

PHYTOPLANKTON IN THE LAKE GEORGE ECOSYSTEM

Final Technical Report (9/1/72-8/31/73)

A final technical report for Union Carbide Subcontract  
No. 3808 for the Eastern Deciduous Forest Biome, IBP,  
Lake George site

by

H. H. Howard

Report #73-71

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1973

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### Abstract

Phytoplankton was collected at one station in Lake George on 7 dates in 1972 and 1973. Biomass and cell-colony number were determined at 1/2, 2, 5, 10 and 15 m on most dates. Biomass ranged from 9.1 to 615.  $\mu\text{g/liter}$  and maxima occurred in April and September. Biomass dominants were predominantly diatoms with Cyclotella comta the most frequent dominant species. Cell-colony number ranged from 0.052 to  $1.14 \times 10^6/\text{liter}$ . In contrast to their importance in the biomass, diatoms were dominant only 13 times as particles. Flagellates were frequent dominants as particles. Nanno- and ultraplankton made up about 90 per cent of the organisms observed.

Key Words: Phytoplankton, Algae, Biomass, Cell Number

Phytoplankton was collected at one station in the south basin of the lake simultaneous with collections for other studies (zooplankton, primary productivity, etc.) One to two liters of water were collected from (usually) 1/2, 2, 5, 10 and 15 meters on the following dates: 13 September 1972, 7 November 1972, 6 March 1973, 17 April 1973, 5 July 1973, 4 August 1973 and 29 August 1973. Samples were preserved with modified Lugol's solution and phytoplankton was concentrated by settling. Counts were made of all cells and colonies from 200 fields on a standard microscope. In most instances, 10 to 20 specimens of each species were measured for volume estimates. Volumes were calculated from formulae for similar geometric shapes and biomass was determined from the volumes assuming a density of 1 gram/cm<sup>3</sup>. Records were made of both the number of particles (cells, colonies) and numbers of individual cells. A list of algae found in the phytoplankton and biomass-particle-dominant values are attached.

The range of the mean values (with depth) of biomass was from 9.1 to 615.  $\mu\text{g}/\text{l}$  (November and April, respectively). A second peak of biomass (308.) occurred in September after low summer values. Particle values usually fluctuated with biomass with the only exception occurring in July and September. Particle numbers ranged from  $1.14 \times 10^6$  to  $0.052 \times 10^6/\text{liter}$ . Biomass maxima with depth usually occurred at 2 or 5 m and particle maxima also were generally at these same depths.

During the period of study, diatoms were dominant in the biomass 26 out of 31 determinations. Cyclotella comta was the most frequent diatom dominant (September, July, August) while Asterionella formosa dominated in March and April. Stephanodiscus astrea dominated at one depth on two occasions, September and July. Other dominants were Anabaena sp. (November, 0.5m),

Eudorina elegans (November, 5m), Cryptomonas sp. (March, 2 and 5m), Dinobryon divergens (co-dominant with Cyclotella at 15m in July), and unknown coccoid alga (November, 10m). Dominants on any date were usually dominant at all depths.

In contrast to their importance in the biomass, diatoms were dominant only 13 times as particles. Unidentified flagellates or other forms were dominant in 11 samples. Particle dominants were also usually distributed uniformly with depth. Of the phyla identified in the phytoplankton, only the Pyrrophyta was not dominant as biomass or particles.

When considering plankton size categories, net, nanno- and ultraplankton (Strickland, 1960) the latter two made up, on the average, about 90 per cent of the organisms observed. Proportions of nanno- and ultraplankton were about equal except in March, April and July when nannoplankton was most abundant. Ultraplankton exceeded nannoplankton in August and September. The highest proportions of net plankton were in March (24 percent), April (20 percent) and September (14 percent).

#### Literature Cited

- Strickland, J. D. H. 1960. Measuring the production of marine phytoplankton. Bull. Fish. Res. Bd. Canada, 122:1-172.





