ANNUAL OPERATING REPORT 1977
SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER CO.
DOCKET NOS. 50-280 and 50-281
VOLUME 4

3.6 FISH MORTALITIES

Fish impingement estimates for the low-level screens for the time period of January 5, 1977 to December 28, 1977 are reported. These estimates are based on two five-minute replicates taken daily Monday through Friday and extrapolated to reflect weekly values. No data are presented for the period January 17, 1977 through May 1, 1977. On January 17 the low-level screens became clogged with ice and had to be removed to permit station operation.

The low-level screens, which were specifically designed to reduce fish impingement mortality, stopped an estimated 3,166,689 fish from entering the high-level canal during this time period. Of this total, an estimated 3,080,433 individuals were returned to the river alive. The average eight month survival was 97.1% with a range of 92% to 99%.

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5
Temperature Min-Max: 0.8 - 1.4
Salinity Min-Max: 3.4 - 6.4
Survival Percentage: 92 %

Week Of January 2 Through January 8, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	140-199,200-299	288	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	120-139	15,264	1,728
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	1,296	288
037	Atlantic menhaden	Brevoortia tyrannus	80-99	288	0
103	Bay anchovy	Anchoa mitchilli			
149	Tidewater silverside	Menidia beryllina	60-79,80-99	288	0
150	Atlantic silverside	Menidia menidia	60-79,80-99	144	288
135	Pumpkinseed	Lepomis gibbosus			
132	White perch	Morone americana	80-99	3,744	0
033	Spot	Leiostomus xanthurus			
005	Atlantic croaker	Micropogon undulatus	40-59	576	0
151	Hogchoker	Trinectes maculatus			
105	Chain pickerel	Esox niger	200-299	144	0
231	Striped mullet	Mugil cephalus	140-199	4,032	0
			TOTAL	26,064	2,304

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5
Temperature Min-Max: 0.0 - 2.6
Salinity Min-Max: 2.7 - 6.6
Survival Percentage: 97 %

Week Of January 9 Through January 15, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	3,312	0
039	White catfish	Ictalurus catus	200-299	576	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	100-119	25,056	576
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	3,024	0
037	Atlantic menhaden	Brevoortia tyrannus	100-119	0	288
103	Bay anchovy	Anchoa mitchilli			
149	Tidewater silverside	Menidia beryllina	60-79	720	288
150	Atlantic silverside	Menidia menidia	80-99	288	0
135	Pumpkinseed	Lepomis gibbosus	100-119	288	0
032	White perch	Morone americana	60-79,80-99	1,296	0
033	Spot	Leiostomus xanthurus			
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus			
107	Silvery minnow	Hybognathus nuchalis	100-119	144	0
231	Striped mullet	Mugil cephalus	140-199	1,152	0
			TOTAL	35,856	1,152

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5*
Temperature Min-Max: 18.0 - 21.8
Salinity Min-Max: 4.7 - 6.0
Survival Percentage: 98 %

Week Of May 1 Through May 7, 1977

* 5 Pumps and 3 Screens

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	576	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	720	0
051	Gizzard shad	Dorosoma cepedianum	140-199	288	0
275	Threadfin shad	Dorosoma petenense	80-99	576	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	200-299	144	0
037	Atlantic menhaden	Brevoortia tyrannus	80-99	24,912	144
103	Bay anchovy	Anchoa mitchilli	60-79	720	0
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	80-99	0	288
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	80-99	2,160	0
033	Spot	Leiostomus xanthurus	100-119,120-139	24,192	864
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	40-59,100-119	576	0
148	Rough silverside	Membras martinica	80-99	576	144
122	Mummichog	Fundulus heteroclitus	80-99	288	0
031	Striped bass	Morone saxatilis	140-199	288	0
003	Summer flounder	Paralichthys dentatus	40-59	720	0
			TOTAL	57,024	1,440

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5*
Temperature Min-Max: 16.6 - 20.2
Salinity Min-Max: 3.1 - 5.9
Survival Percentage: 98 %
* 5 Pumps and 4 Screens

Week Of May 8 Through May 14, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	140-199	144	0
116	Brown bullhead	Ictalurus nebulosus	140-199	144	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	864	0
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense	80-99	1,008	0
026	Alewife	Alosa pseudoharengus	200-299	0	144
027	Blueback herring	Alosa aestivalis	200-299	288	0
037	Atlantic menhaden	Brevoortia tyrannus	80-99	26,928	864
103	Bay anchovy	Anchoa mitchilli	60-79	720	0
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
035	Pumpkinseed	Lepomis gibbosus	80-99,120-139	432	0
032	White perch	Morone americana	100-119	864	0
033	Spot	Leiostomus xanthurus	120-139	38,304	144
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	40-59	1,152	0
009	Bluefish	Pomatomus saltatrix	40-59	288	0
003	Summer flounder	Paralichthys dentatus	40-59	720	0
114	Shorthead redhorse	Moxostoma macrolepidotum	300-399	144	0
031	Striped bass	Morone saxatilis	140-199	288	0
		TOTAL		72,288	1,152

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 20.2 - 23.3
Salinity, Min-Max: 5.5 - 6.7
Survival Percentage: 98 %

Week Of May 15 Through May 21, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	120-139	144	0
116	Brown bullhead	Ictalurus nebulosus	140-199	432	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	432	0
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense	100-119	144	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	58,032	1,440
103	Bay anchovy	Anchoa mitchilli	80-99	288	0
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	140-199	1,440	0
033	Spot	Leiostomus xanthurus	120-139	61,344	432
005	Atlantic croaker	Micropogon undulatus	200-299	576	0
151	Hogchoker	Trinectes maculatus	20-39,40-59	1,152	288
148	Rough silverside	Membras martinica	100-119	144	144
009	Bluefish	Pomatomus saltatrix	200-299	144	0
031	Striped bass	Morone saxatilis	140-199	288	0
007	Weakfish	Cynoscion regalis	140-199,200-299	288	0
003	Summer flounder	Paralichthys dentatus	40-59,200-299	432	0
			TOTAL	125,280	2,304

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 22.6 - 26.1
Salinity Min-Max: 6.0 - 6.6
Survival Percentage: 99 %

Week Of May 22 Through May 28, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	140-199,300-399	432	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	200-299,300-399	576	0
275	Threadfin shad	Dorosoma petenense	80-99	432	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	200-299	144	0
037	Atlantic menhaden	Brevoortia tyrannus	120-139	168,192	1,008
103	Bay anchovy	Anchoa mitchilli	60-79	432	576
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
035	Pumpkinseed	Lepomis gibbosus	120-139	144	0
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	120-139	75,024	0
005	Atlantic croaker	Micropogon undulatus	200-299	144	0
151	Hogchoker	Trinectes maculatus	40-59	2,736	0
030	American shad	Alosa sapidissima	400-499	144	0
148	Rough silverside	Membras martinica	80-99	720	288
009	Bluefish	Pomatomus saltatrix	40-59	432	0
			TOTAL	249,552	1,872

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 23.9 - 24.8
Salinity Min-Max: 7.1 - 7.7
Survival Percentage: 96 %

Week Of May 29 Through June 4, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	120-139	144	0
039	White catfish	Ictalurus catus	140-199	288	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	300-399	144	0
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	103,536	5,616
103	Bay anchovy	Anchoa mitchilli	60-79	1,152	1,440
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	40-59	81,216	1,440
005	Atlantic croaker	Micropogon undulatus	40-59,140-199	288	0
151	Hogchoker	Trinectes maculatus	40-59	5,472	0
052	Carp	Cyprinus carpio	60-79	864	0
009	Bluefish	Pomatomus saltatrix	40-59	720	0
031	Striped bass	Morone saxatilis	20-39	432	0
007	Weakfish	Cynoscion regalis	140-199	288	0
003	Summer flounder	Paralichthys dentatus	200-299	1,152	0
			TOTAL	195,696	8,496

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 20.4 - 26.3
Salinity Min-Max: 5.2 - 8.1
Survival Percentage: 98 %

Week of June 5 Through June 11, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	576	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus	40-59	144	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	308,304	3,600
103	Bay anchovy	Anchoa mitchilli	60-79	3,600	720
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	140-199	288	0
033	Spot	Leiostomus xanthurus	40-59	73,584	2,880
005	Atlantic croaker	Micropogon undulatus	20-39,40-59	864	0
151	Hogchoker	Trinectes maculatus	40-59	58,752	720
052	Carp	Cyprinus carpio	40-59	432	144
009	Bluefish	Pomatomus saltatrix	200-299	576	0
031	Striped bass	Morone saxatilis	20-39,40-59	432	0
003	Summer flounder	Paralichthys dentatus	80-99	864	0
131	Northern pipefish	Syngnathus fuscus	140-199	144	0
			TOTAL	448,848	8,064

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 22.5 - 24.3
Salinity Min-Max: 8.5 - 9.2
Survival Percentage: 98 %

Week Of June 12 Through June 18, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	200-299	432	288
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	60-79	0	144
275	Threadfin shad	Dorosoma petenense	120-139,200-299	576	0
026	Alewife	Alosa pseudoharengus	40-59	864	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	40-59,120-139	103,392	1,152
103	Bay anchovy	Anchoa mitchilli	60-79	1,440	144
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	120-139	144	0
033	Spot	Leiostomus xanthurus	80-99	31,824	0
005	Atlantic croaker	Micropogon undulatus	200-299	144	0
151	Hogchoker	Trinectes maculatus	40-59	9,504	720
196	Atlantic needlefish	Strongylura marina	80-99	432	0
148	Rough silverside	Membras martinica	80-99	1,008	144
204	Crevalle jack	Caranx hippos	40-59	144	0
009	Bluefish	Pomatomus saltatrix	200-299	1,728	0
031	Striped bass	Morone saxatilis	40-59	288	0
003	Summer flounder	Paralichthys dentatus	80-99	432	0
			TOTAL	152,352	2,592

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 24.1 - 27.1
Salinity Min-Max: 8.9 - 9.8
Survival Percentage: 99 %

Week Of June 19 Through June 25, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	120-139	144	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense	140-199	288	0
026	Alewife	Alosa pseudoharengus	40-59	720	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	262,080	2,304
103	Bay anchovy	Anchoa mitchilli	60-79	1,008	0
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	120-139	288	0
033	Spot	Leiostomus xanthurus	60-79	86,112	720
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	40-59	3,168	864
148	Rough silverside	Membras martinica	80-99	576	0
009	Bluefish	Pomatomus saltatrix	200-299	1,584	0
031	Striped bass	Morone saxatilis	40-59	144	0
007	Weakfish	Cynoscion,regalis	200-299	144	0
003	Summer flounder	Paralichthys dentatus	100-119	288	0
			TOTAL	356,544	3,888

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 26.8 - 28.8
Salinity Min-Max: 9.5 - 10.2
Survival Percentage: 99.7 %

Week Of June 26 Through July 2, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	288	0
039	White catfish	Ictalurus catus	140-199	144	0
116	Brown bullhead	Ictalurus nebulosus	40-59,140-199	432	0
108	Golden shiner	Notemigonus crysoleucas	140-199	144	0
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	300-399	144	0
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus	60-79	720	0
027	Blueback herring	Alosa aestivalis	200-299	144	0
037	Atlantic menhaden	Brevoortia tyrannus	40-59	597,024	864
103	Bay anchovy	Anchoa mitchilli	60-79	720	720
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	60-79	110,592	432
005	Atlantic croaker	Micropogon undulatus	200-299	576	0
151	Hogchoker	Trinectes maculatus	40-59	6,768	0
196	Atlantic needlefish	Strongylura marina	80-99	432	0
148	Rough silverside	Membras martinica	80-99	576	0
009	Bluefish	Pomatomus saltatrix	200-299	4,464	0
031	Striped bass	Morone saxatilis	40-59	576	0
007	Weakfish	Cynoscion regalis	140-199	432	0
003	Summer flounder	Paralichthys dentatus	80-99,300-399	288	0
			TOTAL	724,752	2,016

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 27.3 - 29.1
Salinity Min-Max: 9.0 - 10.4
Survival Percentage: 98 %

Week Of July 3 Through July 9, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199,200-299	576	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense			
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	140-199	12,672	144
103	Bay anchovy	Anchoa mitchilli	60-79	2,304	720
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	60-79	78,048	576
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	40-59	1,440	288
052	Carp	Cyprinus carpio	80-99	144	0
148	Rough silverside	Membras martinica	80-99	0	288
009	Bluefish	Pomatomus saltatrix	80-99,200-299	288	0
031	Striped bass	Morone saxatilis	40-59	720	0
007	Weakfish	Cynoscion regalis	40-59,200-299	144	144
003	Summer flounder	Paralichthys dentatus	200-299	432	0
			TOTAL	96,768	2,160

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 27.4 - 30.2
Salinity Min-Max: 8.7 - 10.9
Survival Percentage: 98 %

Week Of July 10 Through July 16, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	100-119,200-299	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	0	288
051	Gizzard shad	Dorosoma cepedianum	100-119	144	0
275	Threadfin shad	Dorosoma petenense	100-119	288	0
026	Alewife	Alosa pseudoharengus	60-79	0	288
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	15,264	576
103	Bay anchovy	Anchoa mitchilli	60-79	2,160	288
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	100-119	288	0
135	Pumpkinseed	Lepomis gibbosus	140-199	0	288
032	White perch	Morone americana	140-199	288	0
033	Spot	Leiostomus xanthurus	80-99	165,888	2,304
005	Atlantic croaker	Micropogon undulatus	100-119	144	0
151	Hogchoker	Trinectes maculatus	40-59	2,304	0
196	Atlantic needlefish	Strongylura marina	100-119	144	0
148	Rough silverside	Membras martinica	40-59,80-99	576	0
136	Bluegill	Lepomis macrochirus	140-199	144	0
031	Striped bass	Morone saxatilis	60-79	576	0
007	Weakfish	Cynoscion regalis	200-299	144	0
144	Naked goby	Gobiosoma bosci	20-39	144	0
003	Summer flounder	Paralichthys dentatus	140-199	144	0
			TOTAL	188,928	4,032

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 28.0 - 31.2
Salinity Min-Max: 9.0 - 10.2
Survival Percentage: 99 %

Week Of July 17 Through July 23, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus	200-299,300-399	432	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	140-199	0	288
051	Gizzard shad	Dorosoma cepedianum	140-199	288	0
275	Threadfin shad	Dorosoma petenense	60-79,80-99	432	0
026	Alewife	Alosa pseudoharengus	60-79	288	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	11,232	288
103	Bay anchovy	Anchoa mitchilli	60-79	2,016	864
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	140-199	288	0
033	Spot	Leiostomus xanthurus	80-99	223,776	1,008
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus			
052	Carp	Cyprinus carpio	60-79	2,016	0
148	Rough silverside	Membras martinica	80-99	0	144
009	Bluefish	Pomatomus saltatrix	200-299	288	0
031	Striped bass	Morone saxatilis	60-79	576	0
007	Weakfish	Cynoscion regalis	40-59	144	0
121	Banded killifish	Fundulus diaphanus	60-79	288	0
003	Summer flounder	Paralichthys dentatus	140-199	144	0
			TOTAL	242,208	2,592

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 25.5 - 27.0
Salinity Min-Max: 9.7 - 12.2
Survival Percentage: 98 %

Week of July 24 Through July 30, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	144	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199	144	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	120-139	1,440	0
275	Threadfin shad	Dorosoma petenense	120-139	144	0
026	Alewife	Alosa pseudoharengus	60-79	144	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	80-99	13,536	432
103	Bay anchovy	Anchoa mitchilli	60-79	6,336	576
149	Tidewater silverside	Menidia beryllina	20-39	288	0
150	Atlantic silverside	Menidia menidia	60-79	1,152	0
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	60-79	144	0
033	Spot	Leiostomus xanthurus	80-99	86,400	576
005	Atlantic croaker	Micropogon undulatus	60-79,100-119	432	0
151	Hogchoker	Trinectes maculatus	40-59	1,872	0
122	Mummichog	Fundulus heteroclitus	40-59	864	0
196	Atlantic needlefish	Strongylura marina	140-199	144	0
009	Bluefish	Pomatomus saltatrix	120-139,300-399	288	0
007	Weakfish	Cynoscion regalis	60-79	288	288
144	Naked goby	Gobiosoma bosci	20-39	576	0
131	Northern pipefish	Syngnathus fuscus	140-199	144	0
011	Harvestfish	Peprilus alepidotus	20-39	144	0
			TOTAL	114,912	1,872

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 27.4 - 28.8
Salinity Min-Max: 11.5 - 12.7
Survival Percentage: 97 %

Week Of July 31, 1977 Through August 6, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	140-199	288	0
275	Threadfin shad	Dorosoma petenense	80-99	1,152	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	15,264	864
103	Bay anchovy	Anchoa mitchilli	60-79	5,040	2,016
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	40-59,80-99	576	0
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	60-79,80-99	88,560	576
005	Atlantic croaker	Micropogon undulatus	120-139	2,736	0
151	Hogchoker	Trinectes maculatus	60-79	288	0
052	Carp	Cyprinus carpio	100-119	288	0
196	Atlantic needlefish	Strongylura marina	140-199	0	144
009	Bluefish	Pomatomus saltatrix	140-199	1,872	0
011	Harvestfish	Peprilus alepidotus	20-39,40-59	864	0
007	Weakfish	Cynoscion regalis	40-59,60-79	1,008	0
		TOTAL		117,936	3,600

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 26.9 - 30.4
Salinity Min-Max: 11.1 - 12.7
Survival Percentage: 99 %

Week Of August 7 Through August 13, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	576	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum			
275	Threadfin shad	Dorosoma petenense	80-99,100-119	288	0
026	Alewife	Alosa pseudoharengus	60-79	144	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	80-99	12,672	144
103	Bay anchovy	Anchoa mitchilli			
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
035	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	131,184	288
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	60-79	144	0
196	Atlantic needlefish	Strongylura marina	200-299	144	288
009	Bluefish	Pomatomus saltatrix	140-199	1,008	144
011	Harvestfish	Peprilus alepidotus	40-59	5,184	0
144	Naked goby	Gobiosoma bosci	20-39	576	0
			TOTAL	151,920	864

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 26.1 - 29.3
Salinity Min-Max: 11.7 - 13.2
Survival Percentage: 98 %

Week Of August 14 Through August 20, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	144	0
051	Gizzard shad	Dorosoma cepedianum	140-199	144	0
275	Threadfin shad	Dorosoma petenense	80-99	1,440	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	7,632	0
103	Bay anchovy	Anchoa mitchilli	20-39	1,008	0
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
035	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	31,248	576
005	Atlantic croaker	Micropogon undulatus	120-139	576	0
151	Hogchoker	Trinectes maculatus			
009	Bluefish	Pomatomus saltatrix	140-199,300-399	288	288
011	Harvestfish	Peprilus alepidotus	40-59	13,680	0
007	Weakfish	Cynoscion regalis	40-59	864	0
144	Naked goby	Gobiosoma bosci	20-39,40-59	1,440	0
131	Northern pipefish	Syngnathus fuscus	100-119	288	0
028	Hickory shad	Alosa mediocris	200-299	0	288
			TOTAL	58,752	1,152

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 23.6 - 27.0
Salinity Min-Max: 12.0 - 13.4
Survival Percentage: 99 %

Week Of August 21 Through August 27, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199	144	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	140-199	144	0
275	Threadfin shad	Dorosoma petenense	80-99	7,056	0
026	Alewife	Alosa pseudoharengus	80-99	288	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	80-99,100-119	19,008	0
103	Bay anchovy	Anchoa mitchilli	60-79	1,728	432
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	60-79	576	0
035	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	73,872	576
005	Atlantic croaker	Micropogon undulatus	120-139	288	0
151	Hogchoker	Trinectes maculatus	40-59	144	0
196	Atlantic needlefish	Strongylura marina	200-299	576	0
204	Crevalle jack	Caranx hippos	40-59	288	0
207	Lookdown	Selene vomer	60-79	288	0
009	Bluefish	Pomatomus saltatrix	140-199,200-299	432	0
011	Harvestfish	Peprilus alepidotus	40-59	14,832	0
007	Weakfish	Cynoscion regalis	40-59	2,732	0
144	Naked goby	Gobiosoma bosci	20-39	864	0
004	Butterfish	Peprilus triacanthus	60-79	144	0
			TOTAL	123,408	1,008

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 26.0 - 27.8
Salinity Min-Max: 11.9 - 12.7
Survival Percentage: 97 %

Week Of August 28 Through September 3, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	120-139,140-199	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	140-199	432	0
275	Threadfin shad	Dorosoma petenense	60-79	1,008	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	80-99	6,912	576
103	Bay anchovy	Anchoa mitchilli	40-59,80-99	0	288
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[illegible]5	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	20,880	144
005	Atlantic croaker	Micropogon undulatus	140-199	288	0
151	Hogchoker	Trinectes maculatus			
011	Harvestfish	Peprilus alepidotus	60-79	2,304	0
064	Atlantic spadefish	Chaetodipterus faber	20-39	144	0
144	Naked goby	Gobiosoma bosci	20-39,40-59	3,600	0
003	Summer flounder	Paralichthys dentatus	200-299	288	0
			TOTAL	36,144	1,008

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 8
Temperature Min-Max: 25.7 - 30.1
Salinity Min-Max: 13.0 - 14.2
Survival Percentage: 98 %

Week Of September 4 Through September 10, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	300-399	288	0
051	Gizzard shad	Dorosoma cepedianum	140-199	864	0
275	Threadfin shad	Dorosoma petenense	80-99	5,040	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	76,752	864
103	Bay anchovy	Anchoa mitchilli	60-79	4,608	1,296
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	60-79	576	0
035	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	40,032	720
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	60-79	2,304	0
148	Rough silverside	Membras martinica	60-79,80-99	144	144
011	Harvestfish	Peprilus alepidotus	40-59	2,448	144
007	Weakfish	Cynoscion regalis	40-59,60-79	576	0
144	Naked goby	Gobiosoma bosci	40-59	864	0
004	Butterfish	Peprilus triacanthus	40-59	144	0
			TOTAL	134,640	3,168

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 23.0 - 25.6
Salinity Min-Max: 13.3 - 14.5
Survival Percentage: 99 %

Week Of September 11 Through September 17, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	140-199	1,152	0
275	Threadfin shad	Dorosoma petenense	80-99	10,944	0
026	Alewife	Alosa pseudoharengus	60-79	144	0
027	Blueback herring	Alosa aestivalis	60-79	144	0
037	Atlantic menhaden	Brevoortia tyrannus	100-119	25,488	288
103	Bay anchovy	Anchoa mitchilli	40-59	4,032	144
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus	120-139	144	0
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	13,968	0
005	Atlantic croaker	Micropogon undulatus	140-199	576	0
151	Hogchoker	Trinectes maculatus	20-39	144	0
122	Mummichog	Fundulus heteroclitus	40-59	2,592	0
148	Rough silverside	Membras martinica	60-79	576	0
009	Bluefish	Pomatomus saltatrix	300-399	144	0
011	Harvestfish	Peprilus alepidotus	40-59	1,296	0
144	Naked goby	Gobiosoma bosci	40-59	432	0
		TOTAL		62,352	432

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 24.7 - 25.8
Salinity Min-Max: 13.3 - 15.4
Survival Percentage: 97 %

[redacted]k Of September 18 Through September 24, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	120-139	576	0
275	Threadfin shad	Dorosoma petenense	80-99	3,168	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	120-139	2,304	0
103	Bay anchovy	Anchoa mitchilli			
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
[redacted]35	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	20,160	1,008
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus			
122	Mummichog	Fundulus heteroclitus	40-59	11,232	0
120	Sheepshead minnow	Cyprinodon variegatus	40-59	144	0
009	Bluefish	Pomatomus saltatrix	200-299	144	0
011	Harvestfish	Peprilus alepidotus	100-119	432	0
144	Naked goby	Gobiosoma bosci	20-39	144	0
071	Northern searobin	Prionotus carolinus	20-39	144	0
[redacted]					
			TOTAL	38,448	1,008

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 22.1 - 26.0
Salinity Min-Max: 13.3 - 16.9
Survival Percentage: 99 %

Week Of September 25 Through October 1, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	120-139	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	140-199	2,304	0
275	Threadfin shad	Dorosoma petenense	80-99	3,888	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	2,736	0
103	Bay anchovy	Anchoa mitchilli	40-59	4,608	288
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	80-99	720	0
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana			
033	Spot	Leiostomus xanthurus	80-99	18,576	0
005	Atlantic croaker	Micropogon undulatus	140-199	288	0
151	Hogchoker	Trinectes maculatus			
052	Carp	Cyprinus carpio	120-139,140-199	288	0
122	Mummichog	Fundulus heteroclitus	40-59	576	0
231	Striped mullet	Mugil cephalus	140-199	144	0
011	Harvestfish	Peprilus alepidotus	80-99	288	0
003	Summer flounder	Paralichthys dentatus	200-299	144	0
071	Northern searobin	Prionotus carolinus	20-39	288	0
			TOTAL	35,136	288

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 18.7 - 21.3
Salinity Min-Max: 12.1 - 15.2
Survival Percentage: 98 %

Week Of October 2 Through October 8, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	720	0
051	Gizzard shad	Dorosoma cepedianum	140-199	288	0
275	Threadfin shad	Dorosoma petenense	80-99	7,776	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	16,848	288
103	Bay anchovy	Anchoa mitchilli	60-79	3,312	144
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia			
035	Pumpkinseed	Lepomis gibbosus	120-139	144	0
032	White perch	Morone americana	140-199	288	0
033	Spot	Leiostomus xanthurus	80-99	4,752	288
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	60-79,80-99	432	0
122	Mummichog	Fundulus heteroclitus	60-79	144	0
148	Rough silverside	Membras martinica	60-79	288	0
009	Bluefish	Pomatomus saltatrix	60-79,200-299	288	0
011	Harvestfish	Peprilus alepidotus	60-79	1,296	0
031	Striped bass	Morone saxatilis	80-99	144	0
007	Weakfish	Cynoscion regalis	200-299	288	0
			TOTAL	37,008	720

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 15.8 - 18.7
Salinity Min-Max: 15.4 - 16.8
Survival Percentage: 98 %

Week Of October 9 Through October 15, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	140-199	1,152	0
275	Threadfin shad	Dorosoma petenense	80-99	4,032	144
026	Alewife	Alosa pseudoharengus	80-99	432	0
027	Blueback herring	Alosa aestivalis			
037	Atlantic menhaden	Brevoortia tyrannus	100-119	61,056	288
103	Bay anchovy	Anchoa mitchilli	60-79	105,120	3,456
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	60-79	2,016	0
035	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	140-199	144	0
033	Spot	Leiostomus xanthurus	80-99	32,976	0
005	Atlantic croaker	Micropogon undulatus	140-199	576	0
151	Hogchoker	Trinectes maculatus	120-139	2,448	0
122	Mummichog	Fundulus heteroclitus	40-59,60-79	864	0
148	Rough silverside	Membras martinica	60-79	576	0
231	Striped mullet	Mugil cephalus	140-199	144	0
009	Bluefish	Pomatomus saltatrix	200-299	720	0
031	Striped bass	Morone saxatilis	140-199	288	0
007	Weakfish	Cynoscion regalis	100-119	144	0
213	Silver perch	Bairdiella chrysura	80-99	144	0
144	Naked goby	Gobiosoma bosci	20-39	1,872	0
003	Summer flounder	Paralichthys dentatus	200-299	288	0
216	Pinfish	Lagodon rhomboides	140-199	288	0
152	Blackcheek tonguefish	Symphurus plagiusa	80-99	0	144
			TOTAL	215,568	4,032

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 13.1 - 15.3
Salinity Min-Max: 13.0 - 15.6
Survival Percentage: 99 %

Week Of October 16 Through October 22, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	140-199	144	0
051	Gizzard shad	Dorosoma cepedianum	140-199	3,744	0
275	Threadfin shad	Dorosoma petenense	80-99	39,600	1,008
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	1,296	0
037	Atlantic menhaden	Brevoortia tyrannus	80-99	73,728	1,008
103	Bay anchovy	Anchoa mitchilli	40-59	13,824	144
149	Tidewater silverside	Menidia beryllina	40-59	720	0
150	Atlantic silverside	Menidia menidia	80-99	2,304	0
035	Pumpkinseed	Lepomis gibbosus	60-79	288	0
032	White perch	Morone americana	140-199	2,160	0
033	Spot	Leiostomus xanthurus	80-99	59,904	288
005	Atlantic croaker	Micropogon undulatus	40-59	144	0
151	Hogchoker	Trinectes maculatus	80-99	2,304	0
122	Mummichog	Fundulus heteroclitus	60-79	1,872	0
148	Rough silverside	Membras martinica	60-79	720	288
011	Harvestfish	Peprilus alepidotus	80-99	1,152	0
031	Striped bass	Morone saxatilis	60-79,200-299	432	0
003	Summer flounder	Paralichthys dentatus	120-139	288	0
007	Weakfish	Cynoscion regalis	100-119	288	0
071	Northern searobin	Prionotus carolinus	40-59	144	0
			TOTAL	205,056	2,736

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 15.0 - 17.1
Salinity Min-Max: 11.7 - 15.0
Survival Percentage: 94 %

Week Of October 23 Through October 29, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	140-199,200-299	576	0
051	Gizzard shad	Dorosoma cepedianum	140-199	144	0
275	Threadfin shad	Dorosoma petenense	80-99	10,224	1,152
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	1,440	144
037	Atlantic menhaden	Brevoortia tyrannus	100-119	43,056	2,304
103	Bay anchovy	Anchoa mitchilli	40-59,60-79	10,656	1,872
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	80-99	1,296	0
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	140-199	576	0
033	Spot	Leiostomus xanthurus	80-99	27,792	288
005	Atlantic croaker	Micropogon undulatus	140-199	432	0
151	Hogchoker	Trinectes maculatus	40-59	144	0
122	Mummichog	Fundulus heteroclitus	60-79	2,736	0
148	Rough silverside	Membras martinica	60-79	2,592	144
009	Bluefish	Pomatomus saltatrix	200-299	2,160	0
007	Weakfish	Cynoscion regalis	100-119	7,056	432
144	Naked goby	Gobiosoma bosci	40-59	144	0
003	Summer flounder	Paralichthys dentatus	200-299	0	288
058	Spotted seatrout	Cynoscion nebulosus	200-299	144	0
071	Northern searobin	Prionotus carolinus	40-59	144	0
238	Orange filefish	Aluterus schoepfi	40-59	432	0
			TOTAL	111,744	6,624

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 14.9 - 17.0
Salinity Min-Max: 10.8 - 12.9
Survival Percentage: 97 %

Week Of October 30 Through November 5, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	288	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	576	0
051	Gizzard shad	Dorosoma cepedianum	120-139,200-299	1,008	144
275	Threadfin shad	Dorosoma petenense	80-99	17,568	288
026	Alewife	Alosa pseudoharengus	80-99	288	0
027	Blueback herring	Alosa aestivalis	60-79	288	0
037	Atlantic menhaden	Brevoortia tyrannus	100-119	21,456	0
103	Bay anchovy	Anchoa mitchilli	60-79	2,880	432
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	80-99	1,008	0
035	Pumpkinseed	Lepomis gibbosus	80-99	576	0
032	White perch	Morone americana	140-199	0	144
033	Spot	Leiostomus xanthurus	80-99	6,048	144
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	120-139	720	0
122	Mummichog	Fundulus heteroclitus	60-79	7,632	0
120	Sheepshead minnow	Cyprinodon variegatus	40-59	288	0
148	Rough silverside	Membras martinica	60-79	3,744	576
009	Bluefish	Pomatomus saltatrix	120-139,140-199	576	0
231	Striped mullet	Mugil cephalus	140-199	288	0
011	Harvestfish	Peprilus alepidotus	80-99	144	0
351	Gray snapper	Lutjanus griseus	120-139	144	0
007	Weakfish	Cynoscion regalis	80-99,120-139	288	0
			TOTAL	65,808	1,728

