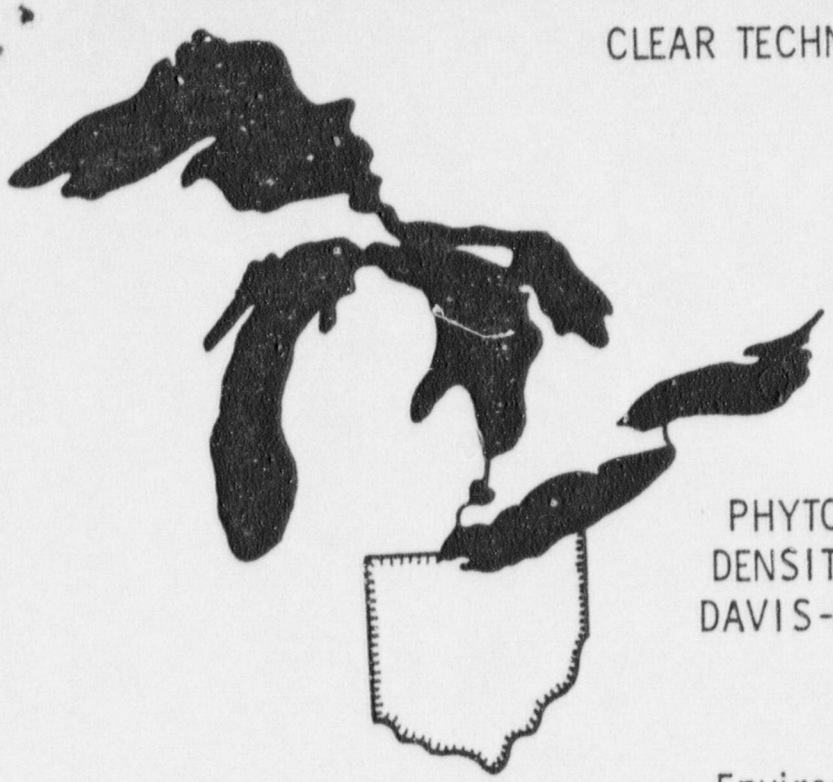
CLEAR TECHNICAL REPORT NO. 90



PHYTOPLANKTON AND ZOOPLANKTON DENSITIES FROM LAKE ERIE NEAR THE DAVIS-BESSE NUCLEAR POWER STATION DURING 1977

Environmental Technical Specifications
Sec. 3.1.2.a.1 Plankton Studies
(Phytoplankton and Zooplankton)

Prepared by

Jeffrey M. Reutter

Prepared for

Toledo Edison Company
Toledo, Ohio

THE OHIO STATE UNIVERSITY

CENTER FOR LAKE ERIE AREA RESEARCH

COLUMBUS, OHIO

September 1978

3.1.2.a.1 Plankton Studies (Zooplankton and Phytoplankton)

Procedures

Plankton samples were collected approximately once every 30 days from April through November from 7 sampling stations in the vicinity of Locust Point (Figure 1). Four vertical tows, bottom to surface, were collected at each station with a Wisconsin plankton net (12 cm mouth; no. 20, 0.080 mm mesh). Each sample was concentrated to 50 ml. Two samples were preserved with lugol's and used for phytoplankton analysis. Soda water was added to the remaining 2 samples to relax the zooplankters prior to preservation with 5% formalin. The volume of water sampled was computed by multiplying the depth of the tow by the area of the net mouth. Three 1-ml aliquots were withdrawn from each 50-ml sample and placed in counting cells.

Whole organism counts of the phytoplankton were made from 25 random Whipple Disk fields in each of the three 1-ml aliquots from 2 samples. When filamentous forms number 100 or more in 10 Whipple fields, they were not counted in the remaining 15 fields. Identification was carried as far as possible, usually to the genus or species level.

All zooplankters within each of the three 1-ml aliquots from 2 samples were counted by scanning the entire counting cell with a microscope. Identification was carried as far as possible, usually to the genus or species level.

Zooplankton

Results. Zooplankters collected April through November 1978 were grouped in 61 taxa generally to the species level (Table 1). Thirty taxa were grouped under Rotifera, 17 under Copepoda, 11 under Cladocera, and 3 under Protozoa.

Monthly mean densities ranged from 55/l in November to 1,086/l in May. The mean density from all samples collected in 1977 was 401/l. Zooplankton densities at individual sampling stations ranged from 34/l at Station 8 in November to 1,474/l at Station 1 in May (Table 2).

Monthly mean rotifer densities ranged from 15/l in November to 362/l in April (Table 1). The annual mean rotifer density for all samples collected in 1977 was 96/l or 24 percent of the entire zooplankton density. The dominant rotifer taxa during 1977 were Synchaeta spp. in April, July, and November; Keratella cochlearis in May; Polyarthra spp. in June, September, and October; and Trichocerca multicrinis in August. Synchaeta spp. had the largest annual mean density, 19/l. Rotifera was the dominant zooplankton group during April and October composing 82 percent and 44 percent, respectively, of the entire zooplankton population. In contrast to this, rotifers constituted only 9 percent of the total zooplankton population in May.

Monthly mean copepod densities ranged from 25/l in November to 851/l in May (Table 1). The mean copepod density from all samples collected in 1977 was 177/l or 44 percent of the entire zooplankton population. Cyclopoid copepodids dominated every month but July when immature Cyclops vernalis was the dominant

