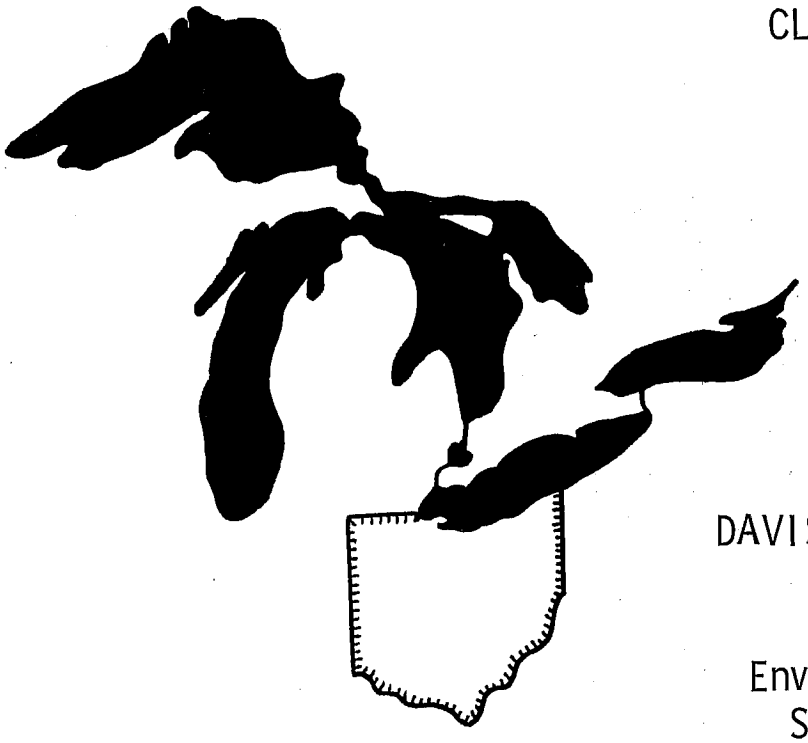
CLEAR TECHNICAL REPORT NO. 210



ICHTHYOPLANKTON STUDIES FROM LAKE ERIE NEAR THE DAVIS-BESSE NUCLEAR POWER STATION DURING 1980

Environmental Technical Specifications Sec. 3.1.2.a.4. Ichthyoplankton

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3.1.2.a.4 Ichthyoplankton

Procedures

Duplicate ichthyoplankton (fish eggs and larvae) samples were collected from the surface and bottom of Stations 3 (control station), 8 (intake), 13 (plume area), 29 (control station), and Toussaint Reef (Figures 1 and 2) using a 0.75 meter diameter heavy-duty oceanographic plankton net (No. 00, 0.75 mm mesh) equipped with a calibrated General Oceanics flow meter. Each sample consisted of a 5-minute circular tow at 3 to 4 knots with this net. Samples were collected on 17 occasions (approximately 10-day intervals or as weather allowed) between 13 April 1980 and 27 August 1980 from the Locust Point vicinity and on 13 occasions at Toussaint Reef. Sampling was terminated after 27 August because no larvae were found in samples collected during the day on 19 and 27 August and during the night on 19 August (see Section 3.1.2.a.5 Fish Egg and Larvae Entrainment). It should be noted that U.S. EPA (Grosse Ile office) terminated their Western Basin sampling on 15 July each year from 1975-1978. Samples were preserved in 5% formalin and returned to the laboratory for sorting and analysis. All specimens were identified and enumerated using the works of Fish (1932), Norden (1961a and b), and Nelson and Cole (1975). Results were reported as the number of individuals per 100 m of water calculated from the volume filtered (flow meter) and the number of individuals within the sample.

