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VEPCO Surry Power Plant Study, river biota and phytoplankton entrainment sections : progress report July 1975

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River Biota and Phytoplankton Entrainment Sections

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by

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Introduction

This report summarizes the biological data collected from January through June 1975 in the river and phytoplankton entrainment portions of the VEPCO Surry Power Plant Study. The sampling program conducted during this period in the Hog Island area of the James River consisted of an expanded version of a study initiated in May 1969 to monitor certain aquatic communities that could be affected by the operation of the power plant. The river phytoplankton, zooplankton, benthos and fouling organism communities have been included in the past and present study designs. The phytoplankton entrainment substudy was begun in April 1975 with the objective of providing a direct assessment of the impact of passage through the power plant condensers on the abundance and species composition of the entrained algal community.

Methods

Station Locations

Table 1 and Figure 1 show the locations of the twelve phytoplankton and zooplankton sampling stations used in the river monitoring study. The same intake and discharge stations were employed in the phytoplankton entrainment study. The benthos and fouling plate stations are shown in Table 2 and Figure 2.

Sampling and Sample Analysis Methods

Phytoplankton samples were accompanied by samples for determination of chlorophyll a concentration, salinity and dissolved oxygen concentration. Temperature was recorded for each sampling depth, and Secchi Disk transparency was measured at each station sampled during daylight. Primary productivity samples were supplemented with samples for inorganic and organic carbon

Table 1

Plankton Sampling Station Locations

Station	Depth (m)	Location
DWS	2	Adjacent to tower (QK Fl Lt "A")
Intake	1	Outside intake forebay - zooplankton sampling;
	8	within intake forebay - phytoplankton sampling
HPE 1	5	Adjacent to black and white buoy "J29"
HPE 2	4	Between black and white buoys "J29" and "J35"
HPS	5	Adjacent to tower (QK Fl Lt "C")
HPN	2	Between tower (QK Fl Lt "B") and north bank of river
HPW 1	1	Off west shore of Hog Point, midway between HPS and discharge
HPW 2	3	Tower (QK Fl Lt "E")
Discharge	3	Outside discharge canal mouth - zooplankton sampling;
	2.5	in discharge canal mouth - phytoplankton sampling
CBE	1	Off west shore of Gravel Neck, south of discharge
CBC	3	Midway between discharge and range markers near Cobham Wharf
JI	8	Tower (QK Fl Lt "G")

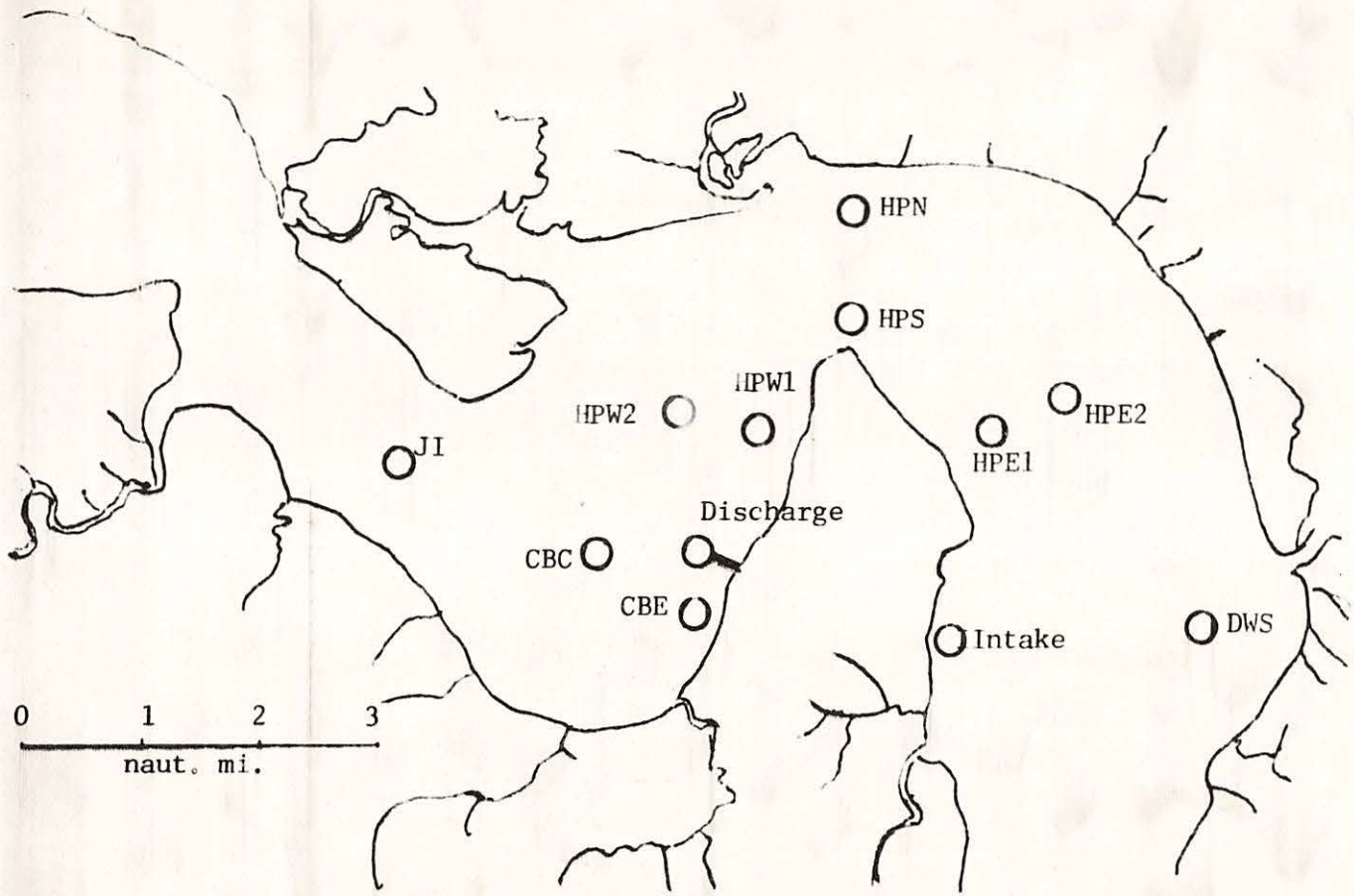

Figure 1. Plankton sampling stations.

Table 2

Benthos and Fouling Plate Station Locations

Station	Depth (m)	Location
1	1.5	Off tower (QK Fl 38 ft.) near Cobham Wharf
2	2.5	Cobham Bay, off Chestnut Bluffs
3	1	Cobham Bay, between mouths of College Run and lower Chippokes Creek
4	3	Center of Cobham Bay
5	3	Tower (QK Fl Lt "E")
6	1	In thorofare off marker tower R "4"
7	1	Cobham Bay, off Gravel Neck
8	4	Tower (QK Fl Lt "F")
9	1	West of Hog Point
10	4	Between station 9 and black buoy "45"
11	5	Tower (QK Fl Lt "C")
12	.5	Off mouth of College Creek
13	1	East of Hog Point, on line with black and white buoy "J29"
14	6	Black and white buoy "J35"
15	1	Off power plant intake
16	2	Tower (QK Fl Lt "A")
DWS	2	Tower (QK Fl Lt "A")
CBN	2.5	Tower (QK Fl Lt "D")
CBS	3	Tower (QK Fl Lt "F")

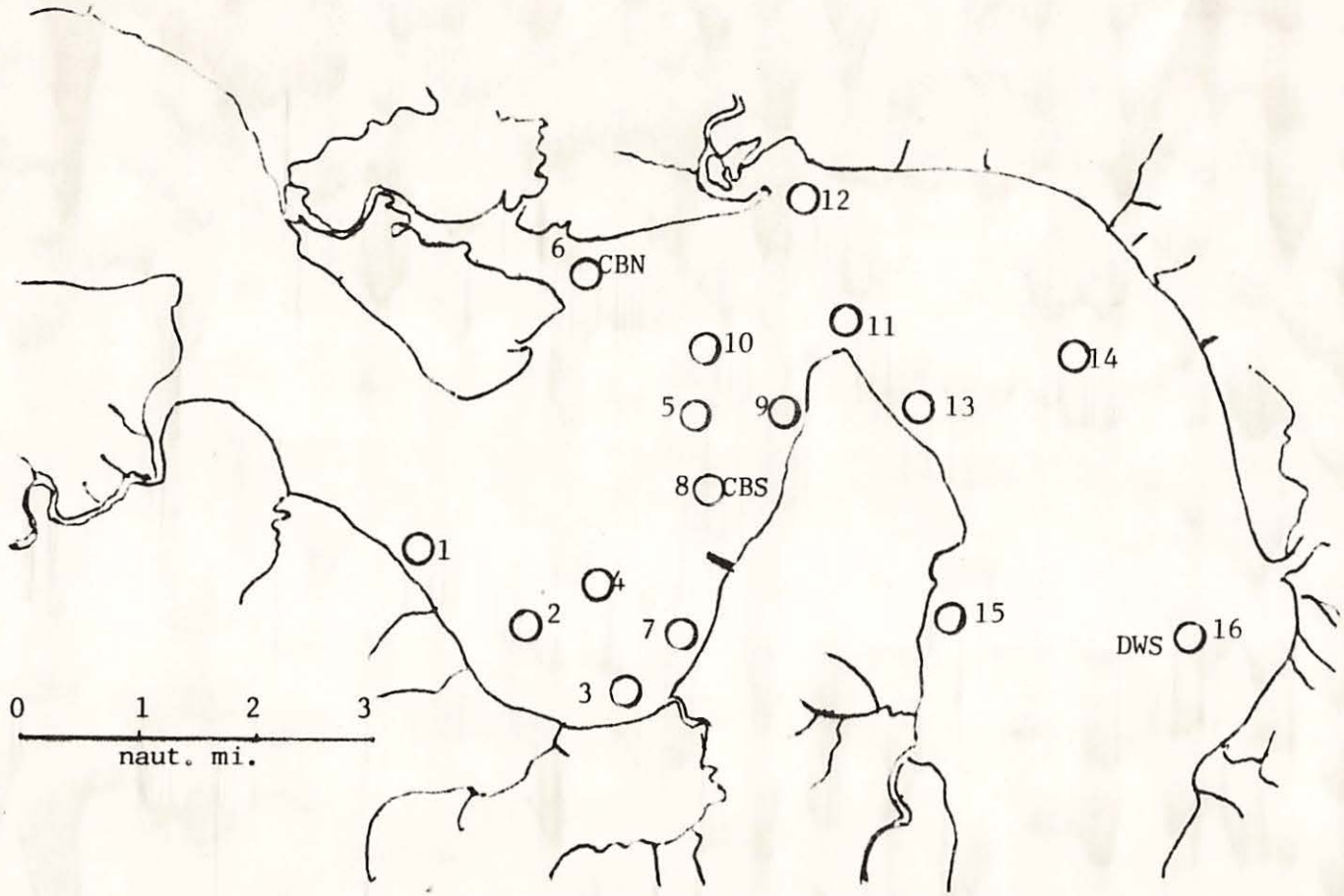

Figure 2. Benthos and fouling plate stations.

determinations.