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 17.2 - 18.7
Salinity Min-Max: 3.5 - 10.8
Survival Percentage: 99 %

Week Of November 6 Through November 12, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	288	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata			
051	Gizzard shad	Dorosoma cepedianum	80-99	288	0
275	Threadfin shad	Dorosoma petenense	80-99	18,144	0
026	Alewife	Alosa pseudoharengus	80-99,100-119	2,016	0
027	Blueback herring	Alosa aestivalis	60-79	2,016	576
037	Atlantic menhaden	Brevoortia tyrannus	100-119	71,424	288
103	Bay anchovy	Anchoa mitchilli	40-59	2,736	432
149	Tidewater silverside	Menidia beryllina	60-79	0	144
150	Atlantic silverside	Menidia menidia	60-79	720	0
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	120-139	8,928	0
033	Spot	Leiostomus xanthurus	80-99	18,144	288
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	100-119	864	0
122	Mummichog	Fundulus heteroclitus	60-79	124,272	576
148	Rough silverside	Membras martinica	60-79	1,440	0
031	Striped bass	Morone saxatilis	60-79,140-199	576	0
351	Gray snapper	Lutjanus griseus	80-99	144	0
007	Weakfish	Cynoscion regalis	80-99	288	0
144	Naked goby	Gobiosoma bosci	20-39	144	0
003	Summer flounder	Paralichthys dentatus	140-199	288	0
105	Chain pickerel	Esox niger	300-399	288	0
			TOTAL	253,008	2,304

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5
Temperature Min-Max: 11.4 - 14.2
Salinity Min-Max: 2.2 - 3.0
Survival Percentage: 98 %

Week Of November 13 Through November 19, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	2,592	0
039	White catfish	Ictalurus catus	200-299	144	0
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	1,584	0
051	Gizzard shad	Dorosoma cepedianum	120-139	3,456	0
275	Threadfin shad	Dorosoma petenense	60-79	25,776	288
026	Alewife	Alosa pseudoharengus	60-79,80-99	432	0
027	Blueback herring	Alosa aestivalis	60-79	16,992	144
037	Atlantic menhaden	Brevoortia tyrannus	100-119	5,184	0
103	Bay anchovy	Anchoa mitchilli	40-59	3,744	1,296
149	Tidewater silverside	Menidia beryllina			
150	Atlantic silverside	Menidia menidia	80-99	288	144
135	Pumpkinseed	Lepomis gibbosus	60-79	1,008	0
032	White perch	Morone americana	80-99	33,840	288
033	Spot	Leiostomus xanthurus	80-99	33,552	720
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	40-59,100-119	576	0
052	Carp	Cyprinus carpio	100-119	144	0
122	Mummichog	Fundulus heteroclitus	60-79	34,704	0
136	Bluegill	Lepomis macrochirus	40-59	576	0
031	Striped bass	Morone saxatilis	120-139	144	0
		TOTAL		164,736	2,880

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5
Temperature Min-Max: 11.1 - 12.1
Salinity Min-Max: 2.9 - 4.5
Survival Percentage: 97 %

ek Of November 20 Through November 26, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	576	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	120-139	3,312	0
275	Threadfin shad	Dorosoma petenense	60-79	3,744	0
026	Alewife	Alosa pseudoharengus	80-99	288	0
027	Blueback herring	Alosa aestivalis	60-79	7,344	576
037	Atlantic menhaden	Brevoortia tyrannus	100-119	4,464	0
103	Bay anchovy	Anchoa mitchilli	40-59	10,080	1,440
149	Tidewater silverside	Menidia beryllina	60-79	288	0
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus	80-99	288	0
032	White perch	Morone americana	60-79	8,064	0
033	Spot	Leiostomus xanthurus	80-99	15,264	0
005	Atlantic croaker	Micropogon undulatus			
151	Hogchoker	Trinectes maculatus	60-79	720	0
136	Bluegill	Lepomis macrochirus	60-79	288	0
144	Naked goby	Gobiosoma bosci	20-39	288	0
122	Mummichog	Fundulus heteroclitus	40-59	1,296	0
			TOTAL	56,592	2,016

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 5
Temperature Min-Max: 7.6 - 9.3
Salinity Min-Max: 1.7 - 4.3
Survival Percentage: 96 %

Week Of November 27 Through December 3, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	144	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	288	0
051	Gizzard shad	Dorosoma cepedianum	100-119	7,056	144
275	Threadfin shad	Dorosoma petenense	60-79	7,488	288
026	Alewife	Alosa pseudoharengus	80-99	144	0
027	Blueback herring	Alosa aestivalis	60-79	9,792	720
037	Atlantic menhaden	Brevoortia tyrannus	100-119	10,368	0
103	Bay anchovy	Anchoa mitchilli	40-59	5,184	288
149	Tidewater silverside	Menidia beryllina	60-79	1,296	0
150	Atlantic silverside	Menidia menidia	80-99	144	0
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	80-99	43,488	2,448
033	Spot	Leiostomus xanthurus	80-99	37,584	576
005	Atlantic croaker	Micropogon undulatus	40-59,60-79	288	288
151	Hogchoker	Trinectes maculatus	60-79	864	0
122	Mummichog	Fundulus heteroclitus	60-79	720	0
136	Bluegill	Lepomis macrochirus	40-59	144	0
031	Striped bass	Morone saxatilis	80-99	144	0
			TOTAL	125,136	4,752

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 6
Temperature Min-Max: 6.0 9.7
Salinity Min-Max: 1.0 3.2
Survival Percentage: 96 %

ek Of December 4 Through December 10,1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus	200-299	144	0
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus	140-199	288	0
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	864	0
051	Gizzard shad	Dorosoma cepedianum	100-119	17,712	144
275	Threadfin shad	Dorosoma petenense	60-79	3,888	288
026	Alewife	Alosa pseudoharengus	80-99	144	0
027	Blueback herring	Alosa aestivalis	60-79	16,416	144
037	Atlantic menhaden	Brevoortia tyrannus	100-119	8,352	144
103	Bay anchovy	Anchoa mitchilli	40-59	4,320	2,016
149	Tidewater silverside	Menidia beryllina	60-79	576	576
150	Atlantic silverside	Menidia menidia	80-99	1,872	0
35	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	80-99	46,368	864
033	Spot	Leiostomus xanthurus	80-99	19,152	288
005	Atlantic croaker	Micropogon undulatus	40-59	1,008	144
151	Hogchoker	Trinectes maculatus	40-59 80-99	576	0
122	Mummichog	Fundulus heteroclitus	60-79	2,736	0
120	Sheepshead minnow	Cyprinodon variegatus	40-59	144	0
031	Striped Bass	Morone saxatilis	120-139	288	0
			TOTAL	124,848	4,608

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 4.8 - 6.8
Salinity Min-Max: 1.1 - 3.4
Survival Percentage: 92 %

ek Of December 11 Through December 17, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	500+	144	0
051	Gizzard shad	Dorosoma cepedianum	100-119	15,408	864
275	Threadfin shad	Dorosoma petenense	60-79	4,608	576
026	Alewife	Alosa pseudoharengus	100-119	432	0
027	Blueback herring	Alosa aestivalis	60-79	61,920	2,016
037	Atlantic menhaden	Brevoortia tyrannus	100-119	144	144
103	Bay anchovy	Anchoa mitchilli	60-79	576	0
149	Tidewater silverside	Menidia beryllina	60-79	576	0
150	Atlantic silverside	Menidia menidia	80-99	720	144
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	80-99	31,392	5,616
033	Spot	Leiostomus xanthurus	80-99	2,160	0
005	Atlantic croaker	Micropogon undulatus	20-39	720	288
151	Hogchoker	Trinectes maculatus	40-59	0	288
231	Striped mullet	Mugil cephalus	140-199	288	0
122	Mummichog	Fundulus heteroclitus	80-99	0	144
			TOTAL	119,088	10,080

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 6.1 - 7.3
Salinity Min-Max: 1.4 - 4.2
Survival Percentage: 98 %

Week Of December 18 Through December 24, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	300-399	288	0
051	Gizzard shad	Dorosoma cepedianum	120-139	22,320	288
275	Threadfin shad	Dorosoma petenense	60-79	4,752	576
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	16,992	432
037	Atlantic menhaden	Brevoortia tyrannus	80-99	9,360	144
103	Bay anchovy	Anchoa mitchilli	40-59	288	144
149	Tidewater silverside	Menidia beryllina	60-79	1,440	288
150	Atlantic silverside	Menidia menidia	80-99	3,312	288
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	80-99	102,240	288
033	Spot	Leiostomus xanthurus	80-99	4,752	144
005	Atlantic croaker	Micropogon undulatus	40-59	2,592	144
151	Hogchoker	Trinectes maculatus	60-79,80-99	432	0
				168,768	2,736

SURRY POWER STATION
LOW LEVEL WEEKLY REPORT

Ave. No. Circ. Pumps: 7
Temperature Min-Max: 4.1 - 4.5
Salinity Min-Max: 0.8 - 1.0
Survival Percentage: 94 %

Week Of December 25 Through December 31, 1977

VIMS CODE	COMMON NAME	SCIENTIFIC NAME	MODAL SIZE (mm)	ALIVE	DEAD
040	Channel catfish	Ictalurus punctatus			
039	White catfish	Ictalurus catus			
116	Brown bullhead	Ictalurus nebulosus			
108	Golden shiner	Notemigonus crysoleucas			
110	Spottail shiner	Notropis hudsonius			
060	American eel	Anguilla rostrata	200-299	720	0
051	Gizzard shad	Dorosoma cepedianum	100-119	10,944	576
275	Threadfin shad	Dorosoma petenense	60-79	1,296	0
026	Alewife	Alosa pseudoharengus			
027	Blueback herring	Alosa aestivalis	60-79	4,752	432
037	Atlantic menhaden	Brevoortia tyrannus	80-99	288	0
103	Bay anchovy	Anchoa mitchilli	40-59	0	432
149	Tidewater silverside	Menidia beryllina	60-79	288	0
150	Atlantic silverside	Menidia menidia			
135	Pumpkinseed	Lepomis gibbosus			
032	White perch	Morone americana	60-79	8,352	288
033	Spot	Leiostomus xanthurus	80-99	432	0
005	Atlantic croaker	Micropogon undulatus	40-59	432	144
151	Hogchoker	Trinectes maculatus	60-79	288	0
231	Striped mullet	Mugil cephalus	200-299	144	0
			TOTAL	27,936	1,872

Appendix 3.0

ECOLOGICAL STUDY
OF THE TIDAL SEGMENT OF THE
JAMES RIVER ENCOMPASSING HOG POINT
1977 Final Technical Report*

Plankton, Benthos, and Fouling
Organism Sections

by

R. A. Jordan, P. A. Goodwin,
R. K. Carpenter, C. E. Sutton

Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

February, 1978

*Study Sponsored by the Virginia Electric and Power Company

Contents

List of Tables

TEXT

TEXT (cont.)

List of Tables (cont.)

Appendix A

List of Tables (cont.)

Appendix B

List of Tables (cont.)

Appendix C

List of Figures

Introduction

The Surry Power Station, operated by the Virginia Electric and Power Company, is located on a peninsula that extends into the James River on its south shore. The tip of the peninsula is known as Hog Point, and it is approximately 30 miles (48 km) upstream from Chesapeake Bay and 50 miles (80 km) downstream from Richmond (Fig. 1). The section of the river bordering this peninsula is the transition zone between fresh water and saline water, where the salinities encountered are near the tolerance minima for most estuarine and marine species and near the tolerance maxima for freshwater species. Therefore, the biological community consists of a few resident species that can tolerate the entire range of conditions, and of visitors from upstream that can survive until their tolerance limits are exceeded. The region is biologically significant mainly as a nursery ground and migration corridor for fish species that are harvested elsewhere. The fish populations in the vicinity of the power station have been monitored by VEPCO personnel. VIMS was engaged by VEPCO to monitor the lower trophic levels, including the phytoplankton, zooplankton, benthic macro-invertebrates and fouling organisms. The monitoring study has been in progress since May, 1969, and intensified sampling programs for phytoplankton and zooplankton were conducted in the years 1975 through 1977. The present report covers the study period January through

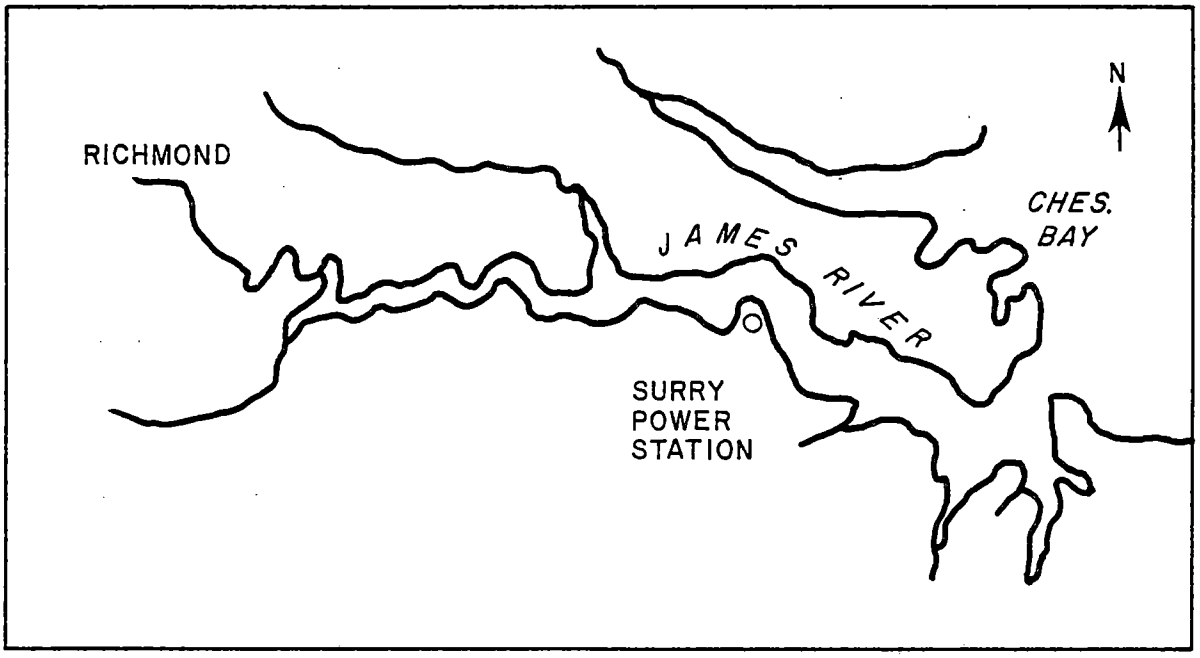

Figure 1. Location of the Surry Power Station.

December 1977.

The first of the two units of the power plant began commercial operation in December 1972, the second in May 1973. Together they require a cooling water flow of $106 m^3 sec^{-1}$, which is pumped from the river on the downstream side of the peninsula into a 2.74 km long elevated intake canal in which it flows by gravity for approximately 33 minutes to the power plant (Fig. 2). The water then flows by gravity through the condensers, where its temperature is raised a maximum of 8.3°C, into a 1 km long sea level discharge canal which has a time of passage of approximately 28 minutes. The cooling water encounters a constriction at the discharge canal mouth, which boosts its velocity to 1.8 $m.sec^{-1}$, causing turbulent mixing of the cooling water with the river water. On ebbing tides the plume hugs the shore downstream from the discharge and elongates, while on flooding tides it is oriented upstream and remains more compact.

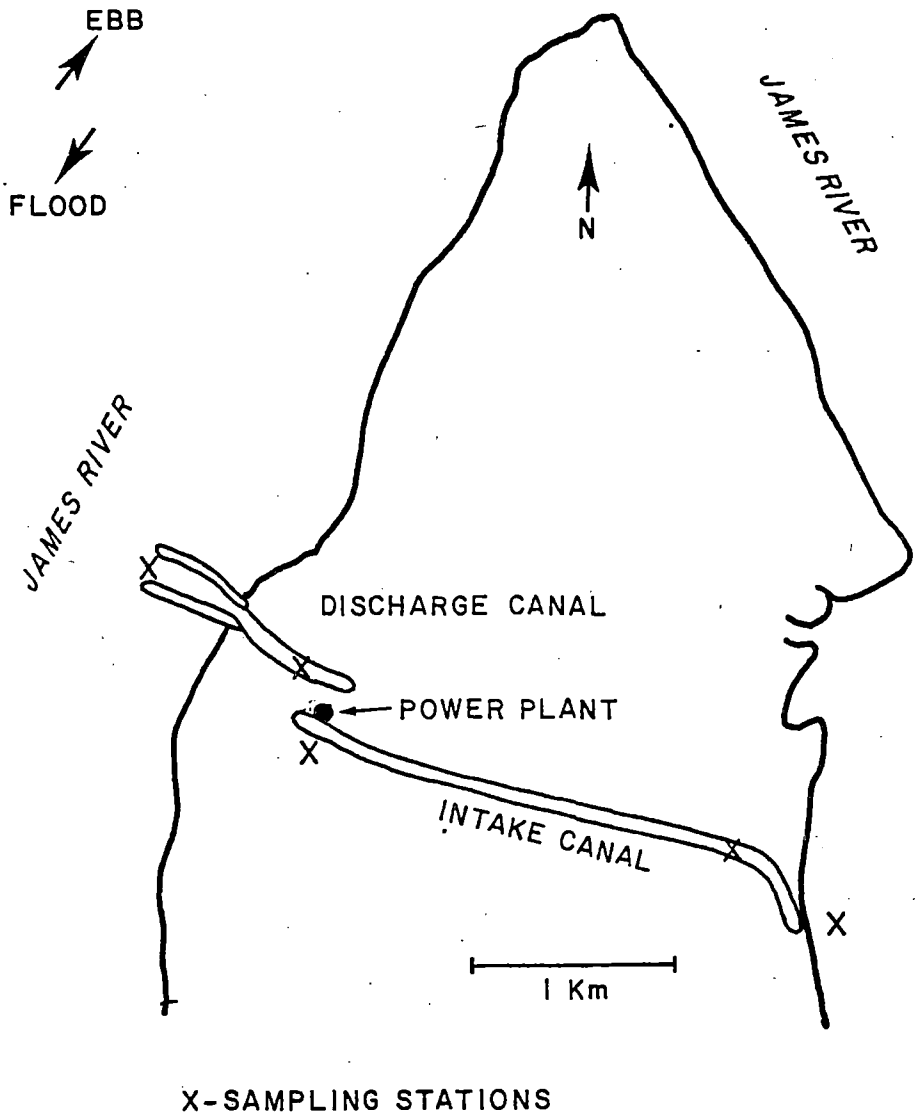

Figure 2. Surry Power Station cooling water canal system showing in-plant sampling stations.

Methods

Station Locations

Table 1 and Figure 3 show the locations of the phytoplankton and zooplankton sampling stations used in the river study. The intake canal was sampled at its upstream and downstream ends, while the discharge canal was sampled near the highway bridge about 0.8 km upstream from the canal mouth (Fig. 2). The benthos and fouling plate stations are shown in Table 2 and Figure 4.

Sampling and Sample Analysis Methods

Phytoplankton samples were accompanied by samples for determinations of chlorophyll a concentration, salinity, and dissolved oxygen concentration. Water temperature and Secchi Disk transparency were measured at each station. 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.

Table 1

Plankton Sampling Station Locations

Station	Depth (m)	Location
DWS	2	Adjacent to tower (QK Fl Lt "A")
Intake	1 8	Outside intake forebay - zooplankton sampling Inside intake forebay - phytoplankton sampling
HPS	5	Adjacent to tower (QK Fl Lt "C")
HPW3	2.5	Adjacent to tower (QK Fl Lt "D")
HPW2	3	Adjacent to tower (QK Fl Lt "E")
HPW1	1	Off west shore of Hog Point, midway between HPS and discharge
Discharge	2.5	Discharge canal mouth
CBE	1	Off west shore of Gravel Neck, south of discharge
CBC	3	Midway between discharge and range markers near Cobham Wharf
JI	8	Adjacent to tower (QK Fl Lt "G")
Intake Canal Uptake and Downstream		Within Surry power plant intake canal (sampled by VEPCO personnel)
Discharge Canal		Within Surry power plant discharge canal (sampled by VEPCO personnel)

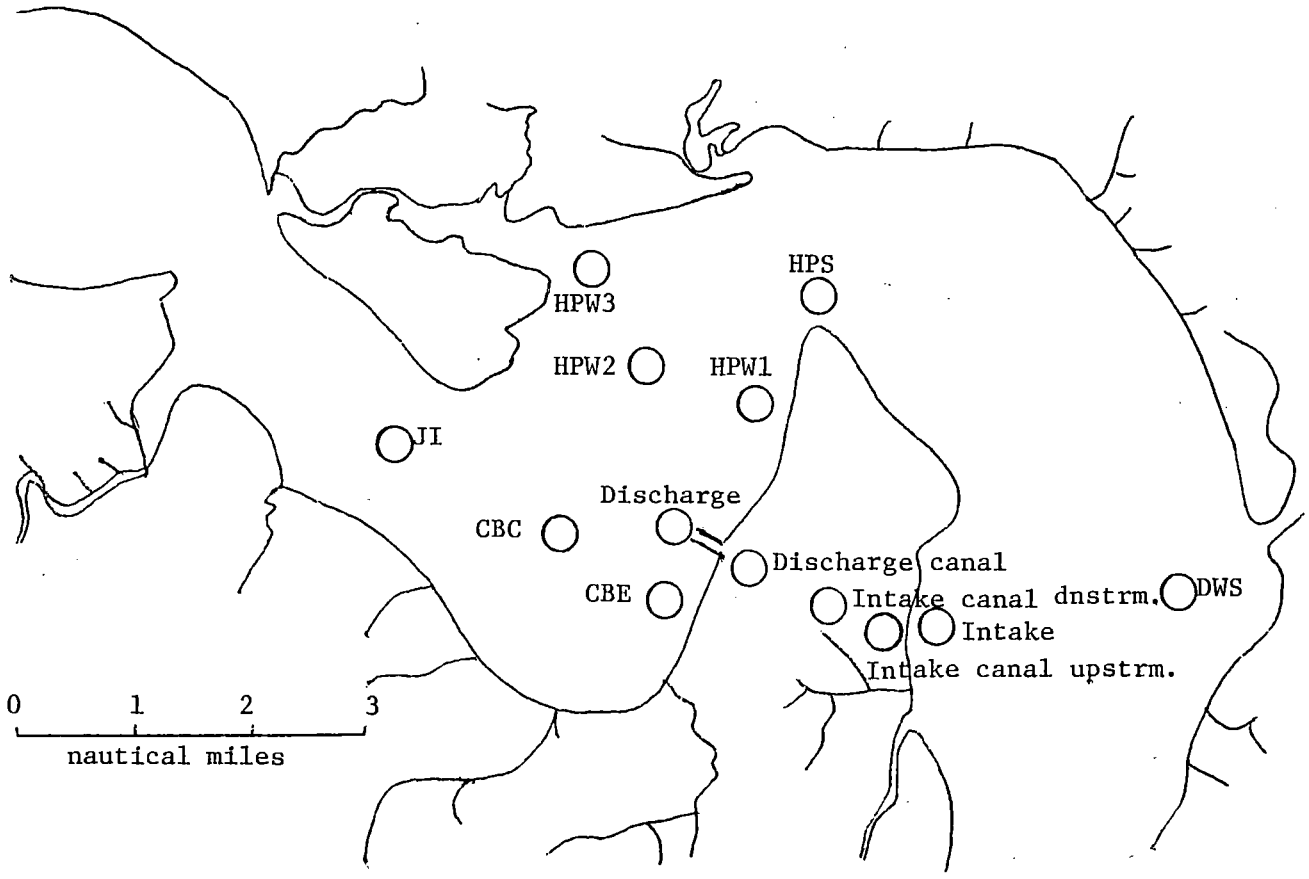

Figure 3. Plankton sampling stations

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")

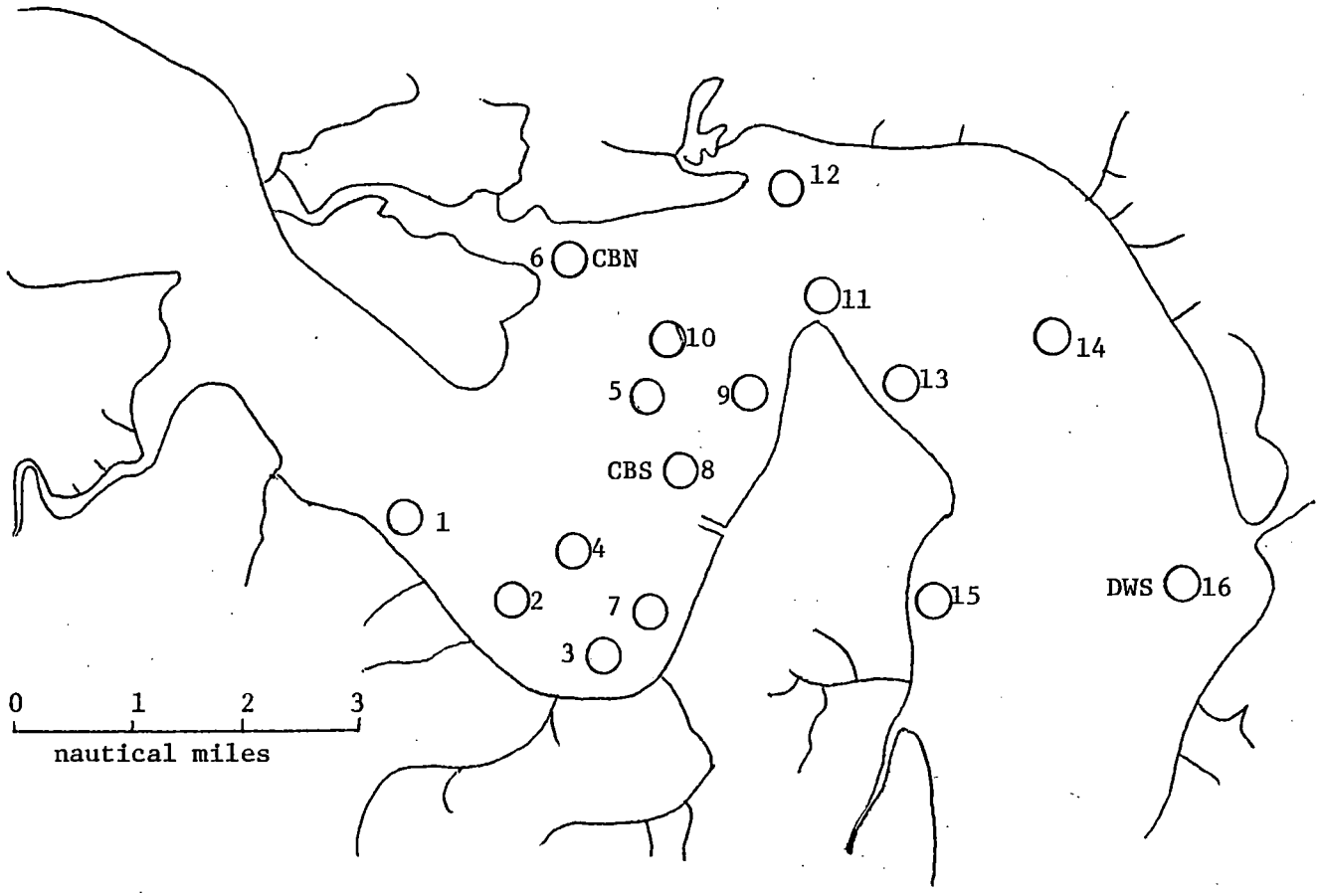

Figure 4. Benthos and fouling plate stations.

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 Olympus 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 sieved through 1.0 mm and 0.5 mm mesh screens, 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 from a VEPCO instrument tower located at each station, one pair being replaced bi-monthly, the other pair yearly. The attached organisms were preserved by freezing, and were 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.

Sampling Design

The sampling dates, stations, and biological parameters sampled are shown in Table 3. Phytoplankton and zooplankton samples for investigation of entrainment effects were taken in the intake and discharge canals by Surry Power Plant personnel. In all months except May and July these samples were obtained on the same day as the river samples. In May the canal samples were taken one day later than the river samples. In July the canal samples were taken nine days late, so additional sets of samples were taken in the river at the plant intake and discharge to provide a complete entrainment series. In January only phytoplankton samples were taken at the upstream end of the intake canal. In all, eight complete plankton runs, including replicated sampling of surface phytoplankton, chlorophyll a, and zooplankton at ten river stations and of phytoplankton and zooplankton at at least two canal stations, were performed during the study year.

Benthos sampling was performed quarterly during the winter, spring, and fall, and monthly during the summer. The winter sampling run was originally scheduled for January, but could not be performed until March 8 due to ice cover at some of the inshore stations. Two samples were taken per station per sampling run.

All of the fouling plates were destroyed by river ice

Table 3

Summary of Biological Sampling Effort; sampling dates, stations sampled, and types of samples taken (Ph = phytoplankton, C = chlorophyll a, Z = zooplankton, B = benthos, F = fouling organisms)

	Date (1977)								
Plankton Stations	2 - 23	4 - 13	5 - 12	6 - 13	7 - 12	7 - 21	8 - 16	9 - 6	11 - 9
DWS	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
Intake	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z
HPS	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
HPW3	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
HPW2	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
HPW1	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
Discharge	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z
CBE	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
CBC	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
JI	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z	Ph,C,Z		Ph,C,Z	Ph,C,Z	Ph,C,Z
Intake Canal Upstrm.	Ph	Ph,Z	Ph,Z	Ph,Z		Ph,Z	Ph,Z	Ph,Z	Ph,Z
Intake Canal Dnstrm.	Ph,Z	Ph,Z	Ph,Z	Ph,Z		Ph,Z	Ph,Z	Ph,Z	Ph,Z
Discharge canal	Ph,Z	Ph,Z	Ph,Z	Ph,Z		Ph,Z	Ph,Z	Ph,Z	Ph,Z

Table 3 (continued)

Benthos Stations	Date (1977) 3 - 8	4 - 25	6 - 20	7 - 14	8 - 18	10 - 20
1	B	B	B	B	B	B
2	B	B	B	B	B	B
3	B	B	B	B	B	B
4	B	B	B	B	B	B
5	B	B	B	B	B	B
6	B	B	B	B	B	B
7	B	B	B	B	B	B
8	B	B	B	B	B	B
9	B	B	B	B	B	B
10	B	B	B	B	B	B
11	B	B	B	B	B	B
12	B	B	B	B	B	B
13	B	B	B	B	B	B
14	B	B	B	B	B	B
15	B	B	B	B	B	B
16	B	B	B	B	B	B

Fouling Plate Stations	Date (1977) 4 - 25	6 - 20	8 - 16	10 - 31	12 - 30
DWS	F	F		F	F
CBN	F	F	F	F	F
CBS	F	F		F	F

in January. New sets of plates were installed at the three stations on March 8, and the spring bimonthly plates were taken from these sets on April 25. Complete sets of samples were recovered from each station on June 20, and included horizontal and vertical bimonthly plates, incubated since April 25, and horizontal and vertical "annual" plates, incubated since March 8. In August the plates at stations DWS and CBS were found to have separated from the instrument towers, and they could not be located by dragging the river bottom with a grappling hook or by diving in the vicinities of the towers. New sets of plates were installed at these stations on September 12.