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B = Biomass, ug/liter  
 P = Cell/Colony x 10<sup>6</sup>/l  
 T = Trace

Date	Depth	Species Code (See Attached Sheet for Identification)															
		30	31	32	33	34	35	36	37	38	39	40	41	42	43		
13/Sept./72	0.5	B			74.4												
		P			0.047												
	5.	B			149.												
		P			0.094												
	10.	B			236.		277.										
		P			0.149		0.016										
15.	B			99.2				9.40		61.9	2.70						
	P			0.063				0.016		0.075	0.008						
7/Nov./72	0.5	B															
		P															
	5.	B															
		P															
	10.	B															
		P															
6/Mar./73	0.5	B			0.20			0.08	1.43		0.75	4.03		0.001		0.02	
		P			T			T	0.002		0.002	0.012		T			
	2.	B	1.10					0.30	1.10		2.90	20.1		0.01			0.60
		P	0.001					T	0.002		0.009	0.052		T			T
	5.	B	2.20		1.10	14.6		1.80	1.20	0.90	8.20	36.8		0.008			7.40
		P	0.002		0.002	0.008		0.001	0.002	0.001	0.023	0.105		T			T
	10.	B	6.01		0.01	3.72	0.44		1.73		2.25	25.1		0.014			2.16
		P	0.004		T	0.002	0.002		0.003		0.006	0.072		T			T
	15.	B	5.27		0.93	8.00	0.48	0.22	10.2		12.3	32.2		0.03			
		P	0.004		0.001	0.004	0.002	T	0.017		0.037	0.092		T			
	17/Ap./73	0.5	B	4.10			16.7					55.2	364.		6.20		27.5
			P	0.008			0.004					0.029	0.726		0.004		0.010
2.		B	0.33			16.7					115.	586.		6.20			5.50
		P	0.012			0.004					0.061	1.13		0.004			0.002
5.		B	0.10			50.0					23.9	390.		9.30	60.4	16.5	
		P	0.003			0.012					0.012	0.750		0.006	0.002	0.006	
10.		B	0.12			16.7					40.5	461.		6.20			
		P	0.006			0.004					0.055	0.887		0.004			
15.		B	0.22								73.6	623.		12.2			
		P	0.008								0.039	1.20		0.008			



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 P = Cell/Colony x 10<sup>6</sup>/l  
 T = Trace

