CRYSTAL LAKE REVISITED

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A comparison of the algal flora of Crystal Lake, Cleveland County, Oklahoma observed by Leake in 1938 is made with that found by the authors forty years later. One hundred-two algal taxa previously unobserved in the state of Oklahoma are reported. Preserved collections are stored in the Department of Botany-Microbiology at the University of Oklahoma.

INTRODUCTION

Prior to the year 1929 almost nothing was known about the algae of Oklahoma. In that year Dr. C. E. Taft began a survey resulting in a number of papers on algae common to the state (1-8). Since then publications on the algae of Oklahoma have been sporadic, correlating understandably with the presence in the State of those interested in "lower" plants (9-30; 41). The first extensive examination of the algae of one body of water in Oklahoma was that by Leake (11) in which she studied the algae of Crystal Lake from 1938 to 1943. The present study, which revisited the algae of Crystal Lake forty years later, compares the algal flora found in 1978 with that observed by Leake in her study and in the process adds 102 new taxa to the state record (Table 1).

MATERIALS AND METHODS

Crystal Lake is approximately 800 m long from north to south and 250 m at its widest point. Its deepest basin measures 3 m. The lake lies on the southwest corner of the intersection of Porter and Rock Creek Road in Norman, Oklahoma. The area surrounding the lake is covered by mixed short-grass prairie with a few scattered trees. Flowering plants in the lake were *Polygonum lapathifolium* L., *Myriophyllum spicatum* L., many sedges and rushes, and a few cattails.

Ten sampling sites were chosen to correspond to various microhabitats in the lake area. A total of 690 samples were collected at each of these stations on each of 31 sampling dates from Oct. 20, 1977 to Oct. 13, 1978. Plankton tows, rock scrapings, plant squeezings, and log scrapings were taken at each station. In addition collections were made between sampling stations when different specimens were observed.

Algal samples were examined fresh when possible and preserved in Transeau's solution when delayed examination necessitated. All algae exclusive of the diatoms were identified.

RESULTS AND DISCUSSION

Three hundred twenty-three taxa were collected and identified over the one-year period with most of the algal divisions represented. A breakdown of these 331 taxa into divisions is shown in Table 1:

Chlorophyta 179	Pyrrhophyta 9
Cyanophyta 96	Xanthophyta 1
Euglenophyta 45	Chrysophyta 1

A comparison of algal taxa collected in 1977-1978 with Leake's results reveals a number of similarities and differences (Table 2). Chlorophyta populations tended to be similar while Cyanophyta and Euglenophyta populations differed. Lake identified 155 taxa while 165 were identified in our study. Diversity increased among Chlorococcales and decreased in Zygnematales (Table 2). Diversity in the Euglenophyta populations rose from 8 taxa reported by Leake to 45 taxa found in our study. Most of this increase was in species of *Euglena* and *Trachelomonas*, both of which are very abundant today. The most striking change was in the Cyanophyta. We were able to identify 92 taxa while Leake only reported 8 in her study. Although we feel certain that more than 8 taxa were present during Leake's study and that the low number merely represents the most commonly occurring species, we believe the population in this division has increased greatly.

It would be very difficult to pinpoint a cause for the changes in the algal flora that have taken place over the last 40 years. The chemistry of the lake has changed considerably since Leake's time and this

TABLE 1. *Taxa identified, their seasonal occurrence and relative abundance as indicated by R (rare), O (occasional), C (common), A (abundant). *Indicates new state record.*

