Fisheries and Marine Service

MS Report 1466

June 1978

SEASONAL SUCCESSIONS OF PHYTOPLANKTON IN SEVEN LAKE BASINS IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO, FOLLOWING ARTIFICIAL EUTROPHICATION. DATA FROM 1974 TO 1976

by

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This is the seventh Manuscript Report

from the Western Region, Winnipeg

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Cat. no. Fs 97-4/1466 ISSN 0701-7618

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Findlay, D. L. 1978. Seasonal successions of phytoplankton in seven lake basins in the Experimental Lakes Area, Northwestern Ontario, following artificial eutrophication. Data from 1974 to 1976. Can. Fish. Mar. Serv. MS Rep. 1466:iv + 41 p.

This report summarizes the changes in the phytoplankton communities of seven lake basins following artificial enrichment with nitrate, phosphate and carbon. Data presented comes from studies of Lakes 227, 304, 226 (south and north basins), 261, and 302 (north and south basins) carried out from 1974 to 1976. Included are 14 figures showing total biomass and % composition and 14 tables listing common species found throughout the study.

Key words: phytoplankton; planktonic algae; biomass; lakes; eutrophication; enrichment.

RESUME

Findlay, D. L. 1978. Seasonal successions of phytoplankton in seven lake basins in the Experimental Lakes Area, Northwestern Ontario, following artificial eutrophication. Data from 1974 to 1976. Can. Fish. Mar. Serv. MS Rep. 1466:iv + 41 p.

Le présent rapport résume les changements provoqués dans les communautés phytoplanctoniques de sept bassins lacustres par l'enrichissement artificiel à l'aide de nitrates, de phosphates et de carbone. Nos données proviennent des études menées sur les lacs N^{os} 227, 304, 226 (bassins nord et sud), 261 et 302 (bassins nord et sud), de 1974 à 1976. Nous incluons 14 figures donnant la biomasse totale et la composition (%) et 14 tableaux qui présentent les espèces les plus communes rencontrées pendant l'étude.

Mots clés: phytoplancton; algues planctoniques; biomasse; lacs; eutrophisation; enrichissement.

INTRODUCTION

This report summarizes the seasonal successions of phytoplankton communities in seven lake basins in the Experimental Lakes Area (E.L.A.) near Kenora, Ontario from 1974 to 1976. It also discusses the possible effects of altering the N/P ratio to induce the presence of nitrogen-fixing cyanophytes.

METHODS

Identification and counting techniques were the same as those described by Kling and Holmgren (1972). In 1974, sampling was also as described by Kling and Holmgren *(op. cit.)*. In 1975 and 1976, following the discovery of thin layers of high algal biomass in the thermocline and hypolimnion, samples were taken with an integrating sampler (Fee 1976). Sampling intervals (epilimnion, metalimnion, hypolimnion) were determined from temperature, light and chlorophyll profiles of each basin. For further details on sampling, see DeClercq et al. (1977).

RESULTS

LAKE 227

1974 (Figure 1, Table 3)

Lake 227 in January of 1974 was dominated by Chrysophyceae. Several chlorophycean species were also present in appreciable numbers. The biomass during this time was extremely low (540 mg/m^3). In February dominance shifted to chlorophytes with those species which were present in January composing the majority of the standing crop of phytoplankton. This trend continued until early April, when cyanophytes became co-dominant with chlorophytes and euglenophytes. Total biomass did not increase from that recorded in January. In early May dominance reverted to Chrysophyceae; Chryptophyceae at this time represented 47% of the standing crop. Fertilization began in mid May with the same concentrations of $NaNO_3$ and H_3PO_4 being added as in previous years (N/P ratio of 15/1 by weight, Table 1). Cryptophyceae represented 60% of the living biomass by late May. Chrysophyceae had decreased from 40% to 20% of the biomass. Cryptophyceae remained dominant until early June when, as in previous years, Chlorophyceae became dominant, representing 35% of the phytoplankton volume. Biomass increased to 11,892 mg/m^3 and chlorophyll *a* values increased from spring values of 7.6 µg/L to 10.3 µg/L. Chlorophyte diversity decreased in mid July, but this group continued to dominate the phytoplankton for the remainder of the ice-free season. During this period, small pulses of Cyanophyceae and Peridineae occurred. In late November *Oscillatoria Redekei* had increased to 32% of the living biomass which was 8293 mg/m^3. The corresponding chlorophyll *a* value for this period was 29.1 µg/L. Bacillariophyceae were conspicuous but never represented more than 10% of the biomass.

1975

Epilimnion (Figure 1, Table 3): Sampling of Lake 227's epilimnion began in early May of 1975. At this time the epilimnion was dominated by Cryptophyceae which represented 40% of the living biomass and Chlorophyceae represented 33% of the standing crop. The maximum spring biomass was 3874 mg/m^3, coinciding with an average chlorophyll *a* concentration of 7.4 µg/L. Fertilization began in mid May with the weekly additions of $NaNO_3$ and H_3PO_4 at a N/P ratio of 5/1 by weight compared to 15/1 for previous years. By late May, chlorophytes had doubled in population and several other chlorophycean species appeared increasing their contribution to 64% of the phytoplankton biomass. The average biomass at this time was 15,000 mg/m^3. It continued to increase until late June, when a yearly maximum value of 24,471 mg/m^3 was recorded. Chlorophyceae remained dominant until late June when Chrysophyceae became dominant and biomass decreased to 6,800 mg/m^3. During late July through August small populations of the cyanophytes *Oscillatoria Redekei* and *Aphanizomenon gracile* (a nitrogen-fixing filamentous cyanophyte) were present. By late September, these two species were co-dominant with the chrysophytes. *Aphanizomenon gracile* became the dominant species early in October composing 35% of the living biomass. At this time, nitrogen-fixation by *Aphanizomenon gracile* was detectable using $^{15}N_2$ uptake method (R. Flett, personal communication). In mid October chrysophytes became co-dominant with the existing cyanophytes. These continued to dominate throughout the remainder of the year. Euglenophyceae, Bacillariophyceae and Peridineae were present on several occasions but never composed more than 10% of the standing crop at any one time.

Hypolimnion (Figure 2, Table 4): The hypolimnion in Lake 227 was dominated by chlorophytes in mid May. The average biomass was 6947 mg/m^3, with a corresponding chlorophyll *a* value of 14.7 µg/L. Chrysophyceae represented 25% of the phytoplankton standing crop at this time with several species. Chlorophyceae dominated from early May until mid August. In early July biomass peaked at 22,959 mg/m^3 then slowly receded throughout August. Cyanophytes composed 15% of the biomass until mid July. *Aphanizomenon gracile* became abundant, increasing the Cyanophyceae to 46% of the algal volume by late August making it the dominant group. Chlorophyceae, Cryptophyceae and Chrysophyceae each composed 15% of the biomass. This trend continued for the remainder of August. By early September the epilimnion extended below the 1% light level and the hypolimnion was no longer sampled.

1976

Epilimnion (Figure 1, Table 3): The epilimnion in Lake 227 had a biomass represented by 39% Chrysophyceae, 33% Cyanophyceae, 10% Euglenophyceae and 10% Cryptophyceae in early January (1976). Biomass was 1000 mg/m^3 with corresponding chlorophyll *a* values of 8.4 µg/L. In late April biomass had increased to 8598 mg/m^3 and Chrysophyceae dominated with the appearance of several new species. Cyanophyceae decreased, now representing only 9% of the biomass. In early May a small pulse of Peridineae was recorded. Biomass had decreased to 4496 mg/m^3. In mid May *Dinobryon sociale* var. *Americanum* appeared in large numbers causing the biomass to double (9290 mg/m^3) and chlorophyll *a* increased to 11.25 µg/L.

Weekly additions of $NaNO_3$ and H_3PO_4 at a ratio of 5:1 by weight began in mid May. Dominance shifted to Cyanophyceae in early June, representing 51% of the total biomass which had increased to 12,756 mg/m^3. Chlorophyceae with several species represented an additional 30% of the standing crop. Chlorophytes became dominant in mid-June composing 61% of the biomass, which had decreased to 10,699 mg/m^3. On July 27 biomass peaked at 20,113 mg/m^3 and chlorophyll *a* increased to 25.5 µg/L; dominance had shifted to Peridineae. Chlorophyceae decreased representing 34% of the biomass. By mid August Peridineae had disappeared and dominance reverted to those chlorophycean species which had dominated earlier. In addition several new species were present. Biomass had decreased to 17,043 mg/m^3 and chlorophyll *a* increased to 28.5 µg/L. In late August Cyanophyceae reappeared representing 17% of the biomass with *Oscillatoria Redekei* and *Aphanizomenon gracile*. At this time nitrogen-fixation was detectable (Barbara Graham, personal communication). Biomass had decreased to 12,568 mg/m^3 at this time (late August) and continued to decrease reaching 5,500 mg/m^3 in mid September. Cyanophyceae represented 26% of the biomass with *Oscillatoria Redekei* representing 96% of it. Nitrogen-fixation had decreased to an insignificant amount (Barbara Graham, personal communication). Chlorophyceae continued to dominate, with those species found earlier. In early October dominance shifted to Peridineae which represented 55% of the biomass (12,061 mg/m^3). Peridineae continued to increase and, in late October, represented 63% of the standing crop. Biomass had increased to 13,167 mg/m^3. Diatomeae were present during the ice-free season but never represented more than 5% of the biomass at any one time.

Metalimnion (Figure 2, Table 4): In mid-May the metalimnion of Lake 227 was dominated by chrysophytes. Biomass was 9913 mg/m^3 with a corresponding chlorophyll *a* value of 13.2 µg/L. Peridineae represented 29% of the standing crop with the cyanophycean species representing 18%. Dominance shifted to Cyanophyceae in early June. In mid June Chlorophyceae became dominant with an increase in several species. Biomass increased to 16,388 mg/m^3 and then decreased to 11,015 mg/m^3 in early July. By mid July the phytoplankton community was represented by 29% Cyanophyceae, 23% Peridineae, 21% Chlorophyceae and 12% Cryptophyceae. Biomass increased to 14,407 mg/m^3 several weeks later when cyanophytes and chlorophytes formed a co-dominance. Biomass continued to increase and by mid August reached 23,194 mg/m^3. Chlorophyll *a* had reached 38.2 µg/L. Dominance had shifted at this time to Peridineae which represented 54% of the total biomass. Chlorophyceae continued to represent 27% of the biomass and Cyanophyceae 12%. Biomass decreased rapidly throughout the latter part of August, reaching 11,048 mg/m^3 (August 26). Biomass increased slightly in mid September (14,016 mg/m^3) and Peridineae continued to dominate the metalimnion. Sampling of the metalimnion ceased in mid September with the deepening of the epilimnion.

Hypolimnion (Figure 2, Table 4): The hypolimnion in Lake 227 was sampled for a brief period after winter breakup, due to the deepening of the metalimnion below the 1% light level. Chrysophyceae dominated the phytoplankton throughout May. Cyanophyceae consistently represented 15 to 20% of the biomass, while Peridineae composed from 12 to 20%. Chlorophyceae were also present in small numbers. Biomass increased from 5236 mg/m^3 in early May to 7288 mg/m^3 in late May.

LAKE 226 SOUTH

1974 (Figure 3, Table 5)

Lake 226 south was dominated by Chrysophyceae in late January 1974. Biomass values at this time were 397 mg/m^3. Phytoplankton species and composition did not change during the remaining period of the ice-covered season. In mid May an average biomass value of 1857 mg/m^3 was recorded with a corresponding chlorophyll *a* value of 5.8 µg/L. Chrysophyceae continued to dominate, while, Cryptophyceae represented 8% of the standing crop of phytoplankton at this time. Artificial enrichment of Lake 226 south began in mid May. As in previous years, sucrose and $NaNO_3$ were added at weekly intervals in the amounts shown in Table 1. Biomass values had increased to 1581 mg/m^3 by late May. Chrysophyceae continued to dominate the standing crop representing 73% of the total biomass. In mid June biomass values had increased to 4448 mg/m^3 and was represented by 76% Chrysophyceae, 10% Bacillariophyceae and 8% Cryptophyceae. Biomass decreased in late June to 3361 mg/m^3 and species composition changed to 59% Chrysophyceae, 21% Diatomeae, and 15% Peridineae. Biomass values decreased to 1500 mg/m^3 by early July. Chlorophyll *a* values at this time were 9.8 µg/L. Biomass values fluctuated around 1500 mg/m^3 throughout July and August. In early August, chlorophytes occurred in large numbers increasing the chlorophycean composition to 24% of the standing crop of phytoplankton. A small pulse of Cyanophyceae was recorded during this period. *Anabaena solitaria* f. a. *planctonica* was the major cyanophycean species present. Chrysophyceae continued to dominate the phytoplankton for the remainder of the ice-free season. Biomass values increased to 3630 mg/m^3 in mid September and slowly decreased to 1766 mg/m^3 in mid December with Chrysophyceae dominating.

1975

Epilimnion (Figure 3, Table 5): The epilimnion of Lake 226 south in mid May was dominated by chrysophycean species remaining from the previous winter. Biomass values at this time were 1283 mg/m^3. Fertilization began in mid May with the same additions of $NaNO_3$ and sucrose as in previous years (Table 1). Biomass values increased to 2680 mg/m^3 in early June. Chrysophyceae represented 70% of the biomass at this time with the previously mentioned species and Diatomeae represented 15% of the biomass. A decrease in biomass values occurred in late June (1447 mg/m^3). Diatomeae had increased, representing 24% of the biomass at this time. In early July, Diatomeae were replaced by chlorophytes and an increase in biomass was evident. Chrysophyceae continued to dominate with those species remaining from early spring. Biomass increased to 3000 mg/m^3 by late July. Cyanophyceae occurred during this period, representing 11% of the biomass. Biomass decreased throughout August and in early September was 1918 mg/m^3 with corresponding chlorophyll *a* values of 7.5 µg/L.

In mid September the biomass was represented by 52% Chrysophyceae, 14% Diatomeae, 13% Cyanophyceae and 11% Chlorophyceae. Average biomass values had increased to 2700 mg/m^3 and continued to increase until early October when a yearly maximum of 5591 mg/m^3 was reached. Chrysophyceae remained dominant for the remainder of the ice-free season. Biomass values gradually decreased and, by November, were 2530 mg/m^3. Euglenophyceae appeared occasionally but never made a major contribution to the standing crop in 1975.

Hypolimnion (Figure 4, Table 6): The hypolimnion in Lake 226 south was dominated by Chrysophyceae in mid May. An average biomass value of 3130 mg/m^3 was recorded at this time with a corresponding chlorophyll a value of 6.1 µg/L. Biomass values increased to 4980 mg/m^3 in early June and then decreased throughout the remaining part of the month. Chrysophyceae continued to dominate with several new species appearing in addition to those previously there. In late July *Dinobryon sertularia* var. *protruberans* bacame the dominant species representing 65% of the total biomass. This species dominated the hypolimnion peak found by E. J. Fee. Biomass continued to increase, and in early August, reached 11,776 mg/m^3, a yearly maximum for the hypolimnion as well as the epilimnion. Chrysophyceae at this time represented 91% of the standing crop of phytoplankton. Biomass decreased by early September to 7395 mg/m^3. Sampling of the hypolimnion was discontinued in mid September because of fall deepening of the epilimnion. Cyanophyceae, Chlorophyceae, Euglenophyceae, Diatomeae, Cryptophyceae and Peridineae were present during the summer but at no time did any one group compose more than 10% of the biomass.

1975

Epilimnion (Figure 3, Table 5): The epilimnion of Lake 226 south was dominated by Chrysophyceae in early January (1976). Biomass was 1026 mg/m^3 and chlorophyll a values were 10.9 µg/L. In early spring (29 April) Chrysophyceae continued to dominate with those species present in January being the major contributors. Biomass had increased to 1427 mg/m^3 at this time. Artificial enrichment began with weekly additions of sucrose and $NaNO_3$ as in previous years (Table 1). In mid June biomass increased to 3524 mg/m^3 and was represented by 57% Chrysophyceae and 37% Diatomeae. Species composition remained the same until mid July when Diatomeae decreased to 15% of the biomass, and Chlorophyceae increased to 11% of the standing crop. Biomass at this time had decreased to 2700 mg/m^3 and chlorophyll a values were 5.6 µg/L. Chlorophyceae continued to represent 10-20% of the biomass until mid August when an increase in several diatom species occurred, replacing the Chlorophyceae. Biomass estimates decreased to a seasonal low of 634 mg/m^3 and chlorophyll a averaged 5.5 µg/L. Dominance shifted to Diatomeae in early September and biomass increased to 4978 mg/m^3. Chrysophyceae represented 30% of the biomass and Chlorophyceae represented an additional 21%. In mid September, Chrysophyceae became dominant with a significant increase in *Synura uvella*. Biomass increased to 6324 mg/m^3 and chlorophyll a increased to 9.2 µg/L. By early October Chrysophyceae represented 67% of the total biomass with *Dinobryon sertularia* var. *protruberans* and *Synura uvella* representing 57% of the total. Diatomeae continued to represent 24% of the biomass. Biomass decreased to 5500 mg/m^3 in late October and Chrysophyceae continued to dominate the phytoplankton, with small populations of diatoms which were present for the remainder of the ice-free season.

Metalimnion (Figure 4, Table 6): The metalimnion in the south basin of Lake 226 had a biomass represented by 71% Chrysophyceae, 18% Chlorophyceae and 4% Peridineae in mid May. Biomass was 3370 mg/m^3 with a corresponding chlorophyll a value of 7.8 µg/L. In mid June several diatom species appeared and biomass decreased to 1286 mg/m^3. In late June the standing crop was represented by 49% Chrysophyceae, 40% Chlorophyceae and 5% Diatomeae. The increase in Chlorophyceae correlates with an increase in *Scenedesmus brevispina* and *Dictyosphaerium simplex*. Biomass continued to decrease and on the 14th of July was estimated at 946 mg/m^3. Chlorophyceae had decreased, representing 15% of the phytoplankton population and Cyanophyceae represented 11% of the standing crop. In late July biomass increased to 4209 mg/m^3 with the appearance of several chrysophytes in large numbers. Chrysophyceae at this time represented 54% of the total biomass and cyanophytes represented 11%. Chlorophyceae represented an additional 19% with those species found earlier. Diatomeae species increased in mid August increasing the diatom population to 17% of the standing crop. Biomass rapidly increased in late August reaching a seasonal maximum of 14,426 mg/m^3 and chlorophyll a values increased to 34.6 µg/L. This increase was due to an increase in *Synura uvella*. (This species dominated the hypolimnion peak and its appearance in the metalimnion in such large numbers can be explained by deepening of the metalimnion to the depth where the peak becomes incorporated into this stratum). Biomass decreased to 9170 mg/m^3 by mid September and Chrysophyceae continued to dominate the phytoplankton representing 78% of the biomass. Sampling of the metalimnion was discontinued in mid September because of the deepening epilimnion.