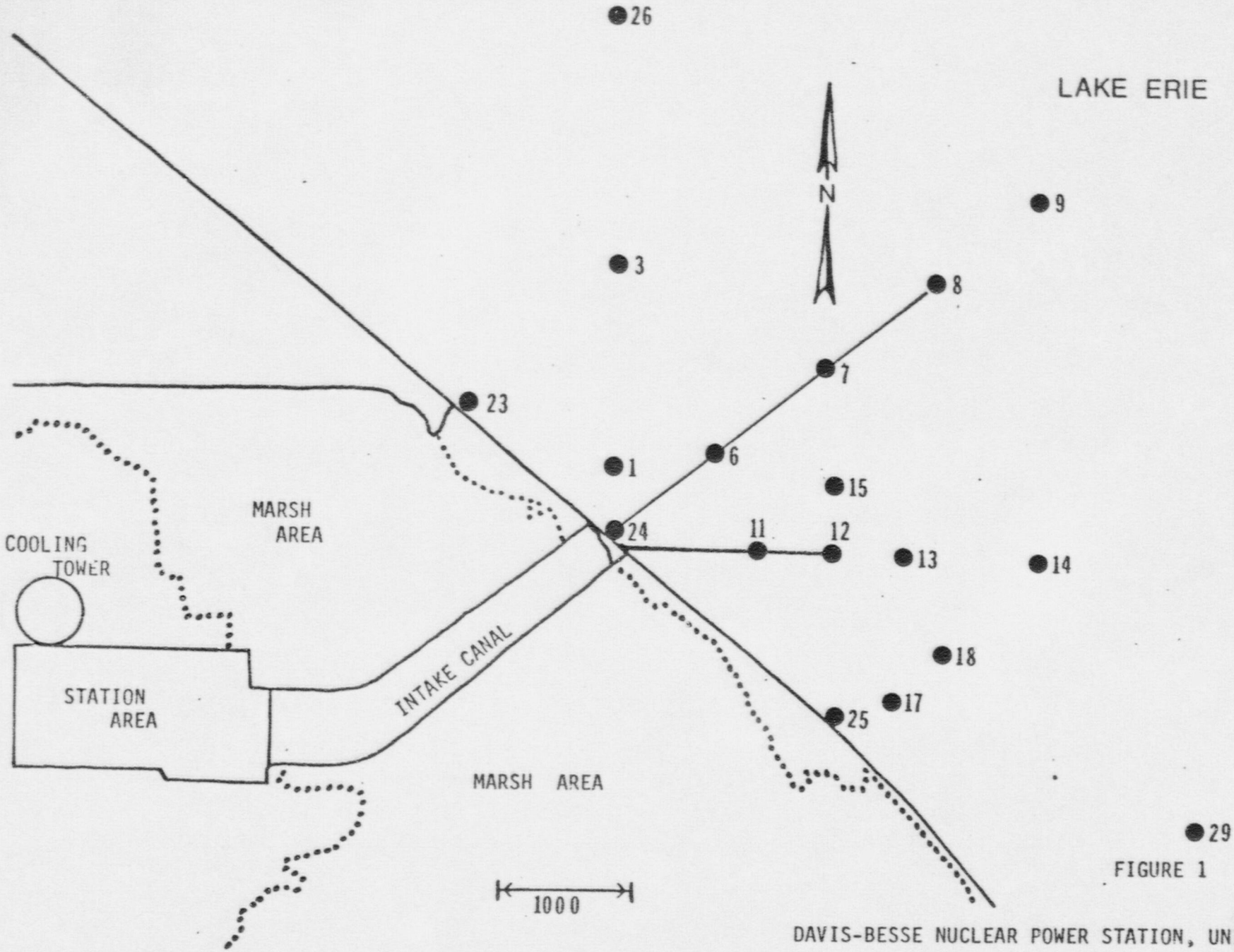


FIGURE 1

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
AQUATIC SAMPLING STATIONS

TABLE 1

MONTHLY MEAN POPULATIONS* OF INDIVIDUAL ZOOPLANKTON TAXA AT LOCUST POINT-1977

TAXA	April 26	May 24	June 22	July 13	August 30	Sept. 12	Oct. 26	Nov. 22	Grand Mean
ROTIFERA									
Anuraeopsis sp.	0.2								0.02
Ascomorpha sp.	0.4								0.04
Asplanchna priodonta	0.1	3.0	0.2		4.5	0.7	0.8		1.17
Brachionus angularis	0.1	0.3	17.2	7.6		0.2			3.18
B. calyciflorus	16.5	1.3	0.4	0.1					2.09
B. caudatus				0.1					0.01
B. havanaensis					1.9	10.5	0.1		1.62
B. urceolaris	14.0	0.2	0.1	0.2					1.62
Chromogaster ovalis	0.4			0.2					0.06
Filinia terminalis	14.8	1.1			0.1				1.81
Kellicottia longispina	0.7	4.0	0.6	0.1		0.1			0.69
Keratella cochlearis	73.9	44.5	2.2	0.8	1.2	0.3	22.4	1.2	17.76
K. quadrata	28.9	1.3	3.7	0.7	0.2	0.1	0.8	0.2	4.14
K. serrulata	3.5								0.39
Lecane luna	0.2								0.02
Lecane sp.	0.2								0.02
Lepadella palella	1.1								0.12
Monostyla sp.	0.2								0.02
Notholca acuminata	2.4	0.2							0.30
N. labis	17.1								1.91
N. squamula	5.0								0.57
N. spp.							1.2	1.3	0.32
Pleosoma sp.		0.1							0.02
Polyarthra spp.	86.5	28.4		4.4	4.6	38.8	35.3	0.9	29.36
Pomphoiyx sulcata				1.7		0.1	5.2	0.1	0.90
Synchaeta spp.	93.0	7.6	16.5	10.8		1.3	3.5	10.8	16.83
Trichocerca cylindrica				0.7					0.08
T. multicrinis		2.3	27.6	8.0	10.4	29.8	1.1		10.10
Unknown A	2.8								0.31
Unknown B	0.2								0.03
Subtotal	362.1	94.2	107.2	35.3	23.1	81.8	70.3	14.5	95.50
COPEPODA									
Calanoid Copepods									
Diaptomus ashlandii	1.8	1.4	0.1						0.40
D. minutus	1.3	0.8	0.2						0.27
D. oregonensis	0.5								0.06
D. sicilis		0.8							0.10
D. siciloides	0.3	3.1	1.0	5.1	7.7	2.3	4.3	1.4	3.11
Epischura lacustris	0.1								0.01
Eurytemora affinis		0.1							0.02
Limnocalanus macrurus	0.3								0.03
Skistodiaptomus oregonensis	0.5	8.4	2.8	0.8				2.0	1.88
Copepodids, calanoid	5.4	12.6	5.2	9.0	0.6	0.9	5.9	0.3	4.96
Nauplii, calanoid	6.8	89.3	0.6	0.9	5.6	2.4	7.8	0.6	14.72
Cyclopoid Copepods									
Cyclops bicuspidatus thomasi	1.0	24.2	2.7		2.4	5.1	1.3	7.2	5.71
C.b.t. (immature)	4.2	33.5	38.6	1.6	2.2	9.1	4.2	3.2	12.51
C. vernalis		13.5	12.4	13.7		0.4	0.1	0.3	5.04
C. vernalis (immature)		6.7	12.5	19.6					4.71
Copepodids, cyclopoid	21.5	656.7	155.0	11.3	31.4	26.4	35.8	9.2	123.03
Nauplii, cyclopoid	2.0				0.6			0.7	0.39
Subtotal	45.8	851.1	231.1	62.1	50.5	46.6	59.3	24.9	176.94
CLADOCERA									
Alona sp.	0.1					0.1			0.01
Bosmina longirostris	1.1	29.1	0.1				0.5	2.5	4.33
Ceriodaphnia sp.					0.1	0.1			0.02
Chydorus sphaericus	2.5	18.6	1.9	0.5	4.3	3.1	6.9	7.9	5.88
Daphnia galeata mendote	1.3	1.1	0.3	1.8		0.1		1.6	0.74
D. magna	0.2								0.03
D. pulex	0.1	0.9							0.13
D. retrocurva	3.9	65.6	52.9	74.8	5.6	7.2	0.5		26.03
Diaphanosoma leuchtenbergianum	0.1	3.7	0.3	1.5	4.7	4.6	0.1	0.1	1.89
Eubosmina coregoni	1.7	10.8	123.8	30.7	16.3	14.0	19.1	3.6	28.03
Leptodora kindtii			0.8	1.0	0.4	1.0	0.1		0.40
Subtotal	10.9	129.8	180.1	110.4	31.2	30.1	27.2	15.6	67.49
PROTOZOA									
Acineta sp.	0.1								0.01
Carchesium sp.			0.2						0.02
Difflugia sp.	20.3	10.6	225.1	98.3	39.5	92.3	1.8	0.2	61.41
Subtotal	20.4	10.6	226.3	98.3	39.5	92.3	1.8	0.2	61.44
TOTAL	439.1	1085.7	744.7	306.0	144.4	250.7	158.6	55.2	401.36

* Expressed as no./l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter; 0.080 mm mesh) from 7 sampling stations on the dates indicated.

TABLE 2

MONTHLY MEAN ZOOPLANKTON POPULATIONS* FROM
SAMPLING STATIONS AT LOCUST POINT, LAKE ERIE - 1977

Date	April 26	May 24	June 22	July 13	August 30	Sept. 12	Oct. 26	Nov. 22	Grand Mean
Station									
1	510	1474	1066	533	85	315	268	63	539
3	323	879	783	265	223	230	112	42	357
6	330	1012	498	249	113	202	128	50	323
8	318	812	504	216	100	263	154	34	300
13	482	1421	875	**	136	249	176	80	489
14	468	929	585	222	156	288	119	67	354
18	528	1073	902	352	167	208	154	50	429
Grand Mean	439	1086	745	306	144	251	159	55	401

* Data presented as no. of organisms/l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter, 0.080 mm mesh)at each station.

** Insufficient preservation.

group. Copepoda was the dominant zooplankton group in May, June, August, and November representing 78 percent, 31 percent, 35 percent, and 45 percent, respectively, of the total zooplankton population. The abrupt pulse in May was due primarily to immature cyclopoid forms although calanoid nauplii also increased from 7/l in April to 89/l in May.

Monthly mean cladoceran densities ranged from 11/l in April to 180/l in June (Table 1). The mean cladoceran density from all samples collected in 1977 was 67/l or 17 percent of the total zooplankton population. Cladoceran populations were dominated by Daphnia retrocurva in April, May, and July; Eubosmina coregoni in June, August, September, and October; and Chydorus sphaericus in November. Eubosmina coregoni had the largest annual mean density, 28/l. Cladocera was the dominant zooplankton group only in July when it constituted 36 percent of the total zooplankton density.

Monthly mean protozoan densities ranged from 0.2/l in November to 226/l in June (Table 1). The annual mean density of 61/l was 15 percent of the total zooplankton population. Difflugia sp. was always the dominant protozoa taxon. Protozoa was the dominant zooplanton group in September constituting 37% of the entire zooplankton population.

All raw data were keypunched and are stored in Columbus, Ohio at the offices of the Center for Lake Erie Area Research on the campus of The Ohio State University.

Analysis. Zooplankton populations at Locust Point have been monitored monthly during ice-free periods since 1972. In 1977, 2 new monthly highs and 3 new monthly lows were established (Figure 2). Zooplankton densities in April and May were the highest observed during those months since sampling was initiated in 1972, while densities observed in July, August, and November were the lowest observed for those months. Results from other months fell within the ranges established from 1972-1976.

In general, densities observed at Locust Point in 1974 and 1975 were higher than those observed in 1972 and 1973. Densities in 1976 were intermediate between the 2 groupings while densities from April - June 1977 were similar to those observed in 1974 and 1975 and those from the remainder of 1977 were similar to those observed in 1972 and 1973.

