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

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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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**U.S. DEPARTMENT OF THE INTERIOR**

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## CONVERSION FACTORS AND VERTICAL DATUM

<i>Multiply</i>	<i>By</i>	<i>To obtain</i>
hectare (ha)	2.471	acre
liter (L)	.3531	cubic foot
meter (m)	3.281	foot
micrometer ( $\mu\text{m}$ )	$3.937 \times 10^5$	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.

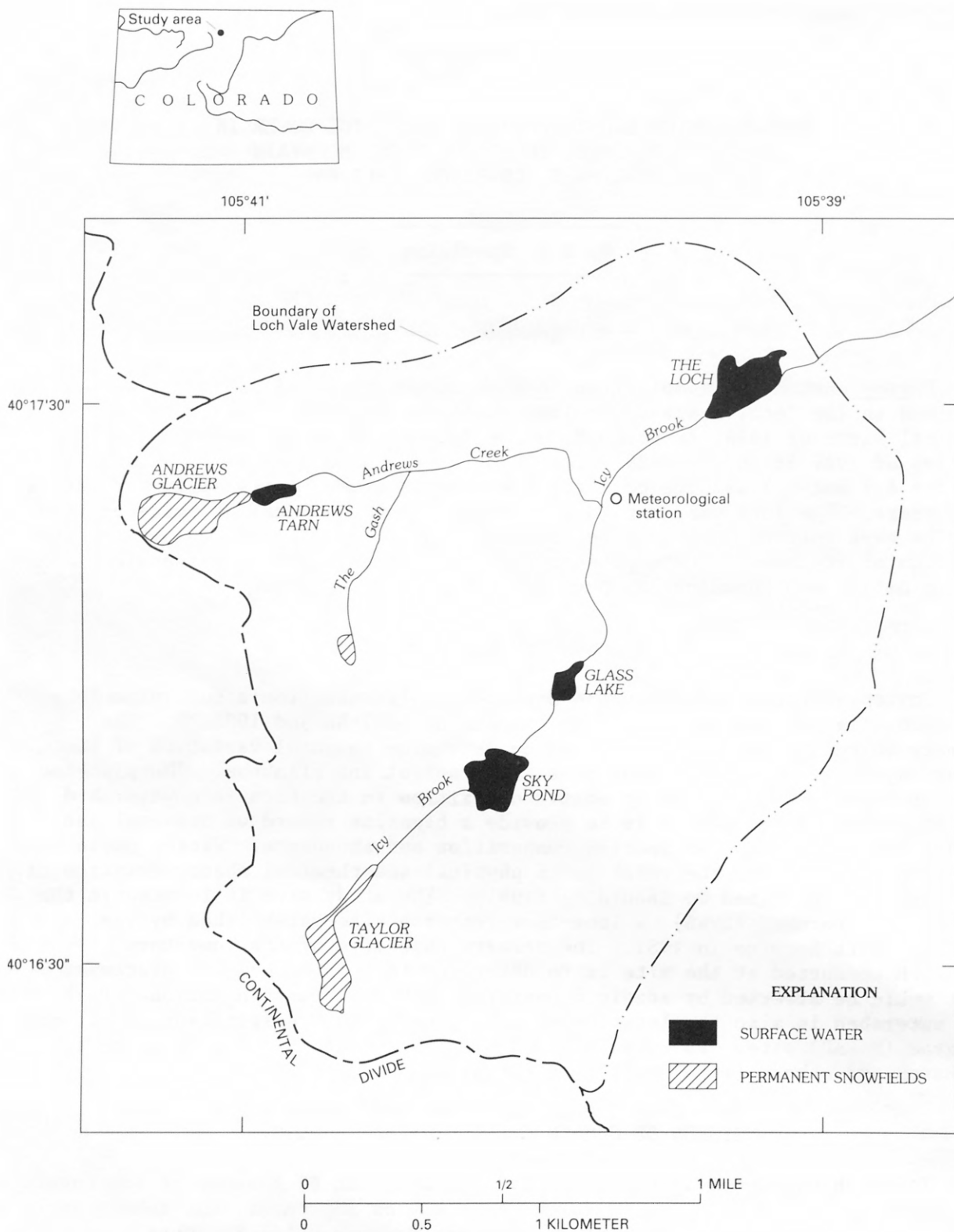


Figure 1. Location of study area and The Loch, the lake in which plankton were collected.