A non-metallic 2-liter Van Dorn bottle was used for sampling of phytoplankton and related parameters. Phytoplankton samples were preserved with Lugol's iodine solution, and cell counts and identifications were performed using the inverted microscope method. Chlorophyll a samples were preserved with mercuric chloride (40 mg/l), and stored in opaque bottles on ice until return to the laboratory. They were then filtered through glass fiber filters, which were subsequently ground in 90% acetone to extract the chlorophyll a. The chlorophyll concentration in the extract was determined using a Turner Fluorometer, model 111.

Primary productivity samples of 106.6 ml volume were dispensed into acid clean 125 ml glass stoppered Pyrex® bottles, two light and two dark bottles per station. Each sample received 1.0 micro-Curie of carbon -14 in a solution of sodium carbonate, and was incubated in the James River at a depth of 5 cm for a minimum of two hours. Following incubation the samples were filtered through .45μ pore size membrane filters, which were then placed in scintillation vials, dissolved in a dioxane scintillation cocktail, and counted on a Beckman LS-150 liquid scintillation counter. Standardization of the stock carbon-14 solution and determination of counting efficiency of the samples were accomplished by adding an internal standard of known activity and recounting the samples.

Zooplankton samples were taken with a 12.5 cm diameter Clarke-Bumpus quantitative sampler, equipped with a No. 20 (76μ pore size) net. Tow duration ranged from one minute to five minutes, depending on the turbidity conditions encountered. Samples were preserved with 5% buffered formalin, and counts and identifications were made using an American Optical

dissecting microscope. Measurements of water temperature, salinity, dissolved oxygen, Secchi Disk transparency, and water depth accompanied each zooplankton tow.

Benthos was sampled with a .05 m^2 Ponar grab. The samples were seived through a 1.0 mm mesh screen, and the organisms were preserved in a formalin solution containing the stain phloxine B. Counts and identifications were made under a dissecting microscope.

Fouling organisms were collected on 125 x 75 mm asbestos boards suspended in the river. Two pairs of horizontal and vertical fouling plates were suspended at each station, one pair being replaced bimonthly, the other pair yearly. The attached organisms were preserved in formalin and counted and identified under a dissecting microscope.

Temperature measurements were performed using a Hydrolab model RT-125 research thermometer equipped with a model L5 A50 thermistor probe. Salinity was measured on a Beckman model RS-7B salinometer. Dissolved oxygen concentrations were determined by the azide modification of the Winkler technique. Carbon analyses were performed on a Beckman model 915 carbon analyzer.

Sampling Design

The sampling dates and biological parameters sampled in the first half of 1975 are shown in Table 3. Sampling for phytoplankton and primary productivity was begun in January and has included two surface phytoplankton samples and two pairs of light and dark bottle productivity samples per station per month. In January stations DWS and J.I. were not sampled because it was believed at that time that they had been dropped from the study. It was subsequently determined that they could not be dropped, and

Table 3

Summary of Biological Sampling Effort: Sampling Dates, Stations Sampled, and Types of Samples Taken (Ph=Phytoplankton, Pr=Productivity, C=Chlorophyll a, Z=Zooplankton, B=Benthos, F=Fouling Organisms)

River Plankton Stations	Date 1975												
	1-23	1-30	2-14	2-27	3-21	3-27	4-17	4-22	5-5,5-6	5-15	5-20	6-16	6-18
DWS			Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
Intake	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
HPE 1	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
HPE 2	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
HPS	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
HPN	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
HPW 2	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C	Z,Ph,C	Z	Ph,Pr,C	Ph,Pr,C	Z
HPW 1	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
Discharge	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
CBE	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
CBC	Ph,Pr	Z	Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z
JI			Z	Ph,Pr,C	Z	Ph,Pr,C	Z,Ph,C	Ph,Pr,C		Z	Ph,Pr,C	Ph,Pr,C	Z

River Benthos Stations	Date (1975)		
	2-20	4-25	6-13
1	B	B	B
2	B	B	B
3	B	B	B
4	B	B	B
5	B	B	B
6	B	B	B
7	B	B	B
8	B	B	B
9	B	B	B
10	B	B	B
11	B	B	B
12	B	B	B
13	B	B	B
14	B	B	B
15	B	B	B
16	B	B	B

Table 3 (cont'd.)

Fouling Plate Stations	Date (1975) 2-20	4-8	4-17	6-13
DWS	F		F	F
CBN	F	F		F
CBS	F		F	F

Phytoplankton Entrainment Stations	Date (1975) 4-7,4-8	5-8,5-9	6-2,6-3
Intake	Ph,C	Ph,C	Ph,C
Discharge	Ph,C	Ph,C	Ph,C

they have been sampled in all months since. Also, after the January sampling chlorophyll a was added to the parameter list, and starting in February a chlorophyll sample has accompanied every phytoplankton sample. Therefore five complete phytoplankton runs, including replicated sampling of surface phytoplankton, primary productivity, and chlorophyll a, were performed in the February through June period.

Two surface zooplankton samples were taken per station per month except in January, when stations DWS and J.I. were omitted. Benthos sampling was performed quarterly during the winter and spring, and monthly during the period June-August. Two samples have been taken per station per sampling run. Fouling plates were recovered in February, April, and June. In June the annual as well as the bimonthly plates were taken.

Entrainment sampling has been accomplished monthly since April. In each run, sampling was performed on four slack tides during a 24 hour period. Two phytoplankton and two chlorophyll a samples were taken at each of three depths (surface, mid-depth, bottom) in the intake forebay and at the discharge canal mouth on each slack tide. Sampling at the discharge was done one hour after sampling at the intake so that approximately the same water mass would be encountered at both stations.

In addition to the monthly plankton sampling runs described above, two intensive studies of plankton distribution were performed during the report period. Sampling to determine the vertical distribution of phytoplankton at each of the twelve stations was performed in conjunction with the monthly zooplankton run on April 17. Two phytoplankton and two chlorophyll a samples were taken at each of 3 depths at each station. On May 15 a

similar sampling run for zooplankton was performed, with the exception that at several of the shallower stations only one or two depths could be sampled. For example, at the intake station phytoplankton was sampled in the forebay, immediately in front of the trash racks in water with a depth of 8 m. The zooplankton sampling, performed by towing the net, however, was done outside the forebay in water 1 m deep. An attempted bottom tow encountered obstacles that damaged the net. Consequently only surface zooplankton samples were obtained at this station.

The other intensive study, performed on May 5-6, was intended to determine the diel and vertical distributions of phytoplankton and zooplankton at a selected river station. Two replicate phytoplankton, chlorophyll a and zooplankton samples were taken at each of three depths at three hour intervals during a 24 hour period (eight sample sets altogether).

Sample Processing Schedule

In the benthos and fouling plate substudies it has been possible for sample analysis to keep up with sample generation. In the phytoplankton and zooplankton substudies sample backlogs have accumulated. For processing, first priority has been assigned to the surface samples collected monthly at the twelve river stations, and analysis of these samples has been completed within one month of their acquisition. Analysis of the samples from the vertical and diel distribution surveys and from the phytoplankton entrainment runs is in progress, and none of these sample sets have yet been completed.

Results and Discussion

Phytoplankton River Study

The phytoplankton cell counts, expressed as total cells per milliliter, are presented in Table 4. For most stations the counts varied little during the period January-April, and rose sharply in May. Station HPN had the highest counts of all stations on three of the six sampling dates. This station is near the mouth of College Creek, and the abundance of phytoplankton is probably a consequence of the nutrients contributed to the James River by this tributary. No other station showed such consistently high, or low, counts and as counts in general increased, so did the variability among stations. As shown in Table 5, the dominant phytoplankton organisms present were diatoms, and flagellates of the divisions Cryptophyta, Chlorophyta, and Pyrrophyta. There was little change in community composition from month to month in the winter and early spring. In May *Coscinodiscus lacustris* appeared in large numbers, and in June the flagellates were distinctly more abundant than the diatoms. Bluegreen algae appeared in samples in all six months, but were never abundant. Genera encountered have included *Anabaena*, *Oscillatoria*, *Merismopedia* and a minute colonial coccoid form not yet identified.

The chlorophyll *a* and primary productivity data (Tables 6 and 7) showed the same general patterns as the cell count data, with elevated levels at HPN in January, April and May, distinct seasonal increases in May, and increased variability among stations in May and June.

Zooplankton River Study

The river zooplankton data for January-June appear in Tables 8-13. Copepod nauplii were the most abundant zooplankters on all dates at all

Table 4

James River Phytoplankton Cell Counts, January - June 1975

(Total cells per ml, surface samples, two samples per station)

Station	Date											
	Jan. 23		Feb. 27		Mar. 27		Apr. 22		May 20		June 16	
DWS	*		200	100	150	100	1900	1400	900	700	1200	1000
Intake	200	250	150	150	400	150	550	450	3000	3300	800	2850
HPE 1	150	150	200	200	250	200	450	250	1500	2000	1700	1850
HPE 2	150	150	150	200	100	150	350	200	950	650	1550	1250
HPS	250	200	200	200	250	200	350	350	1600	1800	1900	1750
HPN	1900	1800	200	200	150	100	5900	6500	6400	5900	3950	3300
HPW 2	200	200	200	150	200	150	350	300	1000	850	950	850
HPW 1	250	350	150	250	300	150	400	300	1500	1350	1800	1750
Discharge	450	350	150	150	150	150	400	350	1000	1450	750	700
CBE	100	150	200	200	250	150	250	350	1100	1700	4650	4200
CBC	150	300	200	200	200	200	350	150	1450	900	1900	1900
J.I.	*		250	200	200	200	250	350	1050	1000	3650	3600