Hypolimnion (Figure 4, Table 6): The hypolimnion in Lake 226 south was dominated in early May by chrysophycean species remaining from the previous winter. Biomass was 1664 mg/m^3 and chlorophyll a values were 7.9 µg/L. In mid May a pulse of Chlorophyceae was recorded and an increase in biomass to 2456 mg/m^3. *Scenedesmus brevispina* accounted for 87% of the chlorophycean population which at this time represented 32% of the total standing crop. By late May Chlorophyceae disappeared and small populations of Cryptophyceae appeared. In early June Diatomeae became abundant with several species contributing to the population. Chrysophyceae continued to dominate at this time with several species contributing to the population. Biomass increased to 5634 mg/m^3 at this time then rapidly decreased reaching 824 mg/m^3 in mid June. By early July biomass had increased significantly, peaking at 7894 mg/m^3. Chlorophyll a had increased to 16.95 µg/L. Chrysophyceae continued to dominate the phytoplankton with small populations of diatoms occurring for the remainder of the sampling period. Biomass decreased to 5678 mg/m^3 in early August then rapidly increased to 11,626 mg/m^3 in mid August. At this time sampling was discontinued due to deeper sampling depths for the epilimnion.

LAKE 226 NORTH

1974 (Figure 5, Table 7)

Lake 226 north was dominated by chrysophytes in January (1974). Diatomeae represented 16% of the standing crop of phytoplankton during this period. Biomass at this time was 2750 mg/m³. It slowly declined throughout the remaining ice-covered season. In early April, an average biomass of 122 mg/m³ was recorded, the lowest value ever recorded for Lake 226 north. By mid May biomass had increased to 1385 mg/m³ and Chrysophyceae remained dominant with those species previously found. Fertilization of Lake 226 north began in mid May with the same weekly additions of C, N, and P as in 1973 (Table 1). Chrysophyceae continued to dominate in the early part of the ice-free season. In early July the standing crop of phytoplankton was represented by 5% Cyanophyceae, 10% Chlorophyceae, 50% Chrysophyceae, 19% Diatomeae and 12% Peridineae and had an average biomass value of 1627 mg/m³. By early August dominance had shifted to *Anabaena spiroidies*, a nitrogen-fixing cyanophyte (R. Flett, personal communication). Chlorophyceae at this time represented 21% of the biomass which had increased to 7300 mg/m³ with a corresponding chlorophyll *a* value of 16.7 µg/L. *Anabaena spiroidies* continued to dominate the phytoplankton until early November when Chrysophyceae became co-dominant with several species contributing. These species continued to dominate the standing crop of phytoplankton from mid November on. Euglenophyceae seldom represented more than 1% of the live biomass at any one time during the year.

1975

Epilimnion (Figure 5, Table 7): Chrysophyceae once again dominated the epilimnion in Lake 226 north in early spring of 1975. Chlorophyceae represented 24% of the standing crop of phytoplankton. An average biomass value of 1959 mg/m³ was recorded at this time with a corresponding chlorophyll *a* value of 5.3 µg/L. Artificial enrichment began in mid May with weekly additions of C, N, and P as in previous years (Table 1). Dominance shifted in late May to Chlorophyceae and biomass continued to increase and by early June had reached 1027 mg/m³. Chlorophyceae continued to dominate with several new species appearing. Also present at this time were several filamentous cyanophytes which represented 18% of the standing crop of phytoplankton. By late June biomass increased to 18,953 mg/m³ (the yearly maximum). Biomass values declined through early July to 5956 mg/m³ and the standing crop was represented by 29% Cyanophyceae, 29% Chlorophyceae and 27% Chrysophyceae. Chrysophyceae increased in early August, representing 44% of the living biomass with several species contributing. Dominance shifted in mid August to *Anabaena solitaria* f. a. *planctonica*, a nitrogen-fixing cyanophyte (R. Flett). Biomass increased steadily and by mid September reached 14,030 mg/m³. Chlorophyll *a* reached 23.9 µg/L. In late September a small pulse of diatoms was recorded, representing 17% of the standing crop. A shift in dominance occurred in early October. Cyanophyceae had declined, representing only 21% of the standing crop and Chlorophyceae, dominating, represented 67% of the biomass. Dominance shifted to chrysophytes in late October with several species contributing. *Oscillatoria Redekei*, a cyanophyte, represented 25% of the standing crop of phytoplankton in late October. Chlorophyceae dominated the phytoplankton at this time. In mid November dominance reverted back to Chrysophyceae as in previous years and continued to dominate.

Hypolimnion (Figure 6, Table 8): The hypolimnion in Lake 226 north was dominated by Chrysophyceae in mid May of 1975 with 23% of the biomass being represented by chlorophytes. An average biomass value of 4005 mg/m³ was recorded with a corresponding chlorophyll *a* value of 7.9 µg/L. Chrysophyceae dominated the phytoplankton until late June, when dominance shifted to chlorophytes. The standing crop of phytoplankton at this time was represented by 59% Chlorophyceae, 19% Cyanophyceae, 12% Chrysophyceae and 6% Cryptophyceae. Biomass had increased to 12,012 mg/m³ with corresponding chlorophyll *a* values of 14.3 µg/L. Cyanophyceae increased to 27% of the biomass by mid July. Biomass values decreased to 4996 mg/m³ at this time with Chlorophyceae representing 42% of the living phytoplankton. Dominance shifted in mid August to those Chrysophycean species found in May. Biomass for this period fluctuated around 7084 mg/m³. Chlorophyceae continued to represent 30% of the standing crop with the species previously found. In early September the biomass was represented by 22% Cyanophyceae, with the major species being *Anabaena solitaria* f. a. *planctonica*, 29% Chlorophyceae with the same species that dominated earlier and 26% Chrysophyceae with those species previously dominant. Sampling was discontinued at this point due to fall mixing of the epilimnion.

1976

Epilimnion (Figure 5, Table 7): In early January (1976) the epilimnion in Lake 226 north was dominated by the chlorophycean species that dominated the biomass in the previous fall. Biomass was 786 mg/m³ with a corresponding chlorophyll *a* value of 2.9 µg/L. In late April dominance shifted to Chrysophyceae. In addition to the dominating chrysophycean population Chlorophyceae and Cryptophyceae were present, representing 10% to 20% of the biomass. Biomass had increased to 7947 mg/m³ in early May, then decreased to 4750 mg/m³ by late May. Artificial enrichment began in mid May with weekly additions of sucrose, $NaNO_3$ and H_3PO_4 being added as in past years (table 1). Chrysophyceae continued to dominate the epilimnion biomass with those species found in late April. Chrysophyceae dominated until mid July when dominance shifted to Cyanophyceae with the appearance of *Anabaena solitaria* f. a. *planctonica* in large numbers. During the latter part of July and early August, nitrogen-fixation was detectable (B. Graham, personal communication). Biomass increased to 5736 mg/m³ at this time with a corresponding chlorophyll *a* value of 10.1 µg/L. Biomass fluctuated throughout July and August, peaking at 13,659 mg/m³ in late August. The standing crop at this time was represented by 55% Cyanophyceae, 23% Chrysophyceae, 10% Chlorophyceae and 7% Diatomeae. Cyanophycean dominance lasted until early September, when it reverted to Chlorophyceae with several species contributing to the chlorophycean population. Biomass had decreased to 6951 mg/m³ and by late September reached 2750 mg/m³. Chrysophyceae became dominant at this time with a noticeable increase in *Uroglena americana*. Chrysophyceae dominated the epilimnion biomass for the remainder of the ice-free season. Biomass increased in early October to 3706 mg/m³ and chlorophyll *a* values increased to 17.2 µg/L.

Metalimnion (Figure 6, Table 8): In mid May (1976) the metalimnion in the north basin of Lake 226 was dominated by chlorophycean species. Chrysophyceae comprised 36% of the phytoplankton population while Cryptophyceae represented 11%, in addition to the 45% chlorophycean population. Biomass was 3151 mg/m^3 with a corresponding chlorophyll *a* value of 9.5 μg/L. In mid June biomass decreased to 380 mg/m^3 and Cryptophyceae increased, representing 35% of the standing crop with those species previously found. Biomass remained low throughout the remainder of June (296 mg/m^3). Dominance shifted to Chrysophyceae in late June. By mid July several chlorophycean species increased in numbers causing the biomass to increase to 1022 mg/m^3 and dominance to shift to Chlorophyceae. In late July the biomass was represented by 34% Chlorophyceae, 30% Chrysophyceae and 23% Diatomeae. In mid August dominance shifted to Cyanophyceae with the appearance of *Anabaena solitaria* f. a. *planctonica*. Biomass increased to 3539 mg/m^3. Populations of Chlorophyceae, Chrysophyceae and Diatomeae continued to exist during this Cyanophyceae bloom. Cyanophyceae dominated until mid September, at which time the biomass was represented by 31% Chrysophyceae, 25% Euglenophyceae and 26% Cryptophyceae. In mid September sampling of the metalimnion was discontinued.

Hypolimnion (Figure 6, Table 8): In early May (1976) the hypolimnion in the north basin of Lake 226 was dominated by Chrysophyceae with a small population of Chlorophyceae and Cryptophyceae present. Biomass was 2443 mg/m^3 at this time with corresponding chlorophyll *a* values of 7.6 μg/L. Dominance shifted to Chlorophyceae in late May with a significant increase in *Scenedesmus brevispina*. Biomass had increased to 3730 mg/m^3 and was represented by 48% Chlorophyceae and 43% Chrysophyceae. In early June species composition had shifted to 36% Chlorophyceae, 35% Cryptophyceae and 27% Chrysophyceae. Biomass had increased to 4119 mg/m^3 (a hypolimnetic maximum for the year) and chlorophyll *a* values increased to 14.3 μg/L. Cryptophyceae populations decreased by late June being replaced by Chrysophyceae, causing a shift in dominance to chrysophytes. Biomass had decreased to 1537 mg/m^3 at this time. In early July Chlorophyceae again dominated with those species found earlier. In mid July Chrysophyceae again became dominant; also present at this time were a large number of chlorophycean species which had previously been dominant as well as euglenophycean species. Biomass was 2367 mg/m^3 with an average chlorophyll *a* value of 7.2 μg/L. Chrysophyceae continued to dominate the phytoplankton until mid August, when an increase in several cryptomonads occurred, causing a dominance shift to Cryptophyceae. Biomass at this time was 3681 mg/m^3 and was represented by 43% Cryptophyceae, 29% Crysophyceae, 7% Chlorophyceae, 7% Diatomeae and 7% Cyanophyceae. Sampling of the hypolimnion was discontinued in late August because of deeper sampling depths for the epilimnion.

LAKE 304

1974 (Figure 7, Table 9)

In mid January of 1974 Lake 304 was dominated by chlorophytes. Biomass at this time was 650 mg/m^3 with corresponding chlorophyll *a* values of 4.8 μg/L. In late February the standing crop of phytoplankton was represented by 32% Chlorophyceae (represented by those species previously found) 30% Chrysophyceae, 25% Euglenophyceae and 11% Cyanophyceae. Chlorophyceae continued to dominate until early April when cyanophycean species appeared in large numbers. Biomass values had not increased from those in earlier months. Fertilization began in mid May with the weekly additions of sucrose and NH_4Cl being added as in 1973 (Table 1).

Dominance shifted to Chrysophyceae in early May with several species comprising the dominance. Biomass values had increased to 1185 mg/m^3 and chlorophyll *a* values reached 14.1 μg/L. Chrysophyceae continued to dominate until mid June, at which time dominance shifted to Chlorophyceae. Biomass values had increased to 5463 mg/m^3 at this time, the yearly maximum. Chlorophytes continued to dominate the phytoplankton community until early October, when dominance shifted to Peridineae. Biomass had decreased to 2443 mg/m^3 and was represented by 48% Peridineae, 25% Chlorophyceae, 14% Cryptophyceae and 11% Chrysophyceae. In late October dominance reverted to Chrysophyceae and biomass decreased to 1032 mg/m^3. Diatomeae were conspicuous several times but did not make a major contribution to the total biomass.

1975

Epilimnion (Figure 7, Table 9): In mid May Lake 304 had a biomass value of 972 mg/m^3 with the standing crop being represented by 63% Chrysophyceae, 23% Peridineae and 10% Chlorophyceae. Fertilization began in mid May with weekly additions of NH_4Cl and H_3PO_4 at a ratio of 15:1 (sucrose was eliminated) (Table 1). Chlorophytes increased in numbers in the latter part of May and by mid June dominated the phytoplankton standing crop. Biomass values had increased to 4500 mg/m^3 and chlorophyll *a* values had reached 17.3 μg/L. During this period a rapid increase in Cryptophyceae was recorded, increasing to 29% of the standing crop of phytoplankton. By late June cryptophycean species dominated the phytoplankton community in the epilimnion. Dominance reverted to Chlorophyceae in mid July, representing 45% of the total biomass which had increased to 9925 mg/m^3 (the yearly epilimnetic maximum). Corresponding chlorophyll *a* values were 6 μg/L. Chlorophyceae continued to dominate until mid August. During this period a large number of cryptophytes were present and became dominant in mid August.

Biomass values had decreased to 5398 mg/m^3 and continued to decrease throughout the remainder of the ice-free season. In mid September biomass values decreased to the very low value of 186 mg/m^3 and Chrysophyceae had become dominant. A live cell estimate of 20 x 10^4 cells/L was recorded at this time. In the latter period of September, biomass had increased to 1075 mg/m^3. Dominance had again shifted to Cryptophyceae with the same species as in mid August. In early October, a shift in dominance back to Chrysophyceae occurred. Biomass values had stabilized around 1100 mg/m^3. Chrysophyceae dominated the standing crop for a short time and in mid October Chlorophyceae resumed dominance. Chlorophyceae continued to dominate the phytoplankton for the remainder of the ice-free season. Biomass values fluctuated between 1100 mg/m^3 and 1400 mg/m^3 during this period. Diatomeae and Euglenophyceae were present throughout the summer, but never made a major contribution to the total biomass. Cyanophyceae seldom occurred even with the additions of H_3PO_4.

Hypolimnion (Figure 8, Table 10): Sampling of Lake 304's hypolimnion began in mid May at which time Peridineae species dominated. Biomass values exceeded 4000 mg/m^3 and chlorophyll *a* values were 3.4 μg/L. Chrysophyceae represented 42% of the standing crop at this time with several species contributing. This trend continued until early June, when the biomass was represented by 34% Chrysophyceae, 32% Chlorophyceae and 16% Peridineae and had decreased to 1690 mg/m^3. By mid June Chlorophyceae dominated. Biomass values increased to 7976 mg/m^3 in early July. Chlorophyceae represented 87% of the total biomass with those species previously found. Cyanophytes appeared in large numbers in late July. (This may have been due to deeper sampling depths due to the lowering of the 1% light level. In previous years this species was found in large mats between 5 and 6 meters). Dominance shifted in mid August to Cryptophyceae, which continued to dominate for the remainder of the sampling period. In early September, the epilimnion had mixed below the 1% light level and sampling of the hypolimnion was discontinued.

1976

Epilimnion (Figure 7, Table 9): The epilimnion in Lake 304 was dominated by Chrysophyceae with large populations of Peridineae species in late April. Biomass at this time was 4815 mg/m^3 with corresponding chlorophyll *a* values of 9.2 μg/l. In early May biomass decreased to 2858 mg/m^3 and dominance shifted to chlorophycean species. At this time the biomass was represented by 40% Chlorophyceae, 33% Chrysophyceae and 20% Peridineae. Artificial enrichment began in mid May with the weekly additions of NH_4Cl and H_3PO_4 at a ratio of 15:1 by weight (Table 1). Chrysophyceae again dominated in mid May with the previous chrysophytes most abundant. Biomass increased to 3327 mg/m^3 in late May and in June reached 13,731 mg/m^3 (the epilimnetic maximum for the year). Chlorophyll *a* had decreased to 2.8 μg/L. An increase in several chlorophycean species correlates with this biomass increase. In mid June the biomass decreased to 1610 mg/m^3 and dominance shifted to the cryptophytes. Chlorophyceae continued to represent 39% of the total biomass while Cryptophyceae represented 51%. In late June, Chlorophyceae became dominant representing 80% of the population. Biomass had increased to 2250 mg/m^3 and chlorophyll *a* to 4.8 μg/L. By late July, Chlorophyceae composed 98% of the total biomass which was 8593 mg/m^3. Biomass decreased in mid August, reaching 4590 mg/m^3. In late August *Anabaena planctonica* and *Aphanizomenon flos-aquae*, appeared in large numbers. Both these species are potential nitrogen-fixers, but no nitrogen-fixation was recorded in Lake 304 (B. Graham, personal communication). During this period (late August) Cyanophyceae represented 30% of the biomass while Chlorophyceae, represented 60%. Biomass had increased to 6842 mg/m^3 and chlorophyll *a* to 25.5 μg/L. In late September biomass had decreased to 715 mg/m^3 and Cyanophyceae and Chlorophyceae were co-dominant, each representing 48% of the biomass. In mid September, Cyanophyceae became dominant but biomass remained low (991 mg/m^3). Dominance reverted to Chlorophyceae in mid October. Biomass decreased to 377 mg/m^3 and was represented by 55% Chlorophyceae and 42% Cyanophyceae.

Metalimnion (Figure 8, Table 10): Sampling of the metalimnion in Lake 304 began on the 20th of May. At this time Chrysophyceae dominated. The biomass was represented by 53% Chrysophyceae, 22% Peridineae and 16% Chlorophyceae and was 2919 mg/m^3. Dominance shifted in mid June to Chlorophyceae and biomass increased to 16,661 mg/m^3, an estimated live cell count of 6 x 10^7 cells/L. Biomass fluctuated throughout July and August as did the species composition. In late July the biomass was represented by 34% Chrysophyceae, 30% Cryptophyceae, 19% Chlorophyceae and 14% Euglenophyceae and had a value of 4332 mg/m^3. In late August, Chlorophyceae increased to 64% of the standing crop and biomass increased to 7344 mg/m^3 with chlorophyll *a* increasing to 62.2 μg/L. Biomass decreased to 4760 mg/m^3 by mid September and continued to be dominated by Chlorophyceae, but with a different species composing the majority. Euglenophycean species contributed 10 to 20% of the biomass from early June until mid September. Sampling of the metalimnion was discontinued in mid September with the deepening of the epilimnion to the 1% light level.

Hypolimnion (Figure 8, Table 10): The hypolimnion in Lake 304 was sampled only three times during the ice-free season. Sampling was discontinued when the metalimnion extended below the 1% light level in late May. By early June the metalimnion extended down to 6 meters. In early May, a biomass value of 8059 mg/m^3 was recorded. The biomass at this time was represented by 49% Cryptophyceae, 20% Peridineae, 16% Chlorophyceae and 15% Chrysophyceae. *Cryptomonas pusilla, Cryptomonas erosa* and *Katablepharis ovalis* dominated the hypolimnion during the entire period it was sampled. Biomass decreased to 6910 mg/m^3 by late May.

