

Table 1. Lake Michigan phytoplankton and zooplankton sampling dates, 1983 to 1992. Generally, analyses in this report incorporate only the spring and summer sampling dates. Dates with stars represent sampling dates where zooplankton samples were not taken.

1983	Stations Sampled	1984	stations Sampled	1985	Stations Sampled
04/17 - 04/21	11	04/09 - 04/12	11	04/15 - 04/22	11
05/04 - 05/06	11	05/06 - 05/07	11	05/01 - 05/02	11
07/04 - 07/05*		07/08 - 07/09 *	11	06/05 - 06/06	11
08/03 - 08/04	11	08/01 - 08/03	11	08/17 - 08/20	11
08/17 - 08/19	11	08/12 - 08/14	11	08/21 - 08/23	11
10/12 - 10/15	11	08/15 - 08/16	24	11/14 - 11/16	11
10/26 - 10/30	11	11/27 - 11/29	11	11/29 - 12/04	11
FEB. 84*		12/13 - 12/18	11		
		02/07 - 02/09/85*	9		
1986	Stations Sampled	1987	Stations Sampled	1988	Stations Sampled
04/12 - 04/13	11	03/26 - 03/28	10	3/31-4/2	11
05/02 - 05/04	11	04/13 - 04/14	11	4/2 - 4/24	11
08/01 - 08/02	11	08/21 - 08/24	10	8/4 - 116	12
08/21 - 08/22	11			8/24-8/26	11
				Feb. 1988*	11
1989	Stations Sampled	1990	stations Sampled	1991	Stations Sampled
3/23-3/24	11	3/29-3/31	11	3/29-3/29	11
8/7-8/9	11	4/4-4/6	11	4/23-4/24	11
8/26-8/28	11	8/2-8/4	11	8/20-8/22	11
		8/21-8/23	11		
1992	Stations Sampled				
4/16-4/20	11				
8/18-8/23	11				

Table 2. Number of species observed in each algal division or grouping, Lake Michigan, 1983 to 1992 and for the total period 1983 to 1992. Spring and summer data only. BAC=Bacillariophyta, CAT = Chloromonophyta, CHL=Chlorophyta, CHR=Chrysophyta, COL - colorless flagellates, CRY=Cryptophyta, CYA=Cyanophyta, EUG = Euglenophyta, PYR=Pyrrhophyta, UNI = unidentified flagellates and XAN = Xanthophyta.

NUMBER OF SPECIES											
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1983-92
BAC	130	118	85	69	59	64	101	72	57	58	220
CAT	1	0	0	0	0	1	0	0	0	0	1
CHL	58	44	27	43	41	33	33	40	28	28	133
CHR	44	32	38	32	28	30	38	33	29	30	87
COL	8	10	7	6	1	2	2	3	2	1	15
CRY	22	17	17	16	16	14	10	17	17	20	33
CYA	15	10	10	9	11	11	21	15	11	13	37
EUG	1	1	1	0	1	2	0	2	1	0	3
PYR	6	4	5	4	4	3	5	4	5	5	11
UNI	1	0	0	1	0	2	0	0	0	0	2
XAN	0	0	0	0	0	0	1	0	0	0	1
TOTAL	286	236	190	180	161	162	211	186	150	155	543

Table 3 Number of genera observed in each algal division or grouping, Lake Michigan, 1983 to 1992 and for the total period 1983 to 1992. Spring and summer data only. BAC=Bacillariophyta, CAT = Chloromonophyta, CHL=Chlorophyta, CHR=Chrysophyta, COL - colorless flagellates, CRY=Cryptophyta, CYA=Cyanophyta, EUG = Euglenophyta, PYR=Pyrrhophyta, UNI = unidentified flagellates and XAN = Xanthophyta.

NUMBER OF GENERA											
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1983-92
BAC	29	26	23	19	18	15	24	17	16	16	35
CAT	1	0	0	0	0	0	0	0	0	0	1
CHL	27	23	15	19	19	17	17	21	15	15	48
CHR	13	14	17	16	13	12	13	15	15	14	24
COL	2	2	3	3	0	1	2	2	1	0	5
CRY	4	4	4	3	3	3	2	2	2	2	5
CYA	8	6	5	6	8	7	13	8	8	7	18
EUG	1	1	1	0	1	2	0	2	1	0	3
PYR	4	3	4	3	3	3	4	3	4	4	5
UNI	0	0	0	0	0	0	0	0	0	0	0
XAN	0	0	0	0	0	0	1	0	0	0	1
TOTAL	89	79	72	69	65	60	76	70	62	58	145

Table 4. Summary of common phytoplankton species occurrence in Lake Michigan during 1983 - 1992. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume). Common species were arbitrarily defined as having an abundance > 0.5% of the total cells or > 0.5% of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE % CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu\text{m}^3/\text{mL}$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
Asterionella formosa	301	19.2	0.71	8,210	1.51
Aulacoseira islandica	236	27.0	1.00	33,244	6.12
Aulacoseira italica	357	30.3	1.12	8,216	1.51
Cyclotella comensis	2600	47.1	1.74	2,123	0.39
Cyclotella comta	139	3.4	0.13	8,341	1.54
Cymatopleura solea	5	0.1	0.00	3,380	0.62
Fragilaria crotonensis	429	33.5	1.24	22,379	4.12
Nitzschia lauenburgiana	16	0.5	0.02	3,232	0.59
Rhizosolenia eriensis	110	5.7	0.21	34,790	6.40
Rhizosolenia longiseta	503	10.7	0.40	11,511	2.12
Stephanodiscus alpinus	369	10.0	0.37	80,056	14.74
Stephanodiscus niagarae	78	1.9	0.07	36,803	6.77
Stephanodiscus transilvanicus	122	4.0	0.18	53,845	9.91
Synedra ulna	33	0.9	0.03	6,753	1.24
Tabellaria flocculosa	202	9.5	0.35	26,210	4.82
			-----		-----
Total			7.56		62.42
CHLOROPHYTA					
Cosmarium sp.	33	0.4	0.01	3,073	0.57
Green coccoid	1440	80.2	2.96	5,294	0.97
Monoraphidium contortum	352	28.4	1.05	328	0.06
			-----		-----
Total			4.03		1.60
CHRYSOPHYTA					
Chromulina sp.	1859	214.6	7.93	5,966	1.10
Chrysophycean coccoids	630	28.4	1.05	456	0.08
Dinobryon divergens	565	21.6	0.80	4,404	0.81
Dinobryon sociale	1857	49.9	1.84	5,666	1.04
Haptophyceae	1473	105.3	6.85	3,402	0.64
Ochromonas sp.	4287	301.7	14.11	13,704	2.52
			-----		-----
Total			32.50		6.20
COLORLESS FLAGELLATES					
Colorless flagellate	1031	33.1	1.22	1,247	0.23
CRYPTOPHYTA					
Chroomonas norstedtii	295	22.1	0.82	703	0.13
Cryptomonas erosa	131	11.1	0.41	24,374	4.49
Cryptomonas marssonii	49	4.3	0.16	4,631	0.85
Cryptomonas phaseolus	98	6.0	0.25	2,948	0.54
Rhodomonas lens	139	13.6	0.50	2,415	0.44
Rhodomonas minuta	965	199.1	7.36	16,872	3.11
			-----		-----
Total			9.50		9.56
CYANOPHYTA					
Anacystis montana	5285	429.5	15.87	4,377	0.81
Coelosphaerium naegelianum	3068	100.7	3.72	1,352	0.25
Oscillatoria limnetica	2266	139.3	5.15	1,184	0.22
Oscillatoria sp.	4132	91.2	3.37	1,718	0.32
Synechococcus sp.	067	37.9	1.40	2,124	0.39
			-----		-----
Total			29.51		1.98
PYRROPHYTA					
Ceratium hirundinella	16	0.4	0.01	15,344	2.82
Gymnodinium sp.	25	2.3	0.09	6,705	1.23
Peridinium sp.	82	1.9	0.07	8,443	1.55
			-----		-----
Total			0.17		5.61
			=====		=====
Total			84.57		87.60