* Not sampled

Table 5

James River Dominant Phytoplankton Organisms, January - June 1975

Date	Organism	DWS*	Intake	HPE 1	HPE 2	HPS	HPN	HPW 2	HPW 1	Discharge	CBE	CBC	JI*
1-23	Melosira sp.		x	x	x	x	x	x	x	x	x	x	
	Nitzschia kützingiana		x	x	x	x	x	x	x	x	x	x	
	Chroomonas sp.		x	x	x	x	x	x	x	x	x	x	
	Pyramimonas sp.		x			x	x	x	x	x			
	Katodinium rotundatum		x	x	x	x	x		x	x	x		
2-27	Melosira sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Nitzschia kützingiana	x	x	x	x	x	x	x	x	x	x	x	x
	Chroomonas sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Pyramimonas sp.				x	x		x	x			x	x
3-27	Melosira sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Nitzschia kützingiana				x	x		x	x	x	x	x	x
4-22	Melosira sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Nitzschia kützingiana	x	x	x	x	x	x	x	x	x	x	x	x
	Chroomonas sp.	x	x	x	x	x	x	x	x	x		x	x
	Katodinium rotundatum	x		x						x		x	
5-20	Melosira sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Nitzschia kützingiana	x	x	x	x	x	x	x	x	x	x	x	x
	Cyclotella meneghiniana	x	x	x	x	x	x	x	x	x	x	x	x
	Coscinodiscus lacustris	x	x	x	x	x	x	x	x	x	x	x	x
	Chroomonas sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Katodinium rotundatum	x			x		x						
	Cryptomonas sp.		x				x		x		x	x	x
	Scenedesmus quadricauda						x						
	Crucigenia sp.						x						
6-16	Chroomonas sp.	x	x	x	x	x	x	x	x	x	x	x	x
	3μ Flagellate	x	x	x	x	x	x	x	x	x	x	x	x
	Pyramimonas sp.	x	x	x	x	x	x	x	x	x	x	x	x
	15μ chrysophyte		x	x	x	x	x	x	x	x	x	x	x
	Nitzschia kützingiana		x	x	x	x			x	x	x	x	x
	Cryptomonas sp.											x	x

* Not sampled in January

Table 6

James River Chlorophyll Concentrations, January - June 1975
(µg Chl a per liter, surface samples, two samples per station)

Station	Jan. 23*	Feb. 27		Mar. 27		Apr. 22		May 20		June 16	
DWS		4.4	2.5	2.6	3.0	2.2	1.5	4.8	4.1	2.0	1.9
Intake		4.4	3.3	4.0	4.3	3.3	3.8	7.3	6.8	3.1	8.1
HPE 1		5.1	5.8	3.6	3.2	1.9	1.9	5.4	6.1	3.5	4.2
HPE 2		2.8	4.1	2.9	3.3	1.5	1.5	6.3	5.1	3.8	4.4
HPS		4.0	4.9	4.0	3.2	2.7	2.7	4.9	4.5	3.1	3.3
HPN		2.4	1.9	2.2	2.3	4.1	4.0	12.9	15.8	5.2	4.4
HPW 2		5.9	3.8	3.9	4.9	1.8	1.3	8.1	4.9	3.2	3.6
HPW 1		2.0	3.1	2.7	2.7	1.3	1.5	5.6	5.8	4.2	5.4
Discharge		2.2	3.6	4.0	3.0	3.0	3.0	3.8	4.4	2.1	2.5
CBE		4.2	5.7	2.2	2.4	2.0	2.2	3.5	4.1	4.6	5.1
CBC		2.9	2.9	3.0	3.2	1.9	1.5	3.0	3.4	2.7	3.5
JI		3.5	4.2	3.0	3.0	2.3	2.7	3.7	3.7	3.6	6.0

* Not sampled

Table 7

James River Phytoplankton Primary Productivity, January - June 1975

(mg C · m^{-3} · hr^{-1}, surface samples, two samples per station)

Station	Jan. 23		Feb. 27		Mar. 27		Apr. 22		May 20		June 16	
DWS	*		.382	.429	.889	.908	6.79	3.59	4.63	4.88	2.59	7.20
Intake	1.13	1.03	.632	.683	1.14	1.29	2.86	2.72	9.60	9.78	13.1	24.0
HPE 1	.601	.848	.643	.484	.921	.792	2.66	2.67	5.43	6.07	13.5	18.2
HPE 2	1.79	.763	.740	+	.792	.760	2.46	2.34	4.70	4.24	10.0	13.5
HPS	.883	.764	.535	+	1.13	1.46	2.49	2.33	8.09	7.34	16.7	18.8
HPN	2.99	3.42	.157	.159	.495	.499	13.4	13.7	21.4	18.6	21.9	25.1
HPW 2	.761	.886	.433	.506	.747	.857	1.53	1.49	6.30	4.35	7.11	6.06
HPW 1	1.14	.725	.360	.354	1.15	1.42	2.58	2.47	6.64	8.69	16.2	17.9
Discharge	1.34	1.74	.784	.603	1.09	1.04	2.94	2.78	4.76	5.80	8.13	9.15
CBE	.581	.535	.780	.702	1.22	1.01	2.35	2.39	8.11	7.74	29.5	29.2
CBC	.904	1.08	.392	.382	.915	1.30	1.63	1.68	4.26	4.03	10.0	13.0
JI	*		.564	.537	1.02	1.13	2.27	1.97	4.50	4.73	20.2	18.2

* Not sampled

\+ Sample lost

Table 8

James River Zooplankton; January 30, 1975
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organism		DWS*	Station Intake	HPE 1	HPE 2	HPS	HPN
Copepod nauplii	1		92.86	129.76	233.06	108.77	298.36
	2		111.20	119.12	142.77	129.52	256.78
	$\bar{x}$		102.03	124.44	187.92	119.14	277.57
	s		12.97	7.52	63.84	14.67	29.40
	$s_{\bar{x}}$		9.17	5.32	45.14	10.38	20.79
Harpacticoid copepods	1		92.86	79.75	141.41	55.71	74.34
	2		89.25	40.58	135.01	69.66	84.94
	$\bar{x}$		91.06	60.16	138.21	62.68	79.64
	s		2.55	27.70	4.52	9.86	7.50
	$s_{\bar{x}}$		1.80	19.58	3.20	6.98	5.30
Bosmina sp.	1		8.90	27.03	49.75	11.94	47.86
	2		4.39	19.64	15.52	15.24	44.91
	$\bar{x}$		6.64	23.34	32.64	13.59	46.38
	s		3.19	5.22	24.20	2.33	2.08
	$s_{\bar{x}}$		2.26	3.70	17.12	1.65	1.48
Eurytemora sp.	1		6.36	20.27	15.71	15.92	79.43
	2		4.39	7.85	24.83	17.41	66.39
	$\bar{x}$		5.38	14.06	20.27	16.66	72.91
	s		1.39	8.78	6.45	1.05	9.22
	$s_{\bar{x}}$		0.98	6.21	4.56	0.74	6.52
Acartia sp.	1		3.82	4.05	---	1.33	5.09
	2		4.39	3.93	9.31	4.35	9.76
	$\bar{x}$		4.10	3.99		2.84	7.42
	s		0.40	0.08		2.14	3.30
	$s_{\bar{x}}$		0.28	0.06		1.51	2.34
Pelecypod larvae	1				2.62	1.33	2.04
	2				---	---	0.98
	$\bar{x}$						1.51
	s						0.75
	$s_{\bar{x}}$						0.53
Ostracods	1		--	--	--	10.61	
	2		2.93	6.54	3.10	--	
Polychaete larvae	1					--	
	2					1.09	
Fish larvae	1			2.70			
	2			1.31			
	$\bar{x}$			2.00			
	s			0.98			
	$s_{\bar{x}}$			0.70			

* Not sampled

Table 8 (cont'd.)

Organism		DWS*	Station Intake	HPE 1	HPE 2	HPS	HPN
Barnacle nauplii	1		--				
	2		1.46				
Rotifers	1			5.41			
	2			--			
Gastropod larvae	1						1.02
	2						--

* Not sampled

Table 8 (cont'd.)

Organism		Station HPW 1	HPW 2	Discharge	CBE	CBS	J.I*
Copepod nauplii	1	198.17	115.26	83.32	112.15	69.39	
	2	184.35	85.61	82.29	95.97	104.84	
	$\bar{x}$	191.26	100.44	82.80	104.06	87.12	
	s	9.77	20.96	0.73	11.44	25.07	
	$s_{\bar{x}}$	6.91	14.82	0.52	8.09	17.72	
Harpacticoid copepods	1	60.66	63.06	154.08	48.81	26.89	
	2	67.47	54.18	143.49	41.99	68.34	
	$\bar{x}$	64.06	58.62	154.08	45.40	47.62	
	s	4.82	6.28	14.97	4.82	29.31	
	$s_{\bar{x}}$	3.40	4.44	10.58	3.41	20.72	
Bosmina sp.	1	47.52	34.79	18.85	11.42	11.28	
	2	37.06	10.84	17.94	5.14	22.52	
	$\bar{x}$	42.29	22.82	18.40	8.28	16.90	
	s	7.39	16.94	0.64	4.44	7.95	
	$s_{\bar{x}}$	5.23	11.98	0.46	3.14	5.62	
Eurytemora sp.	1	11.12	1.09	1.98	3.12	0.87	
	2	7.60	4.33	5.28	0.86	2.33	
	$\bar{x}$	9.36	2.71	3.63	1.99	1.60	
	s	2.49	2.29	2.33	1.60	1.03	
	$s_{\bar{x}}$	1.76	1.62	1.65	1.13	0.73	
Acartia sp.	1	6.07	8.70	1.98	2.08	0.87	
	2	2.85	2.17	7.38	0.86	3.11	
	$\bar{x}$	4.46	5.44	4.68	1.47	1.99	
	s	2.28	4.62	3.82	0.86	1.58	
	$s_{\bar{x}}$	1.61	3.26	2.70	0.61	1.12	
Pelecypod larvae	1	1.01					
	2	0.95					
	$\bar{x}$	0.98					
	s	0.04					
	$s_{\bar{x}}$	0.03					
Ostracods	1		10.87				
	2		--				
Polychaete larvae	1			--	1.04		
	2			1.06	--		
Fish larvae	1						
	2						
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						

* Not sampled

Table 8 (cont'd.)