There are several plausible explanations for the variation which has occurred. Samples in 1972 were collected with a 3-1 Kemmerer water bottle at the surface. From 1973-1976 samples were collected by a vertical tow, bottom to surface, with a Wisconsin plankton net. A brief comparison study in 1973 showed that the vertical tow captured approximately 50 percent more taxa than a 3-1 grab (Reutter and Herdendorf, 1974). The actual stations sampled have varied from year to year. In 1973 the intake and discharge pipelines were being dredged, and in 1972 tropical storm Agnes affected the weather. Due to the weather, samples were neither collected on the same day of the month each year nor spaced exactly one month apart. Hubschman (1960) pointed out the tremendous differences which occurred between daily samples, and these samples were taken monthly, while Wieber and Holland (1968) showed that even with replication, wide variation can occur due to patchiness in population densities. The high spring populations from 1975 were undoubtedly largely due to early warming and lower turbidity as the total zooplankton population was

FIGURE 2. MONTHLY MEAN ZOOPLANKTON POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1977.

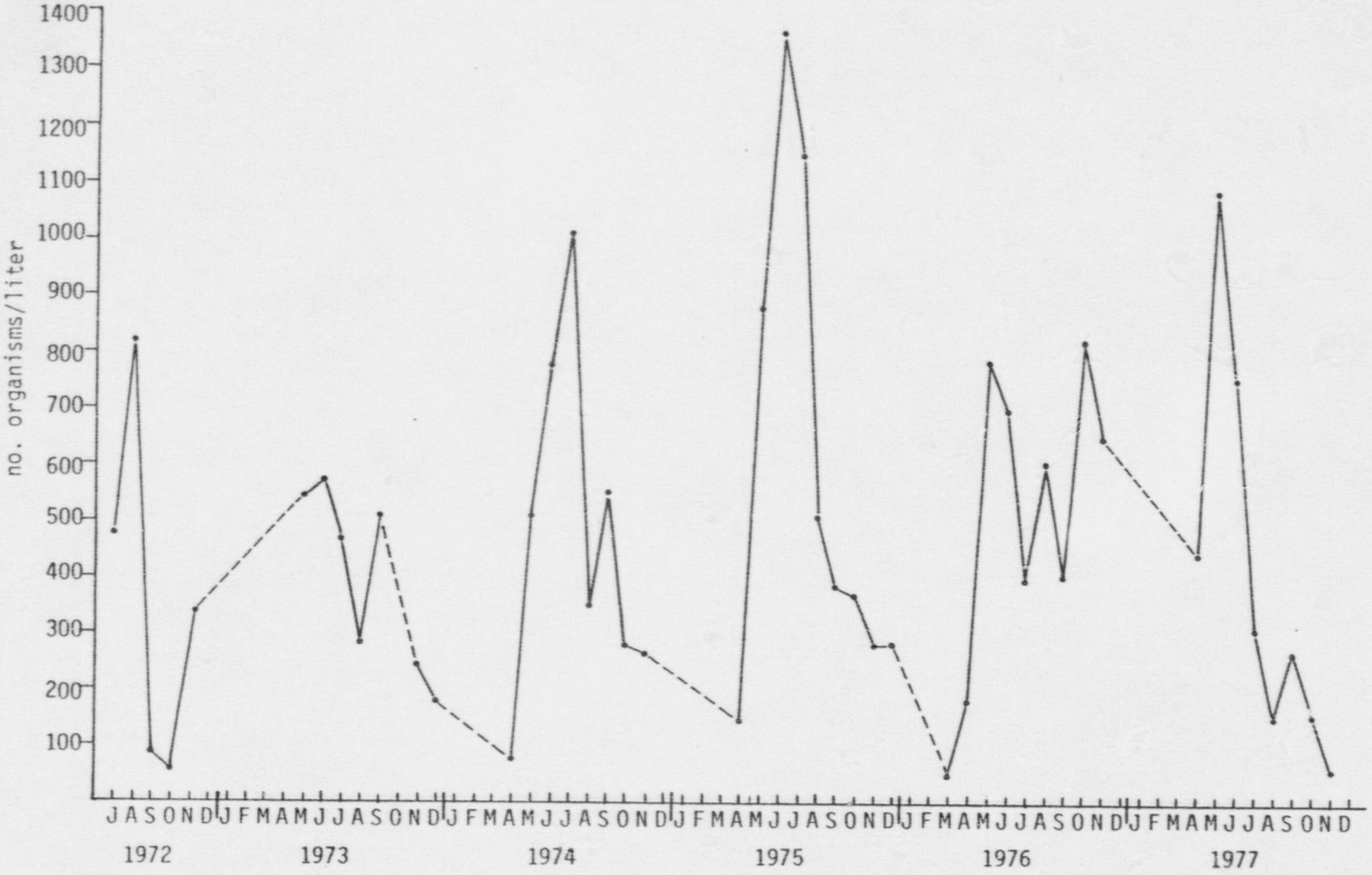
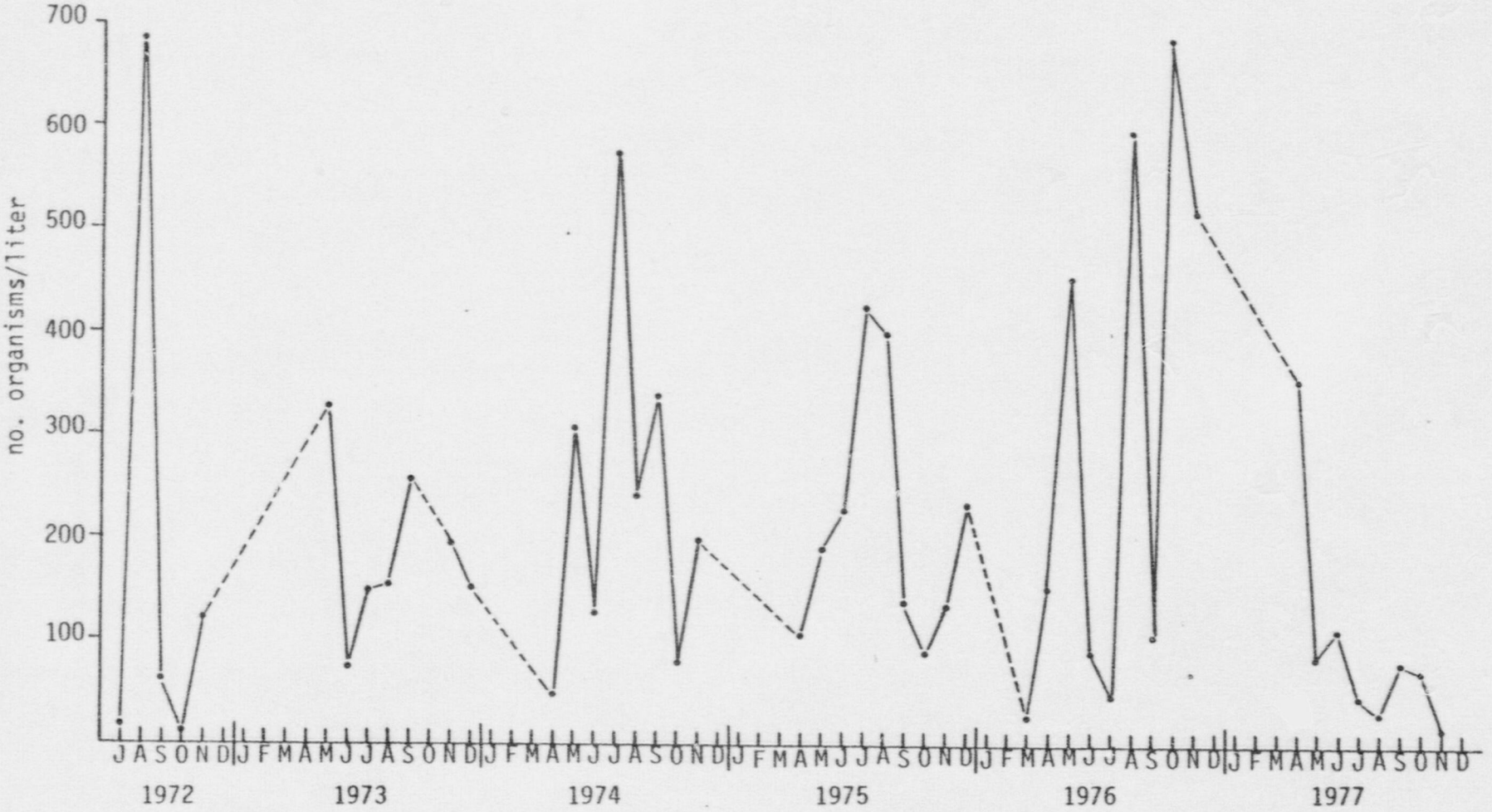


FIGURE 3. MONTHLY MEAN ROTIFER POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1977.



