PHYTOPLANKTON AND ZOOPLANKTON UNDER ICE-COVER IN A SUBALPINE LAKE, THE LOCH, ROCKY MOUNTAIN NATIONAL PARK, COLORADO, 1987-89

U.S. GEOLOGICAL SURVEY

Open-File Report 91-489

Prepared in cooperation with the
COLORADO STATE UNIVERSITY

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By S.A. Spaulding

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	*By*	*To obtain*
hectare (ha)	2.471	acre
liter (L)	.3531	cubic foot
meter (m)	3.281	foot
micrometer (μm)	3.937×10^5	inch
milliliter (mL)	.06102	cubic inch

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A Geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

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ABSTRACT

Phytoplankton and zooplankton species composition and abundance were examined in The Loch, a subalpine lake (3,110 m above National Geodetic Vertical Datum of 1929) in Rocky Mountain National Park during the winter seasons of 1987-88 and 1988-89. The Loch (area = 4.98 hectares, maximum depth = 4.7 meters) was ice covered from early November until early May during both years. The lake was sampled at a single sampling location twice monthly. Samples were collected from three discrete depths in the water column for the duration of ice cover. Data presented in this report include taxonomic determination and abundance of phytoplankton and zooplankton.

INTRODUCTION

Phytoplankton and zooplankton data were collected from a subalpine lake, The Loch (fig. 1) during the winter seasons of 1987-88 and 1988-89. The primary objective of the project was to determine temporal variation of the plankton, and variation in processes that control the plankton. The plankton may potentially be affected by acidic deposition in the Loch Vale Watershed. The objective of the report is to provide a baseline record of seasonal and annual change in plankton species composition and abundance. Winter phytoplankton dynamics and the relation to physical and chemical characteristics of the lake are described by Spaulding (1991). The study site is located in the Loch Vale watershed (LVWS), a long-term research site established by the National Park Service in 1981. The primary objective of the long-term research conducted at the site is to determine the biogeochemical processes that would be affected by acidic deposition in Rocky Mountain National Park. The watershed is also the location of a National Acid Precipitation Assessment Program (NAPAP) site. Further explanation of the research at LVWS is given in Baron and others (1984) and Baron (in press).

METHODS OF SAMPLE COLLECTION AND ANALYSIS

The Loch was sampled during the 1987-88 and 1988-89 seasons of ice cover. During the period of study, ice formed as early as September, but subsequently melted. A continuous covering of ice did not develop until November. Sampling began as soon as the ice was thick enough to safely support human weight. In 1987, sampling began in early December and in 1988, mid November. The site was visited approximately every other week. Sampling continued to about the end of May when the ice could no longer safely support the weight of a person.

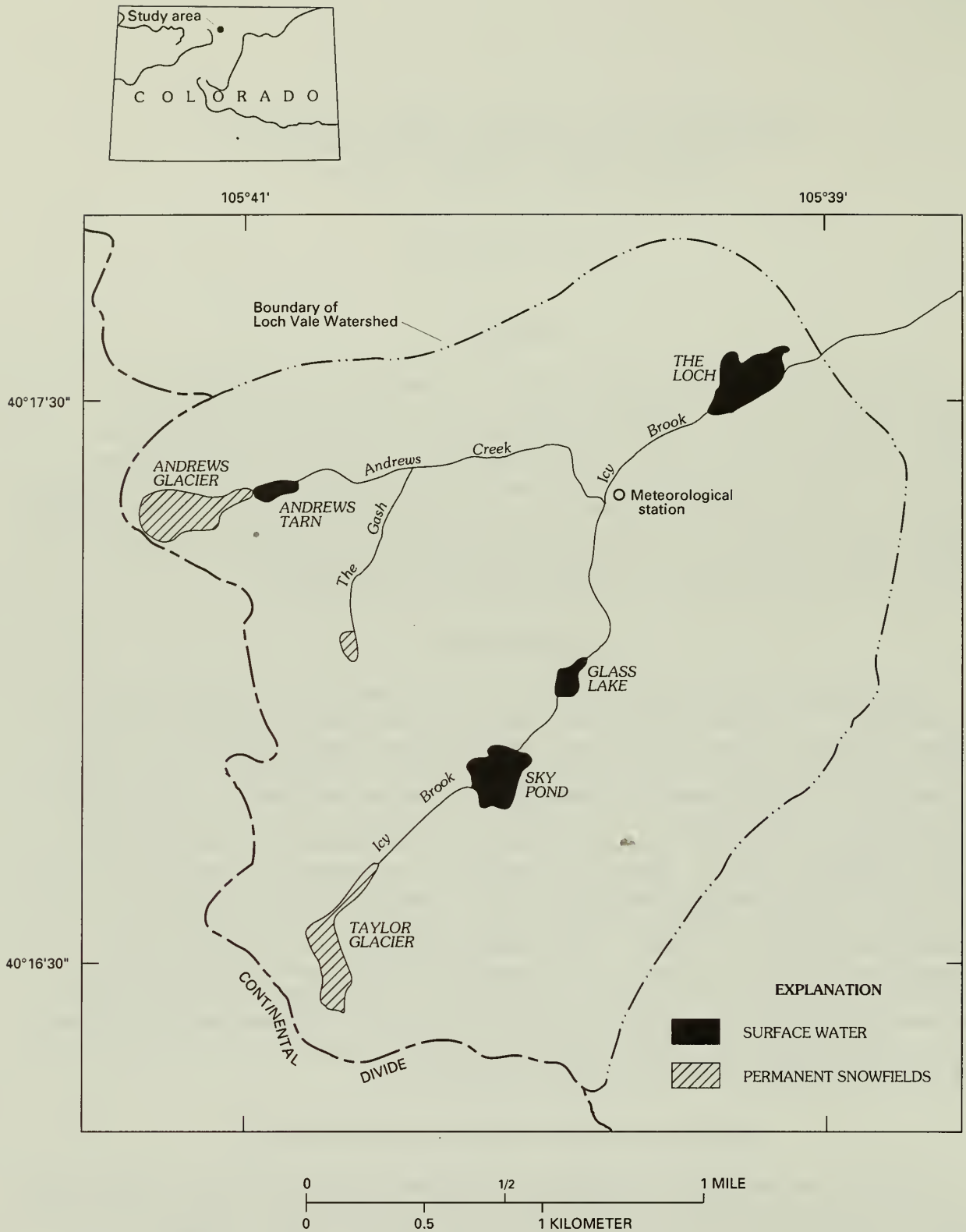

Figure 1. Location of study area and The Loch, the lake in which plankton were collected.