Data Presentation and Analysis

The raw data for each section of the study are presented in an appendix. Most of the plankton data have been subjected to an analysis of variance, followed by Student-Newman-Keuls' test (Steel and Torrie, 1960) to identify significant differences among sampling stations. Log or square root transformations were performed when necessary to normalize the data prior to analysis. Within the body of the report, data summaries are presented, which include parameter means and which depict differences that are significant at at least the .05 level.

The benthos data presented in this report include only the organisms recovered on the 1.0 mm mesh screen, which is the sieving device that was used in all preceding years of the study. The data for the 0.5 mm sieve organisms will be

included in a subsequent report.

Results - Plankton Studies

Data Presentation

The hydrographic data for the plankton sampling runs are presented in Appendix Table A1. The raw biological data are in appendix B, Table B1 (chlorophyll a), Table B2 (total phytoplankton cell counts), Tables B3-B11 (phytoplankton species cell counts), and Tables B12-B20 (zooplankton counts). The river tidal and water temperature conditions on the plankton sampling dates are summarized in Table 4, while the phytoplankton and zooplankton analysis of variance results are presented in Tables 5-22.

Phytoplankton Distribution Patterns

On the phytoplankton ANOVA summary tables (Tables 5-13) station means for chlorophyll a, total cell counts, and individual species cell counts are listed in ascending order. Means not sharing an underline are significantly different at the .05 level according to Student-Newman-Keuls' test.

Examination of the phytoplankton ANOVA results reveals eight distinct spatial distribution patterns. The first of these is an apparent uniform distribution throughout the study area, with no evident power plant effect (for example, 8μ Chroomonas sp. in February).

Distribution patterns involving the study area as a whole include a general increase in abundance from the

Table 4

Environmental Conditions During Plankton Sampling Runs, 1977

Date	Tide	Discharge Temp. minus Intake Temp. (°C)	Discharge Surface Temp. (°C)	No. of Power Plant Units Operating	Stations Affected by Plume
Feb. 23	Flood	7.8	13.20	1	CBE,HPW1,HPS
Apr. 13	HWS - Ebb	5.1	22.10	1	CBE,HPW1
May 12	Ebb	5.2	23.10	1	CBE,HPW1,HPS
June 13	HWS - Ebb	7.9	30.80	2	CBE,HPW1
July 12	Ebb	5.2	33.80	1	CBE,HPW1
July 21	LWS - Flood	4.9	34.90	1	
Aug. 16	Flood	7.9	37.30	2	CBE,HPW1
Sept. 6	Ebb	5.4	36.20	1	CBE,HPW1,HPS
Nov. 9	Ebb	7.5	26.90	2	CBE,HPW1,HPS

upstream to the downstream stations (chlorophyll a, total cells, Chaetoceros sp., Skeletonema costatum, and Asterionella japonica in February), and the opposite pattern, a decrease with progression from upstream to downstream (Nitzschia vermicularis, Amphiprora sp., Asterionella formosa in February; total cells, Melosira subsalsa, Nitzschia Kutzingiana in May; 8u Chroomonas sp., 16μ Chroomonas sp., Katodinium rotundatum in June; Skeletonema costatum in July; 8μ Chroomonas sp., 16μ Chroomonas sp., 3μ flagellate in September; Skeletonema costatum in November). The months in which the upstream-downstream zonation of phytoplankton abundance was observed were those in which upstream-downstream salinity ranges of at least 5 ppt were present (Table A1). In April, when the entire study area was occupied by essentially fresh water and in August, when the salinity range was approximately 3 ppt, there were significant differences in phytoplankton populations among the river stations but there were no distinct upstream-downstream trends.

A number of the spatial distributions indicated essentially uniform abundance throughout the study area, with the exception of one or two stations where population levels were significantly higher than at most of the remaining stations. The exceptional stations included HPW3 (chlorophyll a, total cells, Melosira subsalsa, Melosira ambigua in April; Katodinium rotundatum, Pyramimonas sp. in June), CBE (8μ Chroomonas sp., Cryptomonas sp. in April; 8 μ Chroomonas sp., Ankistrodesmus sp.,

Rhizosolenia minima in June), DWS (8μ Chroomonas sp. in April, Leptocylindrus minimus in July), HPW2 (16μ Chroomonas sp., Katodinium rotundatum in July), and CBC (8μ Chroomonas sp., Rhizosolenia minima in September). Of these stations, HPW3, CBE, and DWS are near creek mouths, where relatively high productivity and population levels have been observed in previous study years (Jordan et al. 1976, 1977). The fact that the exceptionally high populations were found at these stations for sampling runs that were performed during ebbing tides (Table 4) supports the hypothesis that the creek drainage contributed organisms or nutrients to the plankton populations at these stations.

The remaining four distribution patterns relate to the Surry Power Station and its influence on the phytoplankton community in the vicinity of Hog Point. The first of these patterns involves the loss of phytoplankton from the river water passed through the power plant cooling water canals and condensers. This was observed in June (Katodinium rotundatum, total cells, chlorophyll a), July (16μ Chroomonas sp.), August (8μ Chroomonas sp., 16μ Chroomonas sp., Katodinium rotundatum), and September (8μ Chroomonas sp., Katodinium rotundatum). The species affected were flagellates, removal was detected only for sampling runs conducted when discharge water temperatures exceeded 30°C (Table 4), and reduced population levels of the affected species were not

observed in the river beyond the immediate vicinity of the discharge canal mouth.

The power plant occasionally contributed phytoplankton to the upstream side of Hog Point (Skeletonema costatum, Asterionella japonica in February; Nitzschia vermicularis in April; Gyrosigma beaufortianum in August and September; Amphiprora sp. in November). Nitzschia vermicularis and Gyrosigma beaufortianum are large pennate diatoms that were probably swept up from the river bottom in the shallow area adjacent to the power plant intake and transported in suspension through the intake and discharge canals.

In several cases the transport process resulted in reduced population levels of certain species on the upstream side of Hog Point, when the cooling water taken in was poorer in phytoplankton than was the upstream receiving water. This pattern was observed for Amphiprora sp. and Asterionella formosa in February; Melosira ambigua and Synedra ulna in April; and total cells, Melosira subsalsa, and Nitzschia kützingiana in May.

Finally, there was one species, Nitzschia longissima, that was exceptionally abundant in the power plant canals during three of the sampling runs (July 21, August, and September).

Zooplankton Distribution Patterns

The zooplankton ANOVA results (Tables 14-22) are presented

according to the same format as were the phytoplankton results, with population density means in ascending order and underlines joining means that are not significantly different (.05 level). Five patterns, in addition to uniform distribution throughout the study area, are apparent.

A general decrease in abundance from upstream to downstream was observed for copepod nauplii, Eurytemora sp., and cyclopoid copepods in February; rotifers in May and June; and Eurytemora sp. in November. Stations with exceptionally high population densities of one or more zooplankton organisms included HPW3 (polychaete larvae and pelecypod larvae in May), HPS (barnacle nauplii in June), CBE (polychaete larvae and pelecypod larvae in July), and CBC (Eurytemora sp. and Acartia sp. in July). On one sampling date (September 6) the stations on the upstream side of Hog Point exhibited denser populations of pelecypod larvae than did the stations further upstream or downstream.

The power plant effects that appeared in the zooplankton spatial distributions included release of meroplankton into the river water passing through the cooling water canals (barnacle nauplii in April and September) and transport of organisms from the downstream side to the upstream side of Hog Point (polychaete larvae in April; barnacle nauplii in May, August, and November; and polychaete larvae in August).

Table 5

James River Phytoplankton ANOVA Summary 2-23-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl *a* ($\mu g \cdot l^{-1}$)	CBE	JI	CBC	HPW3	HPW2	HPW1	DWS	Dis.	Int.	HPS			
	3.2	5.2	5.2	5.6	5.6	6.0	6.4	7.6	9.6	10.2			
Total cells ($cells \cdot ml^{-1}$)	JI	CBC	HPW2	HPW3	CBE	HPW1	HPS	DWS	Dis.	ICD	DC	Int.	ICU
	1050	2250	2400	2625	2700	2950	3525	4400	4800	5750	5850	5850	7050
8μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	Int.	ICD	CBE	HPW3	HPW1	ICU	CBC	DWS	HPW2	Dis.	DC	JI	HPS
	13	13	20	26	26	26	26	26	32	32	39	46	65
16μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	DWS	CBC	CBE	HPS	HPW3	HPW1	HPW2	ICD	Dis.	JI	Int.	ICU	DC
	0	0	6	13	13	13	20	20	20	20	32	39	64
Cryptomonas sp. ($cells \cdot ml^{-1}$)	JI	HPW3	HPW2	HPS	DWS	HPW1	ICD	DC	Dis.	CBC	ICU	CBE	Int.
	6	13	20	39	39	64	64	64	64	71	90	97	122
Chaetoceros sp. ($cells \cdot ml^{-1}$)	JI	CBC	HPW2	CBE	HPW3	HPS	HPW1	Dis.	DC	DWS	ICD	Int.	ICU
	607	1590	1939	2055	2152	2268	2333	2462	2592	2818	3134	3218	3761
Skeletonema costatum ($cells \cdot ml^{-1}$)	JI	CBE	CBC	HPW3	HPW2	HPW1	HPS	DWS	Dis.	Int.	ICD	DC	ICU
	52	122	169	191	192	377	756	1288	2016	2256	2378	2843	2844
Nitzschia vermicularis ($cells \cdot ml^{-1}$)	DC	ICD	ICU	Int.	Dis.	CBE	HPW1	DWS	JI	HPW2	HPS	CBC	HPW3
	2	2	2	3	4	9	15	18	36	40	42	42	43

Table 5 (continued)

Amphiprora sp. (cells·ml^{-1})	DWS 1	ICU 1	ICD 1	HPW1 2	DC 2	Dis. 2	CBE 2	Int. 2	HPS 7	HPW3 9	CBC 9	JI 10	HPW2 11
Asterionella japonica (cells·ml^{-1})	HPW3 0	HPW2 0	CBE 0	CBC 0	JI 0	HPW1 6	DWS 6	HPS 10	Dis. 24	ICD 42	Int. 44	ICU 46	DC 51
Asterionella formosa (cells·ml^{-1})	DWS 0	Int. 0	ICU 0	ICD 0	DC 0	Dis. 0	HPW2 2	HPS 4	HPW1 4	CBC 4	JI 4	CBE 6	HPW3 7

Table 6

James River Phytoplankton ANOVA Summary 4-13-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl a ($\mu g\ l^{-1}$)	HPW1	CBC	CBE	Int.	Dis.	HPS	JI	HPW2	DWS	HPW3			
	4.0	4.1	4.4	6.4	6.6	6.8	7.8	8.4	9.5	12.2			
Total cells ($cells \cdot ml^{-1}$)	HPW1	HPS	Dis.	Int.	DC	ICU	ICD	HPW2	CBC	CBE	JI	DWS	HPW3
	1875	1925	2025	2100	2400	2725	2750	2950	3850	4075	5150	7750	8075
8μ Chroomonas sp. ($cells \cdot ml^{-1}$)	HPS	Dis.	Int.	JI	HPW2	DC	HPW1	ICD	ICU	HPW3	CBC	DWS	CBE
	271	310	349	349	375	401	542	543	634	672	762	1215	2714
Cryptomonas sp. ($cells \cdot ml^{-1}$)	ICD	DC	HPS	HPW1	Int.	ICU	CBC	Dis.	JI	HPW3	HPW2	DWS	CBE
	39	39	52	52	64	78	78	90	116	142	168	246	297
Melosira subsalsa ($cells \cdot ml^{-1}$)	HPW1	CBE	Int.	Dis.	DC	HPS	HPW2	ICD	ICU	CBC	JI	DWS	HPW3
	287	298	445	474	562	573	644	691	873	1939	2999	4537	5480
Melosira ambigua ($cells \cdot ml^{-1}$)	CBE	HPW1	Dis.	ICD	Int.	DC	HPS	ICU	CBC	DWS	HPW2	JI	HPW3
	8	9	15	22	26	26	42	58	117	124	224	280	295
Cyclotella meneghiniana ($cells \cdot ml^{-1}$)	DC	Dis.	HPW2	CBE	HPW1	ICD	Int.	HPS	HPW3	ICU	CBC	JI	DWS
	0	39	52	64	64	90	129	142	142	155	181	220	310
Nitzschia kützingiana ($cells \cdot ml^{-1}$)	CBE	HPW2	CBC	HPS	ICU	ICD	JI	HPW1	Int.	DC	DWS	Dis.	HPW3
	78	194	207	233	246	246	258	284	284	310	349	426	478
Nitzschia vermicularis ($cells \cdot ml^{-1}$)	HPW3	CBE	JI	CBC	HPW2	HPS	DWS	HPW1	ICU	Int.	DC	ICD	Dis.
	0	0	1	2	2	4	6	8	12	14	15	16	17

Table 6 (continued)

Synedra ulna (cells·ml^{-1})	Int.	Dis.	ICD	ICU	DC	HPW1	CBE	HPS	DWS	CBC	JI	HPW3	HPW2
	0	0	1	2	2	2	3	4	12	14	18	22	24

Table 7

James River Phytoplankton ANOVA Summary 5-12-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl *a* ($\mu g \cdot l^{-1}$)	HPW1	CBC	Dis.	CBE	HPS	Int.	DWS	JI	HPW3	HPW2			
	3.6	4.8	5.4	6.0	6.3	6.7	7.2	9.0	10.8	11.8			
Total cells ($cells \cdot ml^{-1}$)	Dis.	ICU	ICD	Int.	DWS	DC	HPW1	HPS	CBC	HPW3	HPW2	CBE	JI
	850	1300	1350	1700	1725	1725	2000	3675	3675	4075	4150	4875	5925
8 μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	HPW1	HPW3	JI	Dis.	CBC	CBE	ICU	DWS	HPS	ICD	HPW2	Int.	DC
	13	26	26	39	78	90	90	116	116	130	232	272	284
Melosira subsalsa ($cells \cdot ml^{-1}$)	ICD	Int.	Dis.	DC	DWS	ICU	HPW1	HPW2	CBC	HPS	HPW3	CBE	JI
	52	78	78	181	182	414	569	698	802	1047	1460	1952	4098
Skeletonema costatum ($cells \cdot ml^{-1}$)	CBE	CBC	JI	HPW1	ICU	DC	Dis.	ICD	Int.	HPS	DWS	HPW3	HPW2
	0	0	26	26	52	52	65	104	155	168	310	452	698
Cyclotella meneghiniana ($cells \cdot ml^{-1}$)	ICD	CBC	ICU	DC	Dis.	JI	DWS	HPW3	HPW2	CBE	HPW1	Int.	HPS
	13	64	90	129	181	181	329	336	349	426	466	466	504
Nitzschia kützingiana ($cells \cdot ml^{-1}$)	Dis.	Int.	ICU	DC	ICD	DWS	HPW1	HPW2	HPS	JI	HPW3	CBE	CBC
	142	233	272	323	336	362	582	750	1280	1318	1500	1771	2004

Table 8

James River Phytoplankton ANOVA Summary 6-13-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl a ($\mu g \cdot l^{-1}$)				HPW1	HPS	DWS	Dis.	CBE	CBC	JI	HPW3	HPW2	Int.
				2.9	3.1	3.2	3.6	4.1	4.4	4.8	5.0	5.2	5.8
Total cells ($cells \cdot ml^{-1}$)	Dis.	HPS	HPW1	Int.	DC	ICD	CBC	ICU	JI	HPW2	HPW3	DWS	CBE
	650	850	1025	1175	1200	1300	1375	1675	1850	2050	2125	2250	3275
8μ Chroomonas sp. ($cells \cdot ml^{-1}$)	DWS	HPW1	HPS	Dis.	Int.	DC	ICU	CBC	HPW3	ICD	HPW2	JI	CBE
	194	194	265	336	362	375	466	478	510	517	834	834	1448
16μ Chroomonas sp. ($cells \cdot ml^{-1}$)	DWS	ICD	DC	HPW1	Int.	HPW3	Dis.	JI	HPS	CBC	CBE	ICU	HPW2
	39	52	52	78	103	116	116	116	129	148	180	207	297
Katodinium rotundatum ($cells \cdot ml^{-1}$)	DWS	HPW1	DC	Dis.	ICU	HPS	Int.	CBC	ICD	JI	HPW2	CBE	HPW3
	0	0	0	0	26	32	39	52	65	97	142	162	233
Melosira subsalsa ($cells \cdot ml^{-1}$)	ICD	DC	Dis.	HPW2	ICU	JI	CBC	HPW3	Int.	HPS	HPW1	CBE	DWS
	0	0	0	39	52	90	110	129	129	142	187	232	264
Rhizosolenia minima ($cells \cdot ml^{-1}$)	ICU	DC	Dis.	HPS	Int.	ICD	JI	CBC	DWS	HPW2	HPW3	CBE	HPW1
	0	0	13	13	26	26	32	39	58	58	72	148	155
Nitzschia kützingiana ($cells \cdot ml^{-1}$)	DWS	DC	HPW2	CBC	HPW1	Dis.	ICD	ICU	HPW3	HPS	Int.	CBE	JI
	13	26	39	39	46	52	64	65	71	84	129	162	181
Pyramimonas sp. ($cells \cdot ml^{-1}$)	HPS	ICD	DC	Int.	Dis.	HPW1	CBE	ICU	JI	CBC	HPW2	DWS	HPW3
	39	52	52	64	78	90	110	155	162	181	214	226	407

Table 8 (continued)

Ankistrodesmus sp. (cells·ml^{-1})	Dis.	Int.	ICU	DC	HPS	ICD	HPW1	HPW2	DWS	CBC	HPW3	JI	CBE
	0	13	13	13	26	26	32	52	96	110	162	188	252

3μ Flagellate (cells·ml^{-1})	HPS	JI	Dis.	HPW1	HPW2	CBC	Int.	HPW3	DWS	CBE	ICD	ICU	DC
	13	20	26	58	78	90	103	110	122	188	388	440	492

Table 9

James River Phytoplankton ANOVA Summary 7-12-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)									
Chl *a* ($\mu g \cdot l^{-1}$)	CBC	DWS	HPS	Dis.	JI	HPW2	HPW1	Int.	CBE	HPW3
	4.5	5.6	6.0	6.2	7.2	7.6	8.2	8.5	8.7	9.2
Total cells ($cells \cdot ml^{-1}$)	Dis.	CBC	HPS	HPW1	Int.	HPW3	DWS	CBE	HPW2	JI
	925	1025	1150	1325	1475	2025	2450	2750	3500	3850
8μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	CBC	Dis.	Int.	HPS	HPW1	DWS	HPW3	CBE	HPW2	JI
	362	374	466	543	569	795	828	1190	1280	1854
16μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	CBC	Dis.	HPS	HPW1	Int.	CBE	DWS	JI	HPW3	HPW2
	32	78	103	214	220	232	239	304	362	660
Katodinium rotundatum ($cells \cdot ml^{-1}$)	CBC	DWS	HPS	Dis.	CBE	Int.	HPW1	HPW3	JI	HPW2
	13	52	52	78	84	90	116	465	620	808
Leptocylindrus minimus ($cells \cdot ml^{-1}$)	HPW1	JI	CBC	HPW3	HPS	Dis.	HPW2	CBE	Int.	DWS
	0	24	26	39	71	90	155	162	207	750
Chaetoceros sp. ($cells \cdot ml^{-1}$)	HPW1	JI	HPW3	HPW2	Dis.	Int.	CBE	CBC	HPS	DWS
	32	46	60	84	90	90	96	155	194	258
Skeletonema costatum ($cells \cdot ml^{-1}$)	DWS	Int.	Dis.	HPW2	HPS	HPW3	HPW1	CBC	CBE	JI
	6	12	15	24	61	102	118	135	143	271

Table 10

James River Phytoplankton ANOVA Summary 7-21-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)				
Total cells (cells·ml^{-1})	Dis. 1150	ICU 1400	ICD 1600	Int. 1600	DC 1650
8μ Chroomonas sp. (cells·ml^{-1})	ICD 246	DC 271	Dis. 284	ICU 310	Int. 440
Katodinium rotundatum (cells·ml^{-1})	ICD 78	DC 116	Dis. 130	ICU 168	Int. 232
Chaetoceros sp. (cells·ml^{-1})	Dis. 52	DC 142	Int. 298	ICU 323	ICD 375
Skeletonema costatum (cells·ml^{-1})	Int. 87	DC 87	ICD 89	Dis. 92	ICU 139
Nitzschia longissima (cells·ml^{-1})	ICU 207	Int. 220	Dis. 220	ICD 530	DC 530
Gyrosigma sp. (cells·ml^{-1})	Dis. 6	Int. 11	ICD 11	DC 12	ICU 13

Table 11

James River Phytoplankton ANOVA Summary 8-16-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl *a* ($\mu g \cdot l^{-1}$)	DWS	CBE	JI	CBC	HPS	Dis.	HPW1	HPW3	Int.	HPW2			
	4.3	7.6	7.9	9.5	9.6	10.0	10.2	10.4	10.8	11.5			
Total cells ($cells \cdot ml^{-1}$)	Dis.	DC	HPS	CBC	DWS	CBE	HPW2	HPW1	ICD	Int.	ICU	JI	HPW3
	1300	1350	1550	1750	1750	1850	2100	2300	2450	2450	2500	2750	2800
8 μ *Chroomonas* sp. ($cells.ml^{-1}$)	Dis.	DC	HPS	CBE	CBC	HPW1	ICD	ICU	Int.	HPW2	DWS	JI	HPW3
	26	233	426	568	569	736	750	776	866	866	930	1266	1512
16 μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	Dis.	DC	ICD	ICU	DWS	CBC	HPS	HPW3	HPW2	Int.	HPW1	CBE	JI
	0	0	26	26	65	65	90	90	90	103	104	142	258
Katodinium rotundatum ($cells \cdot ml^{-1}$)	Dis.	DC	HPS	CBC	Int.	DWS	ICD	ICU	HPW3	CBE	HPW2	JI	HPW1
	0	0	78	104	142	149	155	194	258	271	272	466	542
Skeletonema costatum ($cells.ml^{-1}$)	DWS	HPW2	HPS	HPW1	CBE	HPW3	ICD	Dis.	Int.	CBC	ICU	DC	JI
	12	38	48	48	55	57	64	71	78	92	92	100	121
Cyclotella meneghiniana ($cells \cdot ml^{-1}$)	ICD	Int.	DWS	JI	ICU	HPW1	HPW3	HPW2	CBC	HPS	CBE	DC	Dis.
	13	26	32	52	52	52	52	64	65	78	90	130	142
Chaetoceros sp. ($cells \cdot ml^{-1}$)	HPW1	Dis.	HPS	Int.	HPW3	DWS	ICU	ICD	DC	CBC	CBE	HPW2	JI
	12	12	14	16	17	19	20	24	26	27	28	30	51
Leptocylindrus minimus ($cells \cdot ml^{-1}$)	HPS	HPW2	CBE	DC	ICU	DWS	CBC	HPW1	JI	Int.	Dis.	ICD	HPW3
	0	0	0	26	26	52	52	64	78	90	90	104	168

Table 11 (continued)

Rhizosolenia minima (cells·ml^{-1})	HPW3	HPW2	ICD	DC	ICU	Int.	Dis.	DWS	HPS	HPW1	CBC	JI	CBE
	26	26	39	52	64	65	104	104	116	142	142	142	232
Gyrosigma beaufortianum (cells·ml^{-1})	DWS	JI	CBE	HPW2	HPW3	HPS	HPW1	DC	ICD	CBC	ICU	Dis.	Int.
	62	80	116	213	222	224	225	240	256	266	302	347	465
Nitzschia longissima (cells·ml^{-1})	DWS	HPW2	HPS	HPW3	JI	Int.	CBE	CBC	HPW1	Dis.	ICD	ICU	DC
	6	13	17	18	19	24	26	30	36	57	64	65	74
Pyramimonas sp. (cells·ml^{-1})	HPW1	ICD	DC	CBC	DWS	Int.	Dis.	CBE	HPS	HPW2	JI	HPW3	ICU
	39	52	65	78	97	104	104	104	116	129	142	181	246
3μ Flagellate (cells.ml^{-1})	HPW2	HPW1	ICU	DC	CBC	JI	Dis.	HPW3	HPS	Int.	CBE	DWS	ICD
	13	39	39	39	39	52	52	52	52	52	65	136	634

Table 12

James River Phytoplankton ANOVA Summary 9-6-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Total cells (cells·ml^{-1})	Dis.	DWS	DC	HPS	CBE	HPW1	ICD	Int.	ICU	JI	HPW3	HPW2	CBC
	1850	2100	2350	2600	2700	2900	3050	3050	3400	3450	3750	3900	4150
8μ Chroomonas sp. (cells·ml^{-1})	Dis.	DC	DWS	CBE	HPW1	HPS	ICU	ICD	Int.	JI	HPW3	HPW2	CBC
	233	426	491	543	620	646	685	698	776	1202	1241	1279	1629
16μ Chroomonas sp. (cells·ml^{-1})	DWS	Dis.	DC	Int.	ICD	HPS	HPW3	HPW1	ICU	CBE	JI	HPW2	CBC
	0	13	39	52	65	78	78	78	90	194	232	246	258
Cryptomonas sp. (cells·ml^{-1})	ICU	ICD	DC	JI	Int.	Dis.	HPS	HPW2	DWS	HPW1	CBC	HPW3	CBE
	0	0	0	13	52	52	64	90	103	155	155	168	284
Katodinium rotundatum (cells·ml^{-1})	DC	Dis.	ICD	DWS	HPW1	HPS	CBE	ICU	Int.	HPW3	JI	HPW2	CBC
	0	13	78	136	155	194	258	258	259	414	440	582	633
Leptocylindrus minimus (cells·ml^{-1})	CBE	DC	JI	Int.	CBC	HPW3	ICD	HPW2	Dis.	ICU	HPW1	DWS	HPS
	90	90	129	168	181	194	220	220	258	272	284	362	388
Rhizosolenia minima (cells·ml^{-1})	ICD	DC	Dis.	ICU	Int.	DWS	CBE	JI	HPS	HPW3	HPW1	HPW2	CBC
	13	26	39	52	52	181	207	310	323	323	374	374	556
Cyclotella meneghiniana (cells·ml^{-1})	HPW3	CBE	CBC	HPW2	HPW1	DC	DWS	HPS	ICU	JI	Dis.	Int.	ICD
	13	26	39	77	90	104	110	116	130	181	181	207	284
Skeletonema costatum (cells·ml^{-1})	Dis.	HPS	CBE	CBC	HPW3	DC	DWS	HPW1	ICD	Int.	HPW2	ICU	JI
	0	15	20	20	22	24	42	44	48	50	50	53	128

Table 12 (continued)

Nitzschia longissima (cells·ml^{-1})	CBC 13	JI 26	DWS 130	HPW2 142	HPW1 168	CBE 181	Int. 220	HPW3 220	HPS 246	Dis. 349	ICU 400	ICD 491	DC 646
Gyrosigma beaufortianum (cells·ml^{-1})	CBE 4	JI 16	CBC 74	HPW1 102	DWS 106	HPW2 297	HPS 384	Dis. 403	HPW3 405	DC 670	ICD 863	Int. 890	ICU 1066
Gyrosigma sp. (cells·ml^{-1})	DWS 0	CBE 0	CBC 2	Dis. 3	JI 4	HPW1 5	ICU 5	Int. 6	ICD 6	DC 7	HPW2 8	HPS 18	HPW3 48
Pyramimonas sp. (cells·ml^{-1})	ICD 39	Int. 90	HPS 90	ICU 90	DC 90	Dis. 130	HPW2 194	HPW3 349	CBC 362	DWS 375	JI 478	HPW1 608	CBE 633
3µ Flagellate (cells·ml^{-1})	DC 0	ICD 26	CBE 39	HPS 39	Dis. 52	ICU 52	DWS 52	HPW1 78	Int. 104	CBC 142	HPW2 207	HPW3 246	JI 298

Table 13

James River Phytoplankton ANOVA Summary 11-9-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Chl *a* ($\mu g \cdot l^{-1}$)	HPW1	DWS	CBC	CBE	Dis.	HPW2	HPS	Int.	JI	HPW3			
	1.6	2.0	2.0	2.2	2.2	2.2	2.4	2.6	2.8	3.0			
Total cells ($cells \cdot ml^{-1}$)	Dis.	HPW2	HPW1	ICD	DC	HPW3	JI	DWS	HPS	CBE	ICU	CBC	Int.
	400	400	400	550	550	550	600	700	700	750	750	800	850
8 μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	HPW1	HPW2	HPW3	JI	ICD	Dis.	DC	CBC	ICU	CBE	HPS	Int.	DWS
	90	174	188	214	214	226	246	252	278	278	284	298	398
16 μ *Chroomonas* sp. ($cells \cdot ml^{-1}$)	Dis.	HPW2	HPW1	DC	ICD	JI	HPS	ICU	CBC	CBE	DWS	HPW3	Int.
	39	58	58	78	84	84	96	116	136	142	142	155	181
Katodinium rotundatum ($cells \cdot ml^{-1}$)	DWS	HPW1	Dis.	JI	HPW2	HPW3	ICD	CBE	DC	Int.	HPS	ICU	CBC
	10	20	26	26	32	64	65	72	78	78	90	129	142
Skeletonema costatum ($cells \cdot ml^{-1}$)	Dis.	ICD	DWS	ICU	DC	HPS	HPW2	Int.	HPW3	CBE	HPW1	JI	CBC
	0	8	8	15	18	32	33	34	35	37	44	93	100
Nitzschia longissima ($cells \cdot ml^{-1}$)	DWS	CBC	HPW3	HPW2	JI	DC	CBE	ICU	ICD	Dis.	HPW1	HPS	Int.
	6	6	20	20	20	26	26	32	39	39	52	58	78
3 μ Flagellate ($cells.ml^{-1}$)	JI	Dis.	HPW3	HPW2	HPW1	CBC	DC	Int.	DWS	HPS	ICD	CBE	ICU
	13	13	26	26	39	39	39	52	55	84	90	97	110
Amphiprora sp. ($cells \cdot ml^{-1}$)	HPW2	CBE	JI	CBC	HPW3	HPS	HPW1	DC	DWS	ICD	ICU	Dis.	Int.
	0	0	1	1	1	4	4	4	6	7	10	10	15

Table 14

James River Zooplankton ANOVA Summary 2-23-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)											
Copepod nauplii (No./100 l)	IC	DC	DWS	Int.	Dis.	HPS	CBE	HPW2	CBC	HPW1	HPW3	JI
	13	21	25	32	50	61	83	116	123	168	404	676
Barnacle nauplii (No./100 l)	HPW3	HPW2	DWS	CBE	Int.	JI	CBC	HPS	IC	DC	Dis.	HPW1
	0	0	1	1	1	1	2	2	3	5	9	13
Polychaete larvae (No./100 l)	JI	HPW3	IC	CBE	CBC	DC	HPW2	HPS	DWS	HPW1	Int.	Dis.
	4	13	16	27	31	46	49	60	74	77	145	176
Eurytemora sp. (No./100 l)	IC	Int.	DWS	Dis.	DC	HPS	HPW2	HPW1	CBC	CBE	HPW3	JI
	1	2	3	6	8	16	51	52	65	84	150	267
Harpacticoid copepods (No./100 l)	HPW2	DWS	HPW3	JI	CBC	DC	CBE	HPW1	HPS	Int.	IC	Dis.
	1	1	2	2	2	4	4	6	9	10	18	21
Cyclopoid copepods (No./100 l)	DWS	Int.	IC	Dis.	CBE	DC	HPS	HPW3	HPW2	HPW1	CBC	JI
	3	4	4	5	7	7	8	8	10	21	23	34
Rotifers (No./100 l)	IC	DC	HPW3	DWS	HPS	HPW2	Dis.	CBE	CBC	HPW1	Int.	JI
	1	1	13	21	24	29	36	37	37	65	87	105