Organism		Station HPW 1	HPW 2	Discharge	CBE	CBS	J.I. *
Barnacle nauplii	1						
	2						
	x						
	s						
	s_x						
Rotifers	1					1.73	
	2					--	
Gastropod larvae	1			1.06			
	2			--			

* Not sampled

Table 9

James River Zooplankton; February 14, 1975

(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Station DWS	Intake	HPE 1	HPE 2	HPS	HPN
Copepod nauplii	1	85.38	117.30	87.94	77.64	87.69	165.61
	2	98.25	81.04	87.51	80.39	78.58	155.69
	$\bar{x}$	91.82	99.17	87.72	79.02	83.14	160.65
	s	9.10	25.64	0.30	1.94	6.44	7.01
	$s_{\bar{x}}$	6.44	18.13	0.22	1.38	4.56	4.96
Harpacticoid copepods	1	18.56	45.70	24.59	23.29	43.84	38.03
	2	24.56	32.89	24.18	21.35	41.10	39.24
	$\bar{x}$	21.56	39.30	24.38	22.32	42.47	38.64
	s	4.24	9.06	0.29	1.37	1.94	0.86
	$s_{\bar{x}}$	3.00	6.40	0.20	0.97	1.37	0.60
Bosmina sp.	1	2.47	16.76	10.40	9.98	6.74	7.36
	2	3.68	9.40	13.82	10.05	6.04	7.59
	$\bar{x}$	3.08	13.08	12.11	10.02	6.39	7.48
	s	0.86	5.20	2.41	0.05	0.49	0.16
	$s_{\bar{x}}$	0.60	3.68	1.71	0.04	0.35	0.12
Eurytemora sp.	1	2.47	18.28	1.89	5.54	3.37	13.49
	2	6.14	9.40	2.30	6.28	2.42	21.52
	$\bar{x}$	4.30	13.84	2.10	5.91	2.90	17.50
	s	2.60	6.28	0.29	0.52	0.67	5.68
	$s_{\bar{x}}$	1.84	4.44	0.20	0.37	0.48	4.02
Acartia sp.	1	--	1.52	1.89	1.11	1.12	3.68
	2	2.46	2.35	2.30	3.77	1.21	2.53
	$\bar{x}$		1.94	2.10	2.44	1.16	3.10
	s		0.59	0.29	1.88	0.06	0.81
	$s_{\bar{x}}$		0.42	0.20	1.33	0.04	0.58
Ostracods	1		4.57	1.89	3.33	2.25	--
	2		1.17	--	2.51	2.42	3.80
	$\bar{x}$		2.87		2.92	2.34	
	s		2.40		0.58	0.12	
	$s_{\bar{x}}$		1.70		0.41	0.08	
Polychaete larvae	1						
	2						
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Cyclopoid copepods	1		1.52				
	2		--				
Barnacle nauplii	1						
	2						

Table 9 (cont'd.)

Organism		Station HPW 1	HPW 2	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	66.41	100.03	47.85	83.17	110.17	161.36
	2	65.76	93.46	45.02	102.43	119.14	136.74
	$\bar{x}$	66.08	96.74	46.44	92.80	114.66	149.05
	s	0.46	4.64	2.00	13.62	6.34	17.41
	$s_{\bar{x}}$	0.32	3.28	1.42	9.63	4.48	12.31
Harpacticoid copepods	1	20.16	42.40	27.91	30.64	22.72	34.31
	2	15.91	28.39	20.86	22.37	14.26	16.53
	$\bar{x}$	18.04	35.40	24.38	26.50	18.49	25.42
	s	3.00	9.90	4.98	5.85	5.98	12.57
	$s_{\bar{x}}$	2.12	7.00	3.52	4.14	4.23	8.89
Bosmina sp.	1	3.56	1.09	5.98	5.47	19.31	15.25
	2	2.12	3.55	3.29	5.89	22.40	18.03
	$\bar{x}$	2.84	2.32	4.64	5.68	20.86	16.64
	s	1.02	1.74	1.90	0.30	2.18	1.96
	$s_{\bar{x}}$	0.72	1.23	1.34	0.21	1.54	1.39
Eurytemora sp.	1	2.37	9.78	1.99	3.28	9.09	8.89
	2	1.06	3.55	2.90	5.89	5.09	4.51
	$\bar{x}$	1.72	6.66	2.44	4.58	7.09	6.70
	s	0.93	4.40	0.64	1.84	2.83	3.10
	$s_{\bar{x}}$	0.66	3.12	0.46	1.30	2.00	2.19
Acartia sp.	1	1.18	--	--	--	1.14	3.81
	2	--	1.18	2.90	1.18	--	1.50
	$\bar{x}$						2.66
	s						1.63
	$s_{\bar{x}}$						1.16
Ostracods	1		4.35				--
	2		3.55				1.50
	$\bar{x}$		3.95				
	s		0.57				
	$s_{\bar{x}}$		0.40				
Polychaete larvae	1		1.09	1.00			
	2		1.18	--			
	$\bar{x}$		1.14				
	s		0.06				
	$s_{\bar{x}}$		0.04				
Cyclopoid copepods	1						
	2						
Barnacle nauplii	1	1.18					
		--					

Table 10

James River Zooplankton; March 21, 1975
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organism		DWS	Intake	HPE 1	HPE 2	HPS	HPN
Copepod nauplii	1	98.82	167.67	101.62	88.48	70.11	326.37
	2	135.90	150.29	84.26	111.09	61.48	527.06
	$\bar{x}$	117.36	158.98	92.94	99.79	65.80	426.72
	s	26.22	12.29	12.28	15.99	6.10	141.91
	$s_{\bar{x}}$	18.54	8.69	8.68	11.31	4.32	100.35
Harpacticoid copepods	1	63.29	84.45	50.81	42.90	56.75	71.58
	2	70.91	41.23	43.02	57.96	30.74	88.11
	$\bar{x}$	67.10	62.84	46.92	50.43	43.75	79.85
	s	5.39	30.56	5.51	10.65	18.39	11.69
	$s_{\bar{x}}$	3.81	21.61	3.90	7.53	13.01	8.27
Bosmina sp.	1	7.77	14.90	12.70	24.13	13.35	23.05
	2	9.20	14.63	19.72	19.32	6.99	22.43
	$\bar{x}$	8.49	14.77	16.21	21.73	10.17	22.74
	s	1.01	0.19	4.96	3.40	4.50	0.44
	$s_{\bar{x}}$	0.72	0.14	3.51	2.41	3.18	0.31
Acartia sp.	1	--	2.48	2.12	8.04	1.67	1.21
	2	3.06	3.99	--	2.41	--	6.41
	$\bar{x}$		3.24		5.23		3.81
	s		1.07		3.98		3.68
	$s_{\bar{x}}$		0.76		2.82		2.60
Eurytemora sp.	1	5.55	2.48	2.12	--	3.34	134.67
	2	3.06	2.66	5.38	--	1.40	233.89
	$\bar{x}$	4.31	2.57	3.75		2.37	184.28
	s	1.76	0.13	2.31		1.37	70.16
	$s_{\bar{x}}$	1.25	0.09	1.63		0.97	49.61
Polychaete larvae	1	1.11	--	--	2.68	3.34	1.21
	2	--	--	--	2.41	--	1.60
	$\bar{x}$				2.55		1.41
	s				0.19		0.28
	$s_{\bar{x}}$				0.14		0.20
Rotifers	1	--	--	8.47	50.94	--	3.64
	2	5.11	--	23.30	38.64	2.79	--
	$\bar{x}$			15.89	44.79		
	s			10.49	8.70		
	$s_{\bar{x}}$			7.42	6.15		
Ostracods	1	--	--	2.12	--	--	--
	2	--	--	3.58	--	--	--
	$\bar{x}$			2.85			
	s			1.03			
	$s_{\bar{x}}$			0.73			
Cyclopoid copepods	1	--	--	--	--	--	--
	2	--	--	--	--	--	--
Decapod larvae	1	--	--	--	--	--	--

Table 10 (cont'd.)

Organism		HPW 1	HPW 2	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	83.58	121.93	93.95	72.67	86.40	86.22
	2	66.73	111.93	106.05	69.12	98.99	87.26
	$\bar{x}$	75.16	116.93	100.00	70.90	92.70	86.74
	s	11.91	7.07	8.56	2.51	8.90	0.74
	$s_{\bar{x}}$	8.43	5.00	6.05	1.78	6.30	0.52
Harpacticoid copepods	1	33.75	24.15	46.33	12.92	22.25	34.82
	2	36.40	17.41	35.75	13.60	22.84	24.43
	$\bar{x}$	35.08	20.78	41.04	13.26	22.55	29.63
	s	1.87	4.77	7.48	0.48	0.42	7.35
	$s_{\bar{x}}$	1.33	3.37	5.29	0.34	0.30	5.20
Bosmina sp.	1	8.04	39.11	12.87	27.45	31.42	29.84
	2	18.20	78.35	11.91	21.53	33.00	15.71
	$\bar{x}$	13.12	58.73	12.39	24.49	32.21	22.78
	s	7.18	27.75	0.68	4.19	1.12	9.99
	$s_{\bar{x}}$	5.08	19.62	0.48	2.96	0.79	7.07
Acartia sp.	1	3.21	3.45	5.15	1.61	5.24	3.32
	2	1.21	3.73	1.19	7.93	2.54	1.74
	$\bar{x}$	2.21	3.59	3.17	4.77	3.89	2.53
	s	1.41	0.20	2.80	4.47	1.91	1.12
	$s_{\bar{x}}$	1.00	0.14	1.98	3.16	1.35	0.79
Eurytemora sp.	1	4.82	5.75	32.17	--	5.24	1.66
	2	8.49	2.49	44.09	2.27	6.34	3.49
	$\bar{x}$	6.66	4.12	38.13		5.79	2.58
	s	2.60	2.31	8.43		0.78	1.29
	$s_{\bar{x}}$	1.84	1.63	5.96		0.55	0.92
Polychaete larvae	1	1.61	2.30	--	--	2.62	--
	2	--	--	--	1.13	--	--
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Rotifers	1	1.61	9.20	--	1.61	11.78	14.92
	2	--	3.73	--	--	12.69	3.49
	$\bar{x}$		6.47			12.24	9.21
	s		3.87			0.64	8.08
	$s_{\bar{x}}$		2.74			0.46	5.72
Ostracods	1	--	1.15	--	1.61	--	--
	2	--	--	--	--	2.54	1.74
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Cyclopoid copepods	1	1.61	--	--	--	--	--
	2	--	--	--	--	--	--
Decapod larvae	1	--	--	--	--	--	--
	2	--	--	1.19	--	--	--

Table 11

James River Zooplankton; April 17, 1975

(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organism		Station DWS	Intake	HPE 1	HPE 2	HPS	HPN
Copepod nauplii	1	810.23	377.02	446.28	280.37	175.11	219.11
	2	522.35	237.35	754.13	280.90	366.72	262.09
	$\bar{x}$	666.29	307.19	600.21	280.63	270.91	240.60
	s	203.56	98.76	217.68	0.37	135.49	30.39
	$s_{\bar{x}}$	143.94	69.83	153.93	0.27	95.81	21.49
Harpacticoid copepods	1	67.30	69.30	85.28	75.77	48.04	48.85
	2	42.74	70.70	74.07	139.56	100.45	58.07
	$\bar{x}$	55.02	70.00	79.67	107.67	74.25	53.46
	s	17.37	0.99	7.93	45.11	37.05	6.52
	$s_{\bar{x}}$	12.28	0.70	5.61	31.89	26.21	4.61
Bosmina sp.	1	2.64	1.17	7.11	7.58	6.20	8.88
	2	--	3.37	8.42	10.73	1.59	4.71
	$\bar{x}$		2.27	7.77	9.15	3.89	6.79
	s		1.56	0.93	2.23	3.26	2.95
	$s_{\bar{x}}$		1.10	0.65	1.57	2.31	2.09
Acartia sp.	1	--	1.17	2.84	1.51	1.55	1.48
	2	--	3.37	--	--	1.59	1.57
	$\bar{x}$		2.27			1.57	1.53
	s		1.56			0.03	0.06
	$s_{\bar{x}}$		1.10			0.02	0.05
Eurytemora sp.	1	15.83	75.17	5.68	12.12	6.20	1.29
	2	7.12	3.37	3.37	10.73	9.57	7.85
	$\bar{x}$	11.47	39.27	4.53	11.43	7.89	4.57
	s	6.16	50.77	1.63	0.98	2.38	4.64
	$s_{\bar{x}}$	4.35	35.90	1.15	0.69	1.69	3.28
Cyclopoid copepods	1	2.64	2.35	4.26	1.51	--	--
	2	7.12	1.68	5.05	8.95	1.59	7.85
	$\bar{x}$	4.88	2.01	4.65	5.23		
	s	3.17	0.47	0.56	5.26		
	$s_{\bar{x}}$	2.24	0.33	0.39	3.72		
Polychaete larvae	1	--	1.17	--	--	--	--
	2	1.19	--	--	--	--	--
Barnacle nauplii	1	--	1.17	--	--	--	--
	2	--	--	--	--	--	--
Gastropod larvae	1	--	--	--	--	--	--
	2	--	--	--	--	4.78	--
Fish larvae	1	--	--	--	--	--	--
	2	0.02	--	--	--	--	--

Table 11 (cont'd.)

