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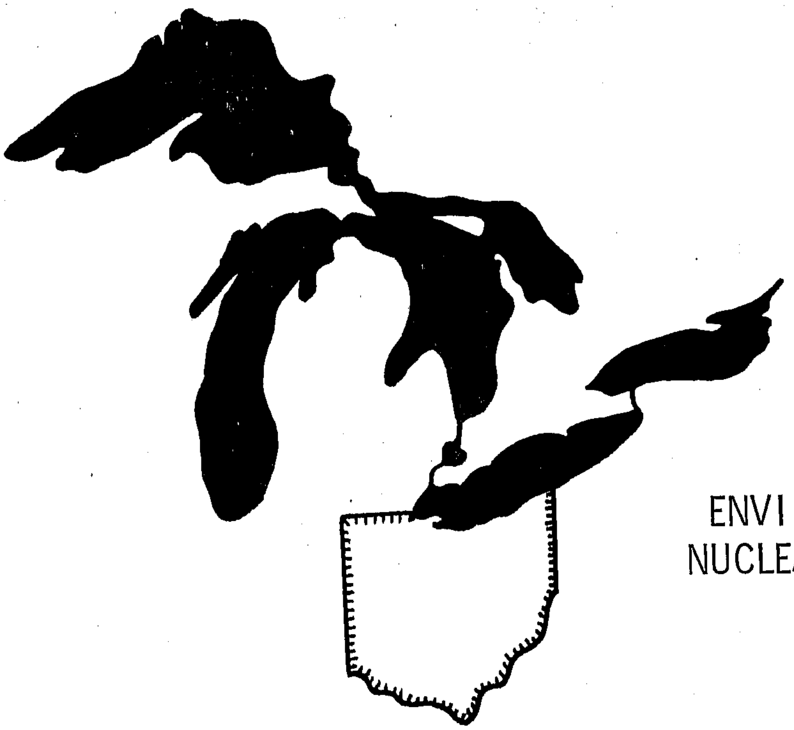

ENVIRONMENTAL EVALUATION OF A NUCLEAR POWER PLANT ON LAKE ERIE

ANNUAL REPORT - 1976
STUDY I
F-41-R-7

Prepared for

U. S. Fish and Wildlife Service
Ohio Department of Natural Resources
Division of Wildlife

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THE OHIO STATE UNIVERSITY
CENTER FOR LAKE ERIE AREA RESEARCH
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FEDERAL AID IN SPORT FISH RESTORATION

ANNUAL PERFORMANCE REPORT

STATE OF:	Ohio
PROJECT NO.:	F-41-R-7
PERIOD COVERED:	June 1, 1975 - May 31, 1976
DATE:	July 31, 1976
STUDY NO.:	I
STUDY TITLE:	Response of Fish and Invertebrates to the Heated Discharge from the Davis-Besse Reactor, Lake Erie, Ohio
PREPARED BY:	Jeffrey M. Reutter and Charles E. Herdendorf

Center for Lake Erie Area Research
The Ohio State University

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Federal Aid Project F-41-R-7

PERFORMANCE REPORT

State:	Ohio	Prepared by:	Jeffrey M. Reutter
Study No.:	I		Charles E. Herdendorf
		Date Prepared:	31 July 1976

Study Title: Response of Fish and Invertebrates to the Heated Discharge from the Davis-Besse Reactor, Lake Erie, Ohio

Period Covered: 1 June 1975 to 31 May 1976

ABSTRACT

The Toledo Edison Company and the Cleveland Electric Illuminating Company are currently building the Davis-Besse Nuclear Power Station on the southwest shore of Lake Erie at Locust Point. This plant will utilize water from Lake Erie to replenish the cooling tower blowdown which will be returned to the lake with a maximum temperature increase of 11.1°C. Phytoplankton, zooplankton, benthic macroinvertebrates, and fish populations along with the water quality

in the vicinity of Locust Point were monitored during 1975. These results were compared to the results of previous years in an effort to develop annual trends and accurately characterize the existing aquatic environment so that changes which occur after the plant becomes operational can be measured.

Phytoplankton populations in 1974 were characterized by diatoms, Melosira sp. In 1975 the diatom population was similar to 1974 but the Myxophycean population, Aphanizomenon sp., increased tremendously during the summer and became the dominant algal taxon. It appeared that these differences were due to changes in the water quality. In 1975 the water warmed sooner and was less turbid and more transparent than in 1974. These conditions favor Myxophycean populations.

Zooplankton populations in 1974 and 1975 were higher than those of 1972 or 1973. Rotifers generally dominated while cladocerans normally had the lowest population. Neither the zooplankton nor the phytoplankton are expected to be significantly effected by the thermal discharge. However, all entrained organisms will be killed.

Benthos populations were dominated by oligochaetes and chironomids. Populations in 1975 indicated that recolonization following the dredging of the intake and discharge pipelines in 1973 was nearing completion.

Although 46 species of fish were collected at Locust Point since

1963, only 10 species, Alosa pseudoharengus, Aplodinotus grunniens, Cyprinus carpio, Dorosoma cepedianum, Ictalurus punctatus, Morone chrysops, Notropis atherinoides, N. hudsonius, Perca flavescens, and Stizostedion v. vitreum, were of any real commercial or numerical importance. Due to their abundance at the site, the larvae of Dorosoma cepedianum, Notropis atherinoides, and Perca flavescens will be the species most likely to be entrained, while Dorosoma cepedianum and Alosa pseudoharengus will be the species most likely to be impinged on the traveling screens.

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- Analysis of Physical Parameters

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- Analysis of Biological Parameters

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STUDY OBJECTIVE

To be able to specify the actual effects on the aquatic biota of the Davis-Besse nuclear power plant at Locust Point, Ohio.

JOB I-a
FISH, PLANKTON, AND BENTHOS POPULATIONS PRIOR TO DISCHARGE

Objectives

To be able to specify fish, plankton, and benthos populations and primary productivity prior to operation of the Davis-Besse Nuclear Power Station.

Procedures

Sampling Station Location

Field data were collected during 1975 from twenty-five stations, 18 along 4 transects in the open lake, 2 stations in the intake canal, 2 stations in the marshes, and 3 stations along the shoreline (Table 1 and Fig. 1). Of the 4 transects, one followed the intake conduit, one the discharge conduit, while control transects were set up on the east and west sides of the entire intake and discharge complex. Control west ran due north from the shore-end of the intake conduit with sampling stations located at 500 ft (150 m) (Station 1), 1000 ft (300 m) (Station 2), 2000 ft (610 m) (Station 3), and 3000 ft (910 m) (Station 4) from the shoreline. Sampling stations on the intake were located at 500 ft (150 m) (Station 5), 1000 ft (300 m) (Station 6), 2000 ft (610 m) (Station 7), 3000 ft (910 m) (Station 8, proposed intake), and 4000 ft (1,220 m) (Station 9) from shore. Along

TABLE 1

SAMPLING DATES DURING 1975 AT THE DAVIS-BESSE NUCLEAR POWER STATION

SAMPLE	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
PLANKTON		22	29	16	14	11	8	6	3	16
BENTHOS		23	21	19	17	19	11	9	6	16
FISH										
Gill Net		17-18	22-23	16-17	14-15	11-12	8-9	6-7	3-4, 17-18	16-17
Shore Seine		17	22	17	15	12	10	14	5	
Otter Trawl										
Lake			5, 27	17	15	21	15	14	7	
Intake Canal				13			16			
Hoop Net		17-18	22-23	16-17	14-15	11-12	8-9	6-7	3-4	
Fry Net										
Lake		22	12, 25	2, 15, 22	2, 13	4, 30				
Intake Canal				13			16			
WATER QUALITY	24	22	29	16	14	11	8	6	3	16

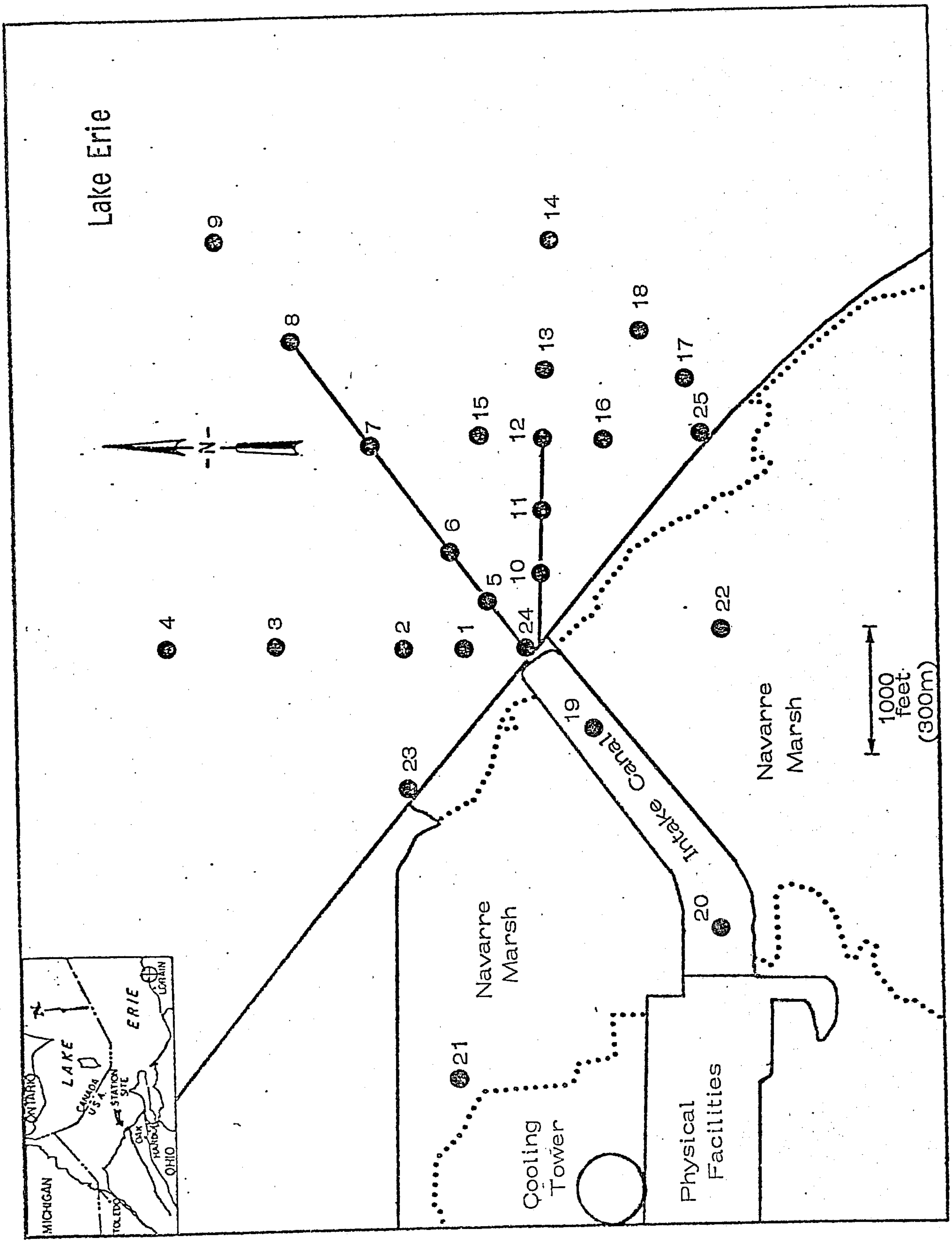


FIGURE 1. BIOLOGICAL SAMPLING STATIONS AT THE DAVIS-BESSE NUCLEAR POWER STATION

the discharge transect sampling stations were at distances of 500 ft (150 m) (Station 10), 1000 ft (300 m) (Station 11), 1500 ft (460 m) (Station 12), proposed discharge), 2000 ft (610 m) (Station 13), and 3000 ft (910 m) (Station 14) from shore. Additional stations were placed 500 ft (150 m) due north of Station 12 (Station 15) and 500 ft (150 m) south of Station 12 (Station 16). Control east ran perpendicular to the shoreline, parallel to the intake, and approximately 2500 ft (760 m) east of the intake. Stations were located 500 ft (150 m) (Station 17) and 1000 ft (300 m) (Station 18) from shore. Station 19 was located in the center of the intake canal, 1000 ft (300 m) from the lake shore. Station 20 was drained of all water in 1974 so samples were not collected there. Stations 21 and 22 were located in the northwest and southeast marshes, respectively. Stations 23 & 25 were on the shoreline at the intersection of the intake conduit and 1500 ft (460 m) to either side.

Fish

Fish populations at Locust Point were sampled by 5 methods, gill nets, shore seine, otter trawl, hoop nets, and fry net, during 1975 (Table 1). All fish captured were weighed, measured, and identified to species (Trautman, 1957 and Bailey et al., 1970). Results were reported as catch per unit effort (CPE).

Gill nets. Experimental gill nets were set parallel to the intake and discharge pipelines at Stations 8 and 13. Each net (125 ft x 6 ft or 38 m x 1.8 m) consisted of five 25 ft x 6 ft (7.6 m x 1.8 m) contiguous panels

[1/2"(1.3 cm), 3/4"(1.9 cm), 1"(2.5 cm), 1-1/2"(3.8 cm), and 2"(5.1 cm) bar mesh]. The nets were fished for approximately 24 hours monthly, April through December. In addition, weather conditions allowed sampling on an additional date in November (Table 1). One unit of effort consisted of one 24-hr set with one of these gill nets.

Shore seine. Shore seining was accomplished monthly, April through November with a 100-ft (30.5 m) bag seine (1/4" or 6 mm bar mesh) at Stations 23, 24, and 25. The seine was stretched perpendicular to the shoreline until the shore brail was at the water's edge. The far brail was then dragged through a 90° arc back to shore. Two hauls were made at each station. One unit of effort consisted of two hauls with the above mentioned seine.

Trawl. Both a 16-ft (4.9 m) and an 8-ft (2.4 m) trawl (1/8" mesh bags) were used to collect fish for CPE estimates of abundance and to obtain live fish for stomach analysis. The 16-ft trawl was used in the open lake. Four 5-min tows between the intake (Station 8) and the discharge (Station 12) were completed monthly April through November. All four trawls were considered to be one unit of effort. Stomachs were taken from a representative number of these fish and preserved in 5-10% formalin prior to analysis.

An 8-ft (2.4 m) trawl was used within the intake canal to determine whether the fish population existing in this canal was different from that found in the lake. Samples were collected on 13 June and 16 September 1975. Two 5-min tows were considered to be one unit of effort.

Hoop nets. Hoop nets, 2.5 ft (0.8 m) diameter with 1 in (2.5 cm) bar mesh, were set at Stations 21 and 22 in the northwest and southeast marshes. The nets were fished for approximately 24 hours monthly, April through November. One unit of effort consisted of a 24 hr set with one net. These fish were identified, weighed, measured and released.

Fry net. In 1975, 5-minute circular tows, surface and near bottom were made 10 times from April through August at Station 8 (intake) and Station 13 (plume area) with a 0.75 m diameter oceanographic plankton net (no. 00, 0.76 mm mesh) to capture ichthyoplankton. Weather conditions prohibited spacing the sampling dates exactly 2 weeks apart (Table 1). Station 13 was sampled in place of Station 12 (discharge), since the current at Station 12 will impeed sample collection and ichthyoplankton residence after the plant becomes operational. Collections were terminated at the end of August as no larvae or eggs were collected in the August samples.

Sampling was initiated in May over Toussaint Reef (a known spawning area) for comparative purposes (Fig. 2). Samples were also collected on 2 occassions from the intake canal, again, in an effort to determine if a spawning population existed within the canal.

One 5-min tow constituted 1 unit of effort. Ichthyoplankters were preserved in 5% formalin and analyzed under a dissecting microsope. Individuals were identified as far as possible (generally species) using the works of Fish (1932) and Norden (unpublished).

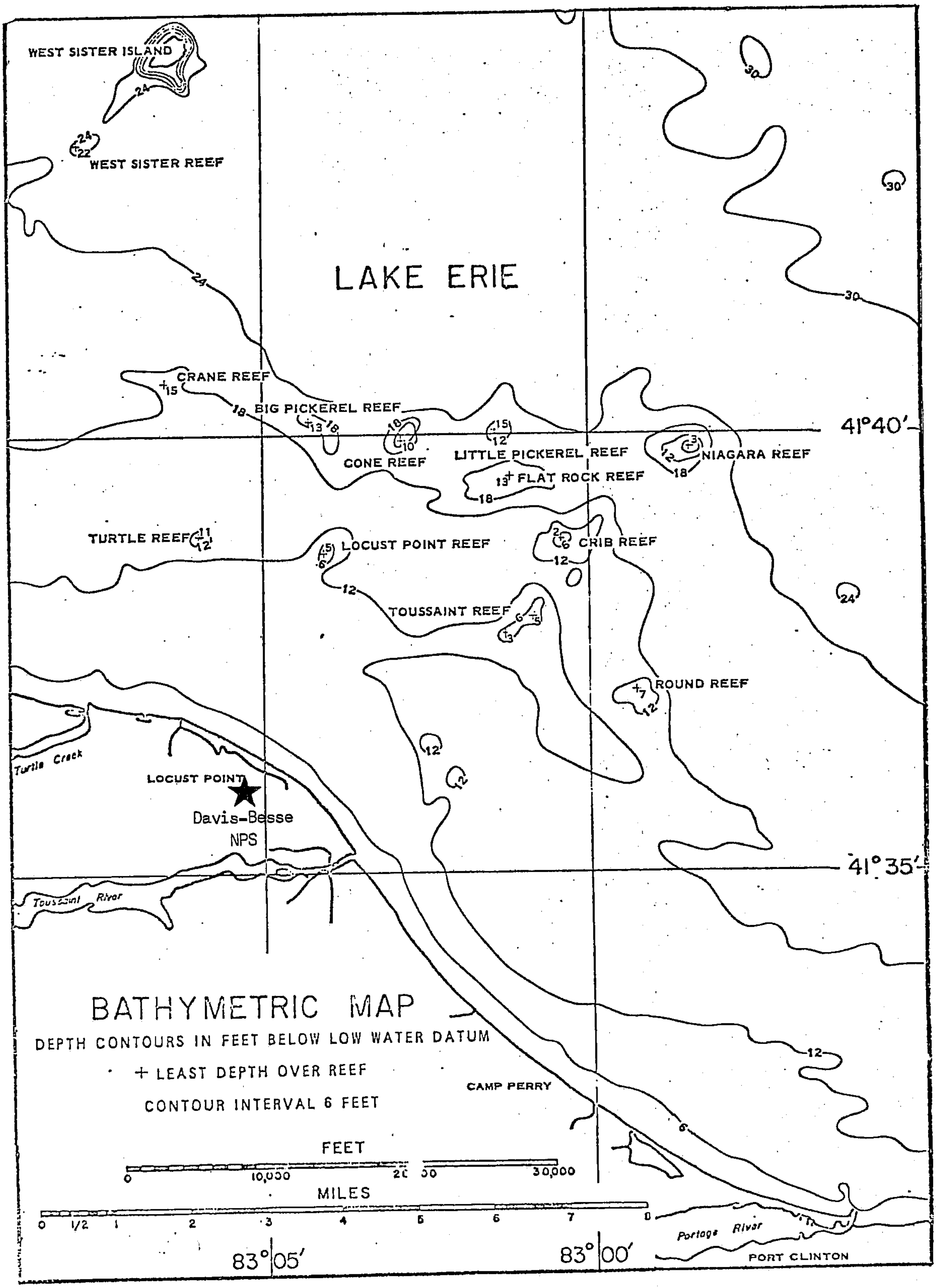


FIGURE 2. REEFS NEAR LOCUST POINT.
(From Herdendorf and Hair, 1972)

Plankton

Plankton was sampled monthly, April through November of 1975 (Table 1), from 11 stations, 10 in the open lake and 1 in the intake canal. In addition, weather conditions in December permitted a brief sampling period in which samples were collected from Stations 1, 8, and 13. Duplicate vertical tows, bottom to surface, were taken at each station with a Wisconsin plankton net (12 cm mouth; 0.080 mm mesh). Each sample was concentrated to 50 ml and preserved in 5% formalin. An equal volume of sugar was added to the formalin which was added to the sample to reduce distortion of zooplankters. The volume of each sample was computed by multiplying the length of the tow by the area of the net mouth. The works of Chengalath et al. (1971) , Collins and Kalinsky (1972), Eddy and Hodson (1964), Ewers (1930), Jahoda (1948), Pennak (1953), Taft and Taft (1971), Torke (1974), and Ward and Whipple (1959) were used in plankton identification.

Phytoplankton. Three 1-ml aliquots were withdrawn from each sample and placed in Sedgewick-Rafter counting cells. Whole organism counts were made from 25 random Whipple disk fields from each 1-ml aliquot in the Sedgewick-Rafter counting cell. When filamentous forms numbered 100 filaments or more in 10 Whipple fields, they were not counted in the remaining 15 fields. Identification was generally to the genus level. Results were reported as number of organisms/l.

Zooplankton. Three 1-ml aliquots were withdrawn from each sample and placed in Sedgewick-Rafter cells. The entire cell was scanned under a microscope at 60x while counting and identifying all zooplankters. Individuals were generally identified to the genus or species level and reported as number of organisms/l.

Analytical Methods. Correlation coefficients were computed for the Bacillariophyceae, Chlorophyceae, Myxophyceae, total phytoplankton, Rotifera Copepoda, Cladocera, total zooplankton and several water quality parameters from the results from 1974 and 1975 on an IBM 360 computer using the "Statistical Analysis System" (SAS) program which computes these statistics by the method of least squares (Service, 1972). In an effort to explain some of the variation in the populations, multiple regressions were also computed with these plankton components as the dependent variables and water quality parameters, station sampled, and date as independent variables. In all of the analytical computations, only the results of plankton tows from Stations 1, 8, and 12 (13 in 1975) were used as these were the stations at which the water quality was determined. Water samples for chemical analysis were collected at the same time plankton samples were collected. Since the plankton was collected by a vertical tow, bottom to surface, the means of the surface and bottom water quality determinations from each station were used in the correlations and regressions.

Benthos

Benthos was sampled monthly, April through November (Table 1) from Stations 1 to 19. In addition, samples were collected from Stations 1, 8, and 13 in December. Three replicate samples were taken at each station with a Ponar dredge ($A = 0.052\ m^2$). Samples were sieved through a U.S. #40 sieve, preserved in 10% formalin and returned to the laboratory. Individuals were identified as far as possible (usually to genus; to species where possible). The number of individuals per square meter was calculated for each of the three replicates by multiplying the number counted in the sample by 19.1. The sample mean and standard deviation for each station were then computed from the 3 replicates. The works of Brinkhurst (1963), (1964), (1965), Brinkhurst, Hamilton, and Herrington (1968), Klemm (1972), Mason (1968), Pennak (1953), Stein (1962), Usinger (1956), Walter and Burch (1957), and Ward and Whipple (1959) were used for the benthos identification.

Water Quality

Eighteen water quality parameters were measured monthly April through December at three stations (1, 8, and 13) in Lake Erie near Locust Point. These parameters and the analytical methods employed are listed in Table 2. Multiple regressions with water quality parameters as the independent variables and total phytoplankton, Bacillariophyceae, Chlorophyceae, Myxophyceae, total zooplankton, Rotifera, Copepoda, and Cladocera as the dependent variables were calculated. Correlations for each variable with each of the other variables were derived and are presented in the plankton section of this report. Statistical analyses were completed on an IBM 360 computer using the "Statistical Analysis System" (SAS) program which computes these statistics by the method of least squares (Service, 1972).

Field Measurements. Water quality measurements were made monthly in the field at Stations 1, 8, and 13 (Fig. 1). Temperature, dissolved oxygen and conductivity were measured from a small survey boat with submerged sensors and shipboard readout meters. Dissolved oxygen was

TABLE 2

REFERENCES FOR THE ANALYTICAL METHODS FOR THE WATER QUALITY DETERMINATIONS USED IN THE ENVIRONMENTAL EVALUATION OF THE DAVIS-BESSE NUCLEAR POWER STATION

Parameter	Units	References for Analytical Methods
1. Temperature	°C	APHA (1971): Sec. 162
2. Dissolved oxygen	ppm	APHA (1971): Sec. 218B
3. Conductivity	umhos/cm (25°C)	ASTM (1973): D1135-64
4. Transparency	meters	Welch (1948): Secchi disk
5. Calcium (Ca)	mg/l	APHA (1971): Sec. 110C
6. Magnesium (Mg)	mg/l	APHA (1971): Sec. 122B
7. Sodium (Na)	mg/l	ASTM (1973): D1428-64
8. Chloride (Cl)	mg/l	APHA (1971): Sec. 112B
9. Nitrate (NO_3)	mg/l	ASTM (1973): D992-71
10. Sulfate (SO_4)	mg/l	ASTM (1973): D516-68C
11. Phosphorus (Total as P)	mg/l	APHA (1971): Sec. 223F
12. Silica (SiO_2)	mg/l	ASTM (1973): D859-68B
13. Alkalinity (Total as $CaCO_3$)	mg/l	APHA (1971): Sec. 102
14. Biochemical oxygen demand	mg/l	APHA (1971): Sec. 219
15. Suspended solids	mg/l	APHA (1971): Sec. 224C
16. Dissolved solids	mg/l	USEPA (1971)
17. Turbidity	F.T.U.	APHA (1971): Sec. 163A
18. Hydrogen-ion conc.	pH units	ASTM (1973): D1293-65

determined with a YSI model 54 meter and conductivity with a Beckman RB3-3341 solubridge temperature-compensated meter; each meter was equipped with a thermistor for temperature readings. Sensor readings were taken at the surface and approximately 50 cm above the bottom. Transparency was determined with a 30 cm diameter Secchi disk lowered on a marked line until it was no longer visible.

Laboratory Determinations. Surface and bottom (50 cm above) water samples were taken at Stations 1, 8, and 13 with a 3-1 Kemmerer sampler at the same time that field measurements were being made. These samples were placed in polyethylene containers and taken to the laboratory for analyses which, in most cases, were completed within 24 hours of the sampling time. Fifteen water quality parameters were determined in the laboratory using the analytical procedures prescribed by the American Public Health Association (1971) and the American Society for Testing and Materials (1973) and listed in Table 2.

Primary Productivity

Primary productivity studies were initiated in 1975. Monthly measurements were taken at Stations 3, 8, 13, and 14. Water samples were collected from various depths with a 3-l Kemmerer water bottle and placed in 300-ml light and dark B.O.D. bottles with a known quantity of sodium bicarbonate tagged with ^{14}C. The bottles were then suspended at the depth from which the sample was collected for 2 hours. The contents of the bottles were then filtered, and the radiation on the filters was counted using liquid scintillation techniques.

Findings

Fish

Total catch. Thirty of the 46 species reported from the Locust Point vicinity since 1963 were captured in 1975 (Table 3). Tables 4 and 5 summarize the catch in numbers of individuals collected each month and by each sampling method. A complete breakdown of the monthly catches by station and by sampling method expressed as CPE is contained in Appendix A.

Dominant species (by number) in 1975 were *Notropis atherinoides* in April, July, August, October, and November; *Perca flavescens* in May and September; and *Dorosoma cepedianum* in June and December (Table 4). Although, *Dorosoma cepedianum* was dominant in only 2 months, the catch from June (young-of-the-year in the shore seine) was so large that this species constituted almost 60% of the total number of fish captured in 1975. The total catch per month with equal effort ranged from 233 fish in September to 21,677 in June (Table 5). December was excluded from this computation since only gill netting was completed.

Gill Net. Gill netting from April through December 1975 yielded 3,020 fish of 19 species (Table 5). The monthly gill net catch with equal sampling effort (one unit of effort at each station) from both stations (8 and 13) ranged from 33 fish of 5 species in December to 995 fish of 12 species in May. The dominant species

TABLE 3

SPECIES FOUND IN THE LOCUST POINT AREA 1963 - 1975[1] INCLUDING THOSE CAPTURED DURING THE PRESENT STUDY

1972	1973	1974	1975	Scientific Name[2]	Common Name
				Amiidae	
*		*	*	*Amia calva*	bowfin
				Atherinidae	
		*	*	*Labidesthes sicculus*	brook silversides
				Catostomidae	
*				*Carpiodes cyprinus*	quillback carpsucker
*	*	*	*	*Catostomus commersoni*	common white sucker
		*		*Minytrema melanops*	spotted sucker
*				*Moxostoma erythrurum*	golden redhorse
*				*Ictiobus cyprinellus*	bigmouth buffalo fish
				Centrarchidae	
		*		*Ambloplites rupestris*	northern rockbass
	*	*	*	*Lepomis cyanellus*	green sunfish
		*	*	*L. gibbosus*	pumpkinseed sunfish
	*	*		*L. humilis*	orangespotted sunfish
		*	*	*L. macrochirus*	northern bluegill sunfish
	*			*L. microlophus*	redear sunfish
*	*	*		*Micropterus dolomieui*	smallmouth bass
	*	*		*M. salmoides*	largemouth bass
	*	*	*	*Pomoxis annularis*	white crappie
*	*	*	*	*P. nigromaculatus*	black crappie
				Clupeidae	
*	*	*	*	*Alosa pseudoharengus*	alewife
*	*	*	*	*Dorosoma cepedianum*	gizzard shad
				Cyprinidae	
*	*	*	*	*Carassius auratus*	goldfish
*	*			*C. auratus* x *Cyprinus carpio*	carp x goldfish hybrid
*	*	*	*	*Cyprinus carpio*	carp
	*	*	*	*Hybopsis storeriana*	silver chub
*	*	*	*	*Notropis atherinoides*	emerald shiner
*	*	*	*	*N. hudsonius*	spottail shiner

TABLE 3 CON'T.

SPECIES FOUND IN THE LOCUST POINT AREA 1963 - 1975[1]
INCLUDING THOSE CAPTURED DURING THE PRESENT STUDY

1972	1973	1974	1975	Scientific Name[2]	Common Name
	*		*	*N. spilopterus*	spotfin shiner
	*		*	*N. volucellus*	mimic shiner
			*	*Pimephales promelas*	fathead minnow
				Esocidae	
				Esox lucius	northern pike
				Ictaluridae	
		*	*	*Ictalurus melas*	black bullhead
*	*	*		*I. natalis*	yellow bullhead
*	*	*	*	*I. nebulosus*	brown bullhead
*	*	*	*	*I. punctatus*	channel catfish
				Noturus flavus	stonecat madtom
				Lepisosteidae	
		*		*Lepisosteus osseus*	longnose gar
				Osmeridae	
*	*	*	*	*Osmerus mordax*	rainbow smelt
				Percidae	
			*	*Etheostoma nigrum*	johnny darter
*	*	*	*	*Perca flavescens*	yellow perch
	*	*	*	*Percina caprodes*	logperch darter
			*	*Stizostedion canadense*	sauger
*	*	*	*	*S. v. vitreum*	walleye
				Percichthyidae	
*	*	*	*	*Morone chrysops*	white bass
				Percopsidae	
	*	*	*	*Percopsis omiscomaycus*	troutperch
				Petromyzontidae	
		*		*Petromyzon marinus*	sea lamprey
				Salmonidae	
*		*		*Oncorhynchus kisutch*	coho salmon
				Sciaenidae	
*	*	*	*	*Aplodinotus grunniens*	freshwater drum
23	28	34	30	Total Species	

[1]Reutter and Herdendorf (1976) [2]Bailey et al. (1970)

TABLE 4

MONTHLY CATCH OF INDIVIDUAL FISH SPECIES AT LOCUST POINT
BY ALL SAMPLING METHODS[1] FROM ALL STATIONS WITH EQUAL EFFORT - 1975
(EXPRESSED AS NUMBER OF INDIVIDUALS)

Species Collected	April[2]	May[3]	June[3]	July[3]	Aug	Sept	Oct	Nov[4]	Dec[5]	Mean
Alosa pseudoharengus	10	46	46	6636	403	26	53	27	1	805
Amia calva	2		3							1
Aplodinotus grunniens	4	9	7	3	2	5	8	3		5
Carassius auratus			3	3		4	1	1		1
Catostomus commersoni		4								0.4
Cyprinus carpio	3	15	25	29	45	19	6	6	1	17
Dorosoma cepedianum	4	14	20498	777	384	22	153	72	12	2437
Etheostoma nigrum							1			0.1
Hybopsis storeriana		1								0.1
Ictalurus melas		Only in intake canal								–
I. nebulosus		3	1	1	2	1				1
I. punctatus		2	8	1	2	1				2
Labidesthes sicculus				2	5	1	1			1
Lepomis cyanellus		Only in intake canal								–
L. gibbosus						1				0.1
L. macrochirus		Only in intake canal								–
Morone chrysops	1	6	91	44	14	2	6	1		18
Notropis atherinoides	1398	32	138	1115	1626	47	1089	520		663
N. hudsonius	71	559	5	24	20	28	23	86	12	92
N. spilopterus					1	1				0.2
N. volucellus			2							0.2
Osmerus mordax	1		5	5	2	1		38	7	7
Perca flavescens	16	1400	547	60	111	67	25	37		251
Percina caprodes	1			2		2		1		1
Percopsis omiscomaycus	1							1		0.2
Pimephales promelas							1			0.1
Pomoxis annularis			1	2	1	1	1			1
P. nigromaculatus	4	1	2		1					1
Stizostedion canadense		6		1	2	1				1
S. v. vitreum	1	2	4	4	1	1		1		2
Number of species	14	15	17	17	17	19	13	13	5	30
TOTAL	1517	2100	21386	8709	2622	231	1368	794	33	4307

[1] Trawling in the intake canal and fry netting at Toussaint Reef and Station 19 were not included in these totals.
[2] This includes the first trawl which was actually done on 5 May 1975.
[3] The mean of fry totals from multiple sampling dates was used.
[4] The mean of the two gill net samples was used in this computation.
[5] Only gill nets were used. Therefore, less fishing effort was expended in December.