Table 5. Time trends in phytoplankton biomass and abundance (1983 to 1992). Only spring and summer are considered. Only major divisions are presented. (*)Mean biomass and abundance is for all divisions. Values in parentheses are percent of total.

BIOMASS (g/m³)

	BAC	CHL	CHR	CRY	CYA	PYR	*Mean Biomass
	g/m ³ %	g/m ³ %	g/m ³ %	g/m ³ %	g/m ³ %	g/m ³ %	g/m ³
1983	.217 (54.4)	.024 (6.1)	.053 (13.5)	.049 (12.4)	.013 (3.2)	.067 (9.7)	.391
1984	.436 (71.5)	.012 (2.0)	.070 (11.5)	.066 (10.9)	.011 (1.X)	.020 (2.2)	.610
1985	.353 (64.2)	.011 (2.1)	.050 (9.4)	.086 (16.2)	.018 (3.3)	.054 (4.6)	.530
1986	1.15 (85.7)	.042 (3.5)	.035 (2.9)	.055 (4.6)	.014 (1.1)	.040 (1.8)	1.19
1987	.214 (70.0)	.010 (3.8)	.011 (3.9)	.036 (13.6)	.006 (2.2)	.026 (6.1)	.267
1988	.235 (60.2)	.020 (5.2)	.023 (6.5)	.047 (12.0)	.010 (2.6)	.073 (13.2)	.391
19x9	.060 (14.6)	.097 (23.7)	.084 (20.6)	.089 (21.6)	.042 (10.1)	.093 (9.0)	.410
1990	.235 (49.1)	.023 (4.7)	.043 (X.9)	.084 (17.7)	.036 (7.5)	.071 (11.4)	.47X
1991	.315 (73.8)	.009 (2.2)	.017 (3.9)	.045 (10.4)	.012 (2.8)	.036 (6.6)	.427
1992	.401 (63.3)	.014 (2.3)	.030(4.X)	.091 (14.4)	.023 (3.6)	.101 (11.6)	.633
Mean (83-87)	.465 (72.8)	.019 (3.2)	.048 (7.9)	.061 (10.1)	.013 (2.0)	.040 (3.7)	
Mean (XX-92)	.23X (52.5)	.032 (7.2)	.040 (X.8)	.069 (15.2)	.024 (5.4)	.070 (10.6)	
Mean (X3-92)	.367 (65.7)	.025 (4.6)	.045 (4.6)	.064 (11.9)	.018 (3.2)	.054 (6.1)	.543

ABUNDANCE (Cells/mL)

	BAC	CHL	CHR	CRY	CYA	PYR	*Mean Abundance
1983	278	150	129X	333	561	7.3	2623
1984	537	166	2469	389	956	9.3	456X
1985	261	209	1359	32X	1199	12.9	3326
1986	36X	326	604	29X	526	x.1	2143
1987	185	159	24X	177	441	5.3	1217
1988	319	314	46X	243	691	11.5	2064
19X9	115	661	640	253	15x5	17.1	3287
1990	19X	142	3X7	236	1290	8.9	2283
1991	205	115	233	231	567	6.5	1370
1992	31X	16X	365	374	1018	x.0	2272
Mean (83-87)	351 (11.1)	200 (6.5)	1369 (45.1)	321 (10.6)	790 (24.9)	8.8 (.17)	
Mean (XX-92)	229 (10.7)	281 (12.5)	423 (1X.9)	257 (11.5)	1024 (45.7)	9.4 (.30)	
Mean (X3-92)	299 (10.9)	234 (X.6)	973 (36.0)	294 (10.9)	x91 (32.1)	9.1 (.21)	2706

Table 6. Lake Michigan mean Spring and Summer division abundances (cells/ml) 1983 - 1992

Year	Bacillariophyta		Chlorophyta		Chrysophyta		Cyanophyta		Pyrrophyta		Cryptophyta	
	Spring (cells/ml)	Summer (cells/ml)	Spring (cells/ml)	Summer (cells/ml)	Spring (cells/ml)	Summer (cells/ml)	Spring (cells/ml)	Summer (cells/ml)	Spring (cells/ml)	Summer (cells/ml)	Spring (cells/ml)	Summer (cells/ml)
1983	329.9	235.9	165.5	137.9	682.5	1,781.5	419.1	686.3	6.8	7.7	356.5	314.3
1984	427.4	592.1	102.4	197.3	930.0	3,239.3	917.5	974.5	4.4	12.7	237.1	464.6
1985	379.4	65.7	186.5	244.0	1,021.3	1,865.6	408.0	2,465.3	8.8	17.3	302.9	364.9
1986	563.9	113.9	195.0	456.2	334.8	872.5	171.7	916.9	7.6	9.0	308.8	287.4
1987	179.4	202.0	76.7	330.3	107.7	542.0	308.1	720.0	3.1	8.3	134.8	264.6
1988	461.8	181.6	76.4	541.8	210.6	713.9	473.1	898.7	8.5	15.4	230.1	256.1
1989	174.0	85.3	416.5	783.4	298.3	810.7	1,054.0	1,851.0	15.7	17.5	333.1	212.3
1990	173.4	221.8	40.4	242.7	193.2	581.2	1,145.5	1,434.5	6.7	11.4	173.0	298.6
1991	239.4	136.5	45.8	252.6	186.8	324.3	648.9	402.7	6.9	5.4	211.7	268.4
1992	395.1	240.1	120.6	215.5	215.4	514.5	910.0	1,127.0	8.3	7.8	244.1	503.7

