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FRESH-WATER ALGAE OF THE MARITIME PROVINCES*

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Abstract

A catalogue is given of 537 species and varieties of fresh-water algae (excluding diatoms) from the Maritime Provinces of Canada The list includes all forms reported by previous workers and 339 species collected by the author. The introduction includes a summary of previous investigations of the fresh-water algae in the Maritime Provinces and a brief discussion of factors affecting the distribution of these plants, New varieties of the following species are described: *Oedogonium zahneri* Tiffany, *Closterium angustatum* Kuetz., *Closterium acerosum* (Schrank) Ehrenb., *Cosmarium eloisianum* Wolle, *Cosmarium panamense* Prescott, *Cosmarium quinarium* Lund.

INTRODUCTION

The Maritime Provinces of Canada, including New Brunswick, Nova Scotia and Prince Edward Island, cover an area of more than 51,000 square miles and are practically unexplored territory so far as investigation of the fresh-

*The greater part of this paper was presented in 1942 as a dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the Ohio State University. Publication was not attempted at that time because of the author's transfer to non-botanical activities. During the past two years, numerous species and county records have been added to the algal flora by further examination of the author's collections. The latter part of the investigation has been carried out at the University of Oklahoma.

water algae is concerned. The algae of the New England States have been investigated since the middle of the nineteenth century by a large number of competent workers. In recent years W. R. Taylor (1934, 1935) and Irénée-Marie (1939) have made extensive contributions to our knowledge of the algal flora of Newfoundland and Quebec. Previous workers have reported 286 species and varieties of fresh-water algae from the Maritime Provinces. The present paper increases the known total to 537 species and varieties, 339 of which are in the writer's collections, and 251 of which are new records for the region.

Earliest reports of fresh-water algae from Nova Scotia are those of the British phycologists, Joshua (1885) and Turner (1885). Since the collections came from Pictou County, it is probable that the collector in each case was A. H. Mackay to whom credit is given by Joshua. A dozen species from Halifax County were added to the Nova Scotian flora by Borge (1909). Roscoe (1931) included two species of *Batrachospermum* in a paper primarily concerned with marine algae of St. Paul's Island, Victoria County. More recently, M. W. Smith (1938) listed seventy-two species and varieties of plankton algae (excluding diatoms) from Lake Jesse in Yarmouth County. Six new species of filamentous green algae from Queens County, N. S., have been described by the present author (Hughes, 1948).

The first person to exhibit an extended interest in the micro-flora of the Maritimes was J. M. Baxter, a physician at Chatham, N. B. This investigator, using Wolle's manuals as a means of identification, reported nearly a hundred species of desmids from Northumberland County in the years 1903, 1905, and 1907. In 1921, A. B. Klugh described a new genus and three new species of blue-green algae from the Miramichi River, N. B. Later, in connection with an ecological study of the fresh-water Entomostraca, Klugh (1927) reported forty-nine species, principally Myxophyceae and Chlorococcales, from the neighborhood of the Atlantic Biological Station

at St. Andrews, Charlotte County, N. B. The latest contribution to the algal flora of New Brunswick was made by Habeeb and Drouet (1948) who list seventy-seven species, principally Myxophyceae, from the neighborhood of Grand Falls, Victoria County.

PHYSIOGRAPHY

Nova Scotia and Prince Edward Island may be divided into two physiographic regions (Map I). The *Upland Region* includes all of the Atlantic coastal area (Southern Upland) as far inland as the Annapolis Valley and with an irregular boundary from Windsor to Chedabucto Bay. Outliers of this Southern Upland are the Cobequid Mountains, the Pictou-Antigonish Highland, and the Cape Breton Highlands. The principal underlying rocks of these areas are Precambrian granites, and Cambrian quartzites and slates. The Upland Region corresponds to the base level of the Atlantic peneplain of Cretaceous time. Altitude increases from sea-level westward to over 1000 feet in the Cobequid Mountains, and northward to nearly 1400 feet in the Cape Breton Highlands. This northwestward increase in altitude is a result of tilting of the Atlantic peneplain towards the end of the late Cretaceous period.

The *Lowland Region* consists of Prince Edward Island and most of the Isthmus of Chignecto as far south and east as the Southern Upland. The substrate of the lowland consists principally of Devonian, Carboniferous, and Triassic sandstones, shales, limestone, and gypsum beds. The Lowland Region has been developed since the tilting of the Atlantic peneplain by the more rapid erosion of less resistant rocks. Prince Edward Island is the remnant of a water-shed on the now submerged Acadian Plain. The average altitude of the lowland is approximately 200 feet above sea level, but a few isolated points reach a height of 400 to 600 feet.

Both the upland and the lowland regions of the Maritimes show plentiful evidence of Pleistocene glaciation. Deposition

of debris by the retreating ice resulted in marked disarrangement of the pre-glacial drainage pattern. Hundreds of lakes and bogs are now found in the ancient river valleys of the southern upland. Except for the presence of some foreign boulders at the west end, the record of glaciation on Prince Edward Island is obscure. The thin mantle of red drift is apparently derived from the same type of sandstone and shale that form the bed-rock, indicating that the ice must have advanced from the north.

Basing his conclusions on interpretations of glacial striae and analyses of drift, Goldthwait (1924) concluded that Nova Scotia had been glaciated by a southeastward-moving lobe of ice advancing from New Brunswick and later by a southward movement of ice which crossed Prince Edward Island from the direction of Labrador. Later workers are of the opinion that a powerful, early glaciation from Labrador covered all of the provinces. This advance was followed by a long interglacial period and a relatively weak Wisconsin glaciation. The presence of relict plants on the islands of Prince Edward, Cape Breton, and the Magdalen group is accepted by the latter school as evidence of incomplete glaciation in Wisconsin time. (Coleman, 1941; Marie-Victorin, 1938).

CLIMATE

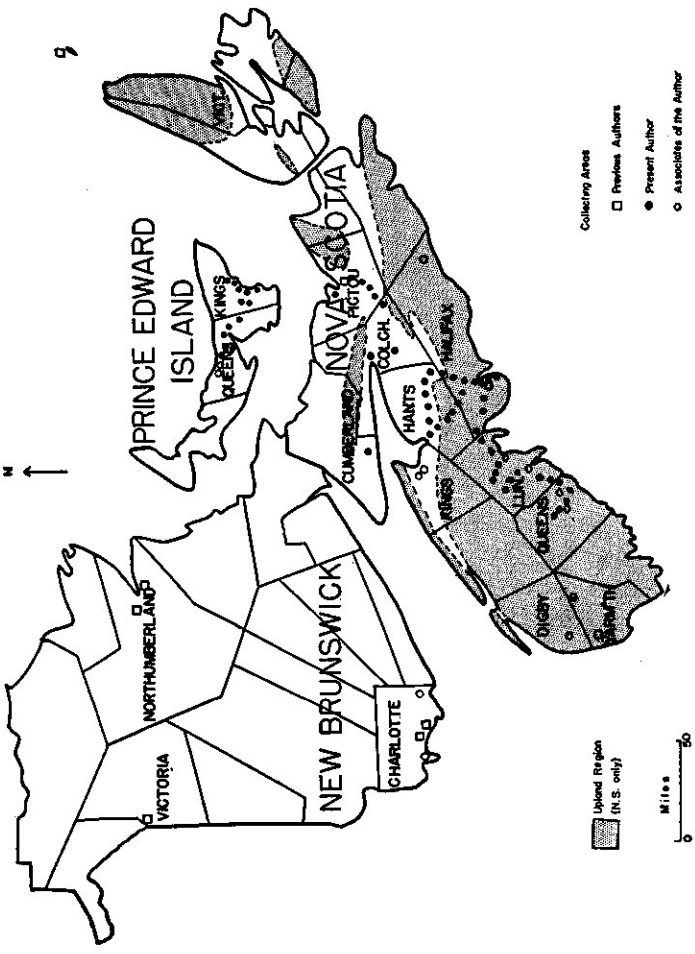
Different parts of the Maritime Provinces have marked differences in climate. Middleton (1935) has referred to the "climates of eastern Canada" whereas Putnam (1940), more conservatively, has divided the climate into several distinct regions. In general, the prevailing eastward movement of the air masses results in a change from a continental climate in northern New Brunswick to one under a major marine influence in Prince Edward Island and Nova Scotia. The oceanic effect is well illustrated by the reduction of the extreme annual temperature range from 150°F. in northern New Brunswick to 131°F. in south-eastern Nova Scotia, accompanied by a

lengthening of the frost-free period from 91 to 143 days. The maximum recorded temperatures for Prince Edward Island and southern Nova Scotia are 92° and 99°, the minima being -27° and -32° respectively.

The average annual precipitation is high in both Upland and Lowland regions, being approximately 51 and 40 inches respectively. Included in these figures are six to seven feet of snow, which falls from November to April inclusively. Steady drizzling rains are far more common than heavy showers. Fogs are frequent along the Atlantic Coast especially during the summer. Precipitation is rather equally distributed throughout the year with a slight increase in the six months of winter.

VEGETATION

As might be expected from the climatic data, the Maritime Provinces come well within the limits of the Hemlock-White Pine Hardwood region, described by Nichols (1918, 1935). A forest classification set up by Halliday (1937) gives a brief description of the forest types present in the Maritimes to-day. Halliday's forest sections correspond rather closely to Goldthwait's physiographic divisions of the provinces (1924) and (somewhat less closely) to the climatic regions set up by Putnam (1940). The original climax forest of Nova Scotia and Prince Edward Island consists of sugar maple, yellow birch, beech, white pine, hemlock, and balsam fir. This association was particularly well developed in the lowland areas but, in the original condition, is now rather rare, particularly on Prince Edward Island. The forest association most prevalent on the Upland Region of Nova Scotia consists of balsam fir, black, red, and hybrid spruce. This type of forest is especially wide-spread at higher altitudes in the highland regions of Cape Breton, in the more exposed eastern coastal areas, and in the more elevated parts of the southern upland. In the southern counties, however, the climax association is frequent on physiographically favorable sites.


PRINCE EDWARD ISLAND
NOVA SCOTIA
NEW BRUNSWICK
NORTHUMBERLAND
VICTORIA
CHARLOTTE
KINGS
QUEENS
CUMBERLAND
COL.CH.
HANTS
KINGS
QUEENS
DIGBY
ANNAPOLIS
Collecting Areas
Previous Authors
Present Author
Associates of the Author
Upland Region (N.S. only)
Miles
50
0

MAP 1

DISCUSSION OF THE ALGAL FLORA

Collections. The great majority of the collections on which this paper is based, were made by the writer in the months of June, July and August, 1939 and 1941. Twenty-five samples of plankton, collected in the summers of 1936, 1938, 1939, and 1948, were contributed by M. W. Smith of the Atlantic Biological Station. Dr. Smith's collections were made in small lakes and ponds in Charlotte County, New Brunswick, Digby and Yarmouth Counties, Nova Scotia, and Queens County, Prince Edward Island. Six collections from Goldmine Brook, Moser's River, Halifax County, N. S., were sent in by J. A. C. Nicol, then connected with the Fisheries Research Board. In 1942, twenty collections from Kings, Queens, and Lunenburg Counties, N. S., were contributed by W. G. Dore and A. E. Roland.

In making his collections, the writer travelled by automobile along the highways and side-roads of the eastern counties of Prince Edward Island, and the central counties of Nova Scotia. Points at which collections were made are indicated on the accompanying map (Map I). All collections were preserved in Transeau's solution (6 parts water, 3 parts 95% ethyl alcohol, 1 part formalin).

Habitat Relationships. The habitats from which algae were collected, fall into the following categories in order of frequency: streams, lakes, ponds, artificial ponds (dammed streams), bogs and springs. A distinct difference between the frequency of the various types of habitat in the Upland and Lowland Areas is shown by the following data.

Collections classified as to habitat:

	Upland	Lowland
Streams	31%	31%
Lakes	35%	6%
Ponds	10%	27%
Artificial Ponds (dammed streams)	4%	21%
Bogs	13%	0%
Springs	0%	9%
Miscellaneous (Wet mud, roadside ditches, etc.)	7%	6%

The large percentage of lake and bog collections in the upland area is accounted for by the poor drainage characteristic of the region. Nearly all of the lakes are glacial in origin, occurring in undrained depressions or in pre-glacial channels now blocked by glacial debris. The pond habitats are more temporary in nature, e.g. water accumulated in gravel pits and depressions in pasture fields. The ponds in Prince Edward Island National Park are formed at the mouths of small streams by barriers built up above the high tide level. The "rivers," appearing on maps of Prince Edward Island are largely tidal estuaries, hence fresh-water algae occur only in the upper reaches where the streams may be little more than brooks. Many of these streams have been dammed to provide water-power for saw-mills or electric power plants. This accounts for the predominance of "artificial pond" collections in the lowland area. Because of excellent drainage in the sandstone areas, there are relatively few lakes and these, for the most part, are fed by underground strams. Most of the streams and tributary brooklets of Prince Edward Island are spring-fed.

Earlier algologists were impressed with the richness of the desmid flora in geologic regions older than the carboniferous and, at first, this peculiarity of distribution was attributed to the antiquity of the rocks. In later years, the phenomenon has been related to the acid nature of the waters and more recently to the higher concentration of K-Na ions in relation to Ca-Mg ions (Nichols and Ackley, 1932), (Prescott and Scott, 1943). Unfortunately, the author has no data on the pH or chemical constituents of the waters in which his collections were made. He knows, however, that desmids were far more abundant in numbers and in richness of species in his collections from the Upland Region than they were from the Lowlands of Prince Edward Island and northwestern Nova Scotia.

The plankton of the Upland lakes is of the characteristic Caledonian type in waters low in pH and poor in calcium.

A survey of such a lake has been published by M. W. Smith (1938) including the relevant physical and chemical data. The Upland lakes contain great numbers of desmid species, *Xanthidium*, *Arthrodesmus*, and the long armed species of *Staurastrum* being especially common. Species of *Closterium* and *Cosmarium* are also important constituents of the phytoplankton. The colonial blue-greens, *Chroococcus*, *Coelosphaerium*, and *Microcystis* occur quite generally. Colonies of *Dinobryon* were present in nearly all the upland lake collections. In Boar's Back Lake (pH 4.3-4.6) a great quantity of *Peridinium limbatum* was present.