The lake was always sampled at its deepest point (fig. 2). Because the level of the lake fluctuated, the maximum depth (from lake bottom to ice surface) ranged between 3.5 and 4.5 m. Sample collection took place between 11:00 A.M. and 1:00 P.M. The first year, two 25-cm diameter holes were drilled side by side with a manual ice auger. An iron bar with a sharpened end was used to remove ice that joined the two holes. The ice opening was then large enough to accommodate sampling equipment. The second year a sampling tube was set into the ice that could be readily accessed. Water samples were collected with a hand operated peristaltic pump. The pump tubing was flushed with water from each sample depth before the samples were collected.

Three replicate water samples for phytoplankton identification and enumeration were collected at each of three depths: 0.5 m below the ice surface, at mid depth (2.0-2.5 m below the ice surface), and 0.5 m above the lake bottom. Samples were collected in 250-mL opaque bottles shielded from direct sunlight and protected from freezing. Within 2 hours, phytoplankton samples were preserved with 10 percent acid Lugol's solution (Standard Methods for the Examination of Water and Wastewater, 1980). Subsamples were concentrated in settling chambers ranging in volume from 5 to 100 mL, depending on the abundance of algal cells. Volume of the settling chambers was adjusted so that at least 100 cells of the most common taxa could be counted in two complete passes across the microscope slide. When individual cells of filamentous algae could not be determined, filament length was measured and recorded. Algae were identified and enumerated using a Leitz Diavert inverted microscope (Lund and others, 1958; Utermöhl, 1958). Identifications were made by the author with the guidance of R.G. Dufford and were primarily based upon keys by Prescott (1962) and Tikkanen (1986). After counts were made, phytoplankton subsamples were archived in vials and preserved in formalin.

Two replicate samples for zooplankton were collected at each of three depths using a bilge pump equipped with 6.35-cm diameter tubing. The large diameter and powerful suction was used to capture zooplankton, which can escape if smaller diameter tubing with less suction is used. The bilge pump was used to fill a 22-liter bottle, the contents of which were poured through a 35-µm mesh plankton net. The zooplankton were washed into collecting bottles and preserved in ethanol. In the laboratory, the entire sample was counted for adult copepods and cladocerans. One milliliter subsamples were taken from a 20-mL concentrated volume using a Henson-Stempel[1] pipet. Each subsample was placed in a Sedgwick Rafter chamber for enumeration of nauplii and rotifers. Zooplankton species identifications were made using the taxonomic keys of Edmondson (1959), Stemberger (1979), and Pennak (1978).

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[1]Use of trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

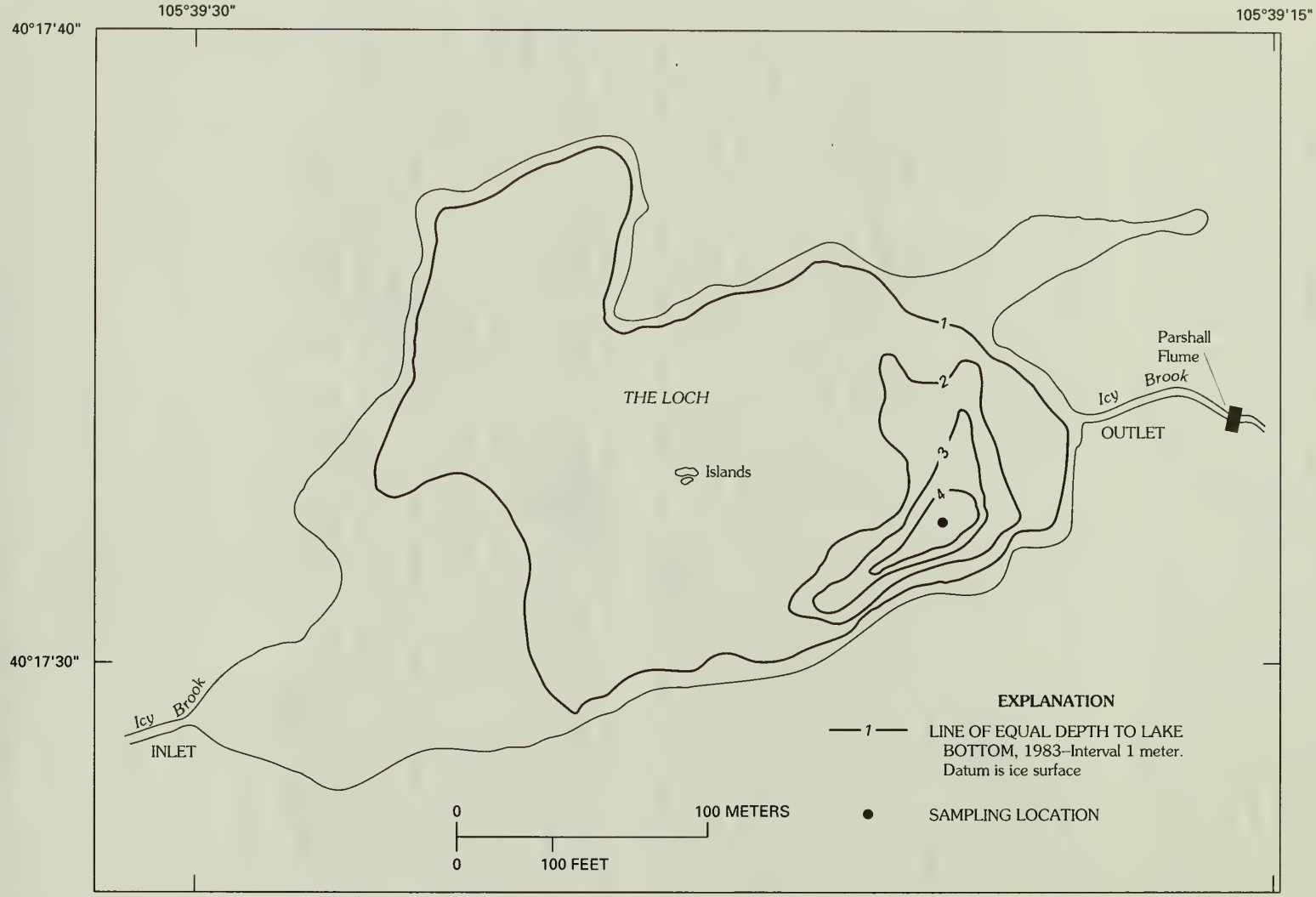

Figure 2. Depth to lake bottom and sampling location in The Loch, 1983.

REFERENCES

Baron, J., Beeson, D.R., Zary, S.A., Walthall, P.M., Lindsay, W.L., and Swift, D.M., 1984, Long-term research into the effects of acidic deposition in Rocky Mountain National Park: Technical Report No. 84-ROMO-2, Fort Collins, CO, National Park Service, Water Resources Division, 43 p.