Date	Depth		Species Code (See Attached)				Total	Dominant Alga	%				
			59	60	61	62			63	64	Dominant Alga of Total		
13/Sept./73	0.5	B					144.	Cyclotella comta	B	74.0	52.		
		P					0.252	Microcystis incerta	P	0.071	25.		
	5.	B					188.	Cyclotella comta	B	149.	79.		
		P					0.296	Cyclotella comta	P	0.094	35.		
	10.	B	0.30	0.40				631.	Stephanodiscus astrea	B	277.	44.	
		P	0.008	0.016				0.370	Cyclotella comta	P	0.149	40.	
15.	B	12.3					271.	Cyclotella comta	B	99.0	37.		
	P	0.016					0.391	Ochromonas sp.	P	0.102	26.		
7/Nov./72	0.5	B					11.0	Anabaena sp.	B	7.90	72.		
		P					0.022	Aphanocapsa elachista	P	0.012	54.		
	5.	B					11.0	Eudorina elegans	B	9.30	85.		
		P					0.028	Eudorina elegans	P	0.061	57.		
	10.	B					5.60	Cocccoid	B	4.40	78.		
		P					0.045	Cocccoid	P	0.039	87.		
6/Mar./73	0.5	B					10.0	Asterionella formosa	B	4.00	40.		
		P					0.036	Asterionella formosa	P	0.012	33.		
	2.	B					51.0	Asterionella formosa	B	21.0	40.		
		P					0.115	Asterionella formosa	P	0.052	45.		
	5.	B					124.	Cryptomonas sp.	B	34.0	28.		
		P					0.278	Asterionella formosa	P	0.105	38.		
	10.	B	1.35					80.0	Asterionella formosa	B	25.0	32.	
		P	0.025					0.276	Asterionella formosa	P	0.072	26.	
	15.	B	2.85					103.	Asterionella formosa	B	32.0	31.	
		P	0.041					0.292	Asterionella formosa	P	0.092	32.	
	17/Ap./73	0.5	B	8.10	1.90	0.28	3.30		511.	Asterionella formosa	B	365.	82.
			P	0.016	0.018	0.010	0.016		0.942	Asterionella formosa	P	0.726	77.
2.		B	0.91	0.11	0.17	11.2		758.	Asterionella formosa	B	526.	81.	
		P	0.024	0.008	0.024	0.054		1.479	Asterionella formosa	P	1.126	76.	
5.		B	1.10	0.11	0.10	0.94	1.70	558.	Asterionella formosa	B	390.	82.	
		P	0.027	0.008	0.014	0.020	0.008	0.988	Asterionella formosa	P	0.750	76.	
10.		B	0.68	0.17	0.37	3.33		531.	Asterionella formosa	B	461.	87.	
		P	0.018	0.012	0.008	0.016		1.023	Asterionella formosa	P	0.887	83.	
15.		B	1.81	0.23	0.22	1.12	4.16	721.	Asterionella formosa	B	623.	86.	
		P	0.047	0.016	0.031	0.024	0.020	1.531	Asterionella formosa	P	1.197	78.	

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 T = Trace

Date	Depth	Species Code (See Attached Sheet for Identification)	Species Code (See Attached Sheet for Identification)														
			44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
13/Sept./72	0.5	B						1.48		2.90	6.80	12.0				0.90	
		P						0.071		0.008	0.047	0.008				0.008	
	5.	B						0.02			4.30		2.00			2.10	7.10
		P						0.008			0.024		0.016			0.008	0.008
	10.	B						0.06			2.20			2.80		1.10	16.6
		P						0.008			0.039			0.008		0.031	0.016
15.	B						0.08			3.10		55.4			0.60	4.60	
	P						0.008			0.008		0.008			0.024	0.039	
7/Nov./72	0.5	B					0.70			0.15				7.90			
		P					0.012			0.002				0.002			
	5.	B														0.40	
		P														0.004	
	10.	B														4.40	
		P														0.039	
6/Mar./73	0.5	B	1.86													0.20	
		P	0.001													0.004	
	2.	B	1.40											0.58		0.002	20.6
		P	T											T		T	0.032
	5.	B	2.10					0.10				0.08				42.8	0.80
		P	0.001					T				T				0.066	0.015
10.	B	2.14					0.11								21.9	4.28	
	P	0.002					0.005								0.034	0.062	
15.	B	1.47								0.09		1.29			21.5	0.72	
	P	0.001								T		T			0.034	0.014	
17/Ap./73	0.5	B	15.3												1.58	1.40	
		P	0.004												0.024	0.006	
	2.	B	0.75											11.5		1.70	0.42
		P	0.008											0.002		0.026	0.018
	5.	B	0.56													0.79	0.61
		P	0.006													0.012	0.025
10.	B														1.20	0.14	
	P														0.018	0.006	
15.	B	0.75													1.80	1.60	
	P	0.008													0.027	0.067	