Organism		Station HPW 2	HPW 1	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	198.67	278.71	435.31	353.67	350.44	298.74
	2	307.32	167.58 *	402.82	126.44	270.59	385.49
	$\bar{x}$	252.99	223.15	419.07	240.05	310.51	342.11
	s	76.83	78.58	22.97	160.68	56.46	61.43
	$s_{\bar{x}}$	54.33	55.57	16.25	113.61	39.93	43.37
Harpacticoid copepods	1	48.56	30.97	30.02	69.66	121.76	97.26
	2	105.23	10.66 *	13.89	28.10	86.10	73.23
	$\bar{x}$	76.89	20.81	21.95	48.88	103.93	85.25
	s	40.07	14.36	11.41	29.39	25.21	16.99
	$s_{\bar{x}}$	28.33	10.15	8.07	20.78	17.83	12.01
Bosmina sp.	1	4.41	2.58	2.73	--	4.45	11.11
	2	5.98	1.52 *	5.21	2.55	2.73	16.58
	$\bar{x}$	5.19	2.05	3.97		3.59	13.85
	s	1.11	0.75	1.75		1.22	3.87
	$s_{\bar{x}}$	0.79	0.53	1.24		0.86	2.73
Acartia sp.	1	2.94	--	--	--	--	1.39
	2	2.39	-- *	1.74	--	--	5.53
	$\bar{x}$	2.67					3.46
	s	0.39					2.93
	$s_{\bar{x}}$	0.27					2.07
Eurytemora sp.	1	8.83	5.16	8.19	10.72	16.33	23.62
	2	15.54	1.52 *	8.69	2.55	16.40	38.69
	$\bar{x}$	12.19	3.34	8.43	6.63	16.37	31.15
	s	4.75	2.57	0.35	5.78	0.05	10.66
	$s_{\bar{x}}$	3.35	1.82	0.25	4.09	0.03	7.53
Cyclopoid copepods	1	2.94	1.29	1.36	12.50	8.91	6.95
	2	13.15	1.52 *	1.74	1.28	13.67	4.14
	$\bar{x}$	8.05	1.41	1.55	6.89	11.29	5.55
	s	7.22	0.16	0.27	7.93	3.37	1.99
	$s_{\bar{x}}$	5.11	0.11	0.19	5.61	2.38	1.41
Polychaete larvae	1	--	--	--	--	--	--
	2	--	-- *	--	1.28	--	--
Barnacle nauplii	1	--	--	--	--	--	--
	2	--	3.05 *	1.74	--	--	--
Gastropod larvae	1	--	--	--	--	2.97	--
	2	--	-- *	--	--	--	--
Fish larvae	1	--	--	--	--	--	--
	2	--	-- *	--	--	--	0.04

* Small portion of sample was lost

Table 11 (cont'd.)

Organism		Station HPW 2	HPW 1	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	198.67	278.71	435.31	353.67	350.44	298.74
	2	307.32	167.58 *	402.82	126.44	270.59	385.49
	$\bar{x}$	252.99	223.15	419.07	240.05	310.51	342.11
	s	76.83	78.58	22.97	160.68	56.46	61.43
	$s_{\bar{x}}$	54.33	55.57	16.25	113.61	39.93	43.37
Harpacticoid copepods	1	48.56	30.97	30.02	69.66	121.76	97.26
	2	105.23	10.66 *	13.89	28.10	86.10	73.23
	$\bar{x}$	76.89	20.81	21.95	48.88	103.93	85.25
	s	40.07	14.36	11.41	29.39	25.21	16.99
	$s_{\bar{x}}$	28.33	10.15	8.07	20.78	17.83	12.01
Bosmina sp.	1	4.41	2.58	2.73	--	4.45	11.11
	2	5.98	1.52 *	5.21	2.55	2.73	16.58
	$\bar{x}$	5.19	2.05	3.97		3.59	13.85
	s	1.11	0.75	1.75		1.22	3.87
	$s_{\bar{x}}$	0.79	0.53	1.24		0.86	2.73
Acartia sp.	1	2.94	--	--	--	--	1.39
	2	2.39	-- *	1.74	--	--	5.53
	$\bar{x}$	2.67					3.46
	s	0.39					2.93
	$s_{\bar{x}}$	0.27					2.07
Eurytemora sp.	1	8.83	5.16	8.19	10.72	16.33	23.62
	2	15.54	1.52 *	8.69	2.55	16.40	38.69
	$\bar{x}$	12.19	3.34	8.43	6.63	16.37	31.15
	s	4.75	2.57	0.35	5.78	0.05	10.66
	$s_{\bar{x}}$	3.35	1.82	0.25	4.09	0.03	7.53
Cyclopoid copepods	1	2.94	1.29	1.36	12.50	8.91	6.95
	2	13.15	1.52 *	1.74	1.28	13.67	4.14
	$\bar{x}$	8.05	1.41	1.55	6.89	11.29	5.55
	s	7.22	0.16	0.27	7.93	3.37	1.99
	$s_{\bar{x}}$	5.11	0.11	0.19	5.61	2.38	1.41
Polychaete larvae	1	--	--	--	--	--	--
	2	--	-- *	--	1.28	--	--
Barnacle nauplii	1	--	--	--	--	--	--
	2	--	3.05 *	1.74	--	--	--
Gastropod larvae	1	--	--	--	--	2.97	--
	2	--	-- *	--	--	--	--
Fish larvae	1	--	--	--	--	--	--
	2	--	-- *	--	--	--	0.04

* Small portion of sample was lost

Table 12

James River Zooplankton; May 15, 1975
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organism		DWS	Intake	HPE 1	HPE 2	HPN	HPS
Copepod nauplii	1	1811.54	95.10	301.50	380.71	277.88	331.62
	2	1753.60	66.14	206.11	202.05	554.76	350.64
	$\bar{x}$	1782.57	80.62	253.81	291.38	416.32	341.13
	s	40.97	20.48	67.45	126.33	195.78	13.45
	$s_{\bar{x}}$	28.97	14.48	47.69	89.33	138.44	9.51
Harpacticoid copepods	1	132.88	32.92	10.20	20.37	6.20	55.67
	2	82.08	12.66	25.10	11.28	16.77	31.59
	$\bar{x}$	107.48	22.79	17.65	15.83	11.49	43.63
	s	35.92	14.33	10.54	6.43	7.47	17.03
	$s_{\bar{x}}$	25.40	10.13	7.45	4.55	5.29	12.04
Bosmina sp.	1	48.84	8.53	2.91	--	23.57	4.84
	2	36.07	1.41	1.32	--	20.96	18.95
	$\bar{x}$	42.45	4.97	2.11		22.27	11.89
	s	9.03	5.03	1.12		1.85	9.98
	$s_{\bar{x}}$	6.39	3.56	0.79		1.31	7.05
Acartia sp.	1	1.14	--	--	--	--	--
	2	--	2.81	--	--	6.99	3.16
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Eurytemora sp.	1	39.75	9.75	2.91	3.13	16.13	26.63
	2	37.31	--	1.32	3.08	15.37	28.43
	$\bar{x}$	38.53		2.11	3.11	15.75	27.53
	s	1.73		1.12	0.03	0.54	1.27
	$s_{\bar{x}}$	1.22		0.79	0.03	0.38	0.90
Cyclopoid copepods	1	1.14	2.44	4.37	--	3.26	1.29
	2	12.44	1.41	1.32	1.03	11.18	6.32
	$\bar{x}$	6.79	1.93	2.85		7.22	3.81
	s	7.99	0.73	2.16		5.60	3.56
	$s_{\bar{x}}$	5.65	0.51	1.53		3.96	2.51
Rotifers	1	--	--	--	--	818.76	4.84
	2	--	2.81	--	--	983.76	3.16
	$\bar{x}$					901.26	4.00
	s					116.67	1.19
	$s_{\bar{x}}$					82.50	0.84
Ostracods	1	--	--	--	--	8.68	--
	2	--	--	--	--	5.59	--
	$\bar{x}$					7.13	
	s					2.19	
	$s_{\bar{x}}$					1.55	
Polychaete larvae	1	1.14	--	--	--	--	--
	2	--	--	--	--	--	--
Barnacle nauplii	1	--	--	--	--	--	--
	2	1.24	--	--	--	--	--
Gastropod larvae	1	--	--	--	--	--	--
	2	--	--	--	--	--	--

Table 12 (cont'd.)