Results

Specimens collected during the 1980 field season were placed into 17 taxa (Table 1). Twelve taxa were to the species level, while the remaining 5 consisted of unidentified, unidentified crappie, unidentified shiner, unidentified sucker, and unidentified sunfish. Collections from Toussaint Reef (a spawning area) produced 10 taxa, all of which were found in Locust Point day or night samples (Table 2). Most larval densities at Locust Point were comparable to those observed at Toussaint Reef. However, of the species which were found in concentrations greater than 1.0/100 m^3, emerald shiners and white bass were more abundant at Toussaint Reef, and freshwater drum, gizzard shad and yellow perch were more abundant at Locust Point. The overall ichthyoplankton concentration at Locust Point (216.9/100 m^3) was 2.4 times larger than that observed at Toussaint Reef (90.8/100 m^3). Gizzard shad, freshwater drum, yellow perch, and white bass were the dominant species at Locust Point respresenting 75 percent, 16 percent, 6 percent, and 2 percent, respectively, of the total ichthyoplankton density. At Toussaint Reef, gizzard shad, white bass, freshwater drum, emerald shiner, and yellow perch were the dominant species representing 76 percent, 8 percent, 6 percent, 5 percent and 4 percent, respectively, of the total ichthyoplankton density. No other species, at either location, constituted as much as 1.0 percent of the total concentration.

Stations 3, 13, (plume area), and 29 the inshore stations, exhibited the greatest mean larval densities, 264.16, 272.88, and 209.11/100 m^3, respectively, while Station 8 (intake) yielded the lowest larval densities, 121.54/100 m^3 (Table 1). All 4 stations had greater densities at the surface. Toussaint Reef had much higher larval densities at the bottom than at the surface.

All raw data were recorded and stored at the offices of The Ohio State University's Center for Lake Erie Area Research in Columbus, Ohio. A voucher collection of all samples is also maintained at these offices.

Analysis

Ichthyoplankton populations have shown tremendous variations since 1974. Emerald shiners constituted 81 percent of the 1974 larvae, 1 percent of the 1975 larvae, 60 percent of the 1976 larvae, 3 percent of the 1977 larvae, 14 percent of the 1978 larvae, 3 percent of the 1979 larvae and 0.5 percent of the 1980 larvae. Yellow perch constituted 5 percent of the 1974 larvae, 70 percent of the 1975 larvae, 4 percent of the 1976 larvae, 26 percent of the 1977 larvae, 2 percent of the 1978 larvae, 11 percent of the 1979 larvae and 6 percent of the 1980 larvae. Gizzard shad increased significantly until 1979 reaching 34 percent of the 1976 larvae, 56 percent of the 1977 larvae, 69 percent of the 1978 larvae, and 82 percent of the 1979 larvae. In 1980 gizzard shad fell to 75 percent of the ichthyoplankton density, but in actual numbers of larvae the density of shad increased from 51/100 m^3 in 1979 to 163/100 m^3 in 1980. It is felt that the above described variability is partially due to the fact that we are sampling schooling specimens. Consequently, when the net is drawn through a school the density appears quite high. This is also quite dependent on the seasonal frequency of sampling. For example, if the weather allows more frequent spring sampling but prohibits summer sampling, then spring species such as perch and walleye appear relatively more abundant.

The 1979 ichthyoplankton density (66.79/100 m^3) was 18 percent greater than the 1978 density (56.6/100 m^3) (Reutter, 1980), and the 1980 density was 3.25 times greater than the 1979 density. Walleye densities have varied from 6.1/100 m^3 in 1978 to 0.15/100 m^3 in 1979 to 0.78/100 m^3 in 1980. Perch have increased from 1.2/100 m^3 in 1978 to 7.5/100 m^3 in 1979 to 12.9/100 m^3 in 1980, while gizzard shad densities have increased from 38.9/100 m^3 in 1978 to 54.6/100 m^3 in 1979 to 162.6/100 m^3 in 1980. It appears that 1980 was an extremely successful spawning year for most species.

