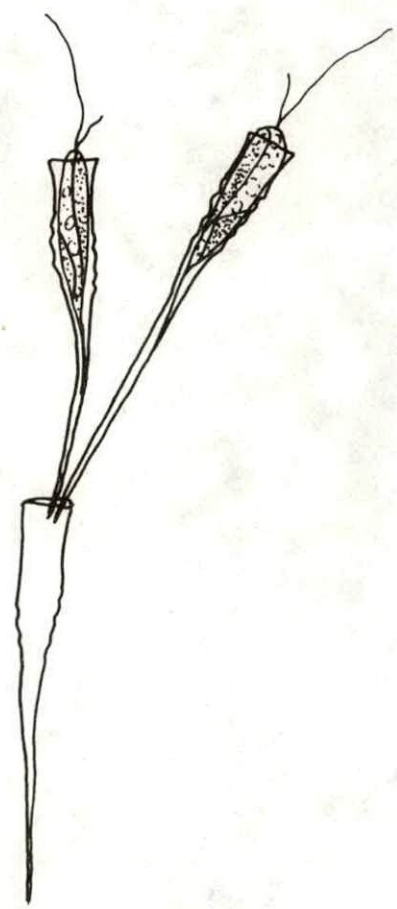
Mallomonas acaroides
Mallomonas caudata
Mallomonas leboimei
Mallomonas tonsurata

Synura sphagnicola
Synura uvella

Dinobryon bavaricum

Closely arranged loricas in slightly diverging free-swimming colonies, the loricas elongate-conical, tapering posterially to a sharp point (the length of the posterior part greatly varying, sometimes forming a short, sharp point), lateral margins undulate, diverging, gradually enlarging at first and then slightly flaring to a wide mouth. Loricas are 6.5 - 8.6 µm in diameter and 45-100 µm long.

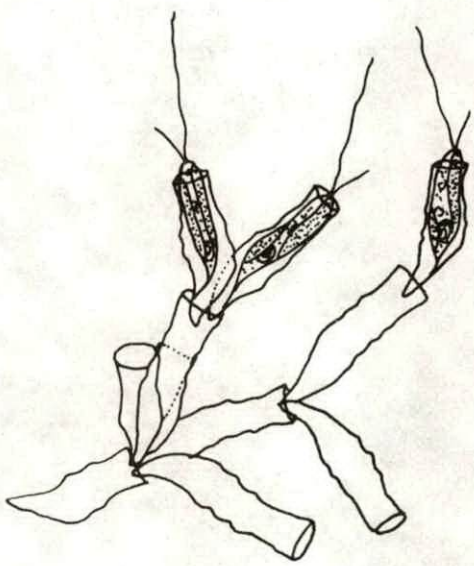
Ecology: Euplanktonic common in variety of lakes, associated with hard or semi-hard water. Growth of species in this genus can be inhibited by high phosphorus concentrations. They occur in oligotrophic waters or in eutrophic waters when nutrient levels are low.



Dinobryon divergens

Loricas united in diverging and much-branched colonies. Loricas densely arranged, cone-shaped, the posterior portion bent at an angle of as much as 90° from the longitudinal axis and blunt pointed. The lateral margins are irregularly undulate, slightly diverging anteriorly to form a companulate mouth. Loricas are 7-8 µm in diameter and 35-50 µm long.