Baron, J., (in press), Biogeochemistry of a Subalpine Ecosystem: Loch Vale Watershed: New York, Springer-Verlag.

Edmondson, W.T. (ed.), 1959, Fresh-Water Biology (2nd ed): New York, Wiley and Sons, 1,248 p.

Lund, J.W.G., Kipling, C., and LeCren, E.D., 1958, The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting: Hydrobiologia, v. 11, p. 143-170.

Pennak, R.W., 1978, Fresh-water invertebrates of the United States: (2nd ed.) New York, Wiley, 803 p.

Prescott, G.W., 1962, Algae of the Western Great Lakes Area: Dubuque, Iowa, Wm. Brown Publishers, 977 p.

Spaulding, S.A., 1991, Phytoplankton Dynamics Under Ice-cover in a Subalpine Lake: M.S. Thesis, Colorado State University, 149 p.

Standard Methods for the Examination of Water and Wastewater, 1980, New York, American Public Health Association, 1,134 p.

Stemberger, R.S., 1979, A Guide to Rotifers of the Laurentian Great Lakes: EPA-600/4-79-021.

Tikkanen, T., 1986, Kasviplanktonopas: Helsinki, Suomen Luonnonsuojelun Tuki Oy, 278 p.

Untermöhl, H., 1958, Zur Vervollkommung der quantitiven Phytoplankton methodik: Mitt. int. Verein. theor. angew. Limnol., v. 9, p. 1-38.

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*

[Each value is the number of cells per milliliter (some filaments are reported as length, indicated as micrometers per milliliter) determined from the mean of three replicate samples. Position in the water column is indicated as follows: S = 0.5 meter below ice surface, M = 2.0 - 2.5 meter below ice surface, B = 0.5 meter above lake bottom. Organisms not present in sample are indicated by "--".]

TAXA	S	M	B
	December 6, 1987		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	201	193	221
Asterionella formosa Hass.	1,051	873	662
indeterminate Pennales	--	--	2
Synedra sp.	10	10	4
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	6	8	6
Chlamydomonas sp.	3	2	4
Chlorella ellipsoidea Gerneck	51	23	--
Chlorella vulgaris Beyerinck	--	33	--
Chlorella sp.	--	--	13
Chlorococcum sp.	108	79	94
Coccomyxa dispar Schmidle	1	15	4
Scenedesmus sp.	34	16	14
indeterminate flagellates	--	3	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	3	2	1
Kephryion sp.	--	1	--
Mallomonas sp.	--	1	--
indeterminate flagellates	5	10	4
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	9	8	14
Rhodomonas sp. 1	58	33	21
Rhodomonas sp. 2	16	26	26
Rhodomonas sp. 3	4	3	--
indeterminate flagellates	139	89	55
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	260	138	125
Chroococcus minimus (Keissel.) Lemm.	31	26	7
Chroococcus sp.	55	20	11
Merismopedia sp.	3	--	5
Oscillatoria sp.	1,119	2,355	634
Phormidium sp.	--	49	72
Rhabdoderma sp.	--	3	--
Synechoccus sp.	--	--	5
indeterminate cyanobacteria	--	2	--

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	December 6, 1987--Continued		
PYRROPHYTA			
cyst	3	--	--
PROTOZOA			
indeterminate ciliates	3	9	6
CHYTRID FUNGI	570	449	312
	December 22, 1987		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	36	275	256
Asterionella formosa Hass.	22	53	19
Navicula sp.	--	--	1
Synedra sp.	8	15	2
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	8	15	5
Chlamydomonas sp.	4	--	--
Chlorella ellipsoidea Gerneck	--	9	2
Chlorella vulgaris Beyerinck	--	228	30
Chlorella sp.	180	--	--
Chlorococcum sp.	13	6	5
Coccomyxa dispar Schmidle	23	201	25
Scenedesmus sp.	12	18	20
Selenastrum sp.	--	3	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	291	62	6
Kephryion sp.	2	--	--
Mallomonas sp.	1	--	--
indeterminate flagellates	43	9	--
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	2	12	39
Rhodomonas sp. 1	51	--	--
Rhodomonas sp. 2	1	3	--
Rhodomonas sp. 3	1	--	--
indeterminate flagellates	36	299	227
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	184	--	--
Chroococcus minimus (Keissel.) Lemm.	7	--	8
Chroococcus sp.	84	461	187
Dactylococcopsis sp.	2	12	1
Oscillatoria sp.	54	--	--
Rhabdoderma sp.	--	21	--
PYRROPHYTA			
Peridinium cinctum Ehrenb.	--	3	--

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
December 22, 1987--Continued			
PROTOZOA			
indeterminate ciliates	2	--	--
CHYTRID FUNGI	9	35	25
January 5, 1988			
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	--	35	25
Asterionella formosa Hass.	14	17	18
Navicula sp.	--	--	1
Synedra sp.	1	6	--
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	6	7	10
Chlamydomonas sp.	--	1	--
Chlorella sp.	6	33	20
Chlorococcum sp.	6	5	7
Coccomyxa dispar Schmidle	15	67	28
Scenedesmus sp.	16	23	11
Selenastrum sp.	--	1	1
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	49	13	3
indeterminate flagellates	--	--	3
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	50	19	13
Rhodomonas sp.	24	7	6
indeterminate flagellates	15	156	261
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	228	152	217
Dactylococcopsis sp.	--	27	1
Phormidium sp. ?	7	2	8
PYRROPHYTA			
Peridinium cinctum Ehrenb.	5	--	--
CHYTRID FUNGI	3	2	--
January 24, 1988			
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	1	11	6
Asterionella formosa Hass.	1	34	29
Melosira sp.	--	--	5
Synedra sp.	--	2	3

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	January 24, 1988		
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	4	6	3
Chlorella ellipsoidea Gerneck	--	1	1
Chlorella vulgaris Beyerinck	17	71	--
Chlorococcum sp.	1	3	18
Coccomyxa dispar Schmidle	20	10	11
Scenedesmus sp. 1	2	19	10
Scenedesmus sp. 2	--	--	2
Selenastrum sp.	--	2	1
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	26	5	--
indeterminate flagellates	212	18	16
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	18	3	9
Rhodomonas sp.	9	--	4
indeterminate flagellates	2	122	59
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	79	107	114
Chroococcus minimus (Keissel.) Lemm.	24	27	59
Chroococcus sp.	4	--	1
Phormidium sp.	--	23	24
Rhabdoderma sp.	12	--	--
Synechoccus sp.	--	--	4
PYRROPHYTA			
Peridinium cinctum Ehrenb.	1	--	--
	February 2, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	3	23	32
Asterionella formosa Hass.	16	144	68
Melosira sp.	8	--	4
Navicula sp.	2	5	4
Synedra sp.	--	4	1
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	59	90	23
Chlorella vulgaris Beyerinck	--	698	297
Chlorococcum sp.	1	--	1
Coccomyxa dispar Schmidle	71	42	37
Scenedesmus sp.	6	23	30
Selenastrum sp.	2	--	--
indeterminate flagellates	1	--	--