In 1976, control stations (3 and 29) were established on either side of the intake (Station 8)/discharge (Station 13) complex to determine if unusually large fish larvae populations were occurring due to possible spawning in the rip-rap material around these structures. This does not appear to be occurring to any significant degree as Station 13 (plume area) exhibited densities similar to Station 3 (control) and Station 8 (intake) exhibited the lowest densities. These lower densities observed at Station 8 are probably due to the fact that this station is the farthest from shore and in the deepest water.

In summary, there is no indication of significant spawning occurring at Locust Point. However, the nearshore waters here, as with the rest of the nearshore waters along the south shore of the Western Basin, appear to serve as a nursery ground for larvae and, consequently, support large densities. Furthermore, due to the similarity between test and control stations, there is no indication that the activities of the plant have significantly altered these populations.

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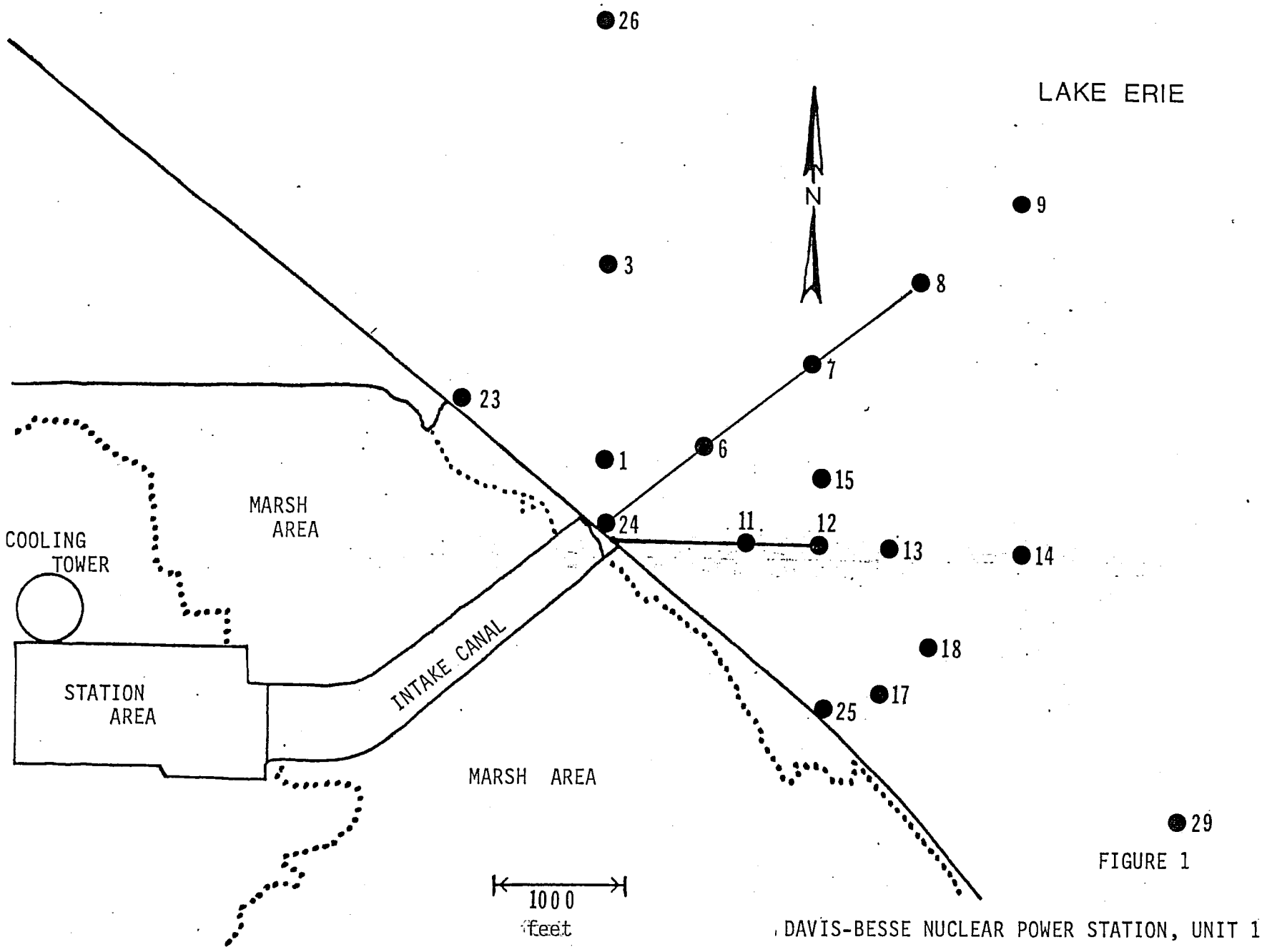