Organism	Relative Abundance	Seasonal Occurrence
Chlorophyta:		
Chaetophorales:		
Aphanochaete repens A. Braun	O	A,My,Ju,N
Coleochaete orbicularis Prings.	O	My,Ju,Jy
Stigeoclonium tenue (Ag.) Kuetz.	O	O,N,Mr,Ap
Charales:		
Chara globularis var. *virgata* (Kuetz.) R. D. W. Wood	A	My,Ju,Jy,Ag,S
Chara vulgaris L.	A	My,Ju,Jy,Ag,S
Cladophorales:		
Cladophora insignis (C. A. Ag.) Kuetz.	O	Ap,My,Ju,Jy
Pithophora oedogonia (Mont.) Wittrock	O	Ap,My,Ju,Jy
Rhizoclonium crassipelitum West and West	C	O,N,Ap,Ju
Rhizoclonium fontanum Kuetz.	C	O,N,Ju,Ju,Jy
Rhizoclonium hieroglyphicum (C. A. Ag.) Kuetz.	C	O,N,Ap,My,Ju
Basicladia crassa Hoffman and Tilden	C	O-O
Chlorococcales:		
Acanthosphaera Zachariasi Lemm.	O	Ag
**Ankistrodesmus convolutus* Corda	C	My,Ju
Ankistrodesmus falcatus var. *tumidus* West and West	C	O,N,Ap,My,Ju,Jy,Ag
Ankistrodesmus spiralis (Turner) Lemm.	O	O,N
Characium sieboldii A. Braun	R	O,N
Coelastrum cambricum Archer	O	Ag
Coelastrum sphaericum Naegeli	O	Ju,Jy,Ag,S,O,N
Coelastrum microporum Naegeli	C	Ju,Jy,Ag,O,N
Crucigenia rectangularis (A. Braun) Gay	C	My,Ju,Jy,N
**Crucigenia lauterbornei* Schmidle	A	My
Crucigenia truncata Smith	O	Ju,Jy,Ag
**Crucigenia apriculata* (Lemm.) Schmidle var. *truncata* (G. M. Smith) Ahlstrom and Tiffany	C	My,Ju,Jy,Ag,S
Crucigenia irregularis Wille	C	Ap,My
Dictyosphaerium pulchellum Wood	R	My
Dictyosphaerium ehrenbergianum Naegeli	R	My,Ju
**Dimorphococcus lunatus* A. Braun	R	Ap
**Gloeotaenium loitelsbergianum* Hansg.	C	Ju,Jy,Ag,S
Lagerheimia citriformis (Snow) G. M. Smith	R	Ag
Micractinium pusillum Fresenius	R	Ag
Nephrocytium limneticum (G. M. Smith) G. M. Smith	O	Jy
Oocystis borgei Snow	O	O,N,My
Oocystis crassa Wittr.	C	Ap,My,Ju,Jy,Ag
Oocystis elliptica W. West	C	O,N,D,My,Ju,Jy,Ag,S
Oocystis eremosphaeria G. M. Smith	O	O,N,D,Ap,Ju,Jy
Oocystis parva West and West	C	Ap,My,Ju,Jy
Oocystis pusilla Hansg.	O	My,Ju,Jy
Oocystis solitaria Wittr. in Wittr. and Norstedt	C	O,N,D,My,Ju,Jy,Ag,S
Oocystis lacustris Chodat	R	Ju,Jy
Pediastrum Boryanum (Turp.) Menegh.	A	Ap,My,Jun,Jy,Ag,S,O,N
Pediastrum duplex var. *reticulatum* Lagerheim	O	N
Pediastrum simplex var. *duodenarium* (Bailey) Rabenhorst	O	N,O,My,Ju
Pediastrum tetras (Ehr.) Ralfs.	A	O,N,Mr,Ap,My
Pediastrum tetras (Ehr.) Ralfs, var. *tetraodon* (Corda) Rabenhorst	C	O,N,My
Planktosphaeria gelatinosa G. M. Smith	R	Jy
Scenedesmus acutiformis Schroeder	R	S
Scenedesmus arcuatus Lemm.	C	N,Ap,My
Scenedesmus arcuatus Lemm. var. *platydiscus* G. M. Smith	O	O,N,My
Scenedesmus armatus var. *chodatii* G. M. Smith	O	N
Scenedesmus basiliensis Bohlin	C	Ap,My,Ju,Jy
Scenedesmus denticulatus Lagerheim	A	My,Ju,Jy,Ag
Scenedesmus quadricauda (Turp.) de Breb.	A	O-O
Selenastrum minutum (Naeg.) Collins	R	N
**Selenastrum Bibrianum* Reinsch	R	S
**Selenastrum Westii* G. M. Smith	R	N

TABLE 1. (continued)