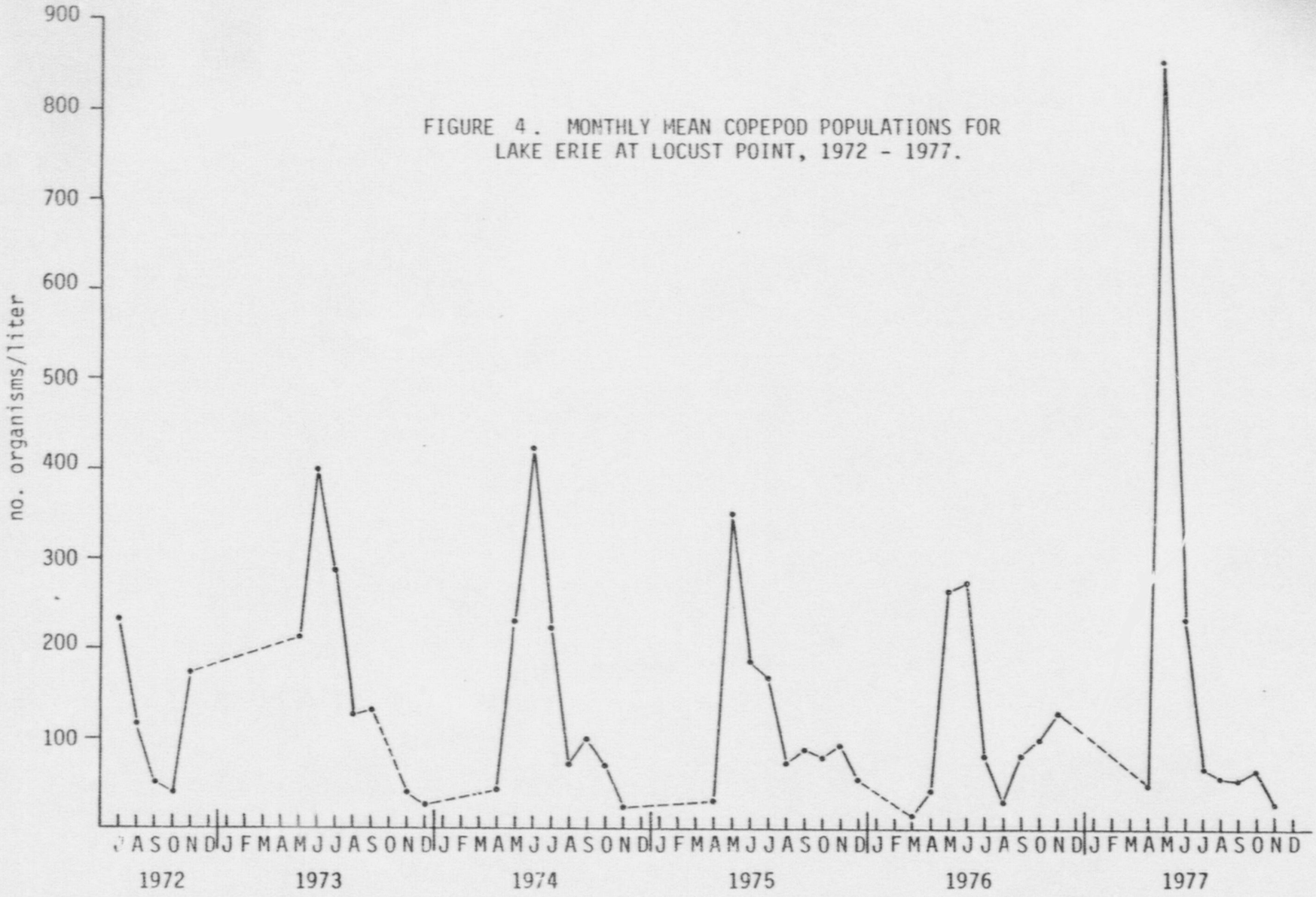
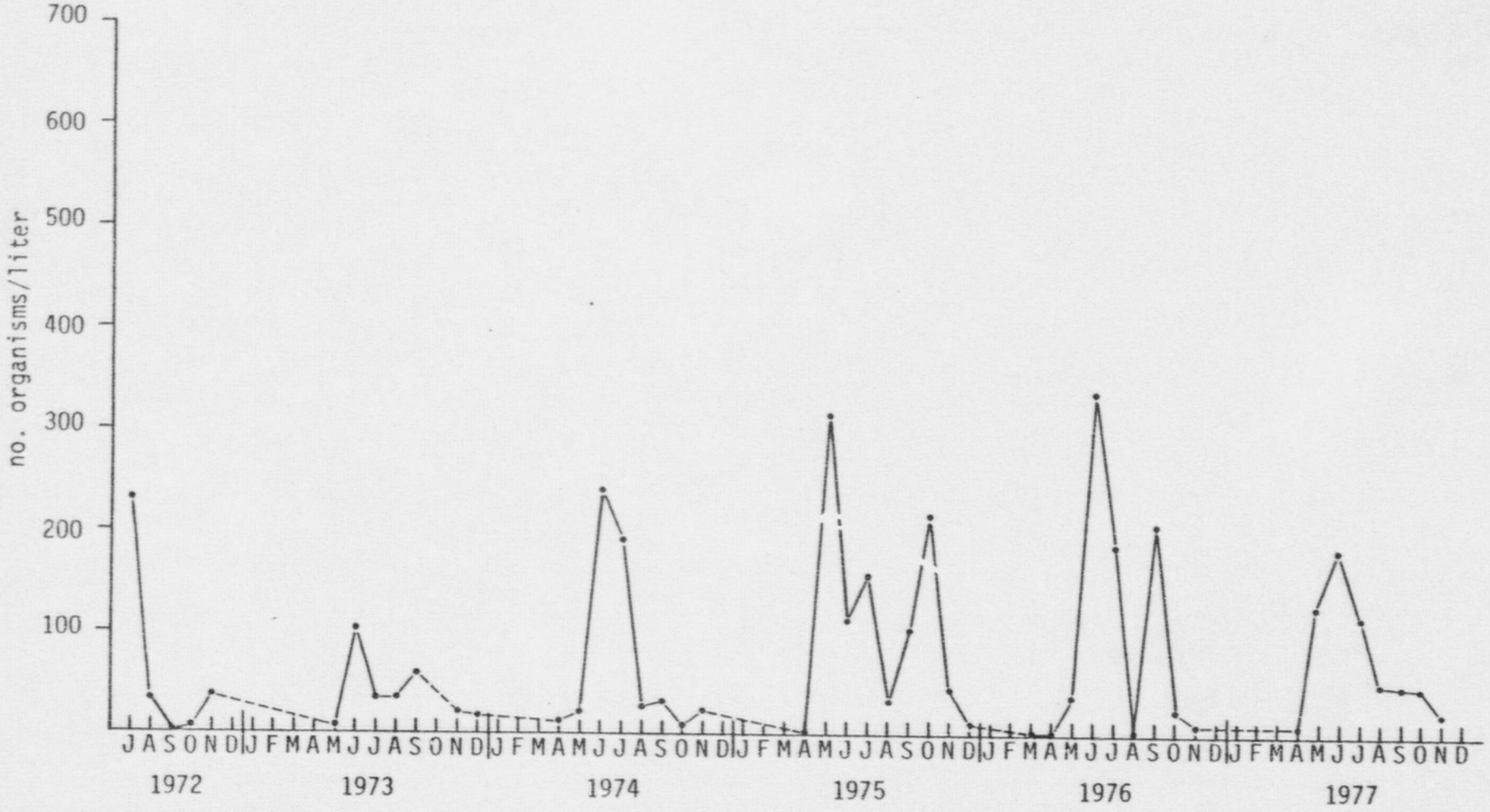


FIGURE 4. MONTHLY MEAN COPEPOD POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1977.

FIGURE 5. MONTHLY MEAN CLADOCERAN POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1977.



significantly correlated with both temperature and turbidity (r = 0.587 and -0.328, respectively) (Reutter, 1976). Finally, operation of station circulating pumps was common in 1976 and 1977.

Rotifer populations in 1977 were the highest observed during the 6 years of the study in April and they were slightly lower than previous years for the remaining months (Figure 3). With the exception of the month of May, copepod populations were similar to those observed in the past (Figure 4). Each year a large copepod pulse is observed during May, June, and sometimes July. In 1977, the May pulse was approximately twice as large as previous pulses. Cladoceran populations during 1977 were very similar to previous years except that the normal fall pulse was not as prominant (Figure 5).

In summary, due to the large variability observed in previous years, zooplankton populations observed in 1977 should be considered typical for the south shore of the Western Basin of Lake Erie.

Phytoplankton

Results. Phytoplankters collected April to November 1977 were divided into 97 taxa, generally to the genus level (Table 3). Twenty-six taxa were grouped in Bacillariophyceae, 46 in Chlorophyceae, 1 in Chrysophyceae, 1 in Cryptophyceae, 3 in Dinophyceae, 2 in Euglenophyceae, 16 in Myxophyceae, and 2 in Protozoa.