Table 7. Summary of common phytoplankton species occurrence in Lake Michigan during 1983 - 1907. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume) Common species were arbitrarily defined as having an abundance $\geq 0.5\%$ of the total cells or $\geq 0.5\%$ of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu\text{m}^3/\text{mL}$	% OF TOTAL BIOVOLUME
HACILLARIOPHYTA					
Asterionella formosa	221	18.7	0.61	6,030	0.99
Aulacoseira islandica	231	28.1	0.92	20,332	4.66
Aulacoseira italica	357	33.0	1.09	6,844	1.13
Cyclotella comensis	2600	57.2	1.88	2,272	0.37
Cyclotella comta	139	3.9	0.13	8,422	1.38
Cymatopleura solea	5	0.1	0.00	5,266	0.87
Fragilaria crotonensis	429	39.3	1.29	25,932	4.26
Nitzschia lauenburgiana	16	0.6	0.02	4,273	0.70
Rhizosolenia eriensis	110	7.5	0.25	50,153	8.24
Rhizosolenia longiseta	503	17.9	0.59	19,255	3.17
Stephanodiscus alpinus	369	12.5	0.41	104,522	17.18
Stephanodiscus niagarae	78	2.2	0.07	45,606	7.50
Stephanodiscus transilvanicus	122	3.8	0.13	68,240	11.22
Synedra ulna	33	1.4	0.05	11,207	1.84
Tabellaria flocculosa	202	12.5	0.41	34,105	5.61
			-----		-----
Total			7.86		69.12
CHLOROPHYTA					
Cosmarium sp.	16	0.5	0.02	4,239	0.70
Dictyosphaerium ehrenbergianum	565	17.9	0.59	166	0.03
Green coccoid	1145	52.9	1.74	2,970	0.49
Monoraphidium contortum	352	42.4	1.40	463	0.08
			-----		-----
Total			3.74		1.29
CHRYSOPHYTA					
Chromulina sp.	1859	349.7	11.51	7,218	1.19
Chrysophycean coccoids	630	48.7	1.60	758	0.12
Dinobryon divergens	565	23.9	0.79	4,207	0.70
Dinobryon sociale	1857	73.0	2.40	8,144	1.34
Haptophyceae	1456	173.6	5.71	2,302	0.39
Ochromonas sp.	4207	608.2	20.01	16,473	2.71
			-----		-----
Total			42.02		6.45
COLORLESS FLAGELLATES					
Colorless flagellate	1031	43.6	1.43	1,349	0.22
CRYPTOPHYTA					
Chroomonas acuta	245	16.9	0.55	529	0.09
Chroomonas norstedtii	295	36.9	1.21	1,176	0.19
Cryptomonas erosa	65	10.2	0.34	23,187	3.81
Cryptomonas marssonii	25	3.0	0.10	3,544	0.58
Rhodomonas lens	139	15.5	0.51	2,733	0.45
Rhodomonas minuta	965	211.9	6.97	17,970	2.95
			-----		-----
Total			9.68		8.08
CYANOPHYTA					
Anacystis montana	5285	296.9	9.77	2,348	0.39
Coelosphaerium naegelianum	3068	108.3	3.56	713	0.12
Oscillatoria limnetica	2266	200.2	6.59	1,563	0.26
Oscillatoria sp.	4132	92.9	3.06	1,800	0.30
			-----		-----
Total			22.98		1.06
PYRROPHYTA					
Ceratium hirundinella	8	0.3	0.01	9,485	1.56
Gymnodinium sp.	25	1.9	0.06	6,693	1.10
Peridinium sp.	16	1.2	0.04	4,110	0.68
			-----		-----
Total			0.11		3.34
			=====		=====
Total			87.82		89.56

Table 8. Summary of common phytoplankton species occurrence in Lake Michigan during 1988 - 1992. Summary includes the maximum population density encountered, the average population density and biovolume, and the relative abundance (% of total cells and % of total biovolume) Common species were arbitrarily defined as having an abundance $> 0.5\%$ of the total cells of $> 0.5\%$ of the total biovolume.

TAXON	MAXIMUM CELLS/ML	AVERAGE CELLS/ML	% OF TOTAL CELLS	MEAN BIOVOLUME $\mu\text{m}^3/\text{mL}$	% OF TOTAL BIOVOLUME
BACILLARIOPHYTA					
Asterionella formosa	301	19.9	0.89	11,240	2.48
Aulacoseira islandica	236	25.4	1.13	40,070	8.85
Aulacoseira italica	214	26.6	1.19	10,124	2.24
Cyclotella comensis	493	32.9	1.47	1,917	0.42
Cyclotella comta	96	2.8	0.12	8,228	1.82
Fragilaria crotonensis	368	25.4	1.13	17,441	3.85
Rhizosolenia eriensis	82	3.3	0.15	13,439	2.97
Stephanodiscus alpinus	113	6.6	0.29	46,053	10.17
Stephanodiscus niagarae	69	1.5	0.06	24,569	5.42
Stephanodiscus transilvanicus	82	6.2	0.28	33,039	7.47
Tabellaria flocculosa	55	5.3	0.24	15,238	3.36
			-----		-----
Total			6.95		49.05
CHLOROPHYTA					
Chlamydomonas sp.	147	17.0	0.76	1,475	0.33
Green coccoid	1440	118.0	5.26	8,512	1.88
Monoraphidium convolutum	614	14.5	0.65	52	0.01
Monoraphidium minutum	360	30.4	1.35	257	0.06
Oocystis gigas v. incrassata	33	0.8	0.04	3,407	0.77

