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VIRGINIA INSTITUTE OF MARINE SCIENCE

GLOUCESTER POINT, VIRGINIA

SUMMARY OF DATA FROM PRODUCTIVITY EXPERIMENTS IN THE YORK RIVER, VIRGINIA, JUNE 1960 - JUNE 1961

SPECIAL SCIENTIFIC REPORT NO. 22

1961

VIRGINIA INSTITUTE OF MARINE SCIENCE

Gloucester Point, Virginia

SUMMARY OF DATA FROM PRODUCTIVITY EXPERIMENTS IN THE YORK RIVER, VIRGINIA, JUNE 1960 - JUNE 1961

Bernard C. Patten, J. Ernest Warinner
and Weston Eayrs

Special Scientific Report No. 22

W. J. Hargis, Jr.
Director

August 1961

SUMMARY OF DATA FROM PRODUCTIVITY EXPERIMENTS IN THE YORK RIVER, VIRGINIA

JUNE 1960 - JUNE 1961

Data obtained in 37 production experiments performed *in situ* at a permanent station situated about 300 yards off the Virginia Fisheries Laboratory pier in the York River are reported. This work was conducted by the Planktology Research Section.

Mean low water depth at the station is about 30 ft. Hydrographic determinations included vertical temperature, chlorinity, and dissolved oxygen profiles, and Secchi disc readings. Temperatures (Table 1) were measured with a thermistor unit or with a thermometer. Chlorinity (Table 2) was titrated with silver nitrate. Dissolved oxygen (Table 3) was determined by the (unmodified) Winkler method. Secchi disc readings appear in Table 4.

Nutrients, total chlorophyll, suspended solids and cell counts were determined at various levels in the water column. Nitrate nitrogen (Table 5) was assayed by the strychnidine method. Phosphorus was fractionated by millipore filtration (type HA). Total phosphorus was measured by digesting samples for 12 hours at 20 psi, or for 4 hours at 30 psi, and then estimating orthophosphate by the molybdate method, corrected for salt interference. Inorganic (Table 6) and organic (Table 7) fractions are reported. Total chlorophyll (Table 8) was determined by extracting millipore (HA)-filtered samples in 90% acetone

saturated with magnesium carbonate, then measuring absorbancies colorimetrically at (broad band) 660 mμ. Conversion to pigment concentration was made by comparison with a standard curve prepared from pure chlorophyll a. Inorganic and ash-free suspended solids (Table 9) were determined by filtering water through tared millipore (HA) filters, desiccating filters plus residues, weighing for total seston, then ashing at 600°C, rehydrating the ash, desiccating, and weighing again to obtain ash weight. Cell counts (Table 10) were made from Sedgwick-Rafter mounts of freshly-collected samples, and numbers of taxa observed were recorded (Table 11).

For productivity determinations, paired dark and light bottles containing water samples from 2, 6 and 10 feet were suspended at various depths for 24 hours, and then fixed for Winkler titration. The suspension depths included all combinations of the collection depths: 2-2, 2-6, 2-10; 6-2, 6-6, 6-10; 10-2, 10-6, 10-10, where the left-hand figure represents collection depth, and the right suspension depth. Gross production (Table 12), respiration (Table 13) and net production (Table 14) were computed from differences between initial and final dissolved oxygen concentrations and converted to gcal based on a PQ($+O_2/-CO_2$) of 1.25. Values of gross production and respiration so-obtained were plotted against depth to 20 ft. The points were then connected and the areas under the two curves determined by planimetric integration to get total gross production, respiration and, by difference,

net production in the (hypothetical) 20 ft water column (Table 15). The depth at which the gross production and respiration curves crossed was recorded as the compensation depth (Table 15).

Light available in the water column was determined by the following procedure. Extinction coefficients (Table 16) for "white" light (GE incandescent lamp CDJ-100W) were calculated from optical densities obtained colorimetrically with a neutral filter at the beginning and end of each experiment. A mean coefficient for the upper 10 ft, $\bar{\eta}$, was employed in the equations

$$I_z = I_o e^{-\bar{\eta} z}$$

and

$$I\Big]_o^b = \int_o^b I_o e^{-\bar{\eta} b}\, dz$$

$$= I_o\, \bar{\eta}^{-1}(1-e^{-\bar{\eta} b}) ,$$

where depth (z) is in meters, to obtain estimates of the light available for photosynthesis at each bottle suspension depth, I_z, and in the whole 20-ft water column, $I\Big]_o^b$, where b is the depth of the column. Incident solar radiation, I_o, was measured by an Eppley 10-junction pyrheliometer installed a few hundred yards from the station, the output of the thermopile being electronically integrated and automatically printed-out every 30 minutes. Light data are summarized in Table 17. Using these data, primary production efficiencies, the photosynthesis per unit light available, were computed for each sample depth and for the whole (20 ft) water column (Table 18).

EXPERIMENT DATES

Experiment No.	Dates
1	22-23 June 1960
2	29-30 June 1960
3	6-7 July 1960
4	13-14 July 1960
5	19-20 July 1960
6	27-28 July 1960
7	3-4 August 1960
8	10-11 August 1960
9	17-18 August 1960
10	24-25 August 1960
11	31 August - 1 September 1960
12	7-8 September 1960
13	14-15 September 1960
14	21-22 September 1960
15	27-28 September 1960
16	11-12 October 1960
17	19-20 October 1960
18	1-2 November 1960
19	15-16 November 1960
20	21-22 November 1960
21	6-7 December 1960
22	16-17 December 1960
23	6-7 January 1961
24	24-25 January 1961
25	10-11 February 1961
26	24-25 February 1961
27	3-4 March 1961
28	10-11 March 1961
29	17-18 March 1961
30	25-26 March 1961
31	30-31 March 1961
32	6-7 April 1961
33	14-15 April 1961
34	21-22 April 1961
35	5-6 May 1961
36	19-20 May 1961
37	1-2 June 1961

Table 1. Vertical temperature profiles, °C, at the beginning (B) and end (E) of each experiment.