FIGURE 1

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
AQUATIC SAMPLING STATIONS

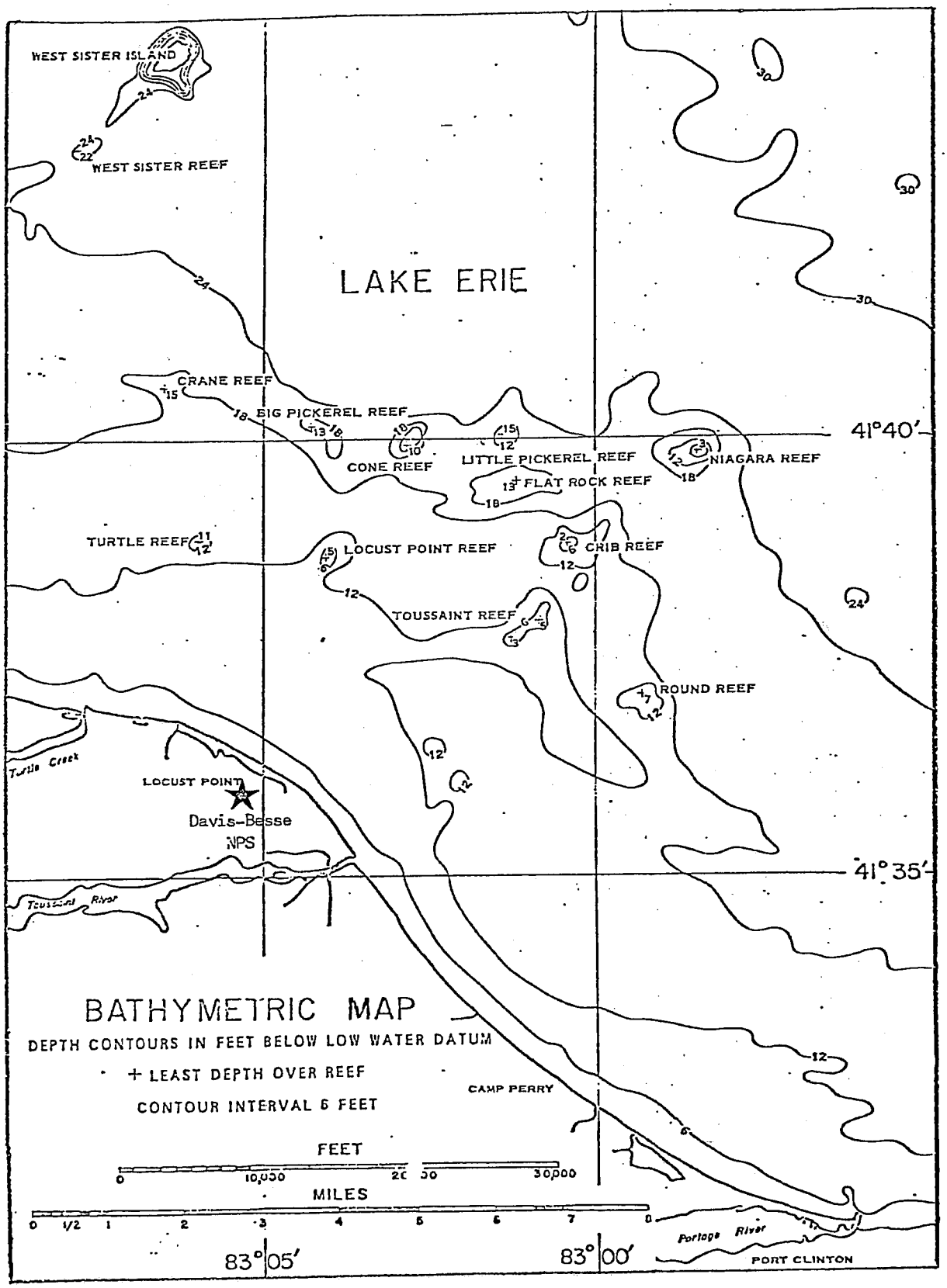

FIGURE 2. REEFS NEAR LOCUST POINT.

TABLE 1

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	13 April					18 April					25 April				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Carp	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Emerald Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Freshwater Drum	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Gizzard Shad	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Logperch Darter	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Rainbow Smelt	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Spottail Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Crappie	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	13 April					18 April					25 April				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Sunfish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Walleye	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
White Bass	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Whitefish	Stage 1								0.4		0.09	0.5	0.4	0.4		0.32
	Stage 2															
	Stage 3											0.9	0.8	0.9		0.65
	Surface															
	Bottom								0.7		0.18					
	Subtotal**								0.4		0.09	0.5	0.4	0.4		0.32
Yellow Perch	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
TOTAL	Stage 1								0.4		0.09	0.5	0.4	0.4		0.33
	Stage 2															
	Stage 3											0.9	0.8	0.9		0.65