The plankton algae of the ponds of Prince Edward Island National Park are of the Baltic type with a predominance of colonial and filamentous blue-greens, while the greens are represented by colonial genera of the Chlorococcales. One of these ponds contained *Chaetoceros* sp., a marine diatom, the presence of which probably indicates contamination by sea-water at high tide. The mill-ponds of the Island contain great quantities of *Oedogonium* in floating mats. *Spirogyra* is usually present, but less abundant.

Most of the algae occurring in the Prince Edward Island collections are characteristic of alkaline waters. Except for the genera *Closterium*, *Cosmarium*, and *Staurastrum*, desmids are rather rare. Correspondence (M. W. Smith, 1942; Hurst, 1942) and conversation with fisheries and agricultural investigators confirm the conclusion, indicated by the algal flora, that the fresh waters of Prince Edward Island are generally alkaline in reaction. Soils of the Island are typically podsolic in profile, and acid in reaction. Agricultural soils give a reaction from pH 4.8 to pH 7.4, the higher pH readings indicating soils that have been heavily limed. The alkalinity of the waters may therefore be due to the presence of some unknown underlying strata of limestone or to the cementing material of the red surface sandstones.

The only lowland habitats supporting an appreciable variety of desmids are the semi-permanent ponds. The

general aspect of such ponds is marshy, with marginal sedges and cat-tails. Decaying vegetation and drainage from the surrounding acid soils results in a lowering of the pH in these poorly drained depressions.

Most of the rapidly flowing rocky brooks and streams of the Maritime Provinces are sterile except for occasional red algae. The sandy or gravelly streams (usually slower-running) contain *Tetraspora, Ulothrix, Draparnaldia, Mougeotia* and *Bulbochaete.* Epiphytic and plentiful on *Tetraspora* and *Draparnaldia* at three such habitats was *Chaetonema ornatum* Transeau hitherto unknown except from Alabama. A brook at Vernon River, Prince Edward Island, yielded the only collection of *Schizomeris.* In the quiet pools at stream and river margins, one frequently finds the common desmids, *Closterium, Cosmarium,* and *Staurastrum,* intermingled with *Oedogonium* and *Spirogyra. Vaucheria* is particularly common in the brooks of the lowland region.

Distributional Relationships. The fresh-water algae are an extremely cosmopolitan group, most of the genera and many of the species being found on all of the continents. No one has succeeded in demonstrating that the distribution of fresh-water algal associations follows the same pattern as that of the higher vegetation. The nature of the latter is largely determined by precipitation and other atmospheric factors. Water is however a constant factor in permanent rivers, streams, lakes and ponds. The nature of the algae present in an aquatic habitat is therefore dependent upon the availability of light, temperature and the physical and chemical nature of the water. Attempts have been made to correlate rich desmid floras with glaciated regions or areas of igneous rock. Increased knowledge of the algae of the unglaciated southeastern United States and the algae of bogs and lakes not underlain by igneous rock has however demonstrated that this correlation was more apparent than real, (Prescott and Scott, 1943). Our extremely limited knowledge of the actual micro-environment in which a given

species may occur makes it impossible to explain many peculiarities of distribution of the algae. Northeastern America contains thousands of unexplored lakes, ponds and pools. Fernald's remarks (1918) on the vascular plants of this area are even more applicable to the fresh-water algae. "The number of remarkable species discovered in a given area seems limited only by the number of pools visited.—Until we know the species and varieties that constitute the flora, it is premature to enter into generalizations which depend for their accuracy on unquestionable premises."

Taylor and Fogg (1927) and Taylor (1934) have indicated their belief that the distributional relationships of the vascular flora of Newfoundland might be paralleled by that of the fresh-water algae. The former paper refers particularly to *Micrasterias arcuata* Bailey and the variety *expansa* (Bail.) Nordst which range south along the Atlantic coast and appear in Newfoundland far to the north of their previous northernmost record in Massachusetts. In the latter paper, Taylor states that "some idea of a coastal plain, or at least of a southern element, was possible." Eight species of desmids are recorded which might possibly be significant. Four of these species are now reported from Quebec, including three also found in Michigan (Irénée-Marie, 1939; Taft, 1939; Nichols and Ackley, 1932). Of these species, four, *Docidium undulatum*, *Micrasterias arcuata* var. *expansa*, *Pleurotaenium rectum*, and *Staurastrum brachiatum* are present in the MaritimeProvinces, indicating an east-west range as well as a north-south distribution. Nearly every new algal list published causes a similar revision of our previously held ideas on the range of this or that species. Of the desmids present in the Maritime Provinces, over eighty species occur on the southern coastal plain (Brown, 1930). Since all but one of these plants are present also in the floras of Michigan and Quebec, we can hardly consider them as part of a distinct coastal plain element.

The coastal plain relict theory is of great value in explain-

ing the distribution of vascular plants whose peculiar range cannot be cleared up on the basis of migration under present-day conditions. Ornithologists have never found migrating birds carrying viable vascular plant debris, either internally or externally, over long distances. It has therefore been assumed that such propagules are not carried from the south-eastern Atlantic coast to Acadia. It is, however, reasonably certain from the investigations of Irênée-Marie (1939) that waterfowl play an important part in the dispersion of the fresh-water algae. The legs of a blue heron brought down between two bogs near Montreal, when washed in filtered water, yielded 12 cells of 15 species belonging to eight desmid genera. The plumage of a duck, similarly examined, was found to be carrying at least 517 specimens of 31 desmid species. Many of the cells were green and carried on division after three days in culture. An important point in this connection is the fact that thousands of desmid cells could be carried in a very small drop of water.

The Maritime Provinces are located on the important Atlantic fly-way used by migrating birds in the spring and autumn. Lincoln (1939) points out that "it appears that migration in general is performed in a leisurely manner, that, after a flight of a few hours along the accepted route, birds stop to feed and rest" . . . "the Canada goose affords a typical example of regular but unhurried migration." The latter bird takes about one to two months to complete its migration from the Carolinas to the Gulf of St. Lawrence region. It is well within the limits of probability that such waterfowl have brought about a great deal of the dispersion of desmids along the Atlantic Coast.

Another active agent in the dispersion of the fresh-water algae is the wind. Irénée-Marie (1939) refers to the western dust-storms which, in recent years, have caused precipitation of dust over immense areas as far east as Virginia and the Gulf of St. Lawrence. His examination of dust, collected over a two month period, disclosed the presence

of several diatom frustules and a number of specimens of *Closterium lunula* and *Cosmarium pyramidatum*. Obviously, these dried out skeletons would play no part in the propagation of the species, but the inference is easily drawn that thick-walled aplanospores, zygospores, etc., from dried-out habitats may be carried in this manner.

Smith (1933) has indicated his belief that, even in the vegetative condition, many algae are carried over long distances by birds and wind. If this be true, it is certainly unnecessary to explain the distribution of the fresh-water algae on the basis of the migration routes available to vascular plants. Even if great numbers of coastal plain algae are also reported from Nova Scotia and Newfoundland, it is quite possible that their distribution can be explained on the basis of present day factors.

Systematic Treatment. In the following catalogue, the classification, with minor deviations, is that used by G. M. Smith (1933,1938). In the first five phyla, genera and species are listed alphabetically. Members of the Chlorophyta are classified as to order and family, with the genera and species arranged alphabetically under the family heading.

The number of Maritime species of *Bulbochaete*, *Oedogonium*, *Mougeotia*, *Spirogyra*, *Zygnema*, and *Vaucheria* is without doubt much greater than appears from this list. Unfortunately the sexual stages necessary for specific identification of these genera were not present in a majority of the collections. Other genera present in the collections, but unidentifiable because of poor preservation or lack of reproductive stages are *Adouinella*, *Batrachospermum*, *Euglena*, *Phacus*, *Volvox*, *Tetraspora*, and *Pleurodiscus*.

The catalogue of species includes all forms (exclusive of diatoms) reported by previous workers. Where possible, the synonymy of earlier records is given. *Species occurring in the author's collections are indicated by an asterisk.* Distributional data are given by county for all species, and habitat records are given for the author's identifications. After each

species and variety identified by the author, a reference is given given to an adequately illustrated description of the plant in question. When the species listed varies in some respect (e.g. size, shape, or ornamentation) from the cited description, the differences are recorded. When the variation cannot be adequately described in words, an illustration has been prepared (Plates I-IV). In the course of identifying the species, the author has kept camera lucida drawings of all the rare forms and many of the common forms encountered. In view of the many fine published figures of these species, it would seem to be a needless duplication of effort to append over five hundred drawings to this catalogue. In the long run, the validity of taxonomic lists, as of all other scientific papers, depends upon the integrity of the author.

CATALOGUE

(Figures in brackets refer to the Literature cited pp. 53-56;

Species occurring in the author's collections are indicated by an asterisk (*).

CYANOPHYTA

Myxophyceae

Anacystis rupestris (Lyngb.) Drouet & Daily	N. B. Victoria (20)
Anabaena circinalis (Kuetz.) Rabenh..	N. S. Yarmouth, lake (51)
**A. circinalis* Rabenh. var. *macrospora* (Wittr.) Forti (16)	N. S. Cumberland, ditch
A. inaequalis B. & F.	N. B. Victoria (20)
Amphithrix janthina B. & F.	N. B. Victoria (20)
**Aphanocapsa delicatissima* W. & G. S. West	N. S. Yarmouth, lakes (51)
Aphanothece pallida (Kuetz.) Rabenh..	N. B. Charlotte (?) (28)
A. saxicola Naeg.	N. B. Charlotte (28)
**A. stagnina* (Spreng.) A. Braun (16)	N. B. Charlotte (28)
	N. S. Halifax, lake
Calothrix braunii B. & F.	N. B. Charlotte (28)
C. juliana B. & F.	N. B. Victoria (20)
C. parietina B. & F.	N. B. Victoria (20)
Chamesiphon polonicus (Rostaf.) Hansg.	N. B. Victoria (20)
**Chroococcus dispersus* (von Keissler) Lemm. (60)	P. E. I. Queens, pond
**Ch. limneticus* Lemm. (60)	N. S. Yarmouth (51)
	N. S. Halifax, lake
Ch. turgidus (Kuetz.) Naeg.	N. B. Charlotte (28)
	N. S. Yarmouth, lake (51)
Coelosphaerium kuetzingianum Naeg.	N. S. Yarmouth, lake (51)
**C. naegelianum* Unger (60)	N. B. Charlotte, lakes
	N. S. Yarmouth, lake
Cylindrospermum licheniforme B. & F.	N. B. Victoria (20)
C. majus B. & F.	N. B. Victoria (20)
C. muscicola B. & F.	N. B. Victoria (20)
**Dactylococcopsis raphidioides* Hansgirg (47)	N. S. Queens, Bog pool
Dichothrix baueriana B. & F.	N. B. Victoria (20)
D. gypsophila B. & F.	N. B. Victoria (20)
Fischerella ambigua (B. & F.) Gom.	N. B. Victoria (20)
Gloeocapsa alpicola (Lyngb). Born.	N. B. Victoria (20)

G. membranina (Menegh.) Drouet & W. A. Daily	N. B. Victoria (20)
G. turgida (Kuetz.) Hollerb.	N. B. Victoria (20)
Gloeothece membranacea (Rabenh.) Bornet	N. B. Charlotte (28)
Gomphosphaeria naegeliana (Ung.) Lemm.	N. S. Halifax (5)
Hydrocoleum homoeotrichum Gom.	N. B. Victoria (20)
Lyngbya ochracea Gom.	N. B. Victoria (20)
**Merismopedia punctata* Meyen (47)	N. S. Halifax, lake
**M. glauca* (Ehrenb.) Naeg. (47)	N. B. Charlotte (28) N. S. Yarmouth, lake (51) N. S. Halifax, lake
**M. tenuissima* Lemm. (60)	P. E. I. Queens, pond
Microcoleus acutissimus Gardn.	N. B. Victoria (20)
M. paludosus Gom.	N. B. Victoria (20)
M. vaginatus Gom.	N. B. Victoria (20)
**Microcystis aeruginosa* Kuetz. (11) *M. flos-aquae* is listed by Klugh but should be included in *M. aeruginosa* according to Drouet and Daily.	N. B. Charlotte (28) N. S. Yarmouth, lake (51) P. E. I. Queens, pond
M. marginata Kuetz. (11) This species has been referred to the genus *Aphanothece*.	N. B. Charlotte (28)
M. amethystina (Filarsky) Forti This species is not mentioned in Drouet and Daily's review of the genus.	N. B. Charlotte (28)
Nostoc comminutum Kuetz.	N. B. Charlotte (28)
N. commune B. & F.	N. B. Victoria (20)
N. depressum Wood	N. B. Charlotte (28)
N. microscopicum B. & F.	N. B. Victoria (20)
N. muscorum B. & F. (?)	N. B. Victoria (20)
Oligoclonium inequale Klugh. Geitler (16) refers this species to the genus *Hydrocoleus*.	N. B. Northumberland (27)
Oscillatoria formosa Gom.	N. B. Victoria (20)
O. splendida Greville	N. B. Charlotte (28)
O. tenuis Gom.	N. B. Victoria (20) N. B. Charlotte (28)
O. tenuis var. *natans* Gom.	N. B. Victoria (20)
Phormidium autumnale Gom.	N. B. Victoria (20)

Ph. favosum Gom.	N. B. Victoria (20)
Ph. incrustatum Gom.	N. B. Victoria (20)
**Ph. mucicola* Naum & Huber (11) Drouet and Daily express doubt as to the algal nature of this organism which grows in the pectic sheath of *Microcystis aeruginosa.*	P. E. I. Queens, pond
Ph. papyraceum	N. B. Victoria (20)
Ph. retzii (Agardh) Gom.	N. B. Charlotte (28)
Ph. setchellianum Gom.	N. B. Victoria (20)
Ph. tenue Gom.	N. B. Victoria (20)
Ph. uncinatum Gom.	N. B. Victoria (20)
P. purpureum Gom.	N. B. Victoria (20)
Schizothrix friesii Gom.	N. B. Victoria (20)
S. heufleri Gom.	N. B. Victoria (20)
S. lacustris Gom.	N. B. Victoria (20)
S. stricklandii Dr.	N. B. Victoria (20)
Scytonema figuratum B. & F.	N. B. Victoria (20)
S. guyanense B. & F.	N. B. Victoria (20)
S. hoffmanii B. & F.	N. B. Victoria (20)
S. myochrous B. & F.	N. B. Victoria (20)
S. ocellatum B. & F.	N. B. Victoria (20)
**Spirulina major* Kuetz. (16)	P. E. I. Queens, pond
Stigonema subsalsa Klugh.	N. B. Northumberland (27)
Symploca muscorum Gom.	N. B. Victoria (20)
Tolypothrix brevicellularis Klugh	N. B. Northumberland (27)
T. tenuis Kuetz.	N. B. Charlotte (28)