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; Untermöhl, 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- $\mu$ m 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<sup>1</sup> 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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<sup>1</sup>Use of trade names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

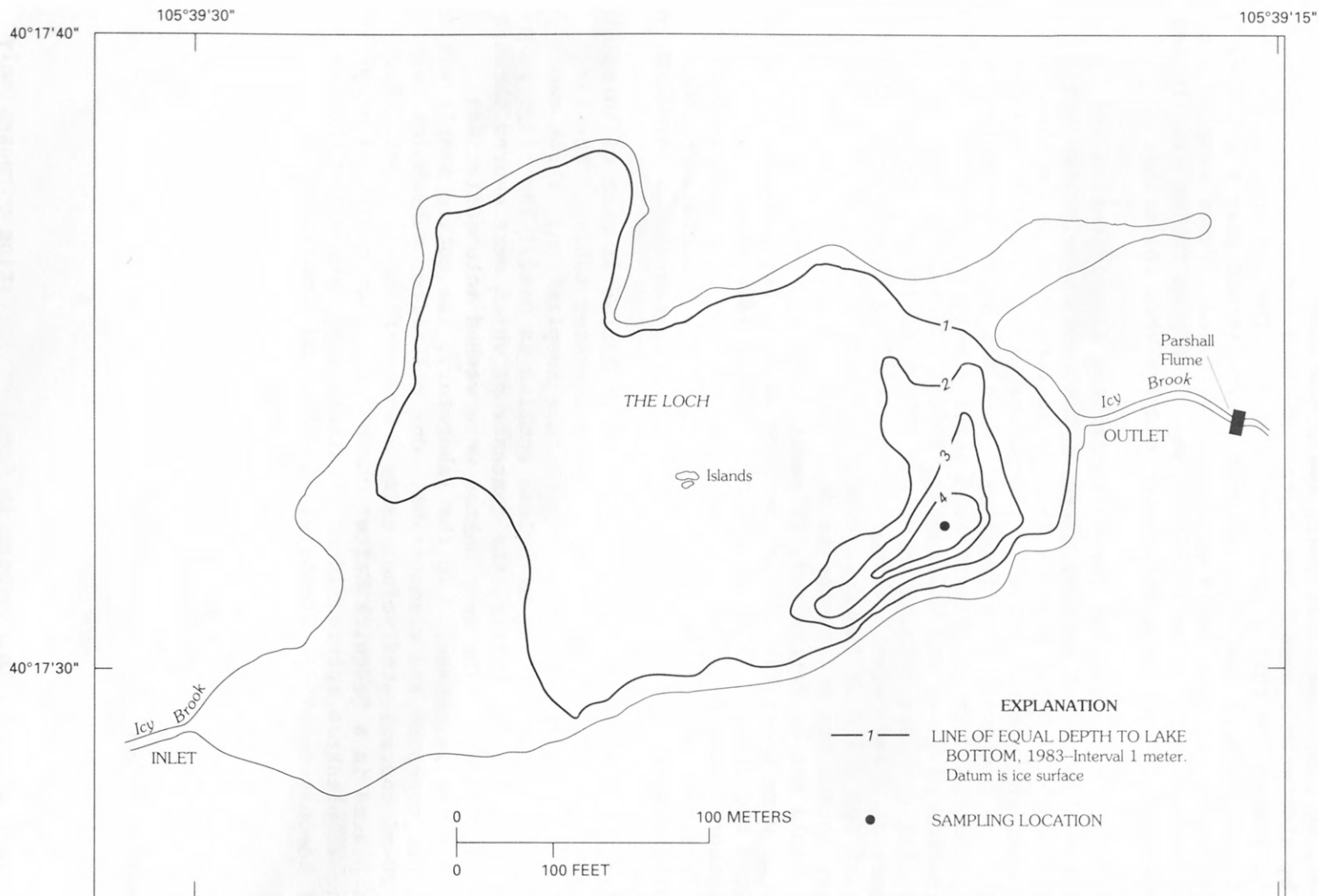


Figure 2. Depth to lake bottom and sampling location in The Loch, 1983.



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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			
<i>Asterionella formosa</i> Hass. (empty frustules)	201	193	221
<i>Asterionella formosa</i> Hass.	1,051	873	662
indeterminate Pennales	--	--	2
<i>Synedra</i> sp.	10	10	4
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	6	8	6
<i>Chlamydomonas</i> sp.	3	2	4
<i>Chlorella ellipsoidea</i> Gerneck	51	23	--
<i>Chlorella vulgaris</i> Beyerinck	--	33	--
<i>Chlorella</i> sp.	--	--	13
<i>Chlorococcum</i> sp.	108	79	94
<i>Coccomyxa dispar</i> Schmidle	1	15	4
<i>Scenedesmus</i> sp.	34	16	14
indeterminate flagellates	--	3	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	3	2	1
<i>Kephyrion</i> sp.	--	1	--
<i>Mallomonas</i> sp.	--	1	--
indeterminate flagellates	5	10	4
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	9	8	14
<i>Rhodomonas</i> sp. 1	58	33	21
<i>Rhodomonas</i> sp. 2	16	26	26
<i>Rhodomonas</i> sp. 3	4	3	--
indeterminate flagellates	139	89	55
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	260	138	125
<i>Chroococcus minimus</i> (Keissel.) Lemm.	31	26	7
<i>Chroococcus</i> sp.	55	20	11
<i>Merismopedia</i> sp.	3	--	5
<i>Oscillatoria</i> sp.	1,119	2,355	634
<i>Phormidium</i> sp.	--	49	72
<i>Rhabdoderma</i> sp.	--	3	--
<i>Synechococcus</i> 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
<u>December 6, 1987--Continued</u>			
PYRROPHYTA			
cyst	3	--	--
PROTOZOA			
indeterminate ciliates	3	9	6
CHYTRID FUNGI	570	449	312
<u>December 22, 1987</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	36	275	256
<i>Asterionella formosa</i> Hass.	22	53	19
<i>Navicula</i> sp.	--	--	1
<i>Synedra</i> sp.	8	15	2
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	8	15	5
<i>Chlamydomonas</i> sp.	4	--	--
<i>Chlorella ellipsoidea</i> Gerneck	--	9	2
<i>Chlorella vulgaris</i> Beyerinck	--	228	30
<i>Chlorella</i> sp.	180	--	--
<i>Chlorococcum</i> sp.	13	6	5
<i>Coccomyxa dispar</i> Schmidle	23	201	25
<i>Scenedesmus</i> sp.	12	18	20
<i>Selenastrum</i> sp.	--	3	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	291	62	6
<i>Kephyrion</i> sp.	2	--	--
<i>Mallomonas</i> sp.	1	--	--
indeterminate flagellates	43	9	--
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	2	12	39
<i>Rhodomonas</i> sp. 1	51	--	--
<i>Rhodomonas</i> sp. 2	1	3	--
<i>Rhodomonas</i> sp. 3	1	--	--
indeterminate flagellates	36	299	227
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	184	--	--
<i>Chroococcus minimus</i> (Keissel.) Lemm.	7	--	8
<i>Chroococcus</i> sp.	84	461	187
<i>Dactylococcopsis</i> sp.	2	12	1
<i>Oscillatoria</i> sp.	54	--	--
<i>Rhabdoderma</i> sp.	--	21	--
PYRROPHYTA			
<i>Peridinium cinctum</i> 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
<u>December 22, 1987--Continued</u>			
PROTOZOA			
indeterminate ciliates	2	--	--
CHYTRID FUNGI	9	35	25
<u>January 5, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	--	35	25
<i>Asterionella formosa</i> Hass.	14	17	18
<i>Navicula</i> sp.	--	--	1
<i>Synedra</i> sp.	1	6	--
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	6	7	10
<i>Chlamydomonas</i> sp.	--	1	--
<i>Chlorella</i> sp.	6	33	20
<i>Chlorococcum</i> sp.	6	5	7
<i>Coccomyxa dispar</i> Schmidle	15	67	28
<i>Scenedesmus</i> sp.	16	23	11
<i>Selenastrum</i> sp.	--	1	1
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	49	13	3
indeterminate flagellates	--	--	3
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	50	19	13
<i>Rhodomonas</i> sp.	24	7	6
indeterminate flagellates	15	156	261
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	228	152	217
<i>Dactylococcopsis</i> sp.	--	27	1
<i>Phormidium</i> sp. ?	7	2	8
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	5	--	--
CHYTRID FUNGI	3	2	--
<u>January 24, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	1	11	6
<i>Asterionella formosa</i> Hass.	1	34	29
<i>Melosira</i> sp.	--	--	5
<i>Synedra</i> 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
<u>January 24, 1988</u>			
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i>			
(A. Brown) G.S. West	4	6	3
<i>Chlorella ellipsoidea</i> Gerneck	--	1	1
<i>Chlorella vulgaris</i> Beyerinck	17	71	--
<i>Chlorococcum</i> sp.	1	3	18
<i>Coccomyxa dispar</i> Schmidle	20	10	11
<i>Scenedesmus</i> sp. 1	2	19	10
<i>Scenedesmus</i> sp. 2	--	--	2
<i>Selenastrum</i> sp.	--	2	1
CHRYSOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	26	5	--
indeterminate flagellates	212	18	16