TABLE 5

NUMBER OF FISH COLLECTED AT LOCUST POINT FROM APRIL - DECEMBER 1975 WITH EQUAL MONTHLY EFFORT[1] WITH EACH PIECE OF FISHING EQUIPMENT

METHOD OF CAPTURE	APRIL		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		TOTAL	
	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species	No. of Fish	No. of Species
Gill Net	96	9	995	12	372	11	433	13	428	10	134	11	271	7	258[4]	10	33	5	3020	19
Shore Seine	1398	3	44	7	20497	11	8219	6	2165	5	76	6	869	6	145	3			33413	17
Otter Trawl																				
Lake	13[3]	6	11	4	320	13	26	8	21	8	22	10	360	11	387	5			1160	16
Intake Canal					20	5					400	12							420	13
Hoop Net	7	3	4	1	8	3	5	2	1	1	1	1	1	1	1	1			28	5
Fry Net[2]																				
Lake	2	1	1050[4]	3	209[5]	6	33[4]	3	0[4]	0									1294	7
Intake Canal					251	4					0	0							251	4
TOTAL	1516	14	2104	15	21677	17	8716	17	2615	17	633	19	1501	13	791	13	33	5	39586	30

[1]These values represent the sum of the CPE results from all stations at which each piece of fishing equipment was used.
[2]Excluding eggs.
[3]Actual Sampling data was 5 May.
[4]Mean of smaples collected on two separate occasions.
[5]Mean of smaples collected on three separate occasions.

(by number) collected April through December were *Notropis hudsonius* in April, May, November, and December; *Perca flavescens* in June and September; *Alosa pseudoharengus* in July; and *Dorosoma cepedianum* in August, October, and December (Tables 18 and 19).

Shore Seine. Shore seining yielded 33,413 fish of 17 species, 84% of total number of fish captured in 1975, from April through November (Table 5). The monthly catches with equal sampling effort (one unit of effort at each of 3 stations) ranged from 44 fish of 7 species in May to 20, 497 fish of 11 species in June. *Dorosoma cepedianum* constituted 99% (by number) of this high June catch. The dominant species, April through November, were *Notropis atherinoides* in April, May, and August through November; *Dorosoma cepedianum* in June; and *Alosa pseudoharengus* in July (Tables 20-27).

Trawl. Trawling in the lake yielded a total of 1,160 fish of 16 species from May through November 1975 (Table 5). Monthly CPE ranged from 11 fish representing 4 species in May to 387 fish representing 5 species in November. Dominant species collected April through November were *Notropis hudsonius* in early May and September; *Notropis atherinoides* in late May, August, October, and November; *Perca flavescens* in late May and June; and *Morone chrysops* in July and August (Table 28).

Trawling in the intake canal in 1975 yielded 420 fish of 13 species, 20 fish of 4 species in June and 400 fish of 12 species in September (Table 5). Perca flavescens was the dominant species in June while Pomoxis annularis was the dominant species in September (Table 29).

Hoop Net. Hoop nets set in the northwest and southeast marshes from April through November 1975 yielded a total of 28 fish of 5 species (Table 5). Cyprinus carpio was the dominant species captured in 1975 (Tables 30 and 31).

Fry Net. A total of 190 eggs and 3,031 larvae representing 7 species were collected from April through September 1975 (Table 5). No larvae were collected in April, August, or September. Perca flavescens was the most numerous species captured constituting 70% of the total catch (Tables 32 and 33). Of the 2,112 yellow perch larvae captured, 99% were captured in May. Notropis atherinoides composed only 1% of the total catch. Pomoxis annularis constituted 72% of the catch from the intake canal. Over 98% of the eggs collected were taken from Toussaint Reef.

Food Habits. Stomachs were removed from 48 fish of 10 species from April - June (Table 6). Cladocerans were the primary food items. Stomachs were removed from 76 fish representing 12 species from July - November (Table 7). Crustacea and benthic

TABLE 6

SUMMARY OF FOOD HABITS OF FISH COLLECTED AT LOCUST POINT APRIL - JUNE 1975

Month	Species	No. Captured	% Containing Food	Length (mm) Mean	Length (mm) Range	Oligochaeta	Cladocera	Bosmina sp.	Daphnia retrocurva	Leptodora kindtii	Copepoda	Amphipoda	Insecta	Diptera	Chironomidae pupae	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Polypedilum sp.	Tanypodinae	Procladius sp.	Trichoptera larvae	Fish	Animal debris	Plant debris
April	Aplodinotus grunniens	3	33	157	111-186																				33	
	Notropis a. atherinoides	1	100	107	-		100		100		100														100	100
	N. hudsonius	5	80	113	107-121	20						40			20	20		20	40						40	20
	Osmerus eperlanus mordax	1	0	140	-																					
	Perca flavescens	2	50	203	167-239													50								
	Percina caprodes	1	100	62	-							100														
	Subtotal	13	62																							
May	Ictalurus punctatus	2	50	137	116-157							50			50		50		50				50		50	
	Notropis a. atherinoides	4	100	87	31-114		50	75	75	50	75									25		25			50	
	N. hudsonius	1	100	101	-		100				100														100	100
	Perca flavescens	4	100	202	185-221		50		100	25	25														25	
	Subtotal	11	91																							
June	Alosa pseudoharengus	1	100	132	-			100	100	100	100														100	
	Aplodinotus grunniens	1	100	96	-			100	100	100	100													100	100	
	Ictalurus nebulosus	1	100	277	-			100	100	100																
	I. punctatus	1	100	148	-			100	100	100															100	
	Notropis a. atherinoides	10	100	106	89-113		20	90	90	50	70														80	
	N. hudsonius	3	100	95	66-128		33	33	100	100															67	
	Perca flavescens	6	100	164	105-201			17	100	100	17													17	100	
	Pomoxis annularis	1	100	141	-			100	100	100	100													100	100	
	Subtotal	24	100																							
	Total	48	88																							

TABLE 7

SUMMARY OF FOOD HABITS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	No. Captured	% Containing Food	Length (mm) Mean	Length (mm) Range	Food Items I: Oligochaeta	Cladocera	*Alona* sp.	*Bosmina* sp.	*Bosmina longirostris*	*Chydorus sphaericus*	*Daphnia galeata*	*D. retrocurva*	*Diaphanosoma* sp.	*Eubosmina coregoni*	*Leptodora kindtii*	Copepoda	Calanoid	Cyclopoid	*Gammarus* sp.	Hydracarina	Insecta	Baetidae
July	*Aplodinotus grunniens*	1	100	200			48					52	64			96							
	Morone chrysops	3	100	191	175–205		5									347							
	Notropis hudsonius	1	0	120																			
	Perca flavescens	2	100	169	165–173		1									6							
	Percina caprodes	1	100	89																6			
	Pomoxis annularis	1	100	197			49									43	2						
	Subtotal	9																					
August	*Ictalurus nebulosus*	1	100	215												35							
	Morone chrysops	5	100	70	59–76								17	5	1	63		1	1				
	Notropis atherinoides	6	100	86	81–93		1				2		8		2	4			2				
	Perca flavescens	2	100	127	75–178														19				
	Pomoxis nigromaculatus	1	100	193																			
	Subtotal	15																					
September	*Aplodinotus grunniens*	1	100	85																			
	Ictalurus nebulosus	1	100	240												2							
	Ictalurus punctatus	1	100	64				1											1				
	Notropis atherinoides	1	100	87							60		232	20	16	4	4						
	N. hudsonius	9	100	92	72–109						1		2		1				3		2		
	Perca flavescens	1	100	159							9				11	1		2	15				
	Percina caprodes	1	100	70																			
	Subtotal	15																					

TABLE 7 (CON'T.)

SUMMARY OF FOOD HABITS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

						Food Items II																	
Month	Species	No. Captured	% Containing Food	Length (mm) Mean	Length (mm) Range	Diptera	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Glyptotendipes sp.	Parachironomus sp.	Polypedilum sp.	Rheotanytarsus sp.	Xenochironomus sp.	Tanypodinae	Procladius sp.	Chironomidae pupae	Trichoptera larvae	Fish	Notropis sp.	Animal debris	Plant debris
July	Aplodinotus grunniens	1	100	200																		X	
	Morone chrysops	3	100	191	175-205					1										2		X	
	Notropis hudsonius	1	0	120																			
	Perca flavescens	2	100	169	165-173																	X	
	Percina caprodes	1	100	89			1		2		3	18						13				X	
	Pomoxis annularis	1	100	197						3								6		1		X	
	Subtotal	9																					
August	Ictalurus nebulosus	1	100	215														4				X	
	Morone chrysops	5	100	70	59-76																	X	X
	Notropis atherinoides	6	100	86	81-93				1									1				X	
	Perca flavescens	2	100	127	75-178				3													X	
	Pomoxis nigromaculatus	1	100	193																			
	Subtotal	15																					
September	Aplodinotus grunniens	1	100	85					1	5			1	11								X	
	Ictalurus nebulosus	1	100	240																			
	Ictalurus punctatus	1	100	64						49				41			1	9				X	
	Notropis atherinoides	1	100	87																		X	
	N. hudsonius	9	100	92	72-109									4								X	X
	Perca flavescens	1	100	159						1			1	5	1			2				X	X
	Percina caprodes	1	100	70																		X	
	Subtotal	15																					

TABLE 7 (CON'T.)

SUMMARY OF FOOD HABITS OF FISH COLLECTED AT LOCUST POINT*
JULY – NOVEMBER 1975

Month	Species	No. Captured	% Containing Food	Length (mm) Mean	Length (mm) Range	Food Items I: Oligochaeta	Cladocera	Alona sp.	Bosmina sp.	Bosmina longirostris	Chydorus sphaericus	Daphnia galeata	D. retrocurva	Diaphanosoma sp.	Eubosmina coregoni	Leptodora kindtii	Copepoda	Calanoid	Cyclopoid	Gammarus sp.	Hydracarina	Insecta	Baetidae
October	Alosa pseudoharengus	4	100	118	113-120						31	28	1573	4	82	28		47	341				
	Aplodinotus grunniens	2	100	84	52-116						1		1			1		1	8				
	Etheostoma nigrum	1	100	37							7		9			1		6	73				
	Morone chrysops	2	100	89	83-95								30			13			6				
	Notropis atherinoides	10	100	76	52-98						80	2	49		111				1				
	N. hudsonius	2	100	92	80-103						2		39		5				1				
	Perca flavescens	1	100	226																			
	Pomoxis annularis	1	100	78							11	10	290		38	19		2	34				
	Subtotal	23																					
November	Notropis atherinoides	12	58	73	47-93					1	2		2		13				1				
	Perca flavescens	1	0	198																			
	Percina caprodes	1	100	70															5	4			1
	Subtotal	14																					
	TOTAL	76																					

TABLE 7 CON'T.

SUMMARY OF FOOD HABITS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	No. Captured	% Containing Food	Length (mm) Mean	Length (mm) Range	Diptera	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Glyptotendipes sp.	Parachironomus sp.	Polypedilum sp.	Rheotanytarsus sp.	Xenochironomus sp.	Tanypodinae	Procladius sp.	Chironomidae pupae	Trichoptera larvae	Fish	Notropis sp.	Animal debris	Plant debris
						Food Items II																	
October	Alosa pseudoharengus	4	100	118	113-120																	X	
	Aplodinotus grunniens	2	100	84	52-116																	X	
	Etheostoma nigrum	1	100	37										3									
	Morone chrysops	2	100	89	83-95																	X	
	Notropis atherinoides	10	100	76	52-98																	X	
	N. hudsonius	2	100	92	80-103																	X	
	Perca flavescens	1	100	226																	1	X	
	Pomoxis annularis	1	100	78																		X	
	Subtotal	23																					
November	Notropis atherinoides	12	58	73	47-93																	X	
	Perca flavescens	1	0	198																			
	Percina caprodes	1	100	70										1									
	Subtotal	14																					
	TOTAL	76																					

* Data presented as mean number of food items per fish.

"X" indicates the presence of a food item.

midges composed the majority of the food consumed. Mason (1973) was used to identify the midges. Additional data are contained in Appendices B and C.

Plankton

Phytoplankton. Phytoplankters collected April through December 1975 were placed in 48 taxa generally at the genus level (Table 8). Thirteen taxa were placed in Bacillariophyceae, 24 in Chlorophyceae, 1 in Chrysophyceae, 3 in Dinophyceae, 1 in Euglenophyceae, and 6 in Myxophyceae.

Monthly mean phytoplankton populations ranged from 4,883/l in May to 327,915/l in August (Table 9). The mean population from all samples collected in 1975 was 76,155/l. Population pulses were observed in April, August, and December (Fig. 3). The August pulse (327,915/l), which was dominated by Myxophyceans, was more than 3 times as large as the spring (97,567/l) or fall (82,963/l) pulses which were dominated by Bacillariophyceans (Fig. 4).

Monthly mean Bacillariophycean populations ranged from 2,080/l in May to 96,783/l in April (Table 8). The mean population from all samples collected during 1975 was 27,304/l or 36% of the entire phytoplankton population. The dominant diatom taxa were Stephanodiscus sp. in April and December; Melosira sp. in May, July, October, and November; Asterionella sp. in June; and Fragilaria sp. in August and September. Stephanodiscus sp. had the largest

TABLE 8

MONTHLY MEAN PHYTOPLANKTON POPULATIONS AT LOCUST POINT - 1975*

TAXA \ DATE	April 22	May 29	June 16	July 14	Aug. 11	Sept. 8	Oct. 6	Nov. 3	Dec. 16	Grand Mean
BACILLARIOPHYCEAE										
(Diatoms)										
Amphiprora sp.				4						0
Asterionella sp.	16179	148	2409	36	62	8	45	684	7365	2993
Centrics (single-celled)	51	52	102	47	114	87	810	41	298	178
Cymatopleura sp.	14	3	6	30	2	7				7
Diatoma sp.	13382	13	43					73	3939	1939
Fragilaria sp.	7933	218	744	220	5172	3942	993	576	2263	2451
Gyrosigma	25	9	2	9	.3					5
Melosira sp.	7222	1377	1253	2176	259	384	30268	10979	4969	6543
Naviculoid	385	23	237	37	11		4	121	123	105
Stephanodiscus sp.	43925	120	427				197	240	58678	11510
Surirella sp.	4	22	9	19	3	7	6			8
Synedra sp.	1566	4	47	1	4	6	107	252	1189	353
Tabellaria sp.	6093	121	1400	3			3	50	1074	972
Subtotal	96783	2080	6573	2556	5628	4440	34799	13002	79879	27304
CHLOROPHYCEAE										
(Green Algae)										
Actinastrum sp.	5	9	101		2	4		13		15
Ankistrodesmus sp.		3	22					4		3
Binuclearia sp.	14	13	297	2	35	3142	436	314	219	497
Closterium sp.	38	42	33	7		14	108	96	103	49
Coelastrum sp.		100	75	525	253	233	33	7		136
Cosmarium sp.				11	26	15	3		96	49
Dictnosphaerium sp.	18	38	212	11	41	19	22	25	96	54
Dimorphococcus sp.		8	0	2		32				5
Eudorina sp.	35	0	2		2	1				4
Kirchneriella sp.					2	1				0
Micractinium sp.	5	5	168	43	3	19	2208	366		313
Mougeotia sp.	176	134	873	64	8				564	202
Oedogonium sp.		73	1537	190	42					205
Oocystis sp.		36	60	112	30	23	53	16		37
Pandorina sp.					4					.0
Pediastrum sp.	54	1395	4262	2029	5224	5102	8852	778	497	3133
Scenedesmus sp.	34	162	266	49	55	3	66	21	32	76
Schroederia sp.		0	31	14	4					5
Selenastrum sp.		6	13	37	4	2				7
Sphaerocystis sp.		13	0	53	2					8
Spirogyra sp.		4	1							1
Staurastrum sp.		69	399	165	175	42	114	48	12	114
Westella sp.	85	7	0							10
Unidentified		56	0							6
Subtotal	464	2110	8347	3384	5910	9511	11820	1691	1522	4973
CHRYSOPHYCEAE										
(Yellow-green Algae)										
Dinobryon sp.	107	6	0				15			15
DINOPHYCEAE										
(Dinoflagellates)										
Ceratium sp.		9	28	2361	1113	135	53			411
Glenodinium sp.					6	1				1
Peridinium sp.			8	39	42	1				10
Subtotal		9	36	2400	1162	137				416
EUGLENOPHYCEAE										
Euglena sp.		1	7	4						1
MYXOPHYCEAE										
(Blue-green Algae)										
Anabaena sp.		5	36	178	64	7	2	3		33
Aphanizomenon		531	12183	32964	313332	17695	5023	2439	1563	42859
Chroococcus sp.	8	1	8	535	146	169	12	6		98
Merismopedia sp.		6	7	2						2
Microcystis sp.		146	610	2011	1722	228	72	10		533
Oscillatoria sp.	205	17	11	5						26
Subtotal	213	688	12854	35777	315263	17977	5109	2456	1563	43544
TOTAL	97567	4883	27817	43951	327915	31352	51795	17148	82963	76155

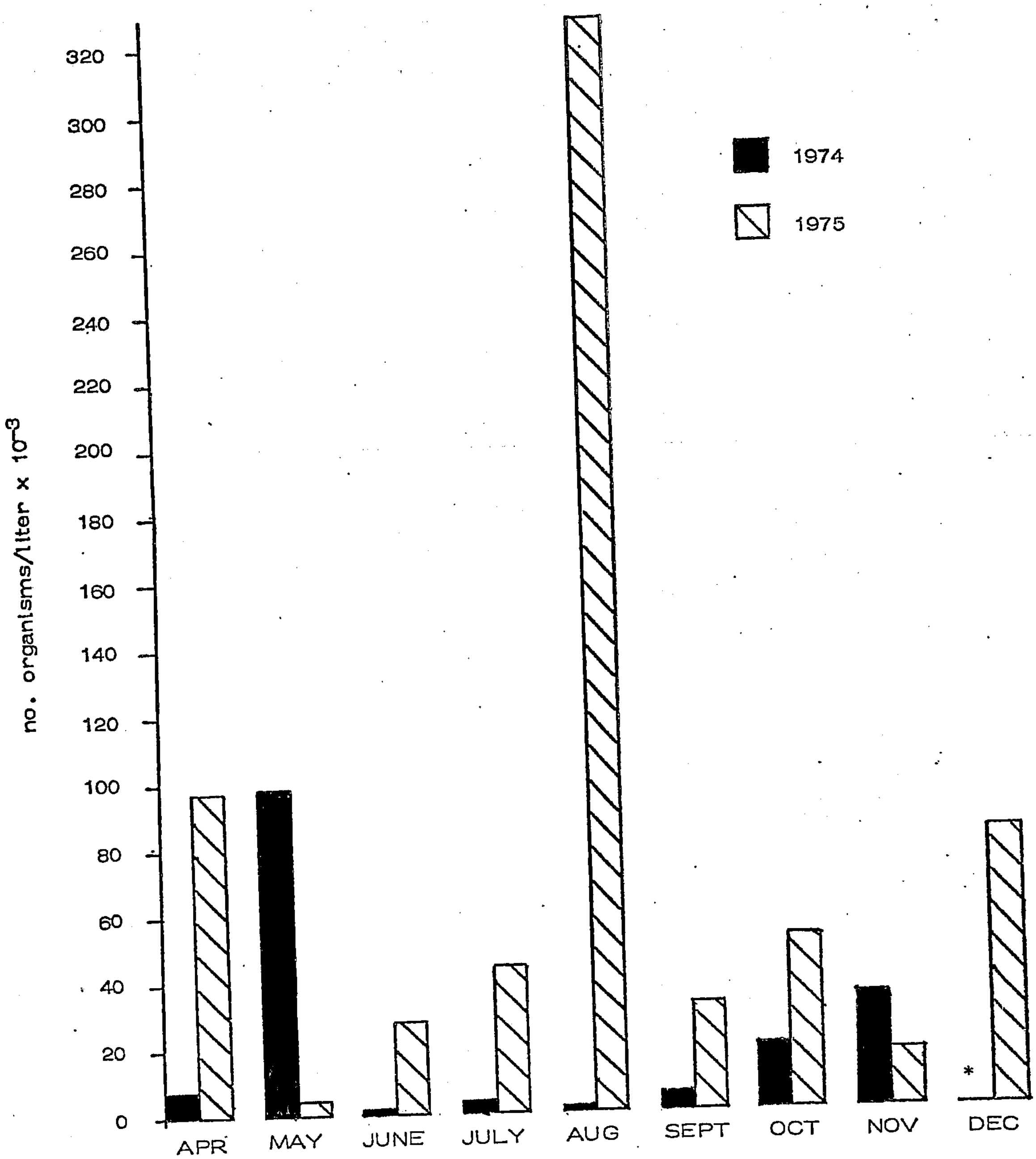
* Expressed as number of whole organisms/l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter, 0.080 mm mesh) from 11 sampling stations on the dates indicated.

TABLE 9

TOTAL PHYTOPLANKTON POPULATIONS* - 1975

STATION	April 22	May 29	June 16	July 14	August 11	September 8	October 6	November	December 16	Mean
1	78323	5423	41866	37630	252327	28591	95586	21106	86509	71929
3	66189	3553	18380	45630	358252	17583	66619	12786		73624
6	84222	5470	25362	44864	315819	32392	64962	23017		74514
8	49687	1634	22427	40957	398417	28524	38589	18399	79075	75301
9	72091	1717	18692	42528	521139	31807	29857	5082		90364
10	233105	15744	77018	51916	189272	62334	67833	28438		90708
12	200831	9588	20828	55484	400803	37893	67487	20242		101645
13	141458	4224	23356	53265	405706	40540	40491	20213	83306	90284
14	51792	2190	22752	44498	328099	24787	35913	18198		66029
18	73268	3800	25731	50969	390225	34373	53841	17007		81152
19	22272	366	9575	15724	47004	6053	8569	4138		14212
Mean	97567	4883	27817	43951	327915	31352	51795	17148	82963	76154

* Number of individuals per liter.



* No sample collected.

FIGURE 3. MONTHLY MEAN PHYTOPLANKTON POPULATIONS FOR LAKE ERIE AT LOCUST POINT - 1974 AND 1975.

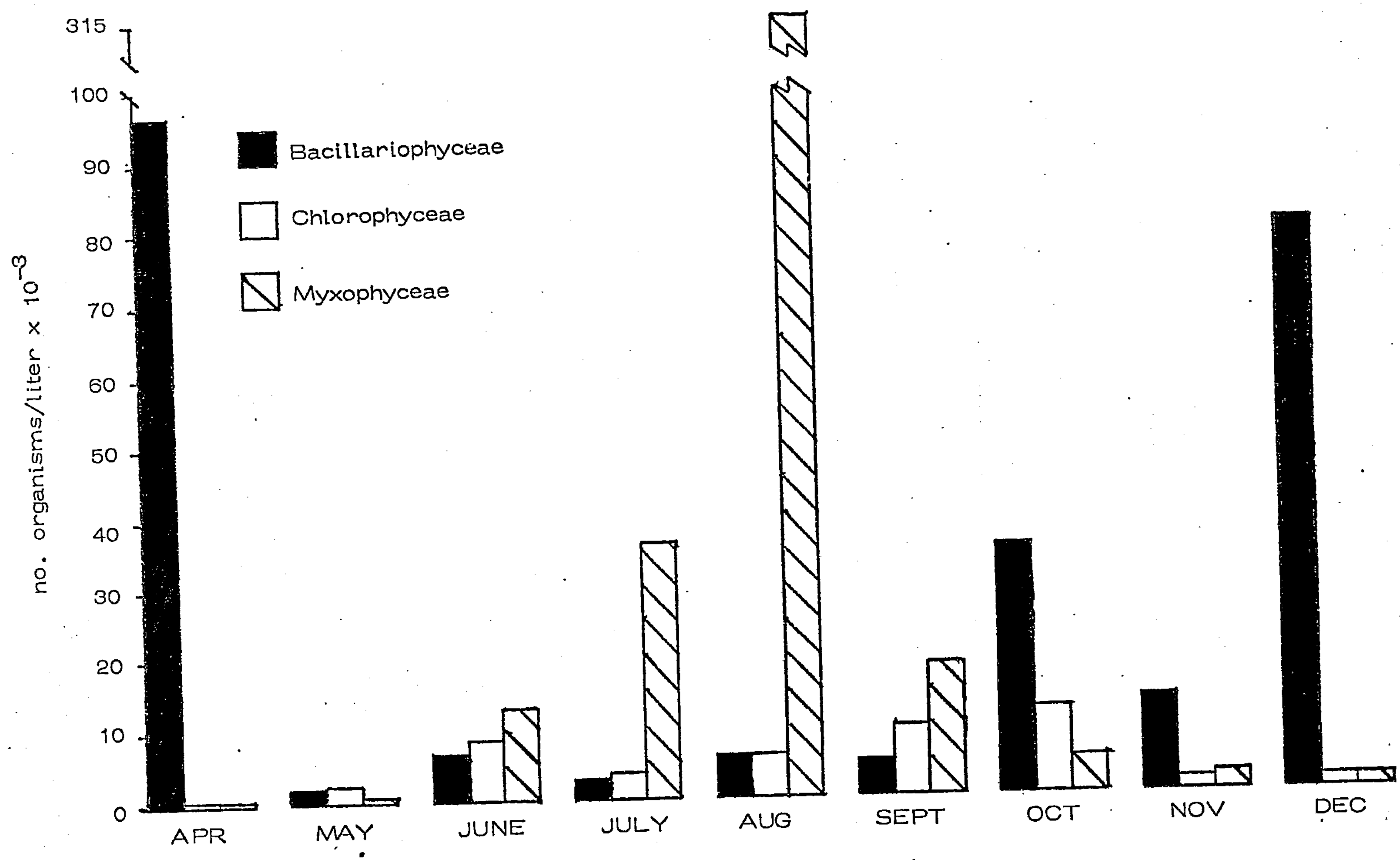


FIGURE 4. MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT - 1975.

annual mean population, 11,510/l. Diatoms were the dominant algal group in April, October, November, and December when they made up 99%, 67%, 76%, and 96%, respectively, of the entire phytoplankton population and caused the spring and fall pulse. In contrast to this, only 2% of the August population was composed of diatoms.

Monthly mean Chlorophycean populations ranged from 464/l in April to 11,820/l in October (Table 8). The mean population from all samples collected during 1975 was 4,973/l or 7% of the entire phytoplankton population. The dominant Chlorophyceans were Mougeotia sp. in April and December and Pediastrum sp. from May through November. Pediastrum sp. had the largest annual mean population, 3,133/l. Chlorophyceae was never the dominant algal group in 1975 (Fig. 4). It was, however, the most diverse group, with 24 taxa. Chlorophyceans were most prominant in May when they represented 43% of the entire phytoplankton population.

The class Chrysophyceae was represented by only 1 taxon, Dinobryon sp. (Table 8). Dinobryon sp. was not found in July, August, September, November, or December and peaked at only 107.l in April. The mean population from all samples in 1975 was 14/l and an insignificant portion of the entire phytoplankton population.

Monthly mean Dinophycean populations peaked in July (2,400/l) and were not observed in April, October, November, or December (Table 8). The mean population from all samples collected in 1975 was 416/l or 0.5% of the entire phytoplankton population. Ceratium sp. was the dominant Dinophycean whenever they occurred. This taxon was most prominent in July when it composed 5% of the entire phytoplankton population.

The class Euglenophyceae was represented by only 1 taxon in 1975, Euglena sp. (Table 8). It was only observed in May (1/l), June (7/l), and July (4/l).

Monthly mean Myxophycean populations ranged from 213/l in April to 315,263/l in August (Table 8). The mean population from all samples collected during 1975 was 43,544/l (57% of the entire phytoplankton population) of which Aphanizomenon sp. composed 98%. Aphanizomenon sp. was the dominant blue-green taxon during all months except April when Oscillatoria sp. dominated, Aphanizomenon sp. also had the largest annual mean population, 42,859/l or 56% of the entire phytoplankton population. Myxophyceans composed 96% of the entire phytoplankton pulse in August (Fig. 4) and Aphanizomenon composed 96% of the August Myxophycean population (Table 8). Blue-greens also dominated the phytoplankton in June, July and September. In contrast to this, blue-greens composed only 0.2% of the April phytoplankton population.