PYRROPHYTA

Dinophyceae (13, 67)

**Ceratium cornutum* (Ehrenb.) Clap. & Lach.	N. S. Queens, artificial lake
**C. curvirostre* Huitfeld-Kaas	N. S. Queens, lake
	N. S. Yarmouth, lake
**C. hirundinella* Schrank	N. B. Charlotte, lakes
	P. E. I. Queens, pond
**Glenodinium aciculiferum* (Lemm.) Lindemann?	P. E. I. Queens, pond
Peridinium cinctum Ehrenb.	N. S. Yarmouth, lake (51)
**P. limbatum* (Stokes) Lemm. Plate III, Fig. 10	N. B. Charlotte, lake
w. 61-67μ; l. 71-80μ	N. S. Digby, lake

In identifying this rarely reported

species, Dr. Samuel Eddy (14) remarked that no complete description had ever been published. *P. limbatum* also occurs in the lakes of Northern Minnesota.	
**P. volzii* Lemm.	N. S. Queens, artificial lake
**P. wisconsinense* Eddy	N. S. Lunenburg, lake

RHODOPHYTA

Rhodophyceae

Batrachospermum vagum (Roth.) Ag.	N. S. Victoria (45)
B. moniliforme Roth.	N. B. Victoria (20)
	N. S. Victoria (45)

EUGLENOPHYTA

Euglenophyceae

**Trachelomonas hispida* (Perty) Stein (9)	N. S. Halifax, bog
**T. oblonga* Playfair var. *attenuata* Playfair (9)	N. S. Halifax, bog
**T. volvocina* Ehrenb. (9)	N. S. Hants, pool

CHRYSOPHYTA

Xanthophyceae

**Botryococcus braunii* Kuetz. (60)	N. B. Charlotte, lake
	N. S. Yarmouth (51)
	N. S. Queens, artificial lake
**Characiopsis cylindricum* (Lambert) Lemm.	N. S. Digby, lake
**Ch. longipes* (Rabenh.) Borzi (60)	N. S. Queens, artificial lake
Ophiocytium arbuscula (A. Braun) Rabenh.	N. B. Charlotte (28)
O. cochleare (Eichwald) A. Braun	N. B. Charlotte (28)
**O. majus* Naeg. (37)	N. B. Charlotte (28)
	N. S. Queens, lake
**O. parvulum* (Perty) A. Braun (60)	N. B. Charlotte (28)
	N. S. Hants, pool
**Stipitococcus vasiformis* Tiffany (60)	N. S. Queens, artificial lake
**Tribonema bombycinum* (Agardh) Derb. & Sol. (60)	N. B. Victoria (20)
	N. S. Halifax, boggy ditch
	N. S. Queens, bog
	N. S. Lunenburg, bog

Chrysophyceae

**Chrysosphaerella longispina* Laut. (47)	N. S. Lunenburg, stream
**Dinobryon cylindricum* Imhof	N. B. Charlotte, lake
**D. divergens* Imhof (60)	N. S. Digby, lake
	N. S. Yarmouth, lakes (51)
**D. sertularia* Ehrenb. (60)	N. B. Charlotte, lake
**D. sociale* Ehrenb. (47)	N. B. Charlotte, lake
D. stipitatum Stein (60)	N. B. Charlotte, lake
	N. S. Yarmouth (51)
**Mallomonas caudata* Iwanoff (60)	N. B. Charlotte, lake
**Synura uvella* Ehrenb. (60)	N. B. Charlotte, lake
	N. S. Queens, river

CHLOROPHYTA

Chlorophyceae

VOLVOCALES

Chlamydomonas communis (synonymy uncertain)	N. B. Charlotte (28)
Ch. globosa Snow	N. B. Charlotte (28)
Gonium pectorale Muell.	N. B. Charlotte (28)
**Pandorina morum* Bory (60)	N. S. Hants, pond
	N. S. Queens, artificial lake
	P. E. I. Queens, pond
Sphaerella lacustris (Girod.) Wittr.	N. B. Charlotte (28)
(syn. *Haematococcus pluvialis*)	N. B. Victoria (20)
Volvox globator L.	N. B. Charlotte (28)

CHLOROCOCCALES

Characiaceae

Characium ambiguum Hermann	N. B. Charlotte (28)
Ch. pringsheimii A. Braun	N. B. Charlotte (28)
**Ch. stipitatum* (Bachmann) Wille (47)	N. S. Digby, lake
	N. S. Yarmouth, lake (51)

Protosiphonaceae

Protosiphon botryoides (Kuetz.) Klebs	N. B. Victoria (20)

Chlorococcaceae

Chlorococcum humicola (Kuetz.) Rabenh.	N. B. Victoria (20)
**Golenkinia paucispina* W. & G. S. West (47)	N. S. Hants, pond
Trebouxia cladoniae (Chod.) G. M. Smith	N. B. Victoria (20)

Coelastraceae

**Coelastrum cambricum* Archer (47) N. S. Lunenburg, lake

**C. chodati* Ducellier (12, 41, 46)
Plate III, Fig. 9 N. S. Halifax, lake

This species, originally reported by Ducellier from Switzerland, has since been recorded as *C. augustae* Skuja var. *armatum* Skuja by Skuja from Latvia and by Prescott and Croasdale from Massachusetts. A comparison of the published dimensions follows:

	Ducellier	Skuja	Prescott and Croasdale	Hughes
Coenobium diameter.	50-70μ	ca.60μ	52μ (with spines)	75-90μ (with spines) 50-60μ (without spines)
No. of cells per coenobe.....	26-32	ca.60	ca.30 (see fig.)	ca. 64—ca. 128
Diameter of cells....	8.5-11.5μ	6-8μ	11.5μ	5-8μ
Length of spines.....	10μ (*rare* 13μ)	9μ	6.5μ	7-10μ

Each cell of the author's material appears to have an axial stellate chromatophore with a central pyrenoid, a feature not previously reported for this genus. Before committing himself further, the author would prefer to examine material from other sources.

**C microporum* Naeg. (47) N. B. Charlotte (28)
N. S. Yarmouth (51)
P. E. I. Queens, ponds

C. proboscideum Bohlin N. B. Charlotte (28)

Hydrodictyaceae

**Pediastrum araneosum* Racib. (47) N. B. Charlotte, lake
N. S. Yarmouth, lake (51)

P. araneosum var. *rugulosum* (G. S. West) G. M. Smith N. S. Yarmouth, lake (51)

**P. boryanum* (Turp.) Menegh. (47) N. B. Charlotte, lakes
N. S. Halifax, ponds, lakes
N. S. Hants, pond
N. S. Lunenburg, lake
N. S. Queens, lake
N. S. Yarmouth, lake
P. E. I. Queens, ponds

**P. duplex* Meyen (47)	N. S. Halifax, ponds
	N. S. Lunenburg, lake
	P. E. I. Queens, pond
**P. duplex* var. *rotundatum* Lucks (47)	N. S. Hants, pond
**P. tetras* (Ehrenb.) Ralfs (47)	N. B. Charlotte (28)
	N. S. Halifax, lake, pond
	N. S. Hants, pond
	P. E. I. Kings, pond
	P. E. I. Queens, ponds
**Sorastrum americanum* (Bohl.) Schmidle (60)	N. B. Charlotte, lake
S. spinulosum Naeg.	N. B. Charlotte (28)
Oocystaceae	
**Ankistrodesmus falcatus* (Corda) Ralfs (47)	N. B. Charlotte (28)
(Syn. *Raphidium falcatum*)	N. S. Halifax, lake
	N. S. Hants, pond
	N. S. Lunenburg, stream
	P. E. I. Queens, ponds
**A. falcatus* var. *mirabilis* (W. & G. S. West) G. S. West	N. S. Hants, pond
	P. E. I. Queens, ponds
**A. spiralis* (Turner) Lemm.	N. S. Halifax, pond
	N. S. Hants, pond
**Dictyosphaerium pulchellum* Wood. (47)	N. B. Charlotte, lakes (28)
	N. S. Queens, bog pools
	N. S. Yarmouth, lake (51)
**Dimorphococcus lunatus* A. Braun (47)	N. S. Hants, pond
Eremosphaera viridis deBary	N. B. Charlotte (28)
**Glaucocystis nostochinearum* Itzigs. Smith (49) states that there is only one species in this genus. Our specimens are much more elliptical than those figured by Smith and agree better with Pascher's drawing (37).	N. S. Queens, artificial lake
**Golenkinia paucispina* W. & G. S. West (47)	N. S. Hants, pond
Kirchneriella lunaris (Kirchner) Moebius	N. B. Charlotte (28)
K. obesa (W. West) Schmidle	N. S. Yarmouth (51)
Nephrocytium agardhianum Naeg.	N. B. Charlotte (28)

**Oocystis solitaria* Wittr. (47)	N. B. Victoria (20) N. S. Halifax, swamps N. S. Queens, bog
**Selenastrum bibraianum* Réinsch (47)	N. B. Charlotte, lake
**S. gracile* Reinsch (47)	N. B. Charlotte, lake
S. minutum (Naeg.) Coll.	N. B. Charlotte (28)
**S. westii* G. M. Smith	P. E. I. Queens, pond
Tetraedron minimum (A. Br.) Hansgirg	N. B. Charlotte (28)
Scenedesmaceae	
**Crucigenia irregularis* Wille	N. B. Charlotte, lake
**Scenedesmus abundans* (Kirchner) Chodat	P. E. I. Queens, pond
Sc. armatus (Chodat) G. M. Smith	N. B. Victoria (20)
Sc. bijuga (Turp.) Lagerh.	N. B. Charlotte (28)
Sc. dimorphus (Turp.) Kuetz.	N. B. Victoria (20)
**Sc. obliquus* (Turp.) Kuetz. (47)	N. B. Charlotte (28) P. E. I. Queens, pond
**Sc. quadricauda* (Turp.) Bréb. (47)	N. B. Charlotte (28) P. E. I. Queens, pond
Sc. quadricauda var. *abundans* Kirchner	N. B. Charlotte (28)
Sc. quadricauda var. *horridus* (Kirchner	N. S. Halifax (5)
**Sc. quadricauda* var. *quadrispina* (Chodat) G. M. Smith (47)	N. S. Halifax, pond
SIPHONALES	
Vaucheriaceae	
**Vaucheria pachyderma* Walz (22) This material was previously misidentified by the author as *V. borealis* Hirn and is so listed in his unpublished dissertation.	N. S. Pictou, brook, 9 July, 1941
**V. geminata* De Candolle em. Walz (22) Much of the material in the author's collection belongs in the now unrecognized var. *racemosa* Walz. The unusual proliferation of the fruiting branch seems worthy of note. Frequently an oogonium is replaced by an additional fruiting branch perpendicular to the main stipe.	N. B. Victoria (20) N. S. Hants, Brook, 14 July, 1941

w. veg. fil. 90-147μ
w. oog. 80-90μ
l. oog. 90-96μ

**V. hamata* Walz (22)	N. S. Pictou, brook, 9 July, 1941
**V. sessilis* De Candolle (22)	N. B. Victoria (20) P. E. I. Kings, marshy ground, 1 Sept., 1939
V. terrestris (Vauch.) De Candolle (syn. *V. terrestris* Lyngb. em. Walz?)	N. B. Victoria (20)
**V. uncinata* Kuetz. w. veg. fil. 48-86μ; oog. 64-74μ x 74-94μ. The identification is based on descriptions by Brown (7), Heering (22), and Hoppaugh (23). The material exhibits variations not mentioned in these works, viz. long fruiting branches (up to 500μ), terminal sex organs, branched fruiting stipes, et al.	N. S. Halifax, marshy ground, 20 July, 1939

TETRASPORALES

Coccomyxaceae

Elakatothrix americana Wille	N. B. Charlotte (28)

Palmellaceae

Gloeocystis confluens (Kuetz.) Richt.	N. B. Victoria (20)
Urococcus insignis Berk & Hass.	N. B Victoria (20)
U. hookerianus Berk. & Hass.	N. B. Victoria (20)

Tetrasporaceae

Apiocystis brauniana Naeg.	N. B. Victoria (20)
**Gloeochaete wittrockiana* Lagerh. (49)	N. S. Queens, lake N. S. Kings, lake
Tetraspora gelatinosa (Vauch.) Desv.	N. B. Victoria (20)

ULOTRICHALES

Chaetophoraceae

**Aphanochaete repens* A. Braun (61)	N. S. Queens, artificial lake
**Chaetonema ornatum* Transeau (65) Originally discovered by Transeau in Alabama, this bi-spinate species has been found epiphytic upon *Tetraspora* sp. and *Draparnaldia platyzonata*.	N. S. Halifax, brook N. S. Queens, river

Chaetophora attenuata Hazen	N. B. Charlotte (28)
Ch. elegans (Roth) Agardh	N. B. Victoria (20)
**Ch. pisiformis* (Roth) Agardh (21)	N. S. Hants, brook
**Draparnaldia platyzonata* Hazen (21)	N. B. Charlotte (28)
	N. S. Halifax, stream
	N. S. Lunenburg, stream
D. plumosa (Vauch.) Agardh	N. B. Victoria (20)
**Stigeocolonium aestivale* Hazen (21)	P. E. I. Kings, stream
S. lubricum (Dillw.) Kuetz.	N. B. Victoria (20)
**S. stagnatile* Hazen (21)	N. S. Queens, pool
Microsporaceae (21, 22)	
**Microspora amoena* (Kuetz.) Rabenh.	P. E. I. Kings, brook
	P. E. I. Queens, brook
**M. floccosa* (Vauch.) Thuret	N. S. Queens, boglake
**M quadrata* Hazen	N. S. Halifax, stream
**M. stagnorum* (Kuetz.) Lagerh.	N. B. Victoria (20)
	N. S. Halifax, bogs
**M. tumidula* Hazen	N. S. Halifax pond, lake
M. wittrockii (Wille) Lagerh.	N. B. Victoria (20)
Protococcaceae	
Protococcus viridis Agardh.	N. B. Victoria (20)
Trentepohliaceae	
Trentepohlia aurea (L.) Martius	N. B. Victoria (20)
Ulotrichaceae (21, 22)	
Stichococcus subtilis (Kuetz.) Klerck	N. B. Victoria (20)
* *Ulothrix tenerrima* Kuetz.	P. E. I. Queens, brook
U. variabilis Kuetz.	N. S. Halifax, pool
U. zonata (Web. & Mohr) Kuetz.	N. B. Victoria (20)
ULVALES (22)	
Schizomeridaceae	
**Schizomeris leibleinii* Kuetz.	P. E. I. Queens, brook
Ulvaceae	
**Enteromorpha intestinalis* (L.) Greville	N. S. Hants, pond
This species was found in quantity on reddish soil in a stagnant pasture pool in the gypsum sink region just north of the Ste. Croix River near Windsor, N. S.	
CLADOPHORALES	
Cladophoraceae	
C. glomerata (L.) Kuetz.	N. B. Victoria (20)