Expt. No.	Surface		2 ft		6 ft		10 ft		14 ft		18 ft		Bottom	
	B	E	B	E	B	E	B	E	B	E	B	E	B	E
1	25.05	24.58	24.98	24.54	24.98	24.54	24.98	24.51	-	-	-	-	24.71	24.38
2	25.76	25.60	25.70	25.50	25.66	24.95	25.70	24.61	-	-	-	-	24.95	24.20
3	25.98	25.29	26.11	25.26	26.11	25.22	26.08	25.22	-	-	-	-	25.86	25.29
4	26.28	25.80	26.31	25.80	26.31	25.63	26.28	25.50	-	-	-	-	26.24	25.53
5	25.73	25.90	25.73	25.83	25.73	25.90	25.73	25.83	-	-	-	-	25.86	25.76
6	26.52	26.66	26.52	26.66	26.56	26.62	26.48	26.52	-	-	-	-	26.31	26.14
7	26.31	26.62	26.31	26.66	26.28	26.66	26.21	26.59	-	-	-	-	25.86	26.45
8	27.20	27.32	27.24	27.32	27.20	27.24	27.20	27.28	-	-	-	-	27.14	27.28
9	26.94	26.04	27.00	26.08	27.20	26.31	27.17	26.48	-	-	-	-	27.14	26.56
10	25.83	25.33	25.83	25.33	25.86	25.36	25.93	25.36	-	-	-	-	25.60	25.43
11	26.35	26.11	26.38	26.18	26.11	26.08	25.90	26.01	-	-	-	-	25.43	25.18
12	26.18	26.24	26.18	26.24	26.21	26.24	26.18	26.24	-	-	-	-	26.18	26.24
13	23.93	22.99	24.00	23.02	24.75	24.85	25.18	25.18	-	-	-	-	25.33	25.15
14	24.91	24.31	24.91	24.31	24.91	24.38	24.88	24.34	-	-	-	-	24.48	24.34
15	22.72	22.37	22.65	22.36	22.70	22.36	22.74	22.39	-	-	-	-	22.85	22.42
16	20.24	20.71	20.31	20.67	20.48	20.31	20.46	20.29	-	-	-	-	20.26	20.06
17	20.75	21.26	20.67	21.28	20.71	21.27	20.74	21.40	-	-	-	-	20.68	21.51
18	14.61	14.72	14.66	14.70	14.57	14.73	14.62	14.58	-	-	-	-	14.87	14.76
19	11.49	12.62	11.55	12.36	11.86	12.12	12.01	12.06	-	-	-	-	12.09	12.06
20	13.0-	13.0-	-	13.0-	13.0-	13.0-	13.0-	13.0-	13.0-	13.0-	13.5-	13.0-	13.0-	13.0-
21	10.0-	9.8-	10.1-	10.0-	10.1-	10.0-	10.0-	10.0-	10.0-	10.0-	9.8-	10.0-	9.9-	10.2-
22	5.0-	4.0-	5.0-	5.0-	5.0-	5.0-	5.5-	5.0-	5.5-	5.5-	5.5-	5.5-	5.0-	6.0-
23	3.5-	5.5-	3.5-	4.6-	3.5-	4.5-	3.5-	5.0-	3.5-	5.0-	3.5-	4.5-	4.0-	4.2-
24	4.04	2.65	4.76	2.58	4.87	2.72	4.62	2.92	4.58	3.08	4.50	3.19	3.37	3.09
25	1.62	2.43	1.57	1.95	1.45	1.85	1.30	1.54	1.31	1.44	1.24	1.64	1.25	1.33
26	7.74	8.10	7.06	8.25	7.72	5.87	4.81	4.54	4.88	4.57	4.70	4.22	4.60	4.56
27	6.87	8.05	6.90	7.77	6.75	7.09	6.60	7.01	5.90	6.74	5.86	6.35	5.75	5.95
28	6.95	7.45	6.95	7.24	6.95	7.18	6.95	7.18	6.91	7.24	6.73	6.38	6.57	6.60
29	7.0-	8.5-	9.0-	-	9.0-	8.5-	9.0-	-	9.0-	8.0-	8.5-	-	8.0-	8.0-
30	8.9-	-	9.0-	-	9.0-	-	8.5-	-	8.0-	9.2-	8.0-	9.0-	-	9.0-
31	11.9-	11.0-	11.9-	11.0-	11.8-	11.1-	11.8-	11.0-	11.8-	11.1-	11.8-	11.0-	11.5-	10.8-
32	10.9-	10.7-	10.8-	10.5-	10.3-	10.0-	10.0-	10.0-	9.9-	9.9-	9.7-	9.8-	9.8-	10.0-
33	9.94	12.0-	9.97	12.0-	9.74	11.4-	9.72	11.6-	9.72	11.5-	9.78	11.5-	9.77	11.3-

Table 1 continued

34	12.2-	13.6-	12.0-	13.5-	12.0-	12.8-	11.8-	12.9-	12.0-	12.7-	12.0-	12.4-	12.0-	12.0-
35	15.1-	14.5-	15.1-	14.6-	15.0-	14.5-	14.9-	14.5-	14.8-	14.5-	14.7-	14.6-	14.5-	14.7-
36	19.7-	18.0-	19.2-	18.0-	19.4-	18.0-	18.8-	18.0-	18.7-	18.0-	19.0-	17.9-	18.0-	17.8-
37	18.5-	19.9-	18.6-	20.0-	18.7-	19.7-	18.8-	19.8-	18.4-	19.9-	18.5-	19.8-	18.4-	18.8-

Table 2. Vertical chlorinity profiles, °/oo, at the beginning of each experiment.

Expt. No.	Surface	2 ft	6 ft	10 ft	14 ft	18 ft	Bottom
1	8.54	8.60	8.66	8.97	-	-	9.01
2	9.10	9.10	9.20	9.20	-	-	10.46
3	9.90	9.70	9.80	9.73	-	-	10.38
4	9.93	9.92	9.93	9.93	10.07	10.00	10.19
5	10.40	10.62	10.37	10.50	10.92	10.97	11.31
6	11.62	11.07	10.94	11.06	11.22	11.21	11.41
7	10.38	9.98	10.50	10.45	10.92	11.13	10.92
8	9.53	9.67	9.91	10.12	10.40	10.44	10.45
9	9.55	9.44	9.45	9.54	9.55	9.54	9.70
10	11.40	11.34	11.13	11.69	11.88	12.60	-
11	10.76	10.81	11.32	11.32	11.42	11.48	11.93
12	11.22	11.22	11.22	11.22	11.22	11.12	11.17
13	-	-	-	-	-	-	-
14	9.30	9.40	9.40	9.50	9.40	9.70	9.52
15	10.10	10.20	10.15	10.05	-	-	10.20
16	9.9-	9.9-	10.1-	10.2-	10.5-	10.8-	10.6-
17	10.0-	9.6-	9.9-	10.0-	-	-	10.1-
18	10.02	10.04	10.12	10.21	10.21	10.21	10.80
19	9.9-	10.6-	10.7-	11.0-	11.0-	11.3-	11.4-
20	11.5-	11.5-	11.5-	11.5-	11.5-	11.5-	11.5-
21	11.53	11.53	11.53	12.47	11.94	12.16	12.26
22	10.19	10.38	10.66	10.76	10.95	11.14	11.23
23	11.1-	11.1-	11.1-	11.4-	11.6-	11.6-	11.9-
24	9.35	9.35	9.35	10.68	10.80	10.88	10.88
25	10.03	10.19	10.51	10.59	11.08	11.78	12.19
26	6.29	6.02	9.55	11.00	10.99	11.53	11.54
27	7.89	7.99	8.03	8.49	9.81	10.80	11.12
28	8.69	9.35	9.53	9.87	11.03	11.62	12.84
29	9.81	10.08	10.10	10.17	10.39	10.60	10.82
30	8.87	9.02	8.86	10.01	10.01	10.39	12.02
31	7.75	7.80	7.80	7.80	-	-	8.85
32	7.54	7.64	8.04	8.46	9.35	9.40	9.80
33	8.64	8.60	8.95	8.95	-	-	9.05
34	6.26	6.60	7.84	8.51	-	-	9.30
35	8.95	8.98	8.94	8.97	-	-	9.00
36	7.14	7.00	7.06	7.57	-	-	7.90
37	9.11	9.19	9.14	9.16	-	-	9.17

Table 3. Vertical distribution of dissolved oxygen, mg/liter, at the beginning of each experiment.