Table 15

James River Zooplankton ANOVA Summary 4-13-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii (No./100 l)	DWS	HPW3	CBC	JI	ICD	Dis.	HPS	CBE	DC	HPW2	ICU	HPW1	Int.
	139	224	234	259	276	341	342	350	364	404	412	698	1252
Barnacle nauplii (No. /100 l)	DWS	Int.	HPS	HPW3	HPW2	HPW1	CBE	CBC	JI	ICU	ICD	DC	Dis.
	0	0	0	0	0	0	0	0	0	13	25	58	233
Eurytemora sp. (No./100 l)	CBE	Dis.	ICD	DC	HPW1	ICU	HPW3	Int.	JI	HPS	HPW2	DWS	CBC
	0	6	7	9	15	18	18	20	21	25	30	34	43
Harpacticoid copepods (No./100 l)	CBC	CBE	DWS	ICU	HPW3	HPW1	JI	HPW2	DC	Int.	Dis.	ICD	HPS
	3	4	4	9	10	13	14	15	17	22	26	26	66
Cyclopoid copepods (No./100 l)	DC	ICD	CBE	ICU	DWS	Dis.	CBC	JI	HPW3	HPS	HPW1	Int.	HPW2
	4	6	8	9	14	15	20	25	28	39	60	66	74
Rotifers (No./100 l)	CBE	DWS	HPS	HPW1	ICU	DC	HPW2	CBC	JI	ICD	Dis.	HPW3	Int.
	2	11	14	17	18	28	38	38	41	45	54	56	255
Bosmina sp. (No./100 l)	DC	HPW1	CBE	JI	HPW3	ICD	ICU	Dis.	DWS	CBC	HPS	HPW2	Int.
	1	5	10	11	14	14	14	15	17	19	29	47	56
Polychaete larvae (No./100 l)	DWS	HPS	HPW3	CBE	CBC	JI	HPW1	Int.	ICU	ICD	DC	HPW2	Dis.
	0	0	0	0	0	0	1	2	3	4	5	6	8

Table 16

James River Zooplankton ANOVA Summary 5-12-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii (No./100 l)	DC	Dis.	ICD	CBE	HPS	ICU	HPW2	Int.	CBC	DWS	JI	HPW1	HPW3
	118	182	192	223	407	502	528	565	619	668	802	1161	1602
Barnacle nauplii (No./100 l)	JI	CBC	HPW3	CBE	HPW2	HPS	ICD	DC	DWS	ICU	HPW1	Int.	Dis.
	9	12	23	54	71	277	293	452	554	555	790	811	1125
Polychaete larvae (No./100 l)	CBE	CBC	JI	HPS	HPW2	ICD	DWS	DC	HPW1	Dis.	ICU	Int.	HPW3
	2	3	5	9	13	18	19	25	25	28	39	82	186
Pelecypod larvae (No./100 l)	CBE	ICD	DC	ICU	HPS	CBC	HPW1	Dis.	DWS	HPW2	JI	Int.	HPW3
	0	0	7	20	35	44	54	58	60	76	87	225	348
Eurytemora sp. (No./100 l)	DC	ICD	ICU	Dis.	CBC	CBE	HPS	HPW2	JI	DWS	HPW1	Int.	HPW3
	11	11	15	44	52	57	136	149	151	154	180	219	303
Acartia sp. (No./100 l)	JI	CBE	CBC	HPW1	HPW2	HPS	DC	HPW3	DWS	Dis.	ICU	Int.	ICD
	2	2	3	7	19	26	34	37	49	112	240	483	859
Harpacticoid copepods (No./100 l)	DWS	ICU	Int.	ICD	DC	HPW3	CBC	Dis.	HPW2	HPW1	HPS	CBC	JI
	9	17	20	21	23	29	41	45	56	70	75	86	166
Rotifers (No./100 l)	Dis.	DC	ICD	Int.	ICU	DWS	HPS	CBC	HPW1	HPW2	HPW3	CBE	JI
	0	0	0	3	4	9	14	20	29	40	42	73	286

Table 17

James River Zooplankton ANOVA Summary 6-13-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii	DC	ICU	ICD	Dis.	HPS	JI	HPW3	CBE	Int.	DWS	HPW2	CBC	HPW1
	69	211	242	266	462	515	574	750	966	1001	1060	1316	1325
Barnacle nauplii (No./100 l)	JI	HPW2	ICD	ICU	DWS	HPW3	CBC	DC	CBE	Int.	Dis.	HPW1	HPS
	0	14	32	56	60	69	72	130	143	148	175	186	300
Polychaete larvae (No./100 l)	ICU	DC	ICD	HPS	Int.	JI	HPW3	CBC	DWS	Dis.	HPW2	HPW1	CBE
	1	3	4	4	4	5	13	16	18	20	24	29	31
Pelecypod larvae (No./100 l)	DWS	ICD	ICU	Dis.	DC	Int.	HPW2	HPS	JI	CBE	CBC	HPW1	HPW3
	0	0	0	2	4	7	12	20	30	40	40	60	62
Eurytemora sp. (No./100 l)	DC	HPW2	HPW3	ICU	DWS	Int.	Dis.	HPS	ICD	JI	CBE	CBC	HPW1
	1	4	4	5	5	11	13	16	17	23	25	30	67
Acartia sp. (No./100 l)	CBC	HPW2	DC	Int.	HPS	Dis.	HPW3	JI	ICU	CBE	HPW1	ICD	DWS
	3	9	11	13	16	16	17	22	34	57	58	62	177
Harpacticoid copepods (No./100 l)	HPW2	JI	ICD	DC	DWS	CBC	Int.	HPW3	HPS	CBE	Dis.	ICU	HPW1
	0	0	2	2	2	3	3	4	4	5	6	9	9
Rotifers (No./100 l)	DWS	Int.	HPS	ICD	ICU	DC	Dis.	HPW3	HPW1	JI	CBC	CBE	HPW2
	0	0	0	0	0	0	6	16	18	28	130	141	195

Table 18

James River Zooplankton ANOVA Summary 7-12-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)									
Copepod nauplii (No./100 l)	DWS	HPW2	Dis.	HPS	CBE	HPW1	HPW3	INT	CBC	JI
	177	1116	1340	1806	2135	2227	2788	2838	3589	3639
Barnacle nauplii (No./100 l)	DWS	HPW2	CBC	Int.	JI	Dis.	HPW1	HPW3	CBE	HPS
	7	8	17	24	70	72	94	125	183	238
Polychaete larvae (No./100 l)	DWS	JI	HPW2	Int.	CBC	Dis.	HPS	HPW1	HPW3	CBE
	7	13	30	37	64	68	83	131	140	325
Pelecypod larvae (No./100 l)	DWS	HPW2	Dis.	Int.	JI	HPS	HPW3	HPW1	CBC	CBE
	7	94	158	170	408	932	1409	1509	2725	9430
Eurytemora sp. (No./100 l)	Dis.	CBE	DWS	HPW2	Int.	HPW3	HPS	HPW1	JI	CBC
	0	0	1	2	9	9	11	29	63	662
Acartia sp. (No./100 l)	DWS	JI	HPW2	Dis.	HPS	HPW1	HPW3	Int.	CBE	CBC
	51	82	151	272	348	421	435	477	614	1214
Harpacticoid copepods (No./100 l)	Dis.	JI	HPW2	DWS	CBC	HPW3	CBE	HPS	Int.	HPW1
	0	0	2	3	11	29	33	39	51	72

Table 19

James River Zooplankton ANOVA Summary 7-21-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)				
Copepod nauplii (No./100 l)	DC 177	Dis. 655	Int. 1262	ICU 1332	ICD 2304
Barnacle nauplii (No./100 l)	DC 65	ICD 85	Int. 152	ICU 184	Dis. 235
Polychaete larvae (No./100 l)	DC 28	ICD 44	Int. 53	Dis. 72	ICU 120
Pelecypod larvae (No./100 l)	DC 1	ICU 5	ICD 7	Dis. 12	Int. 178
Eurytemora sp. (No./100 l)	Int. 9	ICD 18	DC 21	ICU 26	Dis. 37
Acartia sp. (No./100 l)	Dis. 115	DC 161	ICU 321	ICD 410	Int. 479
Harpacticoid copepods (No./100 l)	ICU 10	ICD 11	Int. 18	DC 18	Dis. 34
Rotifers (No./100 l)	DC 1	ICD 1	ICU 2	Dis. 8	Int. 26

Table 20

James River Zooplankton ANOVA Summary 8-16-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii (No./100 l)	DC	CBC	Dis.	HPS	DWS	HPW3	HPW1	HPW2	CBE	ICU	Int.	JI	ICD
	345	349	541	547	597	726	936	981	1142	1671	1694	1935	2776
Barnacle nauplii (No./100 l)	HPS	JI	CBC	HPW2	HPW3	HPW1	DWS	CBE	ICU	Dis.	DC	Int.	ICD
	33	40	50	50	93	125	129	237	306	360	372	402	574
Polychaete larvae (No./100 l)	HPW2	DWS	HPW3	HPW1	Dis.	DC	HPS	JI	CBE	Int.	CBC	ICD	ICU
	8	8	12	18	22	22	29	30	32	39	47	58	93
Pelecypod larvae (No./100 l)	HPS	DWS	DC	HPW2	HPW1	ICU	CBC	ICD	CBE	JI	HPW3	Dis.	Int.
	0	2	4	11	14	17	18	19	23	26	42	52	78
Eurytemora sp. (No./100 l)	DWS	CBC	ICD	HPW1	ICU	HPW3	DC	Dis.	HPS	JI	HPW2	Int.	CBE
	0	0	4	6	7	8	8	9	10	19	22	24	31
Acartia sp. (No./100 l)	DC	CBE	ICU	ICD	CBC	Dis.	HPW3	HPW1	DWS	HPS	Int.	JI	HPW2
	57	70	80	84	114	130	138	166	182	238	253	317	314
Harpacticoid copepods (No./100 l)	DWS	JI	CBE	HPW1	HPW3	Int.	CBC	DC	HPS	Dis.	ICD	HPW2	ICU
	0	0	4	4	4	4	4	5	13	14	14	16	18
Rotifers (No./100 l)	DWS	Dis.	HPW1	DC	HPS	ICD	HPW2	CBE	Int.	HPW3	CBC	JI	ICU
	0	0	2	3	5	6	8	10	12	19	20	26	27

Table 21

James River Zooplankton ANOVA Summary 9-6-77

Parameters	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii (No./100 l)	Dis.	DC	DWS	Int.	CBE	JI	HPS	HPW3	HPW1	ICD	ICU	CBC	HPW2
	272	375	449	495	561	651	797	1017	1160	1177	2978	3972	4249
Barnacle nauplii (No./100 l)	DWS	Int.	HPW3	JI	CBC	CBE	Dis.	HPW2	HPS	HPW1	ICD	ICU	DC
	23	30	44	60	63	76	93	93	106	121	224	267	324
Polychaete larvae (No./100 l)	HPW3	DWS	CBE	CBC	Int.	Dis.	HPS	JI	HPW2	HPW1	DC	ICU	ICD
	2	4	15	16	16	17	20	23	28	44	65	78	92
Pelecypod larvae (No./100 l)	DWS	Dis.	Int.	ICD	DC	JI	ICU	HPW3	HPW1	HPS	CBC	HPW2	CBE
	6	67	70	214	252	378	497	1374	1703	2660	3628	3690	5228
Acartia sp. (No./100 l)	Int.	CBE	Dis.	JI	HPS	DWS	HPW1	HPW3	ICU	ICD	HPW2	CBC	DC
	77	89	127	128	132	148	224	231	262	334	361	572	606
Rotifers (No./100 l)	DWS	Dis.	DC	JI	HPS	HPW1	CBE	CBC	HPW3	HPW2	Int.	ICD	ICU
	2	3	11	28	37	58	63	71	72	87	140	354	2430

Table 22

James River Zooplankton ANOVA Summary 11-9-77

Parameter	Stations and Means (Stations not sharing an underline are significantly different, $\alpha \leq .05$)												
Copepod nauplii (No./100 l)	HPW3	Dis.	JI	CBE	DC	HPW1	Int.	CBC	ICD	DWS	HPW2	ICU	HPS
	84	141	172	184	225	273	316	402	536	550	700	715	1717
Barnacle nauplii (No./100 l)	HPW2	HPW3	JI	CBC	HPW1	ICU	DWS	CBE	HPS	Int.	ICD	Dis.	DC
	1	3	3	4	5	11	12	12	18	21	32	42	56
Polychaete larvae (No./100 l)	DWS	Dis.	JI	CBC	HPW3	HPW2	Int.	DC	HPS	ICD	ICU	CBE	HPW1
	10	17	19	23	32	35	37	53	77	96	106	125	200
Acartia sp. (No./100 l)	HPW3	DC	CBE	Dis.	CBC	HPW1	ICD	DWS	JI	ICU	Int.	HPS	HPW2
	7	12	18	22	25	31	46	57	66	74	77	179	180
Rotifers (No./100 l)	HPW2	HPW1	CBE	CBC	Dis.	HPS	HPW3	DWS	JI	DC	Int.	ICD	ICU
	0	3	6	12	16	24	28	31	43	57	58	64	66
Eurytemora sp. (No./100 l)	DWS	Int.	HPS	HPW1	Dis.	ICU	DC	CBE	ICD	CBC	HPW3	HPW2	JI
	0	0	0	0	0	0	0	2	3	3	12	24	43

Results - Benthos Studies

Data Presentation

The hydrographic data associated with the 1977 benthos sampling runs appear in Appendix Table A2. The benthos biological data are in Appendix C, Tables C1-C6 (species counts) and C7-C12 (diversity indices). One mollusk, which has been designated as Brachidontes recurvus in previous reports, was determined to be Modiolus demissus instead, so this name appears instead of B. recurvus in Tables C1-C6.

Benthos Distribution Patterns

The 1977 spatial distributions for the major benthic organisms of the study area are presented in Table 23. Most of these organisms showed an apparent preference for either the sandy or the silty clay substrate. Those that seemed to be most abundant at the sandy stations were Corbicula manilensis (Table 23E), Nereis succinea (Table 23H), Corophium lacustre (Table 23L), and Lepidactylus dytiscus (Table 23M). Organisms that apparently preferred the silty clay substrate were Rangia cuneata, Congeria leucophaeta, Scolecolepides viridis, Heteromastus filiformis, Gammarus sp., Leptocheirus plumulosus, and Cyathura polita (Tables 23A, C, G, I, K, N, and O, respectively). Macoma mitchelli (Table 23D), Hydrobia sp. (Table 23F), oligochaetes (Table 23J), and dipteran larvae (Table 23P) were not distinctly associated with one or the other of the substrate types. Dipteran larvae, however, were found in the 1.0 mm fractions of samples taken only from stations upstream from Hog Point.

Four species exhibited distribution patterns that suggested possible responses to the power plant plume. Congeria leucophaeta and Heteromastus filiformis yielded the highest numbers of individuals in samples from plume station 11, while for Corophium lacustre the largest numbers obtained within the silty clay substrate were from plume stations 8 and 11. Although the numbers of these organisms that were collected were so small that statistical testing could not be performed there is at least some suggestion of a positive power plant effect on these species. This pattern has been observed in previous study years for Congeria leucophaeta (Jordan et al. 1977).

The only species showing a possible negative power plant effect was Leptocheirus plumulosus, which seemed to be less abundant at plume stations 8 and 11 than at the other silty clay stations. This pattern had been observed previously in 1974 and 1975 (Jordan et al. 1974). Analysis of variance, however, indicated that the apparent differences within the 1977 data were not significant at the .05 level.

Severely cold weather during the winter of 1976 - 77 apparently killed large numbers of Rangia cuneata. Most of the individuals of this species collected on March 8 (Table C1) were decomposing, indicating that they had recently died. The total number of R. cuneata collected in the study area on April 25 (Table 23A) was 51, lower than the total collected on any other sampling date since the Surry Power Station study began in 1969 (Figure 5). Recovery was rapid, however, and population levels determined during the succeeding four sampling runs in the 1977 study year were within the range of the 1975 and 1976 population levels.

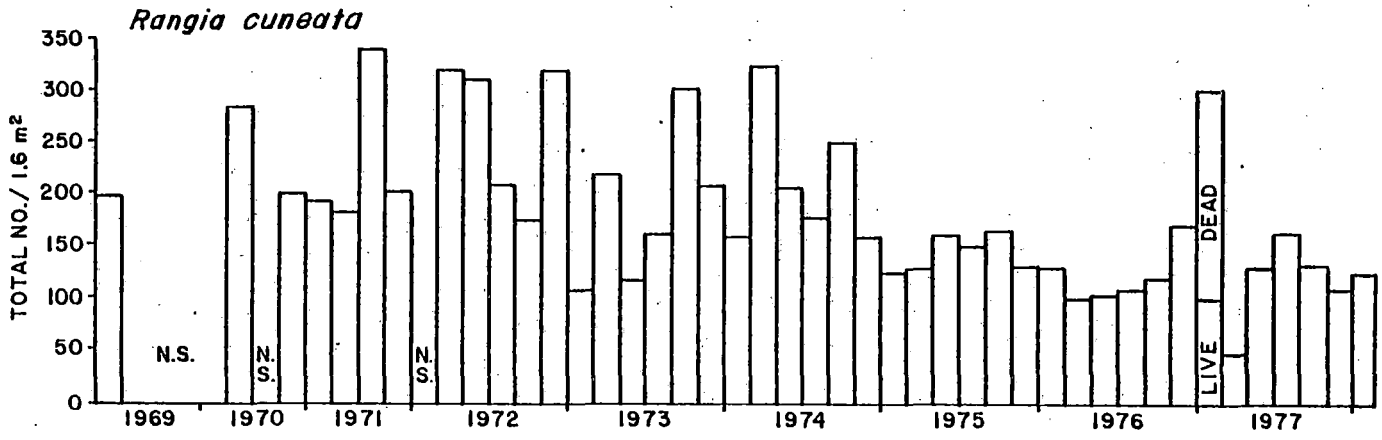

Figure 5. Temporal distribution of Rangia cuneata in the study area, May 1969 - Jan. 1978.

N.S. = Not sampled

Table 23

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

A. Rangia cuneata (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8	1	6		1		3	3	1	7	7	5	11	18	7	19		89
Apr. 25		4		7		2	2		7	2	1	4	17	5			51
June 20	1		17	5	2	1	6	13	5	10	4	21	10	17	15		127
July 14	2	8	2	10	2	5	24	14	4	15	2	12	34	3	13	4	154
Aug. 18	2	2	5	5	11	19	9	9	7	11		10	6	17	11	4	128
Oct. 10	7		11	6	3	2	10	5	6	8	1	27	8	2	11	2	109
Σ	13	20	35	34	18	32	54	42	36	53	13	85	93	51	69	10	658

B. Rangia cuneata (g per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8	.41	.98		.44		1.46	.42		1.69	1.08	.50	1.60	2.55	1.14	12.52		24.79
Apr. 25		1.42		5.28		1.32	.50		4.56	.79	.12	1.15	2.70	.80			18.64
June 20			15.20	2.21	.52	1.31	.14	.26	4.97	4.10		5.49	4.64	.83	3.46		43.13
July 14	.83	1.54		.67	.74	.62	.52	.01	2.77	2.01		2.59	15.13	.62	4.76		32.81
Aug. 18	1.08	2.36		.92	2.17	.80	.01	1.00	5.06	4.19		3.72	1.55	1.65	3.83		28.34
Oct. 10	3.72		8.33	3.95			.01	.74	2.78	2.89		6.73	3.63	.88	3.48	1.42	38.56
Σ	6.04	6.30	23.53	13.47	3.43	5.51	1.60	2.01	21.83	15.06	.62	21.28	30.20	5.92	28.05	1.42	186.27

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

C. Congeria leucophaeta (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control				Plume					Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8											1				1		2
Apr. 25								1						1	1		3
June 20							1								30		31
July 14							1										1
Aug. 18														2			2
Oct. 10																	0
Σ	0	0	0	0	0	0	2	1	0	0	1	0	0	3	32	0	39

D. Macoma mitchelli (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control				Plume					Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8																	0
Apr. 25																6	6
June 20													1				1
July 14							3	4			1		4	1	1		14
Aug. 18							1	2			1	1					5
Oct. 10	11	2	3	2		3	4	4	7	10		4	4		2	1	57
Σ	11	2	3	2	0	3	8	10	7	10	2	5	9	1	3	7	83

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

E. Corbicula manilensis (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8			4	1	1					1							7
Apr. 25		1					1										2
June 20		1	2												1		4
July 14					2												2
Aug. 18				1													1
Oct. 10																	0
Σ	0	2	6	2	3	0	1	0	0	1	0	0	0	0	1	0	16

F. Hydrobia sp. (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8	3			1		1	1			23	21	5					55
Apr. 25	1					1					9	3	1			1	16
June 20	8	2	2				1		4								17
July 14										1			4		3		8
Aug. 18					2					1	3	2	3	1			12
Oct. 10			2	1		1				1		1	1				7
Σ	12	2	4	2	2	3	2	0	4	26	33	11	9	1	3	1	115

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

G. Scolecolepides viridis (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8		1			2	2			1	1			2	1	5		15
Apr. 25		2				1	5						1	1		5	15
June 20							6	2				1	9	2	4		24
July 14							3	5		1	5	1	2	6	7		30
Aug. 18	4					4	4	6	1	3	2		2		1		27
Oct. 10			4			6	6	1			2		1		4		24
Σ	4	3	4	0	2	13	24	14	2	5	9	2	17	10	21	5	135

H. Nereis succinea (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8					1					1	3			2	2		9
Apr. 25	1	1			1					1	1			1	2		8
June 20			1			1					2	1			2	2	9
July 14	1			2								2				1	6
Aug. 18	7	1	1	1	1	3					1			1		1	17
Oct. 10	14	2	9		5	9		2		3	4	1		1	2	8	60
Σ	23	4	11	3	8	13	0	2	0	5	11	4	0	5	8	12	109

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

I. Heteromastus filiformis (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control					Plume					
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8																	0
Apr. 25																1	1
June 20															2		2
July 14							1	1							15	1	18
Aug. 18			1	1		2	2								4		10
Oct. 10	1					1	4								7		13
Σ	1	0	1	1	0	3	7	1	0	0	0	0	0	0	28	2	44

J. Oligochaetes (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control					Plume					
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8	1									3			1				5
Apr. 25				2						2					1		5
June 20									1			1			1		3
July 14	1								1	1							3
Aug. 18														1			1
Oct. 10														1	1		2
Σ	2	0	0	2	0	0	0	0	2	6	0	1	1	2	3	0	19

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

K. Gammarus sp. (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control			Plume						Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8			2				8	4		4		2			9		29
Apr. 25		2		1					5		10	2			1		21
June 20			2				4						1		2		9
July 14	1						1	1									3
Aug. 18																	0
Oct. 10																	0
Σ	1	2	4	1	0	0	13	5	5	4	10	4	1	0	12	0	62

L. Corophium lacustre (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control			Plume						Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8																	0
Apr. 25		3	1	3		1					1	1			7		17
June 20	2	10	14	5	2		3		1		1	2		6	47		93
July 14	378		1						1	1					3		384
Aug. 18	16						1				3			6			26
Oct. 10	1																1
Σ	397	13	16	8	2	1	4	0	2	1	5	3	0	12	57	0	521

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

M. Lepidactylus dytiscus (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control					Plume				Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8			11		1												12
Apr. 25			3		1												4
June 20					13			1									14
July 14			2		2												4
Aug. 18			3		5							1					9
Oct. 10		2		1													3
Σ	0	2	19	1	22	0	0	1	0	0	0	1	0	0	0	0	46

N. Leptocheirus plumulosus (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt	
	Control			Plume			Control					Plume				Sand	Clay
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8		3									2	3	2			7	17
Apr. 25																	0
June 20			1	4		9		3		12		13	8	2	1	10	63
July 14	4		2				3	15	2	10	13	11	1	7		8	76
Aug. 18	1		3				10	12	10	8	4	19	3	1	1	8	80
Oct. 10	4		3			7			2	4	1		3		1		25
Σ	9	3	9	4	0	16	13	30	14	34	20	46	17	10	3	33	261

Table 23 (continued)

Seasonal and Spatial Distributions of Major Benthic Animals - 1977

O. Cyathura polita (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8						1	1				3				2		7
Apr. 25												1	1		6		8
June 20											1	3		1	3		8
July 14							1	1		1	1	3	1	1		1	10
Aug. 18								1	1	1	3			1			7
Oct. 10					1		1	1	1	1				1	1		7
Σ	0	0	0	0	1	1	3	3	2	3	8	7	2	4	12	1	47

P. Dipteran larvae (No. per 0.1 m^2)

Substrates and Station Numbers

	Sand						Silty Clay									Silt Sand Clay	
	Control			Plume			Control			Plume							
Date	1	3	12	7	9	13	5	10	2	6	14	16	4	8	11	15	Σ
Mar. 8										1							1
Apr. 25		3							1	3							7
June 20			1	1													2
July 14	3																3
Aug. 18										1							1
Oct. 10																	0
Σ	3	3	1	1	0	0	0	0	1	5	0	0	0	0	0	0	14

Results - Fouling Organisms Study

The 1977 fouling organism data appear in Tables 24 - 26. The name Modiolus demissus has replaced the name Brachidontes recurvus on these tables, as a result of the correction of a previous error in identification.

As mentioned in the methods section the February plates at all three stations were destroyed by river ice, and the August plates at stations DWS and CBS had separated from the towers and could not be found.

As in previous study years (Jordan et al. 1976, 1977) barnacles and the tube dwelling amphipod, Corophium lacustre, were the most numerous of the organisms collected on the summer and annual fouling plates. The October plates from station DWS, located the farthest downstream, yielded tunicates of the genus Molgula along with three species of marine algae that were not found at the two upstream stations. The August plates recovered from station CBN and the October plates recovered from all three stations were almost completely covered by ectoprocts and hydroids. This probably accounts for the lower numbers of barnacles and C. lacustre on these plates, relative to the numbers present on the June and annual plates. The hydroid - ectoproct covering was apparently favorable for colonization by polychaetes (Nereis succinea) and epibenthic amphipods (Gammarus sp.), which were most abundant on the October plates at each station.

There was no obvious characteristic unique to the fouling organism community at station CBS, near the power plant discharge, that could be interpreted as a power plant effect in this area.

Table 24

Fouling Organisms
1977
Station DWS

Horizontal Plate		No. Organisms/dm^2 Jan-Feb	Mar.-Apr	May-Jun	Annual*
Barnacles	Balanus sp.	Lost		777	996
Bivalves	Modiolus demissus			1	6
	Congeria leucophaeta				
Amphipods	Corophium lacustre		1	1076	1099
	Gammarus sp.		1		5
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis				X
Hydroids					X
Dipteran Larvae					
Total No. of Genera (not including Hydroids and Dipteran Larvae)			2	3	5
Total No. of Organisms (not including Bryozoans and Hydroids)			2	1854	2106

Vertical Plate					
Barnacles	Balanus sp.	Lost		576	1099
Bivalves	Modiolus demissus			1	
	Congeria leucophaeta				
Amphipods	Corophium lacustre			154	1039
	Gammarus sp.		1	7	
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis				X
Hydroids					X
Dipteran Larvae					
Total No. of Genera (not including Hydroids and Dipteran Larvae)			1	4	3
Total No. of Organisms (not including Bryozoans and Hydroids)			1	738	2138

*Incubated from 3-8-77 to 6-20-77

Table 24 (continued)

Fouling Organisms
1977
Station DWS

		No. Organisms/dm^2		
Horizontal Plate		Jul-Aug	Sep-Oct*	Nov-Dec
Barnacles	Balanus sp.	Lost	169	
Bivalves	Modiolus demissus			
	Congeria leucophaeta			
Amphipods	Corophium lacustre		31	
	Gammarus sp.		177	3
	Leptocheirus plumulosus		3	
Polychaetes	Nereis succinea			
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi			
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis		X	
Hydroids			X	
Dipteran Larvae				
Tunicates	Molgula sp.		9	
Algae	Polysiphonia harveyi		X	
	Ceramium rubrum		X	
	Enteromorpha sp.		X	
Total No. of Genera (not including Algae, Hydroids, and Dipteran Larvae)			6	1
Total No. of Organisms (not including Algae, Bryozoans, and Hydroids)			389	3
Vertical Plate				
Barnacles	Balanus sp.	Lost	136	
Bivalves	Modiolus demissus			
	Congeria leucophaeta			
Amphipods	Corophium lacustre		5	3
	Gammarus sp.		363	2
Polychaetes	Nereis succinea		6	
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi			
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis		X	
Hydroids			X	
Dipteran Larvae				
Tunicates	Molgula sp.		8	
Algae	Enteromorpha sp.		X	
Total No. of Genera (not including Algae, Hydroids, and Dipteran Larvae)			6	2
Total No. of Organisms (not including Algae, Bryozoans, and Hydroids)			518	5

*Incubated from 9-12-77 to 10-31-77

Table 25

Fouling Organisms
1977
Station CBN

Horizontal Plate		No. Organisms/dm^2 Jan-Feb	Mar-Apr	May-Jun	Annual*
Barnacles	Balanus sp.	Lost		1249	748
Bivalves	Modiolus demissus				
	Congeria leucophaeta			7	2
Amphipods	Corophium lacustre		1	1366	1333
	Gammarus sp.		1	10	1
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis				
Hydroids			X	X	X
Dipteran Larvae			3		
Total No. of Genera (not including Hydroids and Dipteran Larvae)			2	4	4
Total No. of Organisms (not including Bryozoans and Hydroids)			5	2632	2084

Vertical Plate					
Barnacles	Balanus sp.	Lost		1414	1590
Bivalves	Modiolus demissus				
	Congeria leucophaeta			1	
Amphipods	Corophium lacustre			549	1502
	Gammarus sp.		2	1	1
	Leptocheirus plumulosus		1		
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis				
Hydroids				X	X
Dipteran Larvae			1		
Total No. of Genera (not including Hydroids and Dipteran Larvae)			2	4	3
Total No. of Organisms (not including Bryozoans and Hydroids)			4	1965	3093

*Incubated from 3-8-77 to 6-20-77

Table 25 (continued)

Fouling Organisms
1977
Station CBN

Horizontal Plate		No. Organisms/dm^2 Jul-Aug	Sep-Oct	Nov-Dec
Barnacles	Balanus sp.	80	14	
Bivalves	Modiolus demissus		4	
	Macoma mitchelli		2	
	Congeria leucophaeta	1	1	
Amphipods	Corophium lacustre	20	20	1
	Gammarus sp.		25	5
Polychaetes	Nereis succinea	12	20	
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi	6		
	Palaemonetes vulgaris		1	
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis	X	X	
Hydroids		X	X	
Dipteran Larvae				
Total No. of Genera (not including Hydroids and Dipteran Larvae)		6	9	2
Total No. of Organisms (not including Bryozoans and Hydroids)		119	87	6
Vertical Plate				
Barnacles	Balanus sp.	65	34	
Bivalves	Modiolus demissus		2	
	Congeria leucophaeta		1	
Amphipods	Corophium lacustre	5	9	1
	Gammarus sp.		12	1
Polychaetes	Nereis succinea	8	13	
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi	7	5	
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis	X	X	X
Hydroids		X	X	
Dipteran Larvae				
Nudibranch			1	
Total No. of Genera (not including Hydroids and Dipteran Larvae)		5	9	2
Total No. of Organisms (not including Bryozoans and Hydroids)		85	77	2

Table 26

Fouling Organisms
1977
Station CBS

Horizontal Plate		No. Organisms/dm^2 Jan-Feb	Mar-Apr	May-Jun	Annual*
Barnacles	Balanus sp.	Lost		551	329
Bivalves	Modiolus demissus			3	
	Congeria leucophaeta			7	4
Amphipods	Corophium lacustre		1	1410	1323
	Gammarus sp.		5	1	1
	Leptocheirus plumulosus		1	1	
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis			X	X
Hydroids				X	X
Dipteran Larvae					
Total No. of Genera (not including Hydroids and Dipteran Larvae)			3	7	5
Total No. of Organisms (not including Bryozoans and Hydroids)			7	1973	1657

Vertical Plate					
Barnacles	Balanus sp.	Lost		348	186
Bivalves	Modiolus demissus				1
	Congeria leucophaeta			1	1
Amphipods	Corophium lacustre			1126	1124
	Gammarus sp.		4	8	30
	Leptocheirus plumulosus		3		2
Polychaetes	Nereis succinea				
	Scolecolepides viridis				
Decapods	Rhithropanopeus harrissi				
Ectoprocts	Bowerbankia sp.				
	Membranipora tenuis			X	X
Hydroids				X	X
Dipteran Larvae					1
Total No. of Genera (not including Hydroids and Dipteran Larvae)			2	5	7
Total No. of Genera (not including Bryozoans and Hydroids)			7	1483	1345

*Incubated from 3-8-77 to 6-20-77

Table 26 (continued)

Fouling Organisms
1977
Station CBS

		No. Organisms/dm^2		
Horizontal Plate		Jul-Aug	Sep-Oct*	Nov-Dec
Barnacles	Balanus sp.	Lost	36	
Bivalves	Modiolus demissus		3	
	Congeria leucophaeta			
Amphipods	Corophium lacustre		41	6
	Gammarus sp.		65	11
Polychaetes	Nereis succinea		19	
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi			
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis		X	X
Hydroids			X	
Dipteran Larvae				
Total No. of Genera (not including Hydroids and Dipteran Larvae)			6	3
Total No. of Organisms (not including Bryozoans and Hydroids)			164	17
Vertical Plate				
Barnacles	Balanus sp.	Lost	53	
Bivalves	Modiolus demissus		1	
	Congeria leucophaeta			
Amphipods	Corophium lacustre		23	6
	Gammarus sp.		77	6
	Leptocheirus plumulosus		3	
Polychaetes	Nereis succinea		17	
	Scolecolepides viridis			
Decapods	Rhithropanopeus harrissi			
Ectoprocts	Bowerbankia sp.			
	Membranipora tenuis		X	X
Hydroids			X	X
Dipteran Larvae				
Total No. of Genera (not including Hydroids and Dipteran Larvae)			6	3
Total No. of Organisms (not including Bryozoans and Hydroids)			174	12

*Incubated from 9-12-77 to 10-31-77

Conclusions

Analysis of the 1977 plankton and benthos data from the vicinity of the Surry Power Station yielded results that are consistent with the findings in previous study years (Jordan et al. 1976, 1977). The effects of the power plant on the river phytoplankton community on the upstream side of Hog Point mainly resulted from the introduction of water pumped from the downstream side, that was either richer or poorer in certain species than the upstream receiving water. Destruction of plant entrained phytoplankton occurred in the summer months, but reduced population densities were not detected in the river itself beyond the immediate vicinity of the discharge canal mouth. Modification of the discharge area zooplankton community by the introduction of organisms pumped from the intake side of Hog Point or released into the cooling water by species residing within the intake and discharge canals was observed, but destruction of entrained organisms was not detected in the 1977 study. The power plant discharge plume may have affected four benthos species, but the only indisputable damage to an invertebrate population observed during the 1977 study was the winter kill of Rangia cuneata, from which rapid recovery was achieved.