**C. kuetzingiana* Grunow	P. E. I. Kings,river
**Rhizoclonium hieroglyphicum* (Agardh) Kuetz.	P. E. I. Queens, lake
OEDOGONIALES (10, 17, 58, 62)	
Oedogoniaceae†	
**Bulbochaete citr formis* Hughes (24)	N. S. Queens 11 July, 1941 5 July, 1942
**B. elatior* Pringsheim w.v.c. 10-15μ; l.v.c. 45-80μ; w. oog. 46μ; l. oog. 38μ; w. androsp. 14μ; l. androsp. 10μ.	N. S. Queens, pool July 11, 1941
**B. furberae* Collins w.v.c. 8-16μ; w. oog. 35-38μ; l. oog. 29μ-30μ.	N. S. Queens N. S. Kings, pond 5 July, 1942 27 June, 1942
**B. granulata* Hughes (24)	N. S. Queens 11 July, 1941 5 July, 1942
B. rectangularis Wittrock	N. B. Charlotte (28)
**B. suberecta* (Collins) Tiffany (59)	N. S. Hants, pond 13 July. 1941
**B. wailesii* Hughes (24)	N. S. Queens 11 July 1941 5 July, 1942
**B. woronichini* Tiffany (59) w.v.c. 9-16μ; l.v.c. 32-83μ; l. spines 640μ (+); oosp. 32 x 38μ, filling oogone; androsporangia 10-16μ x 9-16μ; dwarf male 9 x 16μ. (Plate 4, Fig. 1). This material agrees very well with Tiffany's description of the species, previously reported only from the Russian Caucasus.	N. S. Queens 11 July, 1941
**Oedogonium armigerum* Hirn w.v.c. 10μ; l.v.c. 67-70μ; oog. 35 x 38μ; oosp. 32 x 32μ. Plate IV, Fig. 4. No antheridia or dwarf males	N. S. Queens 11 July, 1941

†All of the species of *Oedogonium* and *Bulbochaete* reported from Queens County were found in a small artificial lake formed by damming of the Medway River, north of Charleston.

were seen. There is, however, no macrandrous species with an echinate oospore and superior pore. Assuming the material to be nannandrous, it agrees best with Tiffany's description of *Oe. armigerum*.

**Oe. acrosporum* de Bary — N. S. Queens, 11 July, 1941
w.v.c. 9-13μ (16μ); w. oog. 35-42μ l. oog. 48-54μ; w. oosp. 35-36μ; l. oosp. 45-50μ; anth. 6 x 11μ; dw. male stipe 8 x 22μ.

**Oe. borisianum* (leClerc) Wittr. — N. S. Halifax, pond, 13 July, 1941
w.v.c. 14-16μ; w. oog. 42-46μ; l. oog. 42-80μ; w. oosp. 38-42μ; l. oosp. 42-54μ; dwarf male 9.6-13.8μ x 48-57.6μ; w. anth. 6.4μ. Plate 4, Fig. 5.

**Oe. boscii* Kuetz. fa. *dispar* Hirn — N. S. Kings, pond, 27 June, 1942

**Oe. braunii* Kuetz. — N. S. Queens, 11 July, 1942
w.v.c. 14-16μ; l.v.c. 48-80μ; w. oog. 30-35μ; l. oog. 32-38μ; d. oosp. 30μ; suff. cell. 17 x 57μ; dwarf male 6.5 x 32μ; w. anth. 5μ.

**Oe. crispum* (Hass.) Wittr. — N. B. Charlotte (28) N. S. Hants
w.v.c. 12-16μ; w. oosp. 35-44μ x 38-48μ; w. anth. 11μ; l. anth. 6.4μ.
The Hants material approaches fa. *inflatum* Hirn.

**Oe. gallicum* Hirn. — N. S. Queens, 11 July, 1941
w.v.c. 14-16μ; l.v.c. 80-112μ; oog. 41 x 55μ; oosp. 35 x 35μ; dwarf male 7 x 32μ. Plate IV, Fig. 3.

**Oe. gracilius* (Wittr.) Tiffany — P. E. I. Kings, pond, 25 Aug. 1939
w.v.c. 16-22μ; l.v.c. 40-70μ; w. oog. 42μ; l. oog. 54μ; oosp. globose, d. 38μ, or ovoid 35 x 39-48μ; anth. w. 21μ; anth. l. 6-7μ.

**Oe. macrandrium* Wittr. var. *hohenackerii* (Wittr.) Tiffany — N. S. Halifax, lake

w.v.c. 11-14μ; l.v.c. 25-38μ; w. oog. 37μ; l. oog. 39μ; d. oosp. 32-34μ; dwarf male max. w. 9.6-11μ; dwarf male l. 30-32μ; w. anth. 6.5μ; l. anth. 5-6μ. In this material, the oogonia are not as globose as shown in Tiffany's drawings. The anterior end of the oogonium (with rings) is somewhat elongated.	26 July, 1939
**Oe. regium* Hughes (24)	N. S. Queens 11 July, 1941
**Oe. rugulosum* Nordst. w.v.c. 4-6μ; d. oog. 18μ; d. oosp. 16μ; dwarf males 5 x 16μ, epiphytic on *Oe. borisianum.*	N. S. Halifax, pond 13 July, 1941
**Oe. sexangulare* Cleve w.v.c. 9-19 (25)μ; l.v.c. 38-46μ; w. oog. 27-38μ; l. oog. 32-41μ; w. dwarf male 6.4-9μ; l. dwarf male 28μ; w. anth. 6.5-9μ; l. anth. 13μ. The size range of this material is greater than that recorded by Tiffany.	P. E. I. Kings, pond 31 Aug., 1939
Oe. undulatum (Breb.) A. Braun fa.	N. S. Halifax (5)
**Oe. zehneri* Tiffany var. *pyriforme* var. nov. (59) Varietas oogoniis pyriformibus; extremis distalibus oogoniorum angustioribus; oosporis late ellipsoideis, oogonia non complentibus; crass. cell. veg. 10-13μ; crass. oog. 42μ; long. oog. 61μ; crass. oosp. 38μ; long. oosp. 42μ; crass. cell. suff. 22.4μ; alt. cell. suff. 58μ; crass. nann. 7μ; long. nann. 35μ. Plate IV, Fig. 2. Variety with pyriform oogonia, narrow ends distal; oospores broadly ellipsoid, not filling the oogonia.	N. S. Queens 11 July, 1941

ZYGNEMALES†

Zygnemataceae (66)

**Mougeotia recurva* (Hass.) de Toni	N. S. Kings, lake 28 June, 1942
**M. virescens* (Hass.) Borge	N. S. Halifax, pond 14 July, 1941
**Spirogyra communis* (Hass.) Kuetz. w.v.c. 19μ; cross walls plane; chrom. one with 2.5-3 turns; conj. scalariform; tubes about equal in size; zygospores ellipsoid, smooth, w. 22μ, l. 42-48μ.	N. S. Halifax, swamp 13 July, 1941
**Sp. inflata* (Vauch.) Rabenh. w.v.c. 16μ; cross walls replicate; chrom. one with ca. 2.5 turns. conj. scalariform; both gametangia inflated; zygospores w. 25-28μ; l. 50-70μ.	N. S. Halifax, lake 26 July, 1939
**Sp. lambertiana* Transeau w.v.c. 30-35μ; l.v.c. 200-350μ; cross-walls replicate; chrom. one with 4.5 turns; conj. scalariform; zygospores ellipsoid, yellowish-brown; outer mesospore wrinkled; inner mesospore reticulate; zyg. w. 35-44μ; l. 80-87μ.	N. S. Hants, pool 29 July, 1939
**Sp. minutifossa* Jao w.v.c. 16μ; l.v.c. 64-176μ; cross walls plane; chrom. one with 2.5-5 turns; conj. lateral; zygospores ellipsoid, w. 23-26μ, 1.38-45μ; mesospore yellowish brown to brown, finely reticulate. This species has been previously reported only from Massachusetts. The minor differences in type of conjugation and spore characters do not seem great enough to warrant varietal or specific status for the Nova Scotian material.	N. S. Queens, artificial lake 11 July, 1941

†In his doctoral dissertation, the author inadvertently listed *Mougeotia quadrangulata* Hass., *Spirogyra laxa* Kuetz., and *S. tenuissima* (Hass.) Kuetz. as occurring in his maritime collections. The species mentioned were found in Ontario.

**Sp. sirogonioides* Hughes (24)	N. S. Queens, artificial lake 11 July, 1941 5 July, 1942
**Zygogonium ericetorum* Kuetz.	N. S. Queens, artificial lake 11 July, 1941 5 July, 1942
**Entransia fimbriata* Hughes (24) The systematic position of this genus (found in a sterile condition) is uncertain.	N. S. Queens, artificial lake 11 July, 1941

DESMIDIALES

Desmidiaceae

**Arthrodesmus bulnheimii* Racib. (25)	N. S. Lunenburg, stream
**A. convergens* Ehrenb. (25)	N. S. Hants, pond N. S. Kings, lake
A. incus (Bréb.) Hass.	N. S. Yarmouth, lake (51)
**A. incus* var. *extensus* Anderson (25)	N. S. Hants, pond N. S. Halifax, pond N. S. Kings, lake N. S. Lunenburg, lake, stream
**A. quadridens* Wood (25)	N. S. Halifax, pond
**A. octocornis* Ehrenb. (25)	N. B. Northumberland (1, 2) N. S. Queens, artificial lake N. S. Hants, pond
**A. triangularis* Lagerh. (25)	N. S. Yarmouth, lakes (51)
**A. triangularis* var. *subtriangularis* (Borge) W. and G. S. West (25)	N. S. Yarmouth, lake
**A. triangularis* var. *rotundatus* (Racib) G. M. Smith (48)	N. B. Charlotte, lake
**Closterium abruptum* W. West (29) Max. w. 14-16μ; w. ap. 6.4-8μ; l. 121-154μ. Plate I, Fig. 6.	N. S. Halifax, ponds & bogs
Cl. acerosum (Schrank) Ehrenb.	N. B. Northumberland (1)
**Cl. acerosum* var. *augustius* var. nov. Varietas angustior quam typus longiorque in proportione ad latitudinem; apicibus aliquantulum recurvatis; membranis laevibus aut nonnunquam punctulis minutissimis vix visibilibus et in ordinibus longitudinalibus dispositis. Lat. max. 16-21μ; Lat. apic. 4-5μ;	P. E. I., Kings, marshy pasture at Cardigan. Collection No. 46.

Long. 350-418μ. Plate I, Fig. 4. Variety narrower than type and longer in proportion to width. Apices very slightly recurved. Wall smooth or sometimes with very fine punctae arranged in scarcely visible longitudinal lines.	
Cl. acutum Bréb.	N. B. Northumberland (1)
Cl. acutum var. *tenuius* Nordst. (syn. *Cl. subtile* Bréb.)	N. B. Northumberland (1)
**Cl. angustatum* Kuetz. (29)	N. S. Halifax, ponds and bogs
Max. w. 22-26μ; w. ap. 16μ; l. 260-333μ.	N. S. Hants, pond N. S. Lunenburg, stream
**Cl. angustatum* var. *annulatum* var. nov.	N. S. Halifax, pond one mile west of Waverly. Collection No. 171
Utraque semi-cellula varietatis anulo terminale adquem costae junctae sunt. Ceterum ut in typo. Lat. max. 16-26μ; lat. apic. 9-13μ; long. 225-338μ. Plate I, Fig. 2. Each semi-cell of the variety has a terminal annular ridge to which the costae are attached. In other respects the variety resembles type.	
**Cl. archerianum* Cleve (29)	N. B. Charlotte, lake
max. w. 16-19μ; w. ap. 4μ; l. 200-208μ	N. S. Halifax bog N. S. Yarmouth, lake
**Cl. baillyanum* Bréb. (29)	N. S. Halifax, ponds
max. w. 46μ; w. ap. 17-18μ; l. 416-470μ.	
Cl. braunii Reinsch	N. S. Pictou (26)
Cl. calosporum Wittr.? (see note under *Cl. dianae*)	
**Cl. costatum* Corda (29)	N. B. Charlotte, lake
Max. w. 50μ; w. ap. 16μ; l. 384μ.	N. B. Northumberland (1, 2) N. S. Halifax, pond, lake N. S. Lunenburg, stream
Cl. costatum var. *subcostatum* (Nordst.) Krieger (syn. *Cl. subcostatum* Nordst.)	N. B. Northumberland (1, 2)

*Cl. *costatum* var. *westii* Cushman (29) N. B. Charlotte, lake
Max. w. 22-32μ; w. apices 6.5-10μ; N. S. Queens, artificial lake
l. 260-310μ. N. S. Halifax, pond
Specimens with a slight median tumescence were found in the Charlotte and Halifax collections. The swelling was not considered sufficient to warrant identification as Raciborski's var. *subtumidum*.

*Cl. *cynthia* de Not. (29) N. S. Halifax, ponds, lake

*Cl. *cynthia* var. *jenneri* (Ralfs) Krieger (23) N. S. Pictou, lake
max. w. 9.6μ; w. apices 4.8μ; l. 106μ.

*Cl. *dianae* Ehrenb. (29) N. B. Northumberland (1, 2)
It is impossible to separate *Cl. calosporum* and *Cl. dianae* in the vegetative condition. Since no zygospores were found, either one or both of the species may occur in the author's collections. N. S. Halifax, pond, lake
N. S. Hants, brook
N. S. Lunenburg, lake

*Cl. *dianae* var. *brevius* (Wittr.) Petkoff (29) N. S. Halifax, pond
max. w. 20μ; l. 131μ; Plate I, Fig. 1. N. S. Lunenburg, stream

*Cl. *dianae* var. *pseudodianae* (Roy) Krieger (29) N. S. Halifax, bog

*Cl. *didymotocum* Corda (29) N. B. Northumberland (1)
N. S. Halifax, ponds
N. S. Yarmouth, lake

*Cl. *ehrenbergii* Menegh. (29) N. S. Halifax, ditch
N. S. Queens, artificial lake

*Cl. *ehrenbergii* var. *malinvernianum* (De Not.) Rabenh. P. E. I. Kings, marsh
w. 35.4μ; l. 224.2μ. Plate I, Fig. 5. As indicated in the figure, the median region of our specimens is finely striate, the striate intergrading into parallel rows of minute punctae. The major part of the cell wall except for the tip is, however, finely but irregularly punctate. Girdle-bands were seen in some specimens.