Organism	Relative Abundance	Seasonal Occurrence
Sorastrum spinulosum Naegeli	R	Jy,Ag
Tetraedron constrictum G. M. Smith	R	N
Tetraedron gracile (Reinsch.) Hansgirg	O	My,Ju,Jy
Tetraedron minimum (A. Braun) Hansgirg	C	Jy,Ag
Tetraedron pusillum (Wallich) West and West	O	Jy
**Tetraedron quadratum* (Reinsch) Hansgirg	C	My,Ju,Jy
Tetraedron regulare var. *incus* Teiling	C	N,Ap,My
Tetraedron trigonum (Naeg.) Hansgirg	O	My,Ju,Jy,Ag
**Tetrastrum heteracanthum* (Norstedt) Chodat	R	N
**Trochiscia aspera* (Reinsch) Hansgirg	R	Ag
Trochiscia reticularis (Reinsch) Hansgirg	R	Ag
Westella botryoides (W. West) de Wildeman	R	Ju
Westella linearis G. M. Smith	R	Ju
Cylindrocapsales:		
**Cylindrocapsa conferta* W. West	O	My,Ju,Jy
Oedogoniales:		
**Bulbochaete mirabilis* Wittr.	C	Jy
Bulbochaete pygmaea Pringsheim	C	Jy
Bulbochaete sp.	C	O,N,Ap,My,Ju,Jy
Oedogonium aerolatum Lagerheim	O	Ag
Oedogonium capitellatum Wittr.	O	S
Oedogonium cardiacum (Hass.) Wittr.	O	Jy
Oedogonium crassiusculum Wittr.	O	My,Ju,Jy
**Oedogonium globosum* Nordst.	O	Jy
Oedogonium gracilius (Wittr.) Tiffany	C	Jy
Oedogonium Howardii G. S. West	A	Ju,Jy,Ag
Oedogonium irregulare Wittr.	O	My
**Oedogonium urceolatum* Nordstedt and Hirn in Hirn	O	Ag
Oedogonium spp.	A	O-O
Tetrasporales:		
Asterococcus limneticus G. M. Smith	A	O,N,Ap,My,Ju,Jy
**Elakatothrix viridis* (Snow) Printz.	R	S
Gloeocystis ampla (Kuetz.) Lagerheim	A	Ju,Jy,Ag
Gloeocystis gigas (Kuetz.) Lagerheim	C	My,Ju,Jy,Ag
Gloeocystis vesiculosa Naegeli	A	Ju,Jy,Ag
**Palmodictyon viride* Kuetz.	R	Jy
Sphaerocystis schroeteri Chod.	A	O,N,D,Jn,F,Mr,Ap,My, Ju,Jy,Ag
Tetraspora lacustris Kenn.	A	O,N,Mr,Ap,My,S
Ulotrichales:		
Radiofilum conjunctivum Schmidle	C	O,N,D,Ap,My,Ju
Ulothrix subconstricta G. S. West	O	My,Ju,Jy,Ag
Ulothrix subtilissima Rabenhorst	C	Jy,Ju,Jy,Ag
Volvocales:		
**Chlamaydomonas globosa* Snow	O	Ap,My
**Chlamydomonas polypyrenoideum* Moew.	O	Ju
**Chlamydomonas pseudopertyi* Pascher	O	N,D
Chlamydomonas spp.	C	O-O
Eudorina elegans Ehr.	O	Mr,Ap,My
**Gonium formosum* Pascher	R	S
Pandorina morum (Muell.) Bory	C	My,Ju,Jy,Ag
Phacotus lenticularis Ehr. (Stein)	A	O-O
Pleodorina californica Shaw	C	Ju,Jy,Ag
Volvox aureus Ehr.	C	Mr,Ap,My,Ju,Jy,Ag
Zygnematales:		
**Arthrodesmus phimus* var. *occidentalis* West and West	O	O,N,D
Closterium eboracense (Ehr.) Turner	C	Ap,My,Ju,Jy
Closterium Leibleinii Kuetz.	O	My,Ju,Jy,Ag
Closterium parvulum var. *maius* West f. *maius*	O	O,N,D,My,Ju
Closterium venus var. *apollonionsis* Croasdale	O	O,N
Cosmarium angulare Johnson	C	D,My,Ju,Jy
**Cosmarium angulare* var. *canadensis* Irenee-Marie	C	O,N,D
**Cosmarium aphanichondum* Nordst.	O	O,N,D,My,Ju,Jy

Table 1. (continued)