Expt. No.	Surface	2 ft	6 ft	10 ft	14 ft	18 ft	Bottom
1	5.91	5.69	5.44	5.94	5.85	5.57	5.84
2	7.04	7.02	6.92	6.40	6.62	4.30	3.70
3	5.53	5.38	5.38	5.40	5.26	4.68	4.28
4	5.09	4.97	4.94	4.96	4.83	4.63	4.66
5	6.13	5.85	5.67	5.48	4.90	4.81	3.90
6	5.99	6.46	6.25	5.96	5.76	5.63	4.88
7	5.97	6.53	6.10	6.05	5.60	4.74	5.66
8	4.95	4.89	4.88	4.70	4.54	4.28	3.95
9	6.63	6.56	6.51	6.56	6.40	6.44	5.55
10	4.78	4.78	4.82	4.49	4.36	3.58	2.70
11	5.83	5.92	5.64	5.61	5.42	5.18	5.36
12	5.51	5.56	5.62	5.66	5.48	5.44	5.38
13	6.40	6.57	6.22	5.85	6.00	5.08	5.16
14	6.74	6.59	6.52	6.33	6.49	6.28	5.90
15	6.53	6.50	6.45	6.50	6.22	6.25	6.14
16	7.94	7.90	7.53	7.76	7.41	7.14	7.08
17	7.06	7.11	6.75	6.84	6.27	6.27	6.11
18	7.55	7.55	7.53	7.51	7.43	7.29	7.16
19	9.36	8.78	8.73	8.69	-	8.13	8.15
20	8.72	8.56	8.50	8.54	8.04	8.47	8.47
21	9.20	9.09	9.06	9.20	8.78	8.92	8.83
22	9.97	10.02	9.86	9.79	9.70	9.60	9.67
23	11.01	10.99	10.81	10.81	10.71	10.73	10.48
24	11.08	11.30	10.88	10.42	10.49	10.37	10.22
25	11.57	11.50	11.35	11.40	11.13	10.82	10.79
26	11.99	11.84	11.49	10.28	10.52	10.30	10.24
27	10.99	10.85	10.96	10.73	10.48	10.09	10.16
28	9.59	9.58	9.61	9.60	9.65	9.69	9.51
29	9.82	9.57	9.66	9.68	9.02	9.34	9.35
30	9.85	9.68	9.59	9.53	9.56	9.28	9.17
31	10.31	10.24	10.29	10.20	10.22	10.29	9.43
32	9.96	9.80	9.70	9.14	8.64	8.58	8.52
33	9.66	9.60	9.49	8.97	8.92	8.95	9.03
34	9.78	9.64	8.72	8.16	7.88	7.87	7.93
35	8.78	8.74	8.72	8.56	8.27	8.25	8.18
36	7.38	7.20	7.20	6.03	5.82	5.74	5.92
37	6.47	6.43	6.52	6.53	6.44	6.53	6.58

Table 4. Secchi disc depths, in ft to the nearest ½ ft, at the beginning (B) and end (E) of each experiment.

Expt. No.	Secchi disc depth B	E
1	6.0	5.0
2	4.0	3.5
3	5.0	4.5
4	4.5	4.5
5	5.0	5.5
6	6.5	6.5
7	5.5	5.0
8	4.0	4.0
	6.0	5.0
10	7.5	7.5
11	5.0	5.5
12	5.0	5.0
13	4.0	5.0
14	4.5	5.0
15	5.0	5.0
16	6.0	7.0
17	6.0	6.0
18	7.0	6.0
19	8.0	5.5
20	5.0	6.5
21	9.0	9.0
22	3.5	
23	5.0	6.0
24	4.0	2.0
25	3.0	
26	5.0	
27	4.5	
28		2.5
29	3.0	3.0
30	2.0	2.5
31	5.0	-
32	4.0	3.5
	4.0	4.0
34	5.0	4.5
35	5.0	6.0
36	-	6.0
37	5.0	5.0

Table 5. Nitrate nitrogen, µg atoms/liter.

Expt. No.	Surface	2 ft	6 ft	10 ft	Bottom
1	6.5	5.2	5.2	5.2	7.8
2	7.0	0.9	0.9	0.9	0.9
3	1.5	2.5	1.5	2.5	2.5
4	2.5	2.5	4.5	5.2	6.6
5	0.0	6.5	1.3	4.5	4.5
6	5.2	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0
9	0.0	0.5	2.7	0.5	2.0
10	0.0	0.0	0.0	0.6	0.6
11	0.0	0.0	0.0	0.0	0.0
12	0.0	2.7	2.5	3.1	2.3
13	-	-	-	-	-
14	-	-	-	-	-
15	0.9	2.3	2.4	2.4	2.4
16	2.5	3.5	4.2	3.3	0.0
17	1.1	0.9	3.2	0.0	2.5
18	0.0	0.7	0.8	2.3	2.9
19	4.6	4.2	4.5	4.1	4.3
20	0.0	0.0	0.0	0.0	0.0
21	-	-	-	-	-
22	-	-	-	-	-
23	-	-	-	-	-
24	2.4	1.2	1.2	0.8	0.8
25	0.0	0.0	0.0	0.0	0.0
26	0.7	0.6	0.5	0.5	0.3
27	0.0	0.0	0.0	0.0	0.0
28	1.5	1.5	1.5	3.1	0.7
29	0.0	0.0	0.0	0.0	0.3
30	0.0	0.0	0.0	0.0	0.0
31	-	-	-	-	
32	1.4	0.7	0.7	0.5	3.0
33	2.7	1.8	2.6	1.8	2.3
34	4.4	2.8	0.3	0.0	0.7
35	0.2	0.4	0.4	0.4	0.4
36	0.0	0.0	0.0	0.0	0.0
37	0.1	0.2	0.2	0.2	0.2

Table 6. Orthophosphate, dissolved (D) and adsorbed (A), µg atoms/liter.