Zooplankton. Zooplankters collected April through December 1975 were placed in 52 taxa, 18 in Rotifera, 17 in Copepoda, 9 in Cladocera, and 1 in Protozoa (Table 10). Thirty-two taxa were

TABLE 10

MONTHLY MEAN ZOOPLANKTON POPULATIONS
AT LOCUST POINT - 1975*

TAXA \ DATE	April 22	May 29	June 16	July 14	Aug. 4	Sept. 8	Oct. 6	Nov. 3	Dec. 16	Grand Mean
ROTIFERA										
Asplanchna giroldi					1.1	33.5				3.8
A. priodonta	0.1	1.1		23.2			1.0	0.8	21.8	5.3
Brachionus angularis	18.7	5.9	16.7	8.8	0.8	2.6	0.4	0.1	0.1	6.0
B. calyciflorus	7.2	0.2	0.5	0.8	0.2	0.2		6.6	0.5	1.8
B. havanaensis		0.6	0.1	1.5	0.5	1.7	0.2			0.5
B. urceolaris	1.0									0.0
Chromogaster ovalis				77.8	70.7	2.2				16.7
Conochiloides sp.		22.1	36.8	3.4	0.8					7.0
Filinia terminalis	1.0	0.7	1.9	11.4	0.4	0.4	0.1		0.6	1.8
Hexarthra mira						0.0				0.0
Kellicottia longispina	0.6	0.2	8.0		0.1			0.1	2.6	1.3
Keratella cochlearis	2.1	71.0	89.1	97.9	81.3	21.5	53.1	31.2	68.5	57.3
K. quadrata	3.9	8.1	16.3	0.0	0.1	0.2	0.1	1.0	6.0	4.0
Lecane luna				0.6						0.1
L. lunaris				0.1						0.0
Notholca sp.	31.6	0.1							0.1	3.5
Polyarthra sp.	22.1	76.5	25.7	155.8	23.3	39.0	17.2	35.1	82.6	53.0
Pompholyx sulcata			4.2	3.6	78.7	2.6	1.8			10.1
Rotaria sp.						0.1				0.0
Synchaeta sp.	10.7	0.7	1.1	13.0	113.4	25.3	12.3	67.8	53.2	33.1
Trichocerca cylindrica				1.3		0.1				0.2
T. multicrinis		0.8	0.5	6.3	17.5	14.1	0.3			4.4
T. sp.			0.9	0.3	3.2					0.5
Trichotria tetractis			0.1	0.3						0.0
Unidentified rotifer	29.7	0.1	32.9	14.8						8.6
Subtotal	112.8	186.4	234.2	419.7	391.9	143.1	86.1	142.5	235.6	216.9
COPEPODA										
Calanoid copepods										
Diaptomus siciloides							1.5	0.5		0.2
D. sp.	0.7	4.2	2.0	0.7	0.5	10.7			0.2	2.1
Eurytemora affinis	0.0	0.3	0.0				0.0	0.6	0.3	0.1
Immatures, calanoid	0.3									0.0
Immatures, Diaptomus		1.1	1.9	2.5	1.7	22.0	1.8	2.4	0.1	3.7
Immatures, Eurytemora		0.0						0.9	0.2	0.1
Nauplii, calanoid	15.9	14.7	9.5	6.8	10.3	26.2	6.3	7.1	1.8	11.5
Cyclopoid copepods										
Cyclops bicuspidatus	1.0	3.4	6.6			0.0	0.1	0.5	0.4	1.3
C. vernalis	0.1	12.1	33.0	14.2	0.9	1.4	5.6	3.4	1.2	8.0
Mesocyclops edax			0.0	1.0	0.1	0.1				0.1
Tropocyclops prasinus							0.2	0.2		0.0
Immatures, Cyclops	1.0	37.1	8.0	60.6	3.5	7.1	20.5	21.4	10.5	18.9
Immatures, Mesocyclops					0.3	0.8				0.1
Immatures, Tropocyclops							0.1	0.1	0.1	0.0
Nauplii, cyclopoid	4.9	234.9	120.9	73.3	43.3	8.3	31.4	45.0	37.1	66.6
Nauplii, harpactacoid	0.4									0.0
Subtotal	24.3	337.4	181.7	158.6	60.4	76.4	67.3	81.6	51.8	115.5
CLADOCERA										
Bosmina longirostris	0.5	191.8	0.8	4.1	0.1		0.2	14.3	5.5	24.1
Ceriodaphnia sp.				0.1		0.0	0.0			0.0
Chydorus sphaericus	0.3	3.6	0.5	0.3	9.2	61.1	47.8	8.3	0.6	14.6
Daphnia galeata		0.1		8.6	0.3	0.3	0.8	0.3	0.1	1.2
D. parvula			0.0							0.0
D. retrocurva	0.3	116.1	30.1	137.6	5.2	15.1	50.0	3.4		39.7
Diaphanosoma sp.				1.0	1.1	16.4	1.3	0.0		2.2
Eubosmina coregoni		5.9	71.0	0.6	19.4	8.0	111.2	31.8	5.7	28.2
Leptodora kindtii		1.5	0.5	0.8	0.1	0.3	0.7			0.4
Subtotal	1.1	317.6	102.7	152.7	35.3	101.1	211.4	58.1	11.9	110.2
PROTOZOA										
Difflugia sp.	12.6	30.7	843.4	325.3	36.7	70.8	11.2	14.2	3.3	149.8
TOTAL	150.7	874.9	1305.2	1056.2	524.2	391.2	376.0	296.4	302.5	593.0

* Expressed as number/l and computed from duplicate vertical tows (bottom to surface) with a Wisconsin plankton net (12 cm diameter, 0.080 mm mesh) from 11 sampling stations on the dates indicated.

identified to the species level, 10 to the genus level, one consisted of unidentified rotifers, and 9 contained immature copepods.

Zooplankton populations ranged from 151/l in April to 1,365/l in June. The mean population from all samples collected in 1975 was 593/l (Table 11).

Monthly mean rotifer populations ranged from 86/l in October to 420/l in July (Table 10). The mean rotifer population from all samples collected during 1975 was 217/l or 37% of the entire zooplankton population. The dominant rotifers were Notholca sp. in April; Polyarthra sp. in May, July, September, and December; Keratella cochlearis in June and October; and Synchaeta sp. in August and November. Keratella cochlearis had the largest annual mean population, 57/l. Rotifera was the dominant zooplankton group in April, July, August, September, November, and December composing 75%, 40%, 75%, 37%, 48%, and 78%, respectively, of the total zooplankton population. In contrast to this, rotifers composed only 17% of the June zooplankton population.

Monthly mean copepod populations ranged from 24/l in April to 337/l in May (Table 10). The mean copepod population from all samples collected during 1975 was 116/l or 20% of the entire zooplankton population. The dominant copepod stage were always nauplii. Calanoid nauplii dominated in April and September while cyclopoid nauplii dominated the copepod populations of all other months with an annual mean of 67/l. Copepoda was the dominant zooplankton

TABLE 11

TOTAL ZOOPLANKTON POPULATIONS* - 1975

STATION	April 22	May 29	June 16	July 14	August 11	September 8	October 6	November	December 16	Mean
1	176.3	625.2	2412.7	1635.0	743.3	603.6	505.4	377.4	328.0	823.0
3	113.7	661.7	1209.9	732.9	470.1	385.5	406.3	446.7		553.3
6	136.8	915.7	1294.9	1061.6	443.0	373.3	274.0	287.3		598.3
8	103.7	700.6	1673.0	566.1	358.9	405.9	294.0	225.1	233.6	506.8
9	87.1	655.6	1229.8	687.0	500.4	427.2	260.2	196.8		505.6
10	187.8	1296.4	2342.4	1802.1	1016.8	633.3	465.7	407.9		1018.8
12	208.0	1721.7	808.3	1350.4	700.5	436.8	565.9	323.6		764.4
13	126.6	963.8	1229.9	1069.6	604.3	362.5	429.1	328.1	346.0	606.7
14	123.8	773.9	1317.6	929.2	358.3	291.2	377.2	238.3		551.2
18	170.7	917.2	1157.6	1231.1	421.1	361.1	533.5	294.2		635.8
19	223.6	391.6	342.5	553.6	149.6	23.0	24.1	134.7		230.3
Mean	150.7	874.9	1365.2	1056.2	524.2	391.2	376.0	296.4	302.5	593.0

* Number of individuals per liter.

group in May representing 39% of the total zooplankton population. This sudden increase from the low April population to the high May population was due largely to an increase in cyclopoid nauplii which increased from 5/l in April to 235/l in May.

Monthly mean cladoceran populations ranged from 1/l in April to 318/l in May (Table 10). The mean cladoceran population from all samples collected during 1975 was 110/l or 19% of the entire zooplankton population. Cladoceran populations were dominated by Bosmina longirostris in April and May; Eubosmina coregoni in June, August, October, November and December; Daphnia retrocurva in July; and Chydorus sphaericus in September. Daphnia retrocurva had the largest annual mean population, 40/l. Cladocera was the dominant zooplankton group in October representing 56% of the total population. Cladocerans composed only 0.7% of the April population.

The Protozoa were represented by only 1 taxon, Difflugia sp. which ranged in population from 3/l in December to 843/l in June (Table 10). The mean population from all samples collected during 1975 was 150/l. Protozoa (Difflugia sp.) was the dominant zooplankton group in June composing 62% of the total population.

Correlation Coefficients. Correlation coefficients (r) were computed for each of the following variables against each of the other variables and presented in Table 12: total phytoplankton, Bacillariophyceans, Chlorophyceans, Myxophyceans, total zooplankton, rotifers, copepods, cladoderans, temperature, transparency, turbidity, alkalinity, phosphorus, nitrate and silica.

TABLE 12
CORRELATION COEFFICIENTS FOR SEVERAL WATER QUALITY PARAMETERS AND PLANKTON COLLECTED FROM STATIONS 1,8, AND 12 OR 13 AT LOCUST POINT DURING 1974 AND 1975 *

	Phyto-plankton	Bacillario-phyceae	Chloro-phyceae	Myxo-phyceae	Zoo-plankton	Rotifera	Copepoda	Clado-cera	Tempera-ture	Trans-parency	Turbidity	Alka-linity	Phos-phorus	Nitrate	Silica
Phytoplankton	1.000 0.000	0.285 0.042	0.081 0.574	0.907 0.000	-0.116 0.419	0.106 0.461	-0.230 0.104	-0.242 0.087	0.088 0.537	0.426 0.002	-0.168 0.239	-0.422 0.002	0.075 0.601	-0.125 0.381	-0.212 0.135
Bacillariophyceae	0.285 0.042	1.000 0.000	-0.142 0.319	-0.139 0.331	-0.296 0.035	-0.157 0.271	-0.197 0.165	-0.323 0.021	-0.531 0.000	-0.353 0.011	0.148 0.299	-0.013 0.928	0.576 0.000	0.118 0.411	-0.182 0.201
Chlorophyceae	0.081 0.574	-0.142 0.319	1.000 0.000	0.072 0.616	0.022 0.880	-0.058 0.687	-0.214 0.132	0.101 0.481	-0.104 0.467	-0.062 0.664	-0.225 0.113	0.000 0.999	-0.283 0.044	-0.378 0.006	-0.234 0.098
Myxophyceae	0.907 0.000	-0.139 0.331	0.072 0.616	1.000 0.000	0.004 0.976	0.174 0.223	-0.137 0.338	-0.117 0.413	0.335 0.016	0.604 0.000	-0.222 0.118	-0.432 0.002	-0.159 0.266	-0.209 0.140	-0.122 0.394
Zooplankton	-0.116 0.419	-0.296 0.035	0.022 0.830	0.004 0.976	1.000 0.000	0.632 0.000	0.650 0.000	0.558 0.000	0.587 0.000	0.237 0.095	-0.328 0.019	0.018 0.900	-0.076 0.598	-0.172 0.228	-0.151 0.291
Rotifera	0.106 0.461	-0.157 0.271	-0.058 0.687	0.174 0.223	0.632 0.000	1.000 0.000	0.272 0.053	0.148 0.300	0.472 0.001	0.278 0.049	-0.323 0.021	-0.179 0.209	0.002 0.990	-0.311 0.026	-0.095 0.509
Copepoda	-0.230 0.104	-0.197 0.165	-0.214 0.132	-0.137 0.338	0.650 0.000	0.272 0.053	1.000 0.000	0.670 0.000	0.400 0.004	-0.013 0.928	-0.205 0.149	0.195 0.169	0.140 0.328	-0.138 0.333	-0.106 0.458
Cladocera	-0.242 0.087	-0.323 0.021	0.101 0.481	-0.117 0.413	0.558 0.000	0.148 0.300	0.670 0.000	1.000 0.000	0.375 0.007	0.113 0.429	-0.217 0.126	0.435 0.001	-0.204 0.150	0.381 0.006	-0.119 0.405
Temperature	0.088 0.537	-0.531 0.000	-0.104 0.467	0.335 0.016	0.587 0.000	0.472 0.001	0.400 0.004	0.375 0.007	1.000 0.000	0.599 0.000	-0.535 0.000	-0.113 0.429	-0.087 0.543	-0.354 0.011	-0.136 0.341
Transparency	0.426 0.002	-0.353 0.011	-0.062 0.664	0.604 0.000	0.237 0.095	0.278 0.049	-0.013 0.928	0.113 0.429	0.599 0.000	1.000 0.000	-0.639 0.000	-0.382 0.006	-0.327 0.019	-0.245 0.083	-0.416 0.002
Turbidity	-0.168 0.239	0.148 0.299	-0.225 0.113	-0.222 0.118	-0.328 0.019	-0.323 0.021	-0.205 0.149	-0.217 0.126	-0.535 0.000	-0.639 0.000	1.000 0.000	0.296 0.035	0.132 0.357	0.198 0.163	0.823 0.000
Alkalinity	-0.422 0.002	-0.013 0.928	0.000 0.999	-0.432 0.002	0.018 0.900	-0.179 0.209	0.195 0.169	0.435 0.001	-0.113 0.429	-0.382 0.006	0.296 0.035	1.000 0.000	0.085 0.551	0.605 0.000	0.090 0.528
Phosphorus	0.075 0.601	0.576 0.000	-0.283 0.044	-0.159 0.266	-0.076 0.598	0.002 0.990	0.140 0.328	-0.204 0.150	-0.087 0.543	-0.327 0.019	0.132 0.357	0.085 0.551	1.000 0.000	-0.239 0.091	0.090 0.529
Nitrate	-0.125 0.381	0.118 0.411	0.378 0.006	-0.209 0.140	-0.172 0.228	-0.311 0.026	-0.138 0.333	0.381 0.006	-0.354 0.011	-0.245 0.083	0.198 0.163	0.605 0.000	-0.239 0.091	1.000 0.000	-0.060 0.675
Silica	-0.212 0.135	-0.182 0.201	-0.234 0.098	-0.122 0.394	-0.151 0.291	-0.095 0.509	-0.106 0.458	-0.119 0.405	-0.136 0.341	-0.416 0.002	0.823 0.000	0.090 0.528	0.090 0.529	-0.060 0.675	1.000 0.000

* Expressed as correlation coefficient (r) over probability > /r/ under HO:r=0.
Correlations were considered signigicant if $P \leq 0.050$.

Based on the combined 1974 and 1975 results, the entire phytoplankton population was significantly correlated (5% level) with 2 of its components, Bacillariophyceans and Myxophyceans (highly correlated), and with transparency and alkalinity (negative) (Table 12). These coefficients of the total phytoplankton population changed drastically when the two years were considered separately. In 1974 the r values for total phytoplankton vs. the Bacillariophyceans, Myxophyceans, and transparency were 0.969, 0.021, and -0.213, respectively. In 1975, these values changed to 0.073, 0.946, and 0.513, respectively. When these same computations were made on the 1974 and 1975 results without considering the results from August 1975 (Myxophycean bloom), r for transparency became -0.221 and r for Myxophyceae became 0.071.

Bacillariophycean populations from 1974 and 1975 were significantly correlated (5% level) with the total phytoplankton population, total zooplankton population (negative), cladoceran population (negative), temperature (negative), transparency (negative), and phosphorus (Table 12). These correlations were most significant for temperature and phosphorus.

Chlorophycean populations from 1974 and 1975 were significantly correlated (5% level) with phosphorus (negative) and nitrate (Table 12). No other correlations were significant.

Myxophycean populations from 1974 and 1975 were significantly correlated (5% level) with the total phytoplankton population, temperature, transparency, and alkalinity. The correlation was very high with the total phytoplankton (r = 0.097) and quite high with transparency (r = 0.604).

The total zooplankton population and all three of its components, rotifers, copepods, and cladocerans, were significantly correlated (5% level) with temperature. Copepods and cladocerans were significantly correlated, while rotifer populations were not correlated with either of them. Bacillariophyceae was the only phytoplankton group that was significantly correlated (5% level - negative) with the zooplankton.

Regression Analysis. Results of multiple regressions with total phytoplankton from 1974 and 1975 and its major components as the dependent variables are presented in Appendix D, Tables 36 - 43. Two regressions were developed for each dependent variable, one with the physical parameters of temperature, turbidity, transparency, station number and date (month) as independent variables and another which added the chemical parameters of alkalinity, phosphorus, nitrate, and silica to the list of independent variables. Results of multiple regressions with total zooplankton from 1974 and 1975 and its components as dependent variables are also presented in Appendix D, Tables 44 - 47. One regression was developed for each dependent variable with the physical parameters of temperature, turbidity, transparency, station and date serving as independent variables.

The multiple regression of the total phytoplankton population against only the physical parameters explained 57.9% (r^2 or R-Square = 0.579) of the variation in the total phytoplankton population (Table 36). Temperature, transparency, and date all contributed significantly (5% level). Transparency was the most important single variable. With the 4 chemical parameters added to the regression 75.0% (r^2 = 0.750) of the variation in the phytoplankton population was explainable with transparency, date, alkalinity, and nitrate contributing significantly (5% level) (Table 37). Transparency continued to be the most significant single variable.

The multiple regression of the Bacillariophycean population against the physical parameters accounted for 69.2% (r^2 = 0.692) of the variation in the diatom population during 1974 and 1975 (Table 38). Temperature, turbidity, and date all contributed significantly (5% level) to this regression with date the most important single variable. When the 4 chemical parameters were added to the equation, 88.8% (r^2 = 0.888) of the variability in the Bacillariophycean population was explained with turbidity, date, phosphorus, nitrate, and silica all contributing significantly at the 5% level (Table 39). Silica and date were the most important parameters.

Variations in the Chlorophycean population were the most difficult to explain. The regression of the Chlorophycean population against the physical parameters accounted for only 46.5% (r^2 = 0.465) of the variation in the population as only date contributed significantly (5% level) (Table 40). When the 4 chemical parameters were added to the regression, 71.6% ($r^2 = 0.716$) of the variation in the Chlorophycean population was explained with date, alkalinity, nitrate, and silica contributing significantly to the regression (Table 41). Nitrate was the most important single variable.

The regression of the Myxophycean population against the physical parameters accounted for 67.5% ($r^2 = 0.675$) of the variation in the blue-green algae population (Table 42). Transparency and date made significant contributions (5% level) to the regression with transparency as the most important single variable. When the 4 chemical parameters were added to the regression, 76.5% ($r^2 = 0.765$) of the variation in the Myxophycean population was explainable with transparency, date, alkalinity, and nitrate contributing significantly (5% level) to the regression (Table 43). Transparency, was the most important single variable.

The regression of the 5 physical parameters against the total zooplankton population was able to explain 82.9% ($r^2 = 0.829$) of the variability in the population (Table 44). Temperature, station, and date contributed significantly (5% level) to the regression. Date was the most important single parameter.

The regression of the rotifer population against the 5 physical parameters explained 59.2% ($r^2 = 0.592$) of the variability in the rotifer population (Table 45). Station and date contributed significantly (5% level) to the regression with station acting as the most important single variable.

The multiple regression of the copepod population against the 5 physical parameters accounted for 68.0% (r^2 = 0.680) of the variability (Table 46). Only date contributed significantly to the regression.

The multiple regression of the cladoceran populations against the 5 physical parameters accounted for 65.2% (r^2 = 0.652) of the variation in the cladoceran population (Table 47). Temperature and date contributed significantly (5% level) to the regression.

Benthos

Benthic macroinvertebrates collected April through December 1975 were placed in 26 taxa, generally to the genus or species level within 4 phyla (Table 13). Two taxa were in Coelenterata, 11 in Annelida, 9 in Arthropoda, and 4 in Mollusca.

Monthly mean benthic macroinvertebrate populations ranged from 170/m^2 in December to 2,179/m^2 in August with an annual mean population of 1,154/m^2 and were strongly dominated by the Annelids and Arthropods. Station 19 had the largest annual mean population, 3,290/m^2 (Table 14). Populations along the 4 sampling transects varied directly with distance off shore (Fig. 5). Station 8 (intake, 3000 ft. off shore) was the only exception to this rule.

Monthly mean Annelid populations ranged from 140/m^2 in December to 1,603/m^2 in August with an annual mean population of 825/m^2 (Table 13). Immature Oligochaeta (no hair setae) was the dominant

TABLE 13

MONTHLY MEAN BENTHIC MACROINVERTEBRATE POPULATIONS
AT LOCUST POINT – 1975

TAXA	April 23	May 21	June 19	July 17	Aug. 19	Sept. 11	Oct. 9	Nov. 6	Dec. 16	Mean
COELENTERATA										
Hydra sp. (single polyp)		5.4	1.4	2.7		0.7	1.7	58.0		7.8
Hydra sp. (budding polyp)		4.4	0.7					39.9		5.0
Subtotal		9.8	2.1	2.7		0.7	1.7	97.9		12.8
ANNELIDA										
Hirudinea										
Glossiphonia complanata	0.3	0.3								0.1
Helobdella stagnalis	1.3	0.7	1.3	0.7	1.3	0.3	1.0	1.4		0.9
Piscicolidae						0.3				0.0
Oligochaeta										
Immatures (no hair setae)	509.8	559.9	686.2	947.1	1412.4	1315.2	750.9	629.3	140.1	772.3
Branchyura sowerbyi	7.0	5.4	7.7	6.0	16.4	15.8	7.0	22.1		9.7
Limnodrilus cervix	7.4	8.1	19.4	29.8	63.3	20.8	4.7	1.0		17.2
L. claparedeanus	0.3	0.3	15.1		67.0		0.7			9.3
L. claparedeanus-cervix	1.7	4.7	5.4	4.5	32.5	2.5	1.0	0.3		5.8
L. hoffmeisteri							0.3			0.0
L. maumeensis	2.0	4.0	0.7	5.7		4.7	1.0	0.3		2.0
Potamothrix moldaviensis	10.7	13.1	13.1	16.8	9.7	4.4	0.7			7.6
Subtotal	540.5	596.5	748.9	1010.6	1502.6	1364.0	767.3	654.4	140.1	825.0
ARTHROPODA										
Cladocera										
Leptodora kindtii	0.3	85.6	431.9	157.5	125.7	222.8	210.4	1.7		137.3
Amphipoda										
Gammarus fasciatus	2.7	41.6	9.4	12.4	2.8	0.7	1.4	7.4	6.4	9.4
Chironomidae										
Chironomus sp.	15.8	44.2	18.1	59.0	257.2	245.1	36.5	64.7	17.0	84.2
Chironomus pupae							0.7			0.1
Cryptochironomus sp.	3.4	10.4	1.0	12.7		18.2	11.7	11.7	6.4	8.4
Procladius sp.	3.0	10.7	6.4	29.1	12.7	11.8	3.0	3.4		8.9
Procladius pupa		2.3								0.3
Tanytarsus sp.	1.7	0.3	31.0	15.1	212.9	300.2	56.7	33.5		69.0
Ephemeroptera										
Caenis sp.	2.0	11.4	0.7					1.3		1.7
Subtotal	28.9	206.5	498.5	285.8	611.3	798.8	320.4	123.7	29.8	322.6
MOLLUSCA										
Pelecypoda										
Amblema sp.	1.7			0.3		0.7		0.3		0.3
Leptodea sp.				0.3						0.0
Liqumia sp.				0.7			0.3			0.1
Sphaerium sp.						0.3				0.0
Subtotal	1.7			1.3		1.0	0.3	0.3		0.5
TOTAL	584.1	796.9	1222.6	1308.5	2179.4	2167.4	1064.8	893.8	169.8	1154.1

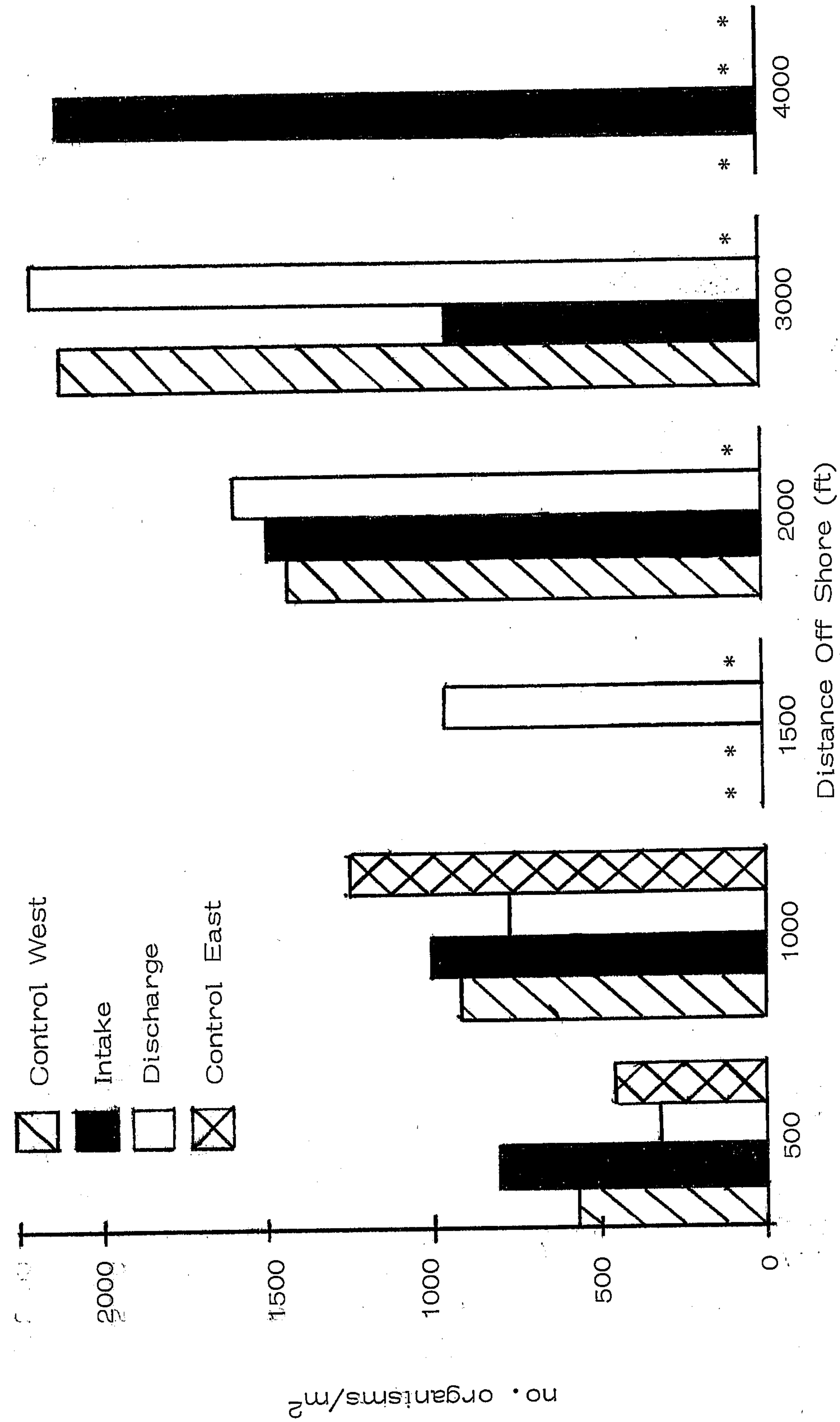
Data presented as number/m^2.

TABLE 14

TOTAL BENTHIC MACROINVERTEBRATE POPULATIONS* - 1975

STATION	April 23	May 21	June 19	July 17	August 19	September 11	October 9	November 6	December 16	Mean
1	6.4	38.2	573.0	789.5	961.4	967.7	464.8	1088.7	203.7	565.9
2	57.3	184.6	1356.1	1190.6	1222.4	1738.1	993.2	560.3		912.8
3	553.9	375.6	1693.5	1916.4	1776.3	1375.2	1719.0	1910.0		1415.0
4	865.9	1426.1	1859.1	1865.4	3762.7	3972.8	999.6	2031.0		2097.8
5	133.7	159.2	216.5	744.9	853.1	458.4	3539.9	248.3		794.3
6	579.4	1018.7	1747.7	1445.2	337.4	1699.9	725.8	432.9		998.4
7	878.6	719.4	1069.6	967.7	203.7	5029.7	694.0	2164.7		1465.9
8	343.8	1012.3	573.0	1617.1	1165.1	1228.8	413.8	1995.0	50.9	933.3
9	744.8	2960.5	3030.5	1617.1	3406.2	3157.9	1413.4	503.0		2104.2
10	63.7	140.1	388.4	254.7	1101.4	280.1	210.1	121.0		319.9
11	50.9	362.9	1680.8	503.0	719.4	1515.3	942.3	369.3		768.0
12	2177.4	1050.5	1362.5	496.6	1432.5	445.7	222.8	350.2		942.3
13	165.5	901.1	923.2	5067.9	3119.7	2285.6	1076.0	337.4	254.7	1570.1
14	1699.9	1795.4	2317.5	1165.1	4584.0	3775.4	1483.4	598.5		2177.4
15	222.8	273.8	1076.3	1292.4	3667.2	2852.3	1623.5	184.6		1399.1
16	38.2	254.7	764.0	700.3	636.7	1120.5	369.3	171.9		507.0
17	19.1	101.9	744.9	553.9	764.0	846.8	490.2	89.1		451.2
18	280.1	640.8	464.8	1387.9	1623.5	3788.2	1449.3	241.9		1234.6
19	2215.6	1725.4	1387.9	1286.1	10078.4	4641.3	1400.7	3584.4		3290.0
Mean	584.1	796.9	1222.6	1308.5	2179.4	2167.4	1064.8	893.8	169.8	1154.1

* Number of individuals per square meter.



* No sampling station at this distance off shore on this transect.

FIGURE 5. MEAN BENTHIC MACROINVERTEBRATE POPULATIONS AT VARIOUS DISTANCES OFF SHORE ALONG THE FOUR SAMPLING TRANSECTS - 1975.

Annelid taxa ranging from $140/m^2$ in December to $1,412/m^2$ in August. The annual mean population of this taxa, $772/m^2$, was 94% of the annual mean Annelid population and 67% of the annual mean benthic macroinvertebrate population. The Annelids were always the dominant group in the benthos.

Monthly mean Arthropod populations ranged from $29/m^2$ in April to $799/m^2$ in September with an annual mean of $323/m^2$. The dominant Arthropod taxa were *Chironomus* sp. in April, August, November, and December; *Leptodora kindtii* in May, June, July, and October; and *Tanytarsus* sp. in September. *Leptodora kindtii* had the highest annual mean population, $137/m^2$.

Water Quality

Results of water quality analyses at Locust Point from April through December 1975 are depicted on Figures 6-10. Tabular results are presented in Appendix E.

In 1975 water temperature rose from 7.2°C in April to 24.3°C in August and then fell to 4.5°C in December (Fig. 6). Dissolved oxygen fell from 12.0 ppm in April to 8.3 ppm in May and then remained relatively constant until the fall increase to 12.6 ppm in December. The moderate turbulence and sediment load of the lake in early spring improved during the summer as indicated by a 2-fold increase in transparency, a 2-fold decrease in suspended solids, and a 10-fold decrease in turbidity (Fig. 7). Considerable decrease in

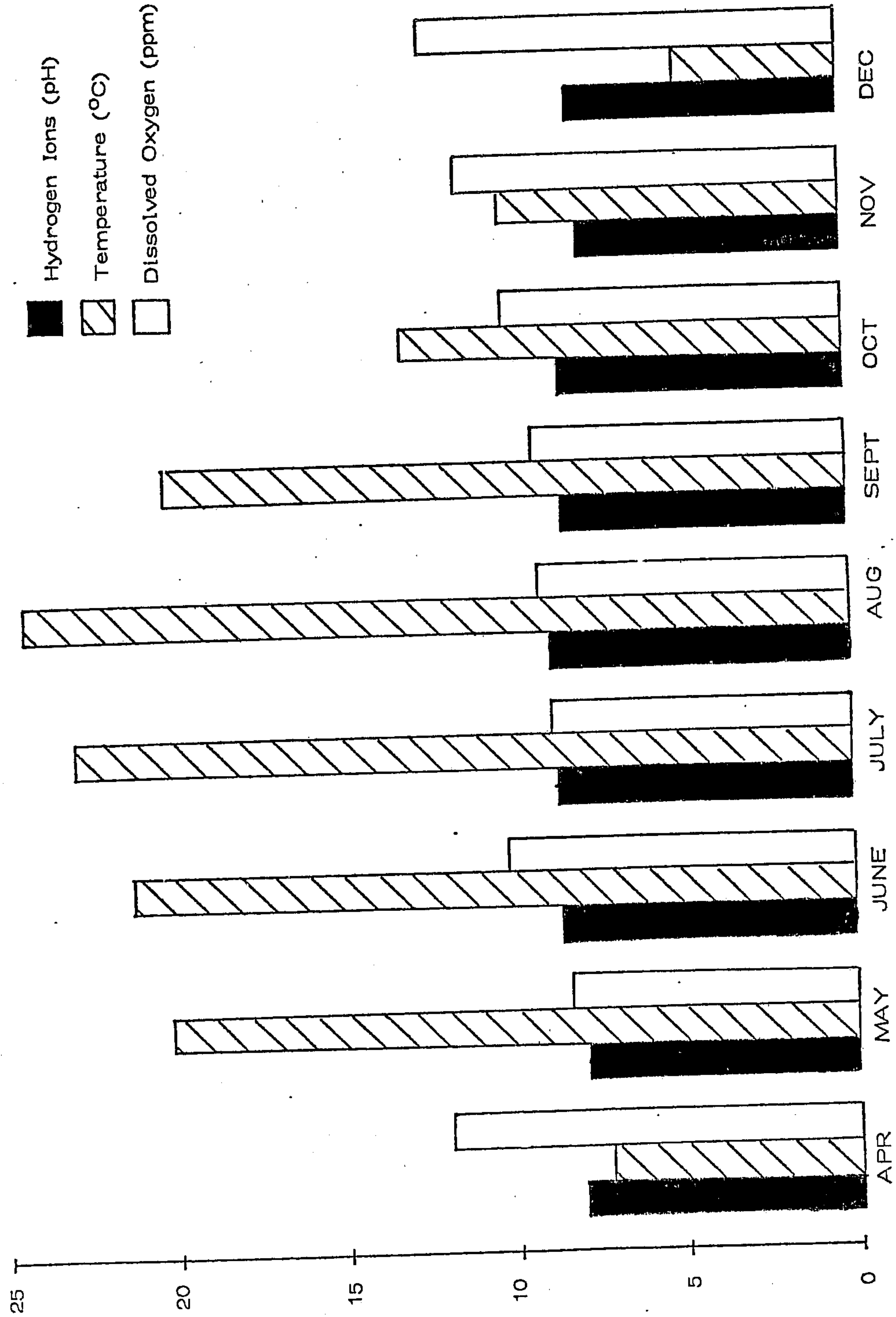


FIGURE 6. MONTHLY MEAN HYDROGEN ION, TEMPERATURE AND DISSOLVED OXYGEN MEASUREMENTS FROM THE SURFACE AND BOTTOM OF STATIONS 1, 8, AND 13 AT LOCUST POINT DURING 1975.