References

Jordan, R. A., R. K. Carpenter, P. A. Goodwin, C. G. Becker, M. S. Ho, G. C. Grant, B. B. Bryan, J. V. Merriner, and A. D. Estes. 1976. Ecological Study of the Tidal Segment of the James River Encompassing Hog Point, 1975 Final Technical Report. VIMS Spec. Sci. Report No. 78. Va. Inst. Mar. Sci., Gloucester Point, Va. 476 pp. + Appendices

Jordan, R. A., P. A. Goodwin, R. K. Carpenter, J. V. Merriner, A. D. Estes, and R. K. Dias. 1977. Ecological Study of the Tidal Segment of the James River Encompassing Hog Point, 1976 Final Technical Report. VIMS Spec. Sci. Report No. 84, Va. Inst. Mar. Sci., Gloucester Point, Va. 440 pp.

Steel, R. J. and J. H. Torrie. 1960. Principles and Procedures of Statistics with Special Reference to the Biological Sciences. New York: McGraw-Hill. 481 pp.

Appendix A

Hydrographic Data Tables

Table 1

James River Hydrographic Data 1977

Plankton Sampling Runs

Date	Parameter	Station DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
2-23	Time (EST)	1040	1106	1147	1215	1236	1300	1325	1347	1408	1441
	Secchi Depth (cm)	89	57	65	75	67	87	55	95	62	39
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	5.25	5.40	6.10	5.05	5.15	6.65	13.20	6.35	5.10	4.00
	Sal. (‰)	4.73	7.01	3.85	2.16	2.17	3.46	6.53	2.51	2.15	1.19
	D.O. (mg/1)	11.68	12.79	11.17	12.44	11.73	12.42	11.52	12.10		12.12
	Sample Depth (m)	.75	3.5	2	1	1.5	1	1	1	1	4
	Temp. (°C)	4.80	5.40	6.00	5.10	5.00	6.60	13.20	6.40	5.15	4.20
	Sal. (‰)	4.90	7.08	3.84	2.25	2.29	3.45	6.54	2.57	2.15	1.74
	D.O. (mg/1)	11.60	12.30	12.07	11.70	11.68	12.18	10.49	13.10		12.54
	Sample Depth (m)	1.5	7	4	2	3		2		2	8
	Temp. (°C)	4.45	6.30	6.15	4.70	5.00		13.35		5.85	4.35
	Sal. (‰)	5.91	7.36	3.90	2.44	2.78		6.58		2.94	1.75
	D.O. (mg/1)	11.83	12.69	11.95	11.97	12.94		12.10			12.01
4-13	Time (EST)	1040	1111	1141	1203	1224	1245	1303	1345	1405	1426
	Secchi Depth (cm)	55	35	35	63	38	49	31	63	62	52
	Sample Depth (m)	0	0	0	0	0	.25	0	0	0	0
	Temp. (°C)	16.40	17.80	17.80	16.95	16.90	21.60	22.10	24.60	17.00	15.40
	Sal. (‰)	0.12	0.21	0.16	0.10	0.13	0.19	0.24	0.14	0.09	0.10
	D.O. (mg/1)	11.11	9.53	9.45	10.03	9.00	9.49	8.96	10.88	9.87	9.45
	Sample Depth (m)	1	4	2.25	1	1.25		1	.5	.75	2.5
	Temp. (°C)	16.40	17.15	17.50	16.90	16.95		22.20	24.20	17.20	15.40
	Sal. (‰)	0.12	0.19	0.16	0.10	0.14		0.24	0.14	0.09	-
	D.O. (mg/1)	10.28	9.36	9.04	10.24	9.87		8.59	-	9.32	9.08
	Sample Depth (m)	2	8	4.5	2	2.5		2		1.5	5
	Temp. (°C)	16.75	17.15	17.65	16.85	17.10		22.50		17.40	15.55
	Sal. (‰)	0.12	0.19	0.16	0.10	0.13		0.24		0.09	0.09
	D.O. (mg/1)	9.94	9.40	9.26	10.79	8.91		8.91		9.62	10.09

Table A1 (continued)

Date	Parameter	Station DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
5-12	Time (EDT)	1008	1057	1130	1155	1210	1228	1255	1353	1410	1440
	Secchi Depth (cm)	55	36	46	40	47	54	46	44	52	46
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	18.00	18.10	19.35	18.70	18.65	19.45	23.10	19.50	18.75	18.80
	Sal. (‰)	4.78	6.24	2.28	2.29	2.42	1.91	6.26	1.08	1.05	0.86
	D.O. (mg/l)	8.42	7.50	8.10	8.12	8.54	8.68	7.40	9.34	8.30	8.76
	Sample Depth (m)	1	3.75	2.5	1	1.5	1	1	1	1	3
	Temp. (°C)	18.10	18.15	19.10	18.70	18.60	19.45	23.50	19.20	18.80	18.75
	Sal. (‰)	4.78	6.24	2.89	2.30	2.44	2.66	6.27	1.11	1.04	0.87
	D.O. (mg/l)	7.78	7.54	8.98	7.92	8.34	8.40	7.14	8.50	8.08	8.62
	Sample Depth (m)	2	7.5	5	2	3		2		2	6
	Temp. (°C)	18.30	18.25	19.20	18.70	18.75		23.40		19.00	18.80
	Sal. (‰)	4.87	6.32	3.06	2.38	2.48		6.21		1.04	1.37
	D.O. (mg/l)	8.10	7.40	7.82	8.00	8.46		7.24		8.06	8.04
6-13	Time (EDT)	1103	1138	1212	1240	1308	1334	1400	1440	1511	1542
	Secchi Depth (cm)	91	42	67	82	73	74	45	82	74	60
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	22.95	22.90	24.10	23.70	23.40	25.30	30.80	25.50	24.30	22.70
	Sal. (‰)	7.26	8.03	6.01	4.68	5.86	5.27	8.23	3.74	4.21	2.87
	D.O. (mg/l)	6.89	6.48	6.35	8.01	6.40	6.99	6.62	7.50	7.50	6.35
	Sample Depth (m)	1	4	2.5	1	1.5	1	1	1	1.5	2
	Temp. (°C)	22.55	23.00	23.40	23.70	23.40	25.05	30.80	25.30	24.20	22.70
	Sal. (‰)	7.82	8.04	6.22	4.70	5.88	5.55	8.23	4.37	4.44	2.88
	D.O. (mg/l)	7.27	-	6.74	6.74	7.01	5.13	4.56	7.46	7.07	6.78
	Sample Depth (m)	2	8	5	2	3		2		3	4
	Temp. (°C)	22.25	22.70	22.70	23.40	23.10		30.80		24.60	22.90
	Sal. (‰)	8.93	8.28	7.88	4.76	6.08		8.17		4.59	3.09
	D.O. (mg/l)	7.03	6.72	6.82	7.17	7.27		5.01		6.27	4.64

Table A1 (Continued)

Date	Parameter	Station DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
7-12	Time (EDT)	1040	1115	1140	1204	1238	1257	1317	1403	1437	1517
	Secchi Depth (cm)	74	29	53	43	58	51	40	77	-	75
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	28.50	28.60	30.30	29.65	31.10	30.85	33.80	30.50	29.80	29.80
	Sal. (‰)	9.87	10.07	8.20	6.58	7.37	7.12	10.09	6.55	5.71	4.63
	D.O. (mg/1)	6.62	6.76	6.78	7.10	7.38	6.64	5.86	7.92	6.14	7.26
	Sample Depth (m)	1	3.5	2.5	1	1.5	1	1	.75	1.5	3.5
	Temp. (°C)	28.50	28.60	29.80	29.80	30.00	30.85	33.80	30.50	29.75	29.60
	Sal. (‰)	6.53	10.20	8.64	6.63	7.43	7.12	10.12	6.44	6.02	5.16
	D.O. (mg/1)	6.42	7.04	6.32	6.38	7.06	6.48	5.96	7.22	6.24	5.98
	Sample Depth (m)	2	7	5	2	3		2	1.5	3	7
	Temp. (°C)	28.50	28.70	29.60	29.80	29.65		33.70	30.70	30.00	29.60
	Sal. (‰)	10.09	10.21	9.07	6.65	7.66		10.09	6.53	6.70	5.19
	D.O. (mg/1)	6.96	6.46	6.10	6.14	5.76		6.10	7.08	5.74	6.20
7-21	Time (EDT)		1042					1248			
	Secchi Depth (cm)		38					43			
	Sample Depth (m)		0					0			
	Temp. (°C)		30.10					34.90			
	Sal. (‰)		9.30					9.42			
	D.O. (mg/1)		5.76					5.94			
	Sample Depth (m)		3.75					1			
	Temp. (°C)		29.95					34.85			
	Sal. (‰)		9.43					9.42			
	D.O. (mg/1)		5.94					4.71			
	Sample Depth (m)		7.5					2			
	Temp. (°C)		29.90					34.90			
	Sal. (‰)		9.54					9.41			
	D.O. (mg/1)		5.88					5.80			

Table A1 (continued)

Date	Parameter	Station DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
8-16	Time (EDT)	1050	1123	1148	1212	1236	1257	1320	1430	1455	1515
	Secchi Depth (cm)	110	54	34	64	60	70	50	82	68	72
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	29.15	29.35	29.60	29.70	29.75	31.10	37.30	32.20	29.80	30.05
	Sal. (‰)	10.73	11.55	10.75	8.60	9.18	10.26	11.79	9.64	10.82	7.92
	D.O. (mg/l)	6.80	6.44	6.30	6.24	6.18	6.30	6.40	6.92	6.92	7.63
	Sample Depth (m)	1	4	2	1.25	1.5	1	1	1	1.5	3.5
	Temp. (°C)	29.00	29.30	29.55	29.75	29.80	31.00	37.20	32.00	29.75	29.70
	Sal. (‰)	10.84	11.57	10.74	8.60	9.69	10.26	11.79	9.66	10.01	9.11
	D.O. (mg/l)	6.44	6.78	6.08	7.00	6.48	6.52	5.99	6.52	6.78	6.48
	Sample Depth (m)	2	8	4	2.5	3	3	2		3	7
	Temp. (°C)	28.60	29.40	29.50	29.75	29.90	31.05	37.20		29.85	29.40
	Sal. (‰)	12.19	11.58	10.75	8.65	9.64	10.29	11.75		10.13	9.18
	D.O. (mg/l)	6.12	6.88	6.40	6.12	6.56	6.64	6.50		5.17	6.58
9-6	Time (EDT)	1040	1115	1149	1219	1244	1311	1339	1422	1447	1516
	Secchi Depth (cm)	110	70	70	95	90	85	67	65	112	97
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	28.20	28.00	30.80	29.55	29.20	31.15	36.20	30.30	29.45	29.40
	Sal. (‰)	11.28	12.85	10.85	8.50	8.94	10.28	12.71	8.40	8.04	6.65
	D.O. (mg/l)	8.78	7.34	7.08	7.92	7.66	7.72	7.28	8.86	8.00	8.98
	Sample Depth (m)	1	3.5	2.25	1	1.5	1	1	.5	1.5	4
	Temp. (°C)	28.20	27.95	30.55	29.50	29.25	32.00	35.90	30.40	29.40	28.70
	Sal. (‰)	11.33	12.92	10.60	8.61	8.95	10.66	12.71	8.49	8.08	7.78
	D.O. (mg/l)	7.76	7.48	8.74	7.62	7.72	7.12	7.34	9.04	8.08	7.20
	Sample Depth (m)	2	7	4.5	2	3		2		3	8
	Temp. (°C)	28.30	27.95	30.90	29.45	29.40		35.60		29.40	28.85
	Sal. (‰)	12.72	13.00	10.86	9.17	8.94		12.70		8.23	8.50
	D.O. (mg/l)	7.42	7.66	7.16	7.32	7.46		6.94		8.18	7.10

Table A1 (continued)

Date	Parameter	Station DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
11-9	Time (EST)	1050	1120	1153	1447	1424	1220	1244	1334	1358	1528
	Secchi Depth (cm)	107	71	66	45	49	64	58	79	69	42
	Sample Depth (m)	0	0	0	0	0	0	0	0	0	0
	Temp. (°C)	18.60	19.00	19.40	18.20	18.50	19.70	26.90	19.00	18.50	18.00
	Sal. (‰)	8.24	8.42	6.86	3.65	4.50	5.81	8.63	4.24	3.32	2.39
	D.O. (mg/1)	8.21	7.99	8.03	7.74	8.41	8.37	7.58	9.04	8.84	7.50
	Sample Depth (m)	1.25	4	2.5	1.25	1.5	1	1	1	1.75	4
	Temp. (°C)	18.50	18.80	19.40	18.20	18.50	19.70	26.80	19.20	18.40	18.00
	Sal. (‰)	8.50	8.50	6.89	3.79	4.54	5.82	8.63	4.37	3.88	2.62
	D.O. (mg/1)	8.56	7.88	7.95	8.49	8.11	7.60	7.68	8.25	8.05	7.99
	Sample Depth (m)	2.5	8	5	2.5	3		2		3.5	8
	Temp. (°C)	18.40	18.60	19.40	18.30	18.60		26.60		18.60	18.00
	Sal. (‰)	9.20	8.70	6.93	4.03	4.56		8.60		4.32	2.74
	D.O. (mg/1)	7.76	7.99	8.05	8.25	8.68		7.74		8.01	7.74

Table A2

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
3-8	Time (EST)	1302	1253	1226	1156	1209	1235	1243	1311
	Secchi Depth (cm)	53	71	86	88	90	110	38	61
	Sample Depth (m)	0	0	0	0	0	0	0	0
	Temp. (°C)	10.25	10.20	10.20	9.80	9.80	10.50	10.15	10.20
	Sal. (‰)	1.85	2.66	3.79	4.87	5.99	4.51	3.80	2.27
	D.O. (mg/1)	11.25	11.55	11.84	12.30	12.74	12.66	11.52	11.38
	Sample Depth (m)	1.5	1	6	2	1	1	5	4.5
	Temp. (°C)	10.15	10.20	9.70	9.25	9.70	10.30	10.15	9.90
	Sal. (‰)	1.87	2.67	4.62	6.33	5.79	4.55	3.81	3.06
	D.O. (mg/1)	11.00	11.65	11.38	11.80	12.41	12.36	11.92	11.59

	Station	5	9	8	7	4	3	2	1
	Time (EST)	1318	1327	1337	1428	1439	1449	1457	1504
	Secchi Depth (cm)	65	92	72	74	72	120	97	89
	Sample Depth (m)	0	0	0	0	0	0	0	0
	Temp. (°C)	10.10	11.60	11.60	10.90	10.40	10.25	10.10	10.40
	Sal. (‰)	2.96	3.49	3.26	2.08	2.51	1.84	1.69	1.54
	D.O. (mg/1)	11.61	12.55	11.31	12.49	11.59	12.74	12.93	13.58
	Sample Depth (m)	3.5	1	4	1	3	2	2	1
	Temp. (°C)	9.90	11.40	11.45	11.00	10.20	10.10	9.80	10.30
	Sal. (‰)	3.04	3.47	3.38	2.12	2.46	1.85	1.72	1.52
	D.O. (mg/1)	11.82	12.05	12.05	13.90	12.22	11.94	12.05	13.52

Table A2 (continued)

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
4-25	Time (EDT)	1050	1113	1126	1150	1200	1214	1219	1228
	Secchi Depth (cm)	35	55	65	48	43	44	46	49
	Sample Depth (m)	0	0	0	0	0	.5	0	0
	Temp. (°C)	19.40	20.35	20.70	20.80	19.60	20.40	20.60	20.95
	Sal. (‰)	0.12	0.14	0.34	0.91	0.99	0.65	0.55	0.36
	D.O. (mg/1)	9.74	11.21	10.84	8.90	9.26	8.96	8.01	9.30
	Sample Depth (m)	1.5		7	2	.75		4	4.5
	Temp. (°C)	19.20		20.10	20.05	19.30		20.30	20.15
	Sal. (‰)	0.11		1.62	1.68	0.94		0.59	0.33
	D.O. (mg/1)	9.85		7.97	8.85	9.95		9.09	9.74

	Station	5	9	8	7	4	3	2	1
	Time (EDT)	1236	1245	1254	1313	1320	1332	1340	1347
	Secchi Depth (cm)	45	52	55	54	53	77	58	54
	Sample Depth (m)	0	0	0	.5	0	0	0	0
	Temp. (°C)	20.85	22.20	21.70	22.00	21.05	21.10	20.90	20.60
	Sal. (‰)	0.44	0.73	0.43	0.34	0.19	0.10	0.13	0.08
	D.O. (mg/1)	9.07	8.35	8.25	9.72	10.08	10.75	10.60	11.01
	Sample Depth (m)	4	1	4		2	1.5	1.5	1
	Temp. (°C)	20.45	22.20	20.40		20.60	20.10	19.50	20.40
	Sal. (‰)	0.43	0.75	0.31		0.20	0.10	0.30	0.08
	D.O. (mg/1)	7.81	8.76	8.31		10.02	10.43	10.02	10.91

Table A2 (continued)

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
6-20	Time (EDT)	1009	1043	1059	1126	1148	1203	1213	1226
	Secchi Depth (cm)	55	69	70	67	38	46	52	71
	Sample Depth (m)	0	0	0	0	0	0	0	0
	Temp. (°C)	26.80	26.60	26.00	25.80	25.90	26.60	27.70	27.20
	Sal. (‰)	4.05	5.11	6.10	7.32	8.76	7.77	6.50	4.59
	D.O. (mg/1)	8.67	7.74	7.18	6.98	7.42	6.96	6.49	7.46
	Sample Depth (m)	1	.5	7.5	2	.5	.5	4.5	4
	Temp. (°C)	26.20	25.80	25.60	25.40	26.00	26.60	27.40	26.60
	Sal. (‰)	4.58	5.50	6.55	7.82	8.74	7.78	6.88	5.12
	D.O. (mg/1)	7.40	6.91	6.87	6.85	7.00	6.65	6.35	6.47

	Station	5	9	8	7	4	3	2	1
	Time (EDT)	1234	1243	1254	1355	1404	1414	1424	1432
	Secchi Depth (cm)	60	70	69	80	69	91	78	82
	Sample Depth (m)	0	0	0	0	0	0	0	0
	Temp. (°C)	27.00	29.60	27.40	27.95	27.20	28.75	27.80	27.90
	Sal. (‰)	4.54	6.54	4.22	4.64	5.22	4.41	4.44	3.96
	D.O. (mg/1)	8.13	7.56	7.92	9.68	7.28	9.64	8.63	9.24
	Sample Depth (m)	3	1	4	1	3	1	2	1
	Temp. (°C)	26.30	28.90	27.60	27.85	28.30	28.40	27.30	27.60
	Sal. (‰)	4.92	6.47	5.66	4.66	5.90	4.43	4.41	3.96
	D.O. (mg/1)	6.77	7.30	7.04	8.79	6.55	9.90	8.59	8.91

Table A2 (continued)

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
7-14	Time (EDT)	1025	1037	1048	1105	1117	1130	1142	1153
	Secchi Depth (cm)	39	44	54	52	40	46	50	53
	Sample Depth (m)	0	.5	0	0	.5	.5	0	0
	Temp. (°C)	29.60	29.80	29.80	29.60	29.60	29.90	30.00	30.50
	Sal. (‰)	5.89	6.33	7.44	8.39	9.01	9.06	7.97	7.68
	D.O. (mg/1)	6.38	7.09	7.42	6.99	6.91	7.72	7.11	6.35
	Sample Depth (m)	1.5		6.5	2			4.5	4.5
	Temp. (°C)	29.80		29.60	29.35			29.65	30.20
	Sal. (‰)	6.19		7.97	8.25			8.06	7.75
	D.O. (mg/1)	6.42		5.93	6.95			7.01	6.33

Station	5	9	8	7	4	3	2	1
Time (EDT)	1201	1213	1219	1234	1228	1242	1250	1302
Secchi Depth (cm)	45	69	56	60	55	61	46	63
Sample Depth (m)	0	.5	0	.5	0	.5	0	.75
Temp. (°C)	29.90	31.05	30.70	31.30	30.80	30.80	30.10	30.20
Sal. (‰)	6.89	7.02	6.52	6.45	6.38	5.77	5.32	5.30
D.O. (mg/1)	7.03	8.85	7.62	8.31	7.56	8.40	7.62	7.76
Sample Depth (m)	3		4		2		2	
Temp. (°C)	29.80		30.35		30.40		29.70	
Sal. (‰)	6.92		7.41		6.51		5.46	
D.O. (mg/1)	6.58		6.78		6.62		6.29	

Table A2 (continued)

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
8-18	Time (EDT)	0740	0750	0805	0818	0832	0844	0855	0907
	Secchi Depth (cm)	39	60	75	93	30	51	62	55
	Sample Depth (m)	0	.5	0	0	.5	.5	0	0
	Temp. (°C)	27.20	27.00	28.40	27.30	26.30	28.90	29.00	28.40
	Sal. (‰)	7.17	8.34	9.72	11.05	11.72	10.07	9.59	8.30
	D.O. (mg/1)	5.74	5.62	6.60	6.36	6.00	5.62	6.22	6.22
	Sample Depth (m)	1		7	1.5			4	3
	Temp. (°C)	26.80		28.70	27.80			28.90	28.50
	Sal. (‰)	7.47		10.64	11.96			9.84	8.48
	D.O. (mg/1)	6.32		6.28	5.70			5.44	6.12

	Station	5	9	8	7	4	3	2	1
	Time (EDT)	0915	0923	1001	1023	1013	1034	1044	1055
	Secchi Depth (cm)	52	59	57	57	51	46	58	65
	Sample Depth (m)	0	.5	0	.5	0	.5	0	.5
	Temp. (°C)	28.40	30.80	28.40	27.10	28.00	26.90	27.80	27.40
	Sal. (‰)	7.47	10.66	7.68	7.66	6.98	7.48	7.82	6.80
	D.O. (mg/1)	5.72	5.92	6.28	6.26	6.46	6.26	5.96	5.84
	Sample Depth (m)	3		4		2.5		2	
	Temp. (°C)	28.15		28.20		27.90		27.50	
	Sal. (‰)	7.50		8.76		7.00		7.80	
	D.O. (mg/1)	6.14		6.06		5.76		6.44	

Table A2 (continued)

James River Hydrographic Data 1977

Benthos Sampling Runs

Date	Station	6	12	14	16	15	13	11	10
10-20	Time (EDT)	0804	0820	0830	0844	0856	0912	0920	0940
	Secchi Depth (cm)	72	87	80	99	54	23	58	49
	Sample Depth (m)	0	.75	0	0	.75	.75	0	0
	Temp. (°C)	13.30	13.20	13.20	12.90	13.20	13.20	15.00	14.20
	Sal. (‰)	9.27	9.84	12.17	11.82	13.20	12.82	10.68	11.07
	D.O. (mg/1)	8.72	8.78	8.44	8.36	8.56	9.00	9.04	8.76
	Sample Depth (m)	1.5		7.5	2			4	5
	Temp. (°C)	13.20		13.60	12.80			14.40	13.50
	Sal. (‰)	9.18		14.01	11.97			10.90	10.84
	D.O. (mg/1)	8.42		8.56	8.62			8.40	8.82

Station	5	9	8	7	4	3	2	1
Time (EDT)	0948	0955	1009	1035	1020	1045	1055	1105
Secchi Depth (cm)	60	60	70	54	63	52	101	84
Sample Depth (m)	0	.75	0	.75	0	.75	0	.75
Temp. (°C)	14.00	14.80	16.00	13.00	14.10	13.50	13.50	13.60
Sal. (‰)	10.65	10.32	10.50	8.39	8.65	9.08	8.61	8.20
D.O. (mg/1)	8.24	8.86	8.24	9.02	9.57	9.75	8.86	9.77
Sample Depth (m)	3		3.5		2		2	
Temp. (°C)	13.80		17.20		14.00		13.50	
Sal. (‰)	10.68		11.25		9.58		8.60	
D.O. (mg/1)	9.02		7.85		8.42		9.19	

Appendix B

Biological Data Tables for the Plankton Studies

Table B1

James River Chlorophyll Concentrations, 1977
(μg Chl a per liter, surface samples, two samples per station)

Station	Date							
	Feb. 23	Apr. 13	May 12	June 13	July 12	Aug. 16	Sept. 6*	Nov. 9
DWS	7.0	8.1	7.5	3.2	5.5	4.3	5.5	2.4
	5.6	10.9	6.8	3.2	5.7	4.3	7.1	1.7
Intake	10.0	7.1	6.7	6.3	8.8	11.3	12.2	2.5
	9.1	5.8	6.7	5.4	8.2	10.3	9.6	2.7
HPS	10.3	7.4	5.7	3.2	5.3	8.8	7.8	2.2
	10.1	6.3	6.9	3.0	6.7	10.3	9.2	2.6
HPW3	5.9	13.1	10.6	5.0	10.5	10.3		2.8
	5.2	11.4	10.9	5.0	7.9	10.6		3.2
HPW2	4.7	8.4	12.0	5.6	7.0	11.2		2.3
	6.5	8.3	11.6	4.8	8.1	11.8		2.2
HPW1	4.9	3.2	3.9	3.0	7.5	11.0		1.6
	7.0	4.7	3.2	2.8	8.8	9.5		1.7
Discharge	9.4	6.4	5.7	3.4	6.7	10.6		2.1
	5.8	6.7	5.0	3.8	5.8	9.4		2.2
CBE	3.7	4.7	6.3	3.2	8.8	8.2		2.3
	2.7	4.2	5.8	5.0	8.6	7.0		2.0
CBC	5.0	4.1	4.9	4.5	4.5	9.5		2.1
	5.4	4.1	4.6	4.2	4.5	9.5		2.0
JI	4.5	8.5	8.8	4.6	7.2	7.8		2.9
	5.8	7.1	9.1	5.1	7.2	8.0		2.7

* Reliable results obtained for only three stations.