Expt. No.	Surface		2 ft		6 ft		10 ft		Bottom	
	D	A	D	A	D	A	D	A	D	A
1	0.208	0.125	0.208	0.000	0.202	0.040	0.184	0.023	0.210	0.1[illegible]
2	0.037	0.262	0.037	0.000	0.1[illegible]	0.[illegible]	0.111	0.087	0.371	0.385
3	0.280	0.000	0.240	0.000	0.280	0.040	0.280	0.000	0.240	0.160
4	0.705	0.000	0.798	0.000	0.724	0.000	0.742	0.000	0.668	0.149
5	0.546	0.000	0.497	0.000	0.49[illegible]	0.037	0.457	0.018	0.568	0.249
6	0.410	0.098	0.346	0.000	0.342	0.[illegible]	0.305	0.104	0.442	0.231
7	0.663	0.663	0.655	0.179	0.65[illegible]	0.[illegible]	0.695	0.159	0.660	0.360
8	0.781	0.000	0.762	0.038	0.8[illegible]	0.116	0.876	0.152	0.952	1.695
9	0.520	0.000	0.661	0.000	0.557	0.019	0.527	0.011	1.039	0.668
10	1.132	0.000	1.114	0.000	1.08[illegible]	0.007	1.108	0.011	1.487	0.453
11	0.914	0.038	0.952	0.000	0.99[illegible]	0.[illegible]	1.003	0.030	1.229	0.000
12	1.048	0.000	1.030	0.075	1.067	0.034	1.067	0.034	1.067	0.243
13	-	-	-	-	-	-	-	-	-	-
14	0.649	0.000	0.631	0.037	0.668	0.000	0.668	0.000	0.835	0.167
15	0.928	0.111	0.984	0.000	1.07[illegible]	0.000	1.058	0.099	1.114	0.[illegible]
16	0.675	0.071	0.728	0.000	0.710	0.038	0.710	0.018	0.627	[illegible]
17	0.546	0.000	0.546	0.052	0.546	0.067	0.546	0.000	0.[illegible]	
18	0.798	0.019	0.817	0.037	0.798	0.074	0.780	0.074	0.7[illegible]	[illegible]
19	0.436	0.034	0.420	0.117	0.441	0.067	0.508	0.018	0.458	0.[illegible]
20	0.377	0.000	0.357	0.000	0.3[illegible]	0.019	0.357	0.[illegible]	0.357	0.0[illegible]
21	0.450	0.000	0.375	0.000	0.279	0.075	0.357	0.034	0.336	0.1[illegible]
22	0.304	0.131	0.210	0.305	0.212	0.354	0.212	0.306	0.212	0.1[illegible]
23	0.211	0.154	0.211	0.154	0.211	0.154	0.211	0.21[illegible]	0.[illegible]	[illegible]
24	0.332	0.062	0.291	0.166	0.291	0.082	0.[illegible]	0.[illegible]	[illegible]	[illegible]
25	0.108	0.073	0.127	0.180	0.127	0.209	0.1[illegible]	0.1[illegible]	[illegible]	
26	0.138	0.018	0.138	0.000	0.17[illegible]	0.018	0.1[illegible]	0.[illegible]	[illegible]	[illegible]
27	0.294	0.000	0.331	0.000	0.294	0.037	0.111	0.1[illegible]	[illegible]	[illegible]
28	0.215	0.179	0.179	0.197	0.125	0.323	0.125	0.[illegible]	[illegible]	[illegible]
29	0.145	0.000	0.106	0.039	0.106	0.005	0.09[illegible]	0.014	[illegible]	[illegible]
30	0.115	0.235	0.115	0.145	0.110	0.140	0.110	0.07[illegible]	0.[illegible]	0.[illegible]
31	0.276	0.000	0.221	0.055	0.221	0.073	0.221	0.075	0.258	0.229
32	0.161	0.000	0.148	0.000	0.149	0.000	0.149	0.016	0.149	0.130
33	0.104	0.089	0.124	0.034	0.174	0.000	0.128	0.000	0.116	0.162

Table 6 continued

34	0.082	0.018	0.085	0.026	0.117	0.023	0.118	0.046	0.095	0.000
35	0.068	0.000	0.099	0.015	0.072	0.042	0.091	0.065	0.068	0.054
36	0.101	0.000	0.101	0.000	0.097	0.028	0.106	0.038	0.170	0.193
37	0.430	0.004	0.500	0.007	0.411	0.140	0.095	0.108	0.341	0....

Table 7. Organic phosphorus, dissolved (D) and particulate (P), µg atoms/liter.

Expt. No.	Surface		2 ft		6 ft		10 ft		Bottom	
	D	P	D	P	D	P	D	P	D	P
1	0.112	0.328	0.312	0.088	0.071	0.281	0.094	0.343	0.072	0.412
2	0.360	0.247	0.265	0.461	0.269	0.437	0.280	0.746	0.199	0.563
3	0.395	0.683	0.485	0.660	0.483	0.320	0.445	0.358	0.451	0.254
4	0.141	0.368	0.000	0.527	0.000	0.330	0.000	0.000	0.000	0.000
5	0.000	0.734	0.002	0.582	0.022	0.436	0.057	0.363	0.000	0.163
6	0.127	0.248	0.102	0.420	0.257	0.134	0.148	0.241	0.080	0.071
7	0.028	0.371	0.087	0.286	0.091	0.505	0.010	0.379	0.059	0.250
8	0.000	0.409	0.031	0.321	0.000	0.116	0.000	0.127	0.000	0.914
9	0.007	0.580	0.000	0.624	0.000	0.307	0.000	0.345	0.000	1.035
10	0.000	0.298	0.000	0.301	0.000	0.119	0.000	0.042	0.000	0.000
11	0.000	0.152	0.000	0.019	0.000	0.000	0.000	0.038	0.000	0.000
12	0.000	0.141	0.000	0.124	0.000	0.030	0.000	0.030	0.000	0.000
13	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	0.869	0.746	0.870	0.320	0.426	1.402	0.426	0.940	0.269	1.755
17	0.642	0.138	0.179	0.632	0.299	0.376	0.219	0.896	0.240	0.600
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19	0.299	0.139	0.250	0.208	0.191	0.325	0.146	0.374	0.196	0.187
20	0.127	0.080	0.047	0.181	0.066	0.303	0.127	0.324	0.329	0.081
21	0.000	0.000	0.000	0.074	0.000	0.063	0.000	0.000	0.000	0.048
22	1.032	0.148	0.774	0.723	0.724	0.826	0.855	0.705	0.705	0.963
23	0.475	0.229	0.475	0.391	0.777	0.411	0.515	0.535	0.883	0.000
24	0.000	0.331	0.000	0.348	0.000	0.653	0.032	0.726	0.000	1.000
25	0.490	0.725	0.571	0.718	0.488	0.908	0.439	0.993	0.316	2.411
26	0.537	0.365	0.610	0.419	0.566	1.504	0.402	1.823	0.458	2.032
27	0.342	0.711	0.249	0.674	0.249	0.637	0.413	0.564	0.318	1.077
28	0.345	0.000	0.317	0.000	0.239	0.000	0.319	0.000	0.238	0.000
29	0.369	0.461	0.324	0.304	0.694	0.000	0.912	0.000	0.827	0.000
30	0.059	0.000	0.408	0.085	0.422	0.099	0.361	-	0.364	0.139
31	0.266	0.644	0.309	0.425	0.221	0.599	0.286	0.438	0.199	0.629
32	0.184	1.389	0.305	1.277	0.571	1.392	0.291	1.353	0.271	0.170
33	0.388	0.852	0.377	0.910	0.213	0.822	0.348	0.710	0.360	0.710

Table 7 continued

34	-	-	-	-	-	-	-	-	-	-
35	0.396	0.401	0.428	0.442	0.400	0.517	0.496	0.588	0.407	0.406
36	0.497	0.501	0.450	0.469	0.486	0.465	0.636	0.240	0.414	0.483
37	0.423	0.461	0.326	0.542	0.476	0.322	0.527	0.468	0.423	0.449

Table 8. Total chlorophyll, µg/liter.