Monthly mean phytoplankton populations ranged from 9,914/l in June to 224,075/l in April (Table 4). The mean density from all samples collected in 1977 was 100,922/l. Phytoplankton densities at individual sampling stations ranged from 3,176/l at Station 3 in June to 400,135/l at Station 1 in November. Population pulses were observed in the spring and the fall (Figure 6). These pulses were caused by diatoms (Figure 7).

Monthly mean bacillariophycean densities ranged from 771/l in June to 216,609/l in April (Table 3). The annual mean bacillariophycean density from all samples collected during 1977 was 77,526/l or 77 percent of the entire phytoplankton density. The dominant diatom taxa were Stephanodiscus binderanus in April, May, and October; Melosira islandica in June and July; Fragilaria spp. in August and September; and Melosira ambigua in November. Stephanodiscus binderanus had the largest annual mean population, 39,219/l. Diatoms were the dominant phytoplankton group during April, May, August, October, and November constituting 97 percent, 99 percent, 58 percent, 71 percent, and 65 percent, respectively, of the entire phytoplankton population. In contrast to this, diatoms represented only 8 percent of the June phytoplankton density. As mentioned above, large pulses were observed in the fall and spring (Figure 7).

Monthly mean chlorophycean densities ranged from 852/l in May to 27,141/l in November with an annual mean population from all samples collected during 1977 of 8,554/l or 8 percent of the total phytoplankton population (Table 3). The dominant green algae taxa were Binuclearia sp. in April and June; Pediastrum duplex in May; P. simplex in July; Mugeotia sp. in August, October, and November; and Ulothrix sp. in September. Binuclearia sp. had the largest annual mean population, 2,212/l. Chlorophyceae was the dominant phytoplankton

TABLE 3

MONTHLY MEAN POPULATIONS* OF INDIVIDUAL PHYTOPLANKTON TAXA AT LOCUST POINT - 1977

TAXA	April 26	May 24	June 22	July 13	August 30	Sept. 12	Oct. 26	Nov. 22	Grand Mean
BACILLARIOPHYCEAE (Diatoms)									
Asterionella sp.	8126	0	0	12	0	0	0	0	1017
A. formosa	9198	4810	20	0	7	0	435	9919	3049
A. gracillima	0	0	0	0	38	0	0	0	5
Cyclotella sp.	3566	336	20	43	0	0	0	0	496
Cymatopleura sp.	312	10	0	4	0	2	0	0	41
Diatoma sp.	27	0	0	0	0	0	0	0	3
Fragillaria spp.	8702	14365	73	32	18187	8638	0	0	6250
F. crotenensis	8389	929	13	116	763	433	664	2941	1781
F. vaucheriae	0	0	0	0	0	0	23583	18722	5288
Gyrosigma sp.	60	0	0	0	8	3	0	0	9
Melosira sp.	0	0	0	0	34	1575	192	9	226
M. ambigua	0	0	0	0	0	0	1183	59744	7616
Melosira granulata	0	5	0	0	273	3110	349	1360	637
M. islandica	23194	48879	321	1315	984	3270	713	7578	10782
M. varians	0	10	0	0	0	0	0	0	1
Naviculoid	0	0	0	0	13	30	6	0	6
Nitzschia sp.	0	0	0	0	6	23	0	0	4
Rhizosolenia sp.	0	0	0	0	0	0	0	707	88
Stephanodiscus sp.	0	5	0	16	0	0	15	0	5
S. astrea	0	0	0	0	0	11	0	0	1
S. binderanus	150742	97042	302	5	161	1021	62517	1963	39219
Surirella sp.	99	0	0	4	7	22	0	36	21
Synedra sp.	132	36	3	4	0	0	91	35	38
Tabellaria sp.	4062	1147	19	8	0	0	0	0	655
T. fenestrata	0	0	0	0	0	0	56	2236	287
Tropidoneis sp.	0	0	0	19	0	0	0	0	2
Subtotal	216609	167574	771	1578	20481	18138	89804	105250	77526
CHLOROPHYCEAE (Green Algae)									
Actinastrum sp.	96	16	0	0	43	204	120	427	113
Ankistrodesmus falcatus	0	0	0	0	101	368	1559	1267	412
Binuclearia sp.	1144	63	5347	119	238	587	3895	6304	2212
Chlamydomonas sp.	0	0	0	0	6	7	0	0	2
Closterium sp.	133	91	5	28	15	9	3	0	36
C. aciculare	0	0	0	0	0	0	200	217	52
Coelastrum sp.	0	0	138	229	26	17	0	34	56
C. microporum	0	0	0	0	0	5	0	0	1
C. naegellanum	0	0	0	0	0	2	0	0	0.3
C. reticulatum	0	0	0	0	18	359	182	79	80
Coelosphaerium sp.	11	11	2	0	0	0	0	0	3
Cosmarium sp.	0	0	1	3	0	0	6	2	2
Crucigenia sp.	0	0	0	0	2	0	3	6	1
C. rectangularis	0	0	0	0	0	7	0	0	1
Dictyosphaerium sp.	0	0	4	0	6	16	6	80	14
Elaktothrix sp.	0	0	0	0	0	0	17	8	3
Errerella bornhemiensis	0	0	0	0	0	2	0	0	0.3
Eudorina sp.	5	0	2	0	0	0	0	0	1
Francela droescheri	0	0	0	0	0	4	0	0	1
Golenkinia sp.	0	0	0	0	4	5	2	0	1
Kirchneriella sp.	0	0	0	0	7	13	37	50	13
K. lunaris	0	0	0	0	0	23	16	57	12
Lagerheimia sp.	0	0	0	0	0	2	0	9	1
Micractinium sp.	28	0	90	8	0	0	0	42	21
Microspora sp.	0	0	0	0	26	0	0	0	3
Mugeotia sp.	815	158	290	30	298	3159	8497	15892	1855

TABLE 3 (CON'T.)

MONTHLY MEAN POPULATIONS* OF INDIVIDUAL PHYTOPLANKTON TAXA AT LOCUST POINT - 1977

TAXA	April 26	May 24	June 22	July 13	August 30	Sept. 12	Oct. 26	Nov. 22	Grand Mean
Oedogonium sp.	0	0	0	0	0	0	0	54	7
Oocystis sp.	0	0	24	11	26	66	49	68	31
Pediastrum biradiatum	129	70	809	163	98	0	0	0	159
P. boryanum	0	0	0	0	2	2	39	146	24
P. duplex	162	236	763	215	197	155	945	1132	446
P. simplex	207	69	86	475	245	339	357	415	274
Scenedesmus sp.	56	0	5	0	11	5	5	0	10
S. acuminatus	0	0	0	0	2	18	52	130	25
S. denticulatus	0	0	0	0	2	7	0	5	2
S. quadricauda	37	124	27	20	22	80	140	187	80
Schroederia sp.	0	10	0	0	20	41	87	96	32
Selenastrum sp.	0	0	0	0	3	17	38	0	7
Sphaerocystis sp.	0	0	0	0	2	0	0	0	0.3
Spirogyra sp.	26	0	0	0	0	0	0	0	3
Staurastrum paradoxum	26	4	28	257	3	18	87	173	75
Tetraedron sp.	0	0	0	0	3	15	18	3	5
Tetrastrum sp.	0	0	0	0	2	10	27	19	7
Treubaria sp.	0	0	0	0	3	7	0	0	1
Ulothrix sp.	0	0	0	0	179	4465	278	239	645
Unidentified	13	0	54	5	0	0	0	0	9
Subtotal	2888	852	7675	1563	1610	10034	16665	27141	8554
CHRYSOPHYSEAE (Brown Algae)									
Dinobryon sp.	0	0	0	0	0	0	0	366	46
CRYPTOPHYCEAE (Golden-brown Algae)									
Cryptomonas erosa	0	0.	0	0	27	135	692	446	163
DINOPHYCEAE (Dinoflagellates)									
Ceratium hirundinella	3478	0	550	164	42	108	6	6	544
Diplosalis acuta	0	0	0	0	0	3	0	0	0.4
Peridinium sp.	0	0	0	3	0	0	0	0	0.4
Subtotal	3478	0	550	167	42	111	6	6	545
EUGLENOPHYCEAE (Euglenas)									
Euglena sp.	0	0	0	0	0	0	0	28	4
Trachelomonas sp.	0	0	0	185	0	0	0	0	23
Subtotal	0	0	0	185	0	0	0	28	27
MYXOPHYCEAE (Blue-green Algae)									
Anabaena sp.	0	0	4	11	51	0	0	0	8
A. planctonica	0	0	0	0	10	291	29	13	43
A. spiroides	0	0	0	24	333	2285	564	454	458
Anacystis sp.	0	0	0	0	87	0	0	0	11
Aphanizomenon sp.	0	0	743	28106	8565	12645	6806	8628	8187
Aphanocapsa sp.	0	0	62	2	70	104	0	0	30
Aphanothece sp.	0	0	0	4	0	2	0	0	1
Chroococcus sp.	0	10	24	5	13	57	0	0	14
Gloeothece sp.	0	0	0	0	8	0	0	0	1
Gomphosphaeria sp.	5	11	0	0	2	0	0	0	2
Merismopedia sp.	0	0	0	0	6	55	0	10	9
Microcystis sp.	40	5	74	772	445	0	0	0	162
M. aeruginosa	0	0	0	0	131	676	84	28	115
M. incerta	0	0	0	1	242	333	3	2	73
Oscillatoria sp.	909	68	11	241	3081	3491	11303	18863	4632
Raphidiopsis sp.	0	0	0	0	4	15	840	221	135
Subtotal	954	94	918	29166	13048	19954	19629	28219	13998
PROTOZOA									
Acineta sp.	0	10	0	0	0	0	0	0	1
Saccate protozoan	147	369	0	0	0	0	0	0	65
Subtotal	147	379	0	0	0	0	0	0	66
TOTAL	224076	168899	9914	32659	35208	48372	126796	161456	100922