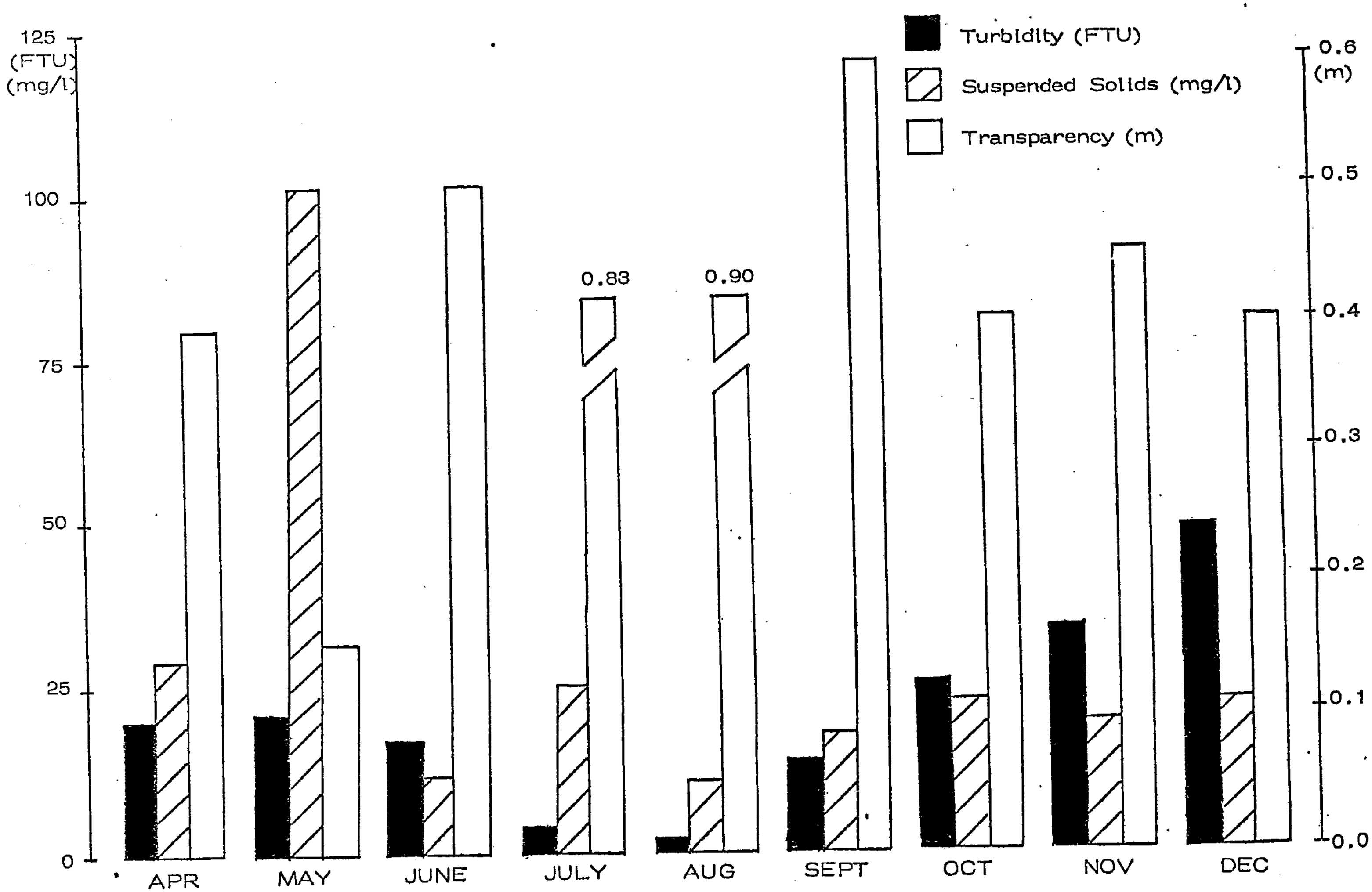


FIGURE 7. MONTHLY MEAN TURBIDITY, SUSPENDED SOLIDS AND TRANSPARENCY MEASUREMENTS FROM THE SURFACE AND BOTTOM OF STATIONS 1, 8, AND 13 AT LOCUST POINT DURING 1975.

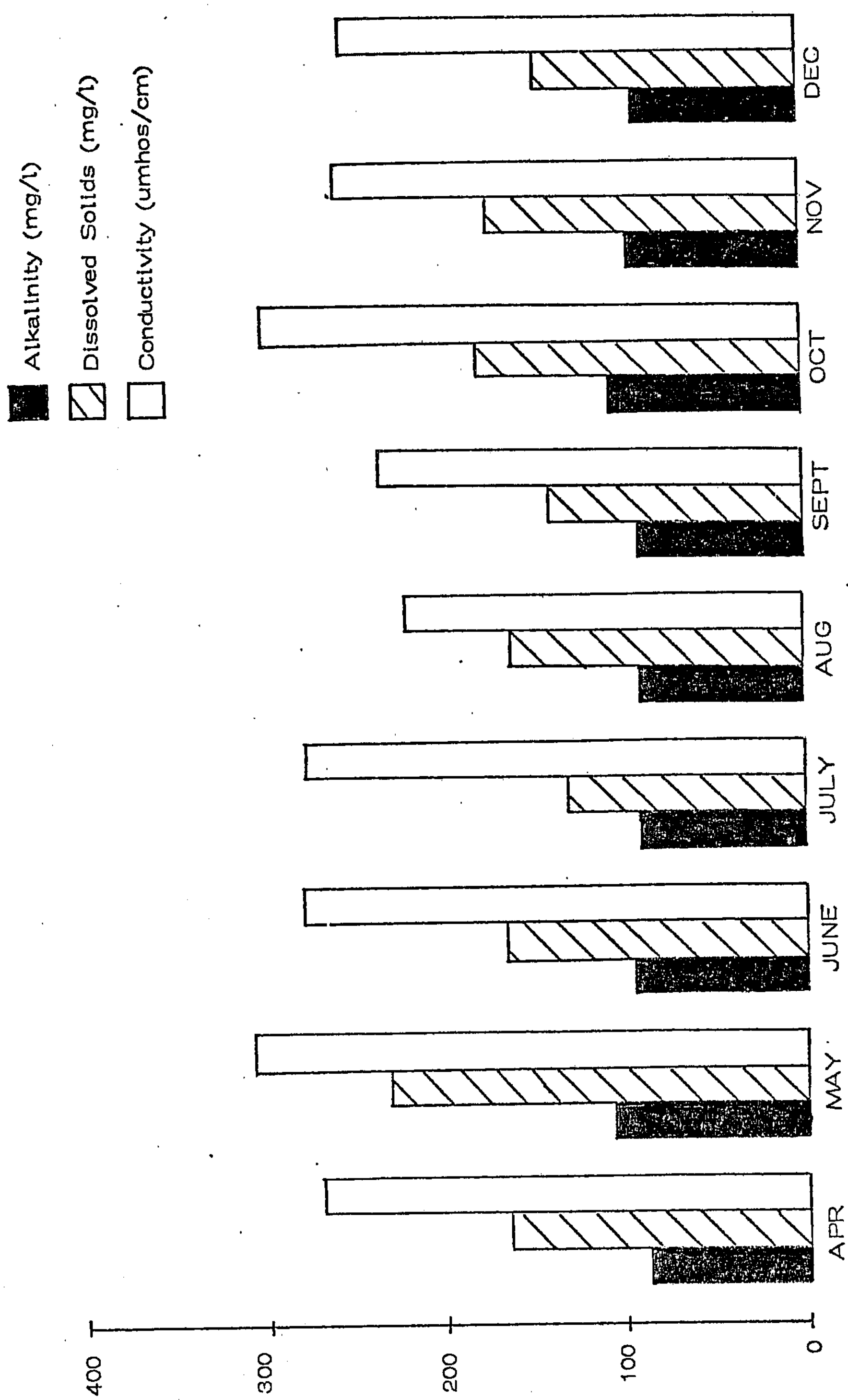


FIGURE 8. MONTHLY MEAN ALKALINITY, DISSOLVED SOLIDS AND CONDUCTIVITY MEASUREMENTS FROM THE SURFACE AND BOTTOM OF STATIONS 1, 8, AND 13 AT LOCUST POINT DURING 1975.

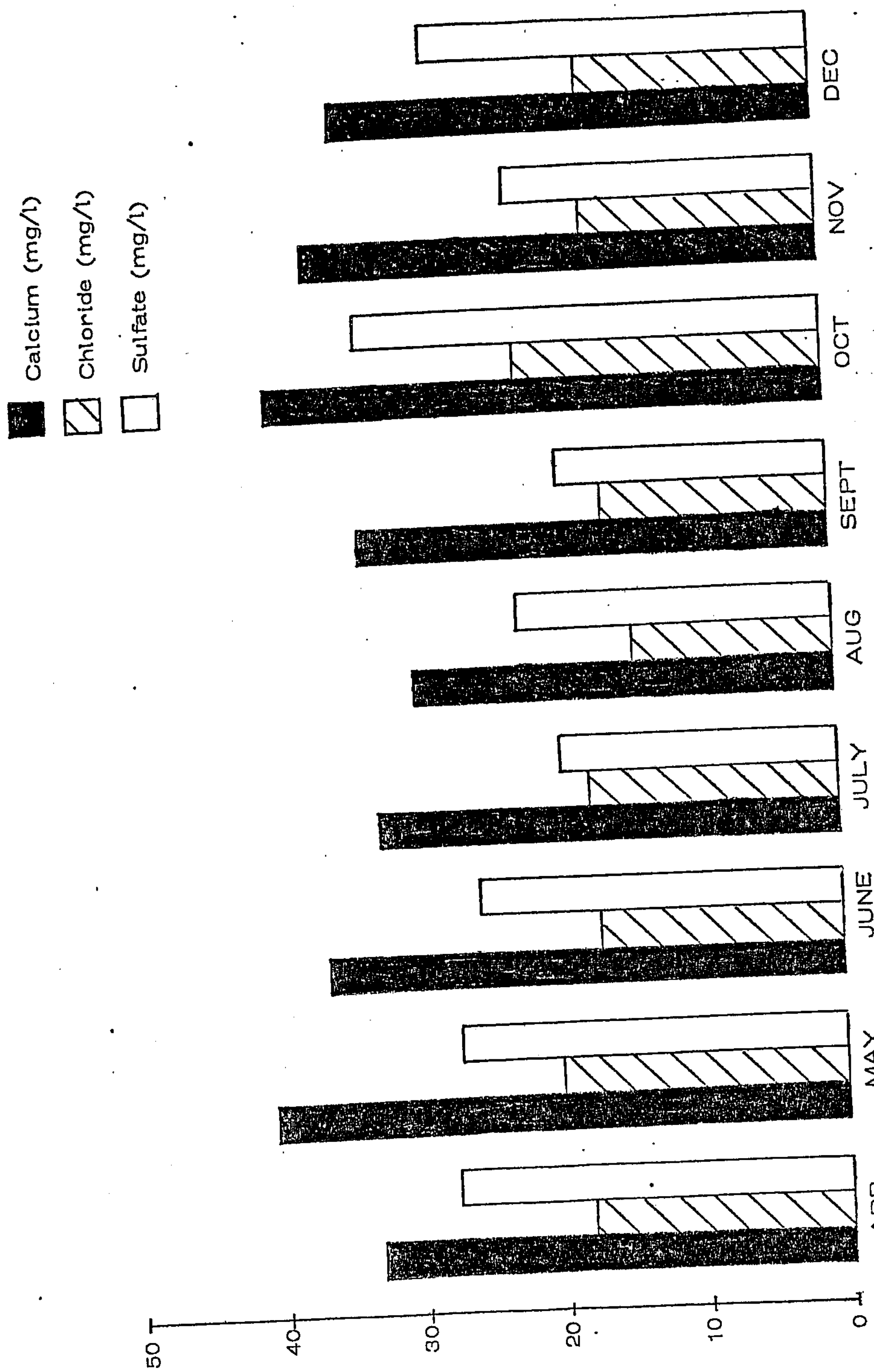


FIGURE 9. MONTHLY MEAN CALCIUM, CHLORIDE AND SULFATE CONCENTRATIONS FROM THE SURFACE AND BOTTOM OF STATIONS 1, 8, AND 13 AT LOCUST POINT DURING 1975.

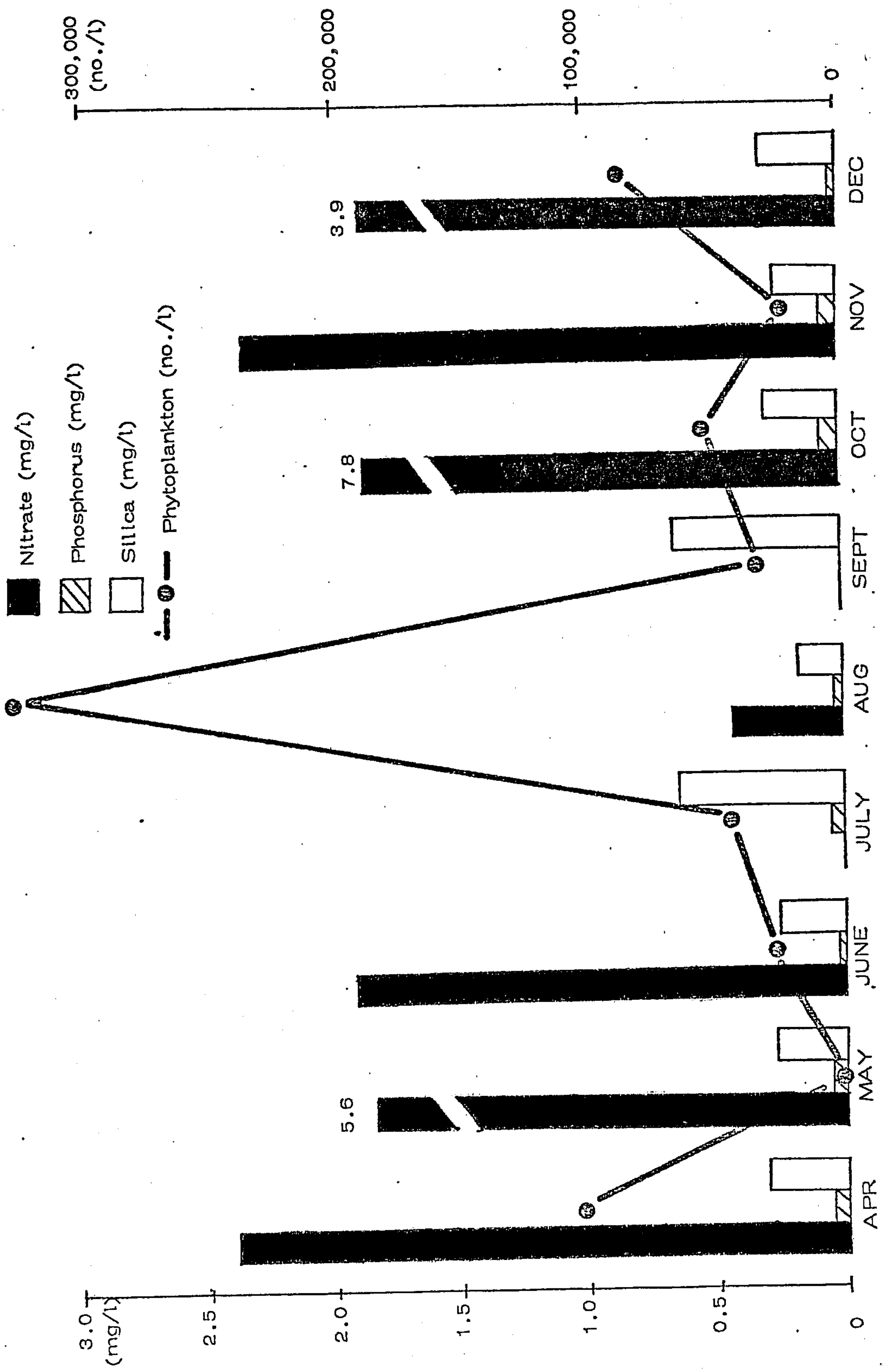


FIGURE 10. MONTHLY MEAN NITRATE, PHOSPHORUS AND SILICA CONCENTRATIONS FROM THE SURFACE AND BOTTOM OF STATIONS 1, 8, AND 13 AT LOCUST POINT DURING 1975.

water clarity was noted in the fall, particularly in turbidity which underwent a 20-fold increase. Biochemical oxygen demand was nearly constant throughout the year at 3 mg/l or less. The alkalinity and pH of the water remained fairly constant throughout the year (Figs. 6 and 8).

The dissolved substances in the water were highest in the spring and fall samples; conductivity showed a significant decrease between May and August but rose sharply in October (Fig. 8). Specific ions such as calcium and sulfate were also highest in May and October, whereas other ions such as magnesium, sodium, and chloride were fairly stable throughout the year (Fig. 9). Nitrate, phosphate and silica, peaked in the spring, decreased markedly during the summer, and then increased sharply in the fall (Fig. 10).

Station Variations. Stations 1,8 and 13 were located approximately 500 ft (150 m), 3000 ft (910 m), and 2000 ft (610 m) off shore, respectively. Generally a slight temperature decrease was noted in an offshore direction in the spring. More noticeable decreases were found for such parameters as conductivity, most of the specific ions, alkalinity, B.O.D., suspended and dissolved solids, and turbidity throughout 1975 (especially May and October). Conversely, transparency increased away from the shore.

The differential in water quality values between stations which was greatest in May and October, may have been related to spring and fall storms. During the summer values obtained from the inshore and offshore stations were similar.

Differences between the surface and bottom water quality were slight due to the shallowness of this portion of Lake Erie. Some depression in the level of dissolved oxygen and small increases in the concentrations of dissolved and suspended solids were noted near the bottom.

Primary Productivity

The major effort in the primary productivity study was concerned with monthly measurements at several of the stations at Locust Point. Stations 4, 8, and 13 were emphasized representing a control station, the location of the cooling water intake, and the location of the cooling water return, respectively. The measurements obtained during July through October are summarized in Table 15.

TABLE 15

PRIMARY PRODUCTIVITY RESULTS FROM
LOCUST POINT DURING 1975

Date	Station	Depth (m)	Primary Productivity $(mgC/m^3/hr)$
9 July 1975	4	1	159
	4	3	87
	13	1	84
	13	3	13
23 July 1975	4	1	121
	4	3	59
	8	1	51
	8	3	90
	13	1	59
	13	3	16
	14	1	76
	14	3	37
14 Aug 1975	4	1	80
	4	3	9
	8	1	61
	8	3	11
19 Sept 1975	4	1	40
	4	3	3
	7	1	52
	7	3	12
	13	1	35
	13	3	5
13 Oct 1975	4	0.5	113
	4	1	20
	4	2	16
	4	3	15
	8	1	28
	8	2	11
	8	3	9
	13	0.5	96
	13	1	10
	13	2	12

Recommendations

The plant is now scheduled to begin testing in late 1976 and should be fully operational by early 1977. Therefore, this is the last year of pre-operational monitoring and the year that additions to or modifications of the sampling program should be made to provide adequate background information and a "de-bugged" post operational monitoring program.

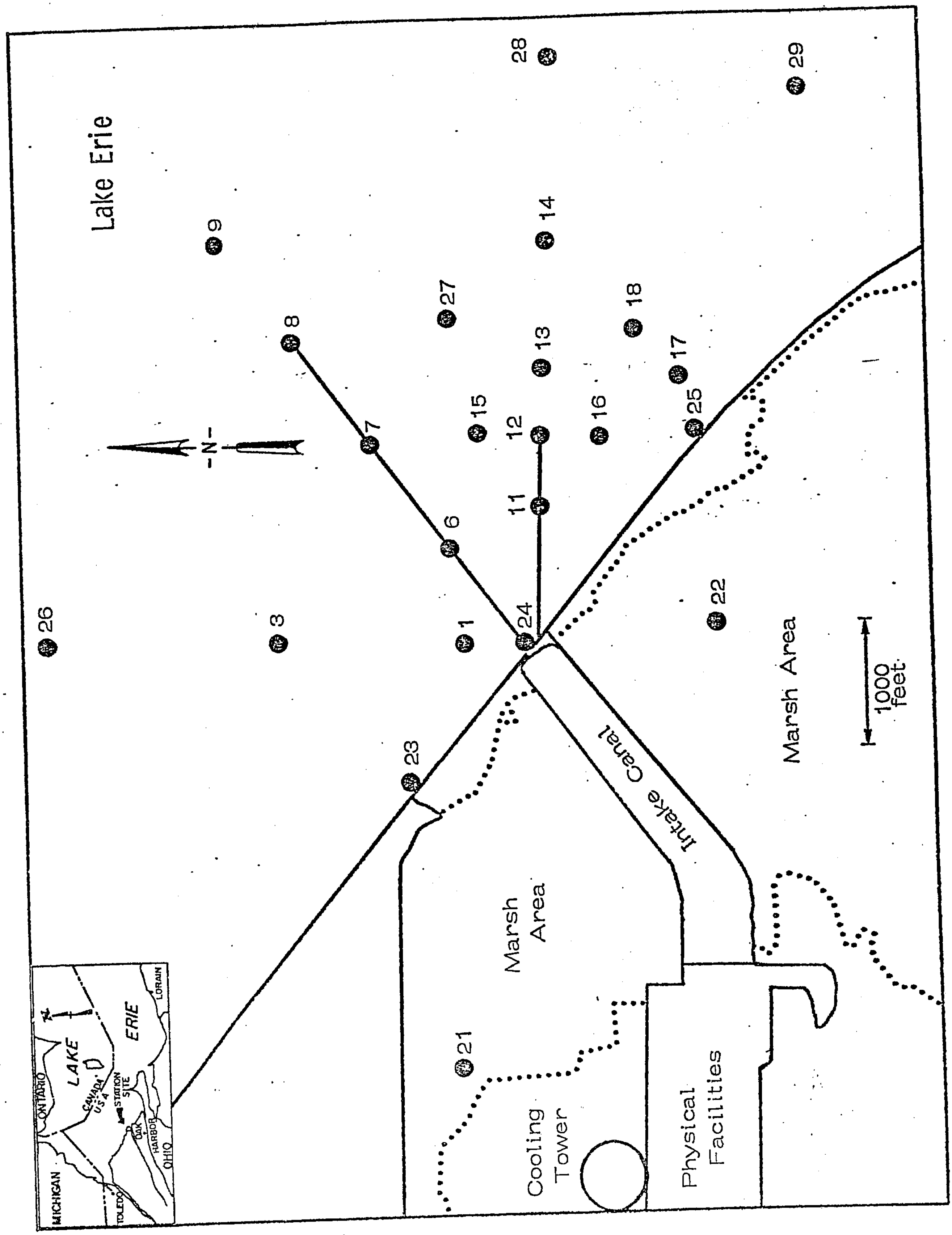
Sampling within the intake canal should be suspended with increased sampling effort in the open lake, especially in the vicinity of the discharge. By amending the location of sampling stations slightly, (Fig. 11) a much more valuable data will be generated with only minimum disruption to the index stations at which background data has been collected.

Plankton, benthos, water quality, and primary productivity sampling methods and frequency should remain the same. However, the fishing effort should be greatly expanded.

In the past, sampling effort has centered around Stations 8 and 12 or 13 to provide background data from the locations which should show the greatest changes (proposed intake and discharge). Sampling effort should now be increased to provided "control stations" on either side of Stations 8 and 13 for trawling, gill netting, and fry netting. This will allow fishery biologists to measure relative accumulations and direction of movements as well as changes from the past.

FIGURE 11

SAMPLING STATIONS AT THE DAVIS-BESSE NUCLEAR POWER STATION



STUDY ANALYSIS

Fish

The species composition and relative abundance in the catch varied by month and by season for all fishing methods indicating that a transient population was being sampled. This is not surprising as there is little shelter at Locust Point to support a resident population. Since this was a transient population, extreme caution should be exercised when trying to quantitatively compare CPE results from year to year, as samples were collected monthly. In a resident population, collecting samples one month apart would not produce serious errors, however, a transient population can change significantly with time. This is especially true when comparing CPE results for schooling species such as Alosa pseudoharengus, Dorosoma cepedianum, Notropis atherinoides, Perca flavescens, and the larvae of all species. When dealing with these populations and monthly sampling effort one should not apply too much significance to CPE results.

Although 46 different species have been captured at Locust Point since 1963, there were only 10 species which were of any real numerical or commercial significance. In 1974 and 1975, 7 species, Alosa pseudoharengus, Cyprinus carpio, Dorosoma cepedianum, Morone chrysops, Notropis atherinoides, N. hudsonius, and Perca flavescens, constituted 97% and 99%, respectively, of the total number of fish captured. *Dorosoma cepedianum* was the dominant species both years. In 1973, *Aplodinotus grunniens* and *Ictalurus punctatus* were also considered to be a significant component of the population (Reutter and Herdendorf, 1974). Herdendorf and Hair (1972) presented commercial fishing results from Locust Point from 1963-1972 which showed that *Cyprinus carpio*, *Ictalurus punctatus*, and *Morone chrysops* were the dominant species, composing 99% (by weight) of the total catch from that 10-year period. *Stizostedion v. vitreum* should be added to the above list of 9 species due to the emphasis placed on this species by sport fishermen, commercial fishermen, and the Ohio Division of Wildlife. Therefore, the 10 species of numerical and commercial significance at Locust Point were *Alosa pseudoharengus*, *Aplodinotus grunniens*, *Cyprinus carpio*, *Dorosoma cepedianum*, *Ictalurus punctatus*, *Morone chrysops*, *Notropis atherinoides*, *N. hudsonius*, *Perca flavescens*, and *Stizostedion v. vitreum*.

The size of the *Perca flavescens* population, an important commercial population, appears to have varied considerably from 1973 to 1975. Van Vooren et al. (1975) also observed this variability, but their results indicated a high 1974 population and low populations in 1973 and 1975, the reverse of the present findings. Since Van Vooren et al. (1975) sampled only in spring and fall with a trawl, this type variability in a schooling species could be expected.

Shore seining results from 1974 and 1975 indicated that the largest shore populations occurred in the vicinity of Station 24. The outlets for the water level control pumps for the northwest and southeast marshes were in this area. Small pieces of fish which could serve as an attractive food supply for area fish were observed to come through these pumps and large schools of Cyprinus carpio were often observed swimming into the discharge current from these pumps.

As mentioned earlier, on 25 September 1974 the commercial toxicant "Noxfish" was used in the intake canal in an effort to rid it of fish so that natural movements of fish into and out of the canal could be documented. Plant officials postulated that without operating the pumps no fish would enter the canal through the intake pipeline. When the plant became operational all fish impinged on the traveling screens would have come in from the lake and would not have been residents of the intake canal. It appears that a complete kill occurred, since many Ictalurus nebulosus, the species most tolerant of Noxfish, were killed. Yet less than one month later the presence of one Cyprinus carpio in the trawl indicated that fish may have entered the canal naturally through the 3000 ft. (915 m) intake conduit. A large number of Pomoxis annularis were removed from this canal prior to poisoning. This species was rare in the lake at Locust Point and could enter the canal only through the intake conduit, yet a large number of young-of-the-year were collected from the canal in 1975 indicating a strong preference for this type of habitat.

Ichthyoplankton sampling was not performed in the vicinity of the intake and discharge of the Davis-Besse Nuclear Power Station prior to 1974. Approximately twice as many fish larvae were collected in 1974 as in 1975, but 69% of those collected in 1974 were taken in one tow during July. The most significant changes in the ichthyoplankton from 1974 to 1975 were the increase in the Perca flavescens populations and the decrease in the Notropis atherinoides populations. N. atherinoides composed 81% of the 1974 ichthylplankton population and 1% of the 1975 population. Perca flavescens composed 5% of the 1974 ichthyoplankton population and 70% of the 1975 population. Again, this type variation in the populations of schooling species is typical, and both species should be considered common at Locust Point.

In 1975 an effort was made to determine the size of the ichthyoplankton populations on the surrounding reefs in relation to those at Davis-Besse. Sampling was started one month earlier than in 1974. No ichthyoplankters were taken on the first sampling date, 22 April 1975 (Table 5). This indicated that in April Locust Point was not a spawning area or nursery ground or that spawning had not yet occured.

In mid-May sizable numbers of Perca flavescens were captured at the bottom at Station 8 (intake) and Station 13 (discharge). The small size of these larvae (6 - 7 mm) indicated a relatively recent hatch. By late May, the composition and numbers of the ichthyo- plankton population were relatively unchanged. However, the size of some of the Perca flavescens larvae had almost doubled.

Dorosoma cepedianum first appeared in the ichthyoplankton in early June. At this time few Perca flavescens were taken, indicating they were now large enough to avoid the net. However, their increased size made them susceptible to the trawl as 269 individuals (mean length 22 mm) were captured in June.

Dorosoma cepedianum decreased in number through the remaining 2 sampling dates in June, indicating that they were getting larger and now able to avoid the fry net. However, as they got larger they became susceptible to the shore seine as 20,418 individuals were captured in mid-June.

No Perca flavescens were captured in the fry net after June 16. Dorosoma cepedianum larvae continued to decrease through July. No ichthyoplankton of any type were collected after July indicating that Locust Point was not a nursery or spawning area after July or that the larvae were now large enough to avoid the net.

Sampling on Toussaint Reef was not initiated until late-May and only 26 larvae were captured. However, 187 eggs were collected on this reef while only 3 were collected at Davis-Besse.

The eggs collected over the reef indicated that fish spawned here as observed by Baker (1969), but left soon after hatching, as indicated by the small numbers of larvae collected.

The fact that few fish larvae were taken from the reef but many were collected at Davis-Besse indicated that after spawning on the reefs the larvae moved to inshore waters. Perca flavescens probably did not spawn in significant numbers at Locust Point, but the small size of the first larvae (6-7 mm) and the fact that they were collected in the bottom tows gives rise to the possibility of some Perca flavescens spawning in the rip-rap aprons around the intake and discharge structures. This hypothesis could be tested using control stations.

Based on the present temperature related research and personal observations of power plants on the great lakes, impingement of fish on the traveling screens of the cooling water intake and entrainment of ichthyoplankton in the cooling water appear to be the most detrimental power plant effects.