James River Phytoplankton Cell Counts, 1977
(Total cells per ml, surface samples, two samples per station)

Station	Date								
	Feb. 23	Apr. 13	May 12*	June 13	July 12**	July 21	Aug. 16	Sept. 6	Nov. 9
DWS	4700	7750	1600	2150	2800		1400	2050	600
	4100	7750	1850	2350	2100		2050	2150	750
Intake	5900	2000	1850	1200	1500	1900	2700	2700	800
	5800	2200	1550	1150	1450	1300	2250	3450	900
HPS	3150	1900	3400	850	1200		1600	2700	650
	3900	1950	3950	850	1100		1500	2500	750
HPW3	2450	8850	4250	2100	2000		2650	3650	450
	2800	7300	3900	2150	2050		2950	3900	650
HPW2	2250	2500	4300	2200	3550		2250	3900	400
	2550	3400	4000	1900	3450		1950	3900	400
HPW1	3350	1900	2000	1050	1350		2100	3000	450
	2550	1850	2000	1000	1300		2500	2800	400
Intake Canal (Upstream)	7500	2850	1000	1650		1050	2450	3350	750
	6600	2600	1600	1700		1750	2550	3400	750
Intake Canal (Downstream)	6850	2900	1500	1350		1900	2600	3250	500
	4650	2600	1200	1250		1300	2250	2850	600
Discharge Canal	5850	2800	1650	1300		1400	1300	2550	550
	5850	2000	1800	1100		1900	1400	2150	500
Discharge	4800	1700	850	600	750	1200	1150	2050	350
	4800	2350	850	700	1100	1100	1400	1650	400
CBE	2550	4700	4100	3150	2600		1850	2800	800
	2850	3450	5650	3400	2900		1800	2550	750
CBC	2300	4000	3650	1550	1150		1700	3750	750
	2200	3700	3700	1200	900		1750	4550	850
JI	1100	4400	5600	1700	3850		2800	3550	700
	1000	5900	6250	2000	3850		2750	3350	500

* Canal samples taken May 13
** Canal sampling missed, run on July 21

Table B3

James River Phytoplankton 2-23-77

Dominant Organisms (cells per ml, 2 samples per station)

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
					Stations								
Cryptophyta													
8μ Chroomonas sp.		13	78	26	39	52	26	13	26	13	26	13	65
	52	13	52	26	26		26	13	52	52	13	39	26
16μ Chroomonas sp.		26	13		13		39	26	103	26			39
		39	13	26	26	26	39	13	26	13	13		
Cryptomonas sp.	65	142	39	26	13	90	65	39	39	116	52	90	13
	13	103	39		26	39	116	90	90	13	142	52	
15μ Cryptophyte	26	90	13		52	39	26				26	13	
	26	26	13		39	39	13				52	26	
Bacillariophyta													
Chaetoceros sp.	2934	2908	1965	2081	1810	2585	4304	3878	2495	2443	2133	1487	658
	2702	3529	2572	2223	2068	2081	3219	2391	2689	2482	1978	1693	530
Skeletonema costatum	1450	2546	672	205	203	418	2689	2792	2908	1939	118	176	40
	1125	1965	840	177	180	336	2999	1965	2779	2094	126	162	64
Rhizosolenia delicatulum		8	1				4	6	6	2			
	1	4					7	5	5	2			
Cyclotella meneghiniana	39	13		26	52							13	13
			13	26	52	13			26		13		
Nitzschia kützinginana	13	13									13		
					26					13			

Table B3 (continued)

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
	Stations												
Nitzschia	16	4	36	48	29	16	2	2	2	4	10	44	35
vermicularis	20	2	48	38	50	14	2	1	2	4	8	40	36
Asterionella	8	47	10			8	66	55	55	22			
japonica	4	42	10			3	27	30	47	26			
Asterionella			4	10	2	6					3	6	2
formosa			3	4	2	2					10	3	7
Amphiprora sp.	1	2	6	4	14	2		1	1	2	1	8	11
		2	8	14	8	1	1	1	2	1	2	10	8

Table B4

James River Phytoplankton 4-13-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Cryptophyta													
8 μ Chroomonas sp.	1112	414	284	724	336	465	362	543	414	336	3102	801	336
	1318	284	258	620	414	620	905	543	388	284	2327	724	362
Cryptomonas sp.	207	103	52	207	103	78		26	78	103	310	129	52
	284	26	52	78	233	26	155	52		78	284	26	181
Bacillariophyta													
Melosira	4782	448	540	6256	621	267	924	766	641	556	328	1913	2663
subsalsa	4292	442	606	4705	666	307	822	616	484	392	269	1965	3335
Melosira	164	40	33	313	252	14	84	20	14	5		149	269
ambigua	83	12	52	277	196	4	32	24	39	25	16	85	290
Cyclotella	388	103	103	155	26	78	181	52				207	233
meneghiniana	233	155	181	129	78	52	129	129		78	129	155	207
Nitzschia	233	336	78	388	207	310	284	259	284	258	78	181	207
kützingiana	465	233	388	569	181	259	207	233	336	595	78	233	310
Nitzschia	8	14	2		2	6	13	20	12	17		3	
vermicularis	3	15	7		2	10	12	13	18	17			1
Synedra	9		7	33	26	2	4		2		5	13	18
ulna	16		1	12	21	1		1	1		1	16	19
Nitzschia	3		1	14	8	1	3	1	1		1	4	11
longissima	7		5	21	4		1			2		3	5
Asterionella	8			38								9	6
formosa	7			16	23							2	31

Table B5

James River Phytoplankton 5-12-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE* CANAL UP	INTAKE* CANAL DOWN	DISCHARGE* CANAL	DISCHARGE	CBE	CBC	JI
Cryptophyta													
8 µ *Chroomonas* sp.	129	362	155	26	207	26	26	78	362	26	103	78	
	103	181	78	26	258		155	181	207	52	78	78	52
16µ *Chroomonas* sp.	13	26	103		103	26		78	78	26	26		
	13		155		26		78	103	52				
15µ Cryptophyte			103	26	879	129			26	26	284	181	
	78		155	52	1034		78				284	52	26
Pyrrophyta													
Katodinium	26	103	26		52		52			78	26		
rotundatum	26	207		26	155		52	52	78	52			
Bacillariophyta													
Melosira	155	103	879	1396	750	336	388		129	52	1344	698	3904
subsalsa	209	52	1215	1525	646	801	439	103	233	103	2559	905	4292
Skeletonema	323	207	155	724	905	52		155		52			
costatum	297	103	181	181	491		103	52	103	78			52
Cyclotella	362	414	595	414	362	517	52	26	129	207	388		155
meneghiniana	297	517	414	259	336	414	129		129	155	465	129	207
Rhizosolenia	13				52	129	26	26	26		26		
minima	52		26	26	26	26		26		26	26	52	78
Nitzschia	336	233	1086	1474	698	569	284	491	310	155	1732	1706	1344
kützingiana	388	233	1474	1525	801	595	259	181	336	129	1810	2301	1293

* Canal samples taken 5-13-77

Table B6

James River Phytoplankton 6-13-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Cryptophyta													
8μ *Chroomonas* sp.	168	491	297	569	879	207	569	620	336	336	1435	517	711
	220	233	233	452	789	181	362	414	414	336	1461	439	957
16μ *Chroomonas* sp.	39	103	103	129	323	13	181	78	26	129	90	155	78
	39	103	155	103	271	142	233	26	78	103	271	142	155
15μ Cryptophyte				52		13					116		13
				65	13						116	13	52
Pyrrophyta													
Katodinium		52	65	233	142		26	78			207	65	39
rotundatum		26		233	142		26	52			116	39	155
Bacillariophyta													
Melosira	284	103	155	103	26	271	52				181	194	52
subsalsa	245	155	129	155	52	103	52				284	26	129
Skeletonema				65	52		52	52		52	13		52
costatum	39						52	78	52				
Cyclotella	362	52	13		13			26	26			13	26
meneghiniana	207	78	26	52	39				26				
Rhizosolenia	65			78	78	168		26		26	142	13	39
minima	52	52	26	65	39	142		26			155	65	26
Nitzschia	13	129	103	52	39	39	78	26	52	52	155	52	220
kützingiana	13	129	65	90	39	52	52	103		52	168	26	142

Table B6 (continued)

Organisms	Stations												
	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Chlorophyta													
Pyraminonas sp.	233	26		336	259	129	155	52	78	26	78	220	207
	220	103	78	478	168	52	155	52	26	129	142	142	116
Ankistrodesmus sp.	103	26	26	194	78	13		52			271	116	233
	90		26	129	26	52	26		26		233	103	142
Microflagellates	103	103		103	142	13	284	362	569	26	155	78	13
3µFlagellate	142	103	26	116	13	103	595	414	414	26	220	103	26

Table B7

James River Phytoplankton 7-12-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
Cryptophyta										
8μ *Chroomonas* sp.	957	595	543	879	1357	595	284	1293	375	1926
	633	336	543	776	1202	543	465	1086	349	1783
16μ *Chroomonas* sp.	271	207	90	310	711	207	103	181	13	310
	207	233	116	414	608	220	52	284	52	297
Pyrrophyta										
Katodinium rotundatum	65	129	78	491	776	129	78	129	13	517
	39	52	26	439	840	103	78	39	13	724
Bacillariophyta										
Leptocylindrus minimus	801	155	52	26	168		26	103	39	39
	698	259	90	52	142		155	220	13	8
Chaetoceros sp.	284	129	258	71	52	39		90	271	65
	233	52	129	49	116	26	181	103	39	26
Skeletonema costatum	5	23	82	88	26	100		134	138	235
	7		40	117	22	137	30	152	132	307
Cyclotella meneghiniana	13	26	26	26		39		65	26	13
	26	78	78			52		78	52	
Rhizosolenia minima	78	26			103	26		39	26	39
	13		13		90	26		103	65	13
Nitzschia kützingiana	65	26	13							
	26	26					26		13	39

Table B7 (continued)

Organisms	Stations									
	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	DISCHARGE	CBE	CBC	JI
Nitzschia longissima	1	9	1	1	2	2	7	1	3	2
	2	6	2	2	3	1	1	2	2	1
Gyrosigma sp.		11	1	1	1	2	4		2	
		3	3			1	4		1	1
Microflagellates										
3μ flagellate	116	52			52			26		
	116				13			13		

Table B8

James River Phytoplankton 7-21-77

Dominant Organisms (cells per ml, 2 samples per station)

Organisms	Stations Intake	Intake Canal Up	Intake Canal Down	Discharge Canal	Discharge
Cryptophyta					
8 μ Chroomonas sp.	465	284	181	258	336
	414	336	310	284	233
16 μ Chroomonas sp.			78	26	26
	52	78		103	103
Pyrrophyta					
Katodinium	181	181	129	129	207
rotundatum	284	155	26	103	52
Bacillariophyta					
Leptocylindrus		26	129	52	78
minimus	52		129		129
Chaetoceros sp.	517	155	595	258	52
	78	491	155	26	52
Skeletonema	78	115	98	64	92
costatum	96	163	80	110	91
Cyclotella		78	52		52
meneghiniana		26			103
Rhizosolenia		26			
minima					78
Nitzschia	181	259	517	465	181
longissima	258	155	543	595	259
Gyrosigma sp.	11	13	14	12	7
	11	13	8	13	6

Table B9

James River Phytoplankton 8-16-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Cryptophyta													
8 μ Chroomonas sp.	840	1008	491	1396	905	646	931	776	233	26	517	569	1318
	1021	724	362	1629	827	827	620	724	233	26	620	569	1215
16 μ Chroomonas sp.	78	103	78	103	103	78	52	52			103	78	284
	52	103	103	78	78	129					181	52	233
Pyrrophyta													
Katodinium	52	129	78	233	388	620	181	207			258	78	388
rotundatum	246	155	78	284	155	465	207	103			284	129	543
Bacillariophyta													
Skeletonema		83	84	19	16	51	90	86	96	41	64	129	113
costatum	23	73	12	96	59	46	95	42	105	101	46	56	130
Cyclotella	26		78	52	26	26	26	26	78	207	103	78	52
meneghiniana	39	52	78	52	103	78	78		181	78	78	52	52
Chaetoceros sp.	31	13	14	17	18	15	7	9	24	8	11	14	40
	7	18	15	17	41	8	33	40	27	17	46	40	62
Leptocylindrus	39	129		103		103		78		52		52	103
minimus	65	52		233		26	52	129	52	129		52	52
Rhizosolenia	78	78	103		52	103	103	78	52		284	181	129
minima	129	52	129	52		181	26		52	207	181	103	155
Gyrosigma	58	460	228	227	213	233	298	248	245	345	118	249	90
beaufortianum	65	470	221	218	213	217	305	264	236	349	114	283	69

Table B9 (continued)

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
					Stations								
Nitzschia longissima	4	24	20	15	13	32	61	79	88	56	33	29	19
	8	24	14	22	13	39	69	49	59	58	20	30	19
Chlorophyta													
Pyramimonas sp.	65	155	207	181	155		259	52	52	129	129	26	155
	129	52	26	181	103	78	233	52	78	78	78	129	129
Microflagellates													
3 µ Flagellate	78	78	52	26				569	52	26	78	52	78
	194	26	52	78	26	78	78	698	26	78	52	26	26

Table B10

James River Phytoplankton 9-6-77

Dominant Organisms (cells per ml, 2 samples per station)

Stations

Organisms	DWS	INTAKE	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Cryptophyta													
8 μ *Chroomonas* sp.	452	595	620	1189	1370	595	698	698	439	233	491	1448	1189
	530	957	672	1293	1189	646	672	698	414	233	595	1810	1215
16 μ *Chroomonas* sp.		52	78	78	233	78	103	78	52	26	233	233	284
		52	78	78	259	78	78	52	26		155	284	181
Cryptomonas sp.	103	103	26	155	155	207				78	388	181	
	103		103	181	26	103				26	181	129	26
Pyrrophyta													
Katodinium	129	259	103	336	517	129	284	103		26	362	465	491
rotundatum	142	259	284	491	646	181	233	52			155	801	388
Bacillariophyta													
Leptocylindrus	427	129	491	155	207	233	233	284	103	233	129	155	129
minimus	297	207	284	233	233	336	310	155	78	284	52	207	129
Rhizosolenia	220	52	336	310	362	465	78		52	52	207	543	336
minima	142	52	310	336	388	284	26	26		26	207	569	284
Cyclotella	129	233	129		26	103	78	414	155	207	52	52	207
meneghiniana	90	181	103	26	129	78	181	155	52	155		26	155
Skeletonema	36	55	30	14	43	33	24	22	33		20	27	146
costatum	48	44		29	58	55	82	73	15		20	14	110
Nitzschia	26	181	336	259	155	155	439	439	776	414	181		52
longissima	233	259	155	181	129	181	362	543	517	284	181	26	

Table B10 (continued)

Stations

Organisms	DWS	Intake	HPS	HPW3	HPW2	HPW1	INTAKE CANAL UP	INTAKE CANAL DOWN	DISCHARGE CANAL	DISCHARGE	CBE	CBC	JI
Gyrosigma beaufortianum	111	834	363	448	317	101	1057	940	738	411	2	78	10
	102	946	405	362	277	102	1075	786	602	395	6	69	21
Gyrosigma sp.		9	17	52	11	6	3	8	4	6		1	4
		3	20	44	4	4	7	5	10			2	4
Microflagellates													
3μFlagellates	78	78	26	233	181	52	52	26		52	52	155	362
	26	129	52	259	233	103	52	26		52	26	129	233
Chlorophyta													
Pyramimonas sp.	323	26	103	414	259	698	26	26	26	181	620	310	336
	427	155	78	284	129	517	155	52	155	78	646	414	620

Table B11

James River Phytoplankton 11-9-77

Dominant Organisms (cells per ml, 2 samples per station)

Organisms	DWS	Intake	HPS	HPW3	HPW2	HPW1	Intake Canal Up	Intake Canal Down	Discharge Canal	Discharge	CBE	CBC	JI
					Stations								
Cryptophyta													
8 μ *Chroomonas* sp.	381	259	220	142	246	78	246	246	246	181	246	259	259
	414	336	349	233	103	103	310	181	246	271	310	246	168
16 μ *Chroomonas* sp.	110	207	103	90	52	39	78	65	103	52	181	155	116
	175	155	90	220	65	78	155	103	52	26	103	116	52
Pyrrophyta													
Katodinium		78	90	26	39	13	168	65	103	26	78	90	26
rotundatum	19	78	90	103	26	26	90	65	52	26	65	194	26
Bacillariophyta													
Skeletonema	3	42	36	55	21	65	26		11		56	102	90
costatum	14	25	27	15	45	22	4	15	24		18	97	96
Nitzschia	6	65	65	13		52	39	39	39	26	39	13	13
longissima	6	90	52	26	39	52	26	39	13	52	13		26
Gyrosigma sp.	2	2	1	2		2	4			2	1	5	2
	1	1		1	3	2	1	1		2		2	1
Amphiprora sp.	6	15	2			4	9	8	5	11		1	
	6	15	5	1		3	11	6	4	9			1
Chlorophyta													
Pyramimonas sp.	19	13		26				26	26	13		52	13
	32			26	13				26	13	13	65	13
Microflagellates													
3 μ flagellate	52	13	116	13		65	116	26	39	13	65	39	13
	58	90	52	39	52	13	103	155	39	13	129	39	13

Table B12

James River Zooplankton; February 23, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	33.1	30.3	56.3	449.6	95.3	164.0
	2	16.9	33.4	65.7	357.8	137.7	171.9
	$\bar{x}$	25.0	31.9	61.0	403.7	116.5	167.9
	s	11.5	2.2	6.6	64.9	30.0	5.5
	$s_{\bar{x}}$	8.1	1.6	4.7	45.9	21.2	3.9
Polychaete larvae	1	91.1	112.2	59.2	15.0	47.1	99.5
	2	57.1	178.3	59.8	11.7	51.0	55.3
	$\bar{x}$	74.1	145.3	59.5	13.3	49.0	77.4
	s	24.0	46.7	0.4	2.3	2.8	31.2
	$s_{\bar{x}}$	17.0	33.0	0.3	1.6	2.0	22.1
Harpacticoid copepods	1	1.2	1.8	7.9	2.2	0.0	8.1
	2	1.1	18.6	10.3	1.5	1.7	2.9
	$\bar{x}$	1.1	10.2	9.1	1.8	0.8	5.5
	s	0.1	11.9	1.7	0.5	1.2	3.6
	$s_{\bar{x}}$	0.1	8.4	1.2	0.4	0.8	2.6
Eurytemora sp.	1	2.4	3.6	13.0	172.0	38.8	44.4
	2	4.2	0.0	19.9	128.5	62.9	59.7
	$\bar{x}$	3.3	1.8	16.5	150.3	50.9	52.0
	s	1.3	2.5	4.9	30.8	17.0	10.8
	$s_{\bar{x}}$	0.9	1.8	3.5	21.8	12.0	7.7
Rotifers	1	26.0	92.6	26.7	13.5	35.3	53.8
	2	15.9	81.7	20.7	13.1	22.1	75.7
	$\bar{x}$	21.0	87.2	23.7	13.3	28.7	64.8
	s	7.2	7.7	4.3	0.2	9.3	15.5
	$s_{\bar{x}}$	5.1	5.4	3.0	0.2	6.6	11.0
Bosmina sp.	1	2.4	-	1.4	-	-	0.0
	2	0.0	-	0.0	-	-	2.9
	$\bar{x}$	1.2	-	0.7	-	-	1.5
	s	1.7	-	1.0	-	-	2.1
	$s_{\bar{x}}$	1.2	-	0.7	-	-	1.5
Cyclopoid copepods	1	1.2	3.6	6.5	9.0	9.4	13.4
	2	5.3	3.7	9.6	7.3	10.2	29.1
	$\bar{x}$	3.2	3.6	8.0	8.1	9.8	21.3
	s	2.9	0.1	2.2	1.2	0.6	11.1
	$s_{\bar{x}}$	2.0	0.1	1.5	0.8	0.4	7.8

Table B12 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Barnacle nauplii	1	0.0	1.8	2.2	-	-	6.7
	2	1.1	0.0	2.2	-	-	18.9
	$\bar{x}$	0.5	0.9	2.2	-	-	12.8
	s	0.7	1.3	0.0	-	-	8.6
	$s_{\bar{x}}$	0.5	0.9	0.0	-	-	6.1
Acartia sp.	1	-	-	3.6	-	1.2	2.7
	2	-	-	2.2	-	0.0	1.5
	$\bar{x}$	-	-	2.9	-	0.6	2.1
	s	-	-	1.0	-	0.8	0.9
	$s_{\bar{x}}$	-	-	0.7	-	0.6	0.6

Table B12 (continued)

Organisms		Discharge	Stations CBE	CBC	J.I.	I.C.D.	D.C.
Copepod nauplii	1	45.1	51.6	141.2	778.6	21.1	14.1
	2	55.5	113.6	104.3	573.7	5.3	28.2
	$\bar{x}$	50.3	82.6	122.8	676.1	13.2	21.1
	s	7.3	43.8	26.2	144.9	11.2	10.0
	$s_{\bar{x}}$	5.2	31.0	18.5	102.4	7.9	7.0
Polychaete larvae	1	119.2	15.9	35.7	4.6	22.9	31.7
	2	233.2	38.3	25.7	4.1	8.8	59.9
	$\bar{x}$	176.2	27.1	30.7	4.3	15.8	45.8
	s	80.6	15.9	7.1	0.4	10.0	19.9
	$s_{\bar{x}}$	57.0	11.2	5.0	0.3	7.0	14.1
Harpacticoid copepods	1	19.3	4.0	4.9	3.1	28.2	3.5
	2	22.2	4.4	0.0	1.3	8.8	3.5
	$\bar{x}$	20.8	4.2	2.4	2.2	18.5	3.5
	s	2.0	0.3	3.4	1.2	13.7	0.0
	$s_{\bar{x}}$	1.4	0.2	2.4	0.9	9.7	0.0
Eurytemora sp.	1	0.0	67.5	68.2	293.5	0.0	5.3
	2	11.1	100.3	62.6	240.8	1.8	10.6
	$\bar{x}$	5.5	83.9	65.4	267.2	0.9	7.9
	s	7.8	23.2	4.0	37.2	1.2	3.7
	$s_{\bar{x}}$	5.5	16.4	2.8	26.3	0.9	2.6
Rotifers	1	35.4	18.5	45.5	109.7	1.8	0.0
	2	37.0	54.6	28.9	100.1	0.0	1.8
	$\bar{x}$	36.2	36.5	37.2	104.9	0.9	0.9
	s	1.1	25.5	11.7	6.7	1.2	1.2
	$s_{\bar{x}}$	0.8	18.0	8.3	4.8	0.9	0.9
Bosmina sp.	1	-	1.3	3.2	1.5	-	-
	2	-	0.0	0.0	1.3	-	-
	$\bar{x}$	-	0.7	1.6	1.4	-	-
	s	-	0.9	2.3	0.1	-	-
	$s_{\bar{x}}$	-	0.7	1.6	0.1	-	-
Cyclopoid copepods	1	3.2	7.9	32.5	41.7	7.0	12.3
	2	7.4	5.9	14.4	27.1	1.8	1.8
	$\bar{x}$	5.3	6.9	23.5	34.4	4.4	7.0
	s	3.0	1.4	12.7	10.4	3.7	7.5
	$s_{\bar{x}}$	2.1	1.0	9.0	7.3	2.6	5.3

Table B12 (continued)

Organisms		Discharge	Stations CBE	CBC	J.I.	I.C. D.	D.C.
Barnacle nauplii	1	9.7	1.3	3.2	0.0	3.5	3.5
	2	7.4	0.0	0.0	2.7	1.8	7.0
	$\bar{x}$	8.5	0.7	1.6	1.4	2.6	5.3
	s	1.6	0.9	2.3	1.9	1.2	2.5
	$s_{\bar{x}}$	1.1	0.7	1.6	1.3	0.9	1.8
Acartia sp.	1	-	1.3	0.0	4.6	-	-
	2	-	1.5	1.6	1.3	-	-
	$\bar{x}$	-	1.4	0.8	3.0	-	-
	s	-	0.1	1.3	2.3	-	-
	$s_{\bar{x}}$	-	0.1	0.8	1.6	-	-

Table B13

James River Zooplankton April 13, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	156.9	1031.5	416.9	156.6	267.7	763.5
	2	121.8	1471.7	267.8	292.2	541.2	631.8
	$\bar{x}$	139.3	1251.6	342.4	224.4	404.4	697.6
	s	24.8	311.3	105.5	95.8	193.4	93.1
	$s_{\bar{x}}$	17.5	220.1	74.6	67.8	136.8	65.9
Bosmina sp.	1	14.9	47.8	30.5	22.4	23.8	8.3
	2	19.1	63.6	27.1	5.5	70.6	2.3
	$\bar{x}$	17.0	55.7	28.8	13.9	47.2	5.3
	s	3.0	11.2	2.4	11.9	33.1	4.3
	$s_{\bar{x}}$	2.1	7.9	1.7	8.4	23.4	3.0
Harpacticoid copepods	1	6.0	35.8	57.6	4.5	5.9	8.3
	2	1.7	8.5	74.6	16.5	23.5	17.3
	$\bar{x}$	3.9	22.2	66.1	10.5	14.7	12.8
	s	3.0	19.3	12.0	8.5	12.4	6.3
	$s_{\bar{x}}$	2.1	13.7	8.5	6.0	8.8	4.5
Eurytemora sp.	1	37.3	23.9	27.1	13.4	29.7	8.3
	2	31.3	17.0	23.7	22.0	29.4	21.6
	$\bar{x}$	34.3	20.4	25.4	17.7	29.6	15.0
	s	4.3	4.9	2.4	6.1	0.2	9.4
	$s_{\bar{x}}$	3.0	3.5	1.7	4.3	0.2	6.6
Rotifers	1	16.4	55.8	13.6	44.8	23.8	25.0
	2	5.2	453.8	13.6	66.1	52.9	8.6
	$\bar{x}$	10.8	254.8	13.6	55.5	38.4	16.8
	s	7.9	281.5	0.0	15.1	20.6	11.6
	$s_{\bar{x}}$	5.6	199.0	0.0	10.7	14.6	8.2
Cyclopoid copepods	1	11.9	31.9	27.1	22.4	65.4	33.4
	2	17.4	101.8	50.8	33.1	82.3	86.5
	$\bar{x}$	14.7	66.8	39.0	27.7	73.9	60.0
	s	3.8	49.4	16.8	7.6	12.0	37.6
	$s_{\bar{x}}$	2.7	35.0	11.9	5.3	8.5	26.6
Polychaete larvae	1	-	4.0	-	-	5.9	0.0
	2	-	0.0	-	-	5.8	2.3
	$\bar{x}$	-	2.0	-	-	5.9	1.1
	s	-	2.8	-	-	0.1	1.6
	$s_{\bar{x}}$	-	2.0	-	-	0.0	1.1

Table B13 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Barnacle nauplii	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B13 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	423.1	393.7	238.1	210.7	327.6	581.2	361.0
	2	258.7	306.9	230.9	307.5	225.4	243.0	366.3
	$\bar{x}$	340.9	350.3	234.5	259.1	276.5	412.1	363.7
	s	116.3	61.4	5.1	68.5	72.2	239.1	3.7
	$s_{\bar{x}}$	82.2	43.4	3.6	48.4	51.1	169.1	2.6
Bosmina sp.	1	17.7	4.2	11.9	6.6	24.7	15.8	1.8
	2	12.3	16.4	26.8	14.6	3.5	12.3	0.0
	$\bar{x}$	15.0	10.3	19.4	10.6	14.1	14.1	0.9
	s	3.8	8.6	10.6	5.7	14.9	2.5	1.2
	$s_{\bar{x}}$	2.7	6.1	7.5	4.0	10.6	1.8	0.9
Harpacticoid copepods	1	35.5	8.4	0.0	6.6	21.1	7.0	24.7
	2	15.4	0.0	5.4	22.0	29.9	10.6	8.8
	$\bar{x}$	25.5	4.2	2.7	14.3	25.5	8.8	16.7
	s	14.2	5.9	3.8	10.9	6.2	2.5	11.2
	$s_{\bar{x}}$	10.0	4.2	2.7	7.7	4.4	1.8	7.9
Eurytemora sp.	1	8.9	-	47.6	13.2	3.5	8.8	8.8
	2	3.1	-	37.6	29.3	10.6	26.4	8.8
	$\bar{x}$	6.0	-	42.6	21.2	7.0	17.6	8.8
	s	4.1	-	7.1	11.4	5.0	12.4	0.0
	$s_{\bar{x}}$	2.9	-	5.0	8.1	3.5	8.8	0.0
Rotifers	1	82.8	4.2	23.8	59.3	42.3	15.8	54.6
	2	24.6	0.0	53.7	22.0	47.5	19.4	1.8
	$\bar{x}$	53.7	2.1	38.7	40.6	44.9	17.6	28.2
	s	41.2	3.0	21.1	26.4	3.7	2.5	37.4
	$s_{\bar{x}}$	29.1	2.1	14.9	18.6	2.6	1.8	26.4
Cyclopoid copepods	1	14.8	12.6	35.7	6.6	8.8	15.8	5.3
	2	15.4	4.1	5.4	43.9	3.5	1.8	3.5
	$\bar{x}$	15.1	8.3	20.5	25.3	6.2	8.8	4.4
	s	0.4	6.0	21.5	26.4	3.7	10.0	1.2
	$s_{\bar{x}}$	0.3	4.2	15.2	18.7	2.6	7.0	0.9
Polychaete larvae	1	8.9	-	-	-	3.5	3.5	1.8
	2	6.2	-	-	-	5.3	1.8	8.8
	$\bar{x}$	7.5	-	-	-	4.4	2.6	5.3
	s	1.9	-	-	-	1.2	1.2	5.0
	$s_{\bar{x}}$	1.4	-	-	-	0.9	0.9	3.5

Table B13 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Barnacle nauplii	1	298.8	-	-	-	19.4	19.4	59.9
	2	166.3	-	-	-	29.9	7.0	56.4
	x	232.6	-	-	-	24.7	13.2	58.1
	s	93.7	-	-	-	7.5	8.7	2.5
	s-	66.3	-	-	-	5.3	6.2	1.8

Table B14

James River Zooplankton; May 12, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	608.1	655.9	477.0	2095.1	607.3	1658.8
	2	728.1	474.5	336.8	1108.8	447.6	663.7
	$\bar{x}$	668.1	565.2	406.9	1601.9	527.5	1161.2
	s	84.8	128.3	99.1	697.4	113.0	703.6
	$s_{\bar{x}}$	60.0	90.7	70.1	493.2	79.9	497.5
Polychaete larvae	1	10.4	81.2	11.8	257.2	16.2	26.9
	2	27.1	82.2	6.7	114.0	9.1	23.2
	$\bar{x}$	18.8	81.7	9.2	185.6	12.7	25.0
	s	11.8	0.7	3.6	101.3	5.0	2.6
	$s_{\bar{x}}$	8.3	0.5	2.6	71.6	3.5	1.8
Barnacle nauplii	1	651.7	999.0	279.9	27.9	86.4	1181.9
	2	457.2	623.2	273.5	18.5	54.8	397.9
	$\bar{x}$	554.5	811.1	276.7	23.2	70.6	789.9
	s	137.5	265.7	4.5	6.6	22.3	554.4
	$s_{\bar{x}}$	97.2	187.9	3.2	4.7	15.8	392.0
Harpacticoid copepods	1	1.7	27.1	106.4	52.7	56.7	107.4
	2	16.1	12.6	43.4	6.2	54.8	32.1
	$\bar{x}$	8.9	19.9	74.9	29.4	55.7	69.8
	s	10.1	10.2	44.6	32.9	1.3	53.3
	$s_{\bar{x}}$	7.2	7.2	31.5	23.3	0.9	37.7
Eurytemora sp.	1	94.1	201.6	118.3	371.9	170.0	221.6
	2	213.2	237.3	153.4	234.1	127.9	137.4
	$\bar{x}$	153.6	219.4	135.8	303.0	149.0	179.5
	s	84.2	25.2	24.8	97.5	29.8	59.6
	$s_{\bar{x}}$	59.6	17.8	17.6	68.9	21.1	42.1
Pelecypod larvae	1	90.6	240.7	19.7	371.9	56.7	73.9
	2	29.5	208.8	50.0	323.4	94.4	33.9
	$\bar{x}$	60.1	224.8	34.9	347.6	75.5	53.9
	s	43.2	22.6	21.4	34.3	26.7	28.3
	$s_{\bar{x}}$	30.6	15.9	15.2	24.3	18.9	20.0
Acartia sp.	1	38.3	652.9	25.0	52.7	35.1	13.4
	2	59.0	313.2	26.7	21.6	3.0	0.0
	$\bar{x}$	48.7	483.1	25.8	37.1	19.1	6.7
	s	14.6	240.2	1.2	22.0	22.7	9.5
	$s_{\bar{x}}$	10.3	169.9	0.8	15.6	16.0	6.7