Organism	Relative Abundance	Seasonal Occurrence
Cosmarium bireme Nordst.	O	My,Ju
Cosmarium biretum de Breb.	O	O,N,D,Ap,My
Cosmarium Blyttii Wille	C	Ag,S
Cosmarium crenulatum var. *tumidulum* Insam and Krieger	O	Jy,Ag,S
Cosmarium depressum (Naegeli) Lundell	A	O,N,D,Jn,F,Mr,Ap
Cosmarium formulosum Hoffman	C	Ag,S
Cosmarium Garrolense Roy and Biss.	O	O,N,D
Cosmarium granatum de Breb.	A	Ap,My,Ju,Jy,Ag,S
Cosmarium granatum de Breb. var. *subgranatum* Nordst.	O	My
Cosmarium humile (Gay) Nordst.	C	O,N,My,Ju,Jy
Cosmarium impressulum Elfving	C	Ap,My,Ju,Jy,Ag
**Cosmarium Lundellii* var. *ellipticum* West	C	O,N,D,Ap,My,Ju,Jy
Cosmarium margaritatum. (Lund.) Roy and Biss.	A	S,O,N
Cosmarium moniliforme (Turp.) Ralfs.	O	Ap,My,Ju,Jy
Cosmarium porrectum Nordst.	A	My,Ju,Jy,Ag,S
Cosmarium pseudoprotuberans Kirchn.	O	N,My,Ju,Jy
Cosmarium portianum Archer	O	Jy
Cosmarium Novae-Semliae var. *sibericum* Boldt	O	S
Cosmarium quadratum Lundell var. *minus* Nordst.	O	My,Ju
Cosmarium reniforme (Ralfs.) Archer	C	O,N,D,Ap,My
**Cosmarium rectangulare* var. *hexagonum* (Elfv.) Nob.	O	My,Ju
**Cosmarium regnellii* Wille	C	Ap,My,Ju,Jy,Ag
**Cosmarium seelyanum* Wille	C	Ap,Ju,Jy
**Cosmarium subocthodes* Schmidle	C	N,O,Ap,My,Ju,Jy
Cosmarium subprotumidum Nordst.	C	Ag,S
Cosmarium umbiculatum Lutkem	C	O,N
Cosmarium turpinii de Breb. var. *podolicum* Gutwinski	O	Jy
**Cosmarium variolatum* Lendell var. *cataractum* Raciborski	C	Jy,Ag,S
Euastrum binale (Turp.) Ehr. f. *hians* W. West	C	My,Ju,Jy
Euastrum dubium Naegeli	C	O,N,D,Ap,My,Ju,Jy,Ag,S
Euastrum insulare (Wittr.) Roy	C	Ap,My,Ju,Jy
Euastrum insulare (Wittr.) Roy var.?	C	My
**Euastrum turneri* West var. *turneri* f. *turneri*	C	O,N,My,Ju,Jy
Micrasterias truncata var. *truncata* f. *semiradiata* (Naeg.) Cleve	C	O,N,Ap,My,Ju
Mougeotia sp.	C	O,N,D,Mr,Ap,My,Ju,Jy
**Netrium digitus* var. *rectum* (Turner) Kreiger	C	O,N,D,J,F,Mr,Ap,My,Ju,Jy
Penium margaritaceum (Ehr.) de Breb.	R	Jy
Sirogonium stictum (Engl. Bot.) Kuetz.	R	My
Spirogyra communis (Hass.) Kuetz.	A	Ap
Spirogyra irregularis Naegeli	A	Ap
Spirogyra Juergenskii Kuetz.	A	Ap,My,Ag,S,O
Spirogyra punctata Cleve	A	Ap,My
Spirogyra spreeiana Rabenhorst	A	Ju,Jy,Ag
Spirogyra spp.	A	O-O
**Staurastrum bicoronatum* Johnson var. *tridentatum* Taft	C	Ag,S
**Staurastrum bineanum* var.? Rabenhorst	C	Mr,Mr,Ap,My,Ju,Jy
**Staurastrum floriferum* W. & G. S. West	C	D,O,N
Staurastrum gracile var. *nanum* Wille	O	Ap,N,O
Staurastrum polymorphum var. *pusillum* West	O	N,D,My
Staurastrum setigerum Cleve	R	Jy,Ag
Staurastrum striolatum (Naeg.) Archer	C	Ju,Jy
**Staurastrum turgescens* De Not.	C	My,Ju,Jy,Ag,S
**Staurastrum vestitum* Ralfs.	C	O,N,Ju,Jy,Ag,S
**Zygnemopsis americana* Transeau	A	S
Cyanophyta:		
Chroococcales:		
**Aphanocapsa biformis* A. Braun	O	Jy,Ag
Aphanocapsa delicatissima West & West	O	Ju,Jy,Ag
**Aphanocapsa elachista* West & West	R	Ag,S
Aphanocapsa pulchra (Kuetz.) Rabenhorst	C	Ju,Jy,Ag
**Aphanocapsa rivularis* (Carm.) Rabenhorst	C	O,Ju,Jy,Ag
Aphanothece nidulans P. Richter	R	Jy
**Aphanothece clathra* G. S. West	R	O