At Davis-Besse, entrainment will be greatest from May through July (this would be the ideal time to shut down for refueling). The larvae of Dorsoma cepedianum (June), Notropis atherinoides (July), and Perca flavescens (May) will be the most likely to be entrained due to their abundance at Locust Point. Based on observations at other power plants and their abundance at Locust Point, Alosa pseudoharengus and Dorosoma cepedianum are the two species most likely to be impinged on the traveling screens. Of the two species, Dorosoma cepedianum will be impinged in the greatest numbers and in the late fall when recruitment of young-of-the-year occurs. At this time, large schools enter bays and tributaries and congregate in shallow, near-shore waters (Miller, 1960; Bodola, 1965). However, deaths due to entrainment and impingement at Davis-Besse will not be significant due to the relatively low intake demand and the offshore submerged intake, as Alosa pseudoharengus and Dorosoma cepedianum are not bottom dwellers. Entrainment of larvae could be enhanced slightly if Perca flavescens and/or Stizostedion v. vitreum elect to spawn in the rip-rap apron around the intake structure. This is not expected to have a significant effect on the population of either species due to the small area which is rip-rapped.

Food Habits. The 1974 results showed that zooplankton in general and specifically the crustaceans were the most important food source at Locust Point. A closer look showed that Daphnia pulex was strongly selected for by many fish, but by the shiners Notropis a. atherinoides and Notropis hudsonius in particular. Although D. pulex was only common in the plankton in May, 10.5/l, and in no other month was even as high as 0.5/l, it was a very common food item as long as it was present in the plankton, April through July.

In 1975, Daphnia pulex was not found in the plankton or as a food item. However, crustaceans were still the most common food item with Bosmina sp., Daphnia retrocurva, and Leptodora kindtii being the most common crustaceans.

Plankton

Phytoplankton. Samples from 1974 and 1975 were the first phytoplankton samples collected at Locust Point during the F-41-R studies that were analyzed quantitatively. Populations in 1974 were characterized by Bacillariophyceans (r = 0.969) and spring and fall pulses (Fig. 3). The spring pulse was due to Bacillariophyceans and occurred in May. The fall pulse was due to Bacillariophyceans and Chlorophyceans and occurred in November (Fig. 12). Phytoplankton populations during the summer months of June, July, and August were very low.

The mean population from all samples collected in 1975 was 3.5 times as large as that from 1974 and highly correlated with the Myxophycean population (r = 0.946) (Table 8). The 1975 population showed three pulses, one in April and one in November, both dominated by diatoms and of similar magnitude to the 1974 populations, and a huge August pulse composed almost entirely of Myxophyceans predominantly (Aphanizomenon sp.) (Fig. 4). This huge Aphanizomenon sp. pulse was the major difference between the 2 years. The 1975 diatom population was larger than in 1974 but still quite comparable, and with the exception of November, the 1975 Chlorophycean population

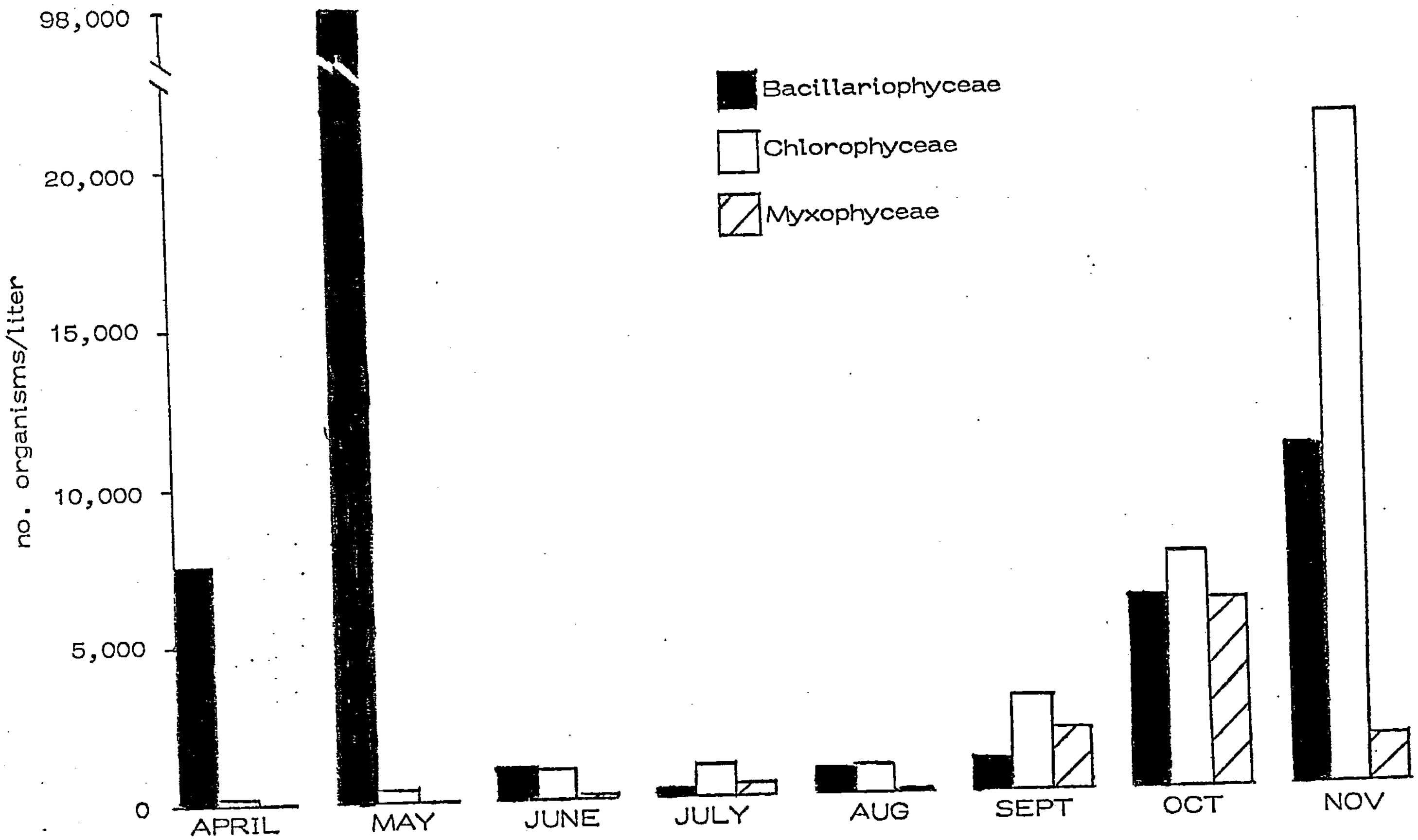


FIGURE 12. MONTHLY MEAN BACILLARIOPHYCEAE, CHLOROPHYCEAE, AND MYXOPHYCEAE POPULATIONS FOR LAKE ERIE AT LOCUST POINT - 1974.

was only slightly larger than the 1974 population.

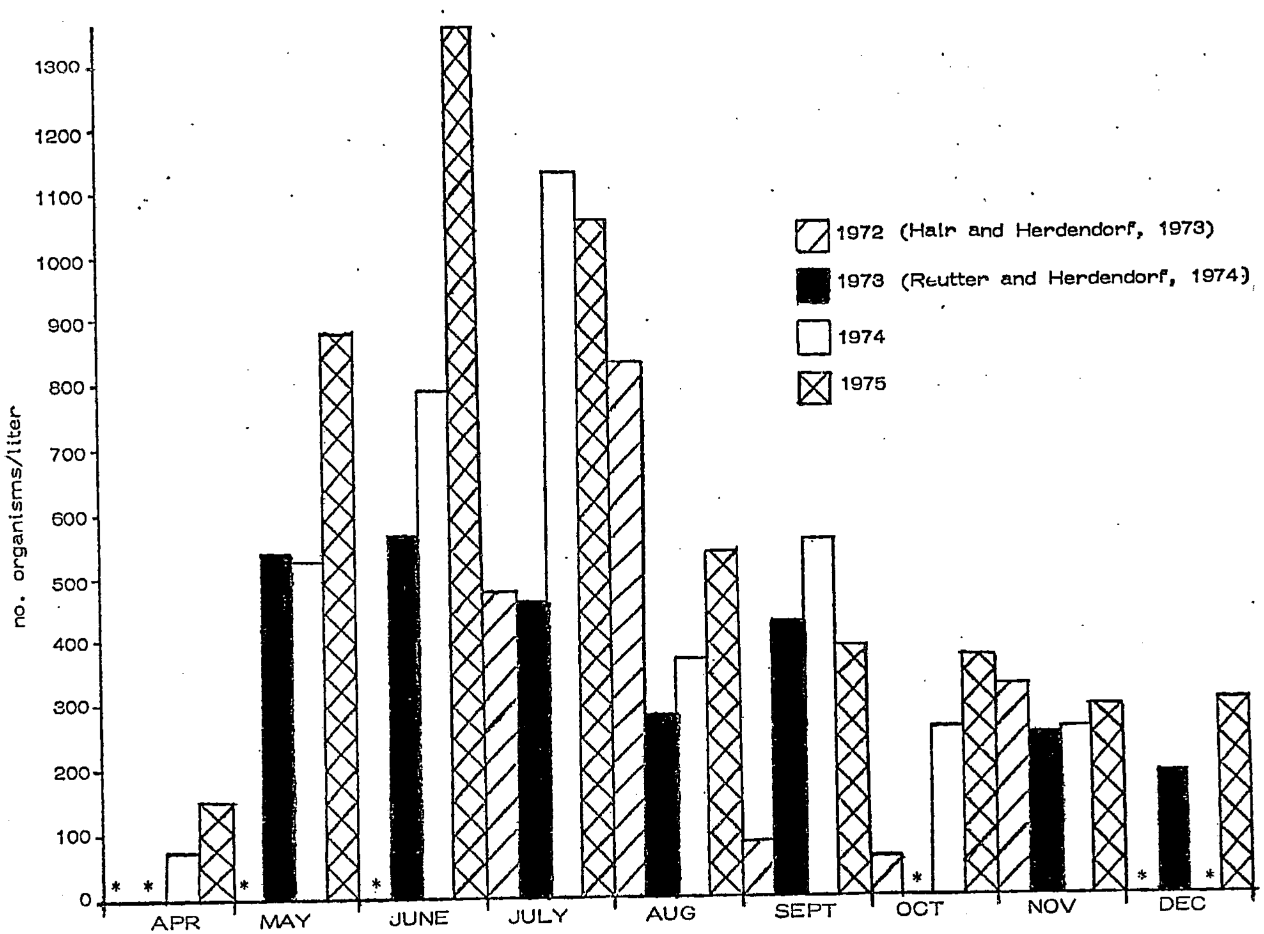
Changes in water quality was the major reason for the large increase in the Myxophycean population from 1974 to 1975. The multiple regressions of Myxophycean populations with physical and chemical water quality parameters indicated that 67.5% (physical parameters only) or 76.5% (physical and chemical parameters) of the variation in the Myxophycean population could be explained by variations in the water quality parameters. Chandler and Weeks (1945) felt that warm, calm, clear water favored blooms of Myxophyceans and Chlorophyceans and the present results support their contention. Correlation coefficients indicated that 36.5% ($r = 0.604$) of the variation in the Myxophycean population was explainable by changes in transparency, and 11.2% ($r = 0.335$) was explainable by changes in temperature. This contention was given added weight when the temperatures and transparencies of 1974 and 1975 were recalled. The mean water temperatures for April, May, and June 1974 were 8.7°C, 14.6°C, and 18.8°C, respectively, while in 1975 the temperatures recorded for those months were 7.2°C, 20.3°C, and 21.2°C, respectively. Following this early warming in 1975 came a relatively calm summer with a 2-fold increase in transparency and a 10-fold decrease in turbidity (Fig. 7). In August 1975, the time of the Myxophycean pulse, the transparency was 80% greater than in 1974 and the turbidity was only 20% of that found in 1974 (Fig. 20).

Predicted Impact on Phytoplankton. These regressions have helped in the extremely difficult task of predicting phytoplankton populations in thermal discharges. By observing the individual B values the change in phytoplankton population brought about by a change in one of the independent variables, while all the other independent variables remain constant, can be estimated (Tables 36-43). Table 36 indicates that an increase in temperature of 1°C, with turbidity, transparency, station, and date remaining constant, will reduce the phytoplankton population by approximately 19,153 individuals/l. Although the accuracy is suspect, (coefficient variation = 119.3%), a helpful estimate is provided.

In the case of Davis-Besse, predicting the effect of plant operation on phytoplankton populations is made easier by the presence of the cooling tower and the high velocity nozzle discharge. The staff of the U.S. Nuclear Regulatory Commission (1975) assumed that the 20-hr average retention time within the plant due to recirculation of cooling water through the cooling tower will kill any and all entrained organisms. This is a very broad statement, but I do agree that the 20-hr retention time will kill most, if not all, entrained organisms. However, the cooling tower greatly reduces the amount of cooling water which is needed. The high velocity nozzle at the discharge promotes rapid mixing and reduces the possibility of a resident phytoplankton population in the warmed area. Consequently, other than in the plume itself, no major changes in the Locust Point phytoplankton populations are expected due to the thermal discharge from the Davis-Besse Nuclear Power Station, Unit 1. Possible minor changes include an increased number of ghost cells in the plankton due to death within the plant, and a possible increase in the warm water forms, forms positively correlated with temperature, in the low velocity sections of the thermal plume periphery.

Zooplankton. Zooplankton populations in 1974 rose from April through July and then, with the exception of a very low August value, decreased steadily through November (Fig. 13). The populations from 1972 also peaked during the summer, August, but at a level 300 organisms/l (27%) below that observed in 1974 (Hair and Herdendorf, 1973). Populations from 1973 peaked in June, but at half the 1974 maximum and 360 organisms/l (43%) below the 1972 maximum (Reutter and Herdendorf, 1974).

A comparison of Locust Point zooplankton populations from 1972-1974 with the 1975 populations indicated that the populations were similar for all months except May and June (Fig. 13). Populations for May and June 1975 were much larger than populations observed for these months in previous years. This was not unexpected as it has already been shown that May and June 1975 were much warmer than May and June 1974, and total zooplankton and all 3 of its components were significantly (5% level) positively correlated with temperature (Table 12).

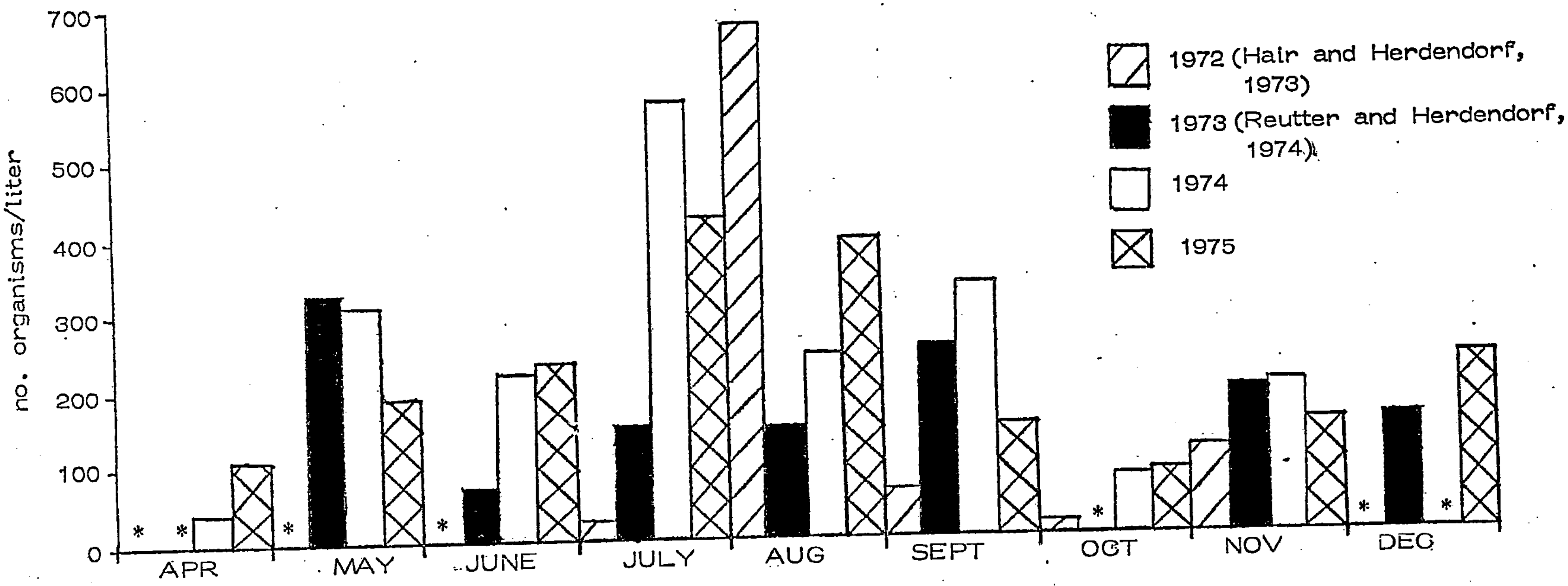


* No samples were collected.

FIGURE 13. MONTHLY MEAN ZOOPLANKTON POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1975.

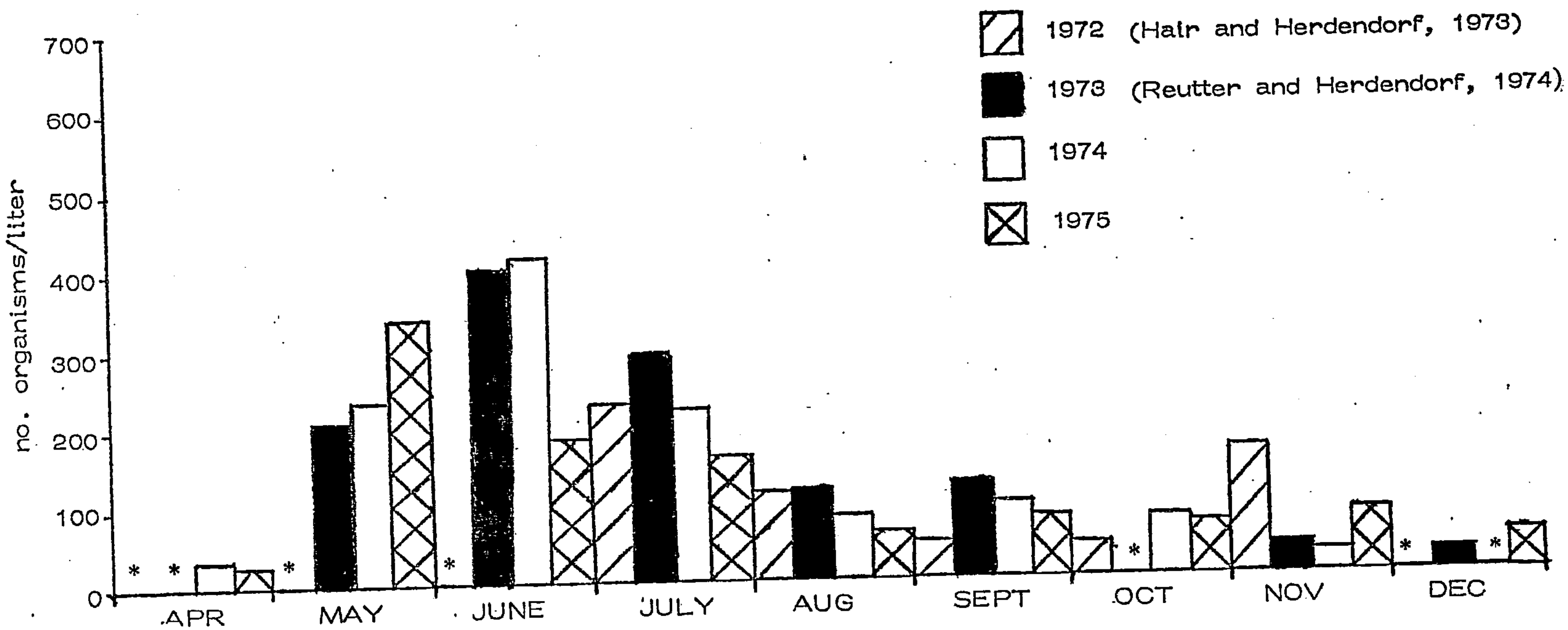
Upon dividing the zooplankton populations from 1972 - 1975 into their major components, Rotifera, Copepoda, and Cladocera, it was observed that the rotifer population tended to peak in July or August and was extremely variable; the copepod population peaked in May, June and July and showed relatively little variability between years; and the cladoceran population had a large peak from May through June and a small peak in October (Figs. 14 - 16). The time of the occurrence of the population maxima of the various zooplankton components corresponded well to that observed by Reutter and Reutter (1975) for Lake Erie at Put-in-Bay.

In general, the populations observed at Locust Point in 1974 and 1975 were higher than those observed in 1972 and 1973. There are several plausible explanations for these differences. Samples in 1972 were collected with a 3-l Kemmerer water bottle at the surface. In 1973, 1974, and 1975 samples were collected by a vertical tow, bottom to surface, with a Wisconsin plankton net. A brief comparison study in 1973 showed that the vertical tow captured approximately 50 percent more taxa than a 3-l grab (Reutter and Herdendorf, 1974). The stations sampled in 1972 and 1973 were similar to those sampled in 1974 and 1975, but not the same. In 1973 the intake and discharge pipelines were being dredged, and in 1972 tropical storm Agnes affected the weather. Also, due to the weather, samples were neither collected on the same day of the month each year nor spaced exactly one month apart. Hubschman (1960) pointed out the tremen-



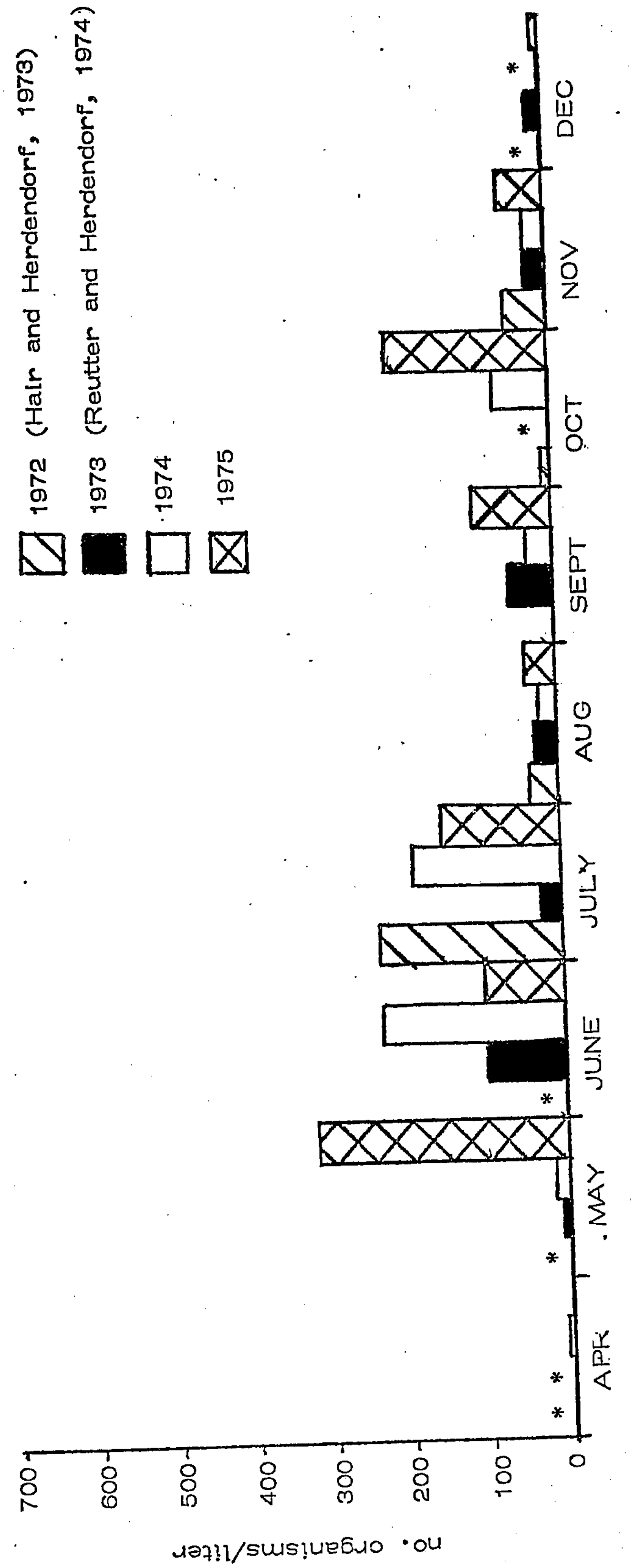
* No samples were collected.

FIGURE 14. MONTHLY MEAN ROTIFER POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1975.



* No samples were collected.

FIGURE 15. MONTHLY MEAN COPEPOD POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1975.



* No samples were collected.

FIGURE 16. MONTHLY MEAN CLADOCERAN POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1975.

dous differences which occurred between daily samples, and these samples were taken monthly, while Wieber and Holland (1968) showed that even with replication, wide variation can occur due to patchiness in population densities. Finally, the unusually high spring populations from 1975 were undoubtedly largely due to the unusual weather conditions associated with that spring and the corresponding changes in water quality (early warming and less turbidity) as the total zooplankton population is significantly correlated with both temperature and turbidity ($r = 0.587$ and -0.328, respectively).

Predicted Impact on Zooplankton. In predicting the impact of the thermal discharge and plant operation on the zooplankton population, one must again remember that most if not all entrained organisms will be killed during the 20-hr average retention time within the plant (U.S. Nuclear Regulatory Commission, 1975). Realization of the fact that with a cooling tower only approximately 20,000 gpm (76 m^3/min) will be drawn through the plant is important. Without the cooling tower this flow would be approximately 480,000 gpm (1,820 m^3/min) (U.S. Atomic Energy Commission, 1973). McNaught (1976) stated that normal mortality with once-through cooling (no cooling tower) is approximately 10% of all entrained organisms. Therefore, Davis-Besse, without a cooling tower, would kill 10% of all the entrained organisms within a 480,000 gpm (1,820 m^3/min) flow and subject the other 90% to sublethal stresses. Stated another way, Davis-Besse, without a cooling tower, would kill all the organisms entrained within a 48,000 gpm (182 m^3/min) flow and subject all those entrained within the remaining 432,000 gpm (1,635 m^3/min) to sublethal stresses.

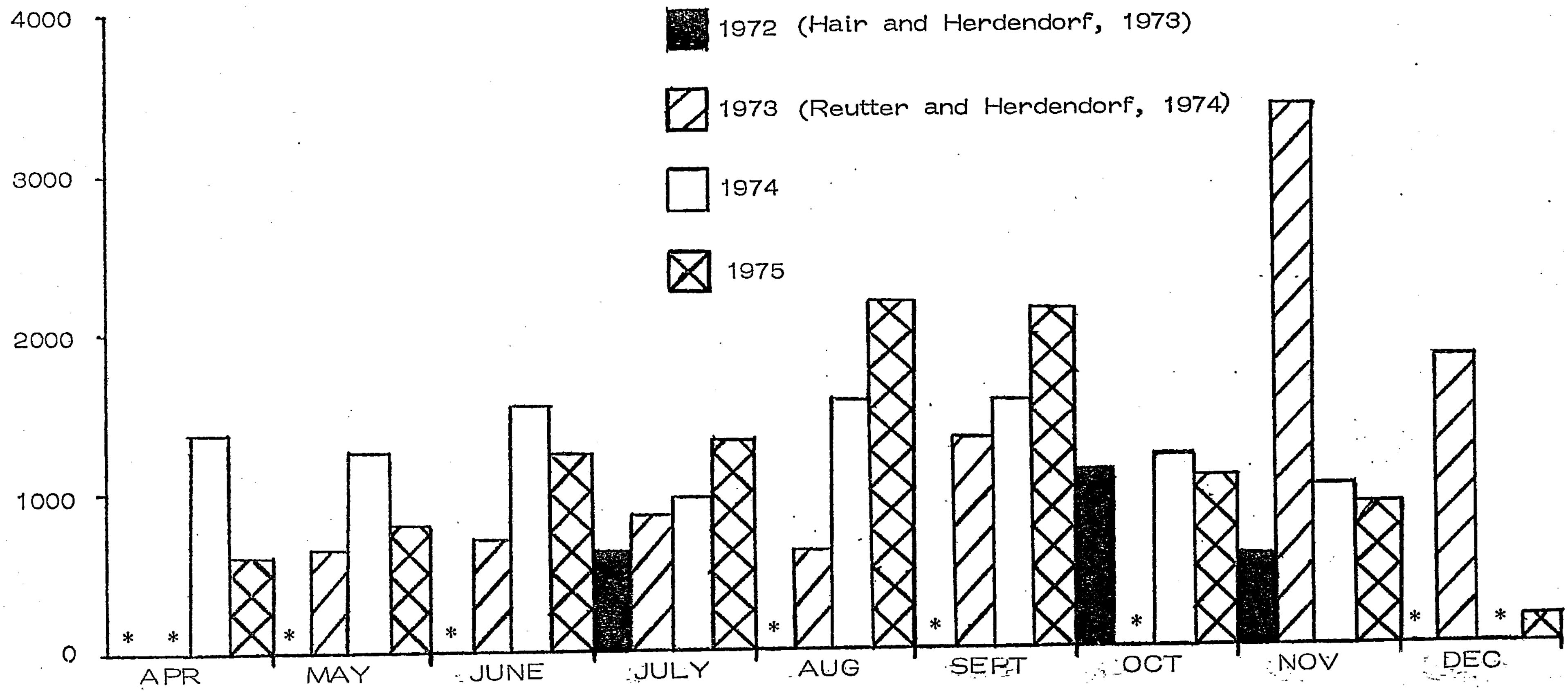
King (1974) observed high cladoceran (excluding Daphnia sp.) and larval copepod populations in heated areas, while rotifers were more abundant in cooler areas. Fenlon et al. (1971) found that the standing crops of Bosmina sp. increased 25 times in the area of a power plant on Lake Ontario. McNaught (1976) found that recovery rates back to the original population size became faster as temperatures increased. He also found that recovery rates of cladocerans were much faster than those of copepods. These observations, coupled with the regressions and their B values, make estimating zooplankton populations in the thermal discharge at Davis-Besse easier, but several difficulties including determining the effects of the high velocity discharge still exist (Tables 44-47). Possibly, by the time discharge velocity is reduced enough to allow zooplankters to maintain position within the flow, the temperature will be so close to ambient that no significant population changes occur. Organisms which are entrained in the discharge current from the shore side of the structure will normally be passed to the 1°F (0.6°C) isotherm within 15 minutes (U.S. Nuclear Regulatory Commission, 1975).

Benthos

Benthic macroinvertebrate populations in 1975 increased steadily from April through August, remaining constant through September, and then decreased steadily through December (Fig. 17). This was the most pronounced pulse observed to date, and it occurred 3 months earlier than the November pulse of 1973 (Fig. 17).

The most significant occurrence of 1975 was what appears to be the completion of recolonization of the intake and discharge pipelines (Fig. 5). Reutter and Herdendorf (1975) felt that recolonization was occurring successfully. They based this belief on the fact that monthly benthic macroinvertebrate populations in 1974 were higher than 1972 or 1973 and on the fact that the 1974 population when plotted against distance off shore, became constant beyond 1000 ft. This also made it appear that recolonization was nearing completion. However, the fact that stations along the control transects at various distances off shore had higher populations that the corresponding stations on the intake and discharge transects proved that recolonization was not yet complete.

In 1975, the population was not constant beyond 1000 ft., but increased steadily to 3000 ft. off shore, where it remained constant through 4000 ft. The control transects no longer had consistently higher populations at various distances off shore than the corresponding stations on the intake and discharge transects (Fig. 5). The



* No samples were collected.

FIGURE 17. MONTHLY MEAN BENTHIC MACROINVERTEBRATE POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1975.

one exception to this was Station 8, 3000 ft. off shore on the intake transect, where recolonization is proceeding at a much slower rate (possibly due to the rip-rap material around the intake crib itself). Therefore, recolonization continued successfully in 1975 and may now be near completion, but a definite conclusion cannot be drawn until the results of 1976 sampling are available.