	Surface															
	Bottom								0.7		0.18					
	Subtotal**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.09	0.5	0.4	0.4	0.0	0.33

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	2 May					9 May					16 May				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Carp	Stage 1											0.3				0.08
	Stage 2															
	Stage 3															
	Surface															
	Bottom											0.6				0.16
	Subtotal**											0.3				0.08
Emerald Shiner	Stage 1														0.3	0.08
	Stage 2															
	Stage 3														0.6	0.16
	Surface															
	Bottom														0.3	0.08
	Subtotal**															
Freshwater Drum	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Gizzard Shad	Stage 1						114.6	49.5	24.3	24.1	53.12	15.1	7.3	11.7	3.8	9.48
	Stage 2															
	Stage 3															
	Surface						76.9	41.1	19.2	23.9	40.26	6.4	10.1	7.7	3.6	6.94
	Bottom						152.4	57.9	29.3	24.3	65.98	23.8	4.5	15.7	4.1	12.01
	Subtotal**						114.6	49.5	24.3	24.1	53.12	15.1	7.3	11.7	3.8	9.48
Logperch Darter	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Rainbow Smelt	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Spottail Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Crappie	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Shiner	Stage 1						1.9				0.47	0.3				0.08
	Stage 2															
	Stage 3															
	Surface															
	Bottom						3.8				0.94	0.6				0.16
	Subtotal**						1.9				0.47	0.3				0.08