Expt. No.	Surface	2 ft	6 ft.	10 ft	14 ft	18 ft	Bottom
1	9.98	9.45	6.02	7.28	-	-	10.63
2	6.76	7.80	5.72	5.72	-	5.10	6.88
3	11.96	11.96	9.38	9.38	8.75	6.88	6.24
4	11.96	6.01	5.09	4.43	7.42	6.25	10.00
5	11.99	11.88	9.63	8.75	8.94	8.13	6.85
6	5.63	5.00	4.50	8.41	6.55	6.49	6.25
7	9.23	8.93	12.73	11.54	14.06	10.38	7.81
8	6.05	6.43	4.92	4.86	5.00	4.50	14.33
9	10.63	10.63	10.63	8.13	9.06	10.06	10.63
10	6.25	5.40	5.47	5.32	5.63	5.73	6.62
11	6.56	5.81	8.75	5.94	5.94	5.75	9.06
12	7.56	4.81	6.25	5.69	5.62	6.88	6.25
13	-	-	-	-	-	-	-
14	8.59	7.81	7.03	5.73	-	-	6.77
15	3.57	3.91	3.38	3.12	2.34	3.22	2.81
16	5.80	5.13	4.69	6.51	4.43	3.91	4.69
17	7.14	6.47	5.58	4.02	4.02	3.79	3.75
18	2.68	3.12	3.35	2.90	2.86	3.12	4.38
19	3.35	3.35	3.12	4.02	5.80	6.47	7.81
20	5.48	4.43	4.43	4.95	4.69	5.00	5.61
21	2.01	3.57	3.12	3.35	3.12	6.51	3.75
22	3.12	3.75	5.00	5.00	2.50	4.38	4.06
23	2.08	1.56	1.25	2.81	3.44	4.69	5.77
24	3.13	3.13	5.31	8.75	7.50	6.25	8.75
25	7.19	6.31	6.56	9.06	11.22	14.45	15.62
26	5.00	2.34	18.75	23.44	19.44	37.11	21.09
27	6.88	5.94	4.69	5.00	5.91	10.31	9.69
28	7.25	6.77	5.73	6.77	7.50	3.75	6.77
29	5.62	0.62	3.12	6.56	1.56	3.12	4.69
30	1.88	3.75	6.25	4.69	4.02	5.36	2.68
31	7.81	6.88	7.81	7.94	5.94	8.75	5.86
32	36.25	40.00	31.25	29.69	24.02	12.11	13.28
33	24.61	25.31	15.94	15.78	11.56	12.34	13.59
34	4.50	5.94	10.25	12.88	10.62	11.75	9.69
35	4.50	4.18	4.70	12.60	10.41	4.16	3.43
36	5.76	5.04	5.04	5.28	5.67	4.95	5.12
37	2.86	2.23	1.82	2.08	-	2.70	2.37

Table 9. Suspended solids, organic (O) and inorganic (I), mg/liter.

Expt. No.	Surface		2 ft		6 ft		10 ft		Bottom	
	O	I	O	I	O	I	O	I	O	I
1	2.67	3.33	-	34.49	2.00	3.00	2.67	3.00	2.83	11.33
2	3.67	7.16	4.33	6.16	3.67	6.66	4.50	5.83	5.00	27.40
3	0.67	4.33	2.33	3.67	1.50	4.60	3.67	6.60	5.50	13.16
4	4.50	8.83	5.17	7.99	6.83	10.00	5.17	13.33	9.20	36.40
5	2.36	4.18	2.60	4.20	6.00	6.00	1.20	3.60	3.80	18.40
6	4.40	7.00	3.40	4.80	2.40	4.80	2.00	4.00	1.20	1.20
7	0.60	4.60	2.60	6.40	4.00	7.50	6.75	22.75	3.00	8.50
8	4.60	5.40	4.60	6.00	7.40	8.60	2.00	5.80	27.00	223.98*
9	0.00	3.80	0.40	4.40	0.00	4.00	0.00	3.40	1.80	64.66
10	2.00	3.86	1.67	2.83	2.17	3.17	1.50	2.83	11.65	107.99*
11	0.00	5.20	0.00	5.20	2.20	8.80	0.00	4.40	4.00	44.80
12	1.20	6.40	0.00	6.20	1.60	8.00	0.40	6.60	2.00	18.40
13	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-
15	1.50	11.33	0.00	7.33	0.33	5.83	-	-	1.67	37.75
16	2.00	7.83	1.33	6.66	1.33	5.33	2.50	5.00	26.67	13.33
17	-	7.57	-	6.29	-	6.43	-	5.57	-	21.00
18	1.71	7.00	2.71	7.15	2.83	8.16	2.67	8.66	4.40	18.40
19	2.43	4.29	-	-	3.84	6.83	5.17	6.33	6.40	18.60
20	0.00	4.17	-	7.16	0.83	5.33	0.67	6.50	2.80	15.60
21	0.29	7.14	0.28	6.86	1.00	9.50	1.34	8.83	2.40	15.00
22	2.6-	9.2-	3.8-	11.2-	4.0-	16.2-	6.8-	15.8-	5.8-	18.6-
23	-	6.00	1.4-	9.83	1.0-	6.16	3.0-	6.50	7.0-	40.33
24	0.4-	5.8-	3.6-	7.4-	2.2-	7.8-	2.6-	18.8-	4.4-	16.8-
25	5.4-	9.2-	4.8-	5.2-	4.8-	5.8-	6.2-	6.2-	9.2-	34.4-
26	2.00	10.75	3.75	8.25	7.75	12.50	10.00	20.25	8.75	22.00
27	3.60	7.60	1.80	8.00	4.51	7.33	3.11	8.89	6.25	19.25
28	9.67	38.66	7.33	32.33	5.34	33.66	5.00	30.33	10.34	64.66
29	5.55	15.78	6.67	13.11	6.50	14.75	8.50	14.75	9.50	41.75
30	3.71	20.00	5.43	18.00	6.85	16.86	7.43	15.43	7.14	19.14
31	4.4-	6.4-	4.8-	4.2-	4.2-	5.0-	4.4-	4.6-	5.5-	12.0-
32	7.0-	5.5-	7.3-	5.5-	7.8-	5.5-	6.3-	4.5-	5.0-	19.5-

* May be in error due to stirring of bottom when sampling.

Table 9 continued

33	5.5-	7.0-	6.8-	7.5-	4.3-	6.5-	4.0-	5.5-	6.0-	15.0-
34	0.00	7.6-	0.8-	6.8-	1.2-	6.2-	2.0-	7.4-	2.4-	8.4-
35	4.67	5.50	5.34	4.33	5.00	4.50	7.17	6.50	6.00	9.17
36	4.00	0.77	3.54	0.31	5.08	0.00	6.00	1.54	8.60	6.60
37	1.00	7.00	2.17	12.16	2.17	7.16	2.17	5.33	3.40	9.60

Table 10. Cell counts, in units (cells, chains or colonies) per ml.

Expt. No.	Surface	2 ft	6 ft	10 ft	Bottom
1	3,351	4,454	954	1,051	2,575
2	3,793	4,030	1,121	1,441	285
3	6,448	6,080	1,963	1,970	1,531
4	2,116	2,255	1,775	1,225	1,893
5	6,219	6,344	2,053	2,046	2,342
6	2,673	4,350	1,048	793	553
7	5,032	3,028	3,661	640	1,281
8	2,972	4,907	793	1,100	856
9	5,631	5,585	3,355	1,775	1,691
10	1,921	1,629	856	536	508
11	2,155	1,258	646	709	243
12	1,418	1,404	368	35	292
13	-	-	-	-	-
14	2,738	7,540	1,682	904	368
15	1,835	1,279	1,043	1,202	97
16	1,612	2,307	3,294	1,202	945
17	5,945	1,432	1,765	1,056	243
18	910	500	945	348	702
19	-	-	-	-	-
20	2,620	2,495	2,439	1,960	2,391
21	945	1,077	917	723	751
22	1,848	1,390	952	1,411	1,237
23	1,091	675	1,008	1,286	1,341
24	1,516	1,365	2,185	2,011	3,096
25	2,478	3,049	2,073	2,009	2,491
26	1,263	1,670	4,833	3,291	3,078
27	2,330	2,740	2,405	1,844	1,709
28	2,688	2,593	1,838	1,781	2,273
29	2,852	2,830	3,039	4,089	2,085
30	3,358	3,178	2,830	3,381	2,586
31	1,223	695	931	994	744
32	3,524	5,011	6,728	2,877	1,925
33	4,142	3,922	2,259	2,078	2,057
34	1,049	396	445	209	855
35	2,875	76	285	577	313
36	-	-	-	-	-
37	1,682	716	514	285	493

Table 11. Number of taxa recorded in the nannoplankton.