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 T = Trace

Date	Depth		Species Code (See attached Sheet for Identification)												
			45	46	47	48	49	50	51	52	53	54	55	56	57
5/July/73	0.5	B												3.29	9.53
		P												0.016	0.130
	2.	B	0.15						0.27					0.82	2.73
		P	0.003						0.002					0.004	0.042
	5.	B							0.20					6.55	7.12
		P							0.003					0.031	0.100
10.	B							0.44				6.12	2.62	6.35	
	P							0.001				0.001	0.012	0.086	
15.	B	4.95											6.06	1.65	
	P	0.002											0.029	0.022	
4/Aug./73	0.5	B	5.98		0.23				8.53					0.28	0.62
		P	0.006		0.006				0.070					0.020	0.014
	2.	B	8.98		4.12				5.47			0.28		0.14	1.09
		P	0.010		0.018				0.050			0.002		0.010	0.010
	5.	B	2.99		3.26				3.86					5.30	0.85
		P	0.006		0.020				0.062					0.130	0.024
15.	B	5.98		4.20				1.57					0.11	7.34	
	P	0.010		0.014				0.018					0.004	0.180	
29/Aug./73	0.5	B			2.73				0.53			1.48	0.39	3.87	0.49
		P			0.026				0.006			0.004	0.004	0.032	0.014
	2.	B			3.26	0.82			1.35			0.02	0.32	1.42	5.23
		P			0.036	0.004			0.008			0.008	0.006	0.010	0.010
	5.	B			1.26	0.69			3.47			1.58	0.21	1.19	1.31
		P			0.016	0.004			0.012			0.006	0.002	0.010	0.024
10.	B			2.62	0.38			0.76			0.38		0.87	1.02	
	P			0.022	0.002			0.006			0.002		0.016	0.030	
15.	B			0.38	1.16			2.68	3.11				1.48	0.06	
	P			0.004	0.006			0.006	0.006				0.032	0.058	





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 T = Trace

Date	Depth		Species		Code (See attached)				Total	Dominant Alga	% Dominant Alga of Total		
			59	60	61	62	63	64					
5/July/73	0.5	B	2.43	1.70	0.86	8.41			325.	Cyclotella comta	233.	72.	
		P	0.037	0.031	0.065	0.004			0.515	Flagellate	0.130	25.	
	2.	B	0.21	1.85	0.24	6.83	0.19	2.60	129.	Cyclotella comta	57.0	44.	
		P	0.004	0.008	0.001	0.093	0.014	0.001	0.386	Flagellate	0.093	24.	
	5.	B	1.02	0.31	0.26	1.32	0.13		261.	Stephanodiscus astrea	87.0	33.	
		P	0.016	0.006	0.001	0.008	0.010		0.406	Flagellate	0.097	24.	
	10.	B	2.18	0.68	0.05				190.	Cyclotella comta	88.	46.	
		P	0.033	0.012	0.004				0.431	Ochromonas sp.	0.106	25.	
	15.	B	1.29	0.86	1.93				188.	Cyclotella comta	52.	28.	
		P	0.020	0.020	0.010				0.574	Dinobryon divergens	0.280	49.	
	4/Aug./73	0.5	B	2.72	0.17	0.24	7.75			189.	Cyclotella comta	148.	77.
			P	0.006	0.004	0.002	0.190			0.366	Flagellate	0.190	52.
2.		B	0.09	0.01	7.30				461.	Cyclotella comta	391.	85.	
		P	0.004	0.002	0.180				0.396	Flagellate	0.180	45.	
5.		B	0.10						260.	Cyclotella comta	148.	56.	
		P	0.056						0.424	Flagellate	0.130	31.	
15.		B							260.	Cyclotella comta	148.	56.	
		P							0.382	Flagellate	0.180	47.	
29/Aug./73		0.5	B	0.50	2.62					79.0	Cyclotella comta	55.0	70.
			P	0.010	0.004					0.136	Cocoid	0.032	24.
		2.	B	0.79	0.07					72.0	Cyclotella comta	55.0	77.
			P	0.008	0.002					0.138	Microcystis incerta	0.036	26.
	5.	B	0.42						131.	Cyclotella comta	83.0	64.	
		P	0.012						0.147	Cocoid	0.024	17.	
	10.	B	0.30	2.62					126.	Cyclotella comta	83.0	66.	
		P	0.006	0.002					0.176	Ochromonas sp.	0.048	27.	
	15.	B	1.74	0.14					106.	Cyclotella comta	83.0	79.	
		P	0.004	0.002					0.172	Cocoid	0.058	34.	