LAKE 261

1974 (Figure 9, Table 11)

The Chrysophycean species continued to diminate Lake 261 from early January until late August. Fertilization was begun in mid May with only H_3PO_4 added at weekly intervals (Table 1). Peridinean species represented 15 to 20% of the standing crop for a brief period in late May and early June. A summer biomass maximum of 4614 mg/m^3 was recorded in mid July and chlorophyll *a* values averaged 17.8 μg/L. Dominance shifted to cryptophytes in early September and biomass decreased to 2525 mg/m^3. Cryptophyceae dominated until late October, when the standing crop was represented by 23% Chlorophyceae, 34% Chrysophyceae, 25% Cryptophyceae and 13% Peridineae. Chrysophyceae dominated from mid October throughout the remaining part of the year. Several peridinian species were also present. Diatomeae and Euglenophyceae contributed very little to the total population at any time during 1974.

1975

Epilimnion (Figure 9, Table 11): The epilimnion in Lake 261 was dominated by chrysophycean species in early May (1975). Peridineae represented 18% of the live biomass during this period. Weekly additions of H_3PO_4 began in mid May (Table 1). In late May Chlorophyceae became more abundant and by late June represented 25% of the phytoplankton standing crop, remaining common throughout the year. Average biomass values for this period were 943 mg/m^3 and chlorophyll *a* averaged 5.3 μg/L. Chrysophyceae remained dominant with those species found in May being the major contributors. Biomass values increased and reached a summer maximum of 3400 mg/m^3. In late August Chlorophyceae increased to 25% and biomass declined slightly to 2141 mg/m^3. Peridinean species represented 25% of the standing crop in early September. Chrysophyceae remained dominant with *Synura uvella* the major contributor. This species dominated the hypolimnion peak at 5 meters during the summer. Its presence in the epilimnion in September could be explained by fall deepening of the thermocline. By late September *Uroglena americana*, a colonial chrysophyte, became abundant. Biomass increased to a yearly maximum of 5098 mg/m^3 during this period. Peridineae, with the same species previously found continued to represent 20% of the biomass. Biomass declined to 917 mg/m^3 in the early part of October with Chrysophyceae dominating. An increase in Peridineae was recorded in mid October. It became co-dominant with the chrysophytes, and by November was the dominating phytoplankton.

Hypolimnion (Figure 10, Table 12): The hypolimnion in Lake 261 in mid May of 1975 was dominated by chrysophycean species. Biomass estimates for this time were 4156 mg/m^3 with corresponding chlorophyll *a* values of 11.1 µg/L. Chrysophyceae continued to dominate through the early part of June with several new species appearing in addition to the previous chrysophytes. Average biomass values increased to 7614 mg/m^3, the seasonal maximum. Chlorophyll *a* also increased to 20.1 µg/L. In late June Chrysophyceae declined from 80% of the standing phytoplankton crop to 50%. Cryptophyceae became abundant, representing 32% of the living biomass. These species continued to increase in numbers until late June. Biomass declined in late June, early July to 2500 mg/m^3 and then to 7385 mg/m^3 by late July. Dominance shifted in mid August back to Chrysophyceae. Biomass decreased to 2248 mg/m^3 by late August. Chrysophyceae dominated representing 56% of the live biomass. Chlorophyceae represented 21% and Euglenophyceae represented 15% of the standing crop of phytoplankton. Chrysophyceae remained dominant throughout September. Shortly after, the epilimnion mixed below the 1% light level and sampling of the hypolimnion was discontinued.

1976

Epilimnion (Figure 9, Table 11): In late April 1976, the epilimnion of Lake 261 had a biomass of 4121 mg/m^3, represented by 71% Chrysophyceae and 20% Peridineae. Fertilization began in mid May with weekly additions of H_3PO_4 as in previous years (Table 1). Biomass decreased throughout May and by early June was 754 mg/m^3. In mid June an increase in Chlorophyceae was recorded. Chlorophyceae represented 44% of the biomass with Chrysophyceae representing 47%. Peridineae had decreased to less than 3% of the standing crop. Biomass had not increased significantly (812 mg/m^3). Chlorophyceae decreased in late June to 19% of the biomass. Cyanophyceae represented 13% of the biomass at this time. By mid July, Cyanophyceae disappeared and were replaced by chlorophytes. Biomass increased to 1090 mg/m^3 with a corresponding chlorophyll *a* value of 4.6 µg/L. Chlorophycean species continued to increase in numbers, and by late July, represented 73% of the total biomass which had increased to 9594 mg/m^3. Chrysophytes at this time represented 21% of the standing crop. Dominance shifted to Chrysophyceae in mid August. Chlorophyceae represented 34% of the biomass at this time and Peridineae 12%. Biomass had increased to 7130 mg/m^3 and chlorophyll *a* to 10.8 µg/L. In late August, biomass crashed to 914 mg/m^3. Dominance shifted to Peridineae with those species found earlier dominating. Several species of Chrysophyceae became dominant in early September. Biomass increased to 3943 mg/m^3 by late September and Chlorophyceae became dominant representing 71% of the total biomass. Chlorophyceae dominated until mid October when dominance reverted back to Chrysophyceae with the appearance of *Synura uvella* in large numbers. This species dominated the hypolimnion peak in 261. Biomass increased to 3757 mg/m^3 at this time. Chrysophyceae continued to dominate the phytoplankton for the remainder of October.

Metalimnion (Figure 10, Table 12): Biomass of the metalimnion in Lake 261 was 878 mg/m^3 in early June (1976). Several species contributed to the dominance of Chrysophyceae. In mid June Chlorophyceae concentration increased to 38% of the total biomass. Chrysophyceae continued to dominate, representing 47% of the total biomass. In early July, the biomass was 746 mg/m^3 and was represented by 51% Chrysophyceae, 25% Chlorophyceae and 14% Peridineae. Biomass increased to 1324 mg/m^3 in mid July, with Peridineae increasing to 23% of the total biomass. Dominance shifted from Chrysophyceae to Chlorophyceae in mid July as the biomass increased to 7470 mg/m^3 (the seasonal maximum). This increase was due to the appearance of *Ankyra judai* in large numbers (in a live cell estimate of 3 x 10^7 cells/L this species accounted for 2.5 x 10^6 cells/L). Chlorophyll *a* at this time was 28.4 µg/L. Biomass decreased in mid August to 4200 mg/m^3 and dominance shifted to Chrysophyceae. Chlorophyceae had decreased, representing 35% of the standing crop. In late August several cryptophytes appeared representing 15% of the biomass while Peridineae represented 12%. In mid September biomass had decreased to 3000 mg/m^3. Chlorophyceae increased to 38% of the biomass. Chrysophyceae continued to dominate until sampling of the metalimnion ceased in mid September with the deepening of the epilimnion.

Hypolimnion (Figure 10, Table 12): The hypolimnion in Lake 261 was sampled for a brief period in May, after which time the hypolimnion was below the 1% light level. Throughout May the hypolimnion was dominated by Chrysophyceae. Biomass values increased from 1700 mg/m^3 in early May to 4600 mg/m^3 in late May. During this period small populations of Peridineae were present in addition to several chlorophycean species.

LAKE 302 NORTH

1974 (Figure 11, Table 13)

In late January (1974) the north basin of Lake 302 was dominated by Chrysophyceae and had a biomass of 344 mg/m^3. Several species composed the chrysophycean dominance. Also present at this time were small populations of Chlorophyceae and Cryptophyceae. Chrysophyceae continued to dominate the phytoplankton through spring and summer. In mid May additions of NH_4Cl, H_3PO_4 and sucrose were pumped below the thermocline (Table 1). In June several new chrysophycean species appeared in addition to those previously present. Biomass increased to 4100 mg/m^3 in early June and slowly decreased throughout July, August and September. In late July the biomass was represented by 40% Chrysophyceae, 19% Chlorophyceae, 18% Peridineae and 15% Diatomeae. Biomass values had decreased to 1199 mg/m^3 and chlorophyll *a* values were 3.8 µg/L. In late August an increase in *Dinobryon sertularia* var. *protuberans* was recorded. This species dominated the hypolimnion peak. A possible explanation for its increase could be fall mixing of the epilimnion deep enough to incorporate the peak dominated by this species. The biomass did not increase significantly with the increase of this species (1625 mg/m^3). In late September it represented 44% of the total biomass. By late October dominance shifted to Cryptophyceae. Biomass had increased to 4863 mg/m^3 and in mid November reached a yearly maximum value of 7780 mg/m^3. Chlorophyll a had a corresponding value of 48.1 μ g/L. Cryptophyceae dominated until early December when the biomass was represented by 34% Chrysophyceae, 32% Cryptophyceae, 20% Chlorophyceae and 12% Diatomeae and had decreased to 2724 mg/m^3.

1975

Epilimnion (Figure 11, Table 13): Lake 302 north's epilimnion was dominated by Chrysophyceae in mid May. Biomass was 3493 mg/m^3 with corresponding chlorophyll a values of 8.2 μg/L. At this time Chrysophyceae represented 65% of the biomass with those species previously present being the major contributors. In addition cryptophytes represented 24% of the standing crop. In mid May additions of NH_4Cl, H_3PO_4 and sucrose began. This solution was pumped down below the thermocline (8 meters) as in previous years (Table 1). Biomass decreased in late May to 2160 mg/m^3 with the disappearance of the Cryptophytes. Chrysophyceae continued to dominate constituting 87% of the biomass with the appearance of *Uroglena americana* in large numbers. By mid June biomass estimates had decreased to 952 mg/m^3 with an estimated cell count of 32 x 10^5 cells/L. In early June an increase in biomass to 2250 mg/m^3 was recorded. Chrysophyceae continued to dominate with those species present in May. Diatomeae represented 10% of the standing crop at this time while Chlorophyceae represented 9%. This trend continued throughout the remainder of the ice-free season. Biomass fluctuated from 1700 mg/m^3 to 3700 mg/m^3 during this period. In mid November biomass increased to 5500 mg/m^3. At this time increases in several cryptophycean species were recorded. The epilimnion of Lake 302 north, as in past years, was continually dominated by Chrysophyceae with small populations of Diatomeae, Cryptophyceae and Chlorophyceae appearing. For the most part, both biomass and chlorophyll a remained low in relation to those of lakes receiving artificial enrichment in the epilimnion.

Hypolimnion (Figure 12, Table 14): The hypolimnion of Lake 302 north had two sucessive peaks in 1975. The first occurred in mid May. Biomass at this time was 3760 mg/m^3 and was dominated by chrysophycean species remaining from the previous winter. Artificial enrichment began in mid May with NH_4Cl, H_3PO_4 and sucrose being pumped into the hypolimnion (Table 1). Biomass decreased and in early July was 1299 mg/m^3. Chrysophyceae continued to dominate representing 82% of the phytoplankton population. Chlorophyceae represented 7% of the biomass at this time while Diatomeae represented another 5%. The second peak occurred in mid July. Biomass increased to 4584 mg/m^3 with corresponding chlorophyll a values of 27 μg/L. Chrysophyceae continued to dominate the phytoplankton for the remainder of the sampling period. By late September biomass decreased to 2710 mg/m^3. Sampling of the hypolimnion was discontinued at this time due to the deepening of the epilimnion.

1976

Epilimnion (Figure 11, Table 13): In late April (1976) the epilimnion in the north basin of Lake 302 was dominated by Chlorophyceae with small populations of chrysophytes present. Biomass was 11,751 mg/m^3 (the highest recorded in 1976 for 302 north) and chlorophyll a averaged 27.9 μg/L. Artificial enrichment began in mid May with C, N and P being pumped below the thermocline (Table 1). Biomass decreased to 2699 mg/m^3 in mid May and dominance shifted to Chrysophyceae. In early June biomass had decreased to 1598 mg/m^3 and chlorophyll a values decreased to 4.5 μg/L. Chrysophyceae continued to dominate with small populations of diatoms occurring frequently. Biomass fluctuated throughout June and in late June was estimated at 2921 mg/m^3. The standing crop at this time was represented by 49% Chrysophyceae, 17% Chlorophyceae, 13% Diatomeae, 10% Peridineae and 6% Cryptophyceae. By mid July Chlorophyceae represented 35% of the biomass with an increase in several species. Chlorophycean populations decreased and by mid August Chrysophyceae had increased to 71% of the total biomass. Diatomeae continued to represent 10 to 15% of the biomass with the species previously mentioned. Species composition did not change until early September when the biomass was represented by 54% Chrysophyceae, 17% Cyanophyceae, 14% Diatomeae and 10% Chlorophyceae. The increase in Cyanophyceae was due to the appearance of *Anabaena planctonica*. Biomass at this time was 5297 mg/m^3 and chlorophyll a was recorded at 4.3 μg/L. Biomass decreased to 3070 mg/m^3 in early October and Chrysophyceae dominated. During this time a small pulse of cryptophycean species was recorded. By mid October the previously mentioned cryptophytes represented 40% of the biomass which had decreased to 2323 mg/m^3.

Metalimnion (Figure 12, Table 14): The metalimnion in Lake 302 north had a biomass of 3860 mg/m^3 and a corresponding chlorophyll a value of 21.5 μg/L in mid May (1976). Chrysophyceae dominated with large populations of chlorophycean species present at this time. In early June dominance shifted to Chlorophyceae which represented 45% of the total biomass. Chrysophyceae had decreased to represent 25% of the standing crop and Diatomeae and Cryptophyceae each represented 7%. Chrysophyceae again became dominant in mid June and biomass decreased to 1567 mg/m^3 and chlorophyll a decreased to 20.0 μg/L. In early July the standing crop was represented by 43% Chrysophyceae,35% chlorophyceae, 14% Diatomeae and 6% Cryptophyceae. Biomass increased to 4443 mg/m^3 in late July. Chrysophyceae remained dominant with those species found in early May. Chlorophyceae represented 15% of the biomass at this time with Diatomeae and Cryptophyceae each representing 7%. In mid August the biomass had receded to 2656 mg/m^3 and an average chlorophyll a value of 8 μg/L was recorded. By late August biomass had increased to 3133 mg/m^3 and continued to increase, reaching 4122 mg/m^3 on the 15th of September. The phytoplankton assemblage was represented by 34% Chrysophyceae and 12% Diatomeae. Sampling was discontinued in mid September because of deepening of the epilimnion.

Hypolimnion (Figure 12, Table 14): In early May (1976) the north basin of Lake 302 was dominated by Chlorophyceae with large numbers of Chrysophyceae present. Biomass was 4408 mg/m^3 and chlorophyll a was recorded at 20 μg/L. Artificial enrichment began in mid May with weekly additions of sucrose,

NH_4Cl and H_3PO_4 being pumped down to 8 meters (below the thermocline) as in previous years (Table 1). Biomass decreased to 1300 mg/m^3 in late May. The standing crop at this time was represented by 41% Chlorophyceae, 33% Chrysophyceae, 18% Diatomeae and 6% Cryptophyceae. Dominance shifted in early June to Chrysophyceae with those species found in early May dominating. Biomass values increased to 3645 mg/m^3 and chlorophyll *a* increased to 20 µg/L. In early July two chlorophycean species increased in numbers causing a shift in dominance to Chlorophyceae. Dominance reverted back to Chrysophyceae in mid July and biomass increased to 10,664 mg/m^3. This increase was caused by the appearance of *Chrysosphaerella longispina* which represented 63% of the total biomass. The standing crop at this time was represented by 90% Chrysophyceae, 4% Diatomeae and 3% Chlorophyceae. By mid August biomass decreased to 5476 mg/m^3 and chlorophyll *a* averaged 58.4 µg/L. Chlorophyceae increased to 33% of the biomass with those species present earlier being the major contributors. *Chrysosphaerella longispina* disappeared at this time and Chrysophyceae decreased, representing 49% of the standing crop. Cryptophyceae increased in numbers representing 10% of the biomass. Sampling was discontinued in mid August due to deepening of the metalimnion below the 1% light level.

LAKE 302 SOUTH

1974 (Figure 13, Table 15)

In late January Lake 302 south had a biomass value of 452 mg/m^3. The standing crop was represented by 61% Chrysophyceae, 12% Diatomeae and 12% Chlorophyceae. Biomass values remained low for the remainder of the ice-covered season and the early part of the ice-free season. In early June biomass values had increased to 2033 mg/m^3. Chlorophyll *a* values for this period averaged 3.9 µg/L. Chrysophyceae dominated with several new species added to those remaining from the previous winter. Biomass continued to increase reaching 3920 mg/m^3 in late July, a yearly maximum for the south basin of Lake 302. Biomass decreased for the remainder of the year and by early December was 1300 mg/m^3. Species composition remained the same until late October. Chrysophyceae remained dominant with increased populations of Cryptophyceae and Diatomeae occurring. In late November the biomass was represented by 60% Chrysophyceae, 15% Diatomeae and 13% Cryptophyceae. This trend lasted for the remainder of the year.

1975

Epilimnion (Figure 13, Table 15): The epilimnion in Lake 302 south was dominated by Chrysophyceae in mid May. Biomass was 992 mg/m^3 with a corresponding chlorophyll *a* value of 3 µg/L. Biomass increased to 1850 mg/m^3 by late May with the appearance of a small population of Chlorophyceae. In mid June an increase in Diatomeae was recorded with several species contributing. By late June the biomass was represented by 68% Chrysophyceae, 20% Diatomeae and 8% Chlorophyceae. In early July the biomass peaked, reaching 4031 mg/m^3 (the yearly maximum). Chrysophyceae dominated the phytoplankton for the remainder of the ice-free season and those species previously found being the more abundant. Chlorophyceae and Diatomeae continued to compose 10 to 20% of the total biomass which fluctuated between 1200 mg/m^3 and 2327 mg/m^3 from mid July until mid November.

Hypolimnion (Figure 14, Table 16): The hypolimnion of Lake 302 south was dominated by Chrysophyceae throughout the entire sampling period in 1975, several which remained from the previous winter. Biomass at this time was 2472 mg/m^3. In early July the formation of a hypolimnion peak at 6 meters was found by E. J. Fee using *in vivo* fluorometry. This peak was dominated by the chrysophycean species *Uroglena americana* and was integrated into the hypolimnion sample; thus the biomass increased significantly. By mid July, biomass estimates increased to 11,679 mg/m^3. A live cell count of 4 x 10^7 cells/L was calculated, of which 3.1 x 10^6 cells/L were *Uroglena americana*. Biomass decreased throughout the remaining part of the ice-free season. Sampling of the hypolimnion ceased in early September due to the deepening of the epilimnion in relation to the 1% light level.

1976

Epilimnion (Figure 13, Table 15): In late April (1976) the epilimnion in the south basin of Lake 302 was dominated by Chrysophyceae. In addition, small populations of chlorophytes were present. Biomass was estimated at 1182 mg/m^3 and chlorophyll *a* averaged 5.1 µg/L. In mid May biomass increased to 3081 mg/m^3. Chrysophyceae, with those species previously present, represented 88% of the standing crop. By early June biomass decreased to 1086 mg/m^3 and the phytoplankton community was represented by 72% Chrysophyceae, 8% Peridineae, 6% Chlorophyceae, 6% Cryptophyceae and 6% Diatomeae. Diatomeae increased to 13% of the biomass in mid June and in late June, a small pulse of chlorophytes was recorded.