Mention should be made of the difficulty in interpreting the large Leptodora kindtii population. This is a large cladoceran and it is quite possible that it is collected on the screen of the Ponar dredge as it is lowered to the bottom.

Water Quality

Station Variations. Although Station 8 (the farthest offshore) had the best water quality, Station 12 (intermediate offshore) had the poorest quality for some parameters in 1974 while Station 1 had the poorest water quality in 1975. This could be related to the condition of the lake bottom. Station 1 (nearshore) had a clean sand bottom whereas Station 12 had a recently disturbed clay bottom and was down current from the disturbed bottom along the intake pipeline. Station 13 was beyond the area disturbed by the dredging of the discharge pipeline.

Annual Trends. Except for transparency, turbidity and conductivity, water quality values were quite predictable from year to year. (Figs. 18-20). The temperature peaked at $\approx 25^{\circ}C$ in July-August and

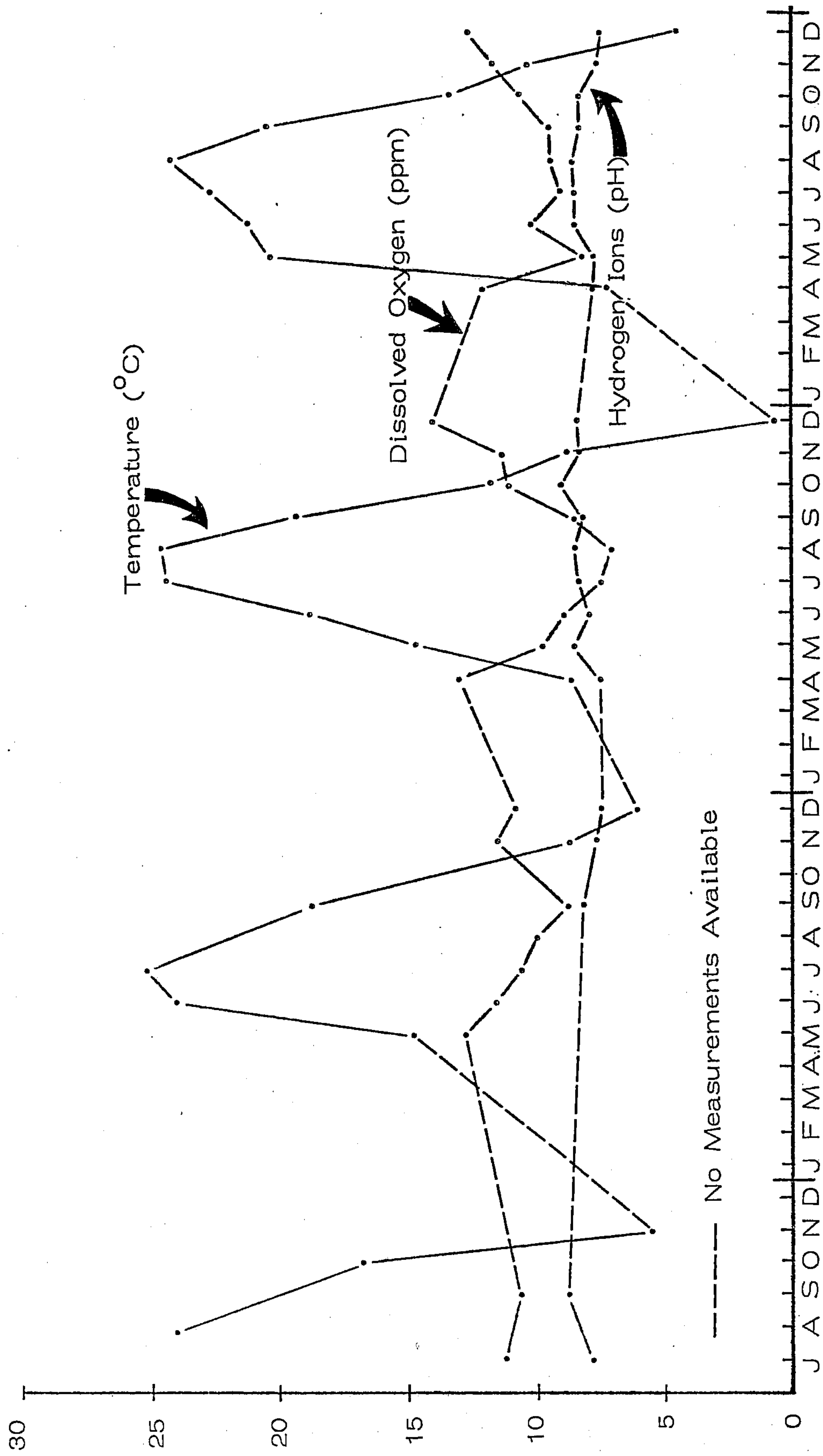


FIGURE 18. TRENDS IN MONTHLY MEAN TEMPERATURE, DISSOLVED OXYGEN, AND HYDROGEN IONS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1975.

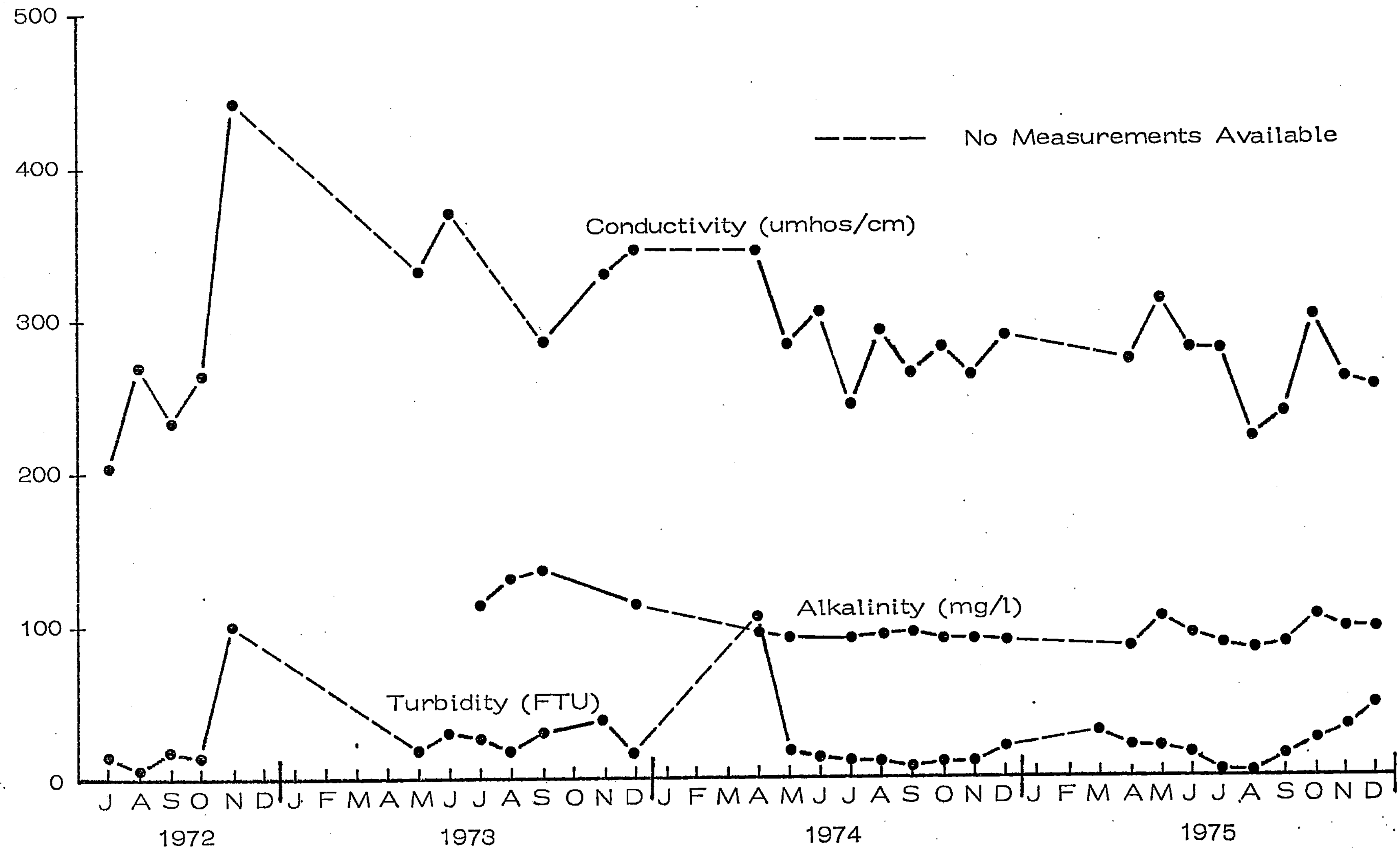


FIGURE 19. TRENDS IN MONTHLY MEAN CONDUCTIVITY, ALKALINITY AND TURBIDITY MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1975.

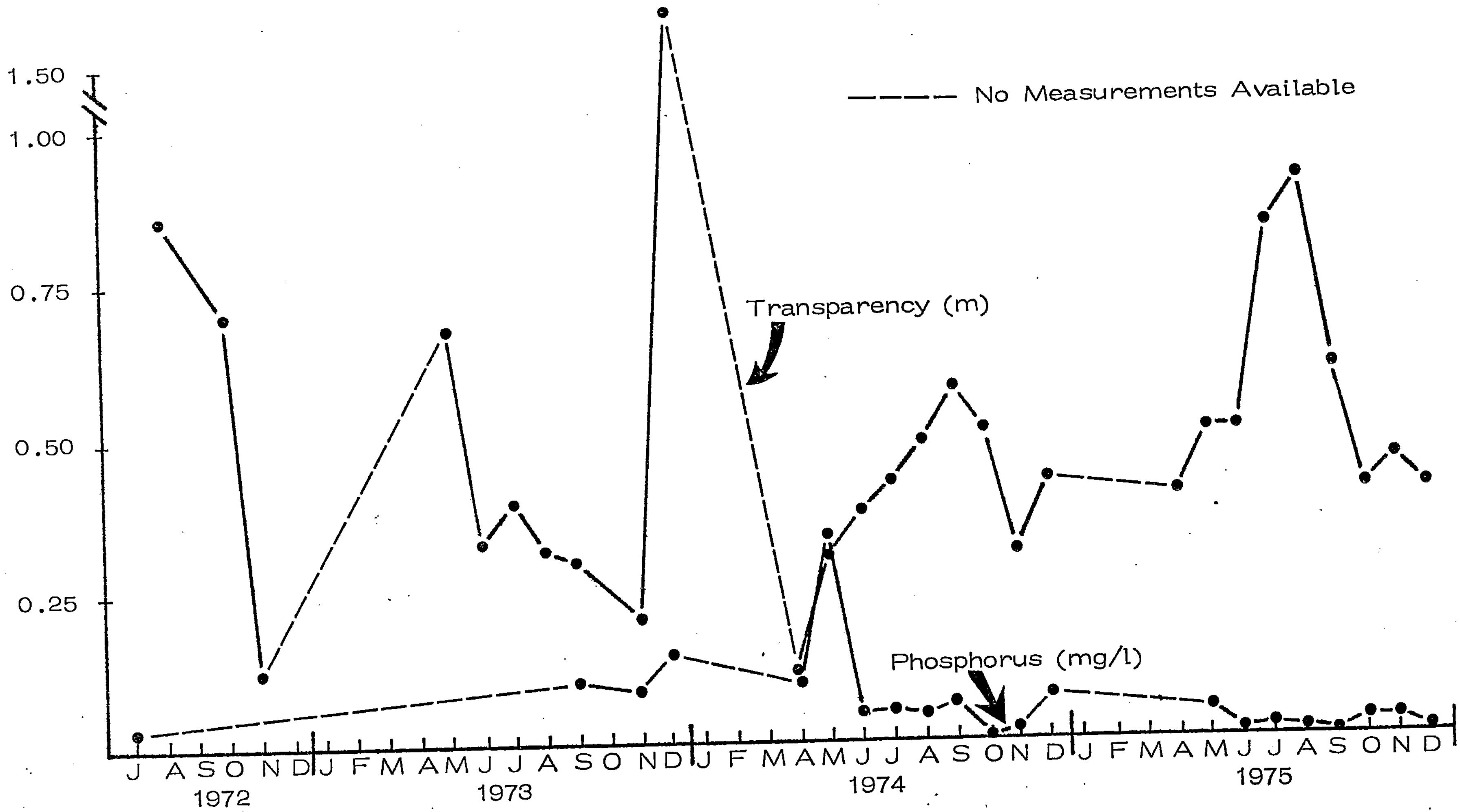


FIGURE 20. TRENDS IN MONTHLY MEAN TRANSPARENCY AND PHOSPHORUS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1975.

reached its minimum of 1.0°C or less between December and March. Between winter and summer the dissolved oxygen ranged from approximately 13 to 7 ppm. Lake Erie was primarily a bicarbonate solution with a moderately alkaline pH of 8.3 which was quite constant. The highest pH value obtained in the 4 years of observations at Locust Point was 9.1 and this occurred in August 1975 during an Aphanizomenon sp. bloom (Table 8). Alkalinity appeared to be relatively constant between 90 and 110 mg/l. The large variations in transparency, turbidity, and conductivity were undoubtedly due to storms and wave action disturbing the bottom sediments.

Primary Productivity

Locust Point Study. These results were somewhat variable. This variability probably represents the layering and/or patchiness, phenomena observed by other workers dealing with phytoplankton in the Great Lakes. Certain trends, however, could be observed.

The control station, Station 4, consistently demonstrated primary productivity values at one meter depth that were close to or greater than the values for all other stations. The one-meter values for all stations showed a general decrease from July through October. There was a considerable decrease in productivity values from the one-meter depth to the three-meter depth for all stations. For Station 4, the three-meter values averaged about 40% of the one-meter values and for Station 13, the three-meter values averaged about 20% of the one-meter values.

During the October cruise, measurements were made at a depth of 0.5 meters and the results indicated a strong tendency for productivity values to be greater at that depth than at one meter. As a consequence, all cruises during the 1976 field year will include measurements at 0.5 meters as well as 1 meter.

Rattlesnake Island Study. To compare primary productivity values at Locust Point with a location removed from Locust Point, studies were conducted several hundred meters south of the "rattles" of Rattlesnake Island. These measurements are summarized in Table 16. These values appear to be considerably less than values measured at Locust Point.

Central Basin Study. In early August, 1975, an attempt was made to study the variation in primary productivity at a particular location over a several-day period. The measurements were performed from the research vessel, R/V Hydra. Unfortunately, a storm forced the vessel off station after only three measurements. The results obtained are shown in Table 17. As anticipated, they indicated a considerable variation during a 24-hour period which should be investigated further.

Methodology Refinement. Two separate studies were performed in an attempt to make the productivity cruises more efficient without changing the overall methodology. The first

TABLE 16

PRIMARY PRODUCTIVITY RESULTS FROM RATTLESNAKE ISLAND DURING JUNE AND JULY 1975

Date	Station	Depth (m)	Primary Productivity ($mgC/m^3/hr$)
28 June 1975	Rattle-snake	1 5 10	21 47 3
17 July 1975 (1145 hrs)	Rattle-snake	1 5 10	69 19 3
17 July 1975	Rattle-snake	1 5 10	55 8 1

TABLE 17

PRIMARY PRODUCTIVITY RESULTS FROM THE CENTRAL BASIN OF LAKE ERIE IN 1975

Date and Time	Depth (m)	Primary Productivity ($mgC/m^3/hr$)
4 Aug 1975 (2030 hrs)	1	16
	3	7
	5	<1
	9	3
5 Aug 1975 (0715 hrs)	1	10
	3	44
	5	4
	7	7
	13	7
	18	9
5 Aug 1975 (1330 hrs)	1	50
	3	48
	5	29
	7	6
	15	8
	18	9

dealt with uptake of ^{14}C in a dark box. The second dealt with modifying manuafacturer's suggested procedures for use of a compact alkalinity test kit.

If ^{14}C uptake could be reduced to a negligible amount by temporary storage in a dark box, filtration could be accomplished in the laboratory at the end of the cruise rather than in the field. Field work could be conducted more quickly and on days when the lake was previously considered to be too rough to allow filtration. To investigate the feasibility of such an approach, an experiment was run during August, 1975, in which multiple bottles were incubated together, placed in a dark box, and removed at varying times for filtration and subsequent counting. The results were promising for the range of 4 hours to 7 hours in the dark box but were inconclusive for shorter times. The experiment will be repeated during the 1976 field season to gain additional information about shorter storage time periods.

The work on the alkalinity test kit was performed in an attempt to utilize more compact equipment for field work without sacrificing the accuracy attributed to the more bulky and fragile apparatus used in the laboratory. Laboratory measurements usually involve dispensing standard solutions (liquid) and the use of glass burettes. This is difficult and somewhat hazardous when working on a research vessel in rough seas. Thus an attempt was made to utilize a small, commercially-available, alkalinity test kit that included dry chemicals and a plastic bottle with dropper for the single liquid standard solution. Use of this small test kit is not universally accepted because of alleged inaccuracies in determinations of total alkalinity. So that the safety and portability features could be retained while the accuracy was improved, the following refinement procedures were undertaken.

The test kit used was a Hach model AL-AP Alkalinity Test Kit. Assuming that the premeasured amounts of phenolphthalein and brom cresol green methyl red are accurate to within a few percent, the certainty of an alkalinity measurement is determined, to a considerable degree, by an observer's ability to measure the volume of the sulfuric acid standard solution added to a sample. Specifically, the certainty of the originally-suggested procedures from the manufacturer is limited to the difference in volume between successive drops of the standard sulfuric acid solution, each drop of which is equivalent to 17.1 ppm, the original procedures can produce no better certainty than plus or minus 17.1 ppm.

The first step in modifying the procedures was to determine the volume of a "standard drop". That volume was determined by dropping "standard" drops into a 10-ml graduated cylinder. A conversion factor for relating alkalinity to volume of sulfuric acid standard solution dispensed was then calculated. Since one grain per gallon equals 0.068 ml, and one drop is required for each grain per gallon, then the volume of standard solution required for each part per million is: 0.068 ml/17.1 ppm = 4.0×10^{-3} ml/ppm.

It was then reasoned that if a sulfuric acid standard solution dispenser with a readout capability of plus or minus 0.01 ml were available, it would be possible to determine alkalinity within a certainty of 0.01 ml/0.0040 ml per ppm = 2.5 ppm. For a water sample with an alkalinity of 80 ppm, the dispenser volume would have to be: (80 ppm)(0.0040 ml/ppm) = 32 ml. The associated uncertainty would be 2.5 ppm/80 ppm = 3%.

Several tests were run using a Yale 1/2 cc tuberculin syringe with glass Luer tip and a one-inch, Yale 18G hypodermic needle as a dispenser. Volume determinations were found to be repeatable to within 0.01 ml. With this syringe, alkalinity values ranging from 2.5 to 125 ppm can be easily determined with reasonable accuracy, and this is the system currently in use.

STUDY RECOMMENDATIONS

The sampling program proposed in the Job I-a recommendations should be initiated. Additional statistical and analytical analysis should be employed. Correlation coefficients as well as multiple regressions should be computed from all results so that changes caused by plant operation can be more fully documented.

After the plant becomes operational, a fish shocker should be used in the thermal plume to collect fish. The internal temperatures of these fish should be measured immediately to determine their location within the thermal plume.

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APPENDIX A

RESULTS OF FISHING EFFORT DURING 1975 FOR THE ENVIRONMENTAL EVALUATION OF THE DAVIS-BESSE NUCLEAR POWER STATION

TABLE 18

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 8 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
17 April 1975						
	Aplodinotus grunniens	1	320		415	415
	Notropis hudsonius	3	114	111-120	16	48
	Perca flavescens	4	199	180-233	112	448
	Subtotal	8				911
22 May 1975						
	Alosa pseudoharengus	2	196	182-210	62	124
	Aplodinotus grunniens	4	254	240-264	194	777
	Catostomus commersoni	2	333	330-335	503	1006
	Cyprinus carpio	1	316		539	539
	Morone chrysops	3	203	137-333	194	582
	Notropis atherinoides	3	115	112-119	12	35
	N. hudsonius	260	114	103-130	16	4171
	Perca flavescens	243	170	90-247	58	13960
	Subtotal	518				21194
16 June 1975						
	Alosa pseudoharengus	21	163	139-220	45	860
	Carassius auratus	1	263		317	317
	Cyprinus carpio	11	275	226-345	320	3515
	Dorosoma cepedianum	9	332	298-360	442	3976
	Morone chrysops	11	136	128-146	35	383
	Notropis atherinoides	3	105		12	36
	Osmerus mordax	1	165		28	28
	Perca flavescens	203	179	130-205	77	4595
	Subtotal	260				13710

TABLE 18 CON'T.

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 8 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
14 July 1975						
	Alosa pseudoharengus	104	152	140-205	39	4056
	Aplodinotus grunniens	1	248		170	170
	Cyprinus carpio	20	304	227-405	415	8309
	Dorosoma cepedianum	6	262	228-365	256	1536
	Notropis hudsonius	11	109	97-116	18	203
	Perca flavescens	35	173	81-216	74	2593
	Stizostedion v. vitreum	2	255	254-255	130	260
	Subtotal	179				17127
11 August 1975						
	Aplodinotus grunniens	1	272		200	200
	Cyprinus carpio	15	326	245-368	494	7404
	Dorosoma cepedianum	61	191	124-385	87	5302
	Morone chrysops	1	218		140	140
	Notropis hudsonius	8	115	107-120	18	147
	Perca flavescens	76	177	82-224	75	5666
	Pomoxis annularis	1	230		158	158
	Stizostedion canadense	1	315		250	250
	Subtotal	164				19267
8 September 1975						
	Alosa pseudoharengus	16	111	95-142	18	291
	Aplodinotus grunniens	3	113	85-165	79	238
	Cyprinus carpio	2	343	330-355	532	1064
	Morone chrysops	1	95		10	10
	Notropis hudsonius	8	109	95-124	17	149
	Perca flavescens	31	168	92-207	61	1904
	Subtotal	61				3656
6 October 1975						
	Alosa pseudoharengus	4	133	100-148	22	86
	Aplodinotus grunniens	6	114	86-156	13	78
	Cyprinus carpio	2	346	329-362	573	1146
	Dorosoma cepedianum	14	132	89-175	25	354
	Notropis hudsonius	7	113	100-137	13	94
	Perca flavescens	22	183	94-230	71	1552
	Subtotal	55				3310

TABLE 18 CON'T.

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 8 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
3 November 1975						
	Alosa pseudoharengus	3	140	135-142	26	78
	Aplodinotus grunniens	5	146	93-315	94	468
	Dorosoma cepedianum	38	142	129-166	30	1143
	Notropis hudsonius	37	113	102-124	13	493
	Osmerus mordax	8	157	65-212	35	276
	Perca flavescens	20	178	145-213	66	1327
	Stizostedion v. vitreum	1	185		54	54
	Subtotal	112				3839
	TOTAL**	1357				83014
17 November 1975						
	Dorosoma cepedianum	6	122	78-135	23	137
	Notropis hudsonius	25	113	105-123	17	417
	Osmerus mordax	5	173	149-215	35	177
	Perca flavescens	6	180	165-192	76	453
	Subtotal	42				1184
16 December 1975						
	Alosa pseudoharengus	1	95		8	8
	Dorosoma cepedianum	5	140	123-155	30	148
	Notropis hudsonius	7	108	100-115	14	96
	Osmerus mordax	6	166	155-180	28	168
	Subtotal	19				420
	TOTAL**	1418				84618

* One 24-hr bottom set with a 125-ft experimental gill net consisting of five 25-ft x 6-ft contiguous panels of 1/2 in, 3/4 in, 1 in, 1-1/2 in, and 2 in bar mesh.

** The total through 3 November 1975 should be used for comparisons with results from previous years, since the later samples were not collected in previous years.

TABLE 19

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 13 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
17 April 1975						
	Alosa pseudoharengus	10	174	162-180	37	374
	Cyprinus carpio	1	292		426	426
	Dorosoma cepedianum	1	114		16	16
	Morone chrysops	1	310		432	432
	Notropis hudsonius	63	111	100-145	16	989
	Perca flavescens	10	185	169-202	79	788
	Percopsis omiscornaycus	1	113		17	17
	Stizostedion v. vitreum	1	225		106	106
	Subtotal	88				3148
22 May 1975						
	Alosa pseudoharengus	44	173	152-190	39	1731
	Aplodinotus grunniens	4	196	168-259	91	363
	Catostomus commersoni	1	355		584	584
	Cyprinus carpio	4	294	236-339	396	1583
	Dorosoma cepedianum	9	329	285-352	426	3838
	Hybopsis storeriana	1	185		70	70
	Ictalurus nebulosus	1	252		287	287
	Morone chrysops	3	135	134-137	32	95
	Notropis hudsonius	293	117	107-127	14	4030
	Perca flavescens	109	154	82-227	56	6091
	Stizostedion canadense	6	229	212-258	114	686
	S. v. vitreum	2	221	208-233	98	195
	Subtotal	477				19553
16 June 1975						
	Alosa pseudoharengus	24	159	137-198	43	1030
	Aplodinotus grunniens	4	130	95-162	73	293
	Cyprinus carpio	8	292	220-375	365	2921
	Dorosoma cepedianum	4	336	320-372	425	1701
	Ictalurus punctatus	7	359	267-412	466	3265
	Morone chrysops	4	140	132-144	38	152
	Notropis atherinoides	1	115		12	12
	Perca flavescens	56	171	103-228	73	4109
	Stizostedion v. vitreum	4	211	193-224	83	331
	Subtotal	112				13814

TABLE 19 CON'T.

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 13 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
8 September 1975 cont.						
	Perca flavescens	35	175	92-204	73	2570
	Pomoxis annularis	1	135		170	170
	Stizostedion canadense	1	335		360	360
	S. v. vitreum	1	177		39	39
	Subtotal	73				12002
6 October 1975						
	Alosa pseudoharengus	4	123	104-140	18	70
	Aplodinotus grunniens	5	121	90-164	21	105
	Cyprinus carpio	3	357	340-376	597	1790
	Dorosoma cepedianum	139	146	90-409	48	6663
	Morone chrysops	4	99	91-115	10	38
	Notropis hudsonius	35	114	99-130	14	475
	Perca flavescens	26	177	95-207	69	1784
	Subtotal	216				10925
3 November 1975						
	Alosa pseudoharengus	47	134	109-157	24	1125
	Cyprinus carpio	2	313	312-313	469	937
	Dorosoma cepedianum	46	140	121-169	32	1466
	Morone chrysops	1	147		40	40
	Notropis hudsonius	64	112	102-124	16	1020
	Osmerus mordax	19	174	149-205	31	592
	Perca flavescens	28	179	91-250	78	2182
	Percopsis omiscomaycus	1	121		16	16
	Subtotal	208				7378
	TOTAL**	1692				113753
17 November 1975						
	Carassius auratus	2	257	212-302	336	671
	Cyprinus carpio	5	369	314-530	939	4697
	Dorosoma cepedianum	42	135	88-158	27	1154
	Notropis hudsonius	45	111	102-130	14	634
	Osmerus mordax	42	170	147-233	31	1286
	Perca flavescens	17	189	155-227	83	1419
	Subtotal	153				9861

TABLE 19 CON'T.

GILL NET CATCH PER UNIT EFFORT* AT LOCUST POINT
STATION 13 - APRIL-DECEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
16 December 1975						
	Cyprinus carpio	1	352		736	736
	Dorosoma cepedianum	7	169	122–407	138	963
	Notropis hudsonius	5	108	104–112	13	66
	Osmerus mordax	1	223		75	75
	Subtotal	14				1840
	TOTAL**	1859				125454

* One 24-hr bottom set with a 125-ft experimental gill net consisting of five 25-ft x 6-ft contiguous panels of 1/2 in, 3/4 in, 1 in, 1-1/2 in, and 2 in bar mesh.

** The total through 3 November 1975 should be used for comparisons with results from previous years, since the later samples were not collected in previous years.

TABLE 20

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
17 APRIL 1975

Station	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
23	No fish in the first tow. Hazardous weather conditions prevented completion of the second tow.					
24	*Dorosoma cepedianum*	2	324	311-337	439	877
	Notropis atherinoides	273	53	44-65	1	295
	Subtotal	275				
25	*Cyprinus carpio*	1	535		2293	2293
	Notropis atherinoides	1122	53	39-66	1	1212
	Subtotal	1123				
	Total	1398				

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 21

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
22 MAY 1975

Station	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
23	*Cyprinus carpio*	1	640		4331	4331
	Ictalurus nebulosus	2	212	200-224	130	260
	Notropis atherinoides	13	55	50-72	1	16
	N. hudsonius	4	68	57-65	4	15
	Subtotal	20				
24	*Aplodinotus grunniens*	1	260		223	223
	Cyprinus carpio	1	671		5436	5436
	Dorosoma cepedianum	3	314	290-334	294	883
	Notropis atherinoides	2	57	53-60	1	2
	Subtotal	7				
25	*Cyprinus carpio*	4	587	449-702	3178	12712
	Dorosoma cepedianum	2	321	309-332	339	677
	Notropis atherinoides	9	50	48-55	1	9
	N. hudsonius	1	81		6	6
	Pomoxis nigromaculatus	1	135		38	38
	Subtotal	17				
	Total	44				

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 22

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
17 JUNE 1975

Station	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
23	Dorosoma cepedianum	6042	28	22-34		
	Morone chrysops	3	22	18-27		
	Notropis atherinoides	28	55	46-72	1	29
	N. hudsonius	3	64	24-109	5	14
	Subtotal	6076				
24	Aplodinotus grunniens	1	115		21	21
	Catostomus commersoni	4	19	17-22		
	Dorosoma cepedianum	14235	28	21-33		
	Morone chrysops	64	17	13-22		
	Notropis atherinoides	41	55	19-115	1	33
	N. hudsonius	6	17	15-20	17	104
	Perca flavescens	8	20	18-22		
	Pimephales promelas	1	38		1	1
	Pomoxis annularis	3	20	19-21		
	P. nigromaculatus	1	17			
	Subtotal	14364				
25	Dorosoma cepedianum	12	20	15-24		
	Morone chrysops	6	19	9-24		
	Notropis atherinoides	35	59	49-107	2	64
	N. hudsonius	2	62	20-103		
	N. volucellus	2	41	36-45	1	2
	Subtotal	57				
	Total	20497				

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 23

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
15 JULY 1975

Station	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
23	*Alosa pseudoharengus*	1144	36	25-55		
	Dorosoma cepedianum	124	38	27-61		
	Morone chrysops	19	44	34-61	1	23
	Notropis atherinoides	455	62	21-111	1	546
	N. hudsonius	7	32	22-54	1	4
	Subtotal	1749				573
24	*Alosa pseudoharengus*	2976	35	26-55	1	1488
	Dorosoma cepedianum	310	35	27-61		
	Labidesthes sicculus	2	31	30-32	1	1
	Morone chrysops	3	44	41-45	1	4
	Notropis atherinoides	36	74	52-100	3	105
	N. hudsonius	2	48	44-51	1	2
	Subtotal	3329				1600
25	*Alosa pseudoharengus*	2253	36	29-56	1	1127
	Dorosoma cepedianum	262	34	26-61		
	Morone chrysops	4	44	39-47	1	4
	Notropis atherinoides	622	72	58-111	3	1804
	Subtotal	3141				2935
	Total	8219				5108

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 24

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
12 AUGUST 1975

Station	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
23	*Alosa pseudoharengus*	36	33	27–40		
	Dorosoma cepedianum	10	48	33–109	2	24
	Labidesthes sicculus	2	49	48–50	1	1
	Notropis atherinoides	382	42	27–85	1	62
	N. spilopterus	1	64		3	3
	Subtotal	430				90
24	*Alosa pseudoharengus*	145	34	26–43	1	73
	Dorosoma cepedianum	110	40	30–58	1	77
	Labidesthes sicculus	1	37		1	1
	Notropis atherinoides	854	41	23–72	1	497
	Subtotal	1110				648
25	*Alosa pseudoharengus*	222	34	24–46		
	Dorosoma cepedianum	17	31	27–38		
	Labidesthes sicculus	2	42	34–49	1	1
	Notropis atherinoides	384	42	22–80	1	230
	Subtotal	625				231
	Total	2165				969

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 25

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
10 SEPTEMBER 1975

Station	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
23	*Alosa pseudoharengus*	3	34	28–46	1	2
	Dorosoma cepedianum	6	121	54–162	27	163
	Notropis atherinoides	5	50	26–88	2	10
	N. spilopterus	1	76		5	5
	Subtotal	15				180
24	*Alosa pseudoharengus*	5	40	31–45	1	4
	Dorosoma cepedianum	10	54	45–140	5	45
	Notropis atherinoides	17	46	24–87	1	19
	N. hudsonius	1	67		3	3
	Subtotal	33				71
25	*Alosa pseudoharengus*	2	27	23–30	0.2	0.4
	Dorosoma cepedianum	1	30		0.3	0.3
	Labidesthes sicculus	2	68	66–69	2	3
	Notropis atherinoides	23	53	34–92	2	39
	Subtotal	28				43
	Total	76				294

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 26

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
14 OCTOBER 1975

Station	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
23	Alosa pseudoharengus	40	37	29-51	1	21
	Dorosoma cepedianum	52	73	34-141	8	438
	Morone chrysops	1	86		6	6
	Notropis atherinoides	628	52	30-100	2	1021
	Pimephales promelas	1	46		1	1
	Subtotal	722				1487
24	Dorosoma cepedianum	9	101	62-192	21	185
	Notropis atherinoides	18	48	33-101	2	31
	Subtotal	27				216
25	Alosa pseudoharengus	5	31	28-39	1	3
	Dorosoma cepedianum	1	122		23	23
	Labidesthes sicculus	1	61		1	1
	Morone chrysops	1	107		14	14
	Notropis atherinoides	112	40	31-82	1	74
	Subtotal	120				115
	Total	869				1818

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 27

SHORE SEINE CATCH PER UNIT EFFORT* AT LOCUST POINT
5 NOVEMBER 1975

Station	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
23	*Alosa pseudoharengus*	2	39	36-41	1	1
	Notropis atherinoides	33	56	41-86	1	48
	Subtotal	35				49
24	*Notropis atherinoides*	15	48	42-59	1	15
	Osmerus mordax	1	144		19	19
	Subtotal	16				34
25	*Notropis atherinoides*	94	53	38-89	1	111
	Total	145				194

* Two hauls through a 90° arc with a 100-ft bag seine (1/4 in bar mesh) at each station.

