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**Dark and light bottle studies in the lower Chesapeake region,  
Summer 1961**

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DARK AND LIGHT BOTTLE STUDIES

IN THE LOWER CHESAPEAKE REGION

— Summer 1961 —

SPECIAL SCIENTIFIC REPORT NO. 39

Virginia Institute of Marine Science  
Gloucester Point, Virginia

1962

DARK AND LIGHT BOTTLE STUDIES  
IN THE LOWER CHESAPEAKE REGION

Summer 1961

This report summarizes results of nine dark and light bottle productivity experiments performed in the York River and lower Chesapeake Bay by the Planktology Department during the summer of 1961.

Four stations along the salinity gradient were occupied at weekly intervals. Station locations and mean low water depths were:

- A) York River, near Page's Rock ( $37^{\circ} 18'$ ,  
 $76^{\circ} 35'$ ); 30 ft.
- B) York River, productivity buoy opposite  
VIMS ( $37^{\circ} 14'$ ,  $76^{\circ} 30'$ ); 30 ft.
- C) Chesapeake Bay, York Spit Light ( $37^{\circ} 13'$ ,  
 $76^{\circ} 16'$ ); 18 ft.
- D) Chesapeake Bay, Kiptopeke crossing north of  
Inner Middle Ground ( $37^{\circ} 08'$ ,  $76^{\circ} 02'$ ); 26 ft.

Data reported include vertical profiles of temperature, chlorinity, dissolved oxygen, extinction coefficients and daily radiation, and a number of derived production variables based on measurements of gross production and respiration. Temperature (Table 1) was measured with a thermistor unit or thermometer. Chlorinity (Table 2) was titrated with silver nitrate. Dissolved oxygen (Table 3) was determined by the unmodified Winkler method

in all but Expts. 8 and 9, in which the Pomeroy-Kirschman-Alsterberg azide modification was employed. Extinction coefficients (Table 4) for "white" light (GE incandescent lamp CDJ-100 w) 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. was used to calculate daily light at various depths and in the whole water column (Table 5) based on incident solar radiation as measured at the VIMS Eppley 10-junction pyrheliometer installation, Gloucester Point.

For productivity determinations, dark and light bottles were suspended in situ for 24 hours and then fixed for Winkler titration. Light bottles were suspended at 2, 6 and 10 ft., and dark bottles at 2, 6, 10, 14 and 18 ft. (to 10 ft. only at shallow St. C). Gross production (Table 6), respiration (Table 7) and net production (Table 8) were computed from oxygen changes in the bottles and converted to gcal assuming  $PQ = RQ = 1.00$ . Values of gross production and respiration were plotted against depth--down to 20 ft. for Sts. A, B and D, and to 10 ft. for St. C. The points were then connected and the areas under the curves determined planimetrically to obtain integral gross production, respiration and, by difference, net production (Table 9) in the water columns (i.e., from surface to 10 ft. or 20 ft.). The depth at which the gross production and respiration curves crossed was recorded as the compensation depth (Table 9). Several efficiencies and a cost variable

were calculated at 2, 6 and 10 ft. and also for the whole water column (Table 10).

The various experiments were performed on the following dates:

<u>Expt. No.</u>	<u>Date (1961)</u>
1	June 27-28
2	July 11-12
3	July 17-18 (Sts. C and D) July 18-19 (Sts. A and B)
4	July 25-26
5	August 1-2
6	August 10-11
7	August 15-16
8	August 22-23
9	August 29-30

Distribution of this report does not constitute publication, and the data are subject to correction and/or revision.