TABLE 1. (continued)

Organism	Relative Abundance	Seasonal Occurrence
**Aphanothece gelatinosa* (Henn.) Lemmermann	R	Jy,Ag
**Chroococcus dispersus* (V. Keissler) Lemm.	O	My,Ju,Jy,Ag
Chroococcus limneticus var. *subsalsus* Lemm.	A	O,N,D,Jn,F,Ap,My
Chroococcus minor (Kuetz.) Naegeli	O	Ju,Jy,S
**Chroococcus Prescottii* Drouet and Daily	C	My,Ju,Jy,Ag,S
Chroococcus turgidus (Kuetz.) Naegeli	C	N,D,Ap,My,Ju,Jy,Ag,S
Chroococcus varius A. Braun	O	Jy
Coelosphaerium kuetzingianum Naegeli	C	Ju,Jy,Ag
Coelosphaerium pallidum Lemm.	C	My,Ju,Jy,Ag,S
**Dactylococcopsis acicularis* Lemm.	C	Jy
**Dactylococcopsis fascicularis* Lemm.	O	My,Ju,Jy
**Gloeocapsa polydermatica* Kuetz.	R	S
**Gloeocapsa luteo-fusca* Martens	A	Ju,Jy
Gloeothece rupestris (Lyngb.) Bornet in Wittr. & Norstedt	R	Ag
Gomphosphaeria aponina Kuetz	C	N,Mr,My,Ju,Jy,Ag,S
Gomphosphaeria lacustris Chod.	C	My,Ju,Jy,Ag
**Marssoniella elegans* Lemm.	O	My,Ju,Jy
Merismopedia elegans A. Braun	C	My,Ju,Jy
Merismopedia glauca (Ehr.) Naegeli	C	My,Ju,Jy
Merismopedia punctata Meyen	C	Jy
Merismopedia tenuissima Lemm.	O	Jy
Microcystis aeruginosa var. *major* (Wittr.) G. M. Smith	A	Ju,Jy,Ag,S
Microcystis flos-aquae (Wittr.) Kirchner	A	Ju,Jy,Ag
Microcystis incerta Lemm.	A	O,N,D,Ap,My,Ju,Jy,Ag,S
**Rhabdoderma sigmoides* fa. *minor* Moorl & Carter	R	S
**Synechococcus aeruginosa* Naegeli	R	Jy,Ag
Hormogonales:		
Anabena aequalis Borge	O	My,Ju,Jy
**Anabena ambigua* Rao, C. B.	C	Jy
Anabena affinis Lemm.	A	Ap,My,Ju
Anabena circinalis Rabenhorst ex. Born. et Flahault	A	Ju,Jy
**Anabena fertilissima* Rao, C. B.	C	Ag
Anabena flos-aquae (Lyngb.) de Breb.	A	Ju,Jy,Ag
Anabena planktonica Brunthaler	A	Ju,Jy
**Anabena oscillarioides* Bory ex. Born. et Flahault	O	S
**Anabena sphaerica* Born. et Flah.	A	My
Anabena spiroides Klebahm	A	My,Ju,Jy
**Anabena torulosa* (Carm.) Lagerh. ex. Born. et Flahault	O	Jy
**Anabena vagnicola* Fritsch et Rich	O	Ag
Anabena inaequalis (Kuetz.) Bornet et Flahault	O	My
**Aulosira implexa* Born. et Flah.	A	Ju,Jy,Ag,S
**Calothrix marchica* var. *intermedia* Rao, C. B.	C	My,Ju,Jy,Ag,S
**Calothrix parietana* (Naeg.) Thuret	A	Jy,Ag,S
**Calothrix scytonemicola* Tilden	R	S
**Cylindrospermum stagnale* (Kuetz.) Born. et Flah.	A	Jy,Ag,S
**Forteia bossei* (Fremy) comb. nov.	R	S
Gloeotrichia echinulata (J. E. Smith) P. Richter	A	Ju,Jy,Ag
**Gloeotrichia pisum* Thuret ex. Born et Flah.	C	Jy,Ag
**Hapalosiphon* intricatus West & West	R	S
**Hydrocoleum homeotrichum* Kuetz.	R	S
Lyngbya aerugineo-caerula (Kuetz.) Gomont	O	Ag
**Lyngbya kuetzingiana* Kirchner	O	Ag
Lynbybya major Meneghinii	O	O-O
**Lyngbya mesotrichia* Skuja	C	Jy,Ag
Microcoleus sp.	R	N
**Nostoc carneum* Ag. ex. Born. et Flah.	O	Jy
Nostoc hatei Dixit	O	Ju,Jy
Nostoc linckia (Roth) Bornet ex. Born. et Flah.	C	Ju,Jy,Ag
**Nostoc paludosum* Kuetz. ex. Born. et Flahault	O	Ag
**Nostoc punctiforme* (Kuetz.) Hariot	O	O,N,Ju,Jy
Oscillatoria agardhii Gomont	O	My,Ju
Oscillatoria amphibia C. A. Agardh	C	My,Ju,Jy
Oscillatoria amphigranulata van Goor	O	Jy
Oscillatoria angustissima West & West	O	My,Ju
Oscillatoria formosa Bory	R	Mr,Ap,Jy,Ju
**Oscillatoria hamelii* Fremy	C	Ju,Jy,Ag