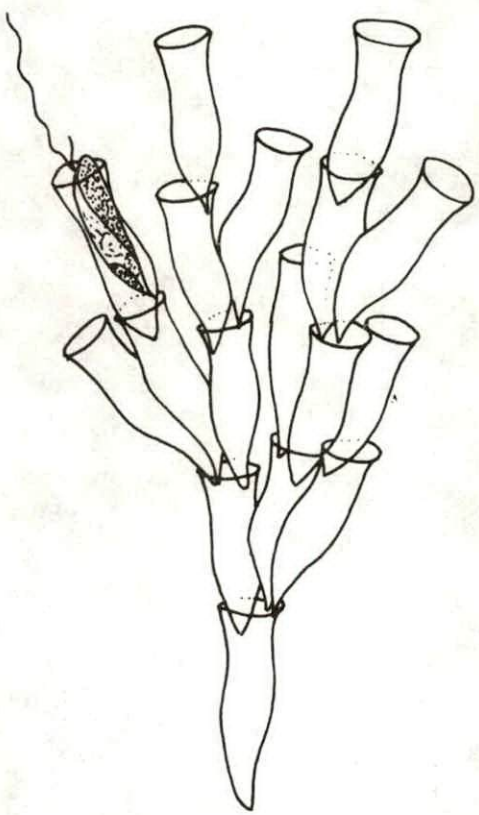
Ecology: Euplanktonic, common and widespread. Flourishes under low phosphorus concentrations.



Dinobryon sertularia

Colonies slightly diverging. Loricas fusiform, campanulate; posterior blunt pointed; lateral margins smooth, convex, narrowed above the mid-region and then slightly flaring to a wide mouth. Loricas are 10-14 µm in diameter and 30-40 µm long.

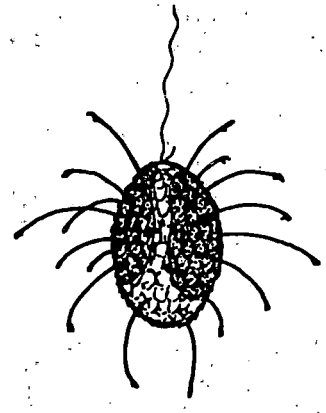
Ecology: Euplanktonic, common in the plankton of hard to medium lakes. Growth is inhibited by high phosphorus concentrations, the appearance of Dinobryon species in mesotrophic and eutrophic lakes usually follows after other algae have lowered the nutrient levels.



Mallomonas acaroides

Unicellular, free-swimming, cells ovoid, broadly rounded at both poles, but somewhat narrowed anteriorly; scales ovoid to subcircular, arranged in spiral series; needles as long or a little longer than the cell, mostly directed posteriorly (slightly recurved at the tips). The cells are (7)-15-(23) µm in diameter and 18-24-(45) µm long.

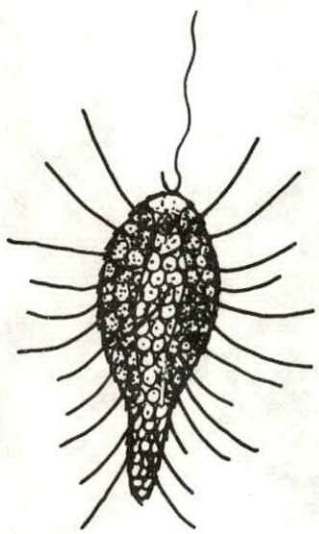
Ecology: Euplanktonic, not common; a summer form associated with eutrophic waters.



Mallomonas caudata

Cells ovoid, much narrower at the posterior end, membrane covered with oval scales so disposed as to form transverse rows; all scales bearing a long needel, the needles directed outward and back; anterior end furnished with a few sharp beaks; there are two chloroplasts, parietal plates. The cells are 12-30 µm in diameter and 40-85 µm long.

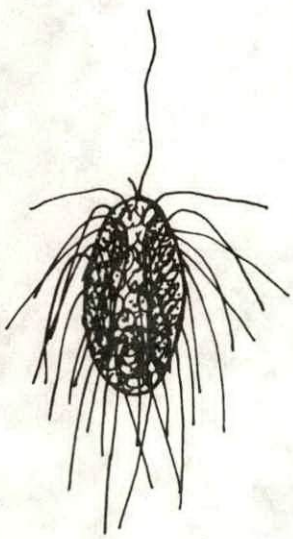
Ecology: Euplanktonic and widely distributed.



Mallomonas leboimei

Unicellular, free-swimming, ellipsoid cells covered with ovoid scales from each of which arises a needle of about the same length as the cell. The needles all curve posteriorly, and are not recurved. The cells are 36-44 µm long and 18-22 µm in diameter.