Table B14 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Rotifers	1	17.4	0.0	17.1	27.9	21.6	47.0
	2	0.0	6.3	10.0	55.4	57.8	10.7
	$\bar{x}$	8.7	3.2	13.5	41.7	39.7	28.9
	s	12.3	4.5	5.0	19.5	25.6	25.7
	$s_{\bar{x}}$	8.7	3.2	3.5	13.8	18.1	18.1
Cyclopoid copepods	1	0.0	3.0	-	-	-	6.7
	2	1.3	0.0	-	-	-	1.8
	$\bar{x}$	0.7	1.5	-	-	-	4.2
	s	0.9	2.1	-	-	-	3.5
	$s_{\bar{x}}$	0.7	1.5	-	-	-	2.5
Bosmina sp.	1	-	-	21.0	-	18.9	6.7
	2	-	-	10.0	-	15.2	7.1
	$\bar{x}$	-	-	15.5	-	17.1	6.9
	s	-	-	7.8	-	2.6	0.3
	$s_{\bar{x}}$	-	-	5.5	-	1.8	0.2
Amphipods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B14 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	160.6	154.1	483.5	894.2	297.6	598.8	195.5
	2	204.3	291.4	753.8	710.8	86.3	405.1	40.5
	$\bar{x}$	182.4	222.7	618.6	802.5	192.0	501.9	118.0
	s	30.9	97.1	191.1	129.7	149.4	137.0	109.6
	$s_{\bar{x}}$	21.9	68.6	135.1	91.7	105.7	96.9	77.5
Polychaete larvae	1	27.2	3.1	3.1	9.2	29.9	52.8	40.5
	2	28.4	0.0	2.8	0.0	7.0	24.7	8.8
	$\bar{x}$	27.8	1.6	3.0	4.6	18.5	38.7	24.7
	s	0.9	2.2	0.2	6.5	16.2	19.9	22.4
	$s_{\bar{x}}$	0.6	1.6	0.1	4.6	11.4	14.1	15.8
Barnacle nauplii	1	926.3	25.2	6.2	15.3	269.5	618.2	623.5
	2	1324.0	83.2	16.9	2.9	317.0	491.4	280.0
	$\bar{x}$	1125.1	54.2	11.6	9.1	293.2	554.8	451.7
	s	281.2	41.1	7.6	8.8	33.6	89.7	242.8
	$s_{\bar{x}}$	198.8	29.0	5.4	6.2	23.8	63.4	171.7
Harpacticoid copepods	1	46.9	53.5	40.3	165.4	15.8	15.8	24.7
	2	44.0	117.9	42.3	166.9	26.4	17.6	21.1
	$\bar{x}$	45.4	85.7	41.3	166.1	21.1	16.7	22.9
	s	2.1	45.6	1.5	1.1	7.5	1.2	2.5
	$s_{\bar{x}}$	1.5	32.2	1.0	0.8	5.3	0.9	1.8
Eurytemora sp.	1	56.8	37.7	58.9	174.5	8.8	10.6	14.1
	2	31.0	76.3	45.2	126.6	14.1	19.4	7.0
	$\bar{x}$	43.9	57.0	52.0	150.6	11.4	15.0	10.6
	s	18.2	27.3	9.7	33.9	3.7	6.2	5.0
	$s_{\bar{x}}$	12.9	19.3	6.9	24.0	2.6	4.4	3.5
Pelecypod larvae	1	46.9	-	43.4	110.2	-	14.1	10.6
	2	69.8	-	45.2	63.3	-	26.4	3.5
	$\bar{x}$	58.4	-	44.3	86.8	-	20.3	7.0
	s	16.2	-	1.3	33.2	-	8.7	5.0
	$s_{\bar{x}}$	11.4	-	0.9	23.5	-	6.2	3.5
Acartia sp.	1	121.0	3.1	6.2	3.1	826.0	149.7	51.1
	2	103.4	0.0	0.0	0.0	891.2	329.3	15.8
	$\bar{x}$	112.2	1.6	3.1	1.5	858.6	239.5	33.5
	s	12.4	2.2	4.4	2.2	46.1	127.0	24.9
	$s_{\bar{x}}$	8.8	1.6	3.1	1.5	32.6	89.8	17.6
Rotifers	1	-	56.6	31.0	315.4	-	1.8	-
	2	-	90.2	8.5	256.1	-	7.0	-
	$\bar{x}$	-	73.4	19.7	285.8	-	4.4	-
	s	-	23.7	15.9	41.9	-	3.7	-
	$s_{\bar{x}}$	-	16.8	11.3	29.6	-	2.6	-

Table B14 (continued)

Organisms		Discharge	Stations CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Cyclopoid Copepods	1	-	6.3	3.1	0.0	-	-	-
	2	-	17.3	2.8	5.8	-	-	-
	$\bar{x}$	-	11.8	3.0	2.9	-	-	-
	s	-	7.8	0.2	4.1	-	-	-
	$s_{\bar{x}}$	-	5.5	0.1	2.9	-	-	-
Bosmina sp.	1	0.0	9.4	24.8	49.0	-	-	-
	2	5.2	24.3	28.2	51.8	-	-	-
	$\bar{x}$	2.6	16.9	26.5	50.4	-	-	-
	s	3.7	10.5	2.4	2.0	-	-	-
	$s_{\bar{x}}$	2.6	7.4	1.7	1.4	-	-	-
Amphipods	1	-	-	-	-	5.3	-	-
	2	-	-	-	-	3.5	-	-
	$\bar{x}$	-	-	-	-	4.4	-	-
	s	-	-	-	-	1.2	-	-
	$s_{\bar{x}}$	-	-	-	-	0.9	- -	-

Table B15

James River Zooplankton June 13, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	1220.5	673.2	393.7	531.9	1093.4	824.0
	2	782.0	1258.4	531.2	616.3	1025.7	1827.7
	$\bar{x}$	1001.2	965.8	462.5	574.1	1059.6	1325.4
	s	310.0	413.7	97.2	59.6	47.8	710.4
	$s_{\bar{x}}$	219.2	292.6	68.7	42.2	33.8	502.4
Acartia sp.	1	187.3	16.6	4.3	22.3	4.9	6.2
	2	166.7	8.6	27.7	11.6	12.4	109.8
	$\bar{x}$	177.0	12.6	16.0	16.9	8.6	58.0
	s	14.5	5.7	16.6	7.6	5.3	73.2
	$s_{\bar{x}}$	10.3	4.0	11.7	5.4	3.8	51.8
Barnacle nauplii	1	68.0	138.5	325.6	80.8	14.6	224.4
	2	53.0	157.9	274.4	57.9	12.4	148.3
	$\bar{x}$	60.5	148.2	300.0	69.3	13.5	186.4
	s	10.6	13.7	36.2	16.2	1.5	53.8
	$s_{\bar{x}}$	7.5	9.7	25.6	11.4	1.1	38.0
Harpacticoid copepods	1	1.2	4.2	6.4	2.8	-	0.0
	2	3.0	1.7	2.5	5.8	-	17.8
	$\bar{x}$	2.1	2.9	4.4	4.3	-	8.9
	s	1.3	1.7	2.7	2.1	-	12.6
	$s_{\bar{x}}$	0.9	1.2	1.9	1.5	-	8.9
Eurytemora sp.	1	6.0	13.8	14.9	5.6	4.9	56.1
	2	4.5	8.6	17.6	2.9	3.1	77.1
	$\bar{x}$	5.3	11.2	16.3	4.2	4.0	66.6
	s	1.0	3.7	1.9	1.9	1.2	14.9
	$s_{\bar{x}}$	0.7	2.6	1.4	1.3	0.9	10.5
Polychaete larvae	1	13.1	5.5	2.1	8.3	9.7	15.6
	2	22.7	3.4	5.0	17.4	37.3	41.5
	$\bar{x}$	17.9	4.5	3.6	12.9	23.5	28.6
	s	6.8	1.5	2.0	6.4	19.5	18.3
	$s_{\bar{x}}$	4.8	1.0	1.4	4.5	13.8	13.0
Pelecypod larvae	1	-	0.0	4.3	66.8	12.1	34.3
	2	-	13.7	35.2	57.9	12.4	86.0
	$\bar{x}$	-	6.9	19.8	62.4	12.3	60.2
	s	-	9.7	21.9	6.3	0.2	36.6
	$s_{\bar{x}}$	-	6.9	15.5	4.5	0.1	25.9
Rotifers	1	-	-	-	11.1	106.9	24.9
	2	-	-	-	20.2	282.9	11.9
	$\bar{x}$	-	-	-	15.7	194.9	18.4
	s	-	-	-	6.4	124.4	9.2
	$s_{\bar{x}}$	-	-	-	4.6	88.0	6.5

Table B15 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Gastropod larvae	1	-	5.1	-	-	-	24.9
	2	-	0.0	-	-	-	47.5
	$\bar{x}$	-	2.6	-	-	-	36.2
	s	-	3.6	-	-	-	15.9
	$s_{\bar{x}}$	-	2.6	-	-	-	11.3
Cyclopoid copepods	1	-	-	-	-	-	0.0
	2	-	-	-	-	-	3.0
	$\bar{x}$	-	-	-	-	-	1.5
	s	-	-	-	-	-	2.1
	$s_{\bar{x}}$	-	-	-	-	-	1.5
Bosmina sp.	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-
Amphipods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B15 (continued)

James River Zooplankton June 13, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	328.1	652.4	1893.8	540.7	153.2	109.2	68.7
	2	204.1	848.1	739.0	488.6	331.2	313.5	68.7
	$\bar{x}$	266.1	750.3	1316.4	514.6	242.2	211.4	68.7
	s	87.6	138.4	816.5	36.8	125.8	144.5	0.0
	$s_{\bar{x}}$	62.0	97.9	577.4	26.1	88.9	102.2	0.0
Acartia sp.	1	9.0	41.3	5.6	39.3	77.5	29.9	14.1
	2	22.7	73.6	0.0	5.4	45.8	38.7	7.0
	$\bar{x}$	15.8	57.4	2.8	22.3	61.6	34.3	10.6
	s	9.7	22.8	3.9	24.0	22.4	6.2	5.0
	$s_{\bar{x}}$	6.8	16.1	2.8	17.0	15.8	4.4	3.5
Barnacle nauplii	1	229.2	153.3	128.1	-	22.9	15.8	135.6
	2	121.0	132.0	15.4	-	40.5	95.1	123.3
	$\bar{x}$	175.1	142.6	71.8	-	31.7	55.5	129.5
	s	76.5	15.0	79.7	-	12.4	56.0	8.7
	$s_{\bar{x}}$	54.1	10.6	59.4	-	8.8	39.6	6.2
Harpacticoid copepods	1	4.5	2.0	5.6	-	0.0	8.8	3.5
	2	7.6	8.6	0.0	-	3.5	8.8	0.0
	$\bar{x}$	6.0	5.3	2.8	-	1.8	8.8	1.8
	s	2.2	4.7	3.9	-	2.5	0.0	2.5
	$s_{\bar{x}}$	1.5	3.3	2.8	-	1.8	0.0	1.8
Eurytemora sp.	1	22.5	15.7	44.6	34.4	15.8	3.5	1.8
	2	3.8	34.6	15.4	10.7	17.6	7.0	0.0
	$\bar{x}$	13.1	25.2	30.0	22.6	16.7	5.3	0.9
	s	13.2	13.4	20.6	16.7	1.2	2.5	1.2
	$s_{\bar{x}}$	9.3	9.4	14.6	11.8	0.9	1.8	0.9
Polychaete larvae	1	13.5	13.8	22.3	4.9	1.8	1.8	3.5
	2	26.5	47.6	10.3	5.4	5.3	0.0	1.8
	$\bar{x}$	20.0	30.7	16.3	5.1	3.5	0.9	2.6
	s	9.2	23.9	8.5	0.3	2.5	1.2	1.2
	$s_{\bar{x}}$	6.5	16.9	6.0	0.2	1.8	0.9	0.9
Pelecypod larvae	1	0.0	49.1	39.0	39.3	-	-	3.5
	2	3.8	30.3	41.1	21.5	-	-	3.5
	$\bar{x}$	1.9	39.7	40.0	30.4	-	-	3.5
	s	2.7	13.3	1.5	12.6	-	-	0.0
	$s_{\bar{x}}$	1.9	9.4	1.0	8.9	-	-	0.0
Rotifers	1	9.0	129.7	167.1	29.5	-	-	-
	2	3.8	151.4	92.4	26.8	-	-	-
	$\bar{x}$	6.4	140.6	129.7	28.2	-	-	-
	s	3.7	15.4	52.8	1.9	-	-	-
	$s_{\bar{x}}$	2.6	10.9	37.4	1.3	-	-	-

Table B15 (continued)

Organisms		Discharge	Stations CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Gastropod larvae	1	-	5.9	5.6	-	-	-	-
	2	-	10.8	0.0	-	-	-	-
	$\bar{x}$	-	8.4	2.8	-	-	-	-
	s	-	3.5	3.9	-	-	-	-
	$s_{\bar{x}}$	-	2.5	2.8	-	-	-	-
Cyclopoid copepods	1	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-	-
	s	-	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-	-
Bosmina sp.	1	-	15.7	-	-	-	-	-
	2	-	8.6	-	-	-	-	-
	$\bar{x}$	-	12.2	-	-	-	-	-
	s	-	5.0	-	-	-	-	-
	$s_{\bar{x}}$	-	3.5	-	-	-	-	-
Amphipods	1	-	-	-	-	0.0	-	1.8
	2	-	-	-	-	3.5	-	3.5
	$\bar{x}$	-	-	-	-	1.8	-	2.6
	s	-	-	-	-	2.5	-	1.2
	$s_{\bar{x}}$	-	-	-	-	1.8	-	0.9

Table B16

James River Zooplankton July 12, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	208.9	1277.4	1623.0	2676.2	582.2	1235.7
	2	145.2	4398.5	1989.2	2900.3	1649.9	3219.0
	$\bar{x}$	177.1	2838.0	1806.1	2788.2	1116.1	2227.4
	s	45.1	2207.0	259.0	158.5	755.0	1402.4
	$s_{\bar{x}}$	31.9	1560.6	183.1	112.1	533.8	991.7
Pelecypod larvae	1	9.3	256.0	545.1	866.7	37.6	604.4
	2	3.8	83.0	1319.7	1951.8	150.7	2412.7
	$\bar{x}$	6.6	169.5	932.4	1409.2	94.1	1508.6
	s	3.9	122.3	547.8	767.3	80.0	1278.6
	$s_{\bar{x}}$	2.7	86.5	387.3	542.6	56.6	904.1
Acartia sp.	1	67.9	686.5	379.7	400.0	75.1	308.9
	2	33.4	268.3	317.1	469.8	226.0	533.3
	$\bar{x}$	50.6	477.4	348.4	434.9	150.6	421.1
	s	24.4	295.8	44.3	49.4	106.7	158.7
	$s_{\bar{x}}$	17.2	209.1	31.3	34.9	75.4	112.2
Barnacle nauplii	1	12.0	34.9	159.2	133.3	4.7	53.7
	2	2.6	12.8	317.1	116.4	11.3	133.3
	$\bar{x}$	7.3	23.8	238.2	124.8	8.0	93.5
	s	6.6	15.7	111.6	12.0	4.7	56.3
	$s_{\bar{x}}$	4.7	11.1	78.9	8.5	3.3	39.8
Polychaete larvae	1	10.6	34.9	85.7	171.4	32.9	147.7
	2	3.8	38.3	80.1	107.6	26.4	114.3
	$\bar{x}$	7.2	36.6	82.9	139.5	29.6	131.0
	s	4.8	2.4	4.0	45.2	4.6	23.6
	$s_{\bar{x}}$	3.4	1.7	2.8	31.9	3.2	16.7
Eurytemora sp.	1	0.0	11.6	12.2	9.5	4.7	0.0
	2	2.6	6.4	9.6	8.8	0.0	57.1
	$\bar{x}$	1.3	9.0	10.9	9.2	2.4	28.6
	s	1.8	3.7	1.9	0.5	3.3	40.4
	$s_{\bar{x}}$	1.3	2.6	1.3	0.4	2.4	28.6
Harpacticoid copepods	1	0.0	69.8	36.8	19.0	4.7	80.6
	2	5.1	31.9	41.6	39.5	0.0	63.5
	$\bar{x}$	2.6	50.9	39.2	29.3	2.4	72.0
	s	3.6	26.8	3.5	14.5	3.3	12.1
	$s_{\bar{x}}$	2.6	18.9	2.4	10.2	2.4	8.6
Rotifers	1	0.0	-	18.4	14.3	9.4	-
	2	2.6	-	16.0	0.0	0.0	-
	$\bar{x}$	1.3	-	17.2	7.2	4.7	-
	s	1.8	-	1.7	10.1	6.6	-
	$s_{\bar{x}}$	1.3	-	1.2	7.1	4.7	-

Table B16 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Gastropod larvae	1	-	-	-	0.0	-	-
	2	-	-	-	6.6	-	-
	$\bar{x}$	-	-	-	3.3	-	-
	s	-	-	-	4.7	-	-
	$s_{\bar{x}}$	-	-	-	3.3	-	-
Decapod larvae	1	-	-	0.0	-	-	-
	2	-	-	6.4	-	-	-
	$\bar{x}$	-	-	3.2	-	-	-
	s	-	-	4.5	-	-	-
	$s_{\bar{x}}$	-	-	3.2	-	-	-
Bosmina sp.	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B16 (continued)

Organisms		Discharge	CBE	Stations CBC	J.I.
Copepod nauplii	1	986.5	1508.1	2670.5	3919.4
	2	1692.6	2762.6	4506.6	3359.3
	$\bar{x}$	1339.5	2135.4	3588.6	3639.3
	s	499.3	887.0	1298.3	396.0
	$s_{\bar{x}}$	353.0	627.2	918.0	280.0
Pelecypod larvae	1	156.4	5576.2	1978.2	391.4
	2	158.7	13283.4	3472.7	424.7
	$\bar{x}$	157.5	9429.8	2725.4	408.1
	s	1.6	5449.8	1056.8	23.6
	$s_{\bar{x}}$	1.1	3853.6	747.2	16.7
Acartia sp.	1	216.5	646.3	797.1	121.3
	2	327.9	581.3	1631.6	43.4
	$\bar{x}$	272.2	613.8	1214.4	82.4
	s	78.8	46.0	590.1	55.0
	$s_{\bar{x}}$	55.7	32.5	417.3	38.9
Barnacle nauplii	1	60.2	67.6	0.0	82.7
	2	84.6	299.3	34.9	57.9
	$\bar{x}$	72.4	183.4	17.4	70.3
	s	17.3	163.8	24.7	17.5
	$s_{\bar{x}}$	12.2	115.8	17.4	12.4
Polychaete larvae	1	72.2	380.2	58.2	11.0
	2	63.5	270.5	69.8	14.5
	$\bar{x}$	67.8	325.4	64.0	12.8
	s	6.2	77.6	8.2	2.4
	$s_{\bar{x}}$	4.4	54.8	5.8	1.7
Eurytemora sp.	1	-	-	564.4	88.2
	2	-	-	759.1	38.6
	$\bar{x}$	-	-	661.7	63.4
	s	-	-	137.7	37.1
	$s_{\bar{x}}$	-	-	97.4	24.8
Harpacticoid copepods	1	-	25.4	17.4	-
	2	-	40.3	4.4	-
	$\bar{x}$	-	32.8	10.9	-
	s	-	10.6	9.3	-
	$s_{\bar{x}}$	-	7.5	6.6	-
Rotifers	1	12.0	4.2	5.8	5.5
	2	10.6	23.0	0.0	9.6
	$\bar{x}$	11.3	13.6	2.9	7.6
	s	1.0	13.3	4.1	2.9
	$s_{\bar{x}}$	0.7	9.4	2.9	2.1

Table B16 (continued)
Stations

Organisms		Discharge	CBE	CBC	J.I.
Gastropod larvae	1	-	52.9	-	-
	2	-	0.0	-	-
	$\bar{x}$	-	26.4	-	-
	s	-	37.4	-	-
	$s_{\bar{x}}$	-	26.4	-	-
Decapod larvae	1	-	-	5.8	-
	2	-	-	0.0	-
	$\bar{x}$	-	-	2.9	-
	s	-	-	4.1	-
	$s_{\bar{x}}$	-	-	2.9	-
Bosmina sp.	1	-	71.8	0.0	-
	2	-	0.0	4.4	-
	$\bar{x}$	-	35.9	2.2	-
	s	-	50.8	3.1	-
	$s_{\bar{x}}$	-	35.9	2.2	-

Table B17

Surry Zooplankton Entrainment 7-21-77

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

Organisms		Stations INT	DIS	ICD	ICU	DC
Copepod nauplii	1	736.7	686.7	2569.8	1241.7	197.3
	2	1788.2	622.5	2037.9	1421.4	156.8
	$\bar{x}$	1262.5	654.6	2303.8	1331.6	177.0
	s	743.6	45.4	376.1	127.0	28.6
	$s_{\bar{x}}$	525.8	32.1	266.0	89.8	20.2
Pelecypod larvae	1	115.1	16.9	12.3	8.8	1.8
	2	241.2	7.6	1.8	1.8	0.0
	$\bar{x}$	178.2	12.2	7.0	5.3	0.9
	s	89.1	6.6	7.5	5.0	1.2
	$s_{\bar{x}}$	63.0	4.6	5.3	3.5	0.9
Acartia sp.	1	270.5	123.8	450.9	258.9	156.8
	2	688.2	106.3	368.1	382.2	165.6
	$\bar{x}$	479.4	115.1	409.5	320.6	161.2
	s	295.4	12.4	58.5	87.2	6.2
	$s_{\bar{x}}$	208.9	8.8	41.4	61.6	4.4
Barnacle nauplii	1	109.4	287.1	103.9	197.3	89.8
	2	194.1	182.2	66.9	170.8	40.5
	$\bar{x}$	151.7	234.6	85.4	184.1	65.2
	s	59.9	74.2	26.2	18.7	34.9
	$s_{\bar{x}}$	42.4	52.4	18.5	13.2	24.7
Polychaete larvae	1	34.5	107.0	37.0	72.2	14.1
	2	70.6	38.0	51.1	167.3	42.3
	$\bar{x}$	52.6	72.5	44.0	119.8	28.2
	s	25.5	48.8	10.0	67.3	19.9
	$s_{\bar{x}}$	18.0	34.5	7.0	47.6	14.1
Eurytemora sp.	1	0.0	73.2	26.4	10.6	31.7
	2	17.6	0.0	8.8	40.5	10.6
	$\bar{x}$	8.8	36.6	17.6	25.5	21.1
	s	12.5	51.7	12.4	21.2	14.9
	$s_{\bar{x}}$	8.8	36.6	8.8	15.0	10.6
Harpacticoid copepods	1	11.5	45.0	21.1	8.8	31.7
	2	23.5	22.8	1.8	10.6	3.5
	$\bar{x}$	17.5	33.9	11.4	9.7	17.6
	s	8.5	15.7	13.7	1.2	19.9
	$s_{\bar{x}}$	6.0	11.1	9.7	0.9	14.1
Rotifers	1	34.5	0.0	1.8	1.8	1.8
	2	17.6	15.2	0.0	1.8	0.0
	$\bar{x}$	26.1	7.6	0.9	1.8	0.9
	s	11.9	10.7	1.2	0.0	1.2
	$s_{\bar{x}}$	8.4	7.6	0.9	0.0	0.9

Table B17 (continued)

Organisms		Stations INT	DIS	ICD	ICU	DC
Gastropod larvae	1	-	5.6	0.0	1.8	1.8
	2	-	0.0	1.8	1.8	0.0
	$\bar{x}$	-	2.8	0.9	1.8	0.9
	s	-	4.0	1.2	0.0	1.2
	$s_{\bar{x}}$	-	2.8	0.9	0.0	0.9
Decapod larvae	1	-	-	-	1.8	1.8
	2	-	-	-	3.5	1.8
	$\bar{x}$	-	-	-	2.6	1.8
	s	-	-	-	1.2	0.0
	$s_{\bar{x}}$	-	-	-	0.9	0.0
Bosmina sp.	1	-	-	3.5	1.8	-
	2	-	-	0.0	0.0	-
	$\bar{x}$	-	-	1.8	0.9	-
	s	-	-	2.5	1.2	-
	$s_{\bar{x}}$	-	-	1.8	0.9	-
Amphipods	1	-	-	-	1.8	1.8
	2	-	-	-	1.8	3.5
	$\bar{x}$	-	-	-	1.8	2.6
	s	-	-	-	0.0	1.2
	$s_{\bar{x}}$	-	-	-	0.0	0.9

Table B18

James River Zooplankton August 16, 1977

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

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	521.9	2448.2	538.1	921.2	611.4	937.8
	2	671.3	940.5	555.9	529.9	1350.9	934.9
	$\bar{x}$	596.6	1694.4	547.0	725.6	981.2	936.4
	s	105.7	1066.1	12.6	276.7	522.9	2.0
	$s_{\bar{x}}$	74.7	753.9	8.9	195.6	369.8	1.4
Acartia sp.	1	128.2	354.2	221.0	150.3	180.4	241.8
	2	235.7	152.9	256.6	125.4	506.6	90.7
	$\bar{x}$	181.9	253.6	238.8	137.9	343.5	166.3
	s	76.0	142.4	25.1	17.6	230.6	106.8
	$s_{\bar{x}}$	53.8	100.6	17.8	12.4	163.1	75.5
Barnacle nauplii	1	95.8	598.3	38.4	106.7	50.1	108.2
	2	162.6	206.4	28.5	78.4	50.7	141.5
	$\bar{x}$	129.2	402.4	33.5	92.5	50.4	124.8
	s	47.2	277.1	7.0	20.0	0.4	23.5
	$s_{\bar{x}}$	33.4	195.9	5.0	14.1	0.3	16.6
Polychaete larvae	1	10.4	39.4	28.8	24.2	15.0	24.0
	2	6.0	38.2	28.5	0.0	0.0	12.3
	$\bar{x}$	8.2	38.8	28.7	12.1	7.5	18.2
	s	3.1	0.8	0.2	17.1	10.6	8.3
	$s_{\bar{x}}$	2.2	0.6	0.2	12.1	7.5	5.9
Pelecypod larvae	1	0.0	70.8	-	43.6	5.0	4.0
	2	3.0	84.1	-	40.8	16.9	23.1
	$\bar{x}$	1.5	77.5	-	42.2	11.0	13.5
	s	2.1	9.4	-	2.0	8.4	13.5
	$s_{\bar{x}}$	1.5	6.6	-	1.4	5.9	9.5
Rotifers	1	-	15.7	9.6	29.1	15.0	1.3
	2	-	7.6	0.0	9.4	0.0	3.1
	$\bar{x}$	-	11.7	4.8	19.2	7.5	2.2
	s	-	5.7	6.8	13.9	10.6	1.2
	$s_{\bar{x}}$	-	4.0	4.8	9.8	7.5	0.9
Harpacticoid copepods	1	-	7.9	19.2	4.8	15.0	2.7
	2	-	0.0	7.1	3.1	16.9	4.6
	$\bar{x}$	-	3.9	13.2	4.0	16.0	3.6
	s	-	5.6	8.6	1.2	1.3	1.4
	$s_{\bar{x}}$	-	3.9	6.0	0.8	0.9	1.0
Eurytemora sp.	1	-	47.2	19.2	0.0	10.0	0.0
	2	-	0.0	0.0	15.7	33.8	12.3
	$\bar{x}$	-	23.6	9.6	7.8	21.9	6.2
	s	-	33.4	13.6	11.1	16.8	8.7
	$s_{\bar{x}}$	-	23.6	9.6	7.8	11.9	6.2

Table B18 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Bosmina sp.	1	-	-	-	-	5.0	2.7
	2	-	-	-	-	0.0	0.0
	$\bar{x}$	-	-	-	-	2.5	1.3
	s	-	-	-	-	3.5	1.9
	$s_{\bar{x}}$	-	-	-	-	2.5	1.3
Gastropod larvae	1	-	-	-	-	0.0	2.7
	2	-	-	-	-	16.9	1.5
	$\bar{x}$	-	-	-	-	8.4	2.1
	s	-	-	-	-	11.9	0.8
	$s_{\bar{x}}$	-	-	-	-	8.4	0.6
Decapod larvae	1	-	-	-	4.8	-	1.3
	2	-	-	-	0.0	-	1.5
	$\bar{x}$	-	-	-	2.4	-	1.4
	s	-	-	-	3.4	-	0.1
	$s_{\bar{x}}$	-	-	-	2.4	-	0.1
Amphipods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B18 (continued)

Organisms		Stations: Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	558.8	642.1	515.2	891.1	2057.2	1655.7	199.0
	2	523.6	1641.6	183.3	2979.2	3494.5	1685.6	491.4
	$\bar{x}$	541.2	1141.8	349.3	1935.1	2775.9	1670.6	345.2
	s	24.9	706.7	234.7	1476.5	1016.3	21.2	206.7
	$s_{\bar{x}}$	17.6	499.7	166.0	1044.1	718.6	15.0	146.2
Acartia sp.	1	192.1	80.6	170.3	260.2	70.4	65.2	26.4
	2	67.9	60.1	57.6	374.3	98.6	95.1	88.1
	$\bar{x}$	130.0	70.4	114.0	317.2	84.5	80.1	57.2
	s	87.8	14.4	79.7	80.7	19.9	21.2	43.6
	$s_{\bar{x}}$	62.1	10.2	56.4	57.1	14.1	15.0	30.8
Barnacle nauplii	1	419.1	106.6	63.9	58.5	576.0	310.0	220.2
	2	300.6	367.9	36.7	22.5	572.4	303.0	523.1
	$\bar{x}$	359.9	237.3	50.3	40.5	574.2	306.5	371.6
	s	83.8	184.8	19.2	25.5	2.5	5.0	214.2
	$s_{\bar{x}}$	59.2	130.7	13.6	18.0	1.8	3.5	151.5
Polychaete larvae	1	43.7	21.3	25.6	13.0	38.8	72.2	10.6
	2	0.0	42.4	68.1	44.9	77.5	114.5	33.5
	$\bar{x}$	21.8	31.9	46.8	29.0	58.1	93.4	22.0
	s	30.9	14.9	30.1	22.6	27.4	29.9	16.2
	$s_{\bar{x}}$	21.8	10.6	21.3	16.0	19.4	21.1	11.4
Pelecypod larvae	1	26.2	0.0	29.8	6.5	35.2	15.8	5.3
	2	77.6	46.0	5.2	44.9	3.5	17.6	3.5
	$\bar{x}$	51.9	23.0	17.5	25.7	19.4	16.7	4.4
	s	36.3	32.5	17.4	27.2	22.4	1.2	1.2
	$s_{\bar{x}}$	25.7	23.0	12.3	19.2	15.9	0.9	0.9
Rotifers	1	-	2.4	8.5	6.5	8.8	24.7	0.0
	2	-	17.7	31.4	44.9	3.5	29.9	5.3
	$\bar{x}$	-	10.0	20.0	25.7	6.2	27.3	2.6
	s	-	10.8	16.2	27.2	3.7	3.7	3.7
	$s_{\bar{x}}$	-	7.7	11.4	19.2	2.6	2.6	2.6
Harpacticoid copepods	1	8.7	0.0	8.5	-	12.3	12.3	3.5
	2	19.4	7.1	0.0	-	15.8	24.7	7.0
	$\bar{x}$	14.1	3.5	4.3	-	14.1	18.5	5.3
	s	7.5	5.0	6.0	-	2.5	8.7	2.5
	$s_{\bar{x}}$	5.3	3.5	4.3	-	1.8	6.2	1.8
Eurytemora sp.	1	17.5	33.2	-	0.0	1.8	12.3	3.5
	2	0.0	28.3	-	37.4	5.3	1.8	12.3
	$\bar{x}$	8.7	30.7	-	18.7	3.5	7.0	7.9
	s	12.4	3.4	-	26.5	2.5	7.5	6.2
	$s_{\bar{x}}$	8.7	2.4	-	18.7	1.8	5.3	4.4