Organism		Station HPW 2	HPW 1	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	794.01	188.38	437.99	245.66	530.22	920.28
	2	806.13	408.79	345.53	675.59	861.10	562.00
	$\bar{x}$	800.07	298.59	391.76	460.63	695.66	741.14
	s	8.57	155.85	65.38	304.01	233.97	253.34
	$s_{\bar{x}}$	6.06	110.21	46.23	214.97	165.44	179.14
Harpacticoid copepods	1	206.74	10.05	8.94	3.19	7.01	100.10
	2	151.91	18.23	5.16	--	93.78	30.91
	$\bar{x}$	179.33	14.14	7.05		50.39	65.51
	s	38.77	5.78	2.67		61.36	48.93
	$s_{\bar{x}}$	27.41	4.09	1.89		43.39	34.59
Bosmina sp.	1	20.97	15.07	14.90	9.57	25.69	113.02
	2	34.30	62.49	7.74	13.90	31.26	61.42
	$\bar{x}$	27.63	38.78	11.32	11.73	28.48	87.22
	s	9.43	33.53	5.06	3.06	3.94	36.49
	$s_{\bar{x}}$	6.67	23.71	3.58	2.17	2.79	25.80
Acartia sp.	1	3.00	--	--	--	2.34	--
	2	2.45	--	--	--	5.68	3.07
	$\bar{x}$	2.73				4.01	
	s	0.39				2.36	
	$s_{\bar{x}}$	0.28				1.67	
Eurytemora sp.	1	44.94	15.07	--	--	63.07	48.44
	2	51.45	10.41	2.58	2.78	54.00	42.99
	$\bar{x}$	48.19	12.74			58.53	45.71
	s	4.60	3.29			6.41	3.85
	$s_{\bar{x}}$	3.25	2.33			4.53	2.73
Cyclopoid copepods	1	41.95	2.51	--	--	7.01	22.60
	2	24.50	--	--	2.78	28.42	3.07
	$\bar{x}$	33.23				17.71	12.83
	s	12.34				15.14	13.81
	$s_{\bar{x}}$	8.73				10.71	9.77
Rotifers	1	41.95	2.51	32.77	--	350.36	477.90
	2	9.80	15.62	--	19.46	36.94	562.00
	$\bar{x}$	25.87	9.07			193.65	519.95
	s	22.73	9.27			221.62	59.47
	$s_{\bar{x}}$	16.07	6.55			156.71	42.05
Ostracods	1	--	--	--	--	--	--
	2	4.90	--	--	--	--	--
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Polychaete larvae	1	--	--	--	--	--	--
	2	--	23.43	--	--	--	--
Barnacle nauplii	1	--	--	2.98	--	--	--
	2	--	--	--	--	--	--
Gastropod larvae	1	3.00	--	--	--	--	--
	2	--	--	--	--	--	--

Table 13

James River Zooplankton; June 18, 1975
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organism		DWS	Intake	HPE 1	HPE 2	HPN	HPS
Copepod nauplii	1	152.38	1003.35	361.18	968.83	929.51	787.76
	2	224.77	649.40	246.07	580.11	400.46	495.31
	$\bar{x}$	188.57	826.37	303.63	774.47	664.99	641.53
	s	51.19	250.28	81.39	274.87	374.09	206.79
	$s_{\bar{x}}$	36.19	176.97	57.55	194.36	265.53	146.23
Harpacticoid copepods	1	6.63	18.09	1.04	11.12	9.17	18.21
	2	7.59	18.59	1.06	3.31	5.24	36.10
	$\bar{x}$	7.11	18.34	1.05	7.21	7.21	27.15
	s	0.68	0.35	0.01	5.52	2.78	12.65
	$s_{\bar{x}}$	0.48	0.25	0.01	3.91	1.97	8.95
Acartia sp.	1	15.46	280.99	11.48	149.53	26.36	31.87
	2	22.78	182.58	23.33	90.43	53.46	163.18
	$\bar{x}$	19.12	231.79	17.41	119.98	39.91	97.53
	s	5.18	69.59	8.38	41.79	19.16	92.85
	$s_{\bar{x}}$	3.66	49.21	5.93	29.55	13.55	65.65
Eurytemora sp.	1	6.63	21.71	11.48	32.13	76.79	4.55
	2	7.59	2.19	23.33	7.72	2.10	--
	$\bar{x}$	7.11	11.95	17.41	19.93	39.45	
	s	0.68	13.80	8.38	17.26	52.81	
	$s_{\bar{x}}$	0.48	9.76	5.93	12.21	37.35	
Barnacle nauplii	1	15.46	160.39	36.53	22.24	136.39	27.32
	2	13.67	51.38	22.27	7.72	110.07	8.66
	$\bar{x}$	14.57	105.89	29.40	14.98	123.23	17.99
	s	1.27	77.08	10.08	10.27	18.61	13.19
	$s_{\bar{x}}$	0.89	54.51	7.13	7.26	13.16	9.33
Polychaete larvae	1	5.52	194.16	9.39	9.89	3.44	5.69
	2	13.67	9.84	4.24	--	1.05	1.44
	$\bar{x}$	9.59	102.00	6.81		2.25	3.57
	s	5.76	130.33	3.64		1.69	3.01
	$s_{\bar{x}}$	4.07	92.16	2.57		1.19	2.13
Gastropod larvae	1	33.16	15.68	1.04	11.12	1.15	--
	2	1.52	--	33.94	--	--	1.44
	$\bar{x}$	17.34		17.49			
	s	22.37		23.26			
	$s_{\bar{x}}$	15.89		16.45			
Pelecypod larvae	1	5.52	41.00	--	14.83	4.58	--
	2	--	--	3.18	11.03	--	--
	$\bar{x}$				12.93		
	s				2.69		
	$s_{\bar{x}}$				1.90		
Rotifers	1	15.46	--	19.83	3.71	--	9.11
	2	--	24.05	--	11.03	--	2.89
	$\bar{x}$				7.37		6.00
	s				5.18		4.40
	$s_{\bar{x}}$				3.66		3.11

Table 13 (cont'd.)

Organism		DWS	Intake	HPE 1	HPE 2	HPN	HPS
Bosmina sp.	1	--	--	--	--	--	1.14
	2	--	--	--	--	1.05	--
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Decapod larvae	1	--	8.44	--	--	1.15	--
	2	1.52	1.09	--	--	--	--
	$\bar{x}$		4.77				
	s		5.20				
	$s_{\bar{x}}$		3.67				
Cyclopoid copepods	1	--	7.23		--	--	--
	2	--	--		--	--	8.66
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Barnacle cyprids	1	--	--	--	--	--	--
	2	--	--	--	--	--	--
Calanoid copepods	1	--	--	--	--	--	--
	2	--	--	--	--	--	--
Ostracods	1	--	--	--	--	--	--
	2	--	--	--	--	--	--
Amphipods	1	--	--	--	--	--	--
	2	--	--	--	--	--	--

Table 13 (cont'd.)

Organism		Station HPW 2	HPW 1	Discharge	CBE	CBC	J.I.
Copepod nauplii	1	775.23	805.49	130.43	352.73	300.46	162.48
	2	984.35	378.43	552.70	487.54	313.19	96.87
	$\bar{x}$	879.79	591.96	341.57	420.13	256.83	129.67
	s	147.87	301.98	298.59	95.33	61.71	46.39
	$s_{\bar{x}}$	104.56	213.53	211.13	67.41	43.63	32.81
Harpactiooid copepods	1	34.45	25.09	2.02	3.51	23.11	15.58
	2	157.63	16.66	13.53	2.48	13.12	28.49
	$\bar{x}$	96.04	20.87	7.77	2.99	18.11	22.03
	s	87.10	5.96	8.14	0.73	7.06	9.13
	$s_{\bar{x}}$	61.59	4.21	5.75	0.51	4.99	6.45
Acartia sp.	1	344.55	56.46	16.18	--	34.13	21.14
	2	70.06	70.21	25.94	1.24	5.47	2.28
	$\bar{x}$	207.31	63.33	21.06		19.80	11.71
	s	194.09	9.72	6.90		20.27	13.34
	$s_{\bar{x}}$	137.25	6.87	4.88		14.33	9.43
Eurytemora sp.	1	--	214.55	1.01	5.26	7.70	33.39
	2	353.80	40.46	13.53	6.20	21.87	6.84
	$\bar{x}$		127.51	7.27	5.73	14.79	20.11
	s		123.10	8.85	0.67	10.02	18.77
	$s_{\bar{x}}$		87.05	6.26	0.47	7.09	13.27
Barnacle nauplii	1	4.31	110.41	38.42	63.17	5.50	6.69
	2	7.01	52.36	129.71	23.57	--	1.14
	$\bar{x}$	5.66	81.39	84.07	43.37		3.91
	s	1.91	41.05	64.55	28.00		3.92
	$s_{\bar{x}}$	1.35	29.03	46.65	19.80		2.77
Polychaete larvae	1	8.61	7.53	1.01	--	--	1.11
	2	--	7.14	2.25	1.24	--	--
	$\bar{x}$		7.33	1.63			
	s		0.28	0.88			
	$s_{\bar{x}}$		0.19	0.62			
Gastropod larvae	1	--	23.84	1.01	3.51	--	--
	2	7.01	4.76	12.41	--	2.19	--
	$\bar{x}$		14.30	6.71			
	s		13.49	8.06			
	$s_{\bar{x}}$		9.54	5.70			
Pelecypod larvae	1	4.31	22.58	--	5.26	--	--
	2	45.54	--	9.02	3.72	1.09	--
	$\bar{x}$	24.93			4.49		
	s	29.15			1.09		
	$s_{\bar{x}}$	20.61			0.77		
Rotifers	1	47.37	--	--	3.51	1.10	148.01
	2	10.51	14.28	--	--	28.43	177.78
	$\bar{x}$	28.94				14.77	162.89
	s	26.06				19.33	21.05
	$s_{\bar{x}}$	18.43				13.67	14.89
Bosmina sp.	1	--	--	--	--	1.10	13.35
	2	3.50	--	--	--	3.28	9.12
	$\bar{x}$					2.19	11.23
	s					1.54	2.99
	$s_{\bar{x}}$					1.09	2.11

Table 13 (cont'd.)

Organism		Station HPW 2	HPW 1	Discharge	CBE	CBC	J.I.
Decapod larvae	1	--	--	--	--	--	--
	2	--	2.38	--	--	1.09	--
	$\bar{x}$						
	s						
	$s_{\bar{x}}$						
Cyclopoid copepods	1	--	3.76	--	--	--	4.45
	2	3.50	--	2.25	--	6.56	3.42
	$\bar{x}$						3.93
	s						0.73
	$s_{\bar{x}}$						0.51
Barnacle cyprids	1	--	--	--	1.75	--	--
	2	3.50	--	--	--	--	--
Calanoid copepods	1	--	--	--	--	--	--
	2	3.50	--	--	--	--	--
Ostracods	1	--	--	--	--	--	--
	2	7.01	--	--	--	--	--
Amphipods	1	--	--	--	--	--	--
	2	--	--	2.25	--	--	--

stations except on January 30, when harpacticoid copepods were more numerous at the discharge, and on May 15 and June 18 when large populations of rotifers were encountered at HPN and J.I., respectively. In January, February and March the largest numbers of nauplii and of Eurytemora sp. were collected at HPN, suggesting an influence of College Creek on the zooplankton as well as the phytoplankton community. The spring increase in overall zooplankton abundance generally paralleled the seasonal increase in phytoplankton.