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	February 2, 1988--Continued		
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	1,078	70	3
Mallomonas sp.	1	--	--
indeterminate flagellates	8	1	2
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	4	5	1
Rhodomonas sp.	4	1	1
indeterminate flagellates	5	7	16
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	116	56	68
Chroococcus minimus (Keissel.) Lemm.	4	--	--
Lyngbya sp. ?	--	31	40
Phormidium sp.	4	--	--
Synechoccus sp.	2	--	1
PROTOZOA			
indeterminate ciliates	--	6	4
CHYTRID FUNGI	--	3	--
	February 21, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	--	17	4
Asterionella formosa Hass.	35	437	264
indeterminate Pennales	--	18	--
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	183	343	61
Chlamydomonas sp. 1	7	25	6
Chlamydomonas sp. 2	--	25	--
Chlorella sp.	6,497	3,131	649
Chlorococcum sp.	40	68	51
Coccomyxa dispar Schmidle	1,538	3,538	648
Crucigenia quadrata Morren	--	--	2
Scenedesmus sp.	36	67	89
Staurastrum sp.	--	--	2
Ulothrix sp.	--	42	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	6,007	231	34
indeterminate flagellates	62	237	47
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	4	9	34
Rhodomonas sp.	36	--	--
indeterminate flagellates	--	--	4

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	February 21, 1988--Continued		
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	5,083	1,732	143
Chroococcus minimus (Keissel.) Lemm.	44	237	247
Chroococcus sp.	86	76	8
Gloeothece sp.	7	--	--
Synechoccus sp.	--	68	2
indeterminate	4	34	--
PYRROPHYTA			
Peridinium cinctum Ehrenb.	169	8	4
CHYTRID FUNGI	26	85	10
	March 6, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	29	19	110
Asterionella formosa Hass.	472	624	984
Navicula sp.	--	--	5
Synedra sp.	5	--	5
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	231	224	221
Chlamydomonas sp.	1,079	775	339
Chlorella ellipsoidea Gerneck	5	--	15
Chlorella sp.	397	297	622
Chlorococcum sp.	93	63	27
Coccomyxa dispar Schmidle	4,622	4,025	4,473
Scenedesmus sp.	144	63	191
Selenastrum sp.	105	54	5
Ulothrix sp.	--	11	278
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	1,813	1,350	957
indeterminate flagellates	61	33	49
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	--	5	10
indeterminate flagellates	--	9	10
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	1,526	989	973
Chroococcus limneticus Lemm.	--	--	9
Chroococcus minimus (Keissel.) Lemm.	176	29	108
Chroococcus sp.	47	5	44
Oscillatoria sp.	--	50µm	161µm
Synechoccus sp.	134	44	124
PYRROPHYTA			
Peridinium cinctum Ehrenb.	24	24	--

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	March 6, 1988--Continued		
PROTOZOA			
indeterminate ciliates	43	19	15
CHYTRID FUNGI	66	107	262
	March 20, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	97	83	185
Asterionella formosa Hass.	375	419	434
Synedra sp.	--	--	5
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	336	546	405
Chlamydomonas sp. 1	599	395	195
Chlamydomonas sp. 2	68	--	--
Chlorogonium sp.	--	5	--
Chlorella ellipsoidea Gerneck	10	--	--
Chlorella sp.	375	975	634
Chlorococcum sp.	83	73	49
Coccomyxa dispar Schmidle	4,294	4,620	4,645
Scenedesmus sp.	98	78	127
Selenastrum sp.	24	20	49
Ulothrix sp.	--	10	--
indeterminate flagellates	--	--	59
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	98	706	541
indeterminate flagellates	102	40	35
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	10	49	10
Rhodomonas sp.	5	--	5
indeterminate flagellates	15	--	--
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	1,866	1,613	1,745
Chroococcus minimus (Keissel.) Lemm.	180	170	68
Lyngbya sp. ?	--	5	--
Synechoccus sp.	49	93	25
PYRROPHYTA			
Peridinium cinctum Ehrenb.	5	49	39
PROTOZOA			
indeterminate ciliates	5	20	20
CHYTRID FUNGI	78	98	102

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	April 6, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	19	25	15
Asterionella formosa Hass.	146	571	580
Synedra sp.	--	2	2
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	331	542	565
Chlamydomonas sp. 1	180	38	16
Chlamydomonas sp. 2	--	2	81
Chlorella vulgaris Beyerinck	--	--	272
Chlorella sp.	268	148	--
Chlorococcum sp.	39	56	40
Coccomyxa dispar Schmidle	609	252	238
Scenedesmus sp.	24	117	56
Selenastrum sp.	19	29	9
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	297	101	--
indeterminate flagellates	15	6	2
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	107	56	36
Rhodomonas sp. 1	53	20	11
Rhodomonas sp. 2	5	--	2
Rhodomonas sp. 3	10	--	--
indeterminate flagellates	10	7	--
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	522	427	810
Chroococcus minimus (Keissel.) Lemm.	--	36	99
Chroococcus sp.	153	47	11
Merismopedia sp.	88	--	67
Oscillatoria sp.	112	--	--
Phormidium sp.	34	--	--
Rhabdoderma sp.	5	5	--
Synechoccus sp.	29	7	5
PYRROPHYTA			
Peridinium cinctum Ehrenb.	78	5	7
PROTOZOA			
indeterminate ciliates	10	13	11
indeterminate flagellates	507	70	182
CHYTRID FUNGI	15	50	52

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	April 19, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	1	13	20
Asterionella formosa Hass.	38	1,466	650
Navicula sp.	1	--	--
Synedra sp.	--	--	2
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	6	556	321
Chlamydomonas spp.	31	90	5
Chlorella sp.	16	238	108
Chlorococcum sp.	4	27	2
Coccomyxa dispar Schmidle	4	40	45
Scenedesmus sp.	3	54	63
Selenastrum sp.	2	7	2
Stichococcus sp.	4	9	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	12	40	29
indeterminate flagellates	11	15	42
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	1	33	243
Rhodomonas sp. 1	10	61	227
indeterminate flagellates	30	70	125
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	240	774	1,002
Chroococcus minimus (Keissel.) Lemm.	--	58	144
Merismopedia sp.	3	9	13
Oscillatoria sp.	4	--	52
Phormidium sp.	7	67	12
Rhabdoderma sp.	77	--	--
Synechoccus sp.	17	--	15
indeterminate filaments	13	--	--
indeterminate coccoid cells	--	2	--
PYRROPHYTA			
Peridinium cinctum Ehrenb.	3	27	--
PROTOZOA			
indeterminate ciliates	46	259	479
indeterminate flagellates	--	49	27
CHYTRID FUNGI	--	17	7
	May 4, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	8	1	1
Asterionella formosa Hass.	62	112	7
indeterminate Pennales	--	--	1