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	18	3	9
<i>Rhodomonas</i> sp.	9	--	4
indeterminate flagellates	2	122	59
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	79	107	114
<i>Chroococcus minimus</i> (Keissel.) Lemm.	24	27	59
<i>Chroococcus</i> sp.	4	--	1
<i>Phormidium</i> sp.	--	23	24
<i>Rhabdoderma</i> sp.	12	--	--
<i>Synechococcus</i> sp.	--	--	4
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	1	--	--
<u>February 2, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	3	23	32
<i>Asterionella formosa</i> Hass.	16	144	68
<i>Melosira</i> sp.	8	--	4
<i>Navicula</i> sp.	2	5	4
<i>Synedra</i> sp.	--	4	1
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i>			
(A. Brown) G.S. West	59	90	23
<i>Chlorella vulgaris</i> Beyerinck	--	698	297
<i>Chlorococcum</i> sp.	1	--	1
<i>Coccomyxa dispar</i> Schmidle	71	42	37
<i>Scenedesmus</i> sp.	6	23	30
<i>Selenastrum</i> 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
<u>February 2, 1988--Continued</u>			
CHRYSOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	1,078	70	3
<i>Mallomonas</i> sp.	1	--	--
indeterminate flagellates	8	1	2
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	4	5	1
<i>Rhodomonas</i> sp.	4	1	1
indeterminate flagellates	5	7	16
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	116	56	68
<i>Chroococcus minimus</i> (Keissel.) Lemm.	4	--	--
<i>Lyngbya</i> sp. ?	--	31	40
<i>Phormidium</i> sp.	4	--	--
<i>Synechococcus</i> sp.	2	--	1
PROTOZOA			
indeterminate ciliates	--	6	4
CHYTRID FUNGI	--	3	--
<u>February 21, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	--	17	4
<i>Asterionella formosa</i> Hass.	35	437	264
indeterminate Pennales	--	18	--
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	183	343	61
<i>Chlamydomonas</i> sp. 1	7	25	6
<i>Chlamydomonas</i> sp. 2	--	25	--
<i>Chlorella</i> sp.	6,497	3,131	649
<i>Chlorococcum</i> sp.	40	68	51
<i>Coccomyxa dispar</i> Schmidle	1,538	3,538	648
<i>Crucigenia quadrata</i> Morren	--	--	2
<i>Scenedesmus</i> sp.	36	67	89
<i>Staurastrum</i> sp.	--	--	2
<i>Ulothrix</i> sp.	--	42	--
CHRYSOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	6,007	231	34
indeterminate flagellates	62	237	47
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	4	9	34
<i>Rhodomonas</i> 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
<u>February 21, 1988--Continued</u>			
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	5,083	1,732	143
<i>Chroococcus minimus</i> (Keissel.) Lemm.	44	237	247
<i>Chroococcus</i> sp.	86	76	8
<i>Gloeotheca</i> sp.	7	--	--
<i>Synechococcus</i> sp.	--	68	2
indeterminate	4	34	--
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	169	8	4
CHYTRID FUNGI			
	26	85	10
<u>March 6, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	29	19	110
<i>Asterionella formosa</i> Hass.	472	624	984
<i>Navicula</i> sp.	--	--	5
<i>Synedra</i> sp.	5	--	5
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	231	224	221
<i>Chlamydomonas</i> sp.	1,079	775	339
<i>Chlorella ellipsoidea</i> Gerneck	5	--	15
<i>Chlorella</i> sp.	397	297	622
<i>Chlorococcum</i> sp.	93	63	27
<i>Coccomyxa dispar</i> Schmidle	4,622	4,025	4,473
<i>Scenedesmus</i> sp.	144	63	191
<i>Selenastrum</i> sp.	105	54	5
<i>Ulothrix</i> sp.	--	11	278
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	1,813	1,350	957
indeterminate flagellates	61	33	49
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	--	5	10
indeterminate flagellates	--	9	10
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	1,526	989	973
<i>Chroococcus limneticus</i> Lemm.	--	--	9
<i>Chroococcus minimus</i> (Keissel.) Lemm.	176	29	108
<i>Chroococcus</i> sp.	47	5	44
<i>Oscillatoria</i> sp.	--	50µm	161µm
<i>Synechococcus</i> sp.	134	44	124
PYRROPHYTA			
<i>Peridinium cinctum</i> 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
<u>March 6, 1988--Continued</u>			
PROTOZOA			
indeterminate ciliates	43	19	15
CHYTRID FUNGI	66	107	262
<u>March 20, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	97	83	185
<i>Asterionella formosa</i> Hass.	375	419	434
<i>Synedra</i> sp.	--	--	5
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	336	546	405
<i>Chlamydomonas</i> sp. 1	599	395	195
<i>Chlamydomonas</i> sp. 2	68	--	--
<i>Chlorogonium</i> sp.	--	5	--
<i>Chlorella ellipsoidea</i> Gerneck	10	--	--
<i>Chlorella</i> sp.	375	975	634
<i>Chlorococcum</i> sp.	83	73	49
<i>Coccomyxa dispar</i> Schmidle	4,294	4,620	4,645
<i>Scenedesmus</i> sp.	98	78	127
<i>Selenastrum</i> sp.	24	20	49
<i>Ulothrix</i> sp.	--	10	--
indeterminate flagellates	--	--	59
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	98	706	541
indeterminate flagellates	102	40	35
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	10	49	10
<i>Rhodomonas</i> sp.	5	--	5
indeterminate flagellates	15	--	--
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	1,866	1,613	1,745
<i>Chroococcus minimus</i> (Keissel.) Lemm.	180	170	68
<i>Lyngbya</i> sp. ?	--	5	--
<i>Synechoccus</i> sp.	49	93	25
PYRROPHYTA			