Biomass increased to 2839 mg/m^3 and chlorophyll *a* averaged 3.6 µg/L. In mid July the standing crop was represented by 50% Chrysophyceae, 24% Diatomeae, 10% Chlorophyceae, 9% Peridineae and 5% Cryptophyceae.

Biomass had decreased to 1501 mg/m^3. Biomass increased throughout the remainder of July, August and in early September peaked at 3754 mg/m^3 (an epilimnetic maximum for Lake 302 south in 1976). Chrysophyceae dominated with those species found earlier in the summer. Diatomeae continued to represent 15 to 20% of the standing crop during this time. Cyanophyceae represented 10% of the biomass in early September. Biomass decreased in late September reaching 3198 mg/m^3. Chlorophyll *a* values at this were 4.8 µg/L. By early October biomass had decreased to 1989 mg/m^3 and was represented by 70% Chrysophyceae, 13% Diatomeae, 9% Cryptophyceae and 7% Chlorophyceae. This trend continued for the remainder of the ice-free season and biomass stabilized around 1900 mg/m^3.

Metalimnion (Figure 14, Table 16): In mid May the metalimnion in the south basin of Lake 302 was dominated by chrysophycean species. Biomass was 3212 mg/m^3 and chlorophyll *a* averaged 3.9 µg/L. Also present during this period were small populations of chlorophytes and diatoms. In mid June Diatomeae increased, representing 29% of the standing crop of phytoplankton. Biomass increased gradually throughout June and early July, reaching 6348 mg/m^3 on July 29th. Species composition at this time was 72% Chrysophyceae, 17% Diatomeae, 5% Chlorophyceae and 3% Cryptophyceae. The increase in biomass was attributed to an increase in several chrysophycean species. Biomass decreased throughout August and early September reaching 2117 mg/m^3 in mid September. Chlorophyll *a* averaged 4.5 µg/L at this time. Chrysophyceae continued to dominate. Sampling was discontinued in mid September because of deepening of the epilimnion.

Hypolimnion (Figure 14, Table 16): The hypolimnion in Lake 302 south had a standing crop represented by 70% Chrysophyceae, 14% Chlorophyceae, 6% Cryptophyceae and 6% Diatomeae in early May. Biomass was 1532 mg/m^3 with a corresponding chlorophyll *a* value of 3.8 µg/L. By late May the biomass increased to 4236 mg/m^3. Chrysophyceae continued to dominate with those species found in early May composing the majority of the population in addition to several new species. The biomass continued to increase reaching 4690 mg/m^3 on June 9th. Diatomeae had increased representing 17% of the biomass. In the latter part of June, biomass decreased to 2777 mg/m^3 and species composition changed to 57% Chrysophyceae, 21% Chlorophyceae and 18% Diatomeae. The chrysophycean species most common were those found in early spring. The biomass increased throughout the early part of July, and on July 21 was recorded at 7652 mg/m^3. Chlorophyll *a* had increased to 21 µg/L. This increase was due to the appearance of *Chrysosphaerella longispina* in large numbers. This species represented 54% of the total biomass at this time which was represented by 82% Chrysophyceae, 5% Diatomeae, 3% Peridineae and 3% Cryptophyceae. Sampling of the hypolimnion ceased in late July due to deeper sampling depths for the metalimnion.

DISCUSSION

EPILIMNION FERTILIZATION

All lakes (226 north, 227 and 304), receiving epilimnetic additions of phosphorus and nitrogen, continued to have greater biomass than the control lakes found in the E.L.A. area. Species composition changed from that of control lakes as in previous years (Findlay and Kling 1975). Biomass increases for 1974-1976 for these lakes in comparison to control lakes and prefertilization ranged from 5000 mg/m^3 to 21,000 mg/m^3 in comparison to increases of 10,000 mg/m^3 to 63,000 mg/m^3 recorded from 1969 to 1973. The control lakes (224, 239, 302 south and 383) had an ice-free average biomass of 2000 mg/m^3 from 1969 to 1974 and an ice-free epilimnetic average biomass of 2200 mg/m^3 for 1974 to 1976 (Table 2) (increased biomass in the control lakes is due to discrete sampling depths in 1969-1973 as compared to integrated sampling in 1975-1976). Species composition shifted from dominance by Chrysophyceae in control lakes to Chlorophyceae dominance, with periods during which Cyanophyceae dominated, in fertilized waters. Lake 227, from 1969 to 1973, received additions of N and P at a ratio of 15:1 (Table 1) and was constantly dominated by small Chlorophyceae throughout the ice-free season with short periods in late summer when *Oscillatoria Redekei*, a filamentous cyanophyte dominated. In 1974, Lake 227 continued to receive additions of N and P at a ratio of 15:1 by weight (Table 1) as in previous years and was dominated by Chlorophyceae from early spring to mid August. In late August and September dominance shifted to *Oscillatoria Redekei* as it had in 1969 and 1973. This species is not believed to be a nitrogen-fixer. In 1975 and 1976 N and P loading ratio for Lake 227 was changed to 5:1 by weight (Table 1). In both years, large populations of *Aphanizomenon gracile*, a filamentous cyanophyte, were present in late August and early September, concurrent with substantial nitrogen-fixation. Lake 226 north also received N:P loading at a ratio of 5:1 by weight (Table 1). From the time artificial enrichment began in 1973, this basin has been dominated by cyanophytes in late summer (*Anabaena spiroides* in 1973, *Anabaena solitaria* f. a. *planctonica* in 1974 to 1976). Nitrogen-fixation has been recorded during these times. Lake 304 was receiving additions of N:P at a ratio of 15:1 (1975 and 1976) (Table 1) and in 1976 was dominated by *Aphanizomenon flos-aquae* in late August. At this time nitrogen-fixation was undetectable. Looking at data from 227, 226 north and 304 it appears that nitrogen-fixation in E.L.A. lakes occurs when the N:P ratio is 5:1 by weight, but not 15:1.

Lake 226 south received the same concentrations of C and N as did the north basin, but no H_3PO_4 was added (Table 1). In 1974 to 1976 biomass did not increase significantly in comparison to control lakes (239, 302 south, 224). Chrysophyceae continued to dominate the epilimnion in the south basin for the entire ice-free season.

HYPOLIMNION FERTILIZATION

Previous to 1975 all samples were taken at discrete depths and then integrated. Therefore there is no existing hypolimnion data for comparison.

Lake 302 north was fertilized with C, N and P below the thermocline (Table 1). In 1974, the epilimnion biomass averaged 5212 mg/m^3 during the ice-free season (Table 2). Chrysophyceae dominated with the occurrence of small populations of Cryptophyceae. In 1975 and 1976 the epilimnetic biomass averaged 2200 to 3300 mg/m^3 (Table 2) throughout the ice-free season with Chrysophyceae dominating. The hypolimnion biomass averaged 5031 mg/m^3 in 1975 (Table 2) and Chrysophyceae were dominant for the entire season. In 1976 the hypolimnion biomass averaged 4111 mg/m^3 (Table 2) and the standing crop was dominated by Chlorophyceae from early May to late June. Dominance shifted to Chrysophyceae in early July. These prevailed throughout the remainder of the ice-free season. Epilimnion biomass has increased slightly since artificial enrichment began in 1973. Hypolimnion biomass for Lake 302 north has also increased since fertilization (in comparison to the values recorded for 1972 to 1974 in Table 2), and species composition has shown an early spring shift to Chlorophyceae away from the predominant chrysophytes which dominated the control lakes in the Experimental Lakes Area (E.L.A.).

EPILIMNION FERTILIZATION WITH PO_4

Lake 261 continued to receive additions of PO_4 to its epilimnion from 1974 to 1976 (Table 1). Epilimnion biomass has increased since additions began in 1974 when a maximum biomass of 4600 mg/m^3 was recorded. In 1976 a maximum biomass of 9600 mg/m^3 was recorded. Both peaks (1974 and 1976) occurred in late July. Chrysophyceae dominated the epilimnion throughout 1974 and 1975 with major species being *Dinobryon* spp. and several species of small flagellated chrysophytes. In 1976 species composition fluctuated throughout the entire ice-free season. Dominance shifted from Chrysophyceae in early spring and summer to Chlorophyceae in late July and early August, then to Peridineae in late August. Chrysophyceae resumed dominance in late October. The effects of PO_4 additions are becoming more noticeable now as shown by increased biomass and fluctuating species composition.

ACKNOWLEDGMENTS

I would like to thank J. A. Shearer and D. R. DeClercq who did the sampling and J. Prokopowich for the use of the chemical data. H. Valiant and S. Elliott assisted in computer programming. Appreciation is given to Dr. D. W. Schindler, Dr. E. J. Fee, H. J. Kling and T. Ruszczynski who offered advice and criticisms during preparation of this report. Thanks is also due to C. Anderson who typed this report.

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Table 1. Nutrient additions and ratios.

Lake	Artificial nutrients added				Ratio	Comments	*Total N:P ratio	
	Year	$C/g/m^2/yr$	$N/g/m^2/yr$	$P/g/m^2/yr$	C N P		1974	1975
227	1969-1974		7 $NaNO_3$	0.5 PO_4	14:1	epilimnion addition by boat	13.9:1	6.7:1
	1975-1976		2.25 $NaNO_3$	0.46 PO_4	5:1	epilimnion addition by point source		
226N	1973-1976	3.46 sucrose	1.808 $NaNO_3$	0.34 PO_4	10:5:1	epilimnion addition by boat 1973-1974	7:1	7.4:1
						epilimnion addition by point source 1975-1976		
226S	1973-1976	3.69 sucrose	1.93 $NaNO_3$			epilimnion addition by boat 1973-1974	70:1	84:1
						epilimnion addition by point source 1975-1976		
261	1973-1976			0.246 PO_4		epilimnion addition by boat 1973-1974	3.5:1	3.9:1
						epilimnion addition by point source 1975-1976		
302N	1972-1976	3.73 sucrose	2.79 $NaNO_3$	0.536 PO_4	7:5:1	hypolimnion addition (below 8 meters)	6.1:1	6.4:1
302S	1972-1976						22:1	29:1
304	1971-1972	5.5 sucrose	5.2 NH_4Cl	0.4 PO_4	13.8:13:1	epilimnion addition by boat	139:1	14.9:1
	1973-1974	5.5 sucrose	5.2 NH_4Cl			epilimnion by boat		
	1975-1976		14.48 $NaNO_3$	1.01 PO_4	14:1	epilimnion addition by point source		

* Note: Total N:P ratios vary due to varying precipitation inputs and runoff inputs.

Table 2. A comparison of mean biomass (mg/m^3) for two sampling techniques.

Lake	Layer	DISCRETE SAMPLING DEPTHS 1969	1970	1971	1972	1973	1974	1969-1974 mean biomass	Integrated sample 1975	1976	1975-1976 mean biomass
227	0-7	1966	5692	3709	13317	10139	10242	7511			
	Epi								9711	11509	10610
	Meta									13885	13885
	Hypo								11535	6347	8941
226N	0-7			836		3342	5000	3060			
	Epi								8570	5597	7084
	Meta									2008	2008
	Hypo								6288	2640	4465
226S	0-7					2589	2666	2628			
	Epi								3005	3498	3252
	Meta									5034	5034
	Hypo								5954	5499	5726
261	0-7			1781	1128	1523	2531	1740			
	Epi								2008	2859	2434
	Meta									2868	2868
	Hypo								4969	3491	4230
302N	0-7				1658	2460	5212	3110			
	Epi								2155	3255	2705
	Meta									3146	3146
	Hypo								3031	4111	3571
302S	0-7				935	2716	2439	2030			
	Epi								1907	2314	2110
	Meta									3628	3628
	Hypo								4519	3951	4235
304	0-5	1693	1441	4456	11418	4712	3511	4539			
	Epi								3295	4320	3807
	Meta									6374	6374
	Hypo								5739	7934	6837

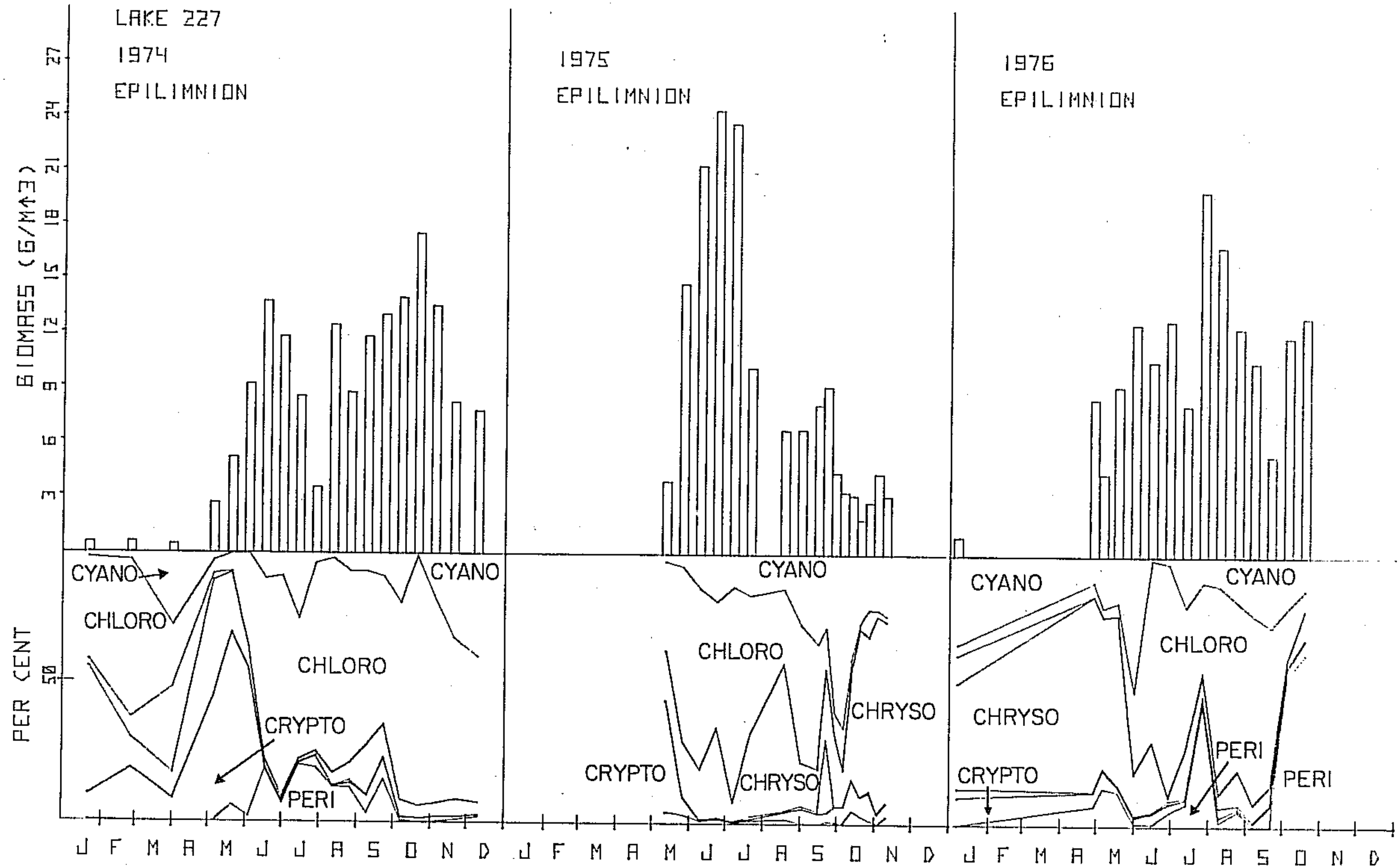

Figure 1. Average phytoplankton volume in the epilimnion of Lake 227 in 1974-1976, and accumulative percent composition.

Table 3. Lake 227

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
0-7 m. 1974	Jan Feb-Apr		*Ankistrodesmus falcatus var. spiralis* *Scenedesmus sp.* *S. quadricauda* *Oocystis submarina var. variablis*	*Erkenia subaequiciliata* *Chromulina sp.*		
	Apr	*Oscillatoria Redekei* *Synechococcus sp.*				
	May			*Botryococcus Braunii* *Erkenia subaequiciliata* *Dinobryon cylindricum*	*Cryptomonas obovata* *C. erosa* *Katablepharis ovalis*	
	Jun-Nov	*Oscillatoria Redekei*	*Scenedesmus sp.* *Oocystis submarina var. variablis* *Dictyosphaerium simplex* *Ankistrodesmus falcatus var. spiralis* *Chlamydomonas sp.*			*Gymnodinium mirabile* *Peridinium aciculiferrim* *P. sp.*
Epi 1975	May		*Scenedesmus brevispina* *Sponoylosium planum* *Ankistrodesmus falcatus var. spiralis* *Chlamydomonas spp.*		*Cryptomonas ovata* *Rhodomonas minuta*	
	Jun Jul-Oct	*Oscillatoria Redekei* *Aphanizomenon gracile*		*Erkenia subaequiciliata*		
	Oct			*Erkenia subaequiciliata* *Dinobryon bavaricum* *Mallomonas pumilio var.*		
Epi 1976	Jan-Apr	*Oscillatoria Redekei*		*Erkenia subaequiciliata* *Dinobryon cylindricum* *D. bavaricum* *D. sociale var. americana*		
	Apr May					*Peridinium sp.* *Gymnodinium mirabile*
	Jun	*Oscillatoria Redekei*	*Spondylosium planum* *Chlamydomonas spp.* *Dictyosphaerium simplex* *Monoraphidium setiforme* *Scenedesmus quadricauda*			
	Jul-Aug					*Peridinium aciculiferrim* *P. inconspicuum* *Gymnodinium mirabile*
	Aug-Oct	*Oscillatoria Redekei* *Aphanizomenon gracile*	*Oocystis submarina var. variablis* *Ankistrodesmus falcatus var. spiralis*			
	Oct					*Peridinium inconspicuum* *Gymnodinium mirabile*

Note: common Euglenophyceae - *Euglena acus*, *Astasia parvula*, *Trachelomonas volvocina* (April 1974).