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27 September 1962

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

Expt. No.	Surface		2		6		10		14		18		22		26		30	
	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E
									<u>St. A</u>									
1	22.37	21.76	22.33	21.80	22.19	21.71	22.14	21.71	20.45	21.71	21.21	21.68	21.50	21.68	21.63	21.68	-	21.69
2	24.6	25.5	24.5	25.1	24.5	24.8	24.2	24.6	24.4	24.6	25.0	24.6	24.5	24.6	-	24.8	-	-
3	27.0	26.8	27.2	26.8	27.0	26.4	26.4	25.9	26.0	25.7	25.2	24.8	24.4	24.3	-	-	-	-
4	29.0	27.2	28.2	27.5	27.2	26.8	26.3	26.4	26.3	25.9	26.7	25.2	25.8	25.0	25.9	25.0	-	-
5	29.0	28.5	29.0	28.5	29.0	28.5	28.8	28.5	28.8	28.8	28.5	28.5	28.5	28.5	28.5	28.5	-	-
6	27.8	27.5	27.7	27.9	27.1	27.6	27.0	27.5	26.9	27.2	26.7	27.0	26.5	27.0	26.5	27.0	-	-
7	25.0	27.2	25.5	27.0	25.8	26.4	26.3	26.8	26.1	26.5	26.7	26.8	26.4	26.5	26.4	26.5	-	-
8	26.0	25.6	26.0	25.4	25.9	25.4	26.0	25.3	26.1	25.3	26.3	25.2	25.9	25.3	26.0	25.1	-	-
9	28.1	27.1	28.8	28.0	28.6	27.9	28.5	27.6	28.1	27.9	28.0	27.6	27.7	27.8	28.1	-	-	-
									<u>St. B</u>									
1	22.67	21.64	22.67	21.64	22.63	21.66	22.69	21.66	22.71	21.68	22.56	21.68	21.63	21.64	21.70	21.68	21.78	21.66
2	24.5	24.6	24.5	24.5	25.0	24.4	24.8	24.4	24.8	24.2	24.6	23.9	24.6	24.0	24.3	-	24.0	24.0
3	26.0	25.2	25.8	25.5	25.5	25.0	25.2	25.0	24.1	24.7	24.0	24.1	23.5	23.8	23.8	23.5	23.5	25.0
4	29.2	28.8	28.8	29.3	28.2	28.3	27.8	27.8	27.5	27.4	26.4	25.8	26.2	25.3	26.5	24.9	-	-
5	28.2	28.0	28.0	28.0	28.2	27.8	27.5	27.5	28.0	27.4	27.5	27.4	27.2	27.2	27.8	27.2	27.2	27.2
6	27.7	27.4	28.0	27.9	27.8	27.5	27.5	27.2	26.9	26.7	26.6	26.1	26.0	26.0	25.2	25.9	25.0	-
7	26.0	27.8	26.4	27.0	25.9	26.8	26.0	26.4	26.0	26.2	25.0	26.2	26.2	26.2	26.0	26.2	26.2	26.2
8	25.9	26.2	26.2	26.0	25.9	25.8	25.8	25.8	25.7	25.9	25.7	25.5	25.3	25.3	25.3	25.4	-	-
9	28.4	28.1	29.8	28.1	29.0	27.7	28.8	27.1	27.9	27.3	27.7	27.0	28.0	27.0	27.7	27.2	-	27.2
									<u>St. C</u>									
1	22.08	-	21.98	-	21.91	-	21.58	-	21.58	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	25.63	25.80	25.60	25.73	25.43	25.73	24.71	25.70	24.34	24.65	23.93	23.86	23.93	23.8	23.8	23.5	23.5	25.0
4	27.07	27.10	26.79	26.94	26.56	26.66	26.45	26.18	22.92	23.93	22.55	23.70	23.5	23.8	23.8	23.5	23.5	25.0
5	25.33	26.38	25.33	26.31	25.36	26.21	25.50	26.04	25.33	25.90	25.29	25.80	25.3	25.3	25.3	25.4	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	24.48	24.18	24.44	24.17	24.44	24.20	24.24	24.24	24.13	24.00	24.13	23.76	-	-	-	-	-	-

Table 1. (Continued)

Expt. No.	Surface		2		6		10		14		18		22		26		30		
	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	
9	25.80	26.38	25.76	26.11	25.66	26.11	25.63	26.04	25.60	26.04	25.60	25.93							
1	21.14	-	20.81	-	20.87	-	20.87	-	St. D 20.87	-	20.81	-	-	-	-	-	-	-	
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	25.53	25.43	25.50	25.43	25.33	25.36	24.71	23.53	24.68	23.02	24.58	22.99	24.58	22.96	24.58	22.96			
4	27.60	27.24	27.35	27.17	22.45	24.85	21.98	22.89	21.81	21.68	21.81	21.68	21.78	20.91	21.71	20.91			
5	26.1	24.24	24.54	24.17	24.24	24.17	24.13	22.89	24.10	22.65	24.10	22.65	24.05	22.62	24.10	22.59			
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	23.77	23.88	23.66	23.88	23.55	23.60	23.44	23.52	23.49	23.44	23.49	23.38	23.49	23.33	-	-	-	-	
9	25.1	24.88	24.85	25.56	24.38	25.15	24.34	24.91	24.24	24.78	24.24	24.71	24.20	24.75	-	-	-	-	