Total			0.06		3.04
CHRYSOPHYTA					
Chromulina sp.	131	26.9	1.20	4,225	0.93
Dinobryon divergens	491	18.4	0.82	4,567	1.01
Dinobryon sociale	270	17.7	0.79	2,221	0.49
Haptophyceae	1473	201.7	8.99	5,012	1.11
Mallomonas sp.	25	1.6	0.07	3,287	0.73
Monosiga ovata	262	16.1	0.72	1,449	0.32
Ochromonas sp.	368	66.9	2.98	9,855	2.18
Pseudokephyrion millerense	139	12.6	0.56	403	0.09

Total			16.14		6.05
COLORLESS FLAGELLATES					
Colorless flagellate	237	18.5	0.83	1,105	0.24
CRYPTOMONAS					
Cryptomonas caudata	69	a.3	0.37	2,971	0.66
Cryptomonas erosa	131	12.3	0.55	26,022	5.75
Cryptomonas marssonii	49	6.2	0.28	6,142	1.36
Cryptomonas phaseolus	98	11.1	0.49	5,578	1.23
Rhodomonas minuta	745	181.4	8.09	15,346	3.39

Total			9.70		12.36
CYANOPHYTA					
Anacystis montana	4238	613.7	27.36	7,198	1.59
Chroococcus sp.	565	12.2	0.54	849	0.19
Coelosphaerium naegelianum	2094	90.2	4.02	2,240	0.49
Oscillatoria limnetica	1145	54.8	2.44	658	0.15
Oscillatoria sp.	2921	88.8	3.96	1,604	0.35
Synechococcus sp.	867	90.6	4.04	5,076	1.12
			-----		-----
Total			42.37		3.89
PYRROPHYTA					
Ceratium hirundinella	16	0.5	0.02	23,488	5.19
Gymnodinium helveticum	7	0.2	0.01	2,566	0.57
Gymnodinium sp.	25	3.0	0.13	6,722	1.48
Peridinium sp.	82	2.9	0.13	14,466	3.19
			-----		-----
Total			0.29		10.43
			=====		=====
Total			84.41		85.88

Table 9. Dominant diatom species (biomass basis) from 1983 to 92. Values are percent of total biomass for the year.

Year	Species	% Biomass	Year	Species	% Biomass
1983	<i>Tabellaria flocculosa</i>	17.0	1988	<i>Asterionella formosa</i>	10.0
	<i>Stephanodiscus alpinus</i>	6.8		<i>Stephanodiscus niagarae</i>	9.5
1984	<i>Rhizosolenia eriensis</i>	26.0	1989	<i>Tabellaria flocculosa</i>	2.4
	<i>Fragillaria crotonensis</i>	8.9		<i>Fragillaria crotonensis</i>	1.9
1985	<i>Stephanodiscus niagarae</i>	10.6	1990	<i>Stephanodiscus transilvanicus</i>	16.3
	<i>Aulacoseira islandica</i>	9.0		<i>Rhizosolenia eriensis</i>	8.8
1986	<i>Stephanodiscus alpinus</i>	35.3	1991	<i>Stephanodiscus alpinus</i>	20.9
	<i>Stephanodiscus transilvanicus</i>	26.3		<i>Aulacoseira islandica</i>	19.6
1987	<i>Stephanodiscus alpinus</i>	43.0	1992	<i>Stephanodiscus alpinus</i>	15.4
	<i>Stephanodiscus transilvanicus</i>	4.3		<i>Aulacoseira islandica</i>	22.1

Table 10. Presence of indicator diatom species in Lake Michigan, 1970-1992. The classification scheme of Tarapchak and Stoermer (1976) and Stoermer (1978) were utilized. M¹=mesotrophic but intolerant of nutrient enrichment, M²=mesotrophic and tolerant of moderate nutrient enrichment, E=eutrophic. 1970-71 (offshore samples) and 1977 (nearshore samples) data are from Holland (1980) and Stoermer and Tuchman (1979) and represent data from three seasons: spring, summer and autumn. Values in the columns M¹, M² and E represent April to November values in 1970-71 and 1977. From 1983-92, only spring and summer values are used. All occurrences of organisms are considered.

Date	M ¹	M ²	E	M ¹ +M ² /E
1977 (Nearshore)	8	6	12	1.2
1970-71 ¹	6	3	5	1.8
1983	9	6	8	1.9
1984	9	7	12	1.3
1985	9	6	11	1.4
1986	8	6	8	1.8
1987	8	6	10	1.4
1988	7	6	10	1.3
1989	8	6	10	1.4
1990	8	6	10	1.4
1991	8	6	9	1.6
1992	9	6	10	1.5

¹ Only "major" species were classified

Table 11. Range of abundance of *Cyclotella* spp. at offshore sites in August of 1970 and 1983-92, Lake Michigan. Data from Holland and Beeton (1972) and this study. Stations 22, 23, and 27 are geographically comparable to Holland and Beeton's offshore sites. Values are in cells/mL.

Date	Site (Stations)	<i>Cyclotella</i> <i>michiganiana</i>		<i>Cyclotella</i> <i>s telligera</i>		<i>Cyclotella</i> <i>comensis</i>	
		Min	Max	Min	Max	Min	Max
11/8/70	Offshore Stations	71	182	300	613	Not observed?	
17/8/83	22&27	0.44	6.8	0.17	2.8	0.18	0.26
15/8/84	22&27	0.38	4.5	1.7	2.8	6.14	6.41
21/8/85	22&27	1.4	16.4	0.9	6.4	0.0	3.27
22/8/86	23&27	0.0	1.9	0.0	0.9	0.0	
24/8/87	23&27	0.0		0.0		0.0	
28/8/88	23&27	0.0	9.1	0.0	2.6	0.0	67.5
27/8/89	23&27	3.0	6.9	5.2	7.6	27.7	47.2
22/8/90	23&27	2.7	5.8	2.2	18.8	17.3	104.3
21/8/91	23&27	1.7	7.4	0.6	2.6	50.8	57.2
20/8/92	23&27	0.0	3.6	0.0		34.1	493.1

Table 12a. Mean spring water chemistry for Lake Michigan 1983 - 1992. NA = not available

YEAR	Temperature (°C)	Turbidity (NTU)	Chlorophyll a (µg/L)	Silica (mg/L)	Nitrate (mg/L)	Dissolved reactive phosphorus (mg/L)	Total phosphorus (mg/L)
1983	3.69	0.68	1.88	0.50	0.25	0.0008	0.0053
1984	2.17	0.44	0.56	0.53	0.25	0.0013	0.0053
1985	2.48	0.35	0.84	NA	0.29	0.0008	0.0055
1986	2.82	0.26	2.06	NA	0.29	0.0010	0.0056
1987	3.24	0.36	1.95	0.51	0.28	0.0006	0.0048
1988	2.37	0.35	1.47	0.55	0.28	0.0022	0.0048
1989	1.70	0.15	3.75	0.55	0.30	0.0005	0.0052
1990	2.40	0.39	0.91	0.61	0.29	0.0012	0.0051
1991	3.06	0.40	1.68	0.68	0.30	0.0010	0.0045
1992	2.91	0.39	1.57	0.62	0.29	0.0008	0.0035

Table 12b. Mean summer water chemistry for Lake Michigan 1983 - 1992. NA = not available.