TABLE 1. (continued)

Organism	Relative Abundance	Seasonal Occurrence
Oscillatoria limnetica Lemm.	C	Mr,Ap,My
**Oscillatoria proteus* Skuja	R	S
Oscillatoria sancta (Kuetz.) Gomont	R	Mr,Ap,Ag
Oscillatoria subbrevis Schmidle	C	O,Mr,Jn
Oscillatoria tenuis C. A. Agardh	C	N,My,Jn,F
**Oscillatoria tenuis* var. *tergetina* (Kuetz.) Rabenh.	C	O,N
**Phormidium inundatum* Kuetz.	O	Ju,Jy,Ag
**Phormidium tenue* (Menegh.) Gomont	O	My
Phormidium uncinatum (Ag.) Gomont	C	Jy
**Rivularia aquatica* De Wilde	R	My
**Rivularia beccariana* (De Not.) Born. et Flahault	C	Ag
**Rivularia globiceps* G. S. West	C	Ju,Jy,Ag
**Scytonema hofmanni* Ag. ex. Born. et Flahault	R	S
**Spirulina Norstedtii* Gomont	R	Ap
Spirulina major Kuetz.	R	Ap
Chamaesiphonales:		
Chamaesiphon incrustans Grunow	O	My,Ju,O,N
Euglenophyta:		
Euglenales:		
Colacium vesiculosum Ehr.	O	Ap,My,Ju
Euglena acus Ehr.	C	N,Ap,My
Euglena acus var. *rigida* Huebner	C	O,N
**Euglena convoluta* Korshikov	C	Ju,Jy,Ag,S
Euglena gracilis Klebs.	C	O,N,Ap,My,Ju,Jy
Euglena proxima Dangeard	O	N,Ju,Jy
Euglena oxyuris Schmarda	R	N,Ap
**Euglena sanguinea* Ehr.	A	Jy,Ag
**Euglena spadix* Gojdics	R	Ag
Euglena spirogyra Ehr.	O	Ag,S
**Lepocinclis fusiformis* (Carter) Lemm.	O	N,S,O
**Lepocinclis glabra* Orez.	R	S
**Lepocinclis ovum* (Ehr.) Lemm.	C	Ju,Jy,Ag
**Lepocinclis Playfairiana* Defl.	O	N,My,Ju,Jy
Phacus caudatus Huebner	R	N
Phacus longicauda (Ehr.) Dujardin	C	N,Ap,My,Ju,Jy
Phacus pseudoswirenkoi Prescott	R	Jy
Phacus pyrum (Ehr.) Stein	O	N
Phacus triqueter (Ehr.) Dujardin	R	N
**Trachelomonas acanthostoma* (Stokes) Deflandre	O	O,N
**Trachelomonas acuminata* var. *amphora* Playf.	O	My,Ju,Jy
Trachelomonas armata var. *longispina* (Playf.) Deflandre	C	Mr,My,Ju,Jy,Ag,S
**Trachelomonas bacillifera* var. *minima* Playf.	R	Ap
Trachelomonas charkowiensis Swirenko	A	Jy,Ag
**Trachelomonas dubia* (Swir.) Defl.	A	My,Ag,S
**Trachelomonas gibberosa* Defl.	O	My,Ju,Jy
**Trachelomonas gracillima* Balech.-Dast.	R	Ag
Trachelomonas granulosa Playfair	O	O,N,D,Jn,F
**Trachelomonas globularis* var. *punctata* Skuja	R	Ag
Trachelomonas hispida (Perty) Stein	A	O-O
Trachelomonas hispida var. *coronata* Lemm.	C	N,My
**Trachelomonas horrida* Palmer	C	Jy
**Trachelomonas lacustris* Drez.	O	Jy
Trachelomonas oblonga Lemm.	C	Ju,Jy
**Trachelomonas pulcherrima* var. *minor* Playfair	C	N,Ap
Trachelomonas robusta Swir. em. Defl.	C	N,D,F,Mr,Jn
**Trachelomonas rotunda* (Playf.) Defl.	O	My,Ju,Jy
**Trachelomonas scabra* Playf. aus Defl.	R	Jy
**Trachelomonas schauinslandii* (Lemm.) Defl.	O	My,Ju
**Trachelomonas triangularis* var. Defl.	O	Jy
**Trachelomonas verrucosa* var. *zmiewika* (Swir.) Defl.	O	My,Ju,Jy
Trachelomonas volvocina Ehr.	A	O-O
Trachelomonas superba (Swir.) Difl.	R	Jy,Ag