Table 2. Vertical chlorinity profiles (‰)  
at the beginning (B) and end (E) of each experiment

Expt. No.	Surface		2		6		10		14		18		22		26		30	
	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E
1	8.56	9.25	9.20	8.69	9.37	9.18	9.58	9.51	St. A		9.77	9.58	9.86	9.68	9.78	9.97	9.97	9.86
2	7.26	7.66	7.31	7.79	8.00	8.33	8.17	8.98	8.48	8.98	8.78	9.08	9.06	9.08	9.26	9.17		
3	6.79	6.45	6.70	6.40	6.85	7.05	7.96	8.46	8.64	9.18	9.62	10.14	10.50	10.85	-	-		
4	8.52	10.92	9.14	10.40	10.47	10.63	11.10	11.09	11.17	11.39	11.18	11.83	11.82	11.99	11.43	11.91		
5	9.58	9.76	9.73	9.99	9.90	9.91	9.88	9.97	10.01	9.99	10.74	10.01	10.27	10.11	-	10.19		
6	11.08	11.46	11.19	11.35	11.52	11.58	11.64	11.58	11.97	12.00	12.21	12.12	12.29	12.27	12.17	12.23		
7	11.86	11.07	12.02	11.50	11.98	11.51	12.12	11.68	12.23	11.70	12.35	11.74	12.40	11.69	12.44	-		
8	10.42	11.07	10.62	11.29	10.54	11.21	10.58	11.21	10.62	11.21	10.64	11.30	10.70	11.33	10.70	11.31		
9	10.24	10.33	9.83	10.29	9.95	10.34	10.25	10.59	10.53	10.72	10.53	10.72	10.48	10.81	10.53	-		
									St. B									
1	9.26	9.42	9.42	9.25	9.42	9.12	9.27	9.61	9.80	9.54	9.79	9.73	9.79	9.81	9.82	9.82	9.82	9.98
2	8.66	8.52	8.58	8.58	8.59	8.55	8.78	8.90	9.08	9.17	9.57	9.56	9.66	9.77	9.84	-	10.55	9.86
3	10.22	10.58	10.19	10.59	10.37	10.60	10.67	10.60	11.22	10.79	11.75	11.30	11.79	11.30	11.84	11.96	11.74	10.55
4	10.60	10.89	10.70	10.87	10.72	10.90	10.64	10.91	10.90	11.19	11.42	11.75	11.56	11.15	11.70	12.54	-	-
5	11.35	11.11	11.28	11.36	11.33	11.35	11.44	11.32	11.26	11.29	11.44	11.27	11.45	11.35	11.26	11.35	11.44	11.36
6	11.37	11.97	11.33	11.98	11.53	11.99	11.43	12.09	12.03	12.47	12.30	12.90	12.79	13.21	13.34	-	13.46	13.50
7	11.57	10.68	11.32	11.05	11.48	11.20	11.71	11.53	11.87	11.68	12.13	11.59	12.22	11.73	12.39	11.70	12.33	11.77
8	11.21	11.41	11.34	11.57	11.50	11.70	11.57	11.72	11.60	11.60	11.75	11.90	11.88	12.15	12.00	12.20	-	-
9	11.26	11.32	11.26	11.23	11.20	11.23	11.20	11.24	11.21	11.26	11.26	11.30	11.20	11.31	-	11.34	11.20	11.32
									St. C									
1	9.93	-	9.93	-	9.93	-	10.34	-	10.31	-	-	-						
2	-	-	-	-	-	-	-	-	-	-	-	-						
3	10.85	10.50	10.80	10.49	11.15	10.49	11.18	10.48	11.47	11.47	11.45	11.65						
4	9.60	10.20	9.50	10.09	9.72	10.18	9.92	10.96	12.01	12.01	13.01	11.92						
5	11.17	10.60	11.35	10.52	11.23	10.53	11.28	10.78	11.46	11.01	11.48	11.07						
6	-	-	-	-	-	-	-	-	-	-	-	-						
7	-	-	-	-	-	-	-	-	-	-	-	-						
8	10.70	11.03	10.63	11.09	10.80	11.20	10.91	12.10	11.58	12.76	11.65	-						

Table 2. (Continued)