YEAR	Temperature (°C)	Turbidity (NTU)	Chlorophyll a (µg/L)	Silica (mg/L)	Nitrate (mg/L)	Dissolved reactive phosphorus (mg/L)	Total phosphorus (mg/L)
1983	20.89	0.31	0.58	0.17	0.17	0.0007	0.0029
1984	20.92	0.25	0.80	0.12	0.16	0.0004	0.0037
1985	19.89	0.38	0.98	NA	0.16	0.0005	0.0032
1986	20.77	0.30	1.26	NA	0.16	0.0007	0.0039
1987	20.56	0.70	1.19	0.09	0.15	0.0006	0.0036
1988	22.22	0.34	0.78	0.07	0.14	0.0002	0.0028
1989	19.73	0.61	2.47	0.06	0.17	0.0002	0.0042
1990	18.75	0.45	0.38	0.10	0.17	0.0005	0.0046
1991	20.68	0.75	1.39	0.06	0.16	0.0001	0.0024
1992	19.03	0.94	1.80	0.10	0.15	0.0002	0.0035

Table 13. Number of species and genera observed in each phylum of zooplankton, Lake Michigan, 1983 - 1992. CAL = Calanoida, CLA = Cladocera, CYC = Cyclopoida, HAR = Harpacticoida, MYS = Mysidacea, ROT = Rotifera and ZM = (veligers of Dreissena polymorpha)

NUMBER OF SPECIES

	1983	19x4	19x5	1986	1987	1988	19x9	1990	1991	1992	19X3-92
CAL	7	7	8	7	7	7	7	8	7	6	9
CLA	13	10	10	11	8	8	8	10	3	3	19
CYC	3	4	3	3	4	4	4	3	2	2	5
HAR	0	0	1	1	0	0	0	1	0	0	2
MYS	1	1	1	0	0	1	1	1	1	1	1
ROT	19	22	27	22	22	24	24	24	22	21	34
ZM	0	0	0	0	0	0	0	1	0	0	1
TOTAL	19	44	50	44	41	44	44	4x	35	33	71

NUMBER OF GENERA

	1983	19x4	1985	1986	19x7	1988	19x9	1990	1991	1992	19X3-92
CAL	4	4	5	4	4	4	4	4	4	3	5
CLA	7	7	6	8	7	7	7	6	3	3	10
CYC	3	3	3	3	3	4	4	4	2	2	4
HAR	0	0	1	1	0	0	0	1	0	0	2
MYS	1	1	1	0	0	1	1	1	1	1	1
ROT	11	13	14	11	13	13	13	13	12	12	15
ZM	0	0	0	0	0	0	0	1	0	0	1
TOTAL	26	2x	30	27	27	29	29	30	22	21	3x

Table 14. Summary of common zooplankton species occurrence in Lake Michigan during the period 1983 to 1992. Species were arbitrarily classified as common if they accounted for $\geq 0.1\%$ of the total abundance or $\geq 1.0\%$ of the total biomass, with the exception of rotifers. Rotifer species were considered common if they accounted for $\geq 1.0\%$ of the total abundance

TAXON	MAXIMUM DENSITY (#/m ³)	AVERAGE DENSITY (#/m ³)	% OF TOTAL ABUNDANCE	MEAN BIOMASS (µg/m ³)	% OF TOTAL BIOMASS
COPEPODA					
Copepoda - nauplii	76,273	14,105.9	15.44	5,196	11.98
Cyclopoida					
Cyclopoid - copepodite	24,480	1,715.3	1.88	3,445	7.94
Cyclops bicuspidatus thomasi	14,688	730.7	0.80	2,924	6.74
Tropocyclops prasinus mexicanus	2,893	94.6	0.10	186	0.43
Calanoida					
Diaptomus - copepodite	50,741	4,071.4	4.45	7,791	17.96
Diaptomus ashlandi	9,352	1,411.8	1.55	3,508	8.09
Diaptomus minutus	11,873	594.8	0.65	1,410	3.25
Diaptomus sicilis	2,395	268.1	0.29	1,535	3.54
Limnocalanus macrurus	1,725	46.8	0.05	694	1.60
Total			25.22		61.52
CLADOCERA					
Bosmina longirostris	21,216	260.6	0.29	439	1.01
Daphnia galaeta mendotae	43,288	1,031.9	1.13	9,841	22.68
Daphnia pulicaria	6,056	102.1	0.11	746	1.72
Holopedium gibberum	1,318	6.9	0.01	997	2.30
Total			1.53		27.71
ROTIFERA					
Collotheca sp.	15,401	1,118.5	1.22	4	0.01
Conochilus unicornis	376,238	13,514.2	14.80	188	0.43
Gastropus stylifer	21,698	1,744.7	1.91	47	0.11
Kellicottia longispina	42,745	3,093.5	3.39	376	0.87
Keratella cochlearis	234,866	13,408.6	14.68	74	0.17
Keratella crassa	64,602	3,774.4	4.13	294	0.68
Ploesoma truncatum	69,895	2,610.3	2.86	76	0.18
Polyarthra major	53,757	1,826.0	2.00	393	0.91
Polyarthra remata	22,857	1,098.3	1.20	19	0.04
Polyarthra vulgaris	467,205	13,135.6	14.38	743	1.71
Synchaeta sp.	98,070	7,468.7	8.18	229	0.53
Total			68.75		5.63
Total			95.51		94.85

Table 15. Summary of common zooplankton species occurrence in Lake Michigan 1983 - 1987. Summary is based on spring and summer cruises only. Species were arbitrarily classified as common if they accounted for > 0.1 % of the total abundance or > 1.0% of the total biomass, with the exception of rotifers. Rotifer species were considered common if they accounted for > 1.0% of the total abundance.