Expt. No.	Surface	2 ft	6 ft	10 ft	Bottom
1	11	9	13	9	13
2	15	13	9	10	3
3	14	15	10	9	14
4	13	12	12	13	11
5	15	16	13	11	9
6	15	17	11	13	8
7	14	9	10	7	8
8	16	18	10	15	6
9	18	14	16	15	12
10	15	12	9	12	7
11	16	10	8	11	8
12	17	12	8	5	6
13	--	--	--	--	--
14	15	13	9	9	8
15	9	9	5	6	5
16	10	9	9	11	12
17	13	13	11	7	8
18	7	6	13	4	5
19	--	--	--	--	--
20	15	18	12	10	10
21	12	10	9	11	13
22	14	19	16	16	15
23	11	14	11	12	14
24	15	14	16	17	18
25	18	25	17	19	20
26	18	11	16	16	12
27	15	15	17	17	20
28	24	25	18	16	21
29	19	21	20	23	29
30	16	19	18	20	21
31	16	15	11	11	15
32	13	11	16	15	14
33	15	12	14	17	14
34	8	10	10	12	6
35	10	2	3	7	8
36	--	--	--	--	--
37	9	8	8	3	7

Table 12. Gross production, in gcal/cm^2/day (based on a 20 ft water column), of samples collected at 2 ft, 6 ft, and 10 ft, and resuspended at all depths. The first number in the column headings denotes depth of collection, and the second number depth of suspension.

Expt. No.	2-2	6-2	10-2	2-6	6-6	10-6	2-10	6-10	10-10
1	3.49	-	-	3.04	0.98	0.49	1.09	0.02	0.30
2	4.00	1.50	2.95	2.65	1.63	1.43	0.96	1.13	0.34
3	5.76	2.44	2.53	4.04	1.95	1.93	1.35	0.58	0.64
4	5.86	4.79	3.60	2.93	0.30	2.05	0.88	0.41	0.71
5	6.23	3.92	4.37	4.30	2.66	3.02	1.78	1.07	1.86
6	3.27	1.22	0.90	0.17	0.79	1.01	1.13	0.88	0.60
7	5.59	2.89	2.40	2.74	1.88	1.97	1.28	1.09	1.41
8	4.75	2.05	2.31	2.08	0.98	1.11	-	0.34	0.66
9	5.22	4.45	2.68	2.65	2.53	0.36	0.68	0.83	1.54
10	1.97	1.99	1.43	0.77	0.88	0.87	0.36	0.28	0.34
11	4.82	2.74	3.06	2.68	1.48	1.50	0.75	0.45	0.88
12	4.24	2.08	2.18	2.40	1.37	1.26	0.58	0.66	0.60
13	4.45	2.22	2.14	2.44	1.65	1.39	1.80	0.75	0.90
14	3.47	2.52	1.26	0.94	0.88	0.64	0.75	0.11	0.28
15	1.52	0.90	0.79	1.20	0.77	0.56	0.34	0.32	0.30
16	2.72	2.14	1.69	2.14	0.96	1.33	0.79	0.71	0.79
17	1.22	0.92	0.62	1.37	0.86	0.54	0.47	0.32	0.43
18	0.36	0.49	0.40	0.49	0.36	0.27	0.09	0.22	0.00
19	1.28	0.75	0.26	0.75	0.62	1.01	0.32	0.41	0.36
20	1.37	1.43	1.37	1.65	1.20	1.18	2.82	0.29	1.03
21	0.30	0.30	0.30	0.30	0.45	0.41	0.30	0.21	0.30
22	0.54	1.39	1.09	0.51	0.56	0.79	0.21	0.58	0.54
23	0.41	0.83	0.75	0.58	0.88	0.75	0.15	0.49	0.19
24	1.35	1.24	1.78	0.94	0.88	0.94	1.26	0.19	0.32
25	1.71	1.67	2.08	1.35	1.58	1.56	0.62	0.62	0.68
26	0.71	5.31	4.71	1.61	3.92	4.09	1.07	2.01	1.48
27	1.84	2.03	1.95	1.35	0.96	1.86	0.34	0.34	0.86
28	2.87	2.61	2.82	1.07	1.63	-	0.15	0.28	0.47
29	3.27	2.91	2.76	0.83	0.34	0.39	0.04	-0.24	-0.13
30	3.08	3.87	4.67	1.41	1.75	1.84	0.24	0.68	0.47
31	0.86	-0.06	1.41	0.90	1.09	0.96	0.13	0.41	0.49
32	8.47	10.53	9.03	5.26	5.86	6.21	1.88	2.93	2.01
33	18.17	20.67	12.95	13.67	15.73	12.35	11.43	10.94	10.87
34	0.04	0.30	1.18	0.09	0.28	0.32	-0.32	0.49	0.32
35	0.30	0.32	0.36	0.24	0.32	-	0.17	0.00	0.24
36	0.30	0.36	-0.17	0.45	0.21	0.34	0.24	0.21	0.26
37	1.95	1.48	1.46	1.01	0.83	-0.26	0.32	0.34	0.21

Table 13. Respiration, in gcal/cm^2/day (based on a 20 ft water column), of samples collected from five depths and resuspended at the depth of collection.

Expt. No.	2 ft	6 ft	10 ft	14 ft	18 ft
1	1.78	1.05	1.73	1.20	0.88
2	2.08	1.95	1.71	1.79	-1.71
3	1.95	1.71	2.03	0.98	0.36
4	0.98	0.81	1.37	0.06	-0.36
5	1.73	1.46	1.56	0.81	0.68
6	1.69	1.43	1.63	0.92	0.96
7	1.54	1.93	2.14	-0.04	1.54
8	1.73	1.28	1.22	1.41	1.63
9	2.20	2.46	1.69	1.01	1.37
10	0.13	1.75	2.03	0.43	0.60
11	0.98	1.01	0.98	1.37	0.38
12	1.03	1.22	1.20	0.88	0.79
13	1.01	1.05	1.11	2.12	0.26
14	0.83	0.79	1.01	0.98	1.22
15	0.26	0.21	0.43	0.13	0.45
16	1.24	0.26	1.46	0.58	0.45
17	0.41	0.00	0.68	0.09	0.15
18	0.09	0.09	0.09	0.13	0.02
19	0.41	0.51	0.75	-	0.71
20	0.38	0.58	1.07	-0.41	0.51
21	-0.04	-0.11	0.24	-0.45	-0.60
22	-0.26	0.41	0.45	0.30	-0.06
23	0.19	0.19	0.15	0.04	0.13
24	0.73	0.51	0.11	-1.30	-0.15
25	-0.09	-0.32	-0.30	-0.36	0.21
26	0.29	1.67	0.02	0.28	0.21
27	0.11	0.62	0.88	0.88	0.96
28	0.43	0.41	0.47	0.54	0.58
29	0.13	0.06	0.17	-0.81	0.04
30	0.28	0.62	0.90	1.24	0.66
31	0.11	0.60	0.19	0.26	0.36
32	0.62	1.20	1.28	1.16	0.13
33	12.93	12.20	11.09	10.74	0.71
34	0.11	0.30	0.41	0.17	0.21
35	0.19	0.32	0.58	0.13	0.24
36	-0.12	0.34	-0.02	0.39	0.36
37	0.00	-0.17	0.28	-0.04	0.17

Table 14. Net production of samples collected from and resuspended at 2 ft, 6 ft and 10 ft, in gcal/cm^2/day.