Expt. No.	Surface		2		6		10		14		18		22		26		30		
	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	B	E	
9	12.22	12.65	12.38	12.57	12.44	12.58	12.32	12.50	12.53	12.56	12.44	12.56							
1	12.09	-	12.14	-	12.29	-	12.29	-	St. D 12.49	-	12.56	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	11.32	11.19	12.25	11.19	12.36	11.09	12.45	11.70	12.47	12.56	12.53	13.41	12.36	13.76	12.25	13.83			
4	11.08	11.61	10.72	11.61	12.83	13.02	14.10	15.90	14.60	16.13	14.92	16.32	14.83	-	14.91	16.34			
5	13.71	15.02	13.71	14.94	13.90	14.99	14.09	15.27	14.30	15.73	14.41	15.92	14.35	15.91	14.29	15.92			
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	11.61	13.07	11.70	13.03	12.30	13.69	12.48	14.27	13.20	14.28	13.43	14.33	13.54	14.56	-	14.45			
9	16.27	15.88	16.37	15.95	16.39	16.06	16.39	16.25	16.30	16.47	16.55	16.35	16.49	16.35	16.34	16.33			

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

Expt. No.	Surface	2	6	10	14	18	22	26	30(B)
<u>St. A</u>									
1	--	6.41	5.69	4.86	4.35	4.27	4.09	--	--
2	7.66	7.50	6.28	6.07	5.48	4.89	4.46	4.23	--
3	6.13	5.83	5.59	4.16	3.58	2.59	2.01	--	--
4	5.94	7.04	6.60	5.30	5.07	5.11	4.43	4.28	--
5	5.74	5.42	5.19	5.10	5.03	4.91	4.80	4.80	--
6	5.46	5.07	4.33	4.02	3.22	2.61	2.41	--	--
7	6.88	7.36	6.16	4.43	3.18	2.97	2.93	2.78	--
8	6.31	6.42	6.45	6.46	6.20	6.15	5.96	5.91	--
9	6.31	6.57	6.28	5.88	5.70	5.58	5.84	5.87	--
<u>St. B</u>									
1	6.20	6.14	6.10	5.85	5.47	5.08	5.28	5.34	--
2	8.75	7.97	7.57	6.25	5.63	5.04	4.88	4.55	--
3	6.13	6.24	6.11	5.49	3.78	3.43	3.38	3.34	3.24
4	8.72	8.35	7.60	7.35	7.24	5.99	5.80	--	5.74
5	3.20	3.61	6.29	5.02	6.38	4.35	2.53	2.50	4.85
6	6.95	6.75	6.53	6.01	3.47	2.95	1.16	1.16	--
7	10.55	10.49	10.31	8.54	7.43	6.49	6.79	5.61	5.39
8	6.32	5.93	5.42	5.27	5.28	5.15	4.34	3.75	--
9	8.36	8.42	8.17	7.09	7.54	7.03	6.81	6.86	--
<u>St. C</u>									
1	6.71	6.66	6.87	6.30	--	6.19	--	--	--
2	--	--	--	--	--	--	--	--	--
3	7.01	7.10	7.25	6.81	6.29	6.33	--	--	--
4	6.71	6.63	6.69	6.65	5.40	4.63	--	--	--
5	6.07	6.22	6.20	6.10	5.89	5.67	--	--	--
6	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--
8	7.89	7.77	7.64	7.40	6.13	6.05	--	--	--
9	6.98	6.81	6.71	6.93	6.69	6.58	--	--	--
<u>St. D</u>									
1	7.00	6.97	6.71	6.83	6.57	--	--	6.55	--
2	--	--	--	--	--	--	--	--	--
3	7.39	6.81	7.07	6.93	6.95	6.81	6.86	6.80	--
4	7.10	7.10	7.21	7.19	7.21	7.19	7.19	7.21	--
5	7.11	7.16	6.98	7.07	6.98	6.98	6.92	6.86	--
6	--	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--	--
8	8.29	8.12	7.57	7.48	7.00	6.88	6.64	--	--
9	7.47	7.40	7.50	7.44	7.42	7.26	7.23	7.42	--





Table 5. Radiation ( $\text{gcal}/\text{cm}^2/\text{day}$ ) at the various depths,  
and total radiation,  $I]_0^b$ , in the water column  
( $b = 10$  ft for St. C and  $b = 20$  ft for Sts. A, B and D)