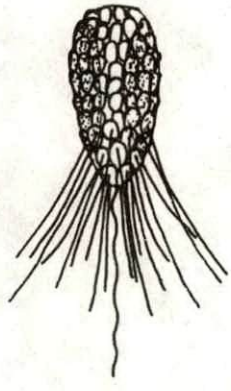
Ecology: Euplanktonic.



Mallomonas tonsurata

Cells ellipsoid or ovate, with the posterior end broadly rounded and the anterior end narrowed; membrane covered with irregularly arranged ovoid scales, those in the anterior end bearing needles. The cells are 11-12 µm in diameter and 21-26 µm long.

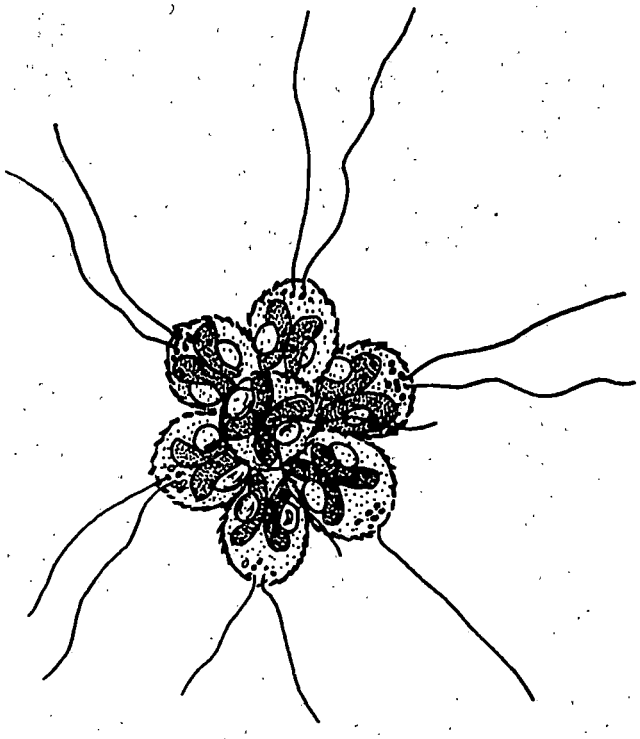
Ecology: Euplanktonic.



Synura sphagnicola

Cells radiately united in free-swimming spherical colonies of (typically) 8-16 cells. The cells are pyriform with the anterior end broadly rounded and the posterior end prolonged into a stalk. There are two flagella, the periplast is covered with elliptical siliceous rings or scales. There are two axial chromatophores.

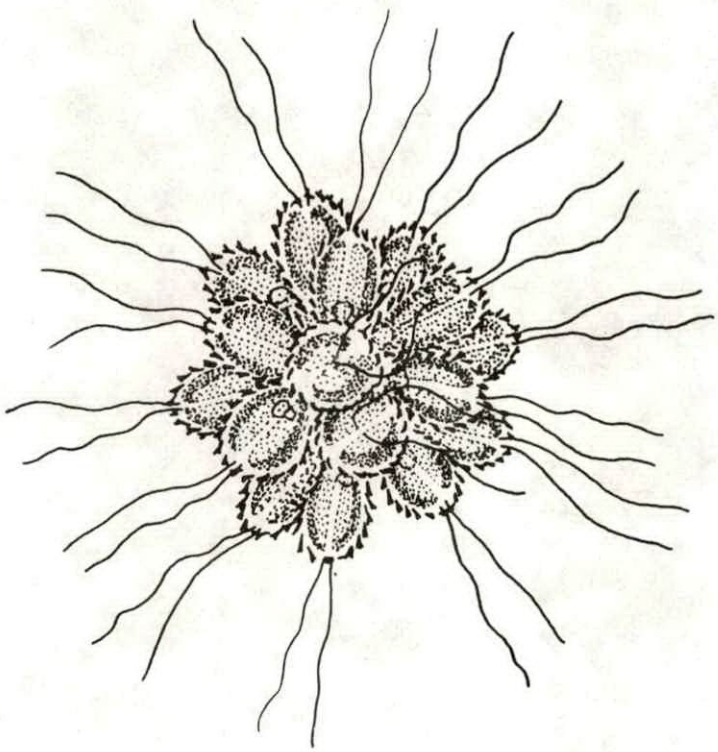
Ecology: Probably heleoplanktonic.