**Cl. gracile* Bréb. (29)	N. B. Northumberland (1) N. S. Halifax, pond N. S. Yarmouth, lake (51)
**Cl. gracile* var. *elongatum* W. and G. S. West (29)	N. S. Halifax, pond
**Cl. intermedium* Ralfs (29) max. w. 15-22μ; w. ap. 6.4-9μ; l. 166-256μ.	N. S. Halifax, pond, bogs N. S. Yarmouth, lake (51)
Cl. juncidum Ralfs	N. B. Northumberland (1)
**Cl. kuetzingii* Bréb. (29) max. w. 15-19μ; w. ap. 3-4μ; l. 375-500μ.	N. B. Charlotte, lake N. S. Halifax, pond N. S. Lunenburg, streams N. S. Queens, lake
**Cl. lagoense* Nordst. (29) fa. max. w. 42μ; w. ap. 6.5μ; l. 448μ. The plants are much larger and apices of the cells are not swollen as much as indicated by Krieger.	N. B. Charlotte, lake
Cl. lanceolatum Kuetz.	N. B. Northumberland (1)
Cl. leibleinii Kuetz. (syn. *Cl. acuminatum*)	N. B. Northumberland (1)
**Cl. libellula* Focke (29) (syn. *Penium closterio des* Ralfs) max. w. 75-80μ; w. ap. 19μ; l. 495-512μ. Dimensions larger than those recorded by Krieger, but the proportions are the same.	N. B. Northumberland (1) N. S. Halifax, ditch
**Cl. lineatum* Ehrenb. (29)	N. B. Northumberland (1) N. S. Kings, lake
Cl. lunula (Muell.) Nitzsch	N. B. Northumberland (1)
Cl. lunula var. *coloratum* Klebs (syn. var. *striatum* Wolle)	N. B. Northumberland (1)
**Cl. macilentum* Bréb. (29) w. 9.6-16μ; w. ap. 6-6.4μ; l. 341μ-511μ. Some of the Halifax specimens have brownish walls but they do not fit into the size range given for the var. *coloratum* Elenkin & Lobik.	N. B. Northumberland (1) N. S. Halifax, pond Lunenburg, lake N. S. Yarmouth, lake
**Cl. moniliferum* (Bory) Ehrenb.	N. B. Charlotte, lake N. S. Colchester, stream N. S. Halifax, pond N. S. Hants, pond N. S. Kings, ditch

Cl. nasutum Nordst.	N. B. Northumberland (1)
Cl. navicula (Bréb.) Luetkem. (syn. *Penium navicula* Breb.)	N. B. Northumberland (1)
**Cl. parvulum* Naeg. (29)	N. B. Northumberland (1, 2) N. S. Halifax, lake (5)
**Cl. pritchardianum* Archer (29)	N. S. Halifax, pond
**Cl. pronum* Bréb. (29)	N. S. Halifax, lake
**Cl. ralfsii* Bréb. (syn. *Cl. decorum* Breb.) (29)	N. B. Northumberland (1) N. S. Halifax, pond N. S. Yarmouth, lake
**Cl. ralfsii* var. *hybridum* Rabenh.	N. S. Yarmouth, lak' (51)
**Cl. rostratum* Ehrenb. (29)	N. S. Hants, brook
**Cl. setaceum* Ehrenb. (29) max. w. 9-11μ; w. ap. 2μ; l. 285-292μ. In some of the Halifax specimens, girdle-bands were present.	N. S. Halifax, pond N. S. Lunenburg, stream N. S. Yarmouth, lake (51)
**Cl. setaceum* var. *elongatum* W. and G. S. West Krieger (29) states that the cells of this variety are 50 to 65 times as long as broad. The Nova Scotian specimens, with a length-width ratio of 44 to 47, agree better with Krieger's illustration.	N. S. Halifax, bog N. S. Lunenburg, stream
Cl. strigosum Bréb.	N. B. Northumberland (1, 2)
**Cl. striolatum* Ehrenb. (29) max. w. 19-41μ; w. ap. 6-14μ; l. 200-368μ.	N. S. Halifax, ponds, ditch
**Cl. subjuncidiforme* Groenblad max. w. 16μ; w. apices 10-11μ; l. 390μ. Plate I, Fig. 3. The L/W ratio of Groenblad's original Finnish specimens is much lower than that of our material. Krieger (29), however, mentions narrower Silesian plants (w. 10μ). The costae in the Halifax specimens become somewhat spirally arranged near the apices, a feature not reported by Groenblad. Since the latter author includes both	N. S. Halifax, lake

straight and spiral costae in *Cl. subscoticiforme*, it seems justifiable to follow the same practice with *Cl. subjuncidiforme*.

**Cl. toxon* W. West max. w. 8μ; w. apices 4.8μ; l. 246μ. Plate I, Fig. 7.	N. S. Lunenburg, lake, stream
**Cl. turgidum* Ehrenb. (29) w. 61-64μ; w. ap. 16-19μ; l. 704-880μ. The specimens from one pond seem to be intermediate between this species and *Cl. pritchardianum* which occurs in the same collection.	N. S. Halifax, ponds
**Cl. ulna* Focke (29) max. w. 9-16μ; w. ap. 7-10μ; l. 240-300μ.	N. S. Halifax, lake, bog
**Cl. venus* Kuetz. (29)	N. B. Northumberland (1, 2) P. E. I. Queens, pond
**Cl. venus* var. *incurvum* (Bréb.) Krieger (29)	P. E. I. Queens, pond
Cosmarium abscissum Luetke. (syn. *Penium truncatum* Bréb.)	N. B. Northumberland (1)
**C. angulosum* Bréb. (70)	P. E. I. Queens, pond
**C. amoenum* Bréb. (25)	N. S. Queens, brook
**C. bipunctatum* Borg. (25)	N. S. Queens, pond
C. botrytis (Bory) Menegh.	N. B. Northumberland (1) N. S. Halifax (5)
C. botrytis var. *subtumidum* Wittr.	N. S. Pictou (26)
**C. boeckii* Wille (25)	N. S. Halifax, pond N. S. Kings, ponds, stream
C. brebissonii Menegh.	N. B. Northumberland (1)
**C. calcareum* Wittr. var. *minor* W. and G. S. West (70)	N. S. Halifax, pond
C. circulare Reinsch	N. B. Northumberland (1)
C. conspersum Ralfs	N. B. Northumberland (3)
**C. contractum* Kirch.	N. B. Charlotte, lake N. B. Northumberland (1) N. S. Queens, pond N. S. Yarmouth, lake (51)
**C. cosmetum* W. and G. S. West (69)	N. S. Lunenburg, lake
**C. crenatum* Ralfs (70)	N. S. Queens, pond

C. crenatum var. *bicrenatum* Nordst. (70) — N. S. Pictou (26)

**C. cucurbita* Breb. (25) — N. S. Queens, bog

C. debaryi Archer — N. B. Northumberland (1)

**C. difficile* Luetke (70) — N. S. Halifax, pond

**C. difficile* var. *sublaeve* Luetke. (70) — N. S. Halifax, pond

**C. eloisianum* Wolle var. *depressum* W. and G. S. West (25) — N. S. Lunenburg, lake

**C. eloisianum* var. *scrobiculatum* var. nov. — N. S. Halifax, pond, Collection No. 171.

A fronte in media membrana semicellularum, aliquot granulis polygonis complanatisque a liris adjunctis. Inter granula et liras scrobiculae polygonae sunt. Ceterum ut in typo.

Lat. 80μ; isth. 22.4μ; Long. 109μ.

Plate II, Fig. 10.

In face view the central area of the wall of each semi-cell bears several flattened polygonal granules or prominences which are joined to each other by ridges surrounding polygonal depressions. Sometimes the ridges appear to be radially arranged around the prominences but at other times the arrangement of prominences, depressions, and ridges is irregular. Other features of the variety are the same as in the type. The prominences and ridges are yellowish brown in color.

**C. granatum* Bréb. (25) — N. S. Halifax, ponds; N. S. Lunenburg, lake

**C. hammeri* Reinsch — N. S. Hants, pond

C. hammeri var. *homalodermum* (Nordst.) W. and G. S. West (syn. *C. homalodermum* Nordst.) — N. B. Northumberland (1)

**C. impressulum* Elfv. (25, 55) — N. S. Hants, pool; P. E. I. Queens, pond

The size of the cells in the Hants collection is smaller than type. w. 17μ; isth. 6-7μ; l. 17μ.

**C. isthmium* W. West	N. S. Queens, river
**C. isthmium* fa. *hibernicum* W. West (25)	N. S. Halifax, pond
w. 30-35μ; l. 51-54μ; isth. 18-19μ. Plate II, Fig. 9.	
**C. isthmochondrum* Nordst. (70)	N. S. Halifax, pond
C. laeve Rabenh.	N. B. Northumberland (1)
C. margaritatum (Lund.) Roy and Biss.	N. S. Kings, pond
fa. *minor* (Boldt) W. and G. S. West (25)	
**C. monomazum* Lund. var. *polymazum* Nordst. (25)	N. B. Charlotte, lake
**C. moniliforme* (Turp.) Ralfs (25)	
**C. obtusatum* Schmidle (25)	N. S. Cumberland, ditch
**C. ochtodes* Nordst. (70)	N. S. Halifax, pond
**C. ornatum* Ralfs (25)	N. S. Halifax, lake, pond
	N. S. Hants, brook, bog
	N. S. Lunenburg, lake
	N. S. Queens, pond
**C. orthostichum* Lund. (25)	N. S. Halifax, pond
w. 29μ; isth. 9.5-11μ; l. 32-34μ.	N. S. Queens, artificial lake
**C. ovale* Ralfs (25)	N. B. Northumberland (1)
	N. S. Halifax, pool
**C. ovale* var. *prescottii* Irénée-Marie (25)	N. S. Halifax, pond
Dimensions of our specimens fall well within the range established by Irénée-Marie. w. 106μ; isth. 35.2μ; th. 74μ; l. 192μ;. Plate II, Fig. 12.	
**C. panamense* Prescott var. *smithii* var. nov. Plate II, Fig. 11.	N. B. Charlotte, lake
Cellulis lat. 58-61μ, long. 84-90μ, crass. 42-48μ; isth. 25-27μ. Semicellulis compresso-ovoidis, polis subtruncatis, angulis basalibus rotundatis, sinu lineare extrorsus ampliato; a vertice late ellipticis vel ovoidis; a latere subtriangularibus, polis subtruncatis, angulis basalibus rotundatis; membranis scrobiculatis granulatisque, scrob-	

iculorum ordinibus parallelis porcis perpendicularibus et horizontalibus disjunctis, granulis prominentibus ad decussationibus porcarum.
Collected in the plankton of Potter's Lake, Charlotte County, New Brunswick, by Dr. M. W. Smith after whom the variety is named.
This variety differs from *C. panamense* (39) in size (larger) and in the shape of the semi-cells (surface-view compressed-ovoid, poles sub-truncate, basal angles rounded; lateral view—subtriangular; vertical view—broadly elliptical to ovoid). The surface ornamentation is identical with that of Prescott's species, and is apparently unique for the genus. Type reported from Panama and Louisiana.

C. perforatum	N. B. Northumberland (1)
**C. portianum* Arch. (25)	N. S. Halifax, bog, pond
	N. S. Hants, ponds
**C. portianum* var. *nephroideum* Wittr. (25)	N. S. Lunenburg, stream
**C. pseudoconnatum* Nordst. (25)	N. B. Northumberland (1)
syn. *Calocylindrus connatus* (Nordst.) Wolle	N. S. Halifax, river
	N. S. Lunenburg, stream
**C. pseudonitidulum* Norst. var. *validum* W. and G. S. West (25)	N. S. Hants, pool
**C. pseudopyramidatum* Lund. (25)	N. S. Halifax, pond
C. punctulatum Breb.	N. B. Northumberland (3)
**C. punctulatum* var. *subpunctulatum* (Nordst.) Boerg. (25)	N. S. Halifax, pond
**C. quadratum* Ralfs (25)	N. S. Queens, brook
**C. quadrifarium* Lund. (25)	N. S. Halifax, ponds
	N. S. Lunenburg, stream
C. quasillus Lund.	N. S. Pictou (26)
**C. quinarium* Lund. var. *hexagonum* var. nov. Plate II. Fig. 8.	N. S. Halifax, pond,

Varietas sine granulis marginalibus. Frontes semi-cellularum decem granulis in duobus hexagonis dispositis. Lat. 48μ; Lat. isth. 15μ; Crass. 31μ; Long. 58μ. A variety without marginal granules. Faces of the semi-cells with ten central granules forming two adjoined hexagons. The plants are larger than type and do not fit Nordstedt's fa. *irregulare* even when the latter is expanded to include Irénée-Marie's material. It is quite possible that the author's material should not be assigned to *C. quinarium*.	Collection No. 171
**C. reniforme* (Ralfs) Arch. (25)	N. S. Halifax, lake, bog N. S. Lunenburg, bog
**C. regnellii* Wille (25)	N. S. Halifax, pond
**C. speciosum* Lund. (25)	
C. subtumidum Nordst.	N. S. Halifax (5) N. S. Yarmouth, lake (51)
C. subtumidum var. *klebsii* (Gut.) W. and G. S. West	N. S. Yarmouth, lake (51)
**C. subspeciosum* Nordst. var. *validius* Nordst. (25) w. 54.4μ; isth. 19.2μ; th. 32μ; l. 70.4μ. The true nature of the crenulations is apparent only in lateral or apical view. Each large granule (varying in shape from circular to square to polygonal) is partially delimited by small granules. When the small granules are strongly developed, the crenulations are bi-granulate in literal view.	N. S. Halifax, pond
**C. sulcatum* Nordst. (68) w. 32μ; isth. 6-7μ; l. 35μ. Plate III, Fig. 4.	N. S. Lunenburg, lake