TAXON	MAXIMUM DENSITY (#/m ³)	AVERAGE DENSITY (#/m ³)	% OF TOTAL ABUNDANCE	MEAN BIOMASS (ug/m ³)	% OF TOTAL BIOMASS
COPEPODA					
Copepoda - nauplii	62,951	14,979.2	25.17	6,291	11.82
Cyclopoida					
Cyclopoid - copepodite	24,480	1,729.1	2.90	6,649	12.50
Cyclops bicuspidatus thomasi	14,688	910.2	1.53	4,234	7.96
Tropocyclops - copepodite	3,190	70.9	0.12	148	0.28
Tropocyclops prasinus mexicanus	2,893	74.5	0.13	192	0.36
Calanoida					
Diaptomus - copepodite	50,741	4,452.8	7.48	13,962	26.24
Diaptomus ashlandi	9,352	1,384.1	2.33	3,991	7.50
Diaptomus minutus	5,119	419.0	0.70	1,194	2.24
Diaptomus sicilis	1,929	278.4	0.47	1,519	2.86
Limnocalanus - copepodite	1,030	84.4	0.14	363	0.68
Limnocalanus macrurus	1,725	69.9	0.12	673	1.26

			Total		73.71
CLADOCERA					
Bosmina longirostris	21,216	295.1	0.50	495	0.93
Daphnia galaeta mendotae	9,644	813.7	1.37	5,883	11.06
Daphnia pulicaria	6,056	199.1	0.33	1,726	3.24
Daphnia retrocurva	5,286	117.6	0.20	725	1.36
Holopedium gibberum	1,318	12.6	0.02	2,391	4.49
			-----	-----	
			Total		21.09
ROTIFERA					
Collotheca sp.	6,814	952.9	1.60	6	0.01
Conochilus unicomis	35,863	1,665.7	2.80	27	0.05
Gastropus stylifer	18,843	1,325.9	2.23	31	0.06
Kellicottia longispina	42,745	2,679.7	4.50	37	0.07
Keratella cochlearis	124,128	6,312.4	10.60	34	0.06
Keratella crassa	64,602	3,009.7	5.06	181	0.34
Notholca squamula	11,133	597.8	1.00	13	0.02
Polyarthra major	19,048	1,185.3	1.99	125	0.24
Polyarthra vulgaris	126,996	8,682.8	14.59	207	0.39
Synchaeta sp.	83,850	3,937.2	6.61	66	0.12
			Total		1.37
			=====	=====	
			Total		96.17

Table 16. Summary of common zooplankton species occurrence in Lake Michigan during the period 1988 to 1992. Species were arbitrarily classified as common if they accounted for $\geq 0.1\%$ of the total abundance or $\geq 1.0\%$ of the total biomass, with the exception of rotifers. Rotifer species were considered common if they accounted for $\geq 1.0\%$ of the total abundance.

TAXON	MAXIMUM DENSITY (#/m ³)	AVERAGE DENSITY (#/m ³)	% OF TOTAL ABUNDANCE	MEAN BIOMASS ($\mu\text{g}/\text{m}^3$)	% OF TOTAL BIOMASS
COPEPODA					
Copepoda - nauplii	76,273	13,197.8	10.61	5,279	12.13
Cyclopoida					
Cyclopoid - copepodite	12,034	1,701.0	1.37	1,405	3.23
Cyclops bicuspidatus thomasi	6,895	544.1	0.44	2,383	5.48
Calanoida					
Diaptomus - copepodite	23,059	3,674.6	2.95	4,085	9.39
Diaptomus ashlandi	8,842	1,440.5	1.16	3,782	8.69
Diaptomus minutus	11,873	777.6	0.63	1,866	4.29
Diaptomus sicilis	2,395	257.4	0.21	1,846	4.24
Limnocalanus macrurus	607	22.8	0.02	846	1.94
			-----		-----
			17.37		49.38
CLADOCERA					
Bosmina longirostris	10,806	224.8	0.18	477	1.10
Daphnia galaeta mendotae	43,288	1,258.8	1.01	15,099	34.70
			-----		-----
			1.19		35.79
ROTIFERA					
Ascomorpha ovalis	27,366	1,413.0	1.14	29	0.07
Collotheca sp.	15,401	1,290.8	1.04	4	0.01
Conochilus unicornis	376,238	25,836.8	20.77	361	0.83
Gastropus stylifer	21,698	2,180.2	1.75	69	0.16
Kellicottia longispina	39,443	3,523.9	2.83	736	1.69
Keratella cochlearis	234,866	20,788.6	16.71	122	0.28
Keratella crassa	56,070	4,569.8	3.67	447	1.03
Ploesoma truncatum	69,895	4,738.1	3.81	141	0.32
Polyarthra major	53,757	2,492.4	2.00	696	1.60
Polyarthra remata	22,857	1,906.8	1.53	30	0.07
Polyarthra vulgaris	467,205	17,766.5	14.28	1,340	3.08
Synchaeta sp.	98,070	11,141.5	8.96	412	0.95
			-----		-----
			78.49		10.08
			=====		=====
			97.05		95.26

Table 17. Zooplankton biomass and abundance of major groups in Lake Michigan, 1983 - 1992 (spring and summer data only). ND = no data, * * weighted mean that considers the number of stations sampled each year.