Expt. No.	2 ft	6 ft	10 ft
1	1.71	-0.06	-1.43
2	1.93	-0.32	-1.37
3	3.81	0.24	0.75
4	4.88	-0.51	-0.66
5	4.49	1.22	0.30
6	1.58	-0.64	-1.03
7	4.04	0.06	-0.73
8	3.02	-0.30	-0.56
9	3.02	0.06	-0.15
10	1.84	-0.87	-1.48
11	3.84	0.47	-0.10
12	3.21	0.15	-0.60
13	3.44	0.60	-0.21
14	2.63	0.09	-0.73
15	1.26	0.56	-0.13
16	1.48	0.70	-0.67
17	0.81	0.86	-0.25
18	0.28	0.28	-0.09
19	0.88	0.11	-0.39
20	0.98	0.62	-0.04
21	0.34	0.56	0.06
22	0.79	0.15	0.09
23	0.21	0.68	0.04
24	0.62	0.36	0.21
25	1.80	1.90	0.98
26	0.43	2.25	1.46
27	1.73	0.34	-0.02
28	2.44	1.22	0.00
29	3.15	0.28	-0.30
30	2.80	1.13	-0.43
31	0.75	0.49	0.30
32	7.85	4.67	0.73
33	5.24	3.53	-0.21
34	-0.06	-0.02	-0.09
35	-0.11	0.00	-0.34
36	0.43	-0.13	0.28
37	1.95	0.66	-0.06

Table 15. Gross production, respiration and net production, gcal/cm^2/day, in the whole 20 ft water column. Compensation depths, in ft, are also indicated.

Expt. No.	Gross Production	Respiration	Net Production	Compensation Depth (ft)
1	5.97	8.17	-2.20	5.8
2	7.44	9.75	-2.31	5.2
3	10.49	8.41	2.08	6.5
4	8.84	3.90	4.94	5.3
5	15.67	7.50	8.17	16.4
6	6.64	8.23	-1.59	3.8
7	15.00	9.14	5.86	6.2
8	10.24	8.78	1.46	4.9
9	14.57	10.55	4.02	6.1
10	4.17	3.72	0.45	4.7
11	10.12	5.61	4.51	8.8
12	8.66	6.22	2.44	6.4
13	9.20	6.46	2.74	8.6
14	6.28	5.85	0.43	6.3
15	3.54	1.83	1.71	9.2
16	7.38	5.00	2.38	7.5
17	3.05	1.77	1.28	8.7
18	1.04	0.49	0.55	9.6
19	3.35	3.72	-0.37	6.8
20	6.52	2.93	3.59	9.6
21	1.28	-1.22	2.50	-
22	3.23	1.10	2.13	-
23	1.95	0.91	1.04	10.3
24	3.11	2.32	0.79	-
25	4.88	-1.10	5.98	-
26	7.56	2.93	4.63	13.5
27	6.52	4.27	2.25	8.9
28	6.16	2.50	3.66	10.0
29	4.51	-0.24	4.27	7.8
30	6.83	4.57	2.26	8.9
31	2.99	1.89	1.10	10.6
32	20.36	2.68	17.68	10.5
33	57.49	60.53	-3.04	9.9
34	-	1.46	-	-
35	1.22	1.71	-0.49	6.3
36	-	0.91	-	4.8
37	4.02	1.04	2.98	9.0

Table 16. Extinction coefficients at the beginning (B) and end (E) of each experiment. Mean coefficients, $\bar{\eta}$, for the upper 10 ft are also indicated.

Expt. No.	Surface		2 ft		6 ft		10 ft		14 ft		18 ft		Bottom		$\bar{\eta}$
	B	E	B	E	B	E	B	E	B	E	B	E	B	E	
1	0.46	-	0.46	-	0.46	-	0.46	-	-	-	-	-	0.46	-	0.46
2	0.86	1.32	0.75	1.27	1.04	1.62	1.15	1.55	-	-	-	-	2.07	2.36	1.20
3	1.15	1.15	1.18	1.15	1.18	1.05	1.15	1.09	-	-	-	-	1.51	2.42	1.14
4	1.26	1.61	1.26	1.38	1.26	1.55	1.72	1.61	2.99	2.01	2.24	2.59	4.48	2.70	1.46
5	0.98	0.86	1.27	0.92	1.15	0.92	1.09	0.75	1.09	0.75	1.15	0.75	2.01	0.98	0.99
6	0.75	0.81	0.75	0.86	0.75	0.86	0.75	0.86	0.75	0.75	0.69	0.81	1.38	1.55	0.80
7	0.81	0.98	1.00	0.86	0.97	0.92	0.97	0.75	1.10	0.81	1.18	0.69	1.40	2.19	0.91
8	0.90	1.17	0.89	1.17	0.83	1.08	0.94	1.06	0.95	1.09	1.13	1.38	10.47*	7.61	1.01
9	0.86	1.04	0.86	0.92	0.92	0.92	0.81	0.92	0.75	1.04	0.81	1.04	3.91	1.73	0.91
10	0.63	1.26	0.63	0.92	0.69	0.86	0.63	0.86	0.63	0.86	0.63	1.15	6.27	2.76	0.81
11	0.92	0.63	0.92	0.52	1.09	0.34	1.04	0.23	1.15	0.23	0.86	0.12	1.26	2.07	0.71
12	0.92	0.63	1.04	0.81	0.81	0.86	0.86	0.92	0.92	0.92	0.98	0.98	1.50	2.64	0.86
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1.27	1.21	1.38	1.44	1.09	1.55	1.15	1.61	-	1.55	-	1.55	3.85	75.90*	1.34
15	1.04	1.27	1.04	1.27	0.92	1.27	0.81	1.27	0.81	1.38	1.27	1.44	3.91	3.28	1.11
16	0.69	0.58	0.58	1.15	0.63	0.86	0.58	0.75	0.29	0.58	0.35	0.58	2.53	1.44	0.73
17	0.63	0.58	0.63	0.92	0.63	0.69	0.63	0.46	0.63	0.52	0.86	0.58	1.96	2.53	0.65
18	0.63	0.75	0.63	0.92	0.69	0.69	0.69	0.52	0.69	0.52	0.69	0.52	1.21	3.16	0.69
19	0.23	0.23	0.58	0.63	0.58	0.69	0.75	0.81	0.75	0.81	0.75	1.15	1.84	2.76	0.56
20	0.69	0.69	0.69	0.52	0.92	0.52	1.32	0.52	1.61	0.52	1.44	0.52	2.47	1.21	0.73
21	0.40	0.63	0.40	0.69	0.40	0.69	0.40	0.69	0.86	0.69	1.04	0.81	1.04	18.75*	0.54
22	1.15	0.86	1.15	1.04	1.61	1.04	1.15	1.27	2.42	1.27	2.19	2.01	1.38	7.48	1.16
23	1.15	1.27	1.15	1.04	1.15	0.92	1.15	1.15	1.15	0.81	1.15	0.81	8.63	1.50	1.12
24	0.46	1.50	0.46	2.42	0.46	2.42	0.46	1.96	0.92	2.30	1.27	2.30	1.73	2.76	1.27
25	1.04	1.09	1.04	0.69	1.38	1.32	1.38	1.32	1.50	2.30	1.67	3.05	4.26	16.10	1.16
26	0.98	0.81	0.98	1.67	1.38	2.13	2.01	2.30	1.73	2.30	1.61	2.88	3.11	3.45	1.53
27	1.04	0.58	0.92	0.58	0.92	0.69	0.92	0.92	0.81	0.63	1.27	0.63	1.96	7.82	0.82
28	4.49	1.78	3.16	1.78	3.16	1.44	1.78	1.44	2.19	0.81	1.50	1.78	4.37	5.58	2.38
29	1.84	2.07	1.61	1.73	1.50	1.96	1.50	1.61	1.15	1.73	1.27	2.07	3.80	2.76	1.73
30	2.07	1.73	2.07	1.04	2.07	1.27	1.90	1.04	1.38	1.04	1.38	0.63	2.13	1.38	1.65

* May be in error due to stirring of bottom when sampling.