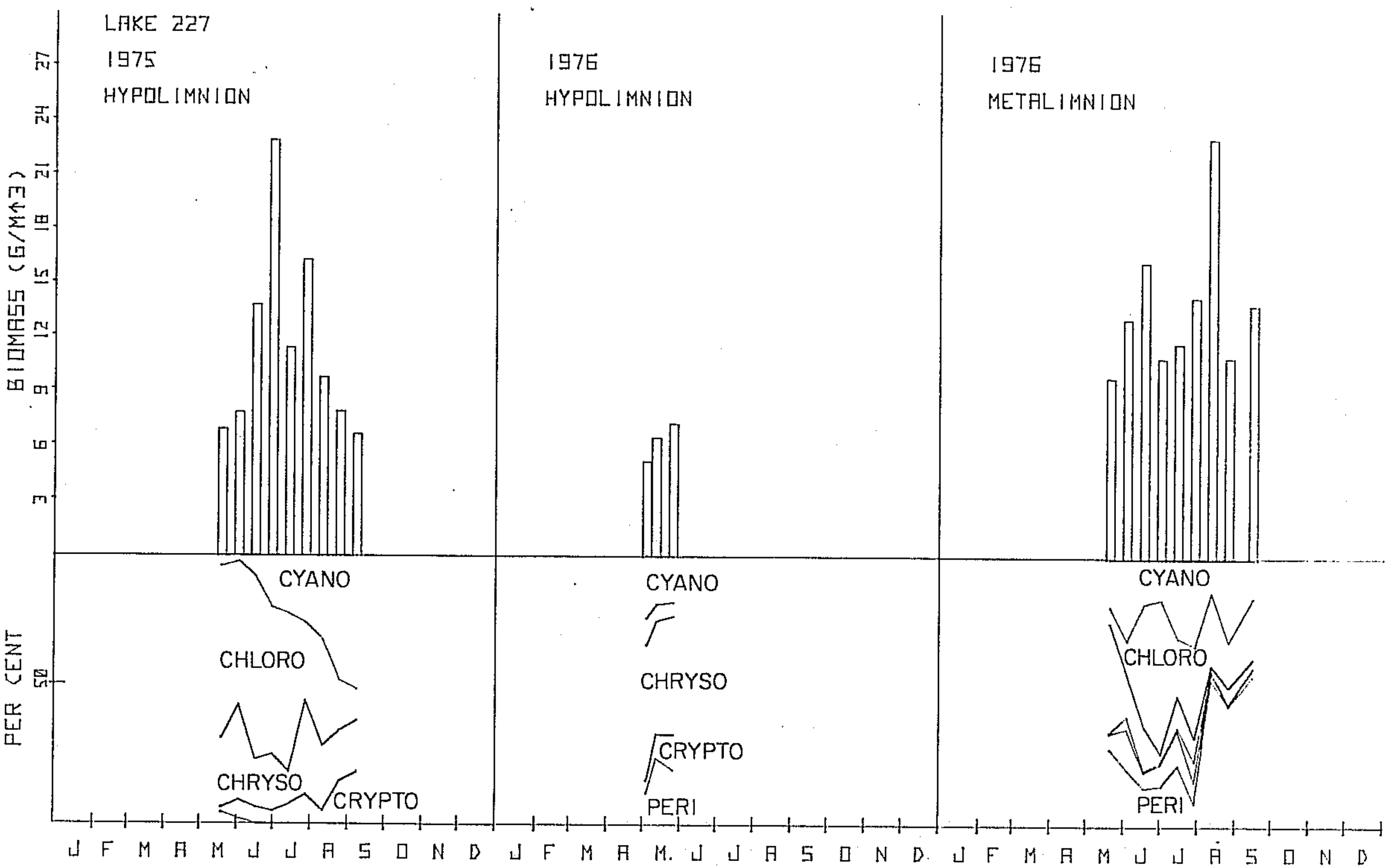

Figure 2. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 227 in 1975-1976, and accumulative percent composition.

Table 4. Lake 227

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
Hypo 1975	May-Aug		*Scenedesmus brevispina*	*Erekenia subaequiciliata* *Dinobryon bavaricum* *Mallomonas pumilio var.*		
	Jul-Sep	*Oscillatoria Redekei* *Aphanizomenon gracile*				
Hypo 1976	May	*Oscillatoria Redekei*	*Chlamydomonas spp.* *Ankistrodesmus falcatus var. spiralis* *Dictyosphaerium simplex*	*Erkenia subaequiciliata* *Mallomonas pumilio var.* *M. elongata* *Dinobryon cylindricum* *D. sertularia* *D. bavaricum var. Vanhoeffenii*		*Gymnodinium sp.* *Peridinium palustre*
Meta 1976	May	*Oscillatoria Redekei* *Lyngbya sp.*		*Erkenia subaequiciliata* *Dinobryon cylindricum* *D. bavaricum var. Vanhoeffenii* *Mallomonas acaroides*		*Peridinium spp.* *Gymnodinium mirabile*
	Jun-Aug	*Oscillatoria Redekei*				
	Aug		*Spondylocium planum* *Dictyosphaerium simplex* *Scenedesmus quadricauda* *Ankistrodesmus falcatus var. spiralis*			*Gymnodinium mirabile*

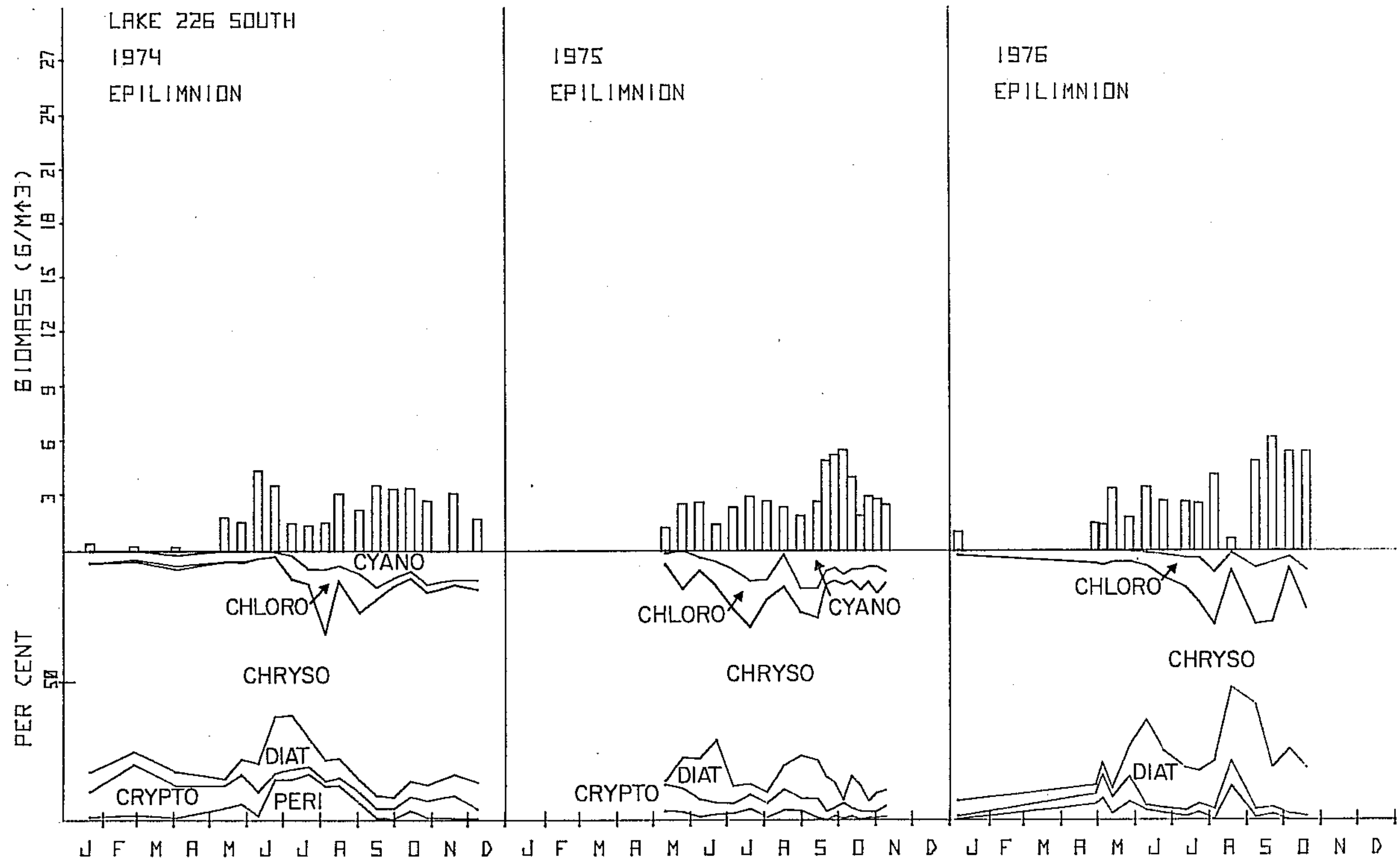

Figure 3. Average phytoplankton volume in the epilimnion of Lake 226 south in 1974-1976, and accumulative percent composition.

Table 5. Lake 226 south

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
0-7 m 1974	Jan-May			*Botryococcus Braunii* *Mallomonas pumilio* *Dinobryon bavaricum* *D. sertularia var. protuberans*		
	May			*Chromulina sp.* *Chrysosphaerella longispina* *Dinobryon cylindricum* *Erkenia sp.*		*Cryptomonas erosa* *C. pusilla*
	Jun-Aug			*Chromulina sp.* *Botryococcus Braunii* *Dinobryon crenulatum* *D. Borgie* *Mallomonas pumilio* *Chromulina sp.*	*Cyclotella comta* *Rhizosolenia eriensis* *Tabellaria flocculosa* *Synedra acus*	*Cryptomonas ovata* *Katablepharis ovalis* *Rhodomonas minuta*
	Aug	*Anabaena solitaria f.a. planctonica*	*Sphaerozosma granulatum*			
	Aug-Nov			*Dinobryon bavaricum* *D. bavaricum var. Vanhoeffenii* *D. sertularia* *Mallomonas globosa* *M. pumilio* *Chromulina sp.* *Erkenia sp.*		
Epi 1975	May-Nov			*Botryococcus Braunii* *Dinobryon sertularia var. protruberans* *Synura uvella* *Mallomonas caudata* *Chromulina sp.*		
	Jun				*Cyclotella comta* *Rhizosolenia eriensis* *Tabellaria fenestrata* *T. flocculosa* *Synedra acus*	
	Jul	*Chroococcus limneticus*	*Sphaerozosma granulatum* *Arthrodesmus incus*			
Epi 1976	Jan-Nov			*Synura uvella* *Chrysosphaerella longispina* *Chrysochromulina parva* *Dinobryon sertularia*		
	Jun Jul		*Scenedesmus brevispina* *Spondylosium planum* *Chlamydomonas spp.*		*Cyclotella comta*	
	Aug				*Synedra acus* *Tabellaria flocculosa* *Cyclotella comta*	
	Sep		*Dictyosphaerium simplex* *Spondylosium planum*	*Chromulina sp.* *Uroglena americana*	*Melosira sp.* *Synedra acus* *Rhizosolenia eriensis*	

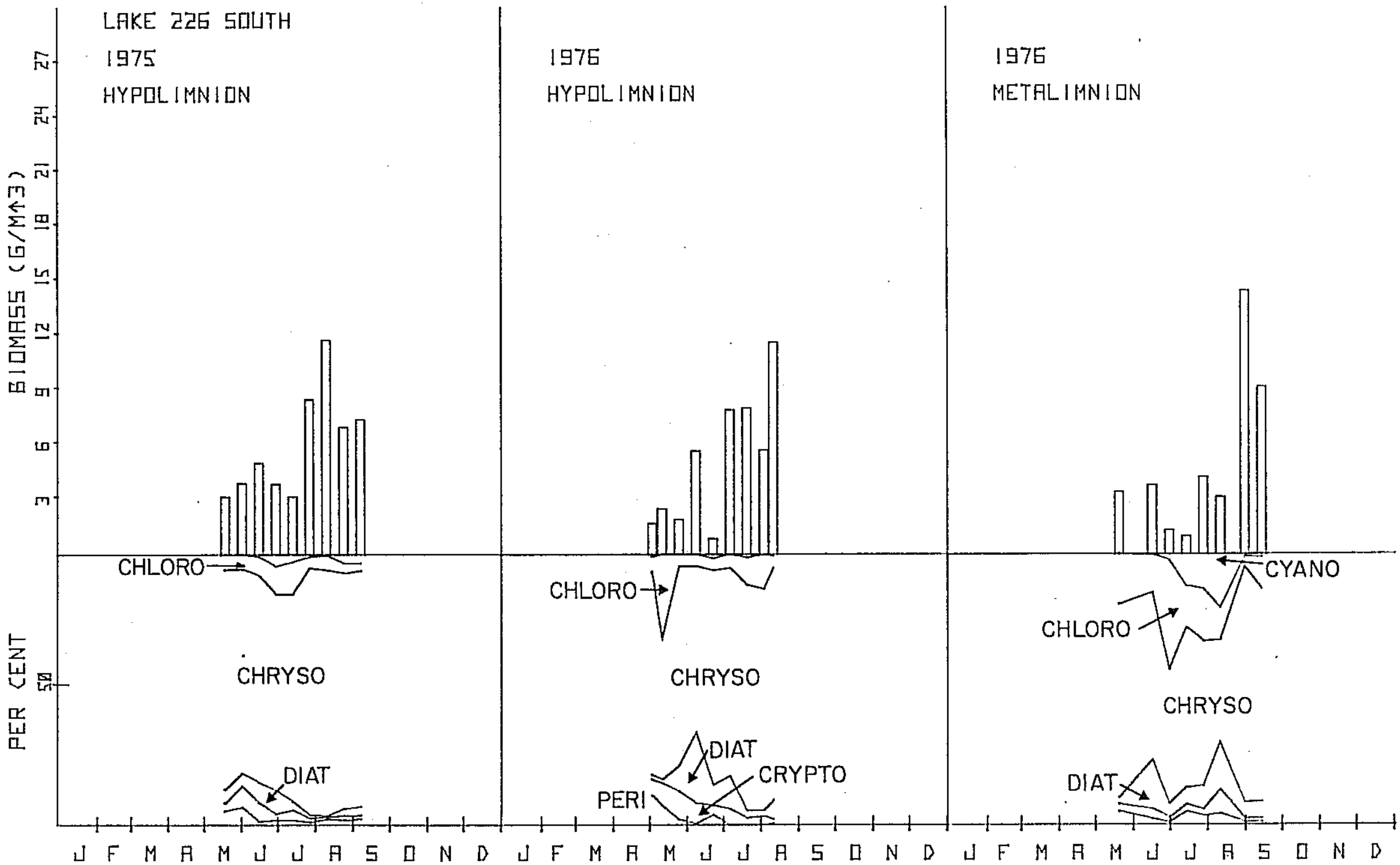

Figure 4. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 226 south in 1975-1976, and accumulative percent composition.

Table 6. Lake 226 south

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
Hypo 1975	May-Jul			*Uroglena americana* *Mallomonas pumilio* *Synura uvella* *Botryococcus Braunii* *Chromulina* sp. *Chrysococcus* sp. *Dinobryon crenulatum* *D. sertularia* var. *protruberans* *D. bavaricum* var. *Vanhoeffenii*		
	Sep			*Synura uvella*		
Hypo 1976	May-Jun		*Scenedesmus brevispina*	*Synura uvella* *Dinobryon sertularia* *Erkenia subaequiciliata* *Chrysoikos skujai* *Chromulina* sp.		
	Jun-Aug			*Botryococcus Braunii* *Uroglena americana* *Synura uvella* *Dinobryon Borgie* *Chrysochromulina parva*	*Cyclotella comta* *Synedra acus* *Tabellaria flocculosa*	*Cryptomonas erosa* *Rhodomonas minuta* *Katablepharis ovalis*
Meta 1976	May-Jul		*Chlamydomonas* sp. *Oocystis lacustris* *Arthrodesmus incus* *Monoraphidium setiforme*	*Dinobryon crenulatum* *D. sertularia* *Chromulina* sp. *Chrysococcus* sp. *Erkenia subaequiciliata* *Mallomonas* spp.		
	Jun		*Scenedesmus brevispina* *Dictyosphaerium simplex*		*Cyclotella comta* *Synedra acus* *Tabellaria fenestrata* *Tabellaria flocculosa*	
	Jul-Aug	*Rhabdoderma Gorskii* *Chroococcus limneticus* *Anabaena solitaria* f.a. *planctonica* *Oscillatoria Redekei*		*Synura uvella* *Dinobryon sertularia* var. *protruberans*	*Cyclotella comta* *Synedra acus*	

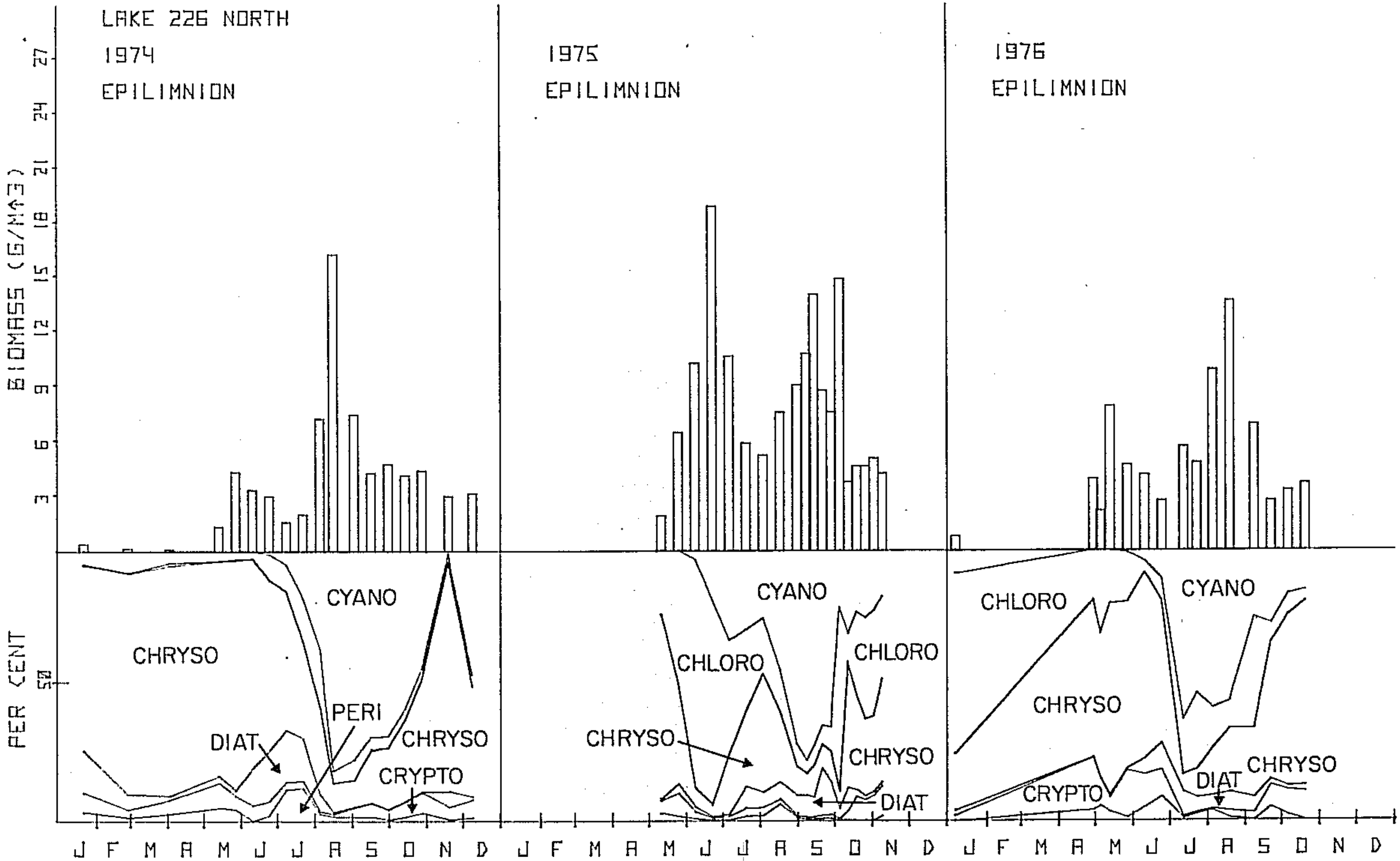

Figure 5. Average phytoplankton volume in the epilimnion of Lake 226 north in 1974–1976, and accumulative percent composition.