Synura uvella

A free-swimming colony of 64-128 short pyriform cells which have several short, sharp spines in the anterior region of the cell; cells 8-17 µm in diameter, 20-30-(35) µm long; there are two lateral chromatophores.

Ecology: This organism sometimes forms dense blooms in lakes and reservoirs and may become obnoxious because of the strong oily taste it imparts to the water. Common in the plankton of many lakes, especially hard waters and habitats where there is a high concentration of organic matter.



CRYPTOPHYCEAE:

Chroomonas acuta

Cryptomonas ovata

Chroomonas acuta

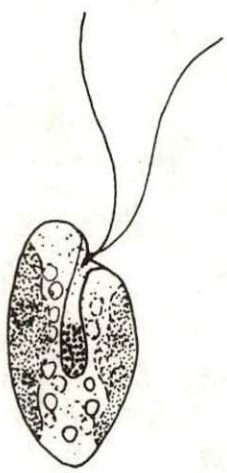
Compressed cells, convex dorsal side and concave ventral surface from which arise two flagella. The anterior end bluntly bilobed, the cell tapering posteriorly to an acute terminus. The gullet is reduced to a slight furrow bounded by a double line of heterocysts. The chromatophore is a dorsal parietal plate with one pyrenoid, the colour is blue-green. The cells are about 15-25 µm long and 6-10 µm at the greatest width.

Ecology: Heleoplanktonic.

Cryptomonas ovata

Cells ovoid to slipper-shaped, the apex unsymmetrically bilobed, the apical depression broad and shallow, gullet extending back about 3/4 the length of the cell. The chromatophores are 2 enlongate parietal plates, brown. The cells are convex on the dorsal surface, flat or concave ventrally. Two flagella are attached on the ventral surface at the anterior end. In the gullet is a conspicuous battery of trichocysts. The cells are 20-80 µm long and 5-18 µm wide.

Ecology: Heleoplanktonic, probably a facultative hetertroph. Very common and probably obiquitous in the lakes and ponds of the Saint John River Basin.



DINOPHYCEAE:

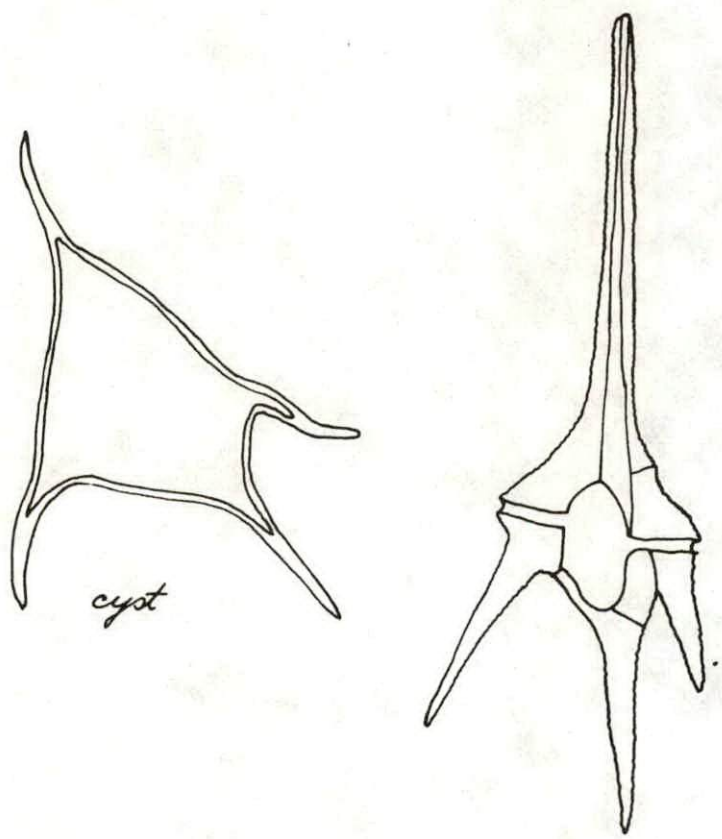
Ceratium hirundinella

Glenodinium kulczynskii
Glenodinium pulvisculus
Glenodinium quadriens

Ceratium hirundinella

Cells broadly or narrowly fusiform in outline, depending upon degree of divergence of the horns; very much flattened dorsiventrally; epithca with sharply converging margins from just above the transverse furrow, then narrowed more gradually to form a long horn; transverse furrow relatively narrow; body of the hypotheca broad and short below the transverse furrow, divided into varying number of posterior horns, usually three, sometimes only one, the central median horn the longest and formed by the antapical plates; plates coarsely reticulate. The cells vary in size depending upon environmental conditions, 100-400 μm long.

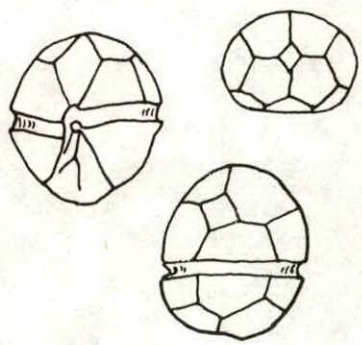
Ecology: This species is very common, especially in eutrophic lakes where occasionally it may become so abundant as to color the lake a deep brown. This species thrives best in hard waters (>15 $mg.l^{-1}Ca$) of pH>7 and low or moderate humic content.



Glenodinium kulczynskii

Cells broadly ovoid or nearly round as seen in ventral view, flattened in polar view, the dorsal margin broadly convex; epitheca with one apical, three intercalary, and six precingular plates; hypotheca with six postcingular and two antapical plates; longitudinal furrow extending to the apex of the hypocone; cell 30-32 µm in diameter, 35 µm long.

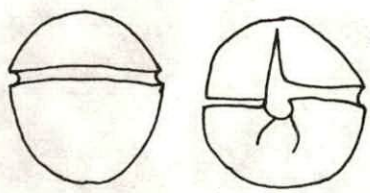
Ecology: Heleoplanktonic.



Glenodinium pulvisculus

Cells ovate to subglobose, the epicone and hypocone both broadly rounded at the poles; transverse furrow widening to the left; longitudinal furrow extending to the hypocone and posteriorly almost to the pole of the hypocone; chromatophores numerous golden-brown bodies; cells are 13-19-(29) µm in diameter and 23-35 µm long. Prescott (1962) states that the plates of the theca of this species are as yet incompletely known, and the assignment to the genus Glenodinium is questionable. It may belong to Gymnodinium.

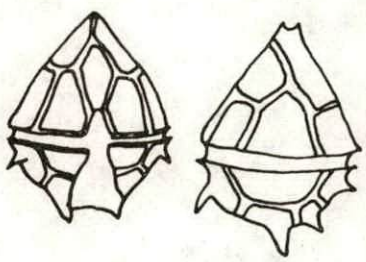
Ecology: Heleoplanktonic.



Glenodinium quadridiens

Cells ovate, the epicone apiculate, the hypocone broadly rounded and furnished with 3-5 short, sharp spines, laterally and posteriorly placed; transverse furrow not spiral, usually median and equally dividing the cell; longitudinal furrow extending into the epicone, widening posteriorly and reaching the apex of the hypocone; epitheca with one apical, five intercalary, and seven precingular plates; hypotheca with five postcingular and two antipical plates with a stout spine on each. Cells are 20-35 µm in diameter and 24-30 µm long.