* Expressed an no. of whole organisms/l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter, 0.080 mm mesh) from 7 sampling stations on dates indicated.

TABLE 4

MONTHLY MEAN PHYTOPLANKTON POPULATIONS*
FROM SAMPLING STATIONS AT LOCUST POINT, LAKE ERIE - 1977

STATION \ DATE	April 26	May 24	June 22	July 13	August 30	September 12	October 26	November 22	GRAND MEAN
1	314406	206334	20205	27636	24242	71216	62534	400135	140839
3	188717	201735	3176	30451	26614	40281	152681	149954	99201
6	302004	171276	15272	34736	19381	48313	83864	172664	105939
8	142686	124782	3598	34028	22641	36743	116363	93383	71778
13	193221	191170	9919	35046	29499	46421	136376	111081	94091
14	205610	167678	6265	33071	35838	43416	150130	80593	90325
18	221878	119267	7801	32535	88200	52222	185656	122409	103746
Grand Mean	224075	168892	9913	32658	35202	48374	126800	161460	100922

* Data presented as no. of whole organisms/l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter, 0.080 mm mesh) at each station.

FIGURE 6. MONTHLY MEAN PHYTOPLANKTON POPULATIONS
FOR LAKE ERIE AT LOCUST POINT, 1974-1977

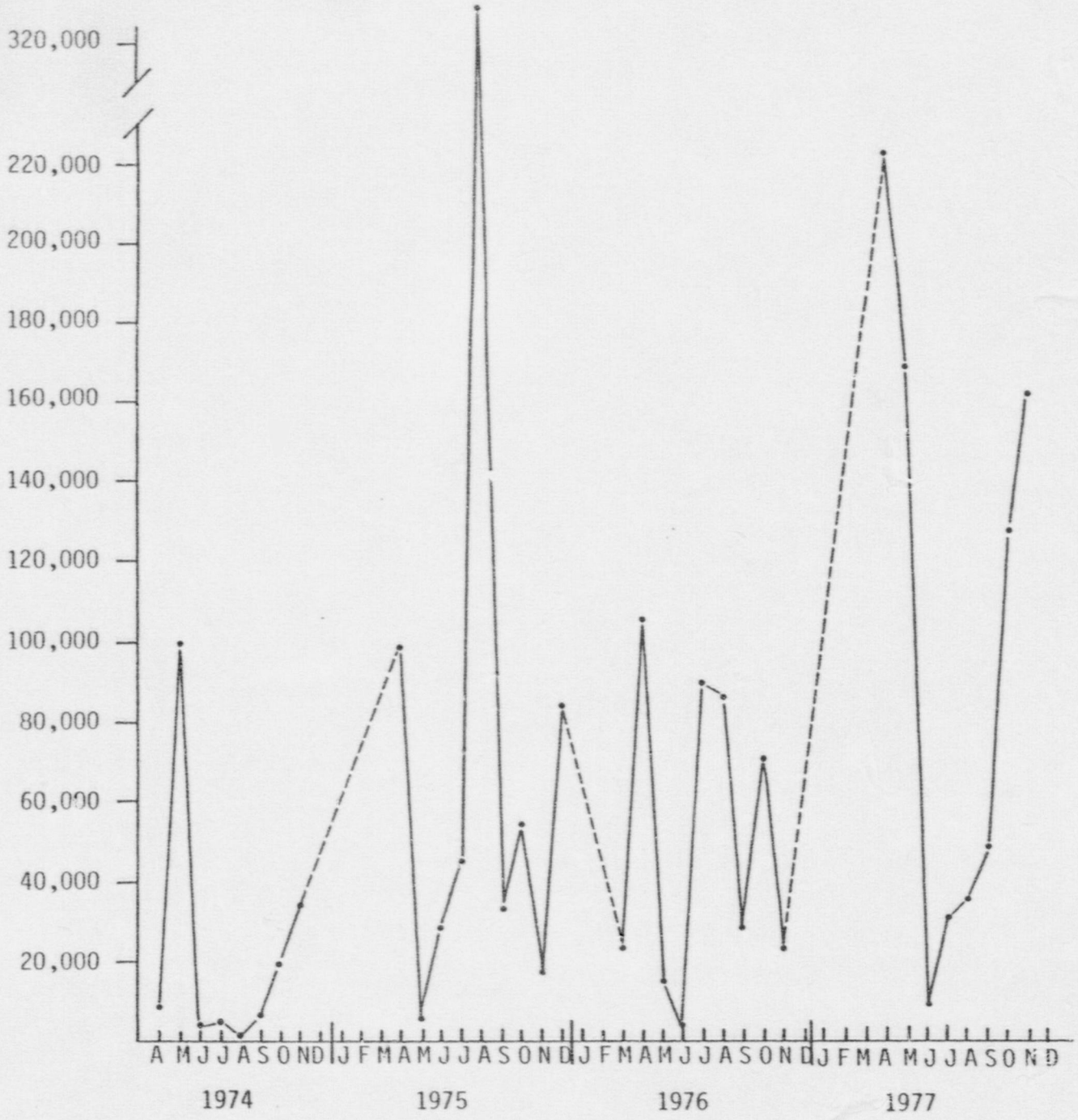
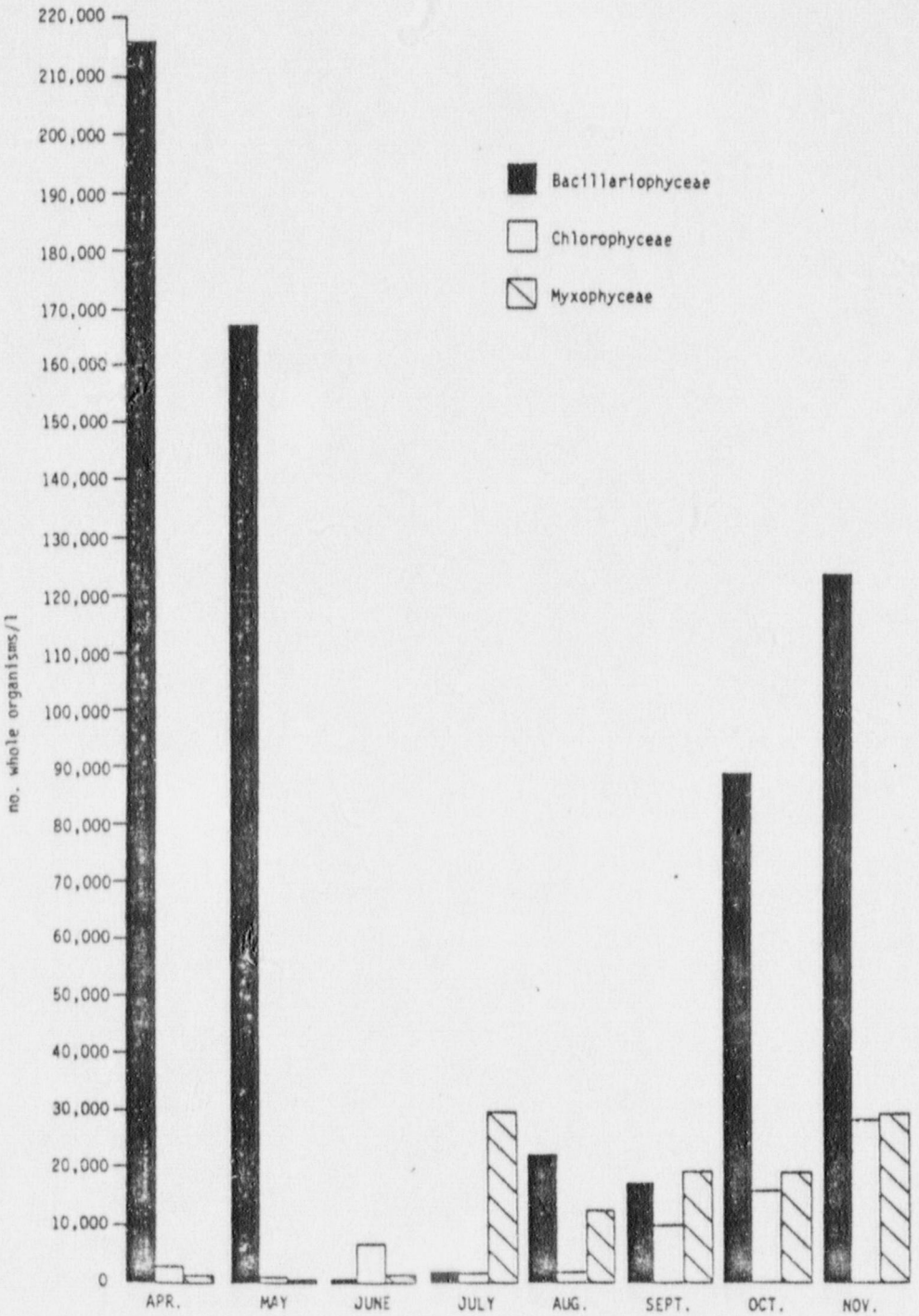