Table 7. Lake 226 north

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
0-7 m 1974	Jan-Aug			*Botryococcus Braunii* *Dinobryon bavaricum* *D. sertularia* *Chrysococcus* sp. *Kephrion boreale*	*Rhizosolenia eriensis*	
	Aug-Nov	*Anabaena spiroides*	*Staurastrum* sp. *Cosmarium undulatum* *Sphaerozosma granulata* *Chlamydomonas* sp.			
	Nov			*Dinobryon bavaricum* *D. sertularia* *Chromulina* sp. *Erkenia subaequiciliata*		
Epi 1975	May		*Ankistrodesmus falcatus* var. *spiralis*	*Uroglena americana* *Dinobryon sertularia* *D. bavaricum* *Erkenia subaequiciliata* *Chromulina* sp. *Chrysoikos skujai*		
	Jun-Jul	*Oscillatoria Redekei* *Anabaena solitaria f.a. planctonica*	*Chlorella* sp. *Chlamydomonas* sp. *Spondylosium planum* *Dictyosphaerium simplex* *Scenedesmus brevispina* *Lagerheimia* sp.			
	Aug			*Mallomonas pumilio* *M. caudata* *Chromulina* sp. *Dinobryon crenulatum* *Dinobryon bavaricum*		
	Aug-Oct	*Anabaena solitaria f.a. planctonica*				
	Sep				*Tabellaria flocculosa* *Synedra acus*	
	Oct-Nov	*Oscillatoria Redekei*	*Dictyosphaerium simplex* *Scenedesmus brevispina* *Spondylosium planum* *Staurastrum cuspitatum*	*Synura uvella* *Botryococcus Braunii* *Chromulina* sp. *Erkenia subaequiciliata* *Chrysochromulina parva* *Mallomonas caudata*		
Epi 1976	Jan-Apr		*Scenedesmus brevispina* *Scenedesmus denticulatus* *Ankistrodesmus falcatus* var. *spiralis* *Dictyosphaerium simplex*			
	Apr-Jul			*Synura uvella* *Chrysosphaerella longispina* *Uroglena americana* *Dinobryon sertularia* *Erkenia subaequiciliata* *Chrysochromulina parva*		*Rhodomonas minuta* *Cryptomonas erosa*
	Jul-Sep	*Anabaena solitaria f.a. planctonica*				
	Sep		*Selenastrum* sp. *Scenedesmus brevispina* *Dictyosphaerium simplex* *Monoraphidium setiforme* *Chlamydomonas* spp.			
	Oct-Nov			*Uroglena americana* *Erkenia subaequickiata* *Chromulina* sp. *Dinobryon sertularia* *D. bavaricum* var. *Vanhoeffenii*		

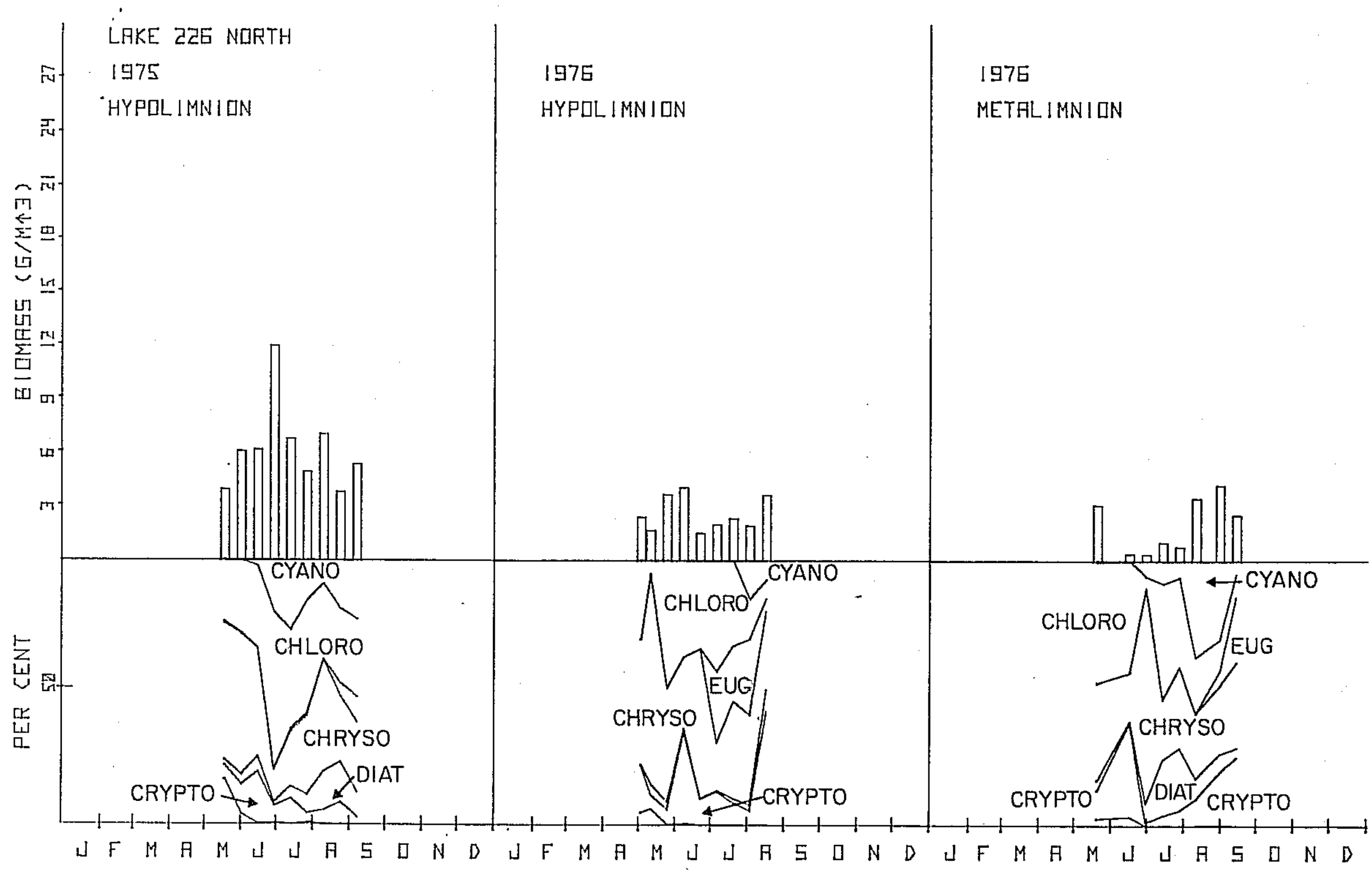

Figure 6. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 226 north in 1975-1976, and accumulative percent composition.

Table 8. Lake 226 north

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
Hypo 1975	May		*Chlamydomonas* sp. *Pediastrum duplex* *Monoraphidium setiforme* *Sphaerozosma granulata*	*Mallomonas pumilio* *Chromulina* sp. *Chrysococcus* sp. *Dinobryon sertularia* *Chrysoikos skujai*		
	Jun-Aug		*Dictyosphaerium simplex* *Scenedesmus brevispina* *Lagerheimia* sp. *Ankistrodesmus falcatus* var. *spiralis* *Sphaerozosma granulata*			
	Jul	*Oscillatoria Redekei*				
	Aug-Sep			*Mallomonas elongata* *M. pumilio* *Erkenia subaequiciliata*		
	Sep	*Anabaena solitaria f.a. planctonica*	*Dictyosphaerium simplex* *Sphaerozosma granulata* *Scenedesmus brevispina* *Ankistrodesmus falcatus* var. *spiralis*	*Dinobryon sertularia*		
Hypo 1976	May-June		*Scenedesmus brevispina* *Monoraphidium setiforme* *Chlamydomonas* spp.	*Synura uvella* *Dinobryon cylindricum* *Uroglena americana* *Erkenia subaequiciliata* *Pseudokepherion Entzii*		*Cryptomonas erosa* *Rhodomonas minuta* *Katablepharis ovalis*
	Jun Jul		*Scenedesmus brevispina* *Dictyosphaerium simplex*	*Chrysochromulina parva* *Erkenia subaequiciliata* *Chromulina* sp.		
	Aug					*Cryptomonas erosa* *Cryptomonas pusilla*
Meta 1976	May-Sep		*Scenedesmus brevispina* *Dictyosphaerium simplex* *Spondylosium planum* *Chlamydomonas* spp.	*Erkenia subaequiciliata* *Chromulina* sp. *Dinobryon sertularia* *Synura uvella* *Botryococcus Braunii* *Dinobryon sociale*		*Cryptomonas erosa* *Rhodomonas minuta* *Katablepharis ovalis*
	Jul		*Staurastrum paradoxum* *Spondylosium planum* *Scenedesmus brevispina*		*Tabellaria flocculosa*	
	Aug	*Anabaena solitaria f.a. planctonica*				*Cryptomonas ovata*

Note: common Euglenophyceae - *Astasia parvula, Euglena acus* (July 1976 Hypo.)

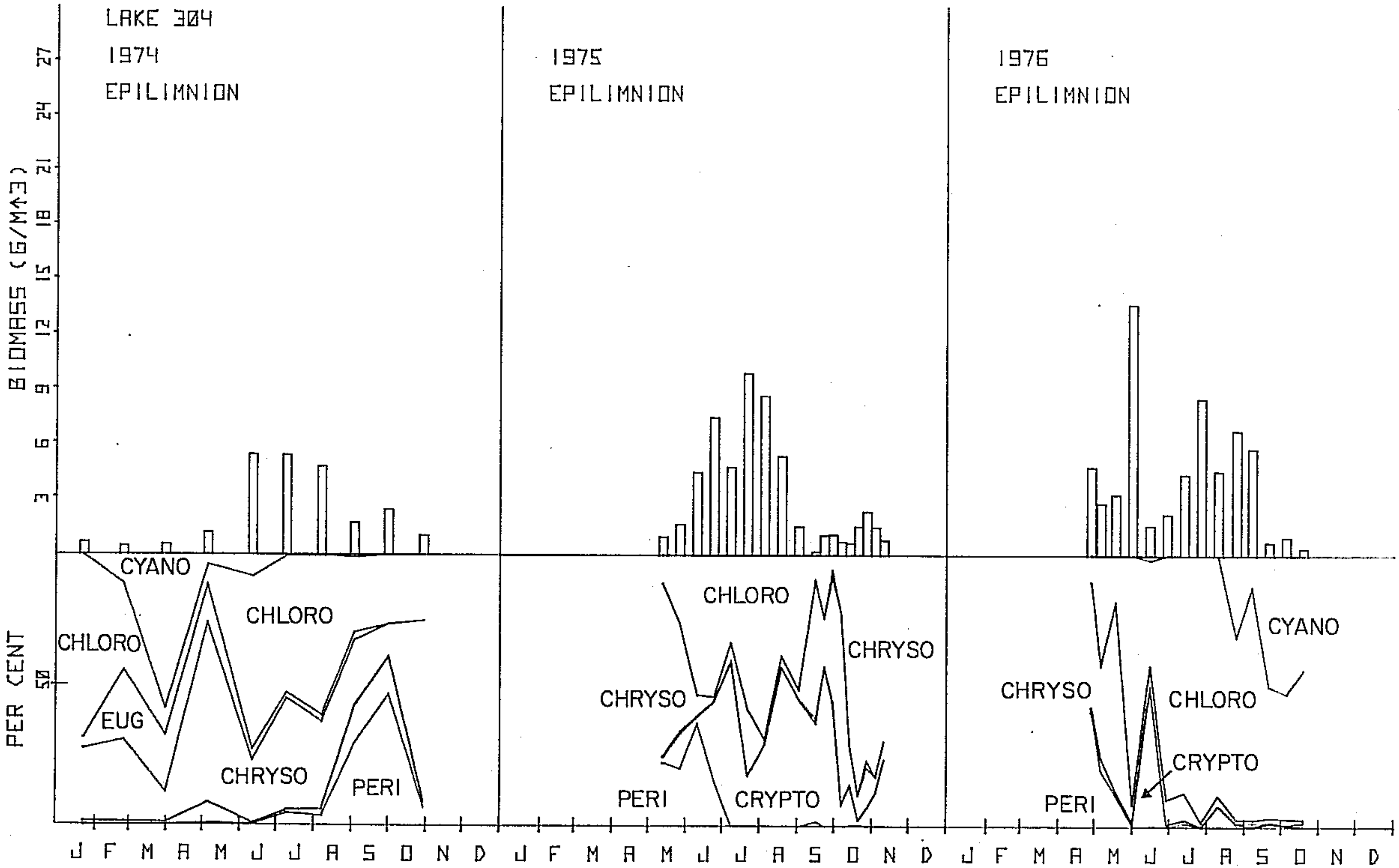

Figure 7. Average phytoplankton volume in the epilimnion of Lake 304 in 1974-1976, and accumulative percent composition.

Table 9. Lake 304

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
0-5 m 1974	Jan-Apr		*Gloeococcus schroeteri* *Arthrodesmus incus*			
	Apr	*Lyngbya pseudospirulina* *Synechococcus sp.*				
	May			*Synura uvella* *Botryococcus Braunii* *Dinobryon cylindricum* *Chromulina spp.* *Chrysococcus sp.*		
	Jun-Oct		*Scenedesmus denticulatus* *Gloeococcus schroeteri* *Crucigenia sp.* *Oocystis lacustris* *Chlamydomonas sp.* *Elaktothrix gelatinosa*			
	Oct			*Botryococcus Braunii* *Dinobryon sertularia* *D. crenulatum* *Chromulina sp.* *Chrysococcus sp.* *Chrysoikos skujai*		*Gymnodinium sp.*
Epi 1975	May			*Dinobryon sertularia* *D. bavaricum* *Pseudokepherion Entzii* *Chromulina sp.* *Chrysococcus spp.* *Chrysoikos skujai*		*Peridinium Willei* *P. aciculiferrim* *Gymnodinium mirabile*
	Jun-Nov		*Gloeocystis planctonica* *Oocystis lacustris* *Gloeocystis planctonica*		*Cryptomonas erosa* *Cryptomonas pusilla* *Rhodomonas minuta*	
	Sep-Oct		*Chlamydomonas spp.*	*Mallomonas caudata*		
Epi 1976	Apr			*Dinobryon sertularia* *Chromulina sp.* *Chrysoikos skujai* *Erkenia sp.*		
	May-Jul		*Gloeocystis planctonica* *Chlamydomonas spp.*			
	Jun-Oct		*Ankyra Judayi* *Scenedesmus brevispina* *S. denticulatus* *Lagerheimia sp.* *Gloeococcus schroeterii* *Gloeocystis planctonica*		*Cryptomonas pusilla*	
	Aug-Sep	*Anabaena planctonica* *Aphanizomenon flos-aquae*				

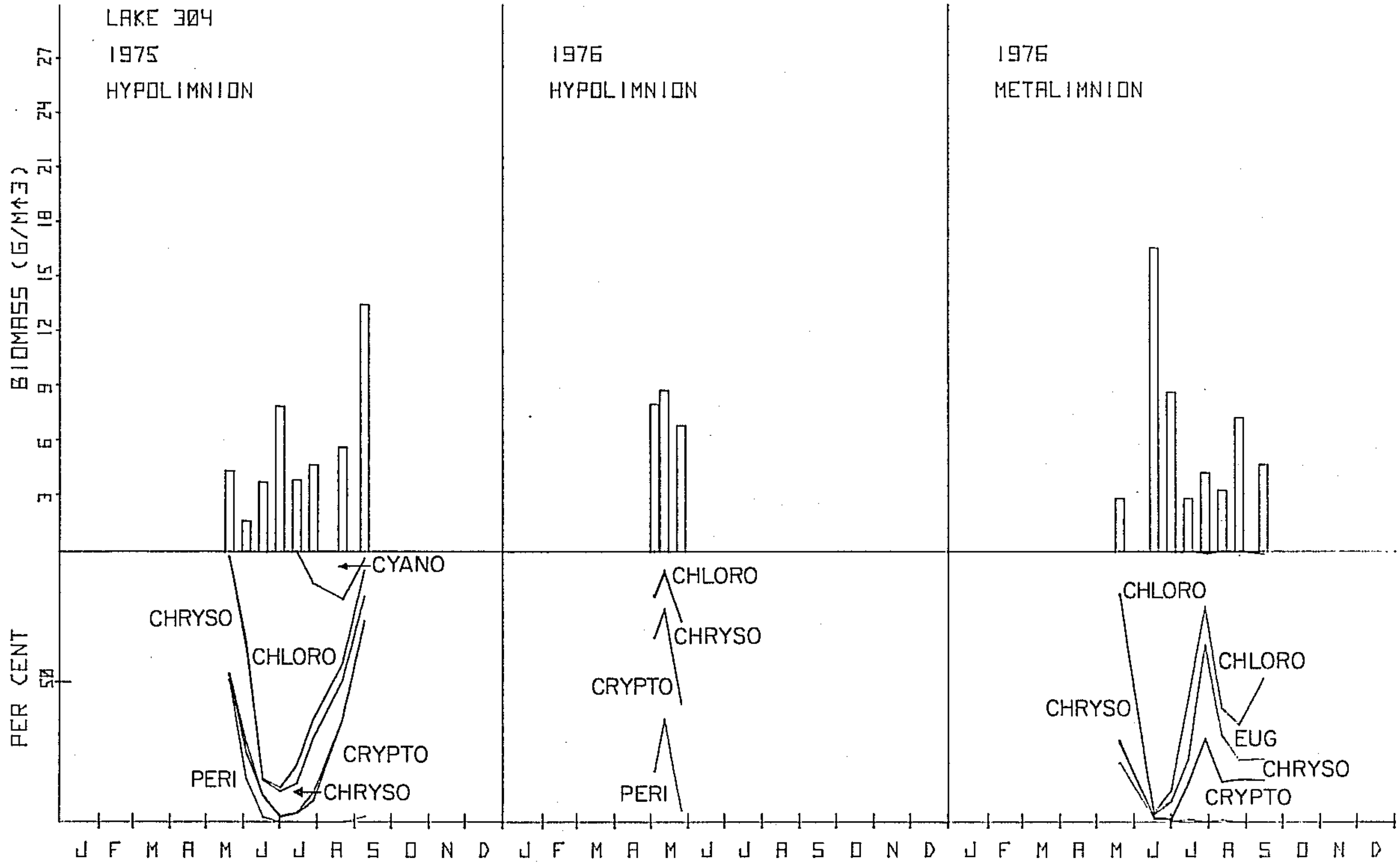

Figure 8. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 304 in 1975-1976, and accumulative percent composition.