**C. taxichondrum* Lund. (25) w. 45-60μ; isth. 10-14μ; th. 23-25μ; l. 45-58μ. In our material the number of surface granules varied from 8 to 12.	N. S. Halifax, pond N. S. Lunenburg, stream
**C. taxichondrum* var. *subundatum* Boldt (4) w. 32μ; isth. 9μ; th. 19μ; l. 35μ. Plate II, Fig. 6. Though larger and possessing one more surface granule per semi-cell, our specimens agree very well with Boldt's description. Laporte (24) reports this variety (mis-named *subundulatum*) from France with no isthmus granule.	N. S. Lunenburg, lake
**C. taxichondrum* var. *unigranulatum* Prescott (38) w. 32-39μ; isth. 10-14μ; th. 19-26μ; l. 41-48μ. Plate II, Fig. 7. Our specimens are slightly smaller than those originally described by Prescott from Michigan.	N. S. Halifax, ditch
C. turpinii Breb. var. *lundellii* Gutw. (included in the type by W. and G. S. West (70))	N. S. Pictou (26)
**C. turpinii* var. *podolicum* Gutw. (25)	N. S. Halifax, ponds
**C. undulatum* Corda (70)	P. E. I. Queens, pond
C. viride (Corda) Joshua syn. *C. cordanum* (Breb.) Rabenh. (70)	N. S. Pictou (26, 49)
**C. venustum* (Breb.) Arch.	P. E. I. Queens, pond
**Desmidium aptogonum* Breb. (25)	N. B. Northumberland (3) N. S. Halifax, pond
**D. aptogonum* var. *acutius* Nordst. (25)	N. S. Halifax, pond N. S. Lunenburg, lake
**D. baileyi* (Ralfs) Nordst. (25)	N. S. Halifax, stream N. S. Lunenburg, stream N. S. Queens, artificial lake N. S. Yarmouth, lake (51)

**D. grevillii* (Kuetz.) de Bary (25)	N. S. Lunenburg, stream
	N. S. Yarmouth, lake (51)
**D. swartzii* Agardh (25)	N. B. Northumberland (1)
	N. S. Halifax, ponds, lake
	N. S. Hants, pond
	N. S. Lunenburg, lake
	N. S. Queens, artificial lake
Docidium baculum Breb.	N. B. Northumberland (1)
D. crenulatum (synonymy uncertain)	N. B. Northumberland (1)
**D. undulatum* Bailey (23)	N. S. Halifax, lake, pond
Euastrum affine Ralfs	N. S. Yarmouth, lake (51)
**Eu. ampullaceum* (23)	N. B. Northumberland (3)
	N. S. Halifax, pond
	N. S. Queens, bog
Eu. ansatum Ehrenb.	N. B. Northumberland (1)
**Eu. binale* (Turp.) Ehrenb. fa. *hians* W. West	N. S. Queens, pond
**Eu. ciastonii* Racib. (29, 25, 43) w. 27μ; isth. 6.5μ; th. 15μ; l. 39μ; depth apical sinus 7μ. Plate II, Fig. 4. The proportions of the specimens agree better with Prescott & Scott (43). The ornamentation is closer to that indicated by Krieger (29) and Irénée-Marie (25).	N. S. Halifax pond
**Eu. crassum* (Breb.) Kuetz. (29)	N. S. Yarmouth lakes (51)
**Eu. crassum* var. *scrobiculatum* Lund. (23) w. 67μ; isth. 18μ; l. 148μ. Plate III, Fig. 2.	N. S. Queens bog
**Eu. denticulatum* (Kirch.) Gay var. *angusticeps* Groenblad (29, 56) w. 16μ; isth. 4-5μ; th. 14μ; l. 22.4μ. Plate II, Fig. 3.	N. S. Lunenburg, lake
**Eu. didelta* Ralfs (29) max. w. 64-77μ; ap. w. 29-32μ; isth. 16-26μ; depth ap. sinus 6.8-9.6μ; l. 122-160μ. Plate II, Fig. 5.	N. B. Charlotte, lake N. S. Hali ax, bog, pond, lake N. S. Lunenburg, lake N. S. Queens, artificial lake, pond N. S. Yarmouth, lake (51)
**Eu. divaricatum* Lund. (29)	N. S. Queens, bog
**Eu. elegans* (Breb.) Kuetz. (29)	N. B. Charlotte, lake

**Eu. gemmatum* Breb. (29)	N. S. Halifax, lake N. S. Lunenburg, lakes
Eu. humerosum Ralfs	N. B. Northumberland, (1, 3)
**Eu. humerosum* var. *parallelum* Krieger (29) max. w. 54.4μ; w. ap. 22.4μ; isth. 16μ; depth ap. sinus 8μ; l. 115μ. Krieger gives no dimensions for this variety which was described first by Borge from Sweden.	N. B. Charlotte, lake
**Eu. insigne* Hass. (29) max. w. 54-70μ; ap. w. 26-32μ; isth. 16-16μ; l. 102-134μ.	N. S. Halifax, pond, lake N. S. Queens, bog
**Eu. lapponicum* Schmidle (29)	N. S. Halifax, lake
**Eu. montanum* W. and G. S. West (29)	N. S. Halifax, ditch N. S. Queens, bog
**Eu. oblongum* (Grev.) Ralfs (29) max. w. 64-67μ; isth. 19-23μ; l. 144-148μ. According to Irénée-Marie (25) in *Eu. oblongum* "les lobes du chaque côté du lobe polaire sont rectangulaires" while in *Eu. humerosum* "les lobes moyens sont arrondis et non rectangulaires." Some of the specimens in one of the Halifax ponds have rounded lobes and are much shorter in relation to length than *Eu. oblongum*. Although the measurements agree more closely with *Eu. humerosum*, the total aspect of the cells is more like *Eu. oblongum*. Dimensions of one of the latter plants follow: w. 74μ; isth. 19μ; l. 119μ.	N. S. Halifax, ponds
**Eu. pinnatum* Ralfs (29)	N. B. Northumberland (1) N. S. Halifax, pond N. S. Queens, bog N. S. Yarmouth, lake (51)
**Eu. sinuosum* Lenorm. var. *germanicum* (Racib.) Luetke. (29) max. w. 37-42μ; w. ap. 19μ; isth. 9-10μ; th. 22-26μ; l. 74μ. Plate III, Fig. 3.	N. S. Lunenburg, lake

Differs from the variety in the presence of an apical pore on each "Anschwellung."	
**Eu. sinuosum* var. *reductum* W. and G. S. West (29) max. w. 29μ; w. ap. 16μ; isth. 7μ; th. 19μ; depth ap. sinus 10μ; l. 50μ. Plate III, Fig. 1. My figure is intermediate between Krieger's and Prescott's (43).	N. S. Halifax, pond
**Eu. verrucosum* Ehrenb. (29) max. w. 58-67μ; isth. 15-16μ; th. 37μ; l. 67-80μ.	N. B. Charlotte, lake N. B. Northumberland (1, 2) N. S. Halifax, pond N. S. Hants, pond N. S. Queens, pond
Eu. verrucosum var. *alatum* Wolle (reported by Baxter as var. *elatum*)	N. B. Northumberland 1)
Eu. verrucosum var. *simplex* Joshua Krieger (29) refers this variety to the genus *Cosmarium* but does not say which species.	N. S. Pictou (26)
Eu. urniforme Wolle Krieger (29) excludes this doubtful species from his monograph.	N. B. Northumberland (1)
**Gymnozyga moniliformis* Ehrenb. (25)	N. B. Northumberland (1) N. S. Halifax, pond, lakes N. S. Hants, lake N. S. Kings, lake N. S. Lunenburg, stream, bog N. S. Queens, river, lake N. S. Yarmouth, lakes (51)
**G. moniliformis* var. *gracilescens* Nordst. (25)	N. S. Halifax, lake
** Hyalotheca dissiliens* (Smith) Breb. (25)	N. B. Northumberland (1) N. S. Digby, lake N. S. Hants N. S. Kings, lake N. S. Lunenburg, lake N. S. Queens, pond, river N. S. Yarmouth, lake (51)
H. dissiliens var. *bidentula* Nordst.	N. S. Halifax (5)
H. dissiliens fa. *tridentula* Nordst.	N. S. Pictou (26)

H. dubia (synonymy uncertain)	N. B. Northumberland (1)
**H. mucosa* (Dillw.) Ehrenb. (25)	N. S. Queens, artificial lake
	N. S. Yarmouth, lake (51)
	P. E. I. Kings, pond
**H. neglecta* Racib. (25)	N. S. Halifax, lake
max. w. 10-11μ; ap. w. 8-9μ; l. 39-41μ.	
Varies from type by the presence of two pyrenoids per chromatophore.	
**Micrasterias americana* (Ehrenb.) Ralfs (29)	N. B. Northumberland (1, 2)
Krieger includes Turner's var. *spinosa* in type.	N. S. Halifax, pond
	N. S. Hants, pond
	N. S. Pictou (63)
M. americana var. *Boldtii* Gutw. (syn. *M. americana* var. *recta* Wolle).	N. B. Northumberland (3)
**M. apiculata* (Ehrenb.) Menegh. (29)	N. B. Northumberland (1)
	N. S. Cumberland, ditch
	N. S. Digby, lake
	N. S. Hants, pond
M. brachyptera Lund.	N. B. Northumberland (1)
M. mamillata Turner	N. B. Northumberland (3)
Krieger (29) includes this species in *M. apiculata* type, but it appears to be quite distinct according to Turner's figures. (63)	
**M. arcuata* Bailey var. *expansa* (Bail.) Nordst. (29)	N S. Queens, bog
**M. conferta* Lund. fa.	N. S. Halifax, bog
max. w. 99μ; ap. w. 51-57μ; isth. 16μ; l. 105-112μ. Plate I, Fig. 9. Differs from type (29) in the following respects—cell outline approaching hexagonal; dimensions 10% larger, apical lobes and sub-apical lobes of the second order proportionally wider than type.	
**M. denticulata* Bréb. (29)	N B. Northumberland (3)
	N. S. Halifax, lake
	N. S. Queens, lake

**M. fimbriata* Ralfs var. *spinosa* Biss. (29)	N. S. Halifax, pond
M. foliacea Bailey	N. S. Yarmouth, lake (51)
**M. jenneri* Ralfs (29)	N. S. Halifax, bog, ditch
M. laticeps Nordst.	N. S. Yarmouth, lake (51)
**M. mahabuleshwarensis* Hobson var. *dichotoma* (G. M. Smith) Krieger (29)	N. S. Yarmouth, lake
**M. mahabuleshwarensis* var. *ringens* (Bail.) Krieger (29) max. w. 144μ; isth. 19μ; l. 128μ. Plate I, Fig. 10.	N. B. Charlotte, lake
**M. muricata* (Bail.) Ralfs (29)	N. S. Queens, artificial lake N. S. Lunenburg, lake N. S. Yarmouth, lake
M. nordstedtiana Wolle	N. S. Yarmouth, lake (51)
**M. papillifera* Bréb. (29)	N. B. Northumberland (3) N. S. Halifax, pond N. S. Cumberland, ditch
M. papillifera var. *nova-scotiae* Turner (spelling changed by Krieger, 29)	N. S. Pictou (63)
**M. pinnatifida* (Kuetz.) Ralfs (29)	N. S. Halifax, lake N. S. Yarmouth, lake (51)
**M. radiata* Hass. (29)	N. B. Charlotte, lake N. S. Lunenburg, stream N. S. Queens, lake N. S. Yarmouth, lake (51)
**M. radiata* var. *dichotoma* (Wolle) Cush. (29)	N. S. Queens, artificial lake
**M. radiata* var. *gracillima* G. M. Smith (29) max. w. 224μ; isth. 17μ; max. l. 224μ. (incl. arms). Plate I, Fig. 11.	N. S. Yarmouth, lakes (51)
**M. rotata* (Grev.) Ralfs (25)	N. S. Halifax, ditch
M. rotata var. *evoluta* Turner (syn. *M. rotata* var. *simplex* Wolle)	N. B. Northumberland (3)
M. sol (Ehrenb.) Kuetz. (syn. *M. radiosa* Ralfs).	N. B. Northumberland (2)
M. sol var. *ornata* Nordst.	N. S. Yarmouth, lake (51)

**M. thomasiana* Arch. (29) w. 269μ; isth. 25μ.; l. 256μ; Plate I, Fig. 12. Differs from previous descriptions in being shorter than broad.	N. S. Halifax, bog
M. thomasiana var. *notata* (Nordst.) Groenblad (syn. *M. denticulata* var. *notata* Nordst.).	N. S. Halifax (5)
**M. truncata* (Corda) Bréb. (29) One specimen from a Halifax pond agrees with var. *pusilla* G. S. West. Other larger specimens (id. loc.) intergrade with var. *tridentata* Bennett. The author doubts the validity of these varieties.	N. B. Northumberland (3) N. S. Digby, lake N. S. Halifax, bog, lake, pond N. S. Hants, lake N. S. Lunenburg, bog, lake N. S. Queens, bog, brook, artificial lake N. S. Yarmouth, lake (51)
**Onychonema filiforme* (Ehrenb.) Roy and Biss. (25)	N. S. Halifax, stream
**O. laeve* Nordst. var. *micracanthum* Nordst. (25)	N. S. Kings, lake
**Penium cylindrus* (Ehrenb.) Bréb. (29)	N. S. Halifax, pond
**P. margaritaceum* (Ehrenb.) Breb. (29) (syn. *Closterium decussatum* Kuetz.)	N. B. Northumberland (2, 3) N. S. Halifax, ditch N. S. Yarmouth, lake
**P. rufescens* Cleve (29) w. 26-29μ; isth. 26μ; l. 63-67μ.	N. S. Halifax, pond
**P. spirostriolatum* Barker var. *amplificatum* Schmidt (29) max. w. 19-30μ; w. ap. 12-24μ; l. 145-176μ. Plate II, Fig. 2. In some specimens the striae are not spiral but resemble more closely Krieger's figure of the type species.	N. S. Halifax, lake, pond
**Pleurotaenium coronatum* (Bréb.) Rabenh. (25)	N. S. Lunenburg, lakes N. S. Yarmouth, lake