TABLE 1. (continued)

Organism	Relative Abundance	Seasonal Occurrence
Xanthophyta:		
Heterosiphonales:		
Vaucheria gemineata (Vauch.) de Candolle	C	O,N,Ap,My,Jn
Chrysophyta:		
Heterococcales:		
Peroniella planktonica G. M. Smith	O	My,Ju,Jy
Chrysomonadales:		
Mallomonas caudata var. *macrolepis* Conrad	O	Ju,Jy,Ag,S
Pyrrophyta:		
Dinococcales:		
**Cystodinedria* sp.	C	Jy,Ag,S
**Cystodinium bataviense* Klebs.	A	Ag,S
**Stylodinium globosum* Klebs.	C	O,N,Ag,S
**Tetradinium javanicum* Klebs.	O	Ag,S
Dinocapsales:		
**Gloeodinium montanum* Klebs.	A	Jy,Ag,S,O
Peridiniales:		
Ceratium hirundinella (O. F. Muell.) Dujardin	C	Jy,Ag
Peridinium bipeps Stein	O	Ag,S
Peridinium gatunense Nygaard	O	Ag,S
**Woloszynskia reticulata* Thompson	C	Ag,S

TABLE 2. *Genera and numbers of species of algae identified.*

Chlorococcales

1978	*1938-1943*
Acanthosphaera (1)	*Ankistrodesmus* (1)
Ankistrodesmus (3)	*Characium* (1)
Characium (1)	*Coelastrum* (1)
Coelastrum (3)	*Kirchneriella* (2)
Crucigenia (5)	*Oocystis* (2)
Dictyosphaerium (2)	*Pediastrum* (5)
Dimorphococcus (1)	*Scenedesmus* (3)
Gloeotaenium (1)	*Sorastrum* (2)
Lagerheimia (1)	*Tetraedron* (2)
Micractinium (1)	*Trochiscia* (1)
Nephrocytium (1)	(20 taxa)
Oocystis (8)	
Pediastrum (5)	
Planktosphaeria (1)	
Radiococcus (1)	
Scenedesmus (7)	
Selenastrum (3)	
Sorastrum (1)	
Tetraedron (7)	
Tetrastrum (1)	
Trochiscia (2)	
Westella (2)	
(57 taxa)	

Oedogoniales

1978	*1938-1943*
Bulbochaete (3)	*Bulbochaete* (2)
Oedogonium (11)	*Oedogonium* (1)
(14 taxa)	(15 taxa)

Charales

1978	*1938-1943*
Chara (2)	*Chara* (2)
(2 taxa)	(2 taxa)

Zygnematales

1978	*1938-1943*
Arthrodesmus (1)	*Arthrodesmus* (1)
Closterium (4)	*Closterium* (14)
Cosmarium (31)	*Cosmarium* (39)
Euastrum (5)	*Cylindrocsytis* (1)
Micrasterias (1)	*Desmidium* (2)
Mougeotia (1)	*Dichotomum* (1)
Netrium (1)	*Euastrum* (5)
Penium (1)	*Hyalotheca* (2)
Sirogonium (1)	*Mesotaenium* (1)
Spirogyra (10)	*Miscrasterias* (1)
Staurastrum (9)	*Netrium* (1)
Zygnemopsis (1)	*Onychonema* (1)
(66 taxa)	*Penium* (2)
	Pleurotaenium (5)
	Sirogonium (2)
	Spirogyra (19)
	Spondylosum (1)
	Staurastrum (20)
	(118 taxa)

Euglenales

1978	*1938-1943*
Colacium (1)	*Cryptoglena* (1)
Euglena (9)	*Euglena* (1)
Lepocinclis (4)	*Phacus* (3)
Phacus (5)	*Trachelomonas* (3)
Trachelomonas (24)	(8 taxas)
(43 taxa)	

(continued next page)

undoubtedly has been the major cause of change in the composition of the algal flora (31). Also, taxonomic classification of algae, especially at the species level, has been amended a great deal since Leake's time which could create artificial differences between the two studies.