Table 10. Lake 304

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
Hypo 1975	May-Jul			*Chrysoikos skujai* *Chromulina sp.* *Chrysococcus spp.* *Dinobryon sertularia*		*Peridinium aciculiferrim*
	Jun-Aug		*Gloeococcus schroeteri* *Oocystis submarina var. variablis* *Scenedesmus denticulatus* *Gloeocystis planctonica*			
	Jul					
	Aug	*Lyngbya Pseudospirulina*			*Cryptomonas erosa* *C. pusilla* *Rhodomonas minuta*	
Hypo 1976	May				*Cryptomonas pusilla* *C. erosa* *Katablepharis ovalis*	
Meta 1976	May			*Dinobryon bavaricum* *D. cylindricum* *Erkenia sp.* *Chrysococcus sp.*		
	Jun-Aug		*Scenedesmus denticulatus* *S. brevispina* *Ankyra Judayi* *Staurastrum paradoxum*			
	Jul			*Synura uvella* *Chrysococcus sp.* *Erkenia sp.*	*Cryptomonas pusilla* *C. erosa* *C. ovata* *Rhodomonas minuta*	
	Aug Sep		*Gloeocystis planctonica* *Scenedesmus denticulatus*			

Note: common Euglenophyceae - *Euglena acus*, *Trachelomonas volvocina* (Jun-Aug, 1976 meta)

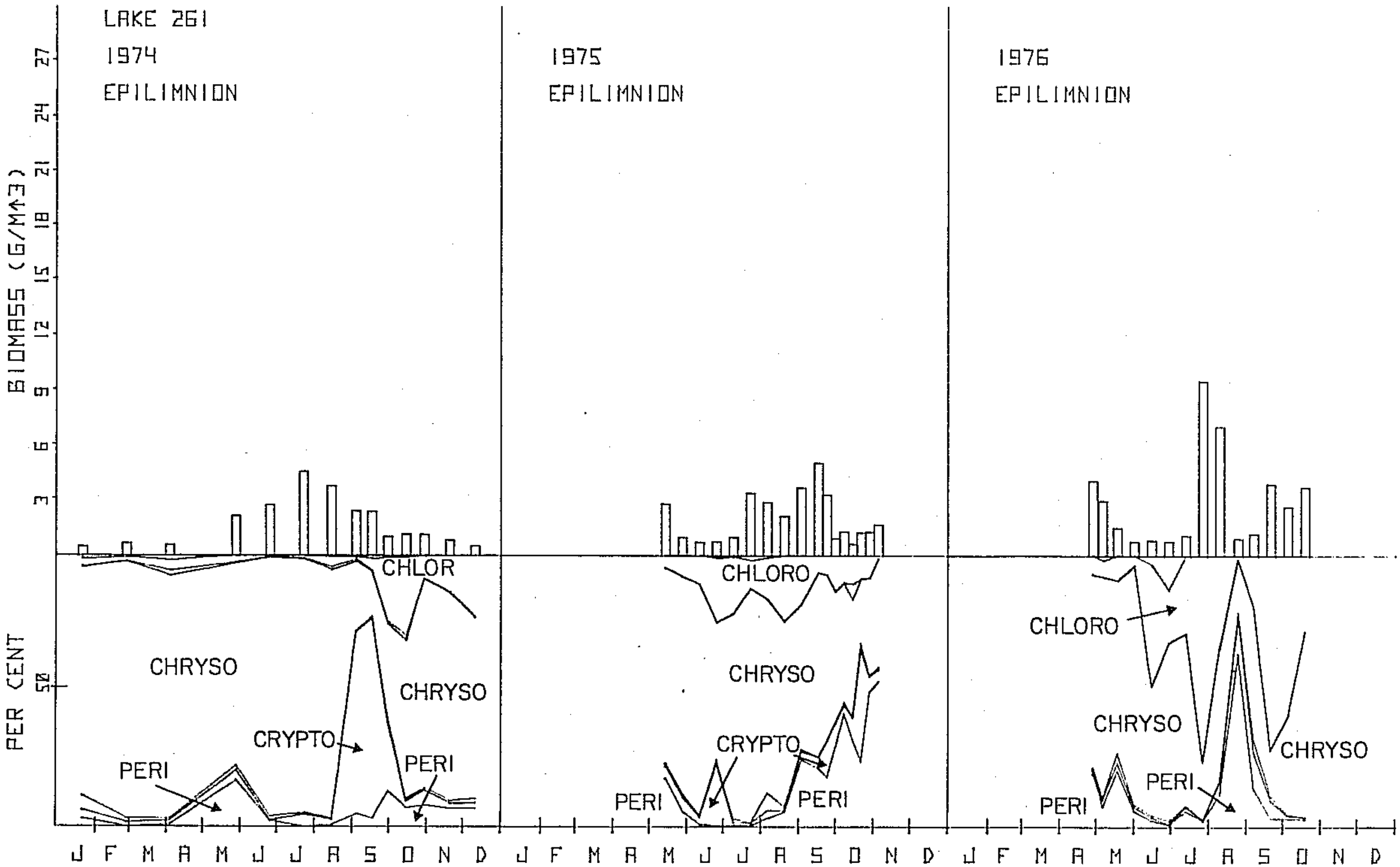

Figure 9. Average phytoplankton volume in the epilimnion of Lake 261 in 1974-1976, and accumulative percent composition.

Table 11. Lake 261 Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
0-7 m 1974	Jan-Aug			*Mallomonas pumilio* *Synura uvella* *Dinobryon bavaricum* *Chromulina sp.*		
	May-Jun					*Peridinium Willei* *P. aciculiferrim* *Gymnodinium spp.*
	Sep-Oct				*Cryptomonas erosa* *Gonyostomum semens*	
	Oct-Dec			*Chromulina sp.* *Chrysochromulina parva* *Dinobryon bavaricum* *D. crenulatum* *Bicoeca sp.*		*Peridinium Willei* *P. aciculiferrim*
Epi 1975	May-Nov		*Monoraphidium setiforme* *Gloeococcus schroeteri*	*Mallomonas caudata* *M. pumilio* *Chromulina sp.* *Dinobryon sertularia* *Chrysoikos skujai* *Mallomonas akrokomos* *Chrysosphaerella longispina*		*Peridinium Willei* *P. sp.* *Gymnodinium sp.*
	Aug		*Arthrodesmus incus* *Mougotia sp.* *Monoraphidium setiforme* *Ankyra Judayi*			
	Sep-Nov			*Synura uvella* *Uroglena americana*		*Gymnodinium sp.* *Peridinium Willei* *P. Palustre*
Epi 1976	Apr-Jul			*Chrysosphaerella longispina* *Erkenia sp.* *Chromulina sp.* *Dinobryon cylindricum* *D. Borgie*		*Peridinium Willei* *P. aciculiferrim* *Gymnodinium mirabile*
	Jun	*Merismopedia glauca*	*Gloeocystis planctonica*			
	Jul-Aug Aug		*Ankyra Judayi*	*Synura uvella* *Dinobryon bavaricum* *Erkenia sp.*		*Peridinium Willei* *Gymnodinium sp.*
	Sep			*Chromulina sp.* *Chrysosphaerella longispina* *Chrysochromulina parva* *Chromulina sp.*		
	Oct		*Gloeococcus schroeteri*	*Synura uvella*		

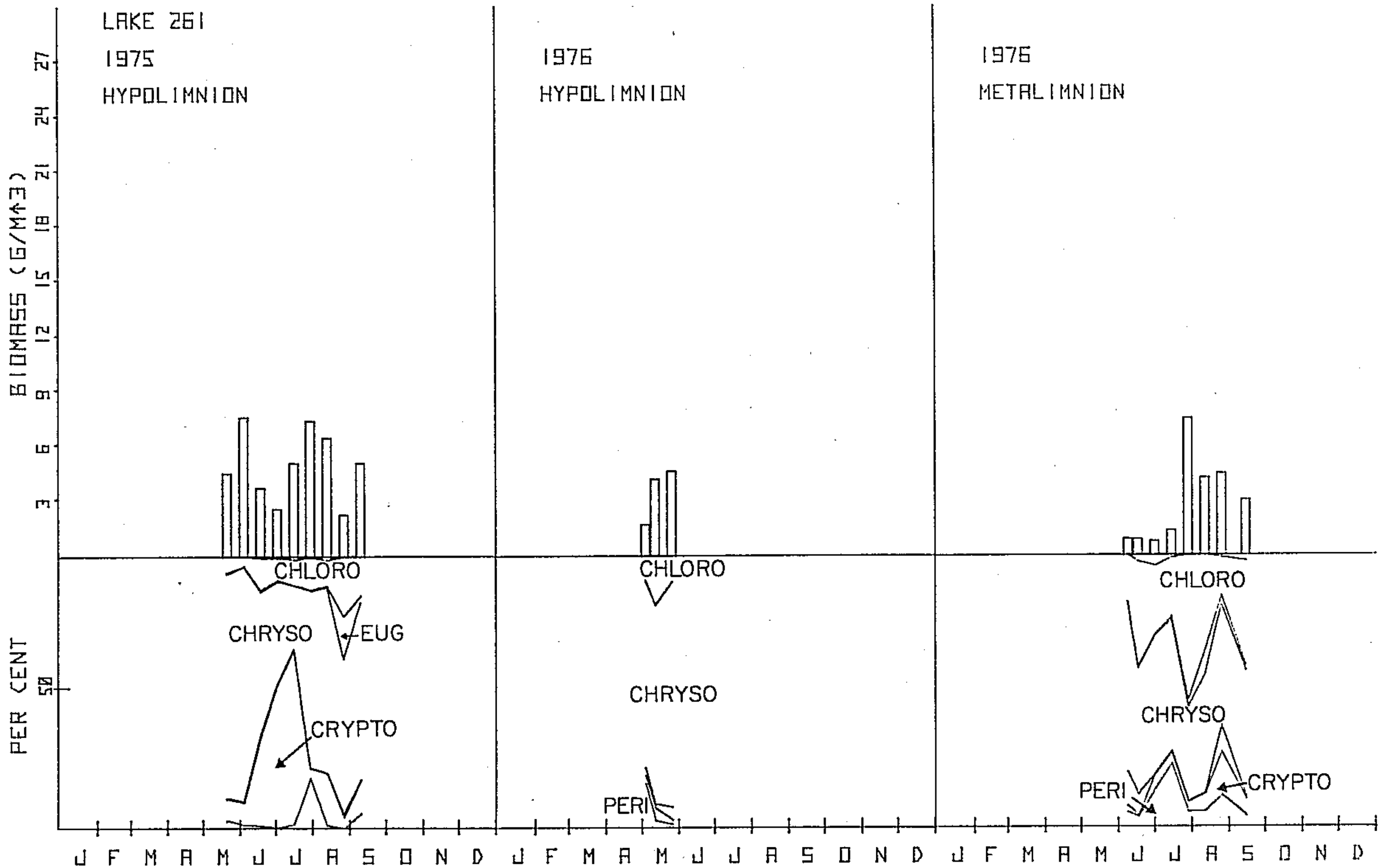

Figure 10. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 261 in 1975-1976, and accumulative percent composition.

Table 12. Lake 261

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Peridineae
Hypo 1975	May-Sep			*Mallomonas caudata* *Mallomonas pumilio var.* *Chrysoikos skujai* *Dinobryon sertularia* *Chromulina sp.* *Erkenia sp.*		
	Jun-Sep			*Chrysochromulina parva* *Pseudokephyrion sp.* *Dinobryon crenulatum* *D. cylindricum* *D. bavaricum*		
	Aug-Sep		*Arthrodesmus incus* *Dictosphaerium simplex* *Monoraphidium setiforme*	*Chrysosphaerella longispina* *Mallomonas caudata* *Synura uvella* *Erkenia sp.* *Chromulina sp.*	*Cryptomonas erosa* *Gonyostomum semens*	
Hypo 1976	May		*Chlamydomonas sp.* *Arthrodesmus incus* *Dictyosphaerium simplex* *Monoraphidium setiforme*	*Chromulina sp.* *Dinobryon cylindricum* *D. Borgie* *D. sertularia var. protruberans* *D. bavaricum var. Vanhoeffenii* *D. crenulatum* *Pseudokepherion Entzii* *Mallomonas caudata* *M. pumilio var.* *Chrysococcus sp.*		*Peridinium sp.* *P. Willei* *Amphidinium sp.*
Meta 1976	Jun-Sep			*Botryococcus Braunii* *Chromulina sp.* *Chrysococcus sp.* *Uroglena americana* *Mallomonas caudata* *Dinobryon cylindricum*		
	Jul		*Gloeocystis planctonica* *Ankyra Judayi*			*Peridinium Willei* *P. pusilla* *Gymnodinium sp.*
	Aug			*Synura uvella*	*Gonyostomum semens* *Cryptomonas erosa* *C. pusilla*	
	Sep		*Gloeocystis planctonica*	*Chrysosphaerella longispina*		

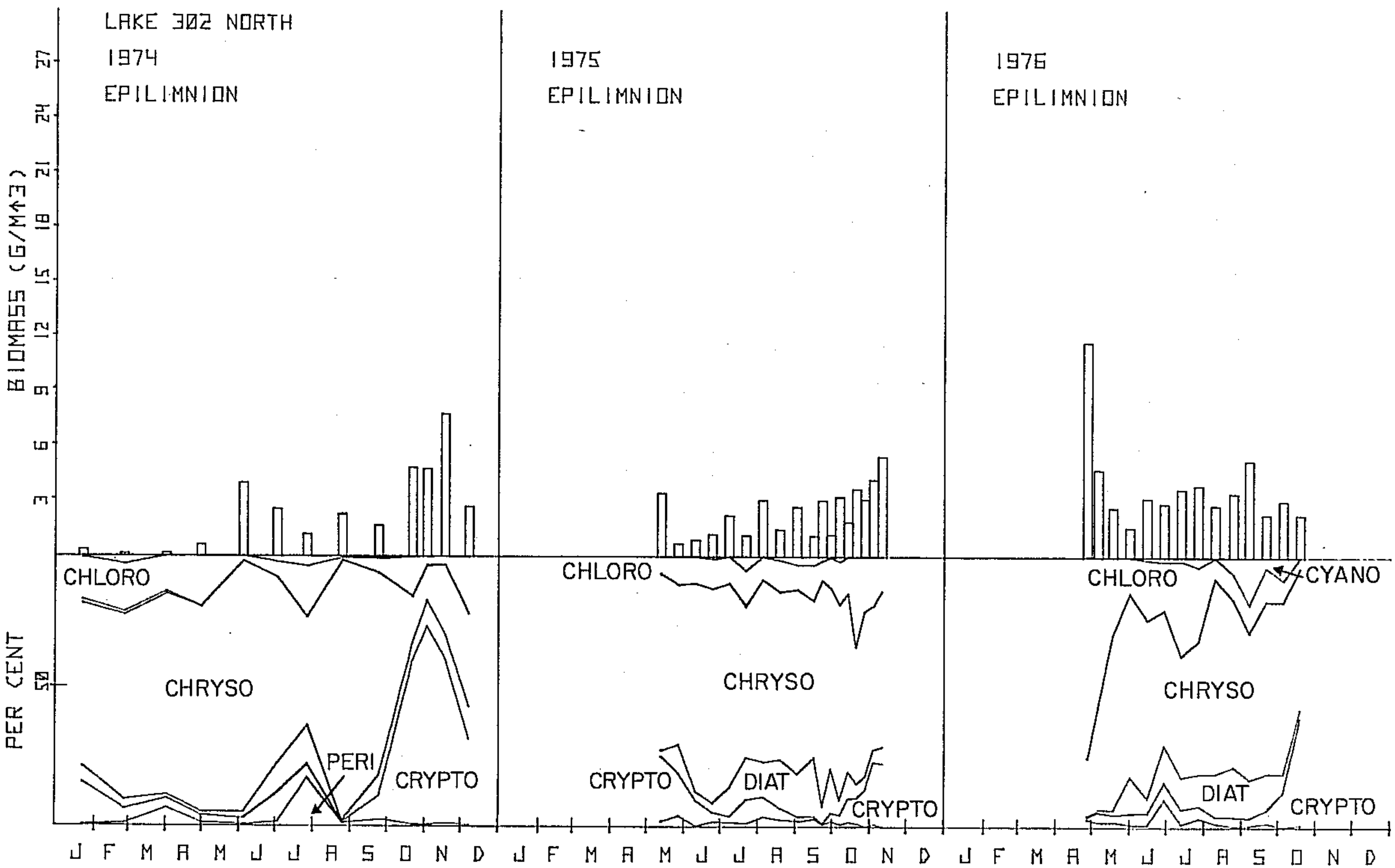

Figure 11. Average phytoplankton volume in the epilimnion of Lake 302 north in 1974-1976, and accumulative percent composition.

Table 13. Lake 302 north

Common Species (5%)

Depth/Year	Date	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae
0-7 m 1974	Jan-Dec	*Closterium* sp. *Arthrodesmus incus* *Ankistrodesmus falcatus* var. *spiralis*	*Chrysococcus* sp. *Chromulina* sp. *Dinobryon bavaricum* *D. sertularia* var. *protruberans* *Botryococcus Braunii* *Mallomonas pumilio* *M. globosa* *Synura uvella* *Bicoeca* sp.		*Cryptomonas erosa* *Rhodomonas minuta* *Katablepharis ovalis*	
	Jun-Dec					*Peridinium aciculiferum* *P. goslaviense* *P. wisconsinense* *Gymnodinium* spp.
	Jul-Aug	*Staurastrum paradoxum* *Arthrodesmus incus* *Monoraphidium setiforme* *Closterium acutum*		*Synedra acus* *Tabellaria fenestrata* *Rhizosolenia eriensis*		
	Aug		*Dinobryon sertularia* var. *protruberans*			
	Oct-Dec				*Cryptomonas erosa*	
	Dec		*Mallomonas caudata* *Botryococcus Braunii* *Chrysococcus* sp. *Chromulina* sp. *Bitrichia chodatii*			
Epi 1975	May-Nov		*Mallomonas pumilio* *M. globosa* *Erkenia* sp. *Chromulina* sp. *Uroglena americana*		*Cryptomonas erosa*	
	Jun-Nov	*Dictyosphaerium simplex* *Monoraphidium setiforme* *Arthrodesmus incus*		*Synedra acus* *Tabellaria fenestrata* *Rhizosolenia eriensis*		
	Nov				*Cryptomonas erosa* *Katablepharis ovalis* *Rhodomonas minuta*	
Epi 1976	Apr	*Monoraphidium setiforme* *Trochisca granulata* *Golenkiniopsis* sp. *Chlamydomonas* spp.	*Dinobryon bavaricum* *Chromulina* sp. *Chrysococcus* sp. *Mallomonas caudata* *Botryococcus Braunii*			
	May-Oct		*Pseudokepharion Entzii* *Dinobryon bavaricum* var. *Vanhoeffenii* *Chromulina* sp. *Chrysococcus* sp. *Mallomonas pumilio* *M. globosa*			
	Jun-Aug	*Monoraphidium setiforme* *Dictyosphaerium simplex*		*Tabellaria flocculosa* *Tabellaria fenestrata* *Asterionella formosa* *Synedra acus* *Rhizosolenia eriensis*		
	Jul-Aug	*Sphaerozosma granulatum* *Chlamydomonas* spp.				
	Oct		*Uroglena americana* *Dinobryon bavaricum* *Chrysochromulina parva* *Chromulina* sp. *Chrysococcus* sp. *Mallomonas* spp.		*Cryptomonas erosa* *C. pusilla* *Katablepharis ovalis* *Rhodomonas minuta*	

NOTE: Common Cyanophyceae - *Anabaena Planctonica* (Sep-Oct Epi 1976).