<i>Peridinium cinctum</i> 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			
<i>Asterionella formosa</i> Hass. (empty frustules)	19	25	15
<i>Asterionella formosa</i> Hass.	146	571	580
<i>Synedra</i> sp.	--	2	2
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	331	542	565
<i>Chlamydomonas</i> sp. 1	180	38	16
<i>Chlamydomonas</i> sp. 2	--	2	81
<i>Chlorella vulgaris</i> Beyerinck	--	--	272
<i>Chlorella</i> sp.	268	148	--
<i>Chlorococcum</i> sp.	39	56	40
<i>Coccomyxa dispar</i> Schmidle	609	252	238
<i>Scenedesmus</i> sp.	24	117	56
<i>Selenastrum</i> sp.	19	29	9
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	297	101	--
indeterminate flagellates	15	6	2
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	107	56	36
<i>Rhodomonas</i> sp. 1	53	20	11
<i>Rhodomonas</i> sp. 2	5	--	2
<i>Rhodomonas</i> sp. 3	10	--	--
indeterminate flagellates	10	7	--
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	522	427	810
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	36	99
<i>Chroococcus</i> sp.	153	47	11
<i>Merismopedia</i> sp.	88	--	67
<i>Oscillatoria</i> sp.	112	--	--
<i>Phormidium</i> sp.	34	--	--
<i>Rhabdoderma</i> sp.	5	5	--
<i>Synechoccus</i> sp.	29	7	5
PYRROPHYTA			
<i>Peridinium cinctum</i> 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
<u>April 19, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	1	13	20
<i>Asterionella formosa</i> Hass.	38	1,466	650
<i>Navicula</i> sp.	1	--	--
<i>Synedra</i> sp.	--	--	2
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	6	556	321
<i>Chlamydomonas</i> spp.	31	90	5
<i>Chlorella</i> sp.	16	238	108
<i>Chlorococcum</i> sp.	4	27	2
<i>Coccomyxa dispar</i> Schmidle	4	40	45
<i>Scenedesmus</i> sp.	3	54	63
<i>Selenastrum</i> sp.	2	7	2
<i>Stichococcus</i> sp.	4	9	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	12	40	29
indeterminate flagellates	11	15	42
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	1	33	243
<i>Rhodomonas</i> sp. 1	10	61	227
indeterminate flagellates	30	70	125
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	240	774	1,002
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	58	144
<i>Merismopedia</i> sp.	3	9	13
<i>Oscillatoria</i> sp.	4	--	52
<i>Phormidium</i> sp.	7	67	12
<i>Rhabdoderma</i> sp.	77	--	--
<i>Synechococcus</i> sp.	17	--	15
indeterminate filaments	13	--	--
indeterminate coccoid cells	--	2	--
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	3	27	--
PROTOZOA			
indeterminate ciliates	46	259	479
indeterminate flagellates	--	49	27
CHYTRID FUNGI	--	17	7
<u>May 4, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	8	1	1
<i>Asterionella formosa</i> 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
<u>May 4, 1988--Continued</u>			
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i>			
(A. Brown) G.S. West	--	25	6
<i>Chlamydomonas</i> sp. 1	8	3	1
<i>Chlamydomonas</i> sp. 2	--	20	--
<i>Chlorella</i> sp.	1	3	4
<i>Chlorococcum</i> sp.	1	--	1
<i>Chlorogonium</i> sp.	--	1	--
<i>Coccomyxa dispar</i> Schmidle	--	1	2
<i>Scenedesmus</i> sp.	9	11	3
<i>Selenastrum</i> sp.	4	1	--
<i>Stichococcus</i> sp.	4	3	--
<i>Ulothrix</i> sp.	--	46	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	1	7	3
<i>Mallomonas</i> sp.	4	12	4
indeterminate flagellates	15	19	26
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	5	--	1
<i>Rhodomonas</i> sp. 1	107	165	72
<i>Rhodomonas</i> sp. 2	4	1	4
indeterminate flagellates	86	41	36
CYANOBACTERIA			
<i>Anabaena</i> sp.	2	--	--
<i>Arthrospira gomontiana</i> Setchell	--	1	--
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	289	349	295
<i>Chroococcus minimus</i> (Keissel.) Lemm.	5	1	--
<i>Dactylococcopsis</i> sp.	2	1	--
<i>Merismopedia</i> sp.	4	--	--
<i>Oscillatoria</i> sp.	132	124	45
<i>Phormidium</i> sp.	--	84	48
<i>Rhabdoderma</i> sp.	101	58	18
<i>Synechococcus</i> sp.	25	9	6
indeterminate coccoid cells	1	--	--
PROTOZOA			
indeterminate ciliates	74	130	42
<u>May 30, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	--	13	13
<i>Asterionella formosa</i> Hass.	208	243	205
<i>Cocconeis</i> sp.	2	--	--
<i>Eunotia</i> sp.	--	--	1
<i>Fragilaria</i> sp.	--	4	--
<i>Meridion</i> sp.	2	1	5
indeterminate Pennales	2	1	4
<i>Synedra</i> 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
<u>May 30, 1988--Continued</u>			
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i>			
(A. Brown) G.S. West	5	7	6
<i>Chlamydomonas</i> sp.	527	319	275
<i>Chlamydomonas nivalis</i> Wille	4	--	--
<i>Chlorella</i> sp.	21	10	12
<i>Chlorococcum</i> sp.	17	3	14
<i>Chlorogonium</i> sp.	55	70	116
<i>Netrium</i> sp.	11	5	1
<i>Scenedesmus</i> sp.	27	36	18
<i>Selenastrum</i> sp.	199	215	122
<i>Stichococcus</i> sp.	27	30	26
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	19	13	18
<i>Mallomonas</i> sp. 1	3	--	--
<i>Mallomonas</i> sp. 2	--	1	--
indeterminate flagellates	25	21	20
CRYPTOPHYTA			
<i>Rhodomonas</i> sp. 1	108	89	62
<i>Rhodomonas</i> sp. 2	23	34	51
<i>Rhodomonas</i> sp. 3	60	57	29