**Pl. ehrenbergii* (Bréb.) de Bary (25)	N. B. Charlotte, lake N. S. Halifax, pond N. S. Kings, lake N. S. Lunenburg, lake N. S. Queens, artificial lake, pond, bog N. S. Yarmouth, lake (51)
Pl. eugeneum (Turn.) W. and G. S. West	N. S. Yarmouth, lake (51)
**Pl. nodosum* Bailey (25) max. w. 54μ; w. apex. 28μ; isth. 20μ; l. 315μ. Plate II, Fig. 1.	N. S. Halifax, pond
**Pl. subcoronulatum* (Turner) W. and G. S. West (68)	N. S. Halifax, lake
**Pl. trabecula* (Ehrenb.) Naeg. (29) (including fa. *clavata*)	N. S. Kings, pond N. S. Lunenburg, bog
Pl. trabecula var. *maximum* (Reinsch) Roll (syn. *Docidium archeri* (Delp.) Wolle).	N. B. Northumberland (1)
Pl. trabecula var. *rectum* (Delp.) W. and G. S. West (syn. *Docidium rectum* (Delp.) Wolle).	N. B. Northumberland (1)
Pl. truncatum (Bréb.) Naeg. (syn. *Docidium truncatum* Brèb.)	N. B. Northumberland (3)
**Sphaerozosma excavatum* Ralfs (25)	N. S. Lunenburg, lake N. S. Queens, artificial lake
**S. excavatum* var. *subquadratum* W. and G. S. West (25)	N. S. Halifax, pond
**S. granulatum* Roy and Bissett (25)	N. S. Halifax (5) N. S. Lunenburg, stream
**Spondylosium planum* (Wolle) W. and G. S. West (25)	N. B. Charlotte, lakes N. S. Yarmouth, lake (51)
Sp. pulchrum Arch.	N. S. Yarmouth, lake (51)
Staurastrum aculeatum Ehrenb.	N. B. Northumberland (1)
**St. anatinum* Cooke and Wills (25)	N. B. Charlotte, lake
St. anatinum var. *longibrachiatum* W. and G. S. West	N. S. Yarmouth, lake (51)
**St. anatinum* var. *truncatum* W. West fa. (25) The specimens examined were biradiate.	N. S. Lunenburg, stream

**St. ankyroides* Wolle	N. S. Yarmouth, lakes (51)
**St. ankyroides* var. *pentacladum* G. M. Smith (48)	N. S. Yarmouth, lake
**St. arctiscon* (Ehrenb.) Lund. (48)	N. B. Charlotte, lake
	N. S. Yarmouth, lake (51)
**St. avicula* Brèb. var. *subarcuatum* (Wolle) W. West (25)	N. S. Kings, pond
**St. brachiatum* Ralfs (25)	N. S. Halifax, lake
**St. brebissonii* Archer var. *brevispinum* W. West (25) Our specimens agree very well with Irénée-Marie's description of this uncertain variety.	N. S. Halifax, bog
**St. brevispinum* Brèb. (25)	N. S. Yarmouth, lakes (51)
**St. brevispinum* fa. *major* W. West (25)	N. S. Lunenburg, lake
Although West and Irénée-Marie state that the cell wall is smooth, the walls of some of our specimens are very finely, but distinctly punctate.	N. S. Yarmouth, lake
St. brevispinum var. *tumidum* G. M. Smith	N. S. Yarmouth, lake (51)
**St. cerastes* Lund. (25)	N. S. Halifax, pond
	N. S. Lunenburg, stream
	N. S. Yarmouth, lakes (51)
St. cornutum Archer	N. B. Northumberland (1)
**St. crenulatum* (Naeg.) Delp. (25)	N. S. Halifax, pond
**St. cuspidatum* Brèb. (25)	N. S. Yarmouth, lake
**St. cyrtocerum* Brèb. (25)	N. S. Queens, pond
**St. dejectum* Brèb. (25)	N. S. Halifax, pond
	N. S. Queens, pond
St. echinatum Brèb.	N. B. Northumberland (1)
**St. furcigerum* Brèb. (25)	N. S. Halifax (5)
	N. S. Halifax, stream
	N. S. Kings, lake
**St. furcigerum* var. *armigerum* (Brèb.) Nordst. (25)	N. S. Kings, pond
St. grande Bulnh.	N. S. Yarmouth, lake (51)
St. hirsutum (Ehrenb.) Bréb.	N. B. Northumberland (1)
**St. jaculiferum* West (70) w. (with spines) 54μ; w. (without spines) 13μ; isth. 6.4μ; l. (without spines) 16μ. Plate III, Fig. 7.	N. S. Yarmouth, lake

**St. johnsonii* W. and G. S. West (21)	N. B. Charlotte, lake
w. 16-19μ; w. (incl. arms) 83-102μ;	N. S. Lunenburg, lake
isth. 9-10μ; l. 38-45μ. Plate III,	N. S. Yarmouth, lake
Fig. 5.	
St. leptacanthum Nordst.	N. S. Yarmouth, lake (51)
St. leptocladum Nordst.	N. S. Yarmouth, lake (51)
St. lunatum Ralfs	N. S. Pictou (26)
**St. margaritaceum* (Ehrenb.) Menegh. (25)	N. S. Pictou, pond
St. megacanthum Lund.	N. S. Yarmouth, lake (51)
St. muticum Brêb. var. *minus* (syn. fa. *minor* Rabenh. ?)	N. B. Northumberland (1, 3)
St. orbiculare (Ehrenb.) Menegh.	N. S. Halifax (5)
St. orbiculare (Ehrenb.) Ralfs fa. *minus* Nordst.	N. S. Pictou (26)
**St. ophiura* Lund.	N. S. Yarmouth, lakes (51)
**St. paradoxum* Meyen (48)	N. S. Queens, bog
**St. pentacerum* (Wolle) G. M. Smith (48)	N. S. Digby, lake
**St. pilosum* Arch. (25)	N. S. Halifax, bog
St. polymorphum Brêb.	N. S. Pictou (26)
St. polytrichum (Perty) Rabenh. (syn. *St. pringsheimii* Reinsch var. *duplo-major* Turner).	N. S. Pictou (63)
St. polytrichum fa. *majus*	N. S. Pictou (26)
**St. pseudopisciforme* Eich. and Gutw. (25)	N. S. Queens, pond
**St. pseudopelagicum* W. and G. S. West (48)	N. B. Charlotte, lake
**St. punctulatum* Brêb. (25)	N. B. Northumberland (1)
	N. S. Halifax, ponds
	N. S. Queens, pond
	N. S. Yarmouth, lake (51)
**St. pyramidatum* W. West? (25, 70)	N. S. Queens, brook
w. 51μ; isth. 15μ; l. 58μ.	
The spines on our specimens are not as coarse as indicated in the descriptions cited.	
**St. ravenellii* Wood var. *spinulosum* Irênée Marie (25)	N. S. Halifax, bog
w. 21-38μ; isth. 7-14μ; l. 25-35μ.	N. S. Lunenburg, stream
**St. rotula* Nordst. (48)	N. B. Charlotte, lake
**St. setigerum* Cleve (48)	

**St. spongiosum* Bréb. (25)	N. S. Pictou (63) N. S. Queens, pond
**St. subcruciatum* Cooke and Wills (56)	N. S. Halifax, bog
**St. subgracillimum* W. and G. S. West (70)	N. S. Yarmouth, lake
**St. suborbiculare* W. and G. S. West (38) w. 29-32μ; isth. 9-10μ; l. 35μ. In vertical view the sides are slightly more concave, and in lateral view the angles more rounded than in Prescott's figure.	N. S. Halifax, pond N. S. Queens, pond
**St. tohopekaligense* Wolle var. *nonanum* Turner (25) w. 23-26μ; isth. 14-16μ; l. 29-32μ. Plate III, Fig. 8. Dimensions smaller than reported by Turner or Irénée-Marie. The ends of the processes bear from two to five short spines.	N. S. Halifax, pond N. S. Hants, pond
St. wolleanum Butler	N. S. Yarmouth, lake (51)
**Staurastrum sp.* w. (with processes) 86μ; w. (without processes) 48μ; isth. 19μ; l. (with processes) 96μ; l. (without processes) 70μ. Plate III, Fig. 6. Each semi-cell has two whorl of processes, one whorl of six at the equator and another whorl of six near the apex. The author has been unable to identify this species which is comparable in some respects with *St. nudibrachiatum* Borge.	N. B. Charlotte, Potter's Lake
**Tetmemorus brebissonii* (Menegh.) Ralfs (25)	N. B. Northumberland (3) N. S. Halifax, bog, ponds, lake N. S. Lunenburg, bog N. S. Queens, bog N. S. Pictou, lake

**T. brebissonii* var. *minor* de Bary (25)	N. S. Halifax, pond, lake N. S. Queens, bog
**T. granulatus* (Brêb.) Ralfs (25)	N. S. Halifax, pond
**T. granulatus* var. *attenuatus* W. West (56)	N. S. Queens, bog
**Triploceras gracile* Bailey (29)	N. S. Halifax, bog, lake N. S. Lunenburg, lake N. S. Yarmouth, lake (51)
**Tr. gracile* var. *bidentatum* Nordst.	N. S. Hants, lake N. S. Queens, river N. S. Lunenburg, lake
Tr. verticillatum Bailey	N. S. Yarmouth, lake (51)
**Xanthidium antilopaeum* (Brêb) Kuetz.	N. B. Northumberland (3) N. S. Halifax, ponds (5) N. S. Yarmouth, lake (51)
X. *antilopaeum* var. *canadense* Joshua	N. S. Pictou (26)
**X. antilopaeum* var. *hebridarum* W. and G. S. West (25)	N. S. Digby, lake
**X. antilopaeum* var. *polymazum* Nordst. (25)	N. S. Halifax, ponds N. S. Hants, brook N. S. Kings, lake N. S. Queens, river N. S. Pictou, lake N. S. Yarmouth, lakes (51)
**X. antilopaeum* var. *minneapolense* Wolle (25)	N. S. Halifax, bog
**X. armatum* (Brêb.) Rabenh. (25)	N. S. Halifax, stream N. S. Lunenburg, bog N. S. Pictou, lake
**X. armatum* var. *fissum* Nordst. (25)	N. S. Halifax, pond N. S. Lunenburg, stream
**X. armatum* var. *mediolaeve* G. M. Smith (48) w. (with processes) 93μ; w. (without processes) 73.6μ; isth. 29μ; l. (with processes) 118μ; l. (without processes) 102μ. Plate II, Fig. 13.	N. S. Halifax, pond, lake N. S. Yarmouth, lake (51)
X. *columbianum* Wolle	N. B. Northumberland (1)

*X. *cristatum* Brëb. (25)	N. B. Northumberland (3) N. S. Halifax, pond N. S. Hants, pond, lake N. S. Pictou, lake
*X. *cristatum* var. *hipparguii* Irénée-Marie (25)	N. S. Pictou, lake
*X. *cristatum* var. *uncinatum* (Breb.) (25)	N. S. Halifax, bog, pond N. S. Hants, lake N. S. Yarmouth, lake (51)
X. *fasciculatum* Ehrenb. var. *hexagonum* Wolle	N. B. Northumberland (1)
X. *fasciculatum* Ehrenb. var. *subalpinum*	N. B. Northumberland (1)
X. *subhastiferum* W. West var. *murrayi* W. and G. S. West fa. *triquetra* W. and G. S. West	N. S. Yarmouth, lake (51)
*X. *sp.* Plate II, Fig. 14 w. 55μ.; 58μ; w. isth. 14μ. In some respects this species resembles X. *antilopaeum* var. *polymazum*. There are, however, no terminal spines and the lateral spines are much shorter. Near the apical margin of each semicell is an arc of six large granules. Between the two lowest granules of the arc is a centrally disposed pair of large granules.	N. S. Queens, river,
Mesotaeniaceae	
Cylindrocystis americana W. and G. S. West var. *minor* Cushman (25)	N. S. Halifax, bog
*C. *brebissonii* Menegh. (25) (syn. *Penium brebissonii* (Menegh.) Ralfs).	N. B. Northumberland (1) N. S. Queens, brook
C. *crassa* de Bary (syn. *Penium crassum* (de Bary) Wolle).	N. B. Northumberland (1)
*Gonatozygon *kinahani* (Arch.) Rabenh. (25)	N. S. Halifax, lake N. S. Lunenburg, bog
*G. *aculeatum* Hastings (25)	N. S. Kings, lake N. S. Queens, river

Mesotaenium macrococcum (Kuetz.) Roy and Biss. (syn. *M. braunii* de Bary).	N. B. Northumberland (1)
* *Netrium digitus* (Ehrenb.) Itzig and Rothe	N. B. Charlotte, lake N. S. Halifax, stream, bog, lake N. S. Yarmouth, lake (51)
N. digitus var. *lamellosum* (Brèb.) Groenblad	N. B. Northumberland (1)
(syn. *Penium lamellosum* (Brèb.) Kuetz.	N. S. Halifax (5)
* *N. interruptum* (Brêb.) Luetke.	N. B. Northumberland (1)
(syn. *Penium interruptum* Brêb.)	N. S. Halifax, pond
* *N. interruptum* var. *minor* (Borge) Krieger (29) w. 20μ; l. 70μ. Cells shorter than previously reported for the variety.	N. S. Cumberland, ditch
* *N. naegelii* (Brêb.) W. and G. S. West (25)	N. S. Cumberland, ditch
* *N. oblongum* (de Bary) Luetke. (29)	N. B. Northumberland (1)
(syn. *Penium oblongum* de Bary).	N. S. Halifax, lakes
**Spirotaenia condensata* Breb. (29)	N. B. Northumberland (1) N. S. Halifax, swampy ditch N. S. Queens bog, lake
Sp. obscura Ralfs.	N. B. Northumberland (1)

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PLATE I

1. *Closterium dianae* Ehrenb. var. *brevius* (Wittr.) Petkoff (x395).
2. *Cl. angustatum* Kuetz. var. *annulatum* var. nov. (x420).
3. *Cl. subjuncidiforme* Groenblad (x255).
4. *Cl. acerosum* (Schrank) Ehrenb. var. *angustius* var. nov. (x285).
5. *Cl. ehrenbergii* Menegh. var. *malinvernianum* (De Not.) Rabenh. (x250).
6. *Cl. abruptum* W. West (x255).
7. *Cl. toxon* W. West (x265).
8. *Cosmarium orthostichum* Lund. (semi-cell x550).
9. *Micrasterias conferta* Lund. fa. (x255).
10. *M. mahabuleshwarense* Hobson var. *ringens* (Bail.) Krieger (semi-cell x245).
11. *M. ra i ta* Hass. var. *gracillima* G. M. Smith (semi-cell x266)
12. *M. thomasiana* Arch. (x235).