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	May 4, 1988--Continued		
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	--	25	6
Chlamydomonas sp. 1	8	3	1
Chlamydomonas sp. 2	--	20	--
Chlorella sp.	1	3	4
Chlorococcum sp.	1	--	1
Chlorogonium sp.	--	1	--
Coccomyxa dispar Schmidle	--	1	2
Scenedesmus sp.	9	11	3
Selenastrum sp.	4	1	--
Stichococcus sp.	4	3	--
Ulothrix sp.	--	46	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	1	7	3
Mallomonas sp.	4	12	4
indeterminate flagellates	15	19	26
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	5	--	1
Rhodomonas sp. 1	107	165	72
Rhodomonas sp. 2	4	1	4
indeterminate flagellates	86	41	36
CYANOBACTERIA			
Anabaena sp.	2	--	--
Arthrospira gomontiana Setchell	--	1	--
Chroococcus dispersus (Keissel.) Lemm.	289	349	295
Chroococcus minimus (Keissel.) Lemm.	5	1	--
Dactylococcopsis sp.	2	1	--
Merismopedia sp.	4	--	--
Oscillatoria sp.	132	124	45
Phormidium sp.	--	84	48
Rhabdoderma sp.	101	58	18
Synechoccus sp.	25	9	6
indeterminate coccoid cells	1	--	--
PROTOZOA			
indeterminate ciliates	74	130	42
	May 30, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	--	13	13
Asterionella formosa Hass.	208	243	205
Cocconeis sp.	2	--	--
Eunotia sp.	--	--	1
Fragilaria sp.	--	4	--
Meridion sp.	2	1	5
indeterminate Pennales	2	1	4
Synedra sp.	1	2	--

Table 1.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1987-88*--Continued

TAXA	S	M	B
	May 30, 1988--Continued		
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	5	7	6
Chlamydomonas sp.	527	319	275
Chlamydomonas nivalis Wille	4	--	--
Chlorella sp.	21	10	12
Chlorococcum sp.	17	3	14
Chlorogonium sp.	55	70	116
Netrium sp.	11	5	1
Scenedesmus sp.	27	36	18
Selenastrum sp.	199	215	122
Stichococcus sp.	27	30	26
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	19	13	18
Mallomonas sp. 1	3	--	--
Mallomonas sp. 2	--	1	--
indeterminate flagellates	25	21	20
CRYPTOPHYTA			
Rhodomonas sp. 1	108	89	62
Rhodomonas sp. 2	23	34	51
Rhodomonas sp. 3	60	57	29
indeterminate flagellates	236	386	208
CYANOBACTERIA			
Arthrospira gomontiana Setchell	21	4	--
Chroococcus dispersus (Keissel.) Lemm.	114	96	75
Merismopedia sp.	1	--	--
Oscillatoria sp.	21	--	22
Phormidium sp.	1	7	--
Rhabdoderma sp.	31	46	--
Synechoccus sp.	7	1	10
PROTOZOA			
indeterminate ciliates	9	5	1

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*

[Each value is the number of cells per milliliter (some filaments are reported as length, indicated as micrometers per milliliter) determined from the mean of three replicate samples. Position in the water column is indicated as follows: S = 0.5 meter below ice surface, M = 2.0 - 2.5 meter below ice surface, B = 0.5 meter above lake bottom. Organisms not present in sample are indicated by "--".]

TAXA	S	M	B
November 13, 1988			
BACILLARIOPHYTA			
Asterionella formosa Hass.	774	922	938
Synedra sp.	--	6	12
CHLOROPHYTA			
Chlamydomonas sp. 1	8,310	76,100	15,104
Chlamydomonas sp. 2	--	98	--
Chlamydomonas sp. 3	--	6	--
Chlorella vulgaris Beyerinck	24	16	24
Gonium sp.	92	46	--
Scenedesmus sp.	46	22	24
indeterminate flagellates	--	--	34
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	--	108	34
Dinobryon sp.	--	--	12
Kephryion sp.	--	--	92
indeterminate flagellates	266	334	174
CRYPTOPHYTA			
Rhodomonas sp. 1	--	6	12
Rhodomonas sp. 2	--	12	--
indeterminate flagellates	128	132	46
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	24	70	92
Chroococcus sp.	58	--	--
Oscillatoria limnetica Lemm.	--	--	590
indeterminate filament	116	--	--
PROTOZOA			
indeterminate ciliates	--	--	70
December 2, 1988			
BACILLARIOPHYTA			
Asterionella formosa Hass.	6,019	4,964	2,691
Synedra sp.	35	10	6

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	December 2, 1988--Continued		
CHLOROPHYTA			
Chlamydomonas sp. 1	13,200	11,214	7,511
Chlamydomonas sp. 2	--	68	52
Chlorella vulgaris Beyerinck	40	28	6
Chlorococcales	--	6	--
Coccomyxa dispar Schmidle	11	--	--
Gonium sp.	6	10	--
Scenedesmus sp.	32	67	23
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	--	64	11
Dinobryon sertularia Ehrenb.	69	50	6
Dinobryon sp.	35	65	40
statospores	6	47	--
Mallomonas sp.	--	6	--
indeterminate flagellates	6	27	--
CRYPTOPHYTA			
Cryptomonas sp.	--	6	--
Rhodomonas sp.	--	11	--
indeterminate flagellates	11	22	29
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	162	28	40
Chroococcus sp.	11	--	--
Oscillatoria sp.	162	177	301
indeterminate filaments	--	58	--
PROTOZOA			
indeterminate ciliates	23	17	52
indeterminate flagellate sp. 1	689	91	92
indeterminate flagellate sp. 2	6	--	46
CHYTRID FUNGI	87	51	69
	December 20, 1988		
BACILLARIOPHYTA			
Asterionella formosa Hass.	2,230	1,313	1,551
Synedra sp.	14	6	6
CHLOROPHYTA			
Actinotaenium sp.	3	--	--
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	3	--	--
Chlamydomonas sp. 1	127	79	41
Chlamydomonas sp. 2	45	39	46
Chlorella vulgaris Beyerinck	23	17	6
Coccomyxa dispar Schmidle	25	57	10
Scenedesmus sp.	11	13	--
indeterminate flagellates	--	--	6