TABLE 28

TRAWL CATCH PER UNIT EFFORT* AT LOCUST POINT
APRIL-NOVEMBER 1975

Date	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
5 May 1975						
	Aplodinotus grunniens	3	157	111-186		
	Notropis atherinoides	1	107			
	N. hudsonius	5	113	107-121		
	Osmerus mordax	1	140			
	Perca flavescens	2	203	167-239		
	Percina caprodes	1	62			
	Subtotal	13				
27 May 1975						
	Ictalurus punctatus	2	137	116-157		
	Notropis atherinoides	4	87	31-114		
	N. hudsonius	1	101			
	Perca flavescens	4	202	185-221		
	Subtotal	11				
17 June 1975						
	Alosa pseudoharengus	1	132		27	27
	Aplodinotus grunniens	2	95	93-96	10	20
	Cyprinus carpio	1	358		590	590
	Ictalurus nebulosus	1	277		204	204
	I. punctatus	1	148		34	34
	Morone chrysops (Larvae)	3	16	15-18		
	Notropis atherinoides	26	103	84-115	10	256
	N. hudsonius	3	95	66-128	12	36
	Osmerus mordax	4	25	20-29		
	Perca flavescens (Larvae)	269	22	16-28		
	P. flavescens	6	164	105-201	61	299
	Pomoxis annularis	1	141		38	38
	P. nigromaculatus (Larvae)	2	17	16-18		
	Subtotal	320				1504

TABLE 28 CON'T.

TRAWL CATCH PER UNIT EFFORT* AT LOCUST POINT
APRIL-NOVEMBER 1975

Date	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
15 July 1975						
	Aplodinotus grunniens	1	200		88	88
	Morone chrysops	12	82	28-205	29	347
	Notropis atherinoides	2	55	43-67	2	3
	N. hudsonius	1	120		21	21
	Osmerus mordax	4	31	25-41	1	4
	Perca flavescens	3	128	46-173	40	120
	Percina caprodes	2	66	42-89	5	10
	Pomoxis annularis	1	197		117	117
	Subtotal	26				710
21 August 1975						
	Cyprinius carpio	1	441		1135	1135
	Dorosoma cepedianium	2	61	52-70	4	7
	Ictalurus nebulosus	1	215		135	135
	Morone chrysops	6	62	22-76	4	24
	Notropis atherinoides	6	86	81-93	5	30
	Osmerus mordax	2	25	23-27		
	Perca flavescens	2	127	75-178	37	73
	Pomoxis nigromaculatus	1	193		114	114
	Subtotal	21				1518
15 September 1975						
	Aplodinotus grunniens	1	85		7	7
	Cyprinius carpio	2	327	278-376	549	1098
	Dorosoma cepedianum	2	43	21-64	1	2
	Ictalurus nebulosus	1	240		181	181
	I. punctatus	1	64		3	3
	Notropis atherinoides	2	59	31-87	2	4
	N. hudsonius	9	92	72-109	7	60

TABLE 28 CON'T.

TRAWL CATCH PER UNIT EFFORT* AT LOCUST FOINT
APRIL-NOVEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
	Osmerus mordax	1	36		–	–
	Perca flavescens	1	159		50	50
	Percina caprodes	2	50	30–70	2	3
	Subtotal	22				1408
14 October 1975						
	Alosa pseudoharengus	4	118	113–120	15	60
	Aplodinotus grunniens	2	84	52–116	8	16
	Carassius auratus	1	261		365	365
	Cyprinus carpio	1	324		616	616
	Dorosoma cepedianum	14	102	62–126	12	171
	Etheostoma nigrum	1	37		1	1
	Morone chrysops	2	89	83–95	8	17
	Notropis atherinoides	331	70	40–108	28	9268
	N. hudsonius	2	92	80–103	8	17
	Perca flavescens	1	226		120	120
	Pomoxis annularis	1	78		5	5
	Subtotal	360				10656
7 November 1975						
	Cyprinus carpio	1	350		719	719
	Dorosoma cepedianium	6	110	86–127	16	93
	Notropis atherinoides	378	81	43–95	34	12852
	Perca flavescens	1	198		90	90
	Percina caprodes	1	70		3	3
	Subtotal	387				13757
	TOTAL	1160				29553

* 20 minutes of trawling between the intake and discharge with a 16-ft trawl (1/8 in mesh).

TABLE 29

TRAWL CATCH PER UNIT EFFORT* FROM THE INTAKE CANAL AT THE DAVIS-BESSE NUCLEAR POWER STATION - 1975

Date	Taxa	No.	Length (mm)		Weight (g)	
			Mean	Range	Mean	Total
13 June 1975						
	Lepomis gibbosus	2	107	103-110	35	69
	Notropis hudsonius	1	86		7	7
	Perca flavescens (adult)	5	120	110-125	25	123
	P. flavescens (YOY)	11	29	20-35		
	Pomoxis nigromaculatus	1	22			
	Subtotal	20				199
16 September 1975						
	Carassius auratus	2	124	124-124	35	69
	Cyprinus carpio	13	109	89-134	21	275
	Dorosoma cepedianum	8	105	96-117	14	108
	Ictalurus melas	24	86	66-114	12	285
	I. punctatus	2	71	69-73	3	6
	Lepomis cyanellus	2	37	35-38	1	2
	L. gibbosus	2	46	45-47	2	3
	L. macrochirus	1	36		1	1
	Perca flavescens	4	91	64-158	12	49
	Percopsis omiscomaycus	3	82	80-86	7	21
	Pomoxis annularis	323	74	61-89	4	1292
	P. nigromaculatus	16	72	55-80	5	75
	Subtotal	400				2186
	TOTAL	420				2385

* 10 minutes of trawling with an 8-ft trawl (1/8 in bar mesh).
YOY - Designates young-of-the-year

TABLE 30

HOOP NET CATCH PER UNIT EFFORT* IN NORTHWEST MARSH (STATION 21)
APRIL-NOVEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
17 April 1975						
	Amia calva	2	526	505-546	1429	2858
	Cyprinus carpio	1	295		362	362
	Pomoxis nigromaculatus	4	230	210-259	193	771
	Subtotal	7				3991
22 May 1975						
	Cyprinus carpio	1	628		2293	2293
	Subtotal	1				2293
16 June 1975						
	Amia calva	3	544	433-620	1576	4727
	Carassius auratus	2	234	215-252	237	474
	Cyprinus carpio	3	340	324-365	559	1677
	Subtotal	8				6878
14 July 1975						
	Cyprinus carpio	2	415	354-476	941	1882
11 August 1975						
	Cyprinus carpio	1	541		1953	1953
8 September 1975.						
	No Fish					
6 October 1975						
	Cyprinus carpio	2	518	465-571	1642	3284
3 November 1975						
	Cyprinus carpio	1	555		2038	2038
	TOTAL	22				22319

* One 24-hour set with a 2.5-ft diameter, 1 in bar mesh hoop net.

TABLE 31

HOOP NET CATCH PER UNIT EFFORT IN SOUTHEAST MARSH (STATION 22)
APRIL-NOVEMBER 1975

Date	Taxa	No.	Length (mm) Mean	Length (mm) Range	Weight (g) Mean	Weight (g) Total
17 April 1975						
	No Fish					
22 May 1975						
	Cyprinus carpio	3	243	210-263	210	629
	Subtotal	3				
16 June 1975						
	No Fish					
14 July 1975						
	Cyprinus carpio	2	351	308-393	562	1124
	Pomoxis annularis	1	303		420	420
	Subtotal	3				
11 August 1975						
	No Fish					
8 September 1975						
	Cyprinus carpio	1	263		228	228
6 October 1975						
	No Fish					
3 November 1975						
	No Fish					
	TOTAL	7				2401

* One 24-hr set with a 2.5-ft diameter, 1 in bar mesh hoop net.

TABLE 32

ICHTHYOPLANKTON CATCH PER UNIT EFFORT*
IN THE VICINITY OF LOCUST POINT, LAKE ERIE
APRIL - SEPTEMBER 1975

Date / Taxa	Length Range (mm)	Sta. 8 (Intake) Surface	Sta. 8 (Intake) Bottom	Sta. 13 (Discharge) Surface	Sta. 13 (Discharge) Bottom	Toussaint Reef Surface	Toussaint Reef Bottom	Sta. 19 (Canal) Surface	Sta. 19 (Canal) Bottom
		Individuals Captured Per 5-minute Tow							
22 April 1975									
No larvae captured									
Notropis atherinoides[1]	48-55	0	2	0	0	-	-	-	-
12 May 1975									
Notropis atherinoides[1]	43-51	0	0	2	0	-	-	-	-
Perca flavescens	6-7	0	226	0	872	-	-	-	-
25 May 1975									
Catostomus commersoni	7	0	1	0	0	0	0	-	-
Notropis atherinoides[1]	62	1	0	0	0	0	0	-	-
Perca flavescens	6-12	0	515	99	376	0	8	-	-
Fish Eggs		0	0	0	0	60	7	-	-
2 June 1975									
Dorosoma cepedianum	6-15	0	408	13	31	0	0	-	-
Notropis atherinoides	54-64	1	1	6	0	0	0	-	-
Perca flavescens	8-13	0	2	1	8	0	0	-	-
Fish Eggs		0	0	0	0	13	4	-	-
13-16 June 1975									
Cyprinus carpio	4-7	0	0	0	4	0	0	2	4
Dorosoma cepedianum	4-27	2	7	36	75	0	0	37	27
Morone chrysops	18	0	0	0	0	0	0	1	0
Notropis atherinoides	8	1	0	0	1	0	0	0	0
Perca flavescens	12-15	2	0	2	1	0	0	0	0
Pomoxis annularis	4-7	0	0	0	0	0	0	32	148
Unidentified Larvae	5-6	0	0	4	0	0	0	0	0
Fish Eggs		0	0	0	0	2	10	0	0

TABLE 32 CONT.

ICHTHYOPLANKTON CATCH PER UNIT EFFORT*
IN THE VICINITY OF LOCUST POINT, LAKE ERIE
APRIL - SEPTEMBER 1975

Date	Taxa	Length Range (mm)	Individuals Captured Per 5-minute Tow: Sta. 8 (Intake) Surface	Sta. 8 (Intake) Bottom	Sta. 13 (Discharge) Surface	Sta. 13 (Discharge) Bottom	Toussaint Reef Surface	Toussaint Reef Bottom	Sta. 19 (Canal) Surface	Sta. 19 (Canal) Bottom
22 June 1975										
	Cyprinus carpio	6	0	0	0	0	0	1	-	-
	Dorosoma cepedianum	7-10	0	7	1	9	0	0	-	-
	Notropis atherinoides	7-12	0	0	0	0	2	0	-	-
	Fish eggs		2	1	0	0	64	1	-	-
2 July 1975										
	Dorosoma cepedianum	5-13	0	5	0	43	0	0	-	-
	Notropis atherinoides	9-14	0	0	0	0	13	1	-	-
	Fish eggs		0	0	0	0	14	10	-	-
13 July 1975										
	Cyprinus carpio	6	1	0	0	0	0	0	-	-
	Dorosoma cepedianum	10-13	0	0	1	0	0	1	-	-
	Fish eggs		0	0	0	0	2	0	-	-
4 August 1975	No Fish		0	0	0	0	0	0	-	-
30 August 1975	No Fish		0	0	0	0	0	0	-	-
16 September 1975	No Fish		-	-	-	-	-	-	0	0

[1] Adults
"0" Indicates no fry appeared in sample.
"-" Indicates no sample was taken.
*One 5-minute tow with a 0.75-m diameter oceanographic plankton net (no. 00,0.76 mm mesh).

TABLE 33

SUMMARY OF ICHTHYOPLANKTON CATCH PER UNIT EFFORT* RESULTS
IN THE VICINITY OF LOCUST POINT, LAKE ERIE
APRIL - SEPTEMBER 1975

	Station 8		Station 13		Toussaint Reef		Station 19		Total	
Date	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
22 April										
Larvae	0	0	0	0	-	-	-	-	0	0
Fish Eggs	0	0	0	0	-	-	-	-	0	0
12 May										
Larvae	0	226	0	872	-	-	-	-	0	1098
Fish Eggs	0	0	0	0	-	-	-	-	0	0
25 May										
Larvae	0	516	99	376	0	8	-	-	99	900
Fish Eggs	0	0	0	0	60	7	-	-	60	7
2 June										
Larvae	0	410	14	39	0	0	-	-	14	449
Fish Eggs	0	0	0	0	13	4	-	-	13	4
13-16 June										
Larvae	5	7	42	81	0	0	72	179	119	267
Fish Eggs	0	0	0	0	2	10	0	0	2	10
22 June										
Larvae	0	7	1	9	2	1	-	-	3	17
Fish Eggs	2	1	0	0	64	1	-	-	66	2

TABLE 33 CON'T.

SUMMARY OF ICHTHYOPLANKTON CATCH PER UNIT EFFORT* RESULTS
IN THE VICINITY OF LOCUST POINT, LAKE ERIE
APRIL - SEPTEMBER 1975

Date	Station 8		Station 13		Toussaint Reef		Station 19		Total	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
2 July										
Larvae	0	5	0	43	13	1	-	-	13	49
Fish Eggs	0	0	0	0	14	10	-	-	14	10
13 July										
Larvae	1	0	1	0	0	1	-	-	2	1
Fish Eggs	0	0	0	0	2	0	-	-	2	0
4 August										
Larvae	0	0	0	0	0	0	-	-	0	0
Fish Eggs	0	0	0	0	0	0	-	-	0	0
30 August										
Larvae	0	0	0	0	0	0	-	-	0	0
Fish Eggs	0	0	0	0	0	0	-	-	0	0
16 Sept										
Larvae	-	-	-	-	-	-	0	0	0	0
Fish Eggs	-	-	-	-	-	-	0	0	0	0
TOTAL										
Larvae	6	1171	157	1420	15	11	72	179	250	2781
Fish Eggs	2	1	0	0	155	32	0	0	157	33

"0" Indicates no larvae appeared in sample.
"-" Indicates no sample was taken.
* One 5-mm tow with a 0.75-m diameter oceanographic plankton net (no. 00, 0.76 mm mesh).

APPENDIX B

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT APRIL - JUNE 1975

TABLE 34
STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT
APRIL - JUNE 1975

Month	Species	Length (mm)	Weight (g)	Food Items: Oligochaeta	Cladocera	Bosmina sp.	Daphnia retrocurva	Leptodora kinditi	Copepoda	Amphipoda	Insecta	Diptera	Chironomidae pupae	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Polypedilum sp.	Tanypodinae	Procladius sp.	Trichoptera larvae	Fish	Animal debris	Plant debris
April	Aplodinotus grunniens	111	-																				A	
	A. grunniens	175	-																					
	A. grunniens	186	-																				B	A
	Notropis a. atherinoides	107	-		23		12		4	3						18	2							
	N. hudsonius	107	-	2									1											
	N. hudsonius	110	-							2													B	
	N. hudsonius	112	-																					
	N. hudsonius	115	-											1			1						B	A
	N. hudsonius	121	-																					
	Osmerus eperlanus mordax	140	-																					
	Perca flavescens	167	-													6								
	P. flavescens	239	-							5														
	Percina caprodes	62	-																					
May	Ictalurus punctatus	116	-							4			2		1		6				1		A	
	I. punctatus	157	-															1		1			A	
	Notropis a. atherinoides	31	-																				B	
	N. a. atherinoides	93	-			2	44	3	13															
	N. a. atherinoides	110	-		148	8	212		12															
	N. a. atherinoides	114	-		55	6	63	2	19														C	A
	N. hudsonius	101	-		40				3															
	Perca flavescens	185	-		20		1400																	
	P. flavescens	200	-		50		800																	
	P. flavescens	203	-				600	70	45														A	
	P. flavescens	221	-				16																	

TABLE 34 CONT.
STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT
APRIL - JUNE 1975

Month	Species	Length (mm)	Weight (g)	Oligochaeta	Cladocera	Bosmina sp.	Daphnia retrocurva	Leptodora kindtii	Copepoda	Amphipoda	Insecta	Diptera	Chironomidae pupae	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Polypedilum sp.	Tanypodinae	Procladius sp.	Trichoptera larvae	Fish	Animal debris	Plant debris
June	Alosa pseudoharengus	132	27			120	880	620	80														A	
	Aplodinotus grunniens	96	10			3	63	22	1													1	A	
	Ictalurus nebulosus	277	204			12	8	500																
	I. punctatus	148	34			10	45	200															A	
	Notropis a. atherinoides	89	6			620	360		5														A	
	N. a. atherinoides	94	10		25	19	230		1															
	N. a. atherinoides	102	8					105															A	
	N. a. atherinoides	105	11			40	350																A	
	N. a. atherinoides	108	10			60	340		6														A	
	N. a. atherinoides	111	9			130	200	15															A	
	N. a. atherinoides	111	11			80	880	2	1														A	
	N. a. atherinoides	112	13			160	640	60	10														A	
	N. a. atherinoides	112	14		25	32	185		1															
	N. a. atherinoides	113	12			25	650	2	1														A	
	N. hudsonius	66	3				22	1															A	
	N. hudsonius	91	10		100		500	10																
	N. hudsonius	128	23			85	520	2															A	
	Perca flavescens	105	14			5	300	5	2													1	A	
	P. flavescens	161	48				520	40															A	
	P. flavescens	171	64				240	10															B	
	P. flavescens	171	66				800	5															A	
	P. flavescens	175	71				210	10															A	
	P. flavescens	201	100				1040	15															A	
	Pomoxis annularis	141	38			43	55	36	31													3	B	

Notes: Letters used under headings "animal debris" and "plant debris" denote the relative abundance of the debris:

A = slight amount
B = moderate amount
C = plentiful amount

Numbers used under all other headings denote the actual number of organisms contained within the stomach.

Weights were not measured in April and May.

APPENDIX C

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT

JULY - NOVEMBER 1975

TABLE 35

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975*

Month	Species	Length (mm)	Weight (g)	Food Items I: Oligochaeta	Cladocera	Alona sp.	Bosmina sp.	Bosmina longirostris	Chydorus sphaericus	Daphnia galeata	D. retrocurva	Diaphanosoma sp.	Eubosmina coregoni	Leptodora kinditi	Copepoda	Calanoid	Cyclopoid	Gammarus sp.	Hydracarina	Insecta	Baetidae
July	Aplodinotus grunniens	200	88		48					52	64			96							
	Morone chrysops	175	89											505							
	M. chrysops	192	110		16									536							
	M. chrysops	205	134																		
	Notropis hudsonius	120	21																		
	Perca flavescens	165	68		2									12							
	P. flavescens	173	51																		
	Percina caprodes	89	9															6			
	Pomoxis annularis	197	117		49									43	2						
August	Ictalurus nebulosus	215	135											35							
	Morone chrysops	59	3						1		28	5	1	71			3				
	M. chrysops	71	5								17	8	2	51		2	1				
	M. chrysops	71	5								36	5	1	114		1					
	M. chrysops	72	5								1	1	1	15							
	M. chrysops	76	6								5	4		63							
	Notropis atherinoides	81	4						2		33		8	7			2				
	N. atherinoides	83	5						11		2		2	7			4				
	N. atherinoides	84	5		4				1	1	12	1		3			4		1		
	N. atherinoides	85	5								1			3							
	N. atherinoides	88	5											1							
	N. atherinoides	93	6																		
	Perca flavescens	75	5														38				
	P. flavescens	178	67																		
	Pomoxis nigromaculatus	193	114																		

TABLE 35 CON'T.)

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items II																	
				Diptera	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Glyptotendipes sp.	Parachironomus sp.	Polypedilum sp.	Rheotanytarsus sp.	Xenochironomus sp.	Tanypodinae	Procladius sp.	Chironomidae pupae	Trichoptera larvae	Fish	Notropis sp.	Animal debris*	Plant debris*
July	Aplodinotus grunniens	200	88																	A	
	Morone chrysops	175	89															1		A	
	M. chrysops	192	110					2										2		A	
	M. chrysops	205	134															3			
	Notropis hudsonius	120	21																		
	Perca flavescens	165	68																	A	
	P. flavescens	173	51																	A	
	Percina caprodes	89	9		1		2		3	18						13				A	
	Pomoxis annularis	197	117					3								6		1		B	
August	Ictalurus nebulosus	215	135														1			A	
	Morone chrysops	59	3																	A	
	M. chrysops	71	5																	A	
	M. chrysops	71	5																	A	
	M. chrysops	72	5																	A	
	M. chrysops	76	6													20				A	A
	Notropis atherinoides	81	4																	A	
	N. atherinoides	83	5																	A	A
	N. atherinoides	84	5													1				A	
	N. atherinoides	85	5																	A	
	N. atherinoides	88	5																	A	
	N. atherinoides	93	6																	A	
	Perca flavescens	75	5																	A	
	P. flavescens	178	67				1									1				A	
	Pomoxis nigromaculatus	193	114				3													A	

TABLE 35 CON'T.

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items I																	
				Oligochaeta	Cladocera	Alona sp.	Bosmina sp.	Bosmina longirostris	Chydorus sphaericus	Daphnia galeata	D. retrocurva	Diaphanosoma sp.	Eubosmina coregoni	Leptodora kindtii	Copepoda	Calanoid	Cyclopoid	Gammarus sp.	Hydracarina	Insecta	Baetidae
September	Aplodinotus grunniens	85	7																		
	Ictalurus nebulosus	240	181											2							
	I. punctatus	64	3			1											1				
	Notropis atherinoides	87	4						60		232	20	16	4	4						
	N. hudsonius	72	3						1		1	1		3			4				
	N. hudsonius	76	4						3		5	1	6			2	1				
	N. hudsonius	83	4								4	1	1								
	N. hudsonius	85	5						3		1	1				1	11		4		
	N. hudsonius	98	7																		
	N. hudsonius	100	8						2										9		
	N. hudsonius	101	8			1			1		1						3		2		
	N. hudsonius	103	10								3							1			
	N. hudsonius	109	11						1		2		3			1	7		6		
	Perca flavescens	159	50						9				11	1		2	15				
	Percina caprodes	70	3																		
October	Alosa pseudoharengus	113	14						20	20	1480		64	36		44	336				
	A. pseudoharengus	118	15						28	24	1400	8	48	24		44	112				
	A. pseudoharengus	119	15						32	24	1520	8	104	24		64	512				
	A. pseudoharengus	120	16						44	44	1920	16	112	48		36	404				
	Aplodinotus grunniens	52	2						1		2			1		2	17				
	A. grunniens	116	14																		
	Etheostoma nigrum	37	1						7		9			1		6	73				
	Morone chrysops	83	7								28			15			6				
	M. chrysops	95	10								32			10			5				

TABLE 35 CON'T.

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items II																	
				Diptera	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Glyptotendipes sp.	Parachironomus sp.	Polypedilum sp.	Rheotanytarsus sp.	Xenochironomus sp.	Tanypodinae	Procladius sp.	Chironomidae pupae	Trichoptera larvae	Fish	Notropis sp.	Animal debris*	Plant debris*
September	Aplodinotus grunniens	85	7				1	5			1	11								A	
	Ictalurus nebulosus	240	181																		
	I. punctatus	64	3					49				41			1	9				A	
	Notropis atherinoides	87	4																	A	
	N. hudsonius	72	3									11								A	
	N. hudsonius	76	4				1		1			18				2				A	A
	N. hudsonius	83	4													1				A	
	N. hudsonius	85	5									3								A	
	N. hudsonius	98	7						1												
	N. hudsonius	100	8				1					1								A	A
	N. hudsonius	101	8																	A	A
	N. hudsonius	103	10																	A	
	N. hudsonius	109	11			3	1					1								A	C
	Perca flavescens	159	50					1			1	5	1			2				A	B
	Percina caprodes	70	3																	A	
October	Alosa pseudoharengus	113	14																	A	
	A. pseudoharengus	118	15																	A	
	A. pseudoharengus	119	15																	A	
	A. pseudoharengus	120	16																	A	
	Aplodinotus grunniens	52	2																		
	A. grunniens	116	14																	A	
	Etheostoma nigrum	37	1									3									
	Morone chrysops	83	7																	A	
	M. chrysops	95	10																	A	

TABLE 35 CON'T.

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items I																	
				Oligochaeta	Cladocera	Alona sp.	Bosmina sp.	Bosmina longirostris	Chydorus sphaericus	Daphnia galeata	D. retrocurva	Diaphanosoma sp.	Eubosmina coregoni	Leptodora kindtii	Copepoda	Calanoid	Cyclopoid	Gammarus sp.	Hydracarina	Insecta	Baetidae
	Notropis atherinoides	52	1						147	1	13		96								
	N. atherinoides	56	1						12		8		15				1				
	N. atherinoides	61	2						101	1	24	1	193				1				
	N. atherinoides	65	2						84		27		145								
	N. atherinoides	75	3						176	3	22		201				2				
	N. atherinoides	82	4						41		23		73								
	N. atherinoides	86	5						7	4	163		10	1			1				
	N. atherinoides	87	5						125	1	103		251								
	N. atherinoides	94	7						1	4	65		5	1							
	N. atherinoides	98	7						103	10	44		125			1	2				
	N. hudsonius	80	5								1		2								
	N. hudsonius	103	12						3		77		10				1				
	Perca flavescens	226	120																		
	Pomoxis annularis	78	5						11	10	290		38	19		2	34				
November	Notropis atherinoides	47	1					1					3								
	N. atherinoides	48	1					3	5		5		5				1				
	N. atherinoides	57	1					1					2								
	N. atherinoides	61	2					1	5		4		29				1				
	N. atherinoides	65	2					2	10		6		68				1				
	N. atherinoides	77	4																		
	N. atherinoides	81	3																		
	N. atherinoides	82	4																		
	N. atherinoides	85	5																		
	N. atherinoides	87	4					3	2		2		43				3				

TABLE 35 (CON'T.)

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items II: Diptera	Chironomidae larvae	Chironominae	*Chironomus* sp.	*Cryptochironomus* sp.	*Glyptotendipes* sp.	*Parachironomus* sp.	*Polypedilum* sp.	*Rheotanytarsus* sp.	*Xenochironomus* sp.	Tanypodinae	*Procladius* sp.	Chironomidae pupae	Trichoptera larvae	Fish	*Notropis* sp.	Animal debris*	Plant debris*
	Notropis atherinoides	52	1																	A	
	N. atherinoides	56	1																		
	N. atherinoides	61	2																	A	
	N. atherinoides	65	2																	A	
	N. atherinoides	75	3																	A	
	N. atherinoides	82	4																	A	
	N. atherinoides	86	5																	A	
	N. atherinoides	87	5																	A	
	N. atherinoides	94	7																	A	
	N. atherinoides	98	7																	A	
	N. hudsonius	80	5																	A	
	N. hudsonius	103	12																	A	
	Perca flavescens	226	120																1	B	
	Pomoxis annularis	78	5																	A	
November	*Notropis atherinoides*	47	1																		
	N. atherinoides	48	1																	A	
	N. atherinoides	57	1																		
	N. atherinoides	61	2																	A	
	N. atherinoides	65	2																	A	
	N. atherinoides	77	4																		
	N. atherinoides	81	3																		
	N. atherinoides	82	4																		
	N. atherinoides	85	5																		
	N. atherinoides	87	4																	A	

TABLE 35 CON'T.

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items I																	
				Oligochaeta	Cladocera	*Alona* sp.	*Bosmina* sp.	*Bosmina longirostris*	*Chydorus sphaericus*	*Daphnia galeata*	*D. retrocurva*	*Diaphanosoma* sp.	*Eubosmina coregoni*	*Leptodora kindtii*	Copepoda	Calanoid	Cyclopoid	*Gammarus* sp.	Hydracarina	Insecta	Baetidae
	Notropis atherinoides	89	5					2					9				1				
	N. atherinoides	93	6														1				
	Perca flavescens	198	90														5	4			1
	Percina caprodes	70	3																		

TABLE 35 CON'T.

STOMACH ANALYSIS OF FISH COLLECTED AT LOCUST POINT*
JULY - NOVEMBER 1975

Month	Species	Length (mm)	Weight (g)	Food Items II																	
				Diptera	Chironomidae larvae	Chironominae	Chironomus sp.	Cryptochironomus sp.	Glyptotendipes sp.	Parachironomus sp.	Polypedilum sp.	Rheotanytarsus sp.	Xenochironomus sp.	Tanypodinae	Procladius sp.	Chironomidae pupae	Trichoptera larvae	Fish	Notropis sp.	Animal debris*	Plant debris*
	Notropis atherinoides	89	5																	A	
	N. atherinoides	93	6																		
	Perca flavescens	198	90																		
	Percina caprodes	70	3									1									

* Letters used under headings "animal debris" and "plant debris" denote the relative abundance of the debris:
A = slight amount
B = moderate amount
C = plentiful amount

Numbers used under all other headings denote the actual number of organisms contained within the stomach.