Expt. No.	Surface	2	6	10	14	18	22	26	$I]_0^b$
					<u>St. A</u>				71.32
1	132.80	42.50	4.38	0.40	-	-	-	-	499.78
2	592.40	288.50	68.13	15.99	3.55	0.89	0.24	0.05	366.32
3	572.60	221.42	32.47	4.58	0.69	0.06	-	-	543.02
4	563.80	300.28	84.34	23.90	6.77	1.86	0.56	-	283.84
5	589.60	165.56	13.21	1.06	0.08	0.01	-	-	554.05
6	625.80	292.69	64.65	29.66	3.13	0.69	0.13	0.03	530.11
7	650.10	307.11	69.17	15.47	3.44	0.78	0.20	-	32.37
8	317.40	119.12	16.76	2.35	0.35	0.03	-	-	52.96
9	562.60	195.02	23.176	2.78	0.34	0.04	-	-	
					<u>St. B</u>				86.76
1	142.80	52.55	7.00	0.86	-	-	-	-	538.01
2	543.40	292.35	86.94	25.00	7.06	2.17	0.54	0.16	679.91
3	559.40	339.56	124.75	46.43	17.34	6.15	2.24	0.56	491.09
4	607.40	286.93	63.35	14.03	3.10	0.67	0.12	0.04	402.55
5	594.40	241.68	39.94	6.60	0.48	0.18	0.03	-	516.55
6	616.00	296.85	69.61	16.32	3.82	0.86	0.18	0.05	712.83
7	647.20	373.43	124.26	40.71	13.66	4.53	1.42	0.45	53.68
8	338.80	180.41	50.14	13.92	3.86	1.12	0.30	-	56.57
9	565.20	207.92	281.40	3.81	0.52	0.07	-	-	
					<u>St. C</u>				
1									971.91
2									1028.11
3	559.40	398.29	201.94	102.37	52.02	26.29	13.43	6.71	1088.53
4	563.60	409.23	215.80	113.79	59.40	-	-	-	-
5	589.60	436.78	227.00	121.46	64.68	34.08	18.16	9.67	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	317.40	217.03	101.50	47.45	22.19	10.25	4.79	-	81.57
9	563.80	338.56	122.08	44.02	15.87	5.67	2.09	-	109.78

Table 5 continued

Expt. No.	Surface	2	6	10	14	18	22	26	$I \int_0^b$
St. D									
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	547.20	397.27	209.58	110.53	58.00	30.64	16.24	8.76	1048.87
4	565.80	423.39	234.69	130.08	72.08	40.40	22.40	-	1112.68
5	615.40	488.94	308.68	194.84	123.02	76.86	48.99	30.65	1465.99
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	338.80	258.60	147.72	84.36	48.18	27.51	15.72	-	113.81
9	5.68	416.59	226.35	124.22	67.50	36.67	19.92	-	177.42

Table 6. Gross production (gal/cm<sup>2</sup>/day, based on a 20 ft water column, volume 0.61 liters/cm<sup>2</sup>) at 2, 6 and 10 ft.

Expt. No.	2	6	10
	<u>St. A</u>		
1	1.95	0.26	0.19
2	-2.22	-1.22	-1.51
3	1.05	1.03	1.05
4	0.71	1.52	0.19
5	0.98	0.90	0.79
6	1.16	0.62	0.54
7	3.25	0.43	0.11
8	0.86	1.22	0.26
9	2.44	1.84	0.51
	<u>St. B</u>		
1	2.63	0.49	0.34
2	0.00	0.19	0.28
3	1.26	1.52	1.09
4	0.98	0.21	0.17
5	0.58	1.05	0.11
6	0.98	0.94	0.86
7	2.33	0.79	0.39
8	0.49	0.75	0.15
9	5.65	5.86	1.78
	<u>St. C</u>		
1	--	--	--
2	--	--	--
3	0.36	0.51	0.81
4	0.26	0.62	0.34
5	1.50	0.62	0.21
6	--	--	--
7	--	--	--
8	1.07	5.03	0.26
9	2.55	3.04	1.88
	<u>St. D</u>		
1	--	--	--
2	--	--	--
3	0.45	0.30	0.28
4	0.36	--	0.21
5	0.32	0.73	0.26
6	--	--	--
7	--	--	--
8	1.54	0.81	0.41
9	1.43	2.61	1.56



Table 7. Respiration (gcal/cm<sup>2</sup>/day, based on a 20 ft water column) at 2, 6, 10, 14 and 18 ft.