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
December 20, 1988--Continued			
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	3	13	--
Dinobryon sertularia Ehrenb.	3	--	6
Dinobryon sp.	3	9	6
Mallomonas sp.	--	8	--
statospores	--	--	6
indeterminate flagellates	3	--	--
CRYPTOPHYTA			
Cryptomonas sp.	8	3	--
indeterminate flagellates	3	4	11
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	28	59	46
Chroococcus minimus (Keissel.) Lemm.	--	8	--
Chroococcus sp.	40	42	29
Phormidium sp. ?	70	69	--
PROTOZOA			
indeterminate ciliates	14	10	46
indeterminate flagellates	14	26	12
CHYTRID FUNGI	2,131	2,069	3,889
January 4, 1989			
BACILLARIOPHYTA			
Asterionella formosa Hass.	411	129	157
Melosira sp.	--	--	4
indeterminate Pennales	--	1	--
Synedra sp.	3	27	7
CHLOROPHYTA			
Actinotaenium sp.	3	1	--
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	6	5	10
Chlamydomonas sp. 1	25	3	7
Chlamydomonas sp. 2	34	159	153
Chlorella vulgaris Beyerinck	844	182	125
Chlorococcum sp.	11	20	9
Coccomyxa dispar Schmidle	23	5	10
Scenedesmus sp.	65	38	30
indeterminate flagellates	--	7	1
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	3	--	3
Dinobryon sertularia Ehrenb.	17	13	3
Dinobryon sp.	5	3	--
indeterminate flagellates	--	--	1

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	January 4,1989--Continued		
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	6	13	3
Rhodomonas sp.	11	4	1
indeterminate flagellates	--	4	--
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	138	232	297
Chroococcus minimus (Keissel.) Lemm.	--	--	3
Chroococcus sp.	48	44	30
Lyngbya limnetica Lemm.	--	24	63
Oscillatoria sp.	--	--	3
PYRROPHYTA			
Peridinium cinctum Ehrenb.	11	3	1
PROTOZOA			
indeterminate ciliates	11	11	7
indeterminate flagellates	62	38	38
CHYTRID FUNGI	217	158	193
	January 20, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	--	372	353
Synedra sp.	8	--	8
CHLOROPHYTA			
Actinotaenium sp.	--	3	--
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	37	17	17
Chlamydomonas sp.	--	45	130
Chlorella vulgaris Beyerinck	1,819	1,416	629
Chlorococcum sp.	20	22	37
Coccomyxa dispar Schmidle	--	28	7
Scenedesmus sp.	64	51	49
indeterminate flagellates	--	3	--
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	3	--	--
Dinobryon sp.	20	22	--
Kephryion sp.	8	3	--
indeterminate flagellates	79	--	6
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	121	73	13
Rhodomonas sp.	11	6	--

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	January 20, 1989--Continued		
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	191	166	7
Chroococcus sp.	--	51	23
Lyngbya sp.	11	--	11
Oscillatoria sp.	8	--	53
Rhabdoderma sp.	--	11	4
indeterminate filament	--	--	6
PYRROPHYTA			
Peridinium cinctum Ehrenb.	3	8	13
PROTOZOA			
indeterminate ciliates	17	14	9
CHYTRID FUNGI	--	--	10
	February 10, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	192	523	561
Synedra sp.	--	--	4
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	39	37	34
Chlamydomonas sp. 1	4	--	--
Chlamydomonas sp. 2	4	19	--
Chlorella vulgaris Beyerinck	977	828	110
Chlorococcales	3	--	--
Chlorococcum sp.	--	--	2
Coccomyxa dispar Schmidle	511	68	31
Scenedesmus sp.	6	40	17
indeterminate flagellates	4	3	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	43	6	50
Kephryion sp.	24	--	--
Mallomonas sp.	4	--	2
indeterminate flagellates	15	--	--
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	35	59	45
indeterminate flagellates	6	5	8
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	103	56	--
Chroococcus turgidus Naeg.	6	--	--
Dactylococcoposis sp.	12	--	6
Phormidium sp. ?	--	--	69
indeterminate filament	--	--	17

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	February 10, 1989--Continued		
PYRROPHYTA			
Peridinium cinctum Ehrenb.	4	6	--
PROTOZOA			
indeterminate ciliates	7	3	--
	February 26, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	1,194	1,286	1,030
CHLOROPHYTA			
Actinotaenium sp.	--	3	--
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	65	62	48
Chlorella vulgaris Beyerinck	1,087	1,449	209
Coccomyxa dispar Schmidle	222	469	17
Scenedesmus sp.	34	28	--
Sphondylosium sp.	6	--	--
indeterminate flagellates	--	3	--
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	11	--	--
Kephryion sp.	14	11	--
Mallomonas sp.	--	--	8
indeterminate flagellates	--	--	3
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	14	17	11
indeterminate flagellates	6	--	--
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	42	--	17
Dactylococcoposis sp.	14	3	--
Phormidium sp. ?	--	--	52
PYRROPHYTA			
Peridinium cinctum Ehrenb.	28	22	--
CHYTRID FUNGI	6	3	--
	March 11, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	1,057	1,326	1,289
indeterminate Pennales	3	--	--
Synedra sp.	--	--	3

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	March 11, 1989--Continued		
CHLOROPHYTA			
Actinotaenium sp.	2	--	--
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	27	59	17
Chlamydomonas sp. 1	131	42	11
Chlamydomonas sp. 2	13	11	8
Chlorella ellipsoidea Gerneck	57	--	--
Chlorella vulgaris Beyerinck	11	152	389
Chlorococcales	19	20	--
Chlorococcum sp.	--	3	--
Coccomyxa dispar Schmidle	287	487	236
Scenedesmus sp.	47	6	23
Selenastrum sp.	--	--	3
Ulothrix sp.	--	3	--
indeterminate flagellates	--	83	--
indeterminate filament	11 µm	--	14 µm
CHRYSOPHYTA			
Dinobryon bavaricum ? Imhof	4	--	--
Dinobryon sertularia Ehrenb.	242	129	3
Kephryion sp.	19	31	--
Mallomonas sp.	--	--	3
indeterminate flagellates	5	17	5
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	74	25	90
indeterminate flagellates	28	8	3
CYANOBACTERIA			
Anacystis sp.	--	14	11
Chroococcus dispersus (Keissel.) Lemm.	299	455	147
Chroococcus minimus (Keissel.) Lemm.	--	14	--
Dactylococcoposis sp.	--	20	3
Gleothece sp.	34	--	--
Lyngbya sp. ?	59	6	11
Synechoccus sp.	--	--	3
PYRROPHYTA			
Peridinium cinctum Ehrenb.	16	12	11
Peridinium sp.	2	--	--
PROTOZOA			
indeterminate ciliates	27	3	3
CHYTRID FUNGI	--	--	5