FIGURE 7

MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1977.



class in June, representing 77 percent of the total phytoplankton population. However, chlorophyceans reached their greatest densities in November, 27,141/l, but constituted only 17 percent of the total phytoplankton population due to a large diatom pulse.

Chrysophycean was a rare class represented only by Dinobryon sp. which occurred only in November, 366/l (Table 3).

Cryptophyceae was another relatively rare class represented only by Cryptomonas erosa which occurred at low densities from August through November (Table 3).

Dinophyceae, grouped here with the phytoplankton, was represented by 3 taxa of which Ceratium hirundinella was the most abundant (Table 3).

Euglenophyceae was represented by Euglena sp. which occurred in November and Trachelomonas sp. which occurred in July.

Monthly mean myxophycean densities ranged from 94/l in May to 29,166/l in July with an annual mean density from all samples collected in 1977 of 13,998/l, 14 percent of the total phytoplankton mean (Table 3). The dominant myxophycean taxa were Oscillatoria sp. in April, May, October, and November and Aphanizomenon sp. from June through September. Aphanizomenon sp. exhibited the largest annual mean density, 8,187/l. Myxophyceae was the dominant algal class in July and September constituting 89 percent and 41 percent, respectively, of the total phytoplankton density. In contrast to this, myxophyceans represented only 0.05 percent of the phytoplankton population in May.

Protozoa, grouped here with the phytoplankton, was represented by only two taxa, Acineta sp. and Saccate protozoan, neither of which represented a significant portion of the total phytoplankton density (Table 3).

All raw data were keypunched and are stored in Columbus, Ohio at the offices of the Center for Lake Erie Area Research on the campus of The Ohio State University.

Analysis. The Center for Lake Erie Area Research has monitored phytoplankton populations at Locust Point since 1974 (Figure 6). Radical differences were noted between populations in 1974 and 1975, but 77 percent of the variation was explainable by variation in physical and chemical parameters of water quality (Reutter, 1976). Bacillariophycean and Chlorophycean populations observed in 1974 and 1975 were quite comparable (Figures 8 and 9). The Myxophycean component of the populations accounted for the differences between the 2 years. No Myxophycean bloom occurred in 1974, whereas a huge Aphanizomenon sp. bloom occurred in August 1975. This bloom was highly correlated with increased transparency (80 percent greater than in 1974) and decreased turbidity (20 percent of that observed in 1974) (Reutter, 1976). A correlation of this type was first hypothesized by Chandler and Weeks (1945).

Bacillariophyceae and Chlorophyceae populations in 1976 were similar in size and composition to those observed in 1974 and 1975 (Figures 8, 9, and 10). The diatom population, especially, was strikingly similar from year to year, with 1976 most resembling 1974. Populations were always greatest in spring and fall, and pulses which begin and end abruptly were commonplace. Chlorophycean

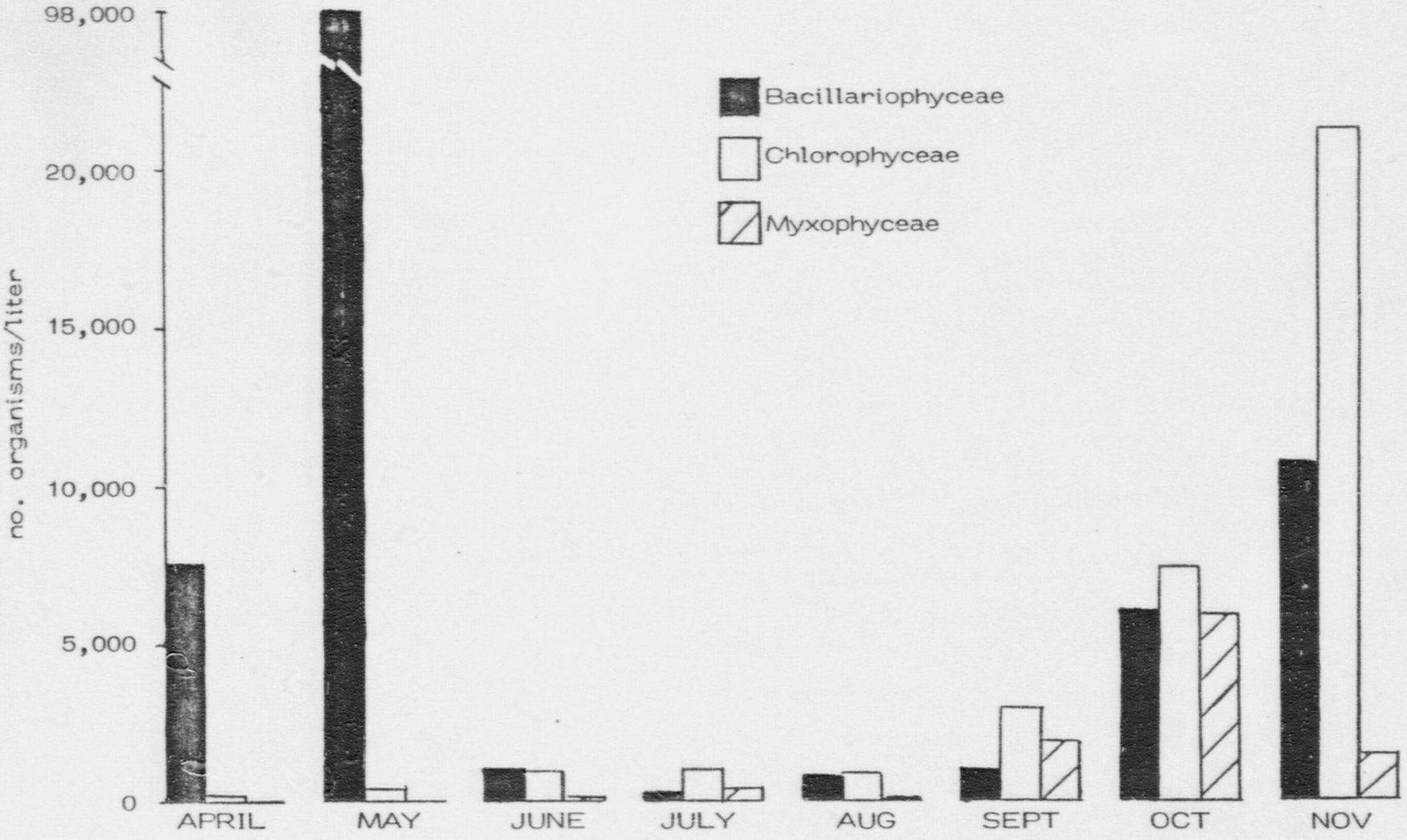


FIGURE 8. MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT - 1974.