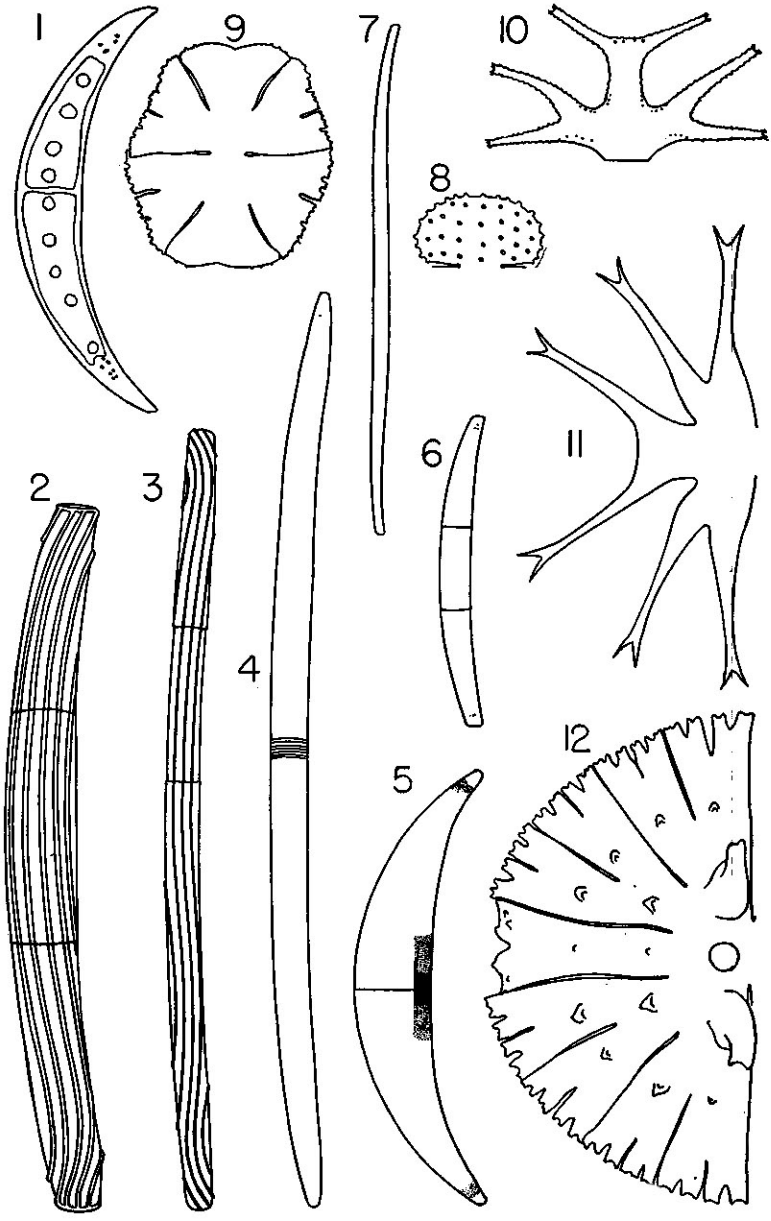

PLATE I

PLATE II

1. *Pleurotaenium nodosum* Bailey (semi-cell x 265).
2. *Penium spirostriolatum* Barker var. *amplificatum* Schmidt (x260).
3. *Euastrum denticulatum* (Kirch.) Gay var. *angusticeps* Groenblad (face and apical view x710).
4. *Eu. ciastonii* Racib. (x770).
5. *Eu. didelta* Ralfs (x285).
6. *Cosmarium taxichondrum* Lund. var. *subundatum* Boldt (face and apical view x430).
7. *C. taxichondrum* var. *unigranulatum* Prescott (face and apical view x475).
8. *C. quinarium* Lund. var. *hexagonum* var. nov. (face and lateral view x420).
9. *C. isthmium* fa. *hibernicum* W. West (x425).
10. *C. eloisianum* Wolle var. *scrobiculatum* var. nov. (x415).
11. *C. panamense* Prescott var. *smithii* var. nov. (lateral, face, and apical view of semi-cell x565).
12. *C. ovale* Ralfs var. *prescottii* Irénée-Marie (lateral and surface view of semi-cell x275).
13. *Xanthidium armatum* (Breb.) Rabenh. var. *mediolaeve* G. M. Smith (x265).
14. *Xanthidium sp.* (face and lateral view x250).

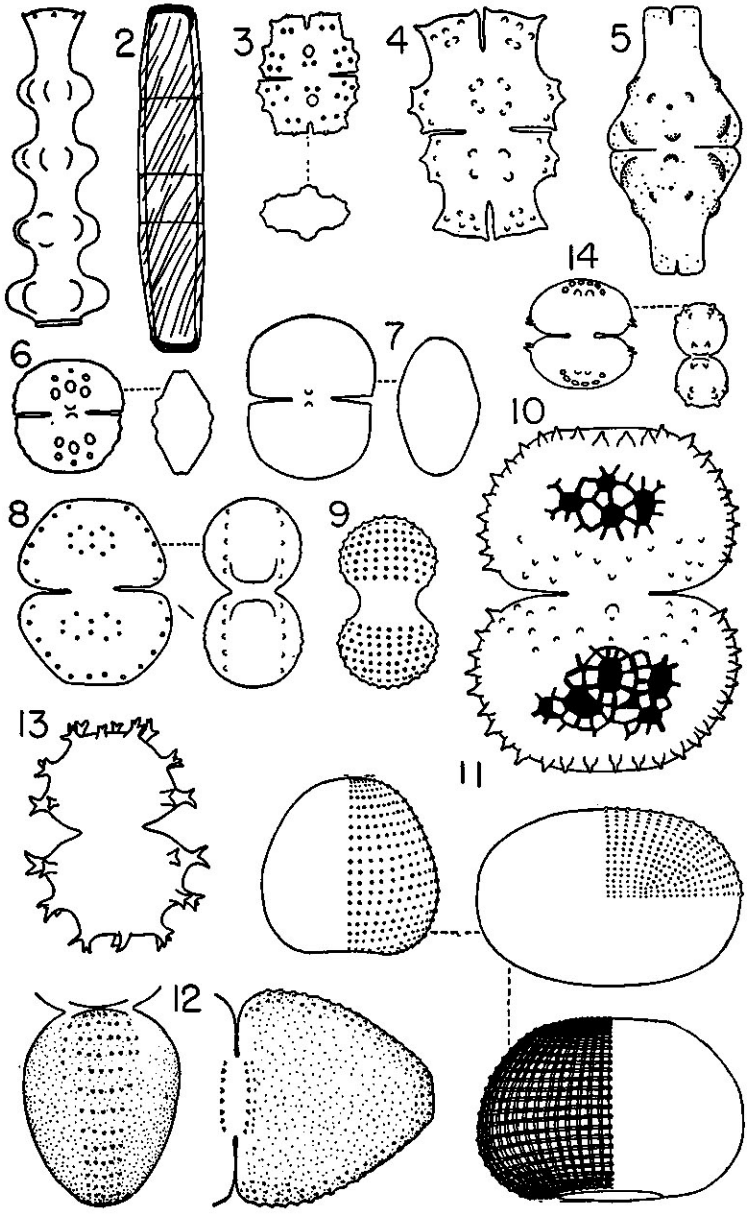

PLATE II

PLATE III

1. *Euastrum sinuosum* Lenorm. var. *reductum* W. and G. S. West (x900).
2. *Eu. crassum* (Breb.) Kuetz. var. *scrobiculatum* Lund. (semi-cell x270)
3. *Eu. sinuosum* var. *germanicum* (Racib.) Luetke. (x615).
4. *Cosmarium sulcatum* Nordst. (lateral, face, and apical view x630).
5. *Staurastrum johnsonii* W. and G. S. West (x275).
6. *Staurastrum sp.* (semi-cell x580).
7. *St. jaculiferum* W. West (lateral and apical view x520).
8. *St. tohopekaligense* Wolle var. *nonanum* Turner (lateral and apica view x615).
9. *Coelastrum chodati* Duc. (one-quarter of coenobium x1000).
10. *Peridinium limbatum* (Stokes) Lemm. (ventral and dorsal view x600).

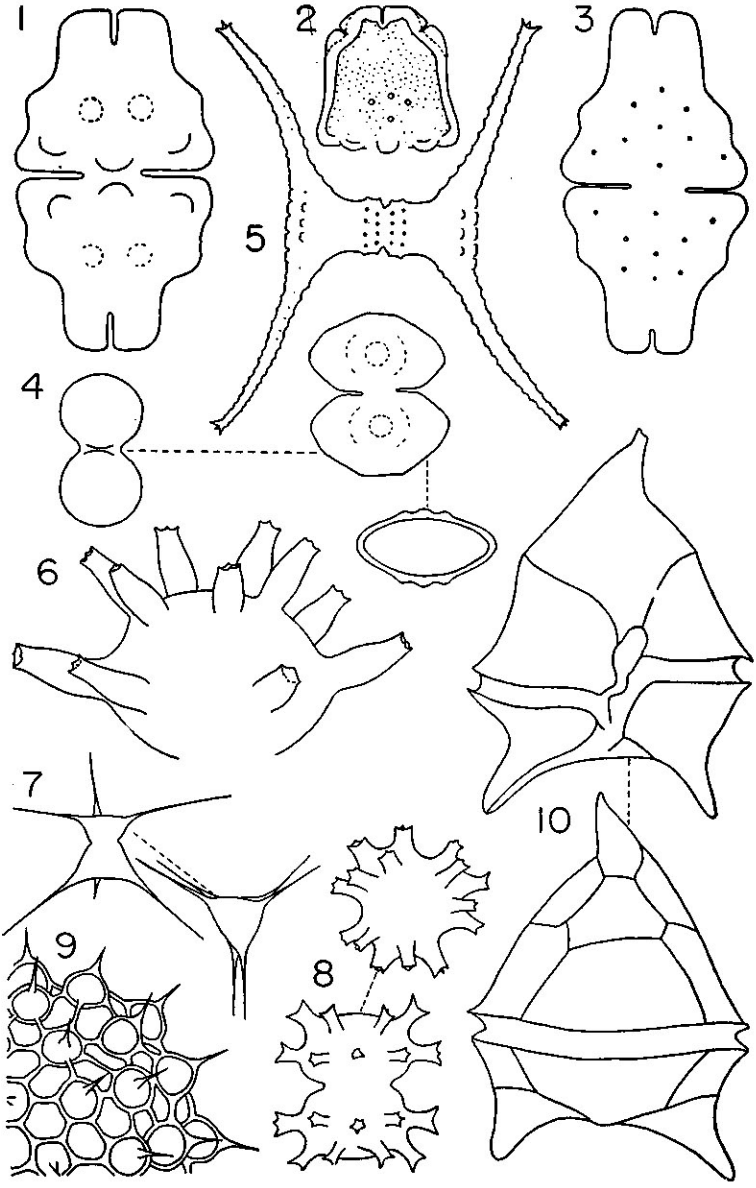

PLATE III

PLATE IV

1. *Bulbochaete woronichini* Tiffany (median view of one-half of oospore surface view of the remainder x750).
2. *Oedogonium zehneri* Tiffany var. *pyriforme* var. nov. (x630).
3. *Oe. gallicum* Hirn (x500).
4. *Oe. armigerum* Hirn (x835).
5. *Oe. borisianum* (leClerc) Wittr. (x390).

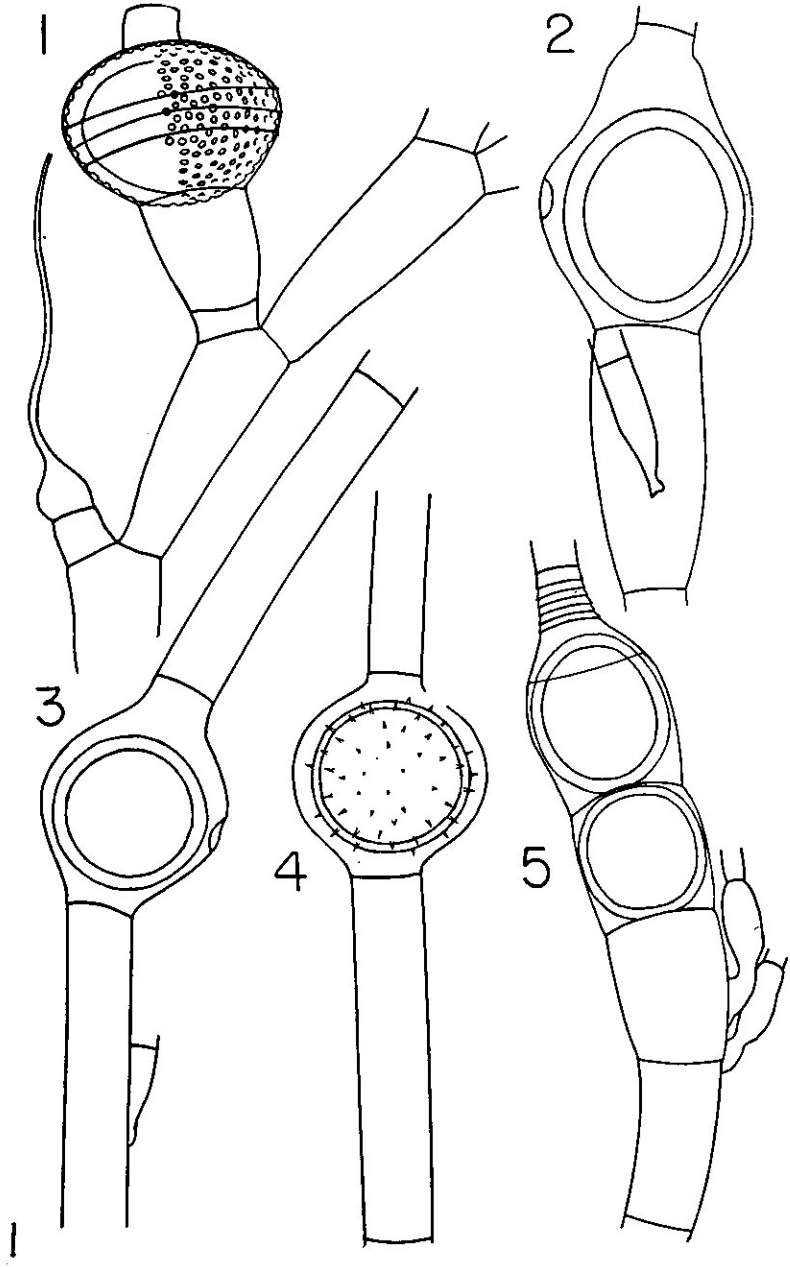

PLATE IV