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
March 27, 1989			
BACILLARIOPHYTA			
Asterionella formosa Hass.	1,317	853	2,216
indeterminate Centrales	3	--	--
Navicula sp.	--	--	3
Synedra sp.	--	--	3
CHLOROPHYTA			
Actinotaenium sp.	--	--	3
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	37	25	56
Chlamydomonas sp. 1	3	3	--
Chlamydomonas sp. 2	3	11	11
Chlorella vulgaris Beyerinck	87	172	188
Chlorococcum sp.	--	--	3
Coccomyxa dispar Schmidle	160	149	251
Pandorina sp.	11	--	--
Scenedesmus sp.	11	28	53
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	749	256	65
Dinobryon sociale Ehrenb.	11	--	--
Dinobryon sertularia Ehrenb.	59	180	7
Dinobryon sp.	31	293	59
statospores	115	--	--
Kephryion sp.	17	3	--
Mallomonas sp.	--	--	14
indeterminate flagellates	--	3	3
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	11	20	101
Cryptomonas sp.	3	--	--
indeterminate flagellates	8	--	--
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	301	315	220
Chroococcus minimus (Keissel.) Lemm.	--	17	--
Chroococcus sp.	23	65	42
Dactylococcoposis sp.	8	11	--
Lyngbya limnetica Lemm.	--	--	124
Oscillatoria sp.	17	6	--
Rhabdoderma sp.	--	--	14
indeterminate filament	--	--	8
PYRROPHYTA			
Peridinium cinctum Ehrenb.	5	--	3
PROTOZOA			
indeterminate ciliates	14	5	5

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	April 8, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass. (empty frustules)	--	~20	25
Asterionella formosa Hass.	749	662	607
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	5	14	25
Chlamydomonas sp. 1	--	--	2
Chlamydomonas sp. 2	20	28	15
Chlorella vulgaris Beyerinck	50	87	118
Chlorococcum sp.	8	20	10
Coccomyxa dispar Schmidle	50	84	78
Scenedesmus sp.	11	23	15
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	169	84	64
Dinobryon sertularia Ehrenb.	53	17	28
Dinobryon sp.	53	31	35
statospores	--	6	--
Kephryion sp.	6	3	--
Mallomonas sp.	3	--	8
indeterminate flagellates	100	--	84
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	79	76	70
indeterminate flagellates	8	8	10
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	79	180	164
Chroococcus sp. 1	39	42	12
Chroococcus sp. 2	59	110	23
Dactylococcoposis sp.	--	6	--
Lyngbya limnetica Lemm.	--	--	61
Lyngbya sp. ?	--	17	--
Oscillatoria sp.	25	6	28
Rhabdoderma sp.	3	--	28
Synechoccus sp.	--	--	6
PROTOZOA			
indeterminate ciliates	14	8	--
CHYTRID FUNGI	--	--	3
	April 26, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	22	8	14
Navicula sp.	3	--	--

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	April 26, 1989--Continued		
CHLOROPHYTA			
Ankistrodesmus falcatus var. *acicularis* (A. Brown) G.S. West	3	3	5
Carteria sp. ?	3	--	--
Chlamydomonas sp. 1	256	248	28
Chlamydomonas sp. 2	14	14	82
Chlamydomonas sp. 3	3	3	73
Chlorella vulgaris Beyerinck	3	--	--
Chlorococcum sp.	143	37	3
Coccomyxa dispar Schmidle	3	3	3
indeterminate filament	--	--	6
CHRYSOPHYTA			
Dinobryon cylindricum Imhof	11	14	--
Dinobryon sertularia Ehrenb.	37	11	6
Dinobryon sp.	19	11	3
Mallomonas sp.	3	3	8
indeterminate flagellates	118	118	214
CRYPTOPHYTA			
Cryptomonas ovata Ehrenb.	--	--	3
indeterminate flagellates	45	71	144
CYANOBACTERIA			
Anacystis sp.	--	3	--
Chroococcus dispersus (Keissel.) Lemm.	90	59	14
Chroococcus varias ? A. Braun	6	--	--
Chroococcus sp.	--	17	--
Dactylococcopsis sp.	--	6	17
Lyngbya sp.	23	8,000 µm	7,500 µm
Oscillatoria sp. 1	175	45	39
Oscillatoria sp. 2	--	--	39
Rhabdoderma sp.	14	--	--
Synechoccus sp.	14	--	6
indeterminate filament	8,000 µm	--	--
PROTOZOA			
indeterminate ciliates	--	--	5
	May 23, 1989		
BACILLARIOPHYTA			
Asterionella formosa Hass.	110	8	42
Navicula sp.	--	8	--
CHLOROPHYTA			
Chlamydomonas sp. 1	2,736	2,078	2,373
Chlamydomonas sp. 2	8	8	8
Chlorococcales	17	25	--
Selenastrum sp.	34	--	17
Ulothrix subtilissima Raben.	34	--	--
indeterminate flagellates	--	16	8

Table 2.--*Species list of planktonic algal taxa, protozoans, and chytrid fungi in The Loch in winter of 1988-89*--Continued

TAXA	S	M	B
	May 23, 1989--Continued		
CHRYSOPHYTA			
Dinobryon sertularia Ehrenb.	8	17	--
indeterminate flagellates	25	24	--
CRYPTOPHYTA			
indeterminate flagellates	34	110	59
CYANOBACTERIA			
Chroococcus dispersus (Keissel.) Lemm.	--	152	84
Oscillatoria sp. 1	76	34	68
Oscillatoria sp. 2	--	68	--
Synechoccus sp.	25	8	34
indeterminate filaments	1,500 µm	--	--
PROTOZOA			
indeterminate ciliates	--	8	--

Table 3.--*Species list of zooplankton taxa in The Loch in 1987-88*

[Each value is the number of organisms per cubic meter determined from the mean of two replicate samples. Position in the water column is indicated as follows: S = 0.5 meter below ice surface, M = 2.0 - - 2.5 meter below ice surface, B = 0.5 meter above lake bottom. Organisms not present in sample are indicated by "--".]