APPENDIX D

MULTIPLE REGRESSIONS WITH PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS FROM 1974 AND 1975 AS DEPENDENT VARIABLES AND WATER QUALITY PARAMETERS AS INDEPENDENT VARIABLES

TABLE 36

MULTIPLE REGRESSION OF PHYTOPLANKTON POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	209099718492	16084593730	3.91	0.0007	0.579	119.3	53752	64126
Error	37	152151607077	4112205597						
Corrected Total	50	361251325569							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	24492570291	5.96	0.0196
Turbidity	1	2012538199	0.49	0.4886
Transparency	1	64361778855	15.65	0.0003
Station	2	16126133138	1.96	0.1533
Date	8	108686292042	3.30	0.0062

INDEPENDENT VARIABLE	B VALUES
Intercept	195989
Temperature	-19153
Turbidity	468
Transparency	314919
Station 1	19295
Station 8	-26792
Station 12 or 13	7497
April (1)	-98183
May (2)	51302
June (3)	59698
July (4)	79098
August (5)	231953
September (6)	22296
October (7)	-65764
November (8)	-116323
December (9)	-164077

TABLE 37

MULTIPLE REGRESSION OF PHYTOPLANKTON POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH STATION NUMBER, DATE, AND SEVERAL PHYSICAL AND CHEMICAL WATER QUALITY PARAMETERS

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	17	270983945765	15940232104	5.83	0.0001	0.750	97.3	53752	52301
Error	33	90267379804	2735375146						
Corrected Total	50	361251325569							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	4715352799	1.72	0.1983
Turbidity	1	6771901891	2.48	0.1252
Transparency	1	40612659468	14.85	0.0005
Station	2	16614329595	3.04	0.0601
Date	8	71378912551	3.26	0.0077
Alkalinity	1	31381095990	11.47	0.0018
Phosphorus	1	5991264167	2.19	0.1484
Nitrate	1	32732683007	11.97	0.0015
Silica	1	3022327531	1.10	0.3008

INDEPENDENT VARIABLE	B VALUES
Intercept	879952
Temperature	-17703
Turbidity	2608
Transparency	305302
Station 1	15158
Station 8	-28522
Station 12 or 13	13364
April (1)	-140396
May (2)	14184
June (3)	97029
July (4)	122594
August (5)	272745
September (6)	57335
October (7)	-69048
November (8)	-129585
December (9)	-224858
Alkalinity	-8607
Phosphorus	394554
Nitrate	23842
Silica	-45565

TABLE 38

MULTIPLE REGRESSION OF BACILLARIOPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	46559061867	3581466297	6.38	0.0001	0.692	103.1	22977	23685
Error	37	20756914609	560997692						
Corrected Total	50	67315976476							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	5407060104	9.64	0.0036
Turbidity	1	2988170636	5.33	0.0267
Transparency	1	663489148	1.18	0.2838
Station	2	515471488	0.46	0.6407
Date	8	24290751037	5.41	0.0003

INDEPENDENT VARIABLE	B VALUES
Intercept	194039
Temperature	-8999
Turbidity	-570
Transparency	-31974
Station 1	1636
Station 8	-4709
Station 12 or 13	3073
April (1)	-28735
May (2)	44966
June (3)	12615
July (4)	45062
August (5)	55344
September (6)	11412
October (7)	-34710
November (8)	-70538
December (9)	-35416

TABLE 39

MULTIPLE REGRESSION OF BACILLARIOPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH STATION NUMBER, DATE, AND SEVERAL PHYSICAL AND CHEMICAL WATER QUALITY PARAMETERS

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	17	59794647002	3517332177	15.43	0.0001	0.888	65.7	22977	15097
Error	33	7521329474	227919075						
Corrected Total	50	67315976476							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	221265896	0.97	0.3316
Turbidity	1	1039963869	4.56	0.0402
Transparency	1	105449678	0.46	0.5011
Station	2	254002352	0.56	0.5832
Date	8	10317235288	5.66	0.0003
Alkalinity	1	732437452	3.21	0.0822
Phosphorus	1	3017362866	13.24	0.0009
Nitrate	1	1262095575	5.54	0.0247
Silica	1	4102245672	18.00	0.0002

INDEPENDENT VARIABLE	B VALUES
Intercept	192572
Temperature	-3835
Turbidity	1022
Transparency	-15557
Station 1	-826
Station 8	-2360
Station 12 or 13	3186
April (1)	10409
May (2)	-8876
June (3)	3266
July (4)	45434
August (5)	32387
September (6)	12489
October (7)	-21896
November (8)	-49720
December (9)	-23493
Alkalinity	-1315
Phosphorus	280002
Nitrate	4681
Silica	-53085

TABLE 40

MULTIPLE REGRESSION OF CHLOROPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	978750822	75288525	2.47	0.0155	0.465	106.5	5183	5518
Error	37	1126756406	30452876						
Corrected Total	50	2105507228							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	12040425	0.40	0.5333
Turbidity	1	44710404	1.47	0.2333
Transparency	1	19162339	0.63	0.4328
Station	2	51665178	0.85	0.5604
Date	8	592748848	2.43	0.0316

INDEPENDENT VARIABLE	B VALUES
Intercept	2509
Temperature	425
Turbidity	-70
Transparency	-5432
Station 1	1529
Station 8	-781
Station 12 or 13	-748
April (1)	227
May (2)	-4787
June (3)	-2233
July (4)	-6245
August (5)	-4944
September (6)	-355
October (7)	6072
November (8)	9928
December (9)	2337

TABLE 41

MULTIPLE REGRESSION OF CHLOROPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH STATION NUMBER, DATE, AND SEVERAL PHYSICAL AND CHEMICAL WATER QUALITY PARAMETERS

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	17	1508316677	88724510	4.90	0.0001	0.716	82.1	5183	4254
Error	33	597190550	18096683						
Corrected Total	50	2105507228							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	20632887	1.14	0.2934
Turbidity	1	43414325	2.40	0.1309
Transparency	1	12918624	0.71	0.4042
Station	2	62680953	1.73	0.1911
Date	8	613860202	4.24	0.0017
Alkalinity	1	105740770	5.84	0.0213
Phosphorus	1	877586	0.05	0.8271
Nitrate	1	332673391	18.38	0.0001
Silica	1	81130499	4.48	0.0419

INDEPENDENT VARIABLE	B VALUES
Intercept	68591
Temperature	-1171
Turbidity	-209
Transparency	-5445
Station 1	1778
Station 8	-1518
Station 12 or 13	-260
April (1)	-16641
May (2)	1202
June (3)	7909
July (4)	3703
August (5)	11413
September (6)	6487
October (7)	-1042
November (8)	671
December (9)	-13702
Alkalinity	-500
Phosphorus	-4775
Nitrate	2404
Silica	7465

TABLE 42

MULTIPLE REGRESSION OF MYXOPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT. VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	224030448482	17233111422	5.92	0.0001	0.675	214.1	25199	53951
Error	37	107696370596	2910712719						
Corrected Total	50	331726819078							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	7319803496	2.51	0.1213
Turbidity	1	11209435693	3.85	0.0573
Transparency	1	80001921326	27.49	0.0001
Station	2	10241451982	1.76	0.1846
Date	8	76637302917	3.29	0.0064

INDEPENDENT VARIABLE	B VALUES
Intercept	-1959
Temperature	-10470
Turbidity	1105
Transparency	351104
Station 1	16078
Station 8	-21136
Station 12 or 13	5058
April (1)	-68800
May (2)	11227
June (3)	49116
July (4)	36910
August (5)	180505
September (6)	12283
October (7)	36802
November (8)	54966
December (9)	-313009

TABLE 43

MULTIPLE REGRESSION OF MYXOPHYCEAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH STATION NUMBER, DATE, AND SEVERAL PHYSICAL AND CHEMICAL WATER QUALITY PARAMETERS

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	17	253720170695	14924715923	6.31	0.0001	0.765	192.9	25199	48619
Error	33	78006648383	2363837830						
Corrected Total	50	331726819078							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	2491117630	1.05	0.3121
Turbidity	1	3278717152	1.39	0.2473
Transparency	1	45865598832	19.40	0.0001
Station	2	12130160318	2.57	0.0904
Date	8	67985766607	3.60	0.0044
Alkalinity	1	20002388078	8.46	0.0064
Phosphorus	1	525469706	0.22	0.6404
Nitrate	1	16770330814	7.09	0.0119
Silica	1	65821	0.00	0.9958

INDEPENDENT VARIABLE	B VALUES
Intercept	628408
Temperature	-12867
Turbidity	1814
Transparency	324446
Station 1	14050
Station 8	-24492
Station 12 or 13	10442
April (1)	-136232
May (2)	23014
June (3)	87333
July (4)	72998
August (5)	231120
September (6)	41076
October (7)	-47067
November (8)	-81861
December (9)	-190381
Alkalinity	-6872
Phosphorus	116848
Nitrate	17066
Silica	-213

TABLE 44

MULTIPLE REGRESSION OF ZOOPLANKTON POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	10013418	770263	13.75	0.0001	0.829	39.2	604	237
Error	37	2072429	56012						
Corrected Total	50	12035847							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	370590	6.62	0.0143
Turbidity	1	26686	0.48	0.4943
Transparency	1	50523	0.90	0.3484
Station	2	794217	7.09	0.0028
Date	8	5017680	11.20	0.0001

INDEPENDENT VARIABLE	B VALUES
Intercept	-662
Temperature	74
Turbidity	-2
Transparency	279
Station 1	186
Station 8	-138
Station 12 or 13	-48
April (1)	232
May (2)	-104
June (3)	500
July (4)	-106
August (5)	-884
September (6)	-390
October (7)	-19
November (8)	165
December (9)	606

TABLE 45

MULTIPLE REGRESSION OF ROTIFER POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	1547476	119037	4.13	0.0005	0.592	68.1	249	170
Error	37	1065936	28809						
Corrected Total	50	2613412							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	2331	0.03	0.7777
Turbidity	1	11426	0.40	0.5327
Transparency	1	453	0.02	0.9009
Station	2	315811	5.48	0.0083
Date	8	561007	2.43	0.0315

INDEPENDENT VARIABLE	B VALUES
Intercept	354
Temperature	-6
Turbidity	-1
Transparency	26
Station 1	113
Station 8	-99
Station 12 or 13	-14
April (1)	-166
May (2)	-42
June (3)	19
July (4)	371
August (5)	109
September (6)	63
October (7)	-190
November (8)	-116
December (9)	-48

TABLE 46

MULTIPLE REGRESSION OF COPEPOD POPULATIONS AT LOCUST POINT DURING 1974 AND 1975
WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	839608	64585	6.05	0.0001	0.680	68.2	151	103
Error	37	394661	10667						
Corrected Total	50	1234269							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	1429	0.13	0.7164
Turbidity	1	590	0.06	0.8154
Transparency	1	9641	0.90	0.3479
Station	2	10368	0.49	0.6244
Date	8	485123	5.69	0.0002

INDEPENDENT VARIABLE	B VALUES
Intercept	136
Temperature	5
Turbidity	-0
Transparency	-122
Station 1	22
Station 8	-11
Station 12 or 13	-11
April (1)	-98
May (2)	111
June (3)	247
July (4)	62
August (5)	-88
September (6)	-57
October (7)	-54
November (8)	-73
December (9)	-50

TABLE 47

MULTIPLE REGRESSION OF CLADOCERAN POPULATIONS AT LOCUST POINT DURING 1974 AND 1975 WITH 3 PHYSICAL WATER QUALITY PARAMETERS, STATION NUMBER, AND DATE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F	R-SQUARE	COEFFICIENT OF VARIATION(%)	MEAN OF DEPENDENT VARIABLE	STANDARD DEVIATION OF DEPENDENT VARIABLE
Regression	13	282761	21751	5.34	0.0001	0.652	71.0	90	64
Error	37	150804	4076						
Corrected Total	50	433565							

INDEPENDENT VARIABLE	DEGREES OF FREEDOM	PARTIAL SUM OF SQUARES	F VALUE	PROB>F
Temperature	1	57592	14.13	0.0006
Turbidity	1	1342	0.33	0.5696
Transparency	1	87	0.02	0.8848
Station	2	2841	0.35	0.7129
Date	8	207913	6.38	0.0001

INDEPENDENT VARIABLE	B VALUES
Intercept	-357
Temperature	29
Turbidity	-0
Transparency	-12
Station 1	8
Station 8	-11
Station 12 or 13	3
April (1)	154
May (2)	-21
June (3)	-37
July (4)	-172
August (5)	-324
September (6)	-150
October (7)	157
November (8)	134
December (9)	259

APPENDIX E

LAKE ERIE WATER QUALITY ANALYSES AT THE DAVIS-BESSE NUCLEAR POWER STATION DURING 1975

TABLE 48

LAKE ERIE WATER QUALITY ANALYSES FOR APRIL 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 4-22-75
Laboratory 4-23-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (^{o}C)	8.0	7.5	6.0	6.0	8.0	7.5	6.0-8.0	7.2	0.9
Dissolved Oxygen (ppm)	11.8	11.8	12.2	11.9	12.2	12.2	11.8-12.2	12.0	0.2
Conductivity (umhos/cm)	270	270	270	280	270	270	270-280	272	4
Transparency (m)	0.3		0.5		0.3		0.3-0.5	0.4	0.1
Depth (m)		1.8		4.3		3.1	1.8-4.3	3.1	1.3
Laboratory Determinations:									
Calcium (mg/l)	32.8	33.6	33.6	32.8	33.6	33.6	32.8-33.6	33.3	0.41
Magnesium (mg/l)	7.68	7.20	7.20	7.68	7.20	7.20	7.68-7.20	7.36	0.25
Sodium (mg/l)	8.9	8.9	9.2	9.2	8.9	8.9	8.9-9.2	9.0	0.15
Chloride (mg/l)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	0.0
Nitrate (mg/l)	2.44	2.44	2.44	2.76	1.81	2.44	1.81-2.76	2.39	0.31
Sulfate (mg/l)	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	0.00
Phosphorus (mg/l)	0.05	0.05	0.04	0.06	0.05	0.04	0.04-0.06	0.05	0.01
Silica (mg/l)	0.26	0.26	0.55	0.47	0.06	0.06	0.06-0.55	0.28	0.20
Total Alkalinity (mg/l)	84	86	87	88	89	87	84-89	87	2.0
B.O.D. (mg/l)	4	4	2	3	3	3	2-4	3	1.0
Suspended Solids (mg/l)	41	31	18	17	36	31	17-41	29	10
Dissolved Solids (mg/l)	168	172	158	158	148	182	148-182	164	12.0
Turbidity (F.T.U.)	28	25	13	12	25	24	12-28	21	7.0
pH	8.1	8.3	7.8	8.0	7.8	7.8	7.8-8.3	8.0	0.2
Conductivity (umhos/cm)	282	279	293	287	276	279	276-293	282	

TABLE 49

LAKE ERIE WATER QUALITY ANALYSES FOR MAY 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 5-29-75
Laboratory 5-30-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	20.0	20.0	20.5	20.0	21.0	20.0	20.0-21.0	20.3	0.4
Dissolved Oxygen (ppm)	8.8	8.6	7.4	7.2	9.0	8.6	7.2-9.0	8.3	0.8
Conductivity (umhos/cm)	320	320	300	300	310	315	300-320	311	9
Transparency (m)	0.4		0.6		0.6		0.4-0.6	0.5	0.1
Depth (m)		2.0		3.2		3.2	2.0-3.2	2.8	0.7
Laboratory Determinations:									
Calcium (mg/l)	46.0	44.4	38.0	38.0	38.8	38.8	38.0-46.0	40.7	3.6
Magnesium (mg/l)	6.5	7.4	9.1	9.4	9.8	10.3	6.5-10.3	8.8	1.5
Sodium (mg/l)	10.7	10.7	10.1	10.1	10.1	10.1	10.1-10.7	10.3	0.3
Chloride (mg/l)	20.5	20.5	18.5	19.0	20.0	20.0	18.5-20.5	19.8	0.8
Nitrate (mg/l)	5.1	5.8	4.4	5.8	5.8	6.5	4.4-6.5	5.6	0.7
Sulfate (mg/l)	30.0	30.0	22.5	25.0	25.0	30.0	22.5-30.0	27.0	3.3
Phosphorus (mg/l)	0.07	0.05	0.04	0.06	0.04	0.03	0.03-0.07	0.05	0.01
Silica (mg/l)	0.25	0.27	0.23	0.23	0.29	0.29	0.23-0.29	0.26	0.03
Total Alkalinity (mg/l)	103	105	103	101	102	104	101-105	103	1
B.O.D. (mg/l)	3	3	1	1	2	3	1-3	2	1
Suspended Solids (mg/l)	41	50	18	26	17	34	17-50	31	13.0
Dissolved Solids (mg/l)	236	234	234	230	226	232	226-236	232	4
Turbidity (F.T.U.)	28	32	16	18	16	18	16-32	21	7
pH	8.20	7.78	7.72	7.80	8.25	7.82	7.72-8.25	7.93	0.23
Conductivity (umhos/cm)	327	330	315	313	318	327	313-327	322	7

TABLE 50

LAKE ERIE WATER QUALITY ANALYSES FOR JUNE 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 6-16-75
Laboratory 6-17-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (^{o}C)	22.2	22.2	20.6	20.6	21.1	20.6	20.6-22.2	21.2	0.8
Dissolved Oxygen (ppm)			10.4	10.2	10.2	10.1	10.1-10.4	10.2	0.1
Conductivity (umhos/cm)	280	280	280	275	280	280	275-280	279	2
Transparency (m)	0.4		0.6		0.5		0.4-0.6	0.5	0.1
Depth (m)		1.7		4.1		3.1	1.7-4.1	3.0	1.2
Laboratory Determinations:									
Calcium (mg/l)	37.2	37.2	36.0	36.8	36.4	36.0	36.0-37.2	36.6	0.5
Magnesium (mg/l)	7.0	7.4	7.7	7.9	8.2	8.2	7.0-8.2	7.7	0.5
Sodium (mg/l)	8.9	8.4	8.4	8.4	8.4	8.0	8.0-8.9	8.4	0.3
Chloride (mg/l)	17.0	16.8	16.5	16.5	17.3	16.8	16.5-17.3	16.8	0.3
Nitrate (mg/l)	2.1	2.1	1.2	1.5	2.1	2.1	1.2-2.1	1.9	0.4
Sulfate (mg/l)	25.0	24.5	25.5	25.0	26.0	26.0	24.5-26.0	25.3	0.6
Phosphorus (mg/l)	0.02	0.01	0.02	0.01	0.01	0.01	0.01-0.02	0.01	0.01
Silica (mg/l)	0.25	0.18	0.16	0.30	0.20	0.16	0.16-0.30	0.21	0.06
Total Alkalinity (mg/l)	93	94	92	91	95	95	91-95	93	2.0
B.O.D. (mg/l)	3	5	3	3	3	3	3-5	3	1.0
Suspended Solids (mg/l)	13	13	9	9	8	7	7-13	10	3.0
Dissolved Solids (mg/l)	166	186	164	162	156	166	156-186	167	10
Turbidity (F.T.U.)	16	25	18	20	10	7	7-25	16	7
pH	8.85	8.75	8.80	8.62	8.85	8.60	8.60-8.85	8.75	0.11
Conductivity (umhos/cm)	280	284	282	286	288	286	282-288	284	3

TABLE 51

LAKE ERIE WATER QUALITY ANALYSES FOR JULY 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 7-14-75
Laboratory 7-15-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	23.0	23.0	23.0	22.5	23.0	22.5	22.5-23.0	22.8	0.3
Dissolved Oxygen (ppm)	9.4	8.9	8.9	8.9	8.8	8.4	8.4-9.4	8.9	0.3
Conductivity (umhos/cm)	280	280	280	280	280	280	280	280	0
Transparency (m)	0.83		0.84		0.82		0.82-0.84	0.83	0.01
Depth (m)		2.25		4.75		3.25	2.25-4.75	3.42	1.26
Laboratory Determinations:									
Calcium (mg/l)	32.0	32.0	32.4	32.0	32.0	32.0	32.0-32.4	32.1	0.2
Magnesium (mg/l)	8.4	8.6	8.9	9.4	9.4	9.4	8.4-9.4	9.0	0.5
Sodium (mg/l)	7.1	7.1	7.0	7.0	6.8	7.0	6.8-7.1	7.0	0.1
Chloride (mg/l)	17.0	17.5	17.0	17.0	17.0	17.0	17.0-17.5	17.1	0.2
Nitrate (mg/l)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulfate (mg/l)	20.5	18.0	18.0	20.5	18.0	19.0	18.0-20.5	19.0	1.2
Phosphorus (mg/l)	0.02	0.02	0.03	0.02	0.02	0.03	0.02-0.03	0.02	0.01
Silica (mg/l)	0.61	0.63	0.63	0.55	0.63	0.61	0.55-0.63	0.61	0.03
Total Alkalinity (mg/l)	87	87	89	88	87	89	87-89	88	1
B.O.D. (mg/l)	3	3	2	3	2	3	2-3	3	1
Suspended Solids (mg/l)	28	28	22	24	23	22	22-28	25	3
Dissolved Solids (mg/l)	126	122	120	136	130	136	120-136	128	7
Turbidity (F.T.U.)	3.1	4.0	4.0	3.5	4.3	4.5	3.1-4.5	3.9	0.5
pH	8.92	8.20	8.80	9.00	8.85	8.70	8.20-9.00	8.75	0.29
Conductivity (umhos/cm)	273	275	266	260	272	274	260-275	270	6

TABLE 52

LAKE ERIE WATER QUALITY ANALYSES FOR AUGUST 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 8-11-75
Laboratory 8-12-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	24.5	24.0	24.5	24.0	24.5	24.0	24.0-24.5	24.3	0.3
Dissolved Oxygen (ppm)	9.2	8.8	9.8	9.1	9.8	9.3	8.8-9.8	9.3	0.4
Conductivity (umhos/cm)	215	215	215	220	220	220	215-220	218	3
Transparency (m)	0.6		1.0		1.0		0.6-1.0	0.9	0.2
Depth (m)		2.0		4.0		3.5	2.0-4.0	3.2	1.0
Laboratory Determinations:									
Calcium (mg/l)	30.4	30.0	29.2	29.2	30.0	29.6	29.2-30.4	29.7	0.5
Magnesium (mg/l)	7.9	7.9	8.4	7.7	8.2	7.0	7.0-8.4	7.9	0.5
Sodium (mg/l)	7.4	7.1	6.4	6.4	7.1	7.1	6.4-7.4	6.9	0.4
Chloride (mg/l)	15.5	13.8	13.5	13.5	14.0	13.5	13.5-15.5	14.0	0.8
Nitrate (mg/l)	0.29	0.59	0.00	0.00	0.89	0.59	0.00-0.89	0.39	0.36
Sulfate (mg/l)	26.5	22.0	22.5	18.5	22.5	19.5	18.5-26.5	21.9	2.8
Phosphorus (mg/l)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Silica (mg/l)	0.13	0.13	0.12	0.13	0.07	0.10	0.07-0.13	0.11	0.02
Total Alkalinity (mg/l)	84	85	83	84	85	86	83-86	85	1
B.O.D. (mg/l)	4	3	2	3	3	2	2-4	3	1
Suspended Solids (mg/l)	11	13	6	8	11	11	6-13	10	3
Dissolved Solids (mg/l)	184	154	162	156	148	150	148-184	159	13
Turbidity (F.T.U.)	3	2	2	2	2	2	2-3	2	0.4
pH	8.75	8.65	9.08	8.90	8.90	8.70	8.65-9.08	8.83	0.16
Conductivity (umhos/cm)	195	240	235	233	250	245	195-250	233	20

TABLE 53

LAKE ERIE WATER QUALITY ANALYSES FOR SEPTEMBER 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 9-8-75
Laboratory 9-9-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	0.0
Dissolved Oxygen (ppm)	9.4	9.4	9.8	9.3	9.6	9.3	9.3-9.6	9.5	0.2
Conductivity (umhos/cm)	235	235	230	235	240	240	230-240	236	4
Transparency (m)	0.5		0.7		0.5		0.5-0.7	0.6	0.1
Depth (m)		2.0		4.0		3.4	2.0-4.0	3.1	1.0
Laboratory Determinations:									
Calcium (mg/l)	32.8	32.8	34.4	33.6	32.0	32.0	32.0-34.4	32.9	0.9
Magnesium (mg/l)	7.2	7.7	7.2	7.0	8.6	7.7	7.0-8.6	7.6	0.6
Sodium (mg/l)	10.0	8.4	8.9	9.2	9.6	8.4	8.4-10.0	9.1	0.7
Chloride (mg/l)	16.5	15.5	15.0	17.0	16.5	14.5	14.5-17.0	15.8	1.0
Nitrate (mg/l)	3.1	3.5	1.3	2.7	2.2	2.7	1.3-3.5	2.6	0.8
Sulfate (mg/l)	17.0	19.0	19.0	20.0	19.0	17.0	17.0-20.0	18.5	1.2
Phosphorus (mg/l)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Silica (mg/l)	0.61	0.60	0.57	0.71	0.66	0.59	0.57-0.71	0.62	0.05
Total Alkalinity (mg/l)	88	90	88	89	87	88	87-90	88	1
B.O.D. (mg/l)	3	3	2	2	3	3	2-3	3	0.5
Suspended Solids (mg/l)	14	19	13	15	20	27	13-27	18	5
Dissolved Solids (mg/l)	152	142	134	128	136	140	128-152	139	8
Turbidity (F.T.U.)	12	14	10	13	15	16	10-16	13	2
pH	8.4	8.4	8.5	8.6	8.4	8.5	8.4-8.6	8.5	0.1
Conductivity (umhos/cm)	215	217	214	217	220	215	214-220	216	2

TABLE 54

LAKE ERIE WATER QUALITY ANALYSES FOR OCTOBER 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 10-6-75
Laboratory 10-7-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	13.0	13.0	14.0	13.0	14.0	13.0	13.0-14.0	13.3	0.5
Dissolved Oxygen (ppm)	11.1	10.8	10.7	10.0	10.8	10.4	10.0-11.1	10.6	0.4
Conductivity (umhos/cm)	320	320	280	280	295	310	280-310	301	19
Transparency (m)	0.3		0.5		0.4		0.3-0.5	0.4	0.1
Depth (m)		2.0		4.0		3.1	2.0-4.0	3.0	1.0
Laboratory Determinations:									
Calcium (mg/l)	40.8	42.0	38.0	37.2	40.0	41.2	37.2-42.0	39.9	1.9
Magnesium (mg/l)	10.6	10.8	8.4	8.9	8.9	7.9	7.9-10.8	9.3	1.2
Sodium (mg/l)	14.4	14.4	14.4	12.2	13.0	13.0	12.2-14.4	13.6	1.0
Chloride (mg/l)	22.5	22.5	19.3	18.8	21.0	21.0	18.8-22.5	20.9	1.6
Nitrate (mg/l)	8.4	8.4	7.3	8.0	6.9	7.7	6.9-8.4	7.8	0.6
Sulfate (mg/l)	39.5	39.5	30.0	27.0	31.0	30.5	27.0-39.5	32.9	5.3
Phosphorus (mg/l)	0.03	0.03	0.02	0.03	0.03	0.03	0.02-0.03	0.03	0.004
Silica (mg/l)	0.30	0.19	0.19	0.19	0.23	0.19	0.19-0.30	0.22	0.04
Total Alkalinity (mg/l)	105	109	101	97	101	111	97-111	104	5
B.O.D. (mg/l)	3	4	2	2	2	3	2-4	3	1
Suspended Solids (mg/l)	35	30	14	13	17	18	13-35	21	9
Dissolved Solids (mg/l)	200	198	164	158	170	176	164-200	178	18
Turbidity (F.T.U.)	32	31	16	18	23	22	16-32	24	7
pH	8.6	8.7	8.4	8.2	8.4	8.4	8.2-8.7	8.5	0.2
Conductivity (umhos/cm)	322	349	312	298	312	324	298-349	320	17

TABLE 55

LAKE ERIE WATER QUALITY ANALYSES FOR NOVEMBER 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 11-3-75
Laboratory 11-4-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (^{o}C)	10.5	10.5	10.0	10.0	10.5	10.5	10.0–10.5	10.3	0.3
Dissolved Oxygen (ppm)	11.8	11.8	11.8	11.5	11.8	11.7	11.5–11.8	11.7	0.1
Conductivity (umhos/cm)	260	260	260	260	260	260	260	260	0.0
Transparency (m)	0.40		0.50		0.45		0.40–0.50	0.45	0.05
Depth (m)		2.0		4.0		3.1	2.0–4.0	3.0	1.0
Laboratory Determinations:									
Calcium (mg/l)	36.0	35.2	38.4	37.6	36.8	33.6	33.6–38.4	36.3	1.7
Magnesium (mg/l)	6.5	7.0	4.3	5.0	5.3	7.2	4.3–7.2	5.9	1.2
Sodium (mg/l)	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.0
Chloride (mg/l)	16.5	16.5	16.8	16.5	16.0	16.0	16.0–16.8	16.4	0.3
Nitrate (mg/l)	2.1	2.1	2.4	1.8	2.1	3.1	1.8–3.1	2.3	0.5
Sulfate (mg/l)	22.0	23.5	22.0	20.5	20.5	20.5	20.5–23.5	21.5	1.2
Phosphorus (mg/l)	0.04	0.02	0.02	0.03	0.02	0.03	0.02–0.04	0.03	0.01
Silica (mg/l)	0.20	0.19	0.13	0.12	0.13	0.12	0.12–0.20	0.15	0.04
Total Alkalinity (mg/l)	95	94	92	94	97	95	92–97	95	2
B.O.D. (mg/l)	1	1	1	1	1	2	1–2	1	0.4
Suspended Solids (mg/l)	20	19	11	11	21	23	11–23	18	5
Dissolved Solids (mg/l)	176	170	162	174	178	184	162–184	174	7
Turbidity (F.T.U.)	36	44	18	36	29	33	18–44	33	9
pH	8.2	8.0	7.7	7.6	7.7	7.7	7.7–8.2	7.8	0.2
Conductivity (umhos/cm)	300	302	307	300	305	306	300–307	303	3

TABLE 56

LAKE ERIE WATER QUALITY ANALYSES FOR DECEMBER 1975
AT THE DAVIS-BESSE NUCLEAR POWER STATION

Dates:
Field 12-16-75
Laboratory 12-17-75

Parameters	Station No. 1		Station No. 8		Station No. 13		Range	Mean	Standard Deviation
	Surface	Bottom	Surface	Bottom	Surface	Bottom			
Field Measurements:									
Temperature (°C)	4.5	4.5	4.5	4.5	4.5	4.5	–	4.5	0
Dissolved Oxygen (ppm)	13.6	13.6	13.6	11.4	13.4	10.2	10.2–13.6	12.6	1.5
Conductivity (umhos/cm)	260	265	240	250	260	250	240–265	254	9.2
Transparency (m)	0.3		0.4		0.4		0.3–0.4	0.4	0.1
Depth (m)		1.9		4.0		3.3	1.9–4.0	3.1	1.1
Laboratory Determinations:									
Calcium (mg/l)	35.2	35.2	34.0	34.0	33.6	35.2	33.6–35.2	34.5	0.7
Magnesium (mg/l)	8.2	7.9	8.2	8.4	8.9	7.9	7.9–8.9	8.3	0.4
Sodium (mg/l)	10.4	10.1	9.3	9.3	9.3	10.7	9.3–10.7	9.9	0.6
Chloride (mg/l)	15.8	16.3	15.8	15.8	16.3	16.3	15.8–16.3	16.1	0.3
Nitrate (mg/l)	5.1	5.5	3.7	2.4	2.8	3.7	2.4–5.5	3.9	1.2
Sulfate (mg/l)	28.5	27.0	27.5	28.5	27.5	27.0	27.0–28.5	27.7	0.7
Phosphorus (mg/l)	0.02	0.01	0.01	0.01	0.01	0.02	0.01–0.02	0.01	0.01
Silica (mg/l)	0.25	0.24	0.25	0.19	0.19	0.16	0.16–0.25	0.21	0.04
Total Alkalinity (mg/l)	97	94	93	93	95	95	93–97	95	2
B.O.D. (mg/l)	2	2	2	2	2	1	1–2	1.8	0.4
Suspended Solids (mg/l)	20	19	11	21	29	23	11–29	21	6
Dissolved Solids (mg/l)	150	140	142	140	152	148	140–152	145	5
Turbidity (F.T.U.)	42	57	44	47	35	54	35–57	47	8
pH	7.6	8.0	8.0	8.1	7.8	7.9	7.6–8.1	7.9	0.2
Conductivity (umhos/cm)	285	288	280	297	290	300	280–300	290	7

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