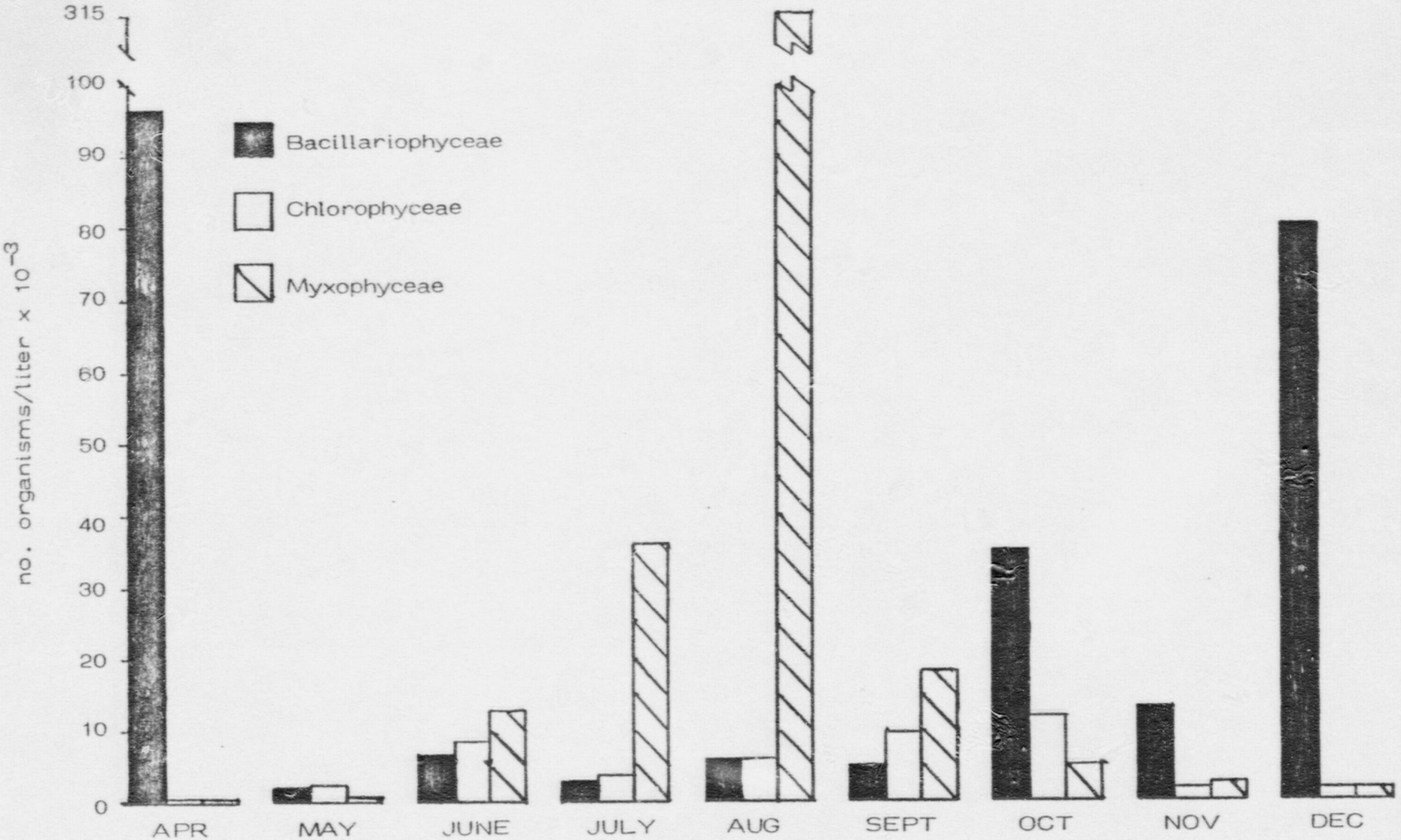
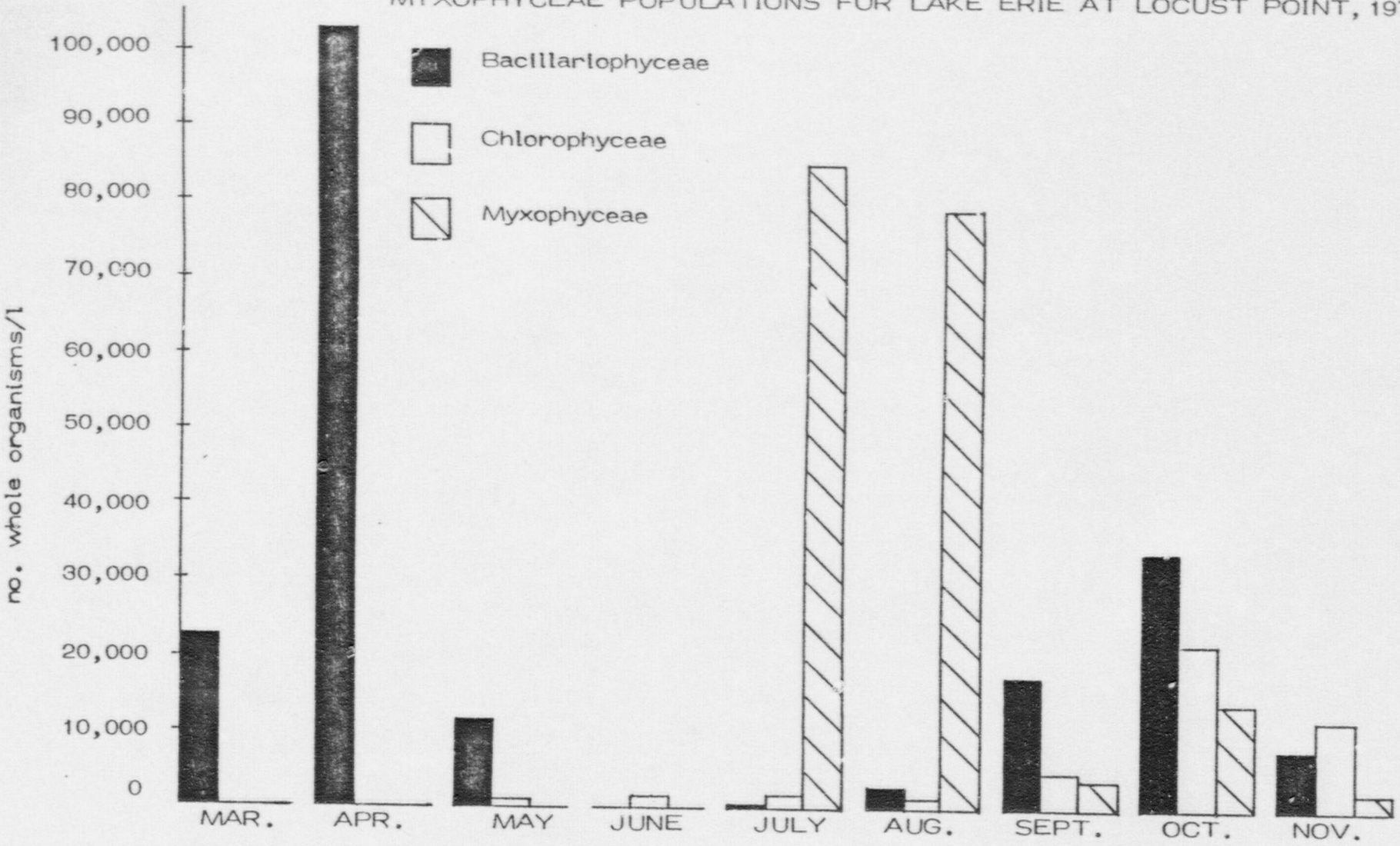


FIGURE 9. MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT - 1975.

FIGURE 10. MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1976.



populations tended to increase in the fall. A very small pulse was observed in June 1975 which was not observed in 1974 or 1976.

The 1976 Myxophycean population was between the extremes set forth in 1974 and 1975. A bloom of Aphanizomenon sp. occurred in July and August which corresponded well in time of occurrence with the 1975 August bloom, but, though it was slightly longer in peak duration, it was only one third the magnitude of the 1975 bloom and started and ended much more abruptly. Again, these pulses appear to be explainable by variation in transparency and turbidity. Transparency in 1976 was similar to 1975 and much greater than 1974, while turbidity, though more variable than in 1974 or 1975, reached a low in July similar to that observed in 1975 and below that of 1974 (Reutter and Herdendorf, 1977).

The 1977 phytoplankton population exhibited diatom blooms in fall and spring as in preceding years, however, the spring bloom was approximately twice as large as those observed from 1974-1976. The myxophycean population showed pulses in summer as in 1975 and 1976, but blue-greens also increased in the fall which was only hinted at in previous years. Chlorophycean populations were generally low and were very similar to those observed in 1974 and 1976.

In summary, it is obvious from Figures 7-10, that the major differences between 1977 and previous years were in the size of the spring and fall diatom pulses and the summer myxophycean pulse. However, lack of a large summer blue-green bloom is not unusual (1974) and the unusually long and cold winters of 1976-1977 and 1977-1978 undoubtedly had a large influence on diatom densities as they are cold water forms. Furthermore, the increase in the myxophycean densities in the fall of 1977 was due to Oscillatoria sp. which is also a cold water form. Consequently, phytoplankton populations observed at Locust Point during 1977 should not be considered unusual for the southwest shore of Lake Erie during 1977.

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