Table B18 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Osmina sp.	1	-	2.4	-	-	5.3	7.0	1.8
	2	-	0.0	-	-	0.0	0.0	0.0
	$\bar{x}$	-	1.2	-	-	2.6	3.5	0.9
	s	-	1.7	-	-	3.7	5.0	1.2
	$s_{\bar{x}}$	-	1.2	-	-	2.6	3.5	0.9
Gastropod larvae	1	8.7	-	-	-	3.5	0.0	-
	2	29.1	-	-	-	3.5	1.8	-
	$\bar{x}$	18.9	-	-	-	3.5	0.9	-
	s	14.4	-	-	-	0.0	1.2	-
	$s_{\bar{x}}$	10.2	-	-	-	0.0	0.9	-
Decapod larvae	1	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-	-
	s	-	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-	-
Amphipods	1	-	-	-	-	-	-	24.7
	2	-	-	-	-	-	-	24.7
	$\bar{x}$	-	-	-	-	-	-	24.7
	s	-	-	-	-	-	-	0.0
	$s_{\bar{x}}$	-	-	-	-	-	-	0.0

Table B19

James River Zooplankton September 6, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	300.9	108.6	826.3	947.4	3075.7	966.9
	2	596.4	881.4	768.1	1086.0	5421.9	1354.1
	$\bar{x}$	448.6	495.0	797.2	1016.7	4248.8	1160.5
	s	209.0	546.5	41.2	98.0	1659.0	273.8
	$s_{\bar{x}}$	147.8	386.4	29.1	69.3	1173.1	193.6
Pelecypod larvae	1	3.2	12.8	2528.0	1011.0	3289.5	1576.6
	2	9.3	127.7	2792.8	1736.4	4090.6	1829.4
	$\bar{x}$	6.3	70.3	2660.5	1373.7	3690.0	1703.0
	s	4.3	81.3	187.2	513.0	566.4	178.7
	$s_{\bar{x}}$	3.0	57.5	132.4	362.7	400.5	126.4
Acartia sp.	1	128.5	51.1	143.9	195.4	390.2	239.9
	2	167.7	102.2	120.6	267.4	332.1	207.2
	$\bar{x}$	148.1	76.6	132.2	231.4	361.1	223.6
	s	27.8	36.1	16.4	50.9	41.1	23.1
	$s_{\bar{x}}$	19.6	25.6	11.6	36.0	29.0	16.3
Barnacle nauplii	1	17.9	19.2	131.6	22.7	53.4	45.8
	2	28.0	38.3	80.4	66.2	132.8	196.2
	$\bar{x}$	22.9	28.7	106.0	44.4	93.1	121.0
	s	7.1	13.6	36.2	30.7	56.1	106.4
	$s_{\bar{x}}$	5.0	9.6	25.6	21.7	39.7	75.2
Rotifers	1	1.6	0.0	45.6	104.5	72.2	38.4
	2	1.9	281.0	28.2	38.6	102.6	77.4
	$\bar{x}$	1.8	140.5	36.9	71.6	87.4	57.9
	s	0.2	198.7	12.4	46.6	21.6	27.5
	$s_{\bar{x}}$	0.1	140.5	8.7	33.0	15.2	19.5
Polychaete larvae	1	1.6	6.4	19.3	4.5	32.1	65.9
	2	5.6	25.6	20.1	0.0	24.2	22.1
	$\bar{x}$	3.6	16.0	19.7	2.3	28.1	44.0
	s	2.8	13.6	0.6	3.2	5.6	31.0
	$s_{\bar{x}}$	2.0	9.6	0.4	2.3	4.0	21.9
Eurytemora sp.	1	0.0	-	7.0	27.3	8.0	16.5
	2	11.2	-	16.1	8.3	6.0	0.0
	$\bar{x}$	5.6	-	11.6	17.8	7.0	8.2
	s	7.9	-	6.4	13.4	1.4	11.6
	$s_{\bar{x}}$	5.6	-	4.5	9.5	1.0	8.2
Harpacticoid copepods	1	-	-	5.3	2.3	0.0	1.8
	2	-	-	2.0	0.0	3.0	8.3
	$\bar{x}$	-	-	3.6	1.1	1.5	5.1
	s	-	-	2.3	1.6	2.1	4.6
	$s_{\bar{x}}$	-	-	1.6	1.1	1.5	3.2

Table B19 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Gastropod larvae	1	1.6	-	1.8	-	-	0.0
	2	0.0	-	0.0	-	-	2.8
	$\bar{x}$	0.8	-	0.9	-	-	1.4
	s	1.2	-	1.2	-	-	2.0
	$s_{\bar{x}}$	0.8	-	0.9	-	-	1.4
Bosmina sp.	1	-	-	5.3	-	0.0	-
	2	-	-	0.0	-	12.1	-
	$\bar{x}$	-	-	2.6	-	6.0	-
	s	-	-	3.7	-	8.5	-
	$s_{\bar{x}}$	-	-	2.6	-	6.0	-
Cyclopoid copepods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-
Decapod larvae	1	-	-	-	-	-	0.0
	2	-	-	-	-	-	2.8
	$\bar{x}$	-	-	-	-	-	1.4
	s	-	-	-	-	-	2.0
	$s_{\bar{x}}$	-	-	-	-	-	1.4
Amphipods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B19 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	247.6	706.2	4826.6	762.8	1004.0	1278.7	369.9
	2	295.4	415.7	3118.0	539.3	1349.2	4678.1	380.4
	$\bar{x}$	271.5	560.9	3972.3	651.1	1176.6	2978.4	375.2
	s	33.8	205.4	1208.2	158.0	244.1	2403.7	7.5
	$s_{\bar{x}}$	23.9	145.3	854.4	111.8	172.6	1699.7	5.3
Pelecypod larvae	1	26.8	5458.9	3270.2	536.4	283.6	376.9	137.4
	2	107.4	4997.9	3985.1	220.2	144.4	616.5	366.4
	$\bar{x}$	67.1	5228.4	3627.6	378.3	214.0	496.7	251.9
	s	57.0	325.9	505.5	223.5	98.4	169.4	161.9
	$s_{\bar{x}}$	40.3	230.5	357.4	158.1	69.6	119.8	114.5
Acartia sp.	1	147.2	142.3	697.0	154.0	361.1	334.6	838.4
	2	107.4	36.3	447.7	101.1	306.5	190.2	373.4
	$\bar{x}$	127.3	89.3	572.4	127.6	333.8	262.4	605.9
	s	28.1	75.0	176.3	37.4	38.6	102.1	328.8
	$s_{\bar{x}}$	19.9	53.0	124.6	26.5	27.3	72.2	232.5
Barnacle nauplii	1	60.2	96.7	45.7	58.0	267.7	213.1	373.4
	2	125.3	56.1	81.0	62.9	179.7	320.6	274.8
	$\bar{x}$	92.8	76.4	63.4	60.4	223.7	266.8	324.1
	s	46.0	28.7	25.0	3.5	62.3	76.0	69.7
	$s_{\bar{x}}$	32.6	20.3	17.7	2.5	44.0	53.7	49.3
Rotifers	1	6.7	56.4	74.4	38.0	0.0	1086.8	0.0
	2	0.0	69.3	66.9	18.0	708.1	3772.8	21.1
	$\bar{x}$	3.4	62.8	70.6	28.0	354.0	2429.8	10.6
	s	4.7	9.1	5.4	14.2	500.7	1899.3	15.0
	$s_{\bar{x}}$	3.4	6.4	3.8	10.0	354.0	1343.0	10.6
Polychaete larvae	1	20.1	10.7	15.2	19.9	70.4	47.6	70.4
	2	13.4	19.8	16.2	27.0	112.7	109.2	59.9
	$\bar{x}$	16.8	15.3	15.7	23.4	91.6	78.4	65.2
	s	4.7	6.4	0.7	5.0	29.9	43.6	7.5
	$s_{\bar{x}}$	3.3	4.5	0.5	3.5	21.1	30.8	5.3
Eurytemora sp.	1	3.4	-	-	-	1.8	1.8	-
	2	0.0	-	-	-	0.0	3.5	-
	$\bar{x}$	1.7	-	-	-	0.9	2.6	-
	s	2.4	-	-	-	1.2	1.2	-
	$s_{\bar{x}}$	1.7	-	-	-	0.9	0.9	-
Harpacticoid copepods	1	13.4	-	0.0	-	7.0	15.8	7.0
	2	4.5	-	2.0	-	21.1	28.2	7.0
	$\bar{x}$	8.9	-	1.0	-	14.1	22.0	7.0
	s	6.3	-	1.4	-	10.0	8.7	0.0
	$s_{\bar{x}}$	4.4	-	1.0	-	7.0	6.2	0.0

Table B19 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Gastropod larvae	1	0.0	-	-	-	14.09	8.8	3.5
	2	4.5	-	-	-	14.09	10.6	7.0
	$\bar{x}$	2.2	-	-	-	14.09	9.7	5.3
	s	3.2	-	-	-	0.0	1.2	2.5
	$s_{\bar{x}}$	2.2	-	-	-	0.0	0.9	1.8
Bosmina sp.	1	-	10.7	0.0	-	8.8	-	-
	2	-	19.8	2.0	-	0.0	-	-
	$\bar{x}$	-	15.3	1.0	-	4.4	-	-
	s	-	6.4	1.4	-	6.2	-	-
	$s_{\bar{x}}$	-	4.5	1.0	-	4.4	-	-
Cyclopoid copepods	1	-	-	0.0	-	7.0	0.0	-
	2	-	-	2.0	-	3.5	10.6	-
	$\bar{x}$	-	-	1.0	-	5.3	5.3	-
	s	-	-	1.4	-	2.5	7.5	-
	$s_{\bar{x}}$	-	-	1.0	-	1.8	5.3	-
Decapod larvae	1	0.0	10.7	-	-	-	-	-
	2	13.4	3.3	-	-	-	-	-
	$\bar{x}$	6.7	7.0	-	-	-	-	-
	s	9.5	5.3	-	-	-	-	-
	$s_{\bar{x}}$	6.7	3.7	-	-	-	-	-
Amphipods	1	-	-	-	-	1.8	0.0	3.5
	2	-	-	-	-	3.5	10.6	0.0
	$\bar{x}$	-	-	-	-	2.6	5.3	1.8
	s	-	-	-	-	1.2	7.5	2.5
	$s_{\bar{x}}$	-	-	-	-	0.9	5.3	1.8

Table B20

James River Zooplankton November 9, 1977
(Numbers of organisms per 100 liters, surface samples, two samples per station)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Copepod nauplii	1	451.2	276.4	1958.8	80.4	684.0	208.5
	2	649.1	355.3	1475.8	86.6	716.0	338.0
	$\bar{x}$	550.1	315.8	1717.3	83.5	700.0	273.3
	s	139.9	55.8	341.5	4.4	22.6	91.6
	$s_{\bar{x}}$	99.0	39.5	241.5	3.1	16.0	64.8
Polychaete larvae	1	2.3	28.5	80.4	31.9	31.2	136.9
	2	17.6	46.4	73.2	31.1	39.0	262.5
	$\bar{x}$	10.0	37.4	76.8	31.5	35.1	199.7
	s	10.8	12.7	5.0	0.5	5.5	88.8
	$s_{\bar{x}}$	7.7	9.0	3.6	0.4	3.9	62.8
Barnacle nauplii	1	9.3	10.7	12.5	3.8	2.8	4.9
	2	15.1	30.5	24.4	1.4	0.0	5.3
	$\bar{x}$	12.2	20.6	18.4	2.6	1.4	5.1
	s	4.1	14.0	8.4	1.8	2.0	0.3
	$s_{\bar{x}}$	2.9	9.9	6.0	1.2	1.4	0.2
Acartia sp.	1	32.5	71.2	220.3	8.9	178.8	29.6
	2	81.9	82.2	136.7	5.4	180.2	31.8
	$\bar{x}$	57.2	76.7	178.5	7.2	179.5	30.7
	s	35.0	7.8	59.1	2.5	1.0	1.6
	$s_{\bar{x}}$	24.7	5.5	41.8	1.8	0.7	1.1
Rotifers	1	31.3	42.7	20.8	30.6	-	6.2
	2	31.5	72.9	26.8	24.4	-	0.0
	$\bar{x}$	31.4	57.8	23.8	27.5	-	3.1
	s	0.1	21.4	4.3	4.4	-	4.4
	$s_{\bar{x}}$	0.1	15.1	3.0	3.1	-	3.1
Pelecypod larvae	1	0.0	7.1	0.0	1.3	-	2.5
	2	7.6	8.0	1.2	5.4	-	6.6
	$\bar{x}$	3.8	7.5	0.6	3.4	-	4.6
	s	5.4	0.6	0.9	2.9	-	2.9
	$s_{\bar{x}}$	3.8	0.4	0.6	2.1	-	2.1
Eurytemora sp.	1	-	-	-	12.8	14.2	-
	2	-	-	-	10.8	34.1	-
	$\bar{x}$	-	-	-	11.8	24.1	-
	s	-	-	-	1.4	14.1	-
	$s_{\bar{x}}$	-	-	-	1.0	10.0	-

Table B20 (continued)

Organisms		Stations DWS	Intake	HPS	HPW3	HPW2	HPW1
Harpacticoid copepods	1	-	-	2.8	10.2	22.7	0.0
	2	-	-	7.3	6.8	39.0	1.3
	$\bar{x}$	-	-	5.0	8.5	30.8	0.7
	s	-	-	3.2	2.4	11.5	0.9
	$s_{\bar{x}}$	-	-	2.3	1.7	8.1	0.7
Cyclopoid copepods	1	-	-	0.0	-	2.8	1.2
	2	-	-	2.4	-	0.0	0.0
	$\bar{x}$	-	-	1.2	-	1.4	0.6
	s	-	-	1.7	-	2.0	0.9
	$s_{\bar{x}}$	-	-	1.2	-	1.4	0.6
Gastropod larvae	1	0.0	0.0	2.8	-	-	0.0
	2	1.3	6.6	1.2	-	-	2.6
	$\bar{x}$	0.6	3.3	2.0	-	-	1.3
	s	0.9	4.7	1.1	-	-	1.9
	$s_{\bar{x}}$	0.6	3.3	0.8	-	-	1.3
Amphipods	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	$\bar{x}$	-	-	-	-	-	-
	s	-	-	-	-	-	-
	$s_{\bar{x}}$	-	-	-	-	-	-

Table B20 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Copepod nauplii	1	143.2	137.2	336.0	170.5	514.3	720.4	244.8
	2	139.1	231.2	469.0	173.4	558.3	709.8	204.3
	$\bar{x}$	141.2	184.2	402.5	172.0	536.3	715.1	224.6
	s	3.0	66.5	94.1	2.1	31.1	7.5	28.6
	$s_{\bar{x}}$	2.1	47.0	66.6	1.5	22.0	5.3	20.3
Polychaete larvae	1	22.2	116.5	25.3	14.9	105.7	88.1	33.5
	2	11.6	133.3	20.0	23.0	86.3	123.3	72.2
	$\bar{x}$	16.9	124.9	22.6	19.0	96.0	105.7	52.8
	s	7.5	11.9	3.8	5.8	13.7	24.9	27.4
	$s_{\bar{x}}$	5.3	8.4	2.7	4.1	9.7	17.6	19.4
Barnacle nauplii	1	44.5	15.5	1.4	2.71	22.9	10.6	49.3
	2	39.1	9.5	6.7	2.71	40.5	10.6	61.6
	$\bar{x}$	41.8	12.5	4.0	2.71	31.7	10.6	55.5
	s	3.8	4.2	3.7	0.0	12.4	0.0	8.7
	$s_{\bar{x}}$	2.7	3.0	2.6	0.0	8.8	0.0	6.2
Acartia sp.	1	18.1	23.3	23.9	65.0	52.8	66.9	10.6
	2	26.1	13.6	26.6	66.4	38.8	81.0	14.1
	$\bar{x}$	22.1	18.4	25.3	65.7	45.8	74.0	12.3
	s	5.6	6.9	1.9	1.0	10.0	10.0	2.5
	$s_{\bar{x}}$	4.0	4.8	1.4	0.7	7.0	7.0	1.8
Rotifers	1	19.5	6.5	11.2	67.6	84.5	49.3	63.4
	2	11.6	5.4	13.3	17.6	44.0	82.8	51.1
	$\bar{x}$	15.5	6.0	12.3	42.6	64.3	66.0	57.2
	s	5.6	0.7	1.5	35.4	28.6	23.7	8.7
	$s_{\bar{x}}$	3.9	0.5	1.0	25.0	20.2	16.7	6.2
Pelecypod larvae	1	0.0	3.9	-	-	1.8	10.6	-
	2	2.9	1.4	-	-	1.8	8.8	-
	$\bar{x}$	1.4	2.6	-	-	1.8	9.7	-
	s	2.0	1.8	-	-	0.0	1.2	-
	$s_{\bar{x}}$	1.4	1.3	-	-	0.0	0.9	-
Eurytemora sp.	1	-	3.9	2.8	46.0	0.0	-	-
	2	-	0.0	4.0	39.3	5.3	-	-
	$\bar{x}$	-	1.9	3.4	42.6	2.6	-	-
	s	-	2.7	0.8	4.7	3.7	-	-
	$s_{\bar{x}}$	-	1.9	0.6	3.4	2.6	-	-

Table B20 (continued)

Organisms		Stations Discharge	CBE	CBC	J.I.	I.C.D.	I.C.U.	D.C.
Harpacticoid copepods	1	-	-	-	20.3	0.0	5.3	-
	2	-	-	-	13.6	1.8	1.8	-
	$\bar{x}$	-	-	-	16.9	0.9	3.5	-
	s	-	-	-	4.8	1.2	2.5	-
	$s_{\bar{x}}$	-	-	-	3.4	0.9	1.8	-
Cyclopoid copepods	1	2.8	1.3	-	2.7	-	-	-
	2	0.0	0.0	-	2.7	-	-	-
	$\bar{x}$	1.4	0.6	-	2.7	-	-	-
	s	2.0	0.9	-	0.0	-	-	-
	$s_{\bar{x}}$	1.4	0.6	-	0.0	-	-	-
Gastropod larvae	1	-	1.3	-	-	-	-	-
	2	-	0.0	-	-	-	-	-
	$\bar{x}$	-	0.6	-	-	-	-	-
	s	-	0.9	-	-	-	-	-
	$s_{\bar{x}}$	-	0.6	-	-	-	-	-
Amphipods	1	0.0	-	-	-	-	1.8	-
	2	2.9	-	-	-	-	1.8	-
	$\bar{x}$	1.4	-	-	-	-	1.8	-
	s	2.0	-	-	-	-	0.0	-
	$s_{\bar{x}}$	1.4	-	-	-	-	0.0	-

Appendix C

Biological Data Tables for the Benthos Study

Table C1

James River Benthos; March 8, 1977

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 (dead)	8	13	3	20		109	1				12		1	18	3	11
Rangia cuneata (live)	1	7	6	18	3	7	1	7		1	19		3	5		11
Congeria leucophaeta											1			1		
Macoma mitchelli																
Macoma balthica														2		
Corbicula manilensis						1	1		1			4				
Hydrobia sp.	3				1	23	1						1	21		5
Modiolus demissus																
Annelids																
Polychaetes																
Scolecolepides viridis		1	1	2		1		1	2		5		2			
Nereis succinea						1		2	1		2			3		
Lysipiddes grayi						1				4						
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis																
Oligochaetes	1			1		3										
Amphipods																
Gammarus sp.					8	4				4	9	2				2
Corophium lacustre																
Lepidactylus dytiscus									1			11				
Leptocheirus plumulosus			3	2										2	7	3

Table C1 (cont'd.)

Species	Station															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Unidentified (Suborder Flabellifera)								1								
Cyathura polita					1						2		1	3		
Edotea triloba																
Chiridotea almyra												1				
Dipteran larvae						1										
Hydroids	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Balanus sp.			4			1		6						60	42	
Ectoprocts														X	X	
Biomass (grams)	.41	1.7	.99	2.6	.43	1.1	.54	1.2	.01	.01	12.6	.21	1.47	.55	.02	1.61

Table C2

James River Benthos; April 25, 1977

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		7	4	17	2	2	7	5					2	1		4
Congeria leucophaeta								1		1	1					
Macoma mitchelli															6	
Macoma balthica																
Corbicula manilensis			1		1											
Hydrobia sp.	1			1									1	9	1	3
Modiolus demissus										1						
Annelids																
Polychaetes																
Scolecolepides viridis			2	1	5			1					1		5	
Nereis succinea	1		1			1		1	1		2			1		
Lysipiddes grayi						1						1	1			
Polydora ligni											3					
Laeonereis culveri													7		2	
Heteromastus filiformis															1	
Oligochaetes						2	2				1					
Amphipods																
Gammarus sp.		5	2				1				1			10		2
Corophium lacustre			3				3				7	1	1	1		1
Lepidactylus dytiscus									1			3				
Leptocheirus plumulosus																

Table C2 (cont'd.)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Cyathura polita				1							6					1
Edotea triloba																
Chiridotea almyra																
Dipteran larvae		1	3			3										
Hydroids	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Balanus sp.											42			14		3
Ectoprocts														X		
Biomass (grams)	.004	4.6	1.44	2.72	.52	.09	5.3	.81	.005	.002	.04	.005	1.34	.14	.04	1.16

Table C3

James River Benthos; June 20, 1977

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	1	5		10	6	10	5	17	2	13	15	17	1	4		21
Congeria leucophaeta					1						30					
Macoma mitchelli				1												
Macoma balthica											1		1			
Corbicula manilensis			1								1	2				
Hydrobia sp.	8	4	2		1							2				
Modiolus demissus								1			4					
Annelids																
Polychaetes																
Scolecolepides viridis				9	6			2		2	4					1
Nereis succinea											2	1	1	2	2	1
Lysipiddes grayi												1				
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis											2					
Oligochaetes		1									1					1
Decapods																
Rhithropanopeus harrissi											1					
Crangon septemspinosus													1			

Table C3 (cont'd.)

Species	Station															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Amphipods																
Gammarus sp.				1	4						2	2				
Corophium lacustre	2	1	10		3		5	6	2		47	14		1		2
Lepidactylus dytiscus									13	1						
Leptocheirus plumulosus				8		12	4	2		3	1	1	9		10	13
Isopods																
Cyathura polita								1			3			1		3
Edotea triloba																
Chiridotea almyra																
Dipteran larvae							1					1				
Hydroids			X	X	X	X	X	X		X	X		X	X		
Balanus sp.					180			29		1	403	141		4		1
Ectoprocts								X			X					
Biomass (grams)	.006	4.98	.11	4.7	.25	4.12	2.22	.87	.53	.28	4.03	15.3	1.6	.02	.02	5.51

Table C4

James River Benthos; July 14, 1977

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	2	4	8	34	24	15	10	3	2	14	13	2	5	2	4	12
Congeria leucophaeta					1											
Macoma mitchelli				4	3			1		4	1			1		
Macoma balthica											1				1	
Corbicula manilensis									2							
Hydrobia sp.				4		1					3					
Modiolus demissus								1			2					
Annelids																
Polychaetes																
Scolecolepides viridis				2	3	1		6		5	7			5		1
Nereis succinea	1						2								1	2
Lysipiddes grayi																
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis					1					1	15				1	
Oligochaetes	1	1				1										
Decapods																
Rhithropanopeus harrissi	1															
Amphipods																
Gammarus sp.	1				1					1						
Corophium lacustre	378	1				1					3	1				
Lepidactylus dytiscus									2			2				
Leptocheirus plumulosus	4	2		1	3	10		7		15		2		13	8	11

Table C4 (cont'.d)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Isopods																
Cyathura polita				1	1	1		1		1				1	1	3
Edotea triloba											1					
Chiridotea almyra																
Dipteran larvae	3															
Hydroids		X		X	X	X	X	X		X	X	X	X	X		X
Balanus sp.	11				9	3					20				18	38
Ectoprocts								X								
Biomass (grams)	1.45	2.77	1.6	15.2	.57	2.04	.68	.65	.84	.05	4.84	.01	.62	.03	.02	2.63

Table C5

James River Benthos; August 18, 1977

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	2	7	2	6	9	11	5	17	11	9	11	5	19		4	10
Congeria leucophaeta								2								
Macoma mitchelli					1					2				1		1
Macoma balthica																
Corbicula manilensis							1									
Hydrobia sp.				3		1		1	2					3		2
Modiolus demissus								4								
Annelids																
Polychaetes																
Scolecolepides viridis	4	1		2	4	3				6	1		4	2		
Nereis succinea	7		1				1	1	1			1	3	1	1	
Lysipiddes grayi																
Polydora ligni								3								
Laeonereis culveri																
Heteromastus filiformis					2		1				4	1	2			
Oligochaetes								1								
Decapods																
Rhithropanopeus harrissi								1								
Crangon septemspinosus															1	

Table C5 (cont'd.)

Species	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Amphipods																
Gammarus sp.																
Corophium lacustre	16				1			6						3		
Lepidactylus dytiscus									5			3				1
Leptocheirus plumulosus	1	10		3	10	8		1		12	1	3	12	4	8	19
Isopods																
Cyathura polita		1				1		1		1				3		
Edotea triloba																
Chiridotea almyra											1					
Dipteran larvae						1										
Hydroids				X	X	X				X		X		X		
Balanus sp.	2	1						23		2	5			5		13
Ectoprocts								X	X		X			X		X
Biomass (grams)	1.14	5.07	2.36	1.56	.04	4.22	.93	1.69	2.18	1.04	3.85	.02	.86	.02	.31	3.75

Table C6

James River Benthos; October 20, 1977

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	7	6		8	10	8	6	2	3	5	11	11	2	1	2	27
Congeria leucophaeta																
Macoma mitchelli	11	7	2	4	4	10	2			4	2	3	3		1	4
Macoma balthica										1						
Corbicula manilensis																
Hydrobia sp.				1		1	1					2	1			1
Modiolus demissus						1	1	2						2	1	6
Annelids																
Polychaetes																
Scolecolepides viridis				1	6					1	4	4	6	2		
Nereis succinea	14		2			3		1	5	2	2	9	9	4	8	1
Lysipiddes grayi																
Polydora ligni																
Laeonereis culveri																
Heteromastus filiformis	1				4						7		1			
Oligochaetes								1			1					
Decapods																
Rhithropanopeus harrissi						1										

Table C6 (cont'd.)

Species	Station															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Amphipods																
Gammarus sp.																
Corophium lacustre	1															
Lepidactylus dytiscus			2				1									
Leptocheirus plumulosus	4	2		3		4					1	3	7	1		
Isopods																
Cyathura polita		1			1	1		1	1	1	1					
Edotea triloba					1					1						
Chiridotea almyra																
Dipteran larvae																
Hydroids				X	X	X		X		X	X		X	X	X	X
Balanus sp.								10		1	4	14		18	38	5
Ectoprocts	X				X		X			X	X			X	X	X
Biomass (grams)	3.8	2.8	.01	3.64	.05	3.2	3.96	.89	.02	.76	3.52	8.40	.07	.04	1.47	6.75

Table C7

Diversity and Related Parameters for Benthic Samples

March 8, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S-1/LN N
1	4	2	0.8113	0.7213
2	8	2	0.5436	0.4809
3	14	4	1.7884	1.1368
4	23	4	1.0862	0.9568
5	13	4	1.4885	1.1696
6	43	10	2.2530	2.3928
7	3	3	1.5850	1.8205
8	17	5	1.9015	1.4118
9	5	4	1.9219	1.8640
10	9	3	1.3921	0.9102
11	38	6	1.9624	1.3745
12	18	4	1.5003	1.0379
13	7	4	1.8424	1.5417
14	97	8	1.7363	1.5302
15	49	2	0.5917	0.2569
16	21	4	1.7057	0.9854
All Stations Combined	370	17	2.9313	2.7057

Table C8

Diversity and Related Parameters for Benthic Samples

April 25, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S-1/LN N
1	2	2	1.0000	1.4427
2	13	3	1.2957	0.7797
3	16	7	2.6556	2.1640
4	20	4	0.8476	1.001
5	8	3	1.2988	0.9618
6	9	5	2.1972	1.8205
7	13	4	1.6692	1.1696
8	8	4	1.5488	1.4427
9	2	2	1.0000	1.4427
10	2	2	1.0000	1.4427
11	63	8	1.7171	1.6895
12	5	3	1.3710	1.2427
13	13	6	2.0349	1.9494
14	36	6	1.9740	1.3953
15	15	5	1.9656	1.4771
16	14	6	2.4138	1.8946
All Stations Combined	239	19	3.4311	3.2868

Table C9

Diversity and Related Parameters for Benthic Samples

June 20, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S-1/LN N
1	11	3	1.0958	0.8341
2	11	4	1.6767	1.2511
3	13	3	0.9913	0.7797
4	29	5	1.9011	1.1879
5	201	7	0.7241	1.1314
6	22	2	0.9940	0.3235
7	15	4	1.8256	1.1078
8	58	7	1.8946	1.4777
9	17	3	1.0224	0.7059
10	20	5	1.5789	1.3352
11	517	15	1.3130	2.2407
12	182	10	1.2690	1.7294
13	13	5	1.5059	1.5595
14	12	5	2.0850	1.6097
15	12	2	0.6500	0.4024
16	43	8	2.0054	1.8611
All Stations Combined	1176	21	2.0090	2.8289

Table C10

Diversity and Related Parameters for Benthic Samples

July 14, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S=1/LN N
1	402	9	0.4686	1.3341
2	8	4	1.7500	1.4427
3	8	1	0.0000	0.0000
4	46	6	1.3719	1.3059
5	46	9	2.2011	2.0895
6	33	8	2.1178	2.0020
7	12	2	0.6500	0.4024
8	19	6	2.1471	1.6981
9	6	3	1.5850	1.1162
10	41	7	2.1498	1.6157
11	66	10	2.6458	2.1481
12	7	4	1.9502	1.5417
13	5	1	0.0000	0.0000
14	22	5	1.6542	1.2941
15	34	7	1.9388	1.7015
16	67	6	1.7788	1.1891
All Stations Combined	822	20	2.4735	2.8309

Table C11

Diversity and Related Parameters for Benthic Samples

August 18, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S-1/LN N
1	32	6	2.0109	1.4427
2	20	5	1.6784	1.3352
3	3	2	0.9183	0.9124
4	14	4	1.8774	1.1368
5	25	6	1.8539	1.5533
6	25	6	1.9715	1.5533
7	7	4	1.1488	1.5417
8	61	12	2.5899	2.6758
9	19	4	1.5288	1.0189
10	26	6	1.7947	1.5346
11	23	6	2.0165	1.5946
12	10	5	1.6855	1.7372
13	40	5	1.8598	1.0843
14	19	8	2.6101	2.3774
15	14	4	1.5216	1.1368
16	46	6	1.9576	1.3059
All Stations Combined	399	20	2.9853	3.1725

Table C12

Diversity and Related Parameters for Benthic Samples

October 20, 1977

Station Number	Number of Individuals	Number of SPECIES	SHANNON Formula H-PRIME	RICHNESS S-1/LN N
1	38	6	2.1161	1.3745
2	14	4	1.2958	1.1368
3	6	3	1.5850	1.1162
4	17	5	1.9254	1.4118
5	26	6	2.2109	1.5346
6	29	8	2.4451	2.0788
7	11	5	1.8676	1.6681
8	17	6	1.8981	1.7648
9	9	3	1.3516	0.9102
10	16	8	2.6494	2.5247
11	32	8	2.5717	2.0198
12	46	7	2.4932	1.5671
13	29	7	2.4288	1.7818
14	28	6	1.6981	1.5005
15	50	5	1.1354	1.0225
16	44	6	1.7435	1.3213
All Stations Combined	415	16	2.9637	2.4883