Benthos

The benthos data appear in Tables 14-16. The most abundant mollusks were Rangia cuneata, Congeria leucophaeta, and Hydrobia sp. (June 13). The polychaete Scolecolepides viridis and unidentified oligochaetes dominated the annelid population, while the most abundant amphipods were Gammarus sp., Corophium lacustre and Leptocheirus plumulosus.

Fouling Plates

The fouling plate results are shown in Tables 17-19. Very few organisms were found on any of the plates examined prior to June 13. The annual plates, recovered along with the bimonthly plates on this date, exhibited the densest colonization, especially at DWS. Microscopic examination of material scraped from the June plates revealed the presence of scattered pennate diatoms, but no bluegreen algae, at all three stations.

Phytoplankton Entrainment

The data obtained, to date, in the phytoplankton entrainment substudy, are presented in Tables 20-22. All chlorophyll samples have been analyzed, but the phytoplankton samples are still in progress. The chlorophyll data have shown little or no indication of vertical stratification at

Table 14

James River Benthos; February 20, 1975

Species, Number of Individuals and Total Wet Weight
(Without Clam Shell) in Grams per 0.1 m^2 at Each Station

Species	Station															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mollusks																
Rangia cuneata	5	10		35	8	13	5	6		2	1		4	15	1	19
Congeria leucophaeta	1			40	1		1	28			19					
Macoma mitchelli															1	4
Macoma balthica																
Corbicula manilensis																
Hydrobia sp.																
Mya arenaria																
Brachidontes recurvus				1							2		1			
Annelids																
Polychaetes																
Scolecolepides virdis		2		1	3	1		1								
Nereis succinea	4		1	1									1		2	2
Lysipiddes grayi				1		1		1		2						
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis																
Oligochaetes	21	33	8	5	6	25	1	1	3	78				31	7	
Amphipods																
Gammarus sp.			1	2	1	1					1	1				
Corophium lacustre	1			1	1						12					
Lepidactylus dytiscus		1	3				7		8			3				
Leptocheirus plumulosus		1			1									1	3	48
Monoculodes edwardsi	2						3		16							
Caprella sp.																

Table 14 (cont'd.)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Cyathura polita																2
Edotea triloba																
Chiridotea almyra																
Dipteran larvae	6		1	1		4	1	1	1	3		1			1	
Nemerteans					2									3	1	
Hydroids	x			x	x	x	x	x		x				x	x	x
Balanus sp.				1				4			16					1
Nematodes	1					1										
Biomass (grams)	2.1	1.5	0.2	5.8	0.7	4.3	2.6	1.3	0.2	0.4	0.3	0.2	0.8	1.8	0.2	0.8

Table 15

James River Benthos; April 25, 1975
Species, Number of Individuals and Total Wet Weight
(Without Clam Shell) in Grams per 0.1 m^2 at Each Station

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mollusks																
Rangia cuneata	9	25	6	10	2	39	5	8	2	2			2	7	2	10
Congeria leucophaeta		2				2		24								
Macoma mitchelli														1		1
Macoma balthica																
Corbicula manilensis			1				1		1	1		6				
Hydrobia sp.																
Mya arenaria																
Brachidontes recurvus																
Annelids																
Polychaetes																
Scolecolepides viridis		6	2	1	10	6		8	2	14	8			2	3	3
Nereis succinea	7		2							1	2		1		8	
Lysipiddes grayi								2								
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis																
Oligochaetes	4	26	4	21	1	20				9	1		8	1		1
Amphipods																
Gammarus sp.																
Corophium lacustre													1			
Lepidactylus dytiscus							3		4			3				
Leptocheirus plumulosus		3	2													18
Monoculodes edwardsi						1										
Caprella sp.																

Table 15 (cont'd.)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Cyathura polita																1
Edotea triloba																
Chiridotea almyra																
Dipteran larvae	2				1	1				1	3		2	1		
Nemerteans				1		1					2				1	2
Hydroids		x		x	x	x		x		x	x		x	x	x	x
Balanus sp.								3		3						
Nematodes				1												
Biomass (grams)	2.8	4.9	1.8	1.6	0.6	7.9	1.7	1.4	0.4	0.2	0.2	0.1	1.1	0.5	1.4	0.5

Table 16

James River Benthos; June 13, 1975

Species, Number of Individuals and Total Wet Weight (Without Clam Shell) in Grams per 0.1 m^2 at Each Station

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mollusks																
Rangia cuneata	4	18	1	26	6	13	2	15	4	3	43	2	6	7		10
Congeria leucophaeta				1	3			23			2					1
Macoma mitchelli														6		3
Macoma balthica																
Corbicula manilensis			1		1				3			1				
Hydrobia sp.	91		87				32					17	4	2	1	
Mya arenaria																
Brachidontes recurvus								2		1						
Annelids																
Polychaetes																
Scolecolepides viridis		6		1	10			23	2		4		1	3	4	1
Nereis succinea					1											
Lysipiddes grayi				1	1						1					
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis																
Oligochaetes	2	20	8	4	1	2	3			5	1	1	8	7	1	
Amphipods																
Gammarus sp.				3	12	8	3	9	6	2	1		1		1	2
Corophium lacustre		2		3	2	20		11		2		2	3	1	1	
Lepidactylus dytiscus			6						1			6				
Leptocheirus plumulosus			7	1	16									12	25	27
Monoculodes edwardsi																
Caprella sp.																

Table 16 (cont'd.)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Cyathura polita Edotea triloba Chiridotea almyra		1						1								
Dipteran larvae	1		4			3	2					3		1		
Nemerteans											1			1		
Hydroids	x				x	x		x	x	x	x	x	x	x	x	
Balanus sp.								3		1						
Nematodes																
Biomass (grams)	1.4	4.0	0.8	7.6	0.9	2.1	0.3	2.1	0.8	0.2	8.1	0.3	1.5	1.1	0.3	1.2

Table 17

Fouling Organisms

1975

Station DWS

Horizontal Plate		No. Organisms /dm^2 Jan-Feb	Mar-Apr	May-Jun	Annual
Barnacles	Balanus sp.			203	38
Bivalves	Brachidontes recurvus				
	Congeria leucophaeta				2
Amphipods	Corophium lacustre			173	547
	Gammarus sp.			25	52
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii			1	1
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis	x			
Hydroids		x	x	x	x
Dipteran Larvae				2	1
Total No. of Genera (not including Hydroids and Dipteran Larvae)				5	6
Total No. of Organisms (not including Bryozoans and Hydroids)				404	641
Vertical Plate					
Barnacles	Balanus sp.			5	47
Bivalves	Brachidontes recurvus				
	Congeria leucophaeta				3
Amphipods	Corophium lacustre			155	354
	Gammarus sp.	3		83	58
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii				
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis				
Hydroids		x	x	x	x
Dipteran larvae				4	
Total No. of Genera (not including Hydroids and Dipteran Larvae)		1		4	4
Total No. of Organisms (not including Bryozoans and Hydroids)		3		247	462

Table 18

Fouling Organisms
1975

Station CBN

Horizontal Plate		No. organisms/dm^2			
		Jan-Feb	Mar-Apr	May-Jun	Annual
Barnacles	Balanus sp.				75
Bivlaves	Brachidontes recurvus				
	Congeria leucophaeta				1
Amphipods	Corophium lacustre			6	255
	Gammarus sp.		3	4	298
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii				
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis				
Hydroids		x	x	x	x
Dipteran larvae					7
Total No. of Genera (not including Hydroids and Dipteran Larvae)			1	2	5
Total No. of Organisms (not including Bryzoans and Hydroids)			3	10	636

Vertical Plate					
Barnacles	Balanus sp.				4
Bivalves	Brachidontes recurvus				
	Congeria leucophaeta				7
Amphipods	Corophium lacustre			6	52
	Gammarus sp.	2		2	81
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii				
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis		x		
Hydroids		x	x	x	x
Dipteran larvae				1	1
Total No. of Genera (not including Hydroids and Dipteran larvae)		1		3	5
Total No. of Organisms (not including Bryozoans and Hydroids)		2		9	145

Table 19

Fouling Organisms
1975
Station CBS

Horizontal Plate		No. of Organisms /dm^2 Jan-Feb	Mar-Apr	May-Jun	Annual
Barnacles	Balanus sp.				
Bivalves	Brachidontes recurvus				
	Congeria leucophaeta				5
Amphipods	Corophium lacustre			15	171
	Gammarus sp.			7	138
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii				
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis	x			
Hydroids		x	x	x	x
Dipteran Larvae				1	5
Total No. of Genera (not including Hydroids and Dipteran Larvae)				3	4
Total No. of Organisms (not including Bryozoans and Hydroids)				23	319
Vertical Plate					
Barnacles	Balanus sp.				16
Bivalves	Brachidontes recurvus				
	Congeria leucophaeta			1	7
Amphipods	Corophium lacustre			10	206
	Gammarus sp.	2	2	2	76
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Flatworms	Stylochus ellipticus				
Crabs	Rhithopanopeus horrisii				
Ectoprocts	Bowerbankia sp.				
Bryozoans	Membranipora tenuis	x	x		
Hydroids		x	x	x	x
Dipteran larvae					1
Total No. of Genera (not including Hydroids and Dipteran Larvae)		1	1	3	5
Total No. of Organisms (not including Bryozoans and Hydroids)		2	2	13	306

Table 20

Phytoplankton Entrainment Data; April 7-8, 1975

Date (1975)	Tide	Time (EDT)	Station	Depth (m)	Temp (°C)	Sal. (°/oo)	D.O. (mg/l)	Chl a (µg/l)		Total cells per ml	
4-7	HWS	1135	Intake	0	8.70	4.06	9.89	3.0	2.4	400	250
				4	8.70	4.51	10.15	2.6	2.5	500	400
				8	8.55	4.65	10.09	2.8	2.8	450	450
4-7		1235	Discharge	0	16.80	4.32	9.89	3.1	3.3	500	500
				1	16.70	4.32	9.43	3.5	3.0	250	600
				2	16.70	4.32	9.83	3.2	3.1	450	450
4-7	LWS	1759	Intake	0	10.20	3.45	10.41	2.5	2.2	600	400
				3.75	9.90	3.62	10.09	3.0	2.9	450	550
				7.5	9.80	3.82	10.31	2.6	2.7	500	400
4-7		1900	Discharge	0	18.40	3.75	9.93	2.5	2.5	450	550
				1	18.20	3.72	9.97	2.2	2.1	300	450
				2	18.00	3.71	10.03	2.1	2.3	250	400
4-7	HWS	2308	Intake	0	9.20	4.35	10.25	2.0	2.5	400	550
				4	9.30	4.53	10.41	2.7	2.9	550	450
				8	9.20	4.58	10.45	3.5	2.8	650	700
4-8		0009	Discharge	0	17.40	4.48	10.03	2.5	2.8	500	
				1	17.10	4.47	10.09	2.6	2.4	400	
				2	17.10	4.45	10.13	2.8	2.8	250	
4-8	LWS	0620	Intake	0	8.60	4.53	10.43	3.9	3.2		
				4	8.95	5.06	10.03	3.3	3.7		
				8	8.80	5.09	10.33	3.6	3.2		
4-8		0721	Discharge	0	17.20	4.52	9.81	2.2	2.4		
				1	17.10	4.51	10.11	3.5	2.5		
				2	17.10	4.48	9.89	2.5	2.7		