Table 16 continued

31	1.09	0.86	0.92	1.09	0.92	0.92	0.92	0.92	0.92	0.86	0.98	0.69	1.78	6.73	0.96
32	1.59	1.73	1.59	2.13	1.55	2.13	1.44	2.13	1.15	2.07	0.92	1.67	2.78	2.53	1.78
33	1.67	1.44	1.55	1.44	1.21	1.21	1.15	0.78	1.15	0.78	1.15	0.78	2.30	1.58	1.31
34	1.32	0.86	1.32	1.15	1.32	1.21	1.38	1.21	1.50	1.55	1.50	1.55	1.86	2.19	1.22
35	0.92	1.27	0.92	1.04	1.04	1.04	1.29	1.04	1.15	0.94	1.50	1.01	1.27	0.92	1.07
36	0.78	1.32	0.75	1.32	0.75	0.98	1.15	0.92	1.15	0.94	1.04	1.07	1.98	2.05	1.00
37	1.15	1.07	1.15	1.07	1.15	1.02	1.15	1.02	1.15	1.02	1.67	1.02	1.90	1.70	1.10

Table 17. Radiation data, gcal/cm^2/day, including incident solar radiation at the water surface, I_o, radiation at 2 ft, 6 ft, 10 ft and 20 ft, and total radiation available for photosynthesis in the water column, $I\Big]_o^b$.

Expt. No.	I_0	I_2	I_6	I_{10}	I_{20}	$I\Big]_o^b$
1	505.8	382.3	218.4	124.7	30.4	1033.9
2	620.0	298.8	68.7	15.9	0.4	515.7
3	582.8	289.4	72.0	18.0	0.5	510.2
4	547.8	224.9	37.9	6.4	0.1	374.9
5	597.2	327.7	97.7	29.1	1.4	601.1
6	367.2	231.8	93.3	37.2	2.6	455.4
7	623.4	363.3	119.7	39.8	2.6	1017.4
8	412.8	222.1	64.9	12.7	0.8	407.8
9	283.2	163.1	53.5	17.9	1.2	306.6
10	225.2	137.4	51.1	19.0	1.6	276.1
11	382.8	249.2	104.1	44.0	5.0	531.6
12	574.0	341.0	119.4	41.9	2.9	663.9
13	485.0	-	-	-	-	-
14	245.8	108.2	21.1	4.2	0.1	183.5
15	175.8	89.1	23.4	6.0	0.2	158.5
16	425.4	274.0	112.3	46.8	5.1	578.5
17	209.6	141.9	64.4	29.1	4.0	317.6
18	205.8	135.2	58.5	25.1	3.1	293.8
19	246.4	175.4	88.0	44.6	8.1	424.3
20	169.0	107.8	44.3	17.9	1.9	228.0
21	265.0	190.5	98.6	51.4	9.8	471.8
22	203.4	100.1	24.4	5.9	0.2	175.6
23	255.6	129.6	33.0	8.4	0.3	228.0
24	326.0	151.0	32.3	6.9	0.1	223.1
25	305.8	150.5	36.7	8.9	0.2	264.0
26	295.2	116.6	18.0	2.7	0.0	192.6
27	464.4	281.9	103.6	38.1	3.3	198.7
28	531.6	124.9	6.9	0.4	0.0	223.1
29	506.6	177.3	21.3	2.5	0.0	307.2
30	588.0	214.0	28.8	4.1	0.0	356.6
31	305.4	171.0	52.8	16.5	0.9	318.2
32	490.2	164.7	18.6	2.0	0.0	274.9
33	592.2	265.9	53.9	11.2	0.2	453.5
34	484.6	228.7	51.4	11.6	0.3	396.2
35	549.4	286.8	78.0	21.4	1.1	514.5
36	663.2	360.1	107.4	31.8	1.3	664.5
37	633.6	324.4	84.9	22.2	0.6	576.7

Table 18. Efficiency of primary production (π_z) relative to available radiation (I_z), in gcal/kcal, at 2 ft, 6 ft, 10 ft, and for the whole 20 ft water column $\left[\pi/I\right]_0^b$. Data are also provided for production efficiency of the water column relative to incident radiation ($\pi\Big]_0^b/I_o$).

Expt. No.	$(\pi/I)_2$	$(\pi/I)_6$	$(\pi/I)_{10}$	$(\pi/I\Big]_0^b$	$(\pi\Big]_0^b/bI_o)$
1	9.1	4.5	2.4	5.77	1.94
2	13.4	23.7	21.4	14.43	1.97
3	19.9	27.1	35.6	20.56	2.95
4	26.1	7.9	111.8	23.58	2.65
5	19.0	27.2	63.8	26.24	4.30
6	14.1	8.5	16.1	14.58	2.97
7	15.4	15.7	35.4	14.74	3.95
8	21.4	15.1	51.9	25.11	4.07
9	32.3	48.0	90.3	47.52	8.44
10	14.3	17.2	17.9	15.16	3.05
11	19.3	14.2	20.0	19.01	4.33
12	12.4	11.5	14.3	13.00	2.47
13	-	-	-	-	-
14	32.1	32.2	67.0	34.33	4.20
15	17.1	32.9	50.2	22.35	3.30
16	9.9	8.6	16.9	12.75	2.84
17	86.0	13.4	14.8	9.62	2.39
18	2.7	6.2	0.0	3.47	0.81
19	73.0	70.5	80.7	7.84	2.22
20	12.7	27.1	57.5	28.62	6.33
21	1.6	4.6	5.8	2.77	0.81
22	5.4	22.9	91.5	18.47	2.62
23	3.2	26.7	22.5	8.56	1.25
24	8.9	27.3	46.7	13.94	1.56
25	11.4	43.1	76.7	18.47	2.62
26	6.1	217.7	556.4	39.21	4.20
27	6.5	9.3	22.6	32.81	2.30
28	23.0	235.9	1,270.3	27.56	1.90
29	18.4	16.0	-51.4	14.69	1.46
30	14.4	60.7	114.1	19.16	1.91
31	5.0	20.6	29.7	9.34	1.60
32	51.4	314.5	1,025.5	73.99	6.80
33	68.3	291.9	966.2	126.71	15.92
34	0.2	5.5	27.5	-	-
35	1.0	4.1	11.2	2.38	0.37
36	0.8	2.0	8.2	-	-
37	6.0	9.8	9.5	6.94	1.04