indeterminate flagellates	236	386	208
CYANOBACTERIA			
<i>Arthrospira gomontiana</i> Setchell	21	4	--
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	114	96	75
<i>Merismopedia</i> sp.	1	--	--
<i>Oscillatoria</i> sp.	21	--	22
<i>Phormidium</i> sp.	1	7	--
<i>Rhabdoderma</i> sp.	31	46	--
<i>Synechoccus</i> 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
<u>November 13, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	774	922	938
<i>Synedra</i> sp.	--	6	12
CHLOROPHYTA			
<i>Chlamydomonas</i> sp. 1	8,310	76,100	15,104
<i>Chlamydomonas</i> sp. 2	--	98	--
<i>Chlamydomonas</i> sp. 3	--	6	--
<i>Chlorella vulgaris</i> Beyerinck	24	16	24
<i>Gonium</i> sp.	92	46	--
<i>Scenedesmus</i> sp.	46	22	24
indeterminate flagellates	--	--	34
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	--	108	34
<i>Dinobryon</i> sp.	--	--	12
<i>Kephyrion</i> sp.	--	--	92
indeterminate flagellates	266	334	174
CRYPTOPHYTA			
<i>Rhodomonas</i> sp. 1	--	6	12
<i>Rhodomonas</i> sp. 2	--	12	--
indeterminate flagellates	128	132	46
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	24	70	92
<i>Chroococcus</i> sp.	58	--	--
<i>Oscillatoria limnetica</i> Lemm.	--	--	590
indeterminate filament	116	--	--
PROTOZOA			
indeterminate ciliates	--	--	70
<u>December 2, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	6,019	4,964	2,691
<i>Synedra</i> 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
<u>December 2, 1988--Continued</u>			
CHLOROPHYTA			
<i>Chlamydomonas</i> sp. 1	13,200	11,214	7,511
<i>Chlamydomonas</i> sp. 2	--	68	52
<i>Chlorella vulgaris</i> Beyerinck	40	28	6
Chlorococcales	--	6	--
<i>Coccomyxa dispar</i> Schmidle	11	--	--
<i>Gonium</i> sp.	6	10	--
<i>Scenedesmus</i> sp.	32	67	23
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	--	64	11
<i>Dinobryon sertularia</i> Ehrenb.	69	50	6
<i>Dinobryon</i> sp.	35	65	40
statospores	6	47	--
<i>Mallomonas</i> sp.	--	6	--
indeterminate flagellates	6	27	--
CRYPTOPHYTA			
<i>Cryptomonas</i> sp.	--	6	--
<i>Rhodomonas</i> sp.	--	11	--
indeterminate flagellates	11	22	29
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	162	28	40
<i>Chroococcus</i> sp.	11	--	--
<i>Oscillatoria</i> 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
<u>December 20, 1988</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	2,230	1,313	1,551
<i>Synedra</i> sp.	14	6	6
CHLOROPHYTA			
<i>Actinotaenium</i> sp.	3	--	--
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	3	--	--
<i>Chlamydomonas</i> sp. 1	127	79	41
<i>Chlamydomonas</i> sp. 2	45	39	46
<i>Chlorella vulgaris</i> Beyerinck	23	17	6
<i>Coccomyxa dispar</i> Schmidle	25	57	10
<i>Scenedesmus</i> 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
<u>December 20, 1988--Continued</u>			
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	3	13	--
<i>Dinobryon sertularia</i> Ehrenb.	3	--	6
<i>Dinobryon</i> sp.	3	9	6
<i>Mallomonas</i> sp.	--	8	--
statospores	--	--	6
indeterminate flagellates	3	--	--
CRYPTOPHYTA			
<i>Cryptomonas</i> sp.	8	3	--
indeterminate flagellates	3	4	11
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	28	59	46
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	8	--
<i>Chroococcus</i> sp.	40	42	29
<i>Phormidium</i> sp. ?	70	69	--
PROTOZOA			
indeterminate ciliates	14	10	46
indeterminate flagellates	14	26	12
CHYTRID FUNGI	2,131	2,069	3,889
<u>January 4, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	411	129	157
<i>Melosira</i> sp.	--	--	4
indeterminate Pennales	--	1	--
<i>Synedra</i> sp.	3	27	7
CHLOROPHYTA			
<i>Actinotaenium</i> sp.	3	1	--
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	6	5	10
<i>Chlamydomonas</i> sp. 1	25	3	7
<i>Chlamydomonas</i> sp. 2	34	159	153
<i>Chlorella vulgaris</i> Beyerinck	844	182	125
<i>Chlorococcum</i> sp.	11	20	9
<i>Coccomyxa dispar</i> Schmidle	23	5	10
<i>Scenedesmus</i> sp.	65	38	30
indeterminate flagellates	--	7	1
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	3	--	3
<i>Dinobryon sertularia</i> Ehrenb.	17	13	3
<i>Dinobryon</i> 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
<u>January 4, 1989--Continued</u>			
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	6	13	3
<i>Rhodomonas</i> sp.	11	4	1
indeterminate flagellates	--	4	--
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	138	232	297
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	--	3
<i>Chroococcus</i> sp.	48	44	30
<i>Lyngbya limnetica</i> Lemm.	--	24	63
<i>Oscillatoria</i> sp.	--	--	3
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	11	3	1
PROTOZOA			
indeterminate ciliates	11	11	7
indeterminate flagellates	62	38	38
CHYTRID FUNGI	217	158	193
<u>January 20, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	--	372	353
<i>Synedra</i> sp.	8	--	8
CHLOROPHYTA			
<i>Actinotaenium</i> sp.	--	3	--
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	37	17	17
<i>Chlamydomonas</i> sp.	--	45	130
<i>Chlorella vulgaris</i> Beyerinck	1,819	1,416	629
<i>Chlorococcum</i> sp.	20	22	37