Table 21

Phytoplankton Entrainment Data; May 8-9, 1975

Date	Tide	Time	Station	Depth (m)	Temp (°C)	Sal. (°/oo)	D.O. (mg/1)	Chl a (µg/l)		Total cells per ml
5-8	HWS	1124	Intake	0	19.00	.910	8.15	3.8	3.5	
				4.25	19.60	.924	8.03	3.5	3.5	
				8.5	18.40	1.07	8.27	3.5	3.5	
5-8		1222	Discharge	0	23.60	.818	8.33	3.5	3.8	
				1.5	23.60	.812	8.17	3.3	3.5	
				3	23.60	.812	7.97	4.0	4.1	
5-8	LWS	1830	Intake	0	21.65	1.10	8.48	4.9	4.8	
				4.25	21.45	1.09	8.60	5.7	4.9	
				8.5	20.80	.981	8.78	4.3	4.8	
5-8		1931	Discharge	0	25.20	.684	8.21	4.7	5.9	
				1.5	25.20	.684	8.35	5.0	4.0	
				3	25.20	.662	8.17	5.4	5.2	
5-9	HWS	0010	Intake	0	19.45	1.28	8.21	5.0	4.4	
				4.25	19.40	1.20	8.56	4.7	3.6	
				8.5	19.20	1.31	8.46	3.8	4.8	
5-9		0110	Discharge	0	24.20	1.04	8.29	3.8	4.4	
				1.5	24.00	1.02	8.13	3.4	4.2	
				3	23.80	1.01	8.01	4.4	4.7	
5-9	LWS	0705	Intake	0	18.15	.737	8.07	4.5	3.5	
				4.25	18.20	.745	--	4.2	3.8	
				8.5	18.25	.762	7.65	4.0	4.6	
5-9		0807	Discharge	0	23.40	.734	8.01	3.2	4.5	
				1.25	23.30	.751	7.71	4.6	4.5	
				2.5	23.20	.745	7.91	4.2	5.1	

Table 22

Phytoplankton Entrainment Data; June 2-3, 1975

Date (1975)	Tide	Time (EDT)	Station	Depth (m)	Temp (°C)	Sal. (°/oo)	D.O. (mg/l)	Chl a (µg/l)		Total cells per ml
6-2	LWS	1456	Intake	0	28.70	.792	10.18	4.8	6.1	
				4	27.40	.621	8.33	7.6	7.0	
				8.25	27.30	.591	7.88	3.8	4.3	
6-2		1556	Discharge	0	32.50	.693	8.41	4.8	7.2	
				1.25	32.40	.704	8.43	4.2	6.4	
				2.5	32.40	.709	8.39	3.8	4.6	
6-2	HWS	1949	Intake	0	26.40	.599	8.43	4.3	4.7	
				4.25	26.25	.629	7.82	4.6	4.1	
				8.5	26.20	.629	7.96	4.6	4.8	
6-2		2047	Discharge	0	32.50	.624	8.27	5.0	3.8	
				1.25	32.40	.621	7.84	4.9	4.6	
				2.5	32.15	.621	7.86	5.4	4.7	
6-3	LWS	0310	Intake	0	24.80	.657	7.88	4.8	4.8	
				4	24.55	.643	7.66	4.0	4.3	
				8	24.00	.748	8.43	5.2	5.3	
6-3		0412	Discharge	0	30.90	.679	7.74	4.4	4.1	
				1.25	30.80	.657	8.11	4.4	3.8	
				2.5	30.40	.657	7.80	4.4	4.4	
6-3	HWS	2013	Intake	0	24.85	.874	7.86	4.3	3.5	
				4.25	24.90	.941	8.04	3.5	2.7	
				8.5	24.90	.961	7.44	3.4	4.0	
6-3		2114	Discharge	0	30.70	.876	7.74	2.5	2.5	
				1.25	30.65	.876	7.50	3.0	3.8	
				2.5	30.65	.882	7.34	4.4	3.1	

either the intake or the discharge station. Therefore in testing for significant differences between the two stations, six observations per station per sampling time have been used. Using the t test, three significant differences, all in the April run, have been detected. The mean discharge chlorophyll concentration was higher than the mean intake concentration in the first sampling period (.01 level), and lower in the second period (.05 level) and fourth period (.01 level). Analysis of the cell count data for this date showed no significant differences in either the first or second sampling period.

Vertical and Diel Distribution Studies

Tables 23 and 24 present the hydrographic and chlorophyll a data for the two intensive phytoplankton distribution surveys. At only two stations sampled for vertical distribution, CBC and JI, was there apparent vertical stratification of chlorophyll a. At both of these stations concentrations increased with increasing depth. During the diel distribution study differences in chlorophyll a concentrations among the sampling times related more to tidal current differences than to time of day. Elevated concentrations at the bottom sampling depth at 1830 occurred 1.25 hours before the time of maximum flood tide current velocity at Hog Point, while the higher concentrations throughout the water column at 0353 occurred 1.5 hours after the time of maximum ebb current. During the 0353 sampling, waves of suspended sediment could be seen being swept along by the current.

Table 23

Vertical Phytoplankton Distribution Data; April 17, 1975

Station	Time (EDT)	Depth (m)	Temp (°C)	Sal. (°/oo)	D.O. (mg/l)	Secchi Depth (cm)	Chl a (µg/l)		Total cells per ml	
DWS	1046	0	11.10	2.85	9.7	50	1.5	1.6	300	300
		1	11.20	2.89	9.8		1.9	1.9	300	400
		2	11.40	2.98	10.0		1.6	1.7	400	250
Intake	1123	0	11.95	2.23	9.8	30	2.4	2.3	300	400
		4	12.00	2.32	9.7		2.6	2.7	300	450
		8	12.10	2.46	9.9		2.8	2.6	550	350
HPE 1	1154	0	12.15	1.06	9.9	25	2.2	2.4	150	200
		2.5	12.15	1.07	9.9		2.2	2.3	150	200
		5	12.35	1.09	10.0		2.4	2.7	100	250
HPE 2	1253	0	11.85	.86	10.0	25	2.0	2.0	250	150
		2	11.70	.90	9.9		1.9	2.1	200	250
		4	11.90	.92	9.8		2.1	2.0	150	150
HPS	1321	0	13.35	1.11	9.8	28	2.0	1.6		
		2.5	13.00	1.10	10.0		3.2	2.8		
		5	13.05	1.10	9.9		3.0	2.3		
HPN	1349	0	11.95	.61	9.9	26	1.6	1.8		
		1	11.85	.61	10.0		1.6	2.6		
		2	11.50	.65	9.9		1.9	1.9		
HPW 2	1418	0	12.60	.49	10.0	25	2.2	2.1		
		1.75	12.40	.50	9.8		1.8	2.4		
		3.5	12.20	.50	9.7		2.7	3.0		
HPW 1	1445	0	15.40	1.40	10.1	33	1.8	2.0		
		0.5	15.25	1.40	9.7		1.7	2.3		
		1	15.30	1.41	9.7		2.0	2.2		
Discharge	1525	0	21.40	2.72	9.8	32	2.3	2.2		
		1.25	21.40	2.72	9.8		2.3	2.4		
		2.5	21.40	2.71	9.7		2.2	2.3		

Table 23 (cont'd.)

Station	Time (EDT)	Depth (m)	Temp (°C)	Sal. (°/oo)	D.O. (mg/l)	Secchi Depth (cm)	Chl a (µg/l)		Total cells per ml
CBE	1550	0	13.90	.59	9.5	29	1.6	1.4	
		0.5	13.40	.55	9.9		1.5	2.0	
		1	13.25	.53	9.7		1.6	1.4	
CBC	1618	0	11.60	.48	9.8	29	2.2	2.3	
		2	12.45	.47	9.8		3.0	2.7	
		4	12.40	.46	10.0		5.6	4.4	
JI	1649	0	11.85	.19	9.8	23	1.1	2.4	
		4	11.70	.19	9.8		3.7	3.7	
		8	11.70	.19	9.9		5.8	6.2	

Table 24

Diel Phytoplankton Data, HPW 2; May 5-6, 1975

Date (1975)	Tide	Time (EDT)	Depth (m)	Temp. (°C)	Sal. (°/oo)	D.O. (mg/l)	Secchi Depth (cm)	Chl a (µg/l)	Total cells per ml
5-5	ebb	1249	0	17.55	.474	8.45	32	2.4	4.3
			1.5	17.60	.474	8.33		5.1	2.5
			3	17.60	.480	8.43		4.8	3.7
5-5	ebb	1549	0	17.20	.101	8.17	38	3.3	2.0
			1.5	17.25	.101	8.03		1.9	1.8
			3	17.35	.104	8.03		3.0	3.0
5-5	flood	1830	0	18.85	.690	8.45	32	2.7	3.8
			1.75	18.75	.665	8.33		2.3	3.1
			3.5	18.80	.629	8.23		5.6	6.8
5-5	flood	2145	0	17.40	.632	8.43	--	2.1	2.4
			1.75	17.35	.627	8.53		2.5	2.5
			3.5	17.30	.635	8.45		1.9	2.3
5-6	ebb	0032	0	17.25	.464	8.35	--	3.0	3.2
			1.75	17.20	.469	8.41		3.1	4.0
			3.5	17.10	.477	8.37		2.3	3.5
5-6	ebb	0353	0	17.00	.118	8.03	--	3.9	3.6
			1.75	16.90	.116	7.84		3.8	5.6
			3.5	16.80	.116	8.01		5.7	3.8
5-6	LWS	0635	0	17.00	.108	7.94	37	1.9	3.7
			1.75	16.90	.106	8.07		2.9	2.2
			3.5	16.75	.106	7.88		2.6	1.8
5-6	flood	0933	0	18.35	.657	8.25	34	2.8	1.9
			1.75	17.95	.640	8.43		3.6	2.5
			3.5	17.95	.649	8.23		4.0	2.4

Conclusions

The results presented in this report are in a preliminary form, since many samples have not yet been processed and statistical analysis of the data from the processed samples is not yet complete. It is planned to perform variance analyses on the monthly plankton monitoring data to detect significant differences among stations, correlation analyses among the chlorophyll, cell count, and productivity data to evaluate their interrelationships, and community structure parameter calculations on the benthos data. Results of these analyses will be presented in future reports.