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	2 May					9 May					16 May				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Sunfish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Walleye	Stage 1						11.2	7.0	9.3	13.8	10.32	0.6		0.9	4.0	1.37
	Stage 2													0.7	0.3	0.25
	Stage 3															
	Surface						22.5	14.0	18.5	27.6	20.64	1.1		3.2	8.6	3.23
	Bottom						11.2	7.0	9.3	13.8	10.32	0.6		1.6	4.3	1.61
	Subtotal**															
White Bass	Stage 1						4.0	2.6	1.8		2.08	3.6	0.3	1.0	1.3	1.53
	Stage 2															
	Stage 3															
	Surface						2.4	2.1	2.6		1.76	0.6	0.6	1.3	0.6	0.78
	Bottom						5.5	3.1	1.0		2.40	6.5		0.7	2.0	2.29
	Subtotal**						4.0	2.6	1.8		2.08	3.6	0.3	1.0	1.3	1.53
Whitefish	Stage 1															
	Stage 2															
	Stage 3				0.5	0.13										
	Surface				1.1	0.26										
	Bottom															
	Subtotal**				0.5	0.13										
Yellow Perch	Stage 1	0.5	0.5			0.23	30.5	18.2	14.8	23.3	21.69	21.0	8.1	8.9	10.1	12.04
	Stage 2															
	Stage 3															
	Surface	1.0	0.9			0.49	23.8	8.8	8.1	14.6	13.84	5.8	2.5	8.4	5.8	5.65
	Bottom						37.2	27.5	21.5	32.0	29.54	36.2	13.8	9.4	14.4	18.43
	Subtotal**	0.5	0.5			0.25	30.5	18.2	14.8	23.3	21.69	21.0	8.1	8.9	10.1	12.04
TOTAL	Stage 1	0.5	0.5			0.25	162.3	77.2	50.1	61.1	87.68	40.9	15.7	22.5	19.5	24.65
	Stage 2													0.7	0.3	0.25
	Stage 3				0.5	0.13										
	Surface	1.0	0.9		1.1	0.76	103.1	52.0	29.9	38.4	55.86	12.8	13.2	17.4	10.6	13.52
	Bottom						221.4	102.5	70.3	83.9	119.49	69.0	18.2	28.9	29.0	36.28
	Subtotal**	0.5	0.5	0.0	0.5	0.38	162.3	77.2	50.1	61.1	87.68	40.9	15.7	23.2	19.8	25.90

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	23 May					6 June					14 June				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Carp	Stage 1	0.4				0.10			0.3		0.08				0.6	0.16
	Stage 2															
	Stage 3															
	Surface	0.8				0.19			0.6		0.16				1.3	0.32
	Bottom															
	Subtotal**	0.4				0.10			0.3		0.08				0.6	0.16
Emerald Shiner	Stage 1						1.3	1.0	2.2	0.8	1.33		1.6			0.39
	Stage 2												2.7			0.67
	Stage 3													2.2		0.54
	Surface						1.2	0.7	4.4	1.6	1.97		8.0	4.3		3.06
	Bottom						1.4	1.3			0.70		0.5			0.13
	Subtotal**						1.3	1.0	2.2	0.8	1.33		4.2	2.2		1.59
Freshwater Drum	Stage 1						2.0	19.1	1.2	1.4	5.91	0.7	2.7			0.85
	Stage 2						0.4				0.09		0.3	3.5		0.94
	Stage 3												1.2	0.3	0.6	0.54
	Surface							38.1	1.3		9.84	1.4	3.0	0.7	1.3	1.62
	Bottom						4.7		1.2	2.7	2.16		5.3	6.8		3.03
	Subtotal**						2.4	19.1	1.2	1.4	6.00	0.7	4.2	3.8	0.6	2.32
Gizzard Shad	Stage 1	31.2	51.5	18.4	10.8	27.97	234.7	355.0	504.3	1544.4	659.60	48.8	131.4	48.6	121.7	87.60
	Stage 2	1.5	1.0	1.2	0.4	1.03	118.8	159.6	654.7	324.1	314.28	55.5	374.9	160.4	73.6	166.09
	Stage 3						18.1	27.2	182.7	24.1	63.05	16.9	72.1	9.7	29.7	32.08
	Surface	25.1	65.1	28.6	6.9	31.41	700.7	501.7	2533.4	3572.9	1827.19	219.7	841.5	389.9	192.6	410.92
	Bottom	40.3	39.8	10.7	15.5	26.59	42.7	581.9	149.9	212.2	246.67	22.6	315.1	47.5	257.3	160.62
	Subtotal**	32.7	52.5	19.6	11.2	29.00	371.7	541.8	1341.7	1892.5	1036.93	121.1	578.3	218.7	225.0	285.77
Logperch Darter	Stage 1															
	Stage 2							0.4			0.10					
	Stage 3								1.0		0.24					
	Surface								0.7		0.17					
	Bottom							0.8	1.3		0.51					
	Subtotal**							0.4	1.0		0.34					
Rainbow Smelt	Stage 1															
	Stage 2								0.3		0.08					
	Stage 3															
	Surface								0.6		0.16					
	Bottom															
	Subtotal**								0.3		0.08					
Spottail Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified	Stage 1			0.4		0.11			0.3		0.08					
	Stage 2															
	Stage 3															
	Surface			0.9		0.22										
	Bottom								0.7		0.16					
	Subtotal**			0.4		0.11			0.3		0.08					
Unidentified Crappie	Stage 1							0.3			0.08					
	Stage 2															
	Stage 3								0.3		0.08					
	Surface															
	Bottom							0.7	0.7		0.33					
	Subtotal**							0.3	0.3		0.16					
Unidentified Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface				0.3	0.08										
	Bottom															
	Subtotal**				0.7	0.17										
					0.3	0.08										