Expt. No.	2	6	10	14	18
		<u>St. A</u>			
1	2.95	0.66	0.47	0.19	0.45
2	5.44	3.30	3.38	3.27	1.28
3	2.50	1.90	1.54	1.13	0.79
4	2.82	2.70	1.46	1.05	1.33
5	3.29	3.68	3.55	2.33	1.67
6	3.06	2.37	3.66	1.93	0.83
7	7.90	8.77	1.99	0.21	0.34
8	3.68	4.39	3.00	1.16	1.18
9	3.02	2.95	1.48	0.77	0.68
		<u>St. B</u>			
1	2.80	2.20	0.92	0.56	0.43
2	3.14	2.27	1.16	0.66	0.64
3	1.37	1.52	2.03	0.25	0.75
4	6.01	3.72	1.67	1.28	1.22
5	-2.10	2.08	-0.11	2.57	1.28
6	5.20	4.69	4.22	0.73	1.03
7	10.74	11.81	4.88	3.53	1.97
8	2.57	2.03	1.88	1.90	2.12
9	5.82	4.00	2.29	3.02	1.78
		<u>St. C</u>			
1	---	---	---		
2	---	---	---		
3	0.68	1.28	1.34		
4	0.79	1.26	1.33		
5	2.86	1.07	0.81		
6	---	---	---		
7	---	---	---		
8	2.33	6.36	1.58		
9	2.33	2.25	1.95		
		<u>St. D</u>			
1	---	---	---	---	---
2	---	---	---	---	---
3	0.49	1.43	0.32	0.75	0.47
4	0.81	---	0.21	2.82	4.71
5	0.60	0.68	0.79	2.61	0.56
6	---	---	---	---	---
7	---	---	---	---	---
8	1.52	1.07	1.05	0.68	1.28
9	1.20	1.75	1.86	1.16	0.98

Table 8. Net production (gcal/cm<sup>2</sup>/day, based on a 20 ft water column) at 2, 6 and 10 ft.

Expt. No.	<u>St. A</u>		
	2	6	10
1	-1.00	-0.41	-0.28
2	-4.75	-2.61	-3.23
3	-1.45	-0.87	-0.49
4	-2.12	-1.18	-1.26
5	-2.31	-2.78	-2.76
6	-1.90	-1.75	-3.12
7	-4.65	-8.35	-1.88
8	-2.82	-3.17	-2.74
9	-0.58	-1.11	-0.97
	<u>St. B</u>		
1	-0.17	-1.71	-0.58
2	-3.14	-2.08	-0.88
3	-0.11	0.00	-0.94
4	-5.03	-3.50	-1.50
5	2.68	-1.02	0.22
6	-4.22	-3.75	-3.36
7	-8.41	-11.02	-4.49
8	-2.08	-1.28	-1.73
9	-0.17	1.86	-0.51
	<u>St. C</u>		
1	--	--	--
2	--	--	--
3	-0.32	0.77	-0.53
4	-0.53	-0.64	-0.98
5	-1.37	-0.45	-0.60
6	--	--	--
7	--	--	--
8	-1.26	-1.33	-1.32
9	0.22	0.79	-0.07
	<u>St. D</u>		
1	--	--	--
2	--	--	--
3	-0.04	-1.13	-0.04
4	-0.45	-0.19	0.00
5	-0.28	0.05	-0.53
6	--	--	--
7	--	--	--
8	0.02	-0.26	-0.64
9	0.23	0.86	-0.30

Table 9. Integral gross production ( $\pi \int_0^b$ ),  
 respiration ( $\rho \int_0^b$ ) and net production ( $\pi - \rho \int_0^b$ ),  
 in g cal/cm<sup>2</sup>/day, based on b=20 ft for Sts. A, B and D  
 and b=10 ft for St. C. Compensation depths (ft)  
 are also indicated; "none" signifies that gross production  
 never exceeded respiration at any depth.