<i>Coccomyxa dispar</i> Schmidle	--	28	7
<i>Scenedesmus</i> sp.	64	51	49
indeterminate flagellates	--	3	--
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	3	--	--
<i>Dinobryon</i> sp.	20	22	--
<i>Kephyrion</i> sp.	8	3	--
indeterminate flagellates	79	--	6
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	121	73	13
<i>Rhodomonas</i> 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
<u>January 20, 1989--Continued</u>			
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	191	166	7
<i>Chroococcus</i> sp.	--	51	23
<i>Lyngbya</i> sp.	11	--	11
<i>Oscillatoria</i> sp.	8	--	53
<i>Rhabdoderma</i> sp.	--	11	4
indeterminate filament	--	--	6
PYRRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	3	8	13
PROTOZOA			
indeterminate ciliates	17	14	9
CHYTRID FUNGI	--	--	10
<u>February 10, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	192	523	561
<i>Synedra</i> sp.	--	--	4
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	39	37	34
<i>Chlamydomonas</i> sp. 1	4	--	--
<i>Chlamydomonas</i> sp. 2	4	19	--
<i>Chlorella vulgaris</i> Beyerinck	977	828	110
Chlorococcales	3	--	--
<i>Chlorococcum</i> sp.	--	--	2
<i>Coccomyxa dispar</i> Schmidle	511	68	31
<i>Scenedesmus</i> sp.	6	40	17
indeterminate flagellates	4	3	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	43	6	50
<i>Kephyrion</i> sp.	24	--	--
<i>Mallomonas</i> sp.	4	--	2
indeterminate flagellates	15	--	--
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	35	59	45
indeterminate flagellates	6	5	8
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	103	56	--
<i>Chroococcus turgidus</i> Naeg.	6	--	--
<i>Dactylococcoposis</i> sp.	12	--	6
<i>Phormidium</i> 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
<u>February 10, 1989--Continued</u>			
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	4	6	--
PROTOZOA			
indeterminate ciliates	7	3	--
<u>February 26, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	1,194	1,286	1,030
CHLOROPHYTA			
<i>Actinotaenium</i> sp.	--	3	--
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	65	62	48
<i>Chlorella vulgaris</i> Beyerinck	1,087	1,449	209
<i>Coccomyxa dispar</i> Schmidle	222	469	17
<i>Scenedesmus</i> sp.	34	28	--
<i>Sphondylosium</i> sp.	6	--	--
indeterminate flagellates	--	3	--
CHRYSTOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	11	--	--
<i>Kephyrion</i> sp.	14	11	--
<i>Mallomonas</i> sp.	--	--	8
indeterminate flagellates	--	--	3
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	14	17	11
indeterminate flagellates	6	--	--
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	42	--	17
<i>Dactylococcopsis</i> sp.	14	3	--
<i>Phormidium</i> sp. ?	--	--	52
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	28	22	--
CHYTRID FUNGI	6	3	--
<u>March 11, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	1,057	1,326	1,289
indeterminate Pennales	3	--	--
<i>Synedra</i> 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			
<i>Actinotaenium</i> sp.	2	--	--
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	27	59	17
<i>Chlamydomonas</i> sp. 1	131	42	11
<i>Chlamydomonas</i> sp. 2	13	11	8
<i>Chlorella ellipsoidea</i> Gerneck	57	--	--
<i>Chlorella vulgaris</i> Beyerinck	11	152	389
Chlorococcales	19	20	--
<i>Chlorococcum</i> sp.	--	3	--
<i>Coccomyxa dispar</i> Schmidle	287	487	236
<i>Scenedesmus</i> sp.	47	6	23
<i>Selenastrum</i> sp.	--	--	3
<i>Ulothrix</i> sp.	--	3	--
indeterminate flagellates	--	83	--
indeterminate filament	11 $\mu$ m	--	14 $\mu$ m
CHRYSTOPHYTA			
<i>Dinobryon bavaricum</i> ? Imhof	4	--	--
<i>Dinobryon sertularia</i> Ehrenb.	242	129	3
<i>Kephyrion</i> sp.	19	31	--
<i>Mallomonas</i> sp.	--	--	3
indeterminate flagellates	5	17	5
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	74	25	90
indeterminate flagellates	28	8	3
CYANOBACTERIA			
<i>Anacystis</i> sp.	--	14	11
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	299	455	147
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	14	--
<i>Dactylococcopsis</i> sp.	--	20	3
<i>Gleotheca</i> sp.	34	--	--
<i>Lyngbya</i> sp. ?	59	6	11
<i>Synechoccus</i> sp.	--	--	3
PYRROPHYTA			
<i>Peridinium cinctum</i> Ehrenb.	16	12	11
<i>Peridinium</i> 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			
<i>Asterionella formosa</i> Hass.	1,317	853	2,216
indeterminate Centrales	3	--	--
<i>Navicula</i> sp.	--	--	3
<i>Synedra</i> sp.	--	--	3
CHLOROPHYTA			
<i>Actinotaenium</i> sp.	--	--	3
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	37	25	56
<i>Chlamydomonas</i> sp. 1	3	3	--
<i>Chlamydomonas</i> sp. 2	3	11	11
<i>Chlorella vulgaris</i> Beyerinck	87	172	188
<i>Chlorococcum</i> sp.	--	--	3
<i>Coccomyxa dispar</i> Schmidle	160	149	251
<i>Pandorina</i> sp.	11	--	--
<i>Scenedesmus</i> sp.	11	28	53
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	749	256	65
<i>Dinobryon sociale</i> Ehrenb.	11	--	--
<i>Dinobryon sertularia</i> Ehrenb.	59	180	7
<i>Dinobryon</i> sp.	31	293	59
statospores	115	--	--
<i>Kephyrion</i> sp.	17	3	--