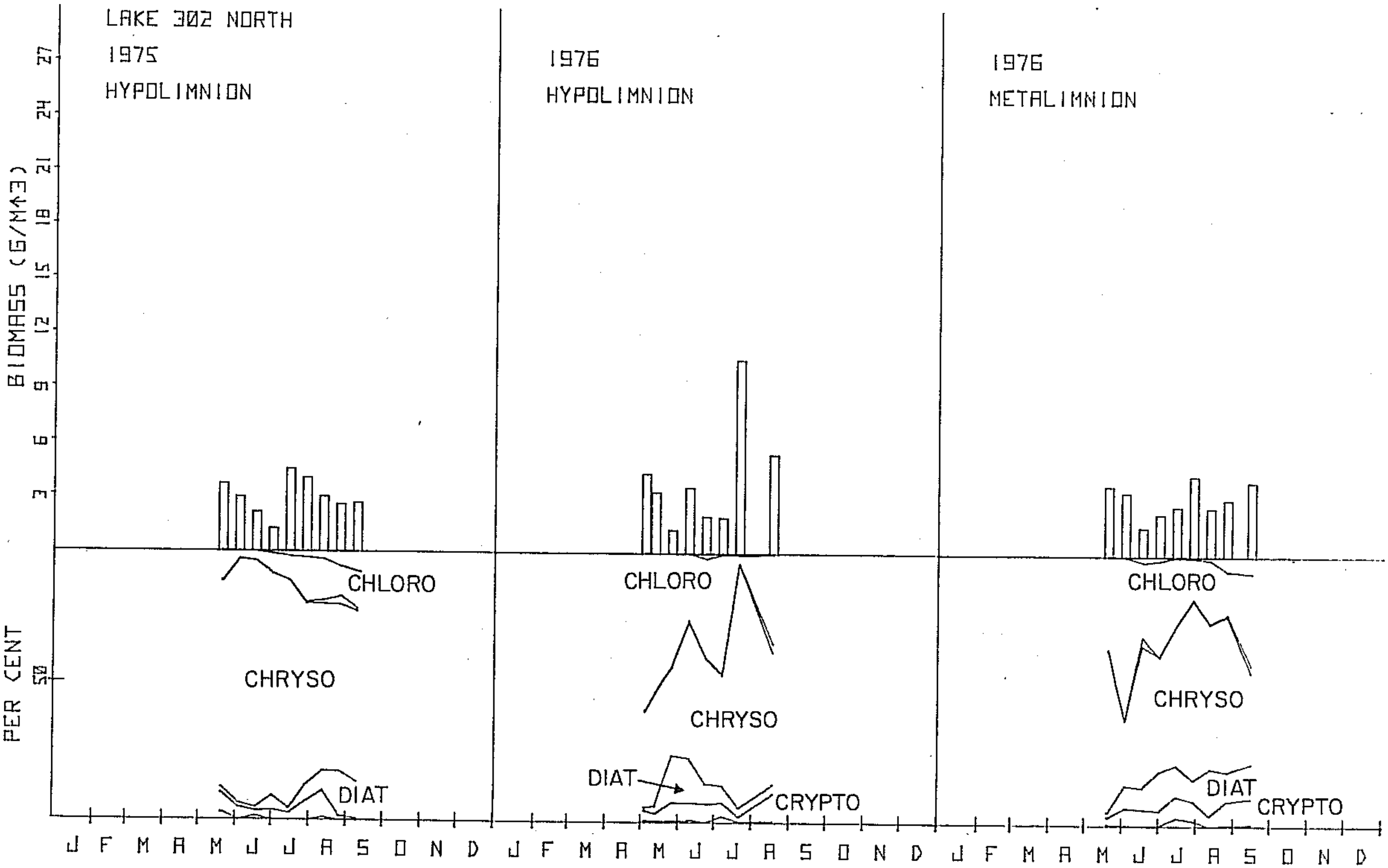

Figure 12. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 302 north in 1975-1976, and accumulative percent composition.

Table 14. Lake 302 north

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
Hypo 1975	May-Sep			*Mallomonas elongata* *Uroglena americana* *Chromulina* sp. *Chrysococcus* sp. *Dinobryon* spp.		
	Jul-Sep		*Arthrodesmus incus* *Chlamydomonas* spp. *Dictyosphaerium simplex*	*Mallomonas pumilio* *M. caudata* *Dinobryon bavaricum* *Chromulina* spp.	*Melosira distans* *Rhizosolenia eriensis* *Synedra acus*	
	Aug-Sep			*Botryococcus Braunii* *Chrysosphaerella longispina*		
	Sep			*Synura uvella*		
Hypo 1976	May-Aug		*Chlamydomonas* spp. *Monoraphidium setiforme* *Golenkiniopsis* sp.	*Chromulina* sp. *Dinobryon bavaricum* var. *Vanhoeffenii* *Synura uvella* *Botryococcus Braunii* *Mallomonas elongata* *Chrysoikos skujai*	*Asterionella formosa* *Synedra acus* *Tabellaria fenestrata* *T. flocculosa*	*Cryptomonas erosa* *C. ovata* *Katablepharis ovalis* *Rhodomonas minuta*
	Jul		*Dictyosphaerium simplex* *Monoraphidium setiforme*			
	Jul-Aug			*Chrysosphaerella longispina*		
	Aug					*Cryptomonas erosa* *Cryptomonas pusilla*
Meta 1976	May-Sep		*Monoraphidium setiforme* *Dictyosphaerium simplex* *Chlamydomonas* sp. *Treubaria granulata*	*Chrysococcus* sp. *Dinobryon sertularia* *D. bavaricum* var. *Vanhoeffenii* *Chromulina* sp. *Mallomonas* spp. *Chrysoikos skujai*		
	Jun-Sep		*Dictyosphaerium simplex*			
	Jul-Sep				*Rhizosolenia eriensis* *Synedra acus* *Tabellaria fenestrata* *Cyclotella comta* *Asterionella formosa*	*Rhodomonas minuta* *Cryptomonas erosa* *C. ovata* *Katablepharis ovalis*
	Sep		*Monoraphidium setiforme* *Spondylosium planum* *Chlamydomonas* sp.	*Mallomonas elongata* *M. caudata* *Chrysococcus* sp. *Chromulina* sp.		

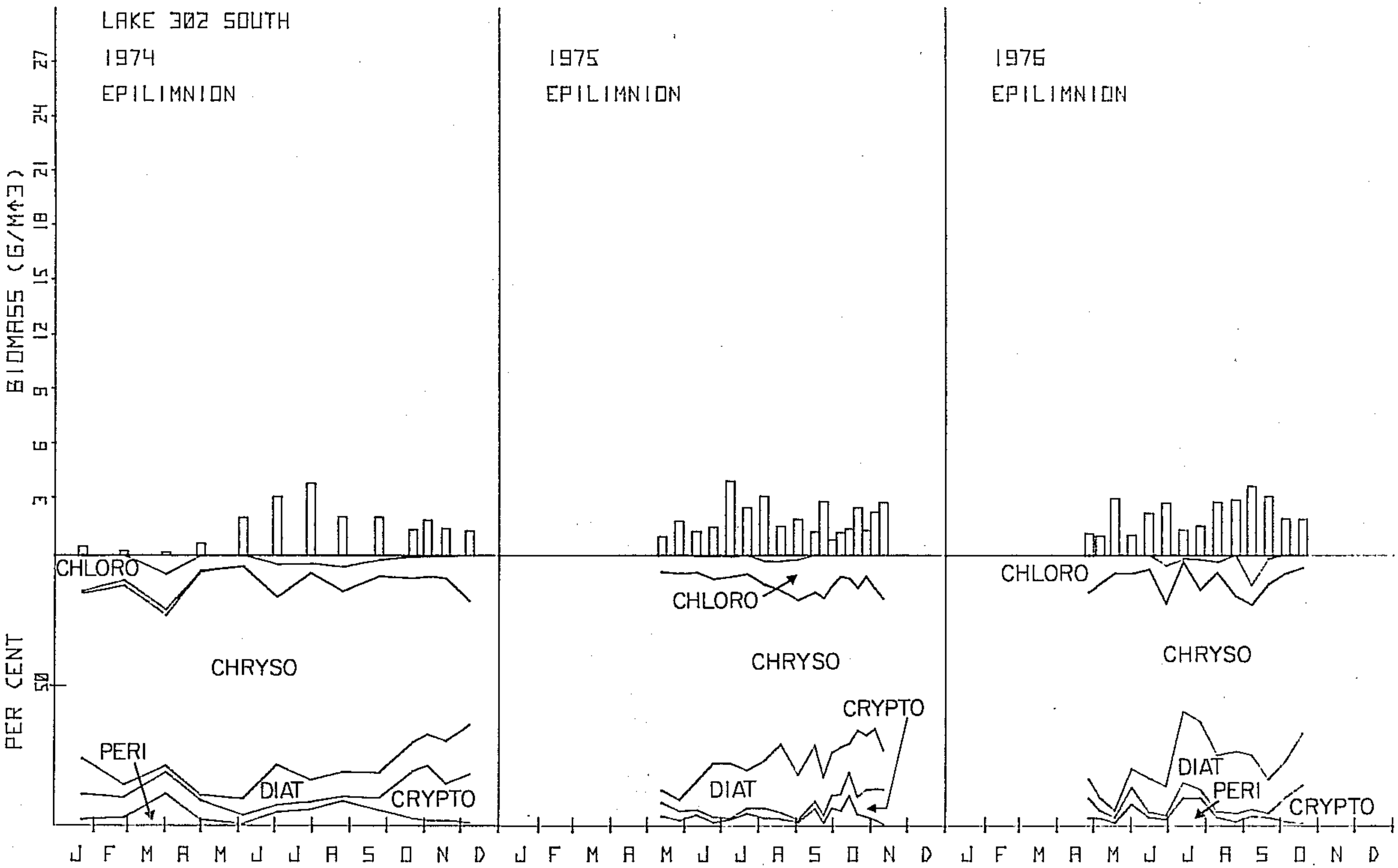

Figure 13. Average phytoplankton volume in the epilimnion of Lake 302 south in 1974-1976, and accumulative percent composition.

Table 15. Lake 302 south

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
0-7 m 1974	Jan-Dec			*Chromulina* sp. *Chrysococcus* sp. *Botryococcus Brawnii* *Mallomonas caudata* *M. pumilio* *M. globosa* *Dinobryon crenulatum* *Dinobryon bavaricum* *Chrysosphaerella longispina*		
	Jun-Dec					
	Oct-Dec				*Synedra acus* *Tabellaria fenestrata* *Rhizosolenia eriensis* *Cyclotella comta* *Melosira distans*	*Cryptomonas erosa* *Rhodomonas minuta* *Katablepharis ovalis*
Epi 1975	May-Nov		*Closterium* sp. *Ankistrodesmus falcatus* var. *spiralis* *Monoraphidium setiforme* *Chlamydomonas* sp.	*Dinobryon bavaricum* *D. sertularia* var. *protruberans* *Mallomonas globosa* *Chromulina* sp. *Chrysococcus* sp.		
	Jun-Nov				*Tabellaria fenestrata* *Rhizosolenia eriensis*	
Epi 1976	Apr-Oct		*Monoraphidium setiforme* *Golenkiniopsis* sp.	*Chrysosphaerella longispina* *Mallomonas* spp. *M. globosa* *Chromulina* sp. *Chrysococcus* sp. *Pseudokepherion Entzii* *Dinobryon crenulatum* *D. bavaricum* var. *Vanhoeffenii* *D. cylindricum*		
	Jun-Oct				*Cyclotella comta* *Tabellaria fenestrata* *Rhizosolenia eriensis* *Synedra acus*	*Cryptomonas erosa*
	Sep	*Anabaena planctonica*	*Monoraphidium setiforme* *Dictyosphaerium simplex*			

Note: Common Peridineae - *Gymnodinium* sp. (Jun-Oct Epi 1976)

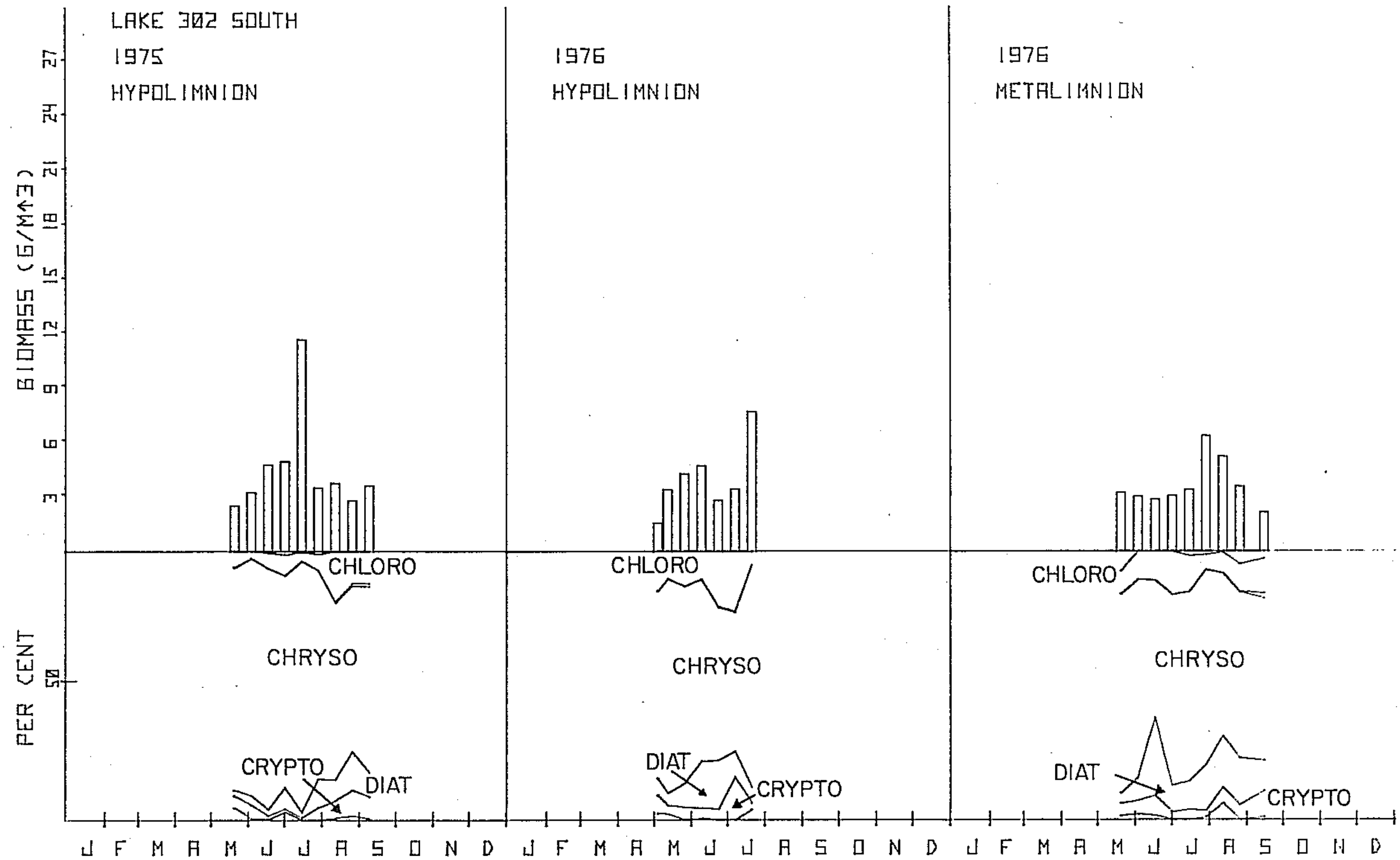

Figure 14. Average phytoplankton volume in the metalimnion and hypolimnion of Lake 302 south in 1975-1976, and accumulative percent composition.

Table 16. Lake 302 south

Common Species (5%)

Depth/Year	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae
Hypo 1975	May-Sep			*Chromulina* sp.		
				Chrysococcus sp.		
				Dinobryon bavaricum		
				D. sertularia var. *protruberans*		
				Chrysoikos skujai		
	Jul-Sep			*Uroglena americana*		
	Aug-Sep			*Synura uvella*		
				Dinobryon bavaricum		
				D. sertularia var. *protuberans*		
Hypo 1976	May-Jul		*Troschisca granulata*	*Synura uvella*		
			Golenkiniopsis sp.	*Mallomonas globosa*		
			Monoraphidium setiforme	*Dinobryon crenulatum*		
			Chlamydomonas spp.	*D. cylindricum*		
				D. bavaricum var. *Vanhoeffenii*		
				Chromulina sp.		
				Chrysococcus sp.		
				Botryococcus Braunii		
				Mallomonas pumilio var.		
				Pseudokepherion Entzii		
				Dinobryon sertularia		
	Jun-Jul		*Dictyosphaerium simplex*		*Asterionella formosa*	
	Jul			*Chrysosphaerella longispina*		
Meta 1976	May		*Monoraphidium setiforme*	*Dinobryon bavaricum*	*Synedra acus*	
			Dictyosphaerium simplex	*D. bavaricum* var. *Vanhoeffenii*	*Tabellaria fenestrata*	
			Sphaerozosma granulata	*Chromulina* sp.	*Asterionella formosa*	
				Chrysococcus sp.	*Rhizosolenia eriensis*	
				Mallomonas globosa	*Cyclotella comta*	
				M. pumilio var.		
				Pseudokepherion Entzii		
				Chrysoikos skujai		
	Jul			*Dinobryon sertularia*		
				Synura uvella		
				Chrysosphaerella longispina		
				Botryococcus Braunii		
	Sep			*Chromulina* sp.		
				Chrysococcus sp.		