BIOMASS ($\mu\text{g/L}$)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean $\mu\text{g/L}$
	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1984	12.1	27.1	20.1	45.3	5.0	11.2	6.3	14.1	1.0	2.2	44.4
1985	27.3	59.7	8.0	17.4	6.5	14.2	3.2	6.9	0.8	1.6	45.8
1986	32.1	37.0	18.0	20.7	7.5	8.6	28.7	33.0	0.6	0.7	86.9
1987	10.1	39.9	2.2	8.5	5.4	21.5	3.8	15.0	3.8	15.0	25.3
1988	11.6	42.4	6.6	15.4	4.6	16.9	4.3	15.8	2.5	9.2	27.5
1989	9.2	42.1	7.2	23.1	3.5	16.2	2.2	10.2	1.7	7.7	21.9
1990	18.3	44.6	17.7	22.6	5.2	12.8	5.8	14.1	2.4	5.8	41.0
1991	12.0	21.0	97.8	53.3	6.7	11.6	2.4	4.2	5.2	9.2	57.3
1992	15.7	16.4	78.6	50.6	7.3	7.6	5.2	5.5	19.1	19.9	96.1
1983-92	17.4	36.3	25.1	29.2	5.7	12.0	7.5	15.6	3.3	6.8	48.0 **

ABUNDANCE

(number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean #/L
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	
1983	6.2	12.2	0.8	1.6	11.7	23.2	1.2	2.3	30.7	60.7	50.6
1984	5.6	8.1	2.2	3.2	12.4	17.9	3.2	4.6	45.9	66.2	69.4
1985	4.6	11.2	0.8	2.0	16.3	39.5	1.6	3.8	18.0	43.4	41.3
1986	11.2	16.1	2.0	2.8	18.8	26.9	5.7	8.1	32.2	46.1	69.8
1987	5.3	7.5	1.9	2.6	13.6	19.1	2.1	3.0	48.3	67.8	71.2
1988	5.4	4.4	1.5	0.8	11.6	9.4	2.5	2.0	102.9	83.4	123.3
1989	4.5	4.2	1.3	0.9	8.9	8.3	1.7	1.6	91.0	85.0	107.0
1990	7.8	5.3	1.9	0.7	13.1	8.9	2.6	1.8	122.1	83.2	146.8
1991	5.7	9.9	6.4	3.5	16.6	28.8	1.8	3.2	31.5	54.5	57.8
1992	9.1	4.3	6.2	1.9	18.3	8.8	3.8	1.8	173.7	83.2	208.8
1983-92	6.6	7.2	2.6	1.6	14.1	15.4	2.6	2.9	66.5	72.8	91.3 **

Table 18. Zooplankton biomass and abundance of major groups in Lake Michigan, 1983 - 1992 (summer data only). ND = no data, ** weighted mean that considers the number of stations sampled each year.

SUMMER BIOMASS ($\mu\text{g/L}$)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean $\mu\text{g/L}$
	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1984	21.1	25.4	41.7	50.1	6.6	7.9	11.9	14.3	1.9	2.3	83.3
1985	27.2	37.1	31.7	43.2	5.0	6.9	6.7	9.2	2.7	3.6	73.3
1986	53.9	35.3	36.0	23.6	7.8	5.1	54.0	35.4	1.1	0.7	152.7
1987	10.5	26.6	6.4	16.4	5.8	14.7	5.4	13.7	11.3	28.6	39.3
1988	14.9	37.9	8.3	21.0	4.9	12.5	6.2	15.8	4.8	12.2	39.4
1989	8.8	35.0	7.6	30.2	3.6	14.1	2.5	9.9	2.5	9.8	25.1
1990	27.2	40.1	18.5	27.3	6.9	10.2	10.4	15.3	4.7	7.0	67.8
1991	17.7	12.9	88.9	64.9	9.2	6.7	4.9	3.6	15.2	11.1	137.0
1992	18.3	11.1	92.9	56.5	9.4	5.7	7.9	4.7	35.9	21.8	164.5
1983-92	20.0	28.5	26.6	37.8	5.4	7.7	12.0	17.1	6.1	8.7	81.8**

SUMMER ABUNDANCE (number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean #/L
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	
1983	5.2	5.7	2.1	2.3	7.5	8.3	2.3	2.6	73.7	81.1	90.8
1984	10.3	8.2	4.7	3.7	16.5	13.1	6.1	4.8	88.5	70.2	126.1
19x5	4.8	5.5	3.3	3.8	12.6	14.6	3.8	4.4	61.9	71.7	86.4
1986	18.8	16.7	3.9	3.5	19.4	17.2	10.6	9.4	60.2	53.3	113.0
1987	8.3	4.8	5.6	3.2	14.4	8.4	4.2	2.4	140.2	81.2	172.7
1988	7.5	3.4	1.9	0.8	12.3	5.5	4.0	1.8	196.9	88.5	222.5
1989	5.2	3.4	1.4	0.9	8.9	5.9	2.2	1.4	134.1	88.3	151.8
1990	12.8	4.6	2.0	0.7	17.3	6.2	4.8	1.7	243.4	86.8	280.6
1991	9.6	7.2	5.8	4.4	23.1	17.3	4.2	3.1	90.9	68.0	133.7
1992	12.1	3.2	7.4	1.9	23.5	6.2	6.6	1.7	329.7	86.9	379.4
1983-92	9.2	5.5	3.2	1.9	14.2	8.5	4.7	2.8	136.0	81.3	178.8**

Table 19. Zooplankton biomass and abundance of major groups in Lake Michigan, 1983 - 1992 (spring data only). ND = no data, * * weighted mean that considers the number of stations sampled each year.

SPRING BIOMASS ($\mu\text{g/L}$)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean $\mu\text{g/L}$
	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	$\mu\text{g/L}$	%	
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1984	3.6	43.8	0.002	0.028	3.4	41.4	1.1	12.9	0.137	1.7	8.2
1985	27.4	74.8	0.052	0.142	7.0	19.2	2.0	5.4	0.111	0.3	36.6
1986	10.4	49.0	0.018	0.084	7.3	34.3	3.4	16.1	0.115	0.5	21.2
1987	9.9	54.3	0.003	0.015	5.3	28.8	3.0	16.6	0.060	0.3	18.3
1988	8.2	54.7	0.003	0.020	4.3	28.8	2.4	15.7	0.116	0.8	15.0
1989	10.0	65.2	0.001	0.009	3.5	23.1	1.7	11.0	0.106	0.7	15.3
1990	9.4	65.9	0.0003	0.002	3.6	25.0	1.2	8.7	0.015	0.1	14.3
1991	9.1	58.4	0.000	0.000	5.3	34.1	1.1	6.9	0.029	0.2	15.6
1992	12.9	61.9	0.020	0.095	5.0	24.2	2.3	10.9	0.580	2.8	20.8
1983-92	11.9	62.7	0.013	0.070	5.0	26.2	2.0	10.3	0.106	0.6	20.1**

SPRING ABUNDANCE (number/L)