<i>Mallomonas</i> sp.	--	--	14
indeterminate flagellates	--	3	3
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	11	20	101
<i>Cryptomonas</i> sp.	3	--	--
indeterminate flagellates	8	--	--
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	301	315	220
<i>Chroococcus minimus</i> (Keissel.) Lemm.	--	17	--
<i>Chroococcus</i> sp.	23	65	42
<i>Dactylococcopsis</i> sp.	8	11	--
<i>Lyngbya limnetica</i> Lemm.	--	--	124
<i>Oscillatoria</i> sp.	17	6	--
<i>Rhabdoderma</i> sp.	--	--	14
indeterminate filament	--	--	8
PYRROPHYTA			
<i>Peridinium cinctum</i> 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
<u>April 8, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass. (empty frustules)	--	~20	25
<i>Asterionella formosa</i> Hass.	749	662	607
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	5	14	25
<i>Chlamydomonas</i> sp. 1	--	--	2
<i>Chlamydomonas</i> sp. 2	20	28	15
<i>Chlorella vulgaris</i> Beyerinck	50	87	118
<i>Chlorococcum</i> sp.	8	20	10
<i>Coccomyxa dispar</i> Schmidle	50	84	78
<i>Scenedesmus</i> sp.	11	23	15
CHRYSTOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	169	84	64
<i>Dinobryon sertularia</i> Ehrenb.	53	17	28
<i>Dinobryon</i> sp.	53	31	35
statospores	--	6	--
<i>Kephyrion</i> sp.	6	3	--
<i>Mallomonas</i> sp.	3	--	8
indeterminate flagellates	100	--	84
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	79	76	70
indeterminate flagellates	8	8	10
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	79	180	164
<i>Chroococcus</i> sp. 1	39	42	12
<i>Chroococcus</i> sp. 2	59	110	23
<i>Dactylococcopsis</i> sp.	--	6	--
<i>Lyngbya limnetica</i> Lemm.	--	--	61
<i>Lyngbya</i> sp. ?	--	17	--
<i>Oscillatoria</i> sp.	25	6	28
<i>Rhabdoderma</i> sp.	3	--	28
<i>Synechoccus</i> sp.	--	--	6
PROTOZOA			
indeterminate ciliates	14	8	--
CHYTRID FUNGI	--	--	3
<u>April 26, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	22	8	14
<i>Navicula</i> 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
<u>April 26, 1989--Continued</u>			
CHLOROPHYTA			
<i>Ankistrodesmus falcatus</i> var. <i>acicularis</i> (A. Brown) G.S. West	3	3	5
<i>Carteria</i> sp. ?	3	--	--
<i>Chlamydomonas</i> sp. 1	256	248	28
<i>Chlamydomonas</i> sp. 2	14	14	82
<i>Chlamydomonas</i> sp. 3	3	3	73
<i>Chlorella vulgaris</i> Beyerinck	3	--	--
<i>Chlorococcum</i> sp.	143	37	3
<i>Coccomyxa dispar</i> Schmidle	3	3	3
indeterminate filament	--	--	6
CHRYSOPHYTA			
<i>Dinobryon cylindricum</i> Imhof	11	14	--
<i>Dinobryon sertularia</i> Ehrenb.	37	11	6
<i>Dinobryon</i> sp.	19	11	3
<i>Mallomonas</i> sp.	3	3	8
indeterminate flagellates	118	118	214
CRYPTOPHYTA			
<i>Cryptomonas ovata</i> Ehrenb.	--	--	3
indeterminate flagellates	45	71	144
CYANOBACTERIA			
<i>Anacystis</i> sp.	--	3	--
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	90	59	14
<i>Chroococcus varius</i> ? A. Braun	6	--	--
<i>Chroococcus</i> sp.	--	17	--
<i>Dactylococcopsis</i> sp.	--	6	17
<i>Lyngbya</i> sp.	23	8,000 $\mu$ m	7,500 $\mu$ m
<i>Oscillatoria</i> sp. 1	175	45	39
<i>Oscillatoria</i> sp. 2	--	--	39
<i>Rhabdoderma</i> sp.	14	--	--
<i>Synechococcus</i> sp.	14	--	6
indeterminate filament	8,000 $\mu$ m	--	--
PROTOZOA			
indeterminate ciliates	--	--	5
<u>May 23, 1989</u>			
BACILLARIOPHYTA			
<i>Asterionella formosa</i> Hass.	110	8	42
<i>Navicula</i> sp.	--	8	--
CHLOROPHYTA			
<i>Chlamydomonas</i> sp. 1	2,736	2,078	2,373
<i>Chlamydomonas</i> sp. 2	8	8	8
<i>Chlorococcales</i>	17	25	--
<i>Selenastrum</i> sp.	34	--	17
<i>Ulothrix subtilissima</i> 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
<u>May 23, 1989--Continued</u>			
CHRYSOPHYTA			
<i>Dinobryon sertularia</i> Ehrenb.	8	17	--
indeterminate flagellates	25	24	--
CRYPTOPHYTA			
indeterminate flagellates	34	110	59
CYANOBACTERIA			
<i>Chroococcus dispersus</i> (Keissel.) Lemm.	--	152	84
<i>Oscillatoria</i> sp. 1	76	34	68
<i>Oscillatoria</i> sp. 2	--	68	--
<i>Synechococcus</i> sp.	25	8	34
indeterminate filaments	1,500 $\mu$ m	--	--
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
<u>December 21, 1987</u>			
COPEPODA			
nauplii	--	--	3,000
ROTIFERA			
<i>Keratella hiemalis</i>	--	--	127,000
<i>Polyarthra</i> sp.	--	--	150,000
<u>January 5, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	25	25	--
nauplii	2,000	1,500	1,500
ROTIFERA			
<i>Keratella cochlearis</i>	750	--	--
<i>Keratella hiemalis</i>	208,000	259,000	48,000
<i>Notholca squalma</i>	750	1,500	1,500
<i>Polyarthra</i> sp.	24,000	27,000	34,000
<u>January 24, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	670	75	100
nauplii	750	2,250	2,250
ROTIFERA			
<i>Keratella hiemalis</i>	563,000	194,000	32,000
<i>Notholca squalma</i>	1,500	750	--
<i>Polyarthra</i> sp.	63,000	91,000	39,000
<u>February 9, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	530	925	550
nauplii	1,500	1,500	2,250
ROTIFERA			
indeterminate Bdelloida	2,250	--	--
<i>Brachionus</i> sp.	--	--	1,500
<i>Keratella hiemalis</i>	442,000	66,000	10,000
<i>Notholca squalma</i>	750	--	--