TAXA	S	M	B
December 21, 1987			
COPEPODA			
nauplii	--	--	3,000
ROTIFERA			
Keratella hiemalis	--	--	127,000
Polyarthra sp.	--	--	150,000
January 5, 1988			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	25	25	--
nauplii	2,000	1,500	1,500
ROTIFERA			
Keratella cochlearis	750	--	--
Keratella hiemalis	208,000	259,000	48,000
Notholca squalma	750	1,500	1,500
Polyarthra sp.	24,000	27,000	34,000
January 24, 1988			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	670	75	100
nauplii	750	2,250	2,250
ROTIFERA			
Keratella hiemalis	563,000	194,000	32,000
Notholca squalma	1,500	750	--
Polyarthra sp.	63,000	91,000	39,000
February 9, 1988			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	530	925	550
nauplii	1,500	1,500	2,250
ROTIFERA			
indeterminate Bdelloida	2,250	--	--
Brachionus sp.	--	--	1,500
Keratella hiemalis	442,000	66,000	10,000
Notholca squalma	750	--	--
Polyarthra sp.	30,000	38,000	52,000

Table 3.--*Species list of zooplankton taxa in The Loch in 1987-88*--Continued

TAXA	S	M	B
	February 21, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	550	880	700
nauplii	1,500	1,500	750
ROTIFERA			
indeterminate Bdelloida	750	750	--
Brachionus sp.	750	--	--
Keratella hiemalis	104,000	15,000	20,000
Notholca squalma	750	--	--
Polyarthra sp.	493,000	391,000	210,000
	March 6, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	730	1,060	300
nauplii	75	5,250	750
ROTIFERA			
Keratella hiemalis	72,000	36,000	26,000
Notholca squalma	--	29,000	7,500
Polyarthra sp.	128,000	246,000	243,000
	March 20, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	750	300	280
nauplii	--	1,500	750
OSTRACODA	--	--	50
ROTIFERA			
indeterminate Bdelloida	--	8,500	--
Brachionus sp.	--	--	1,500
Keratella hiemalis	39,000	12,000	14,000
Notholca squalma	1,500	1,500	1,500
Polyarthra sp.	42,000	81,000	87,000
	April 4, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	400	140	80
nauplii	--	750	3,000
ROTIFERA			
indeterminate Bdelloida	--	750	--
Brachionus sp.	750	--	2,250
Keratella hiemalis	27,000	30,000	44,000
Notholca squalma	6,000	5,000	5,000
Polyarthra sp.	99,000	122,000	120,000

Table 3.--*Species list of zooplankton taxa in The Loch in 1987-88*--Continued

TAXA	S	M	B
	April 19, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	750	125	150
nauplii	1,500	750	750
ROTIFERA			
indeterminate Bdelloida	--	--	750
Brachionus sp.	750	--	--
Keratella hiemalis	750	3,000	2,250
Notholca squalma	2,250	4,500	3,750
Polyarthra sp.	--	7,500	7,500
	May 4, 1988		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	175	275	125
nauplii	750	--	1,500
ROTIFERA			
indeterminate Bdelloida	--	--	750
Keratella hiemalis	750	--	3,750
Notholca squalma	750	750	750
Polyarthra sp.	750	--	--
	May 30, 1988		
CLADOCERA			
Bosmina sp.	50	--	--
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	--	--	50
nauplii	--	750	--
ROTIFERA			
Polyarthra sp.	7,500	1,500	1,500

Table 4.--*Species list of zooplankton taxa in The Loch in 1988-89*

[Each value is the number of organisms per cubic meter determined from the mean of two replicate samples. Position in the water column is indicated as follows: S = 0.5 meter below ice surface, M = 2.0 - 2.5 meter below ice surface, B = 0.5 meter above lake bottom. Organisms not present in sample are indicated by "--".]

TAXA	S	M	B
November 13, 1988			
CLADOCERA			
Bosmina sp.	--	--	50
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	25	75	125
nauplii	75	9,000	19,000
ROTIFERA			
Keratella hiemalis	750	--	750
Notholca squalma	--	2,250	1,500
Polyarthra sp.	3,750	44,000	51,000
December 2, 1988			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	600	280	850
nauplii	750	3,000	5,000
ROTIFERA			
Keratella hiemalis	2,250	750	3,000
Notholca squalma	750	750	6,800
Polyarthra sp.	35,000	34,000	246,000
December 20, 1988			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	125	50	2,300
nauplii	750	750	1,500
ROTIFERA			
Brachionus sp.	--	750	--
Keratella hiemalis	1,500	8,000	15,000
Notholca squalma	8,000	8,000	7,000
Polyarthra sp.	453,000	496,000	524,000
January 4, 1989			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	400	125	200
nauplii	1,500	2,250	750
ROTIFERA			
indeterminate Bdelloida	--	--	750
Keratella hiemalis	34,000	31,000	11,000
Notholca squalma	3,000	3,800	750
Polyarthra sp.	708,000	627,000	484,000

Table 4.--*Species list of zooplankton taxa in The Loch in 1988-89*--Continued

TAXA	S	M	B
	January 20, 1989		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	400	5,800	175
nauplii	3,800	1,500	4,500
ROTIFERA			
indeterminate Bdelloida	--	9,000	--
Brachionus sp.	1,500	750	--
Keratella hiemalis	48,000	170,000	66,000
Notholca squalma	--	--	750
Polyarthra sp.	514,000	335,000	187,000
	February 10, 1989		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	4,000	1,580	1,100
nauplii	3,000	750	3,800
ROTIFERA			
indeterminate Bdelloida	--	1,500	750
Brachionus sp.	3,800	1,500	--
Keratella cochlearis	3,000	--	--
Keratella hiemalis	27,000	73,000	10,000
Notholca squalma	750	750	--
Polyarthra sp.	307,000	129,000	134,000
	February 26, 1989		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	1,100	650	380
nauplii	2,250	--	--
ROTIFERA			
indeterminate Bdelloida	2,250	--	750
Keratella hiemalis	30,000	62,000	32,000
Polyarthra sp.	57,000	38,000	99,000
	March 11, 1989		
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	1,500	630	450
ROTIFERA			
indeterminate Bdelloida	2,250	--	--
Brachionus sp.	--	--	750
Keratella hiemalis	2,250	7,000	5,000
Polyarthra sp.	32,000	34,000	32,000

Table 4.--*Species list of zooplankton taxa in The Loch in 1988-89*--Continued

TAXA	S	M	B
April 26, 1989			
ROTIFERA			
indeterminate Bdelloida	--	1,500	--
Brachionus sp.	--	--	50
Notholca squalma	1,500	1,500	--
May 8, 1989			
COPEPODA			
Eucyclops agilis and *Acanthocyclops* sp.	1,000	400	550
ROTIFERA			
Brachionus sp.	750	750	--
Keratella hiemalis	8,000	5,000	11,000
Polyarthra sp.	6,000	8,000	11,000

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