Year	Calanoida		Cladocera		Copepoda		Cyclopoida		Rotifera		Mean #/L
	#/L	%	#/L	%	#/L	%	#/L	%	#/L	%	
1983	6.8	26.5	0.017	0.065	14.3	55.7	0.5	1.8	4.1	16.0	25.7
1984	1.2	7.5	0.001	0.007	8.5	51.2	0.5	3.1	6.4	38.2	16.7
1985	4.6	17.5	0.010	0.038	17.6	66.7	0.9	3.2	3.3	12.6	26.4
1986	3.6	13.7	0.002	0.009	18.2	68.2	0.7	2.5	4.1	15.6	26.7
1987	3.8	18.8	0.002	0.009	13.2	64.6	1.1	5.3	2.3	11.4	20.4
1988	3.3	16.9	0.001	0.007	10.8	54.9	0.9	4.7	4.6	23.4	19.6
1989	3.0	17.0	0.001	0.003	8.9	51.0	0.8	4.5	4.8	27.5	17.4
1990	2.9	22.2	0.0001	0.001	8.9	68.7	0.5	3.5	0.7	5.6	13.0
1991	3.7	20.7	0.000	0.000	13.3	73.8	0.6	3.4	0.4	2.1	18.0
1992	5.7	26.9	0.002	0.008	12.6	59.5	0.8	3.7	2.1	9.9	21.2
1983-92	4.2	18.7	0.005	0.020	14.0	62.9	0.8	3.4	3.3	15.0	21.1**

Table 20. Average crustacean zooplankton biomass (mg/m^3 dry weight) for 1976 and 1984 to 1992, Lake Michigan. Values are the mean \pm S.E. The 1976 data (Bartone and Schelske 1982) were converted to dry weight (mg/m^3) assuming carbon content was 50% of dry weight, The 1984-1992 data represent the spring and summer period only.

1976	50.0 \pm 14.8
1984	43.4 \pm 9.0
1985	45.0 \pm 6.9
1986	86.4 \pm 15.5
1987	21.5 \pm 3.3
1988	24.9 \pm 3.8
1989	20.0 \pm 3.5
1990	38.6 \pm 5.8
1991	51.7 \pm 22.0
1992	77.0 \pm 32.9

Table 21. Early August Cladocera abundance in 1954, 1966, 1968, 1983 through 1992 in Lake Michigan. Data from Wells (1970) and this study. Values represent the mean station number/m³. Values in parentheses include Stations 6,56,64 and 77, which are nearshore sites not sampled after 1984.

Species	1953	1966	1968	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
<i>Bosmina longirostris</i>	26	98	16	318 (342)	169 (5231)	33	103	4314	548	262	1014	11	67
<i>Bythotrephes cederstroemi</i>	0	0	0	0	0	0	1	4	18	7	56	6	12
<i>Ceriodaphnia quadrangula</i>	0	4	1	0	0	0	0	0	0	0	0	0	0
<i>Daphnia galeata</i>	1200	0	0.4	883 (514)	4650 (3508)	2150	2802	1133	1272	1568	918	5825	7309
<i>Daphnia longiremis</i>	0	16	0	0	14	47	9	0	14	0	0	0	0
<i>Daphnia pulicaria</i>	0	0	0	2447 (1011)	303 (248)	694	396	0	0	0	9	0	0
<i>Daphnia retrocurva</i>	1400	79	2100	82 (82)	1061 (1061)	266	376	1	0	3	3	0	0
<i>Diaphanosoma brachyurum</i>	2	0	0	1	0	1	0	0	0	0	0	0	0
<i>Eubosmina coregoni</i>	0	1	16	80 (159)	202 (208)	66	100	0	1	51	12	0	0
<i>Holopedium gibberum</i>	0	2	5	23 (456)	66 (536)	8	70	0	0	0	7	0	0
<i>Leptodora kindtii</i>	29	4	16	42 (34)	66 (98)	43	71	8	2.5	0	0	0	0
<i>Polyphemus pediculus</i>	2	15	10	13	7	0	8	0	0.4	7	2	0	0
Total	2659	219	2164.4	3889	6538	3308	3936	5460	1855.9	1898	2021	5842	7388

Table 22. Species diversity indices for Cladocera in Lake Michigan. N1 and E5 follow Hill (1973)

	Species Diversity (N1)	Evenness (E5)
1984	2.92	0.58
1985	2.77	0.72
1986	3.99	0.70
1987	2.18	0.89
1988	1.64	0.46
1989	1.32	0.35
1990	2.11	0.50
1991	1.01	0.22
1992	1.01	0.26

Table 23. Early August Copepoda abundance in 1954, 1966, 1968, 1983 through 1992 in Lake Michigan. Data from Wells (1970), and this study. Values represent the mean station number/m³. Values in parentheses include Stations 6,56,64 and 77, which are nearshore sites not sampled after 1984.

Species	1954	1966	1968	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
<i>Diaptomus ashlandi</i>	140	220	13	2185 (1256)	2363 (1733)	1148	3060	1341	1178	865	3033	1488	1121
<i>Diaptomus minutus</i>	39	25	1500	245 (151)	254 (183)	342	1076	1095	622	391	702	2700	1708
<i>Diaptomus oregonensis</i>	63	58	100	92 (138)	29 (58)	78	101	108	43	14	7	32	125
<i>Diaptomus sicilis</i>	3	1	3	85 (70)	73 (155)	12	77	6	106	45	115	402	55
<i>Epischura lacustris</i>	41	7	21	17 (19)	16 (14)	43	80	130	86	84	130	58	57
<i>Eurytemora affinis</i>	0	33	3	0	0	3	0	0	0	10	0	0	0
<i>Limnocalanus macrurus</i>	91	34	270	13 (18)	55 (64)	9	48	8	33	18	34	32	6
<i>Senecella calanoides</i>	0.2	0.2	0.1	1.4	0	0	1	0	1	0.3	1	1	0
Subtotal Calanoida	377.2	378.2	1910.1	2638.4	2790	1635	4443	2688	2069	1427.3	4022	4713	3072
<i>Cyclops bicuspidatus</i>	310	1000	860	2118 (1457)	2737 (2807)	1074	3114	508	539	314	1595	898	1126
<i>Cyclops vernalis</i>	0	0	0	0	16	0	0	0.4	0	0	0	0	0
<i>Mesocyclops edax</i>	200	0	0	7 (13)	48 (31)	107	71	47	14	5	0	0	0
<i>Tropocyclops prasinus mexicanus</i>	0	0	0	29 (52)	64 (88)	147	78	728	242	307	60	435	261
Subtotal Cladocera	510	1000	860	2154	2865	1328	3263	1283.4	795	626	1655	1333	1387