<i>Polyarthra</i> 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
<u>February 21, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	550	880	700
nauplii	1,500	1,500	750
ROTIFERA			
indeterminate Bdelloida	750	750	--
<i>Brachionus</i> sp.	750	--	--
<i>Keratella hiemalis</i>	104,000	15,000	20,000
<i>Notholca squalma</i>	750	--	--
<i>Polyarthra</i> sp.	493,000	391,000	210,000
<u>March 6, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	730	1,060	300
nauplii	75	5,250	750
ROTIFERA			
<i>Keratella hiemalis</i>	72,000	36,000	26,000
<i>Notholca squalma</i>	--	29,000	7,500
<i>Polyarthra</i> sp.	128,000	246,000	243,000
<u>March 20, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	750	300	280
nauplii	--	1,500	750
OSTRACODA	--	--	50
ROTIFERA			
indeterminate Bdelloida	--	8,500	--
<i>Brachionus</i> sp.	--	--	1,500
<i>Keratella hiemalis</i>	39,000	12,000	14,000
<i>Notholca squalma</i>	1,500	1,500	1,500
<i>Polyarthra</i> sp.	42,000	81,000	87,000
<u>April 4, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	400	140	80
nauplii	--	750	3,000
ROTIFERA			
indeterminate Bdelloida	--	750	--
<i>Brachionus</i> sp.	750	--	2,250
<i>Keratella hiemalis</i>	27,000	30,000	44,000
<i>Notholca squalma</i>	6,000	5,000	5,000
<i>Polyarthra</i> 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
<u>April 19, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp. nauplii	750 1,500	125 750	150 750
ROTIFERA			
indeterminate Bdelloida	--	--	750
<i>Brachionus</i> sp.	750	--	--
<i>Keratella hiemalis</i>	750	3,000	2,250
<i>Notholca squalma</i>	2,250	4,500	3,750
<i>Polyarthra</i> sp.	--	7,500	7,500
<u>May 4, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp. nauplii	175 750	275 --	125 1,500
ROTIFERA			
indeterminate Bdelloida	--	--	750
<i>Keratella hiemalis</i>	750	--	3,750
<i>Notholca squalma</i>	750	750	750
<i>Polyarthra</i> sp.	750	--	--
<u>May 30, 1988</u>			
CLADOCERA			
<i>Bosmina</i> sp.	50	--	--
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp. nauplii	-- --	-- 750	50 --
ROTIFERA			
<i>Polyarthra</i> 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
<u>November 13, 1988</u>			
CLADOCERA			
<i>Bosmina</i> sp.	--	--	50
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	25	75	125
nauplii	75	9,000	19,000
ROTIFERA			
<i>Keratella hiemalis</i>	750	--	750
<i>Notholca squalma</i>	--	2,250	1,500
<i>Polyarthra</i> sp.	3,750	44,000	51,000
<u>December 2, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	600	280	850
nauplii	750	3,000	5,000
ROTIFERA			
<i>Keratella hiemalis</i>	2,250	750	3,000
<i>Notholca squalma</i>	750	750	6,800
<i>Polyarthra</i> sp.	35,000	34,000	246,000
<u>December 20, 1988</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	125	50	2,300
nauplii	750	750	1,500
ROTIFERA			
<i>Brachionus</i> sp.	--	750	--
<i>Keratella hiemalis</i>	1,500	8,000	15,000
<i>Notholca squalma</i>	8,000	8,000	7,000
<i>Polyarthra</i> sp.	453,000	496,000	524,000
<u>January 4, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	400	125	200
nauplii	1,500	2,250	750
ROTIFERA			
indeterminate Bdelloida	--	--	750
<i>Keratella hiemalis</i>	34,000	31,000	11,000
<i>Notholca squalma</i>	3,000	3,800	750
<i>Polyarthra</i> 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
<u>January 20, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	400	5,800	175
nauplii	3,800	1,500	4,500
ROTIFERA			
indeterminate Bdelloida	--	9,000	--
<i>Brachionus</i> sp.	1,500	750	--
<i>Keratella hiemalis</i>	48,000	170,000	66,000
<i>Notholca squalma</i>	--	--	750
<i>Polyarthra</i> sp.	514,000	335,000	187,000
<u>February 10, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	4,000	1,580	1,100
nauplii	3,000	750	3,800
ROTIFERA			
indeterminate Bdelloida	--	1,500	750
<i>Brachionus</i> sp.	3,800	1,500	--
<i>Keratella cochlearis</i>	3,000	--	--
<i>Keratella hiemalis</i>	27,000	73,000	10,000
<i>Notholca squalma</i>	750	750	--
<i>Polyarthra</i> sp.	307,000	129,000	134,000
<u>February 26, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	1,100	650	380
nauplii	2,250	--	--
ROTIFERA			
indeterminate Bdelloida	2,250	--	750
<i>Keratella hiemalis</i>	30,000	62,000	32,000
<i>Polyarthra</i> sp.	57,000	38,000	99,000
<u>March 11, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	1,500	630	450
ROTIFERA			
indeterminate Bdelloida	2,250	--	--
<i>Brachionus</i> sp.	--	--	750
<i>Keratella hiemalis</i>	2,250	7,000	5,000
<i>Polyarthra</i> 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
<u>April 26, 1989</u>			
ROTIFERA			
indeterminate Bdelloida	--	1,500	--
<i>Brachionus</i> sp.	--	--	50
<i>Notholca squalma</i>	1,500	1,500	--
<u>May 8, 1989</u>			
COPEPODA			
<i>Eucyclops agilis</i> and <i>Acanthocyclops</i> sp.	1,000	400	550
ROTIFERA			
<i>Brachionus</i> sp.	750	750	--
<i>Keratella hiemalis</i>	8,000	5,000	11,000
<i>Polyarthra</i> sp.	6,000	8,000	11,000









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



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