Ecology: Heleoplanktonic.



EUGLENOPHYCEAE:

Euglena proxima

Lepocinclis marssonii

Trachelomonas granulosa

Euglena proxima

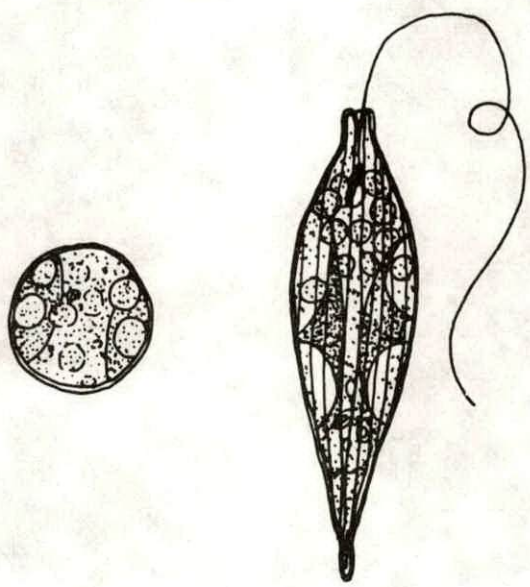
Cells free-swimming, metabolic, fusiform, narrowed posteriorly to a blunt tip; periplast spirally striated. The chloroplasts are numerous, irregularly shaped discs. There are numerous small rod-like bodies of paramylon. The cells are 14-20 µm in diameter and (50)-70-85-(95) µm long.

Ecology: Heleo- and tychoplanktonic.

Lepocinclis marssonii

Rigid periplast with numerous longitudinal striae. The cells are lanceolate with anteriorly produced lips and gullet. The posterior end tapers smoothly to an acute point. In cross section, the cell is perfectly circular. The single flagellum is bifurcate at the lower end and with a granular swelling. There are numerous parietal discoid chloroplasts and two large laterally located paramylum bodies. Cells are 50-60 µm long and 12-18 µm in diameter.

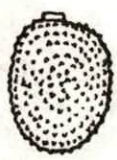
Ecology: Heleoplanktonic.



Trachelomonas granulosa

Free-swimming euglenoid cells enclosed in a firm gelatinous shell which has an opening for the flagellum. The test is broadly ellipsoidal. The flagellum opening is usually furnished with an exterior thickening. Wall of the test is brown, and densely granular. The test is 19 µm in diameter and 21 µm long.

Ecology: Heleoplanktonic.



MYXOPHYCEAE:

Anacystis cyanea
Anacystis marina
Anacystis thermalis

Agmenellum quadruplicatum

Arthrospira khannac

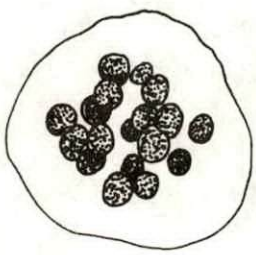
Gomphosphaeria aponina
Gomphosphaeria aponina var cordiformis

Oscillatoria rileyi
Oscillatoaia tenuis

Anacystis (Microcystis) cyanea

Spherical cells closely and irregularly distributed in a colonial mucilage. There are a number of different growth forms for this species. The cells contain pseudovacuoles of nitrogen gas which gives the colony buoyancy. The cells are 3-7 μm in diameter.

Ecology: Euplanktonic; associated with eutrophic waters, commonly forming massive summer water blooms. This species may produce toxins.



Anacystis (Aphanothece) marina

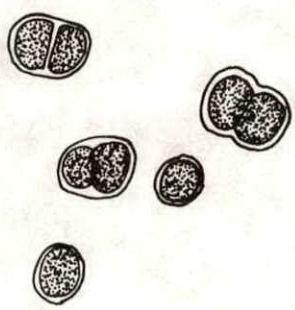
A spherical or lobed colony consisting usually of many small closely arranged spherical cells evenly distributed throughout a homogeneous mucilaginous envelope. The cells often occur in pairs as a result of recent division. There are no pseudovacuoles. The cells are 0.5 - 2 µm in diameter.