Chroococcales	
1978	*1938-1943*
Aphanocapsa (5)	*Coelosphaerium* (1)
Aphanothece (3)	*Gomphosphaeria* (1)
Chroococcus (6)	*Merismopedia* (1)
Coelosphaerium (2)	(3 taxas)
Dactylococcopsis (2)	
Gloeocapsa (2)	
Gloeothece (1)	
Gomphosphaeria (2)	
Marsoniella (1)	
Merismopedia (4)	
Microcystis (3)	
Rhabdoderma (1)	
Synechococcus (1)	
(33 taxa)	
Hormogonales	
Anabena (13)	*Anabena* (1)
Aulosira (1)	*Aphanizomenon* (1)
Calothrix (3)	*Lyngbya* (1)
Cylindrospermum (1)	*Oscillatoria* (1)
Forteia (1)	(5 taxa)
Gloeotrichia (2)	
Hapalosiphon (1)	
Hydrocoleum (1)	
Lyngbya (4)	
Microcoleus (1)	
Nostoc (5)	
Oscillatoria (12)	
Phormidium (3)	
Rivularia (3)	
Scytonema (1)	
Spirulina (2)	
(54 taxa)	

Qualitatively Crystal Lake and the surrounding area have changed in many ways since Leake's study. The drainage basin of the lake, which was heavily grazed during Leake's study, is now covered heavily with grass and ungrazed. This undoubtedly has caused a change in the quality of solid runoff. Crystal Lake was formerly used extensively for boating, skiing and swimming, whereas now recreational use is limited to fishing. The lake has filled in 19-20 feet since Leake's study; this has resulted in reduced resistance to mixing. *Myriophyllum spicatum,* which has become the dominant plant in the lake, was not present when Leake did her study.

The presence of *Myriophyllum* has affected populations of algae in several ways. It provided a new habitat for many organisms resulting in greater algal diversity. Because of its presence, shoreline erosion and wave action in shallow areas was reduced, resulting in less sediment disturbance and clearer water. *Myriophyllum* also has an important effect on lake chemistry. Irwin and Stevenson (32) have shown that aquatic plants secrete substances into the water which combine with suspended particles and expedite their settling, thus reducing turbidity. Rooted submergent macrophytes such as *Myriophyllum* are important in the nutrient system of the lake as has been demonstrated by Gessner (33), Schwoerbel and Tillmans (34), and Wetzel (35). They function as "nutrient pumps'" by bringing up nutrients from sediments and leaking them into the water through their leaves. Additional amounts of nutrients are released into the water when *Myriophyllum* dies in the fall. The nutrients added to the water by *Myriophyllum* are then utilized by algae and bacteria (36). While the Chlorophyta populations have remained relatively constant since Leake's study, the Cyanophyta and Euglenophyta populations have increased in diversity. Crystal Lake, therefore, seems to fit the hypothesis (35, 37) that established populations tend to remain constant. Palmer (38) has found that the green algae are the group most tolerant to changes in the environment, and this appears to be the case in Crystal Lake. The data also agree with the hypothesis (35, 39) that Euglenophytan and Cyanophytan populations tend to diversify with increased eutrophication.

Two factors besides the increase in Euglenophytan and Cyanophytan populations indicate that Crystal Lake is in an advanced state of eutrophication. One is that the surface area/volume ratio has increased greatly since the lake was built. Using the rate of filling in over the last 50 years, one can calculate that the lake will be filled in completely within 20-30 years. Whether or not this will happen is uncertain, but without a doubt, the lake will become shallower and thus will be more prone to eutrophication. The other factor is the heavy growth of *Myriophyllum.* Several authors (39, 40) indicate that a heavy growth of submerged macrophytes is a definite sign of advanced eutrophication and Crystal Lake certainly fits this description. We believe, therefore, that algal populations in Crystal Lake will continue to change but probably faster than over the last 40 years.

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