Expt. No.	$\pi \int_0^b$	$\rho \int_0^b$	$\pi - \rho \int_0^b$	Compensation Depth
		<u>St. A</u>		
1	2.879	6.130	-3.251	none
2	1.861	19.044	-17.183	none
3	3.184	9.711	-6.527	none
4	2.940	11.375	-8.435	none
5	4.300	17.934	-13.634	none
6	2.440	14.060	-11.620	none
7	4.453	22.021	-17.56	none
8	2.804	16.170	-13.366	none
9	5.883	10.851	-4.968	none
		<u>St. B</u>		
1	4.209	8.388	-4.179	none
2	0.433	9.730	-9.297	none
3	4.636	7.131	-2.495	none
4	1.647	17.538	-15.891	none
5	---	---	---	--
6	2.818	19.550	-16.732	none
7	4.453	41.752	-37.119	none
8	1.757	12.809	-11.052	none
9	17.038	20.391	-3.353	9.7
		<u>St. C</u>		
1	---	---	---	--
2	---	---	---	--
3	1.464	7.308	-5.844	none
4	1.391	3.245	-1.854	none
5	2.532	7.131	-4.599	none
6	---	---	---	--
7	---	---	---	--
8	8.461	12.962	-4.501	none
9	8.687	10.942	-2.255	9.9
		<u>St. D</u>		
1	---	---	---	--
2	---	---	---	--
3	1.110	4.368	-3.258	none
4	1.281	10.480	-9.199	10.0
5	1.580	6.503	-4.923	none
6	---	---	---	--
7	---	---	---	--
8	3.587	6.966	-3.379	2.2
9	6.880	8.520	-1.640	9.1

Table 10. Gross production efficiency  $(\pi/I)_z$  at  $z = 2, 6$  and  $10$  ft (gcal/kcal  $\times 10^2$ ); integral production efficiency with respect to incident radiation  $(\pi)_0^b/I_0$  and integral radiation  $[\pi/I]_0^b$ , also in gcal/kcal  $\times 10^2$ ; cost  $(\rho_z/\pi_z)$  at  $z = 2, 6$  and  $10$  ft (gcal/gcal), and integral cost  $[\rho/\pi]_0^b$ , also in gcal/gcal.

Expt. No.

St. A

1	4.58	5.93	47.50	2.17	4.04	1.51	2.54	2.47	2.13
2	0.24	1.00	0.94	0.31	0.37	8.00	4.85	22.53	10.23
3	0.47	3.17	22.93	0.56	0.87	2.38	1.84	1.47	3.05
4	0.24	1.80	0.79	0.52	0.54	3.97	1.78	7.68	3.87
5	0.59	6.81	74.53	0.73	1.51	3.36	4.09	4.49	4.17
6	0.40	0.96	1.82	0.39	0.44	2.64	3.82	6.78	5.76
7	1.06	0.62	0.71	0.68	0.84	2.43	20.39	18.09	4.99
8	0.72	7.28	11.07	0.88	8.66	4.28	3.60	11.54	5.77
9	1.25	7.94	18.33	1.05	11.11	1.24	1.60	2.90	1.84

St. B

1	5.01	7.00	39.50	2.95	4.85	1.67	4.49	2.71	1.99
2	-	0.22	1.12	0.08	0.08	-	11.95	4.14	22.47
3	0.37	1.22	2.17	0.83	0.68	1.09	1.00	1.86	1.54
4	0.34	0.33	1.21	0.27	0.34	6.13	17.71	9.82	10.65
5	0.24	2.63	1.67	-	-	3.62	1.98	1.00	-
6	0.33	1.35	5.27	0.46	0.55	5.31	4.99	4.91	6.94
7	0.62	0.64	0.96	1.19	0.62	4.61	14.95	12.51	9.34
8	0.27	1.50	1.08	5.19	3.27	5.24	2.71	12.53	7.29
9	2.72	20.82	46.74	3.02	30.12	1.03	0.68	1.29	1.20

St. C

1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	0.09	0.25	0.79	2.62	0.15	1.89	2.51	1.65	4.99
4	0.06	0.29	0.30	2.47	0.14	3.04	2.03	3.91	2.33
5	0.34	0.27	0.17	4.29	2.33	1.91	1.73	3.86	2.82
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	0.49	4.96	0.55	2.67	10.37	2.18	1.26	6.08	1.53
9	0.75	2.49	4.27	1.54	7.91	0.91	0.74	1.04	1.26

St. D

1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	0.11	0.14	0.25	0.20	0.11	1.09	4.77	1.14	3.94
4	0.09	-	0.16	0.23	0.12	3.86	-	1.00	8.18
5	0.07	0.24	0.13	0.26	0.11	1.88	0.93	3.04	4.12
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	0.60	0.55	0.49	1.06	3.15	0.99	1.32	2.56	1.94
9	0.34	1.15	1.25	1.21	3.88	0.84	0.67	1.19	1.24