Ecology: Heleoplanktonic or benthic, occurring in both hard and soft waters.

Anacystis (Chroococcus) thermalis

Two or more spherical cells arranged in groups (commonly in twos) or irregularly scattered within a mucilaginous envelope. There are no pseudovacuoles. The cells are 6-12 µm in diameter.

Ecology: Eu- and Tychoplanktonic.



Agmenellum (Merismopoedia) quadruplicatum

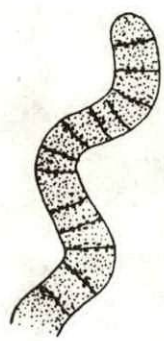
Spherical to ovoid cells, usually without pseudo-vacuoles, arranged on a flat plate in a regular series of rows and columns perpendicular to each other. The cells are 1 - 1.35 μm in diameter, plants are 1-64 cells.

Ecology: Euplanktonic

Arthrospira jenneri

Trichomes scattered or gregarious, loosely coiled, not tapering towards the apices, 6-8 µm in diameter. Cells quadrate, dissepiments granular, 4-5 µm long; Spiral 10-15 µm wide, distance between turns 12-14 µm.

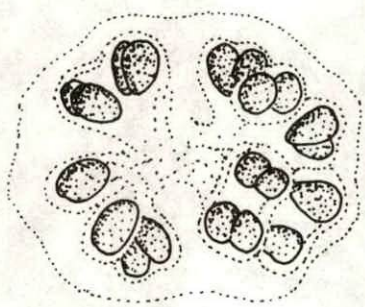
Ecology: Benthic, on mud or organic sediments occasionally pseudoplanktonic, common.



Gomphosphaeria aponina

Cells spherical to pyriform, or cordate in stages of division arranged at the periphery of a globular and usually wide gelatinous sheath, and at the ends of radiating, gelatinous strands. The cells are 4-14 µm in diameter, and without pseudovacuoles.

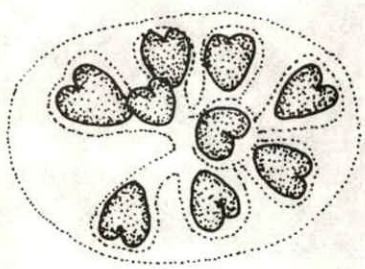
Ecology: Heleoplanktonic, common.



Gomphosphaeria aponina var cordiformis

Cells decidedly cordate, compactly arranged within a thick gelatinous envelope, individual sheaths distinct. Cells at the end of stout radiating strands. The cells are 6-12 µm in diameter and 12-15(20) µm long. This is probably a growth form of the nominant species.

Ecology: Occurring with the typical plant.



Oscillatoria rileyi

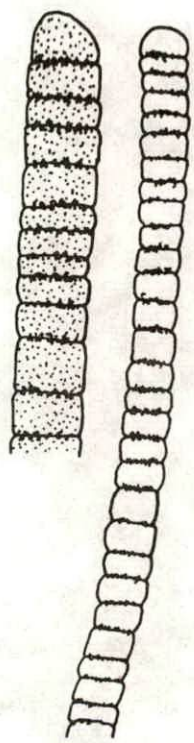
Trichomes containing pseudovacuoles, the tips rounded; cells longer than broad. Trichome is the same diameter throughout its length. Cells are 2-3 μm in diameter.

Ecology: Euplanktonic, sometimes developing as water blooms.

Oscillatoria tenuis

Trichomes aggregated or scattered and appearing singly. Straight or slightly flexuous, of the same diameter throughout. Trichomes without pseudovacuoles and rounded at the tips. Cells are at least 1/3 as long as broad, 4-10 µm in diameter and 2.5 - 5 µm long, granulated and somewhat constricted at the cross walls.

Ecology: Heleoplanktonic or benthic.



Oscillatoria tenuis