Species Found in Lake George Phytoplankton

Ne: net plankton (maximum dimension greater than 50  $\mu$ )

Na: nanoplankton (maximum dimension 50  $\mu$  or less)

1. Eudorina elegans Ehrenberg. (Na)
2. Sphaerocystis Schroeteri (Wolle) W. & G. S. West. (Na)
3. Gloocystis gigas (Kuetzing) Lagerheim. (Na)
4. Elakatothrix gelatinosa Wille. (Na)
5. Planktosphaeria gelatinosa G. M. Smith. (Na)
6. Oocystis crassa Wittrock. (Na)
7. Oocystis pusilla Hansgirg. (Na)
8. Oocystis submarina Lagerheim. (Na)
9. Oocystis sp. (Na)
10. Botryococcus Braunii Kuetzing. (Na)
11. Dimorphococcus lunatus A. Braun. (Na)
12. Ankistrodesmus falcatus (Corda) Raife var. acicularis (A. Braun) G. S. West (Na)
13. Selenastrum minutum (Naeg.) Collins. (Na)
14. Quadrigula closterioides (Bohlin) Printz. (Na)
15. Tetraedron minimum (A. Braun) Hansgirg. (Na)
16. Scenedesmus bijuga (Turp.) Lagerheim. (Na)
17. Crucigenia rectangularis (A. Braun) Gay. (Na)
18. Crucigenia tetrapaedia (Kirch.) W. & G. S. West. (Na)
19. Cosmarium sp. (Na)
20. Cosmarium sp. (Na)
21. Staurastrum furcigerum De Brabissou.
22. Spondylosium planum (Wolle) W. & G. S. West (Ne)
23. Tribonema sp. (Ne)
24. Ochromonas sp. (Na)
25. Bitrichia chodati (Reverdin) Chodat. (Na)
26. Dinobryon bavaracum Imhof. (Na)
27. Dinobryon cylindricum Imhof. (Na)
28. Dinobryon divergens Imhof. (Na)
29. Epipyxis sp. (Na)
30. Mallomonas sp. (Na)
31. Mallomonas sp. (Na)
32. Melosira sp. (Ne)
33. Cyclotella comta (Ehren.) Kuetzing. (Na)
34. Cyclotella stelligera Clet & Grunow. (Na)
35. Stephanodiscus astrea (Ehren.) Grunow. (Na)
36. Tabellaria fenestrata (Lyngb.) Kuetzing. (Na)
37. Meridion circulare (Grev.) Agardh. (Na)
38. Fragilaria crotonensis Kitton (Ne)
39. Asterionella formosa Hassall. (Ne)
40. Synedra sp. (Ne)
41. Gymnodinium sp. (Ne)
42. Glenodinium pulvisculus (Ehren.) Stein (Na)
43. Peridinium cinctum (Mueil.) Ehrenberg (Ne)
44. Cryptomonas sp. (Na)
45. Chroococcus dispersus (Keissl.) Lemmermann. (Na)
46. Chroococcus limneticus Lemmermann. (Na)
47. Gloeocapsa punctata Naegeli (Na)
48. Aphanocapsa elachista West & West. (Na)
49. Microcystis incerta Lemmermann. (Na)
50. Gloethece linearis Naegeli var. composita G. M. Smith (Na)
51. Aphanothece clathrata G. S. West (Na)
52. Aphanothece nidulans P. Richter. (Na)
53. Coelosphaerium Naegelianum Unger. (Na)
54. Gomphosphaeria sponina Kuetzing. (Na)
55. Lyngbya limnetica Lemmermann. (Ne)
56. Anabaena sp. (Na)
- 57 - 64. Unknown coccoid cells and flagellates. All (Na).