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	23 May					6 June					14 June				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Sunfish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Walleye	Stage 1	1.0		0.3	0.3	0.43										
	Stage 2				0.3	0.08										
	Stage 3				0.7	0.17			1.0		0.25					
	Surface				0.7	0.17			0.7		0.17					
	Bottom	2.1		0.7	2.0	1.19			1.3		0.33					
	Subtotal**	1.0		0.3	1.4	0.68			1.0		0.25					
White Bass	Stage 1	3.7	1.9	4.4	11.8	5.46	0.3		8.5	2.0	2.72		1.2			0.31
	Stage 2						1.5	2.4	2.9	1.9	2.19					
	Stage 3						0.3	2.4	6.9	1.6	2.80	13.4		19.1	15.8	12.08
	Surface	0.8	1.0	0.9	14.3	4.23	1.3	8.9	13.2	10.3	8.44	25.6	2.5	25.9	25.3	19.81
	Bottom	6.6	2.8	7.9	9.4	6.69	3.0	0.7	23.6	0.7	6.99	1.2		12.4	6.3	4.96
	Subtotal**	3.7	1.9	4.4	11.8	5.46	2.2	4.8	18.4	5.5	7.71	13.4	1.2	19.1	15.8	12.39
Whitefish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Yellow Perch	Stage 1	196.5	50.6	84.6	87.0	104.67	0.6	0.7		0.4	0.43					
	Stage 2	1.9		1.6	3.0	1.63	6.5		0.6	3.6	2.70					
	Stage 3	0.4			1.8	0.55	19.8	48.3	69.2	139.5	69.22					
	Surface	192.5	65.1	107.4	120.1	121.27	37.9		73.5	267.6	94.75					
	Bottom	205.0	36.1	65.0	63.5	92.42	16.0	98.1	66.2	19.4	49.94					
	Subtotal**	198.8	50.6	86.2	91.8	106.84	26.9	49.0	69.9	143.5	72.34					
TOTAL	Stage 1	232.8	104.0	108.2	110.3	138.82	239.0	376.1	516.9	1548.9	670.23	49.5	136.8	48.6	121.7	89.15
	Stage 2	3.4	1.0	2.8	3.7	2.74	127.2	162.4	658.6	329.6	319.44	55.5	377.9	163.8	74.2	167.86
	Stage 3	0.4			2.5	0.72	38.3	78.0	261.2	165.1	135.64	30.2	73.3	31.3	46.2	45.23
	Surface	219.1	131.2	137.7	142.6	157.65	741.1	549.4	2628.4	3852.4	1942.84	246.7	855.0	420.8	220.4	435.73
	Bottom	254.0	78.8	84.3	90.5	126.89	67.9	683.5	244.8	235.0	307.78	23.7	321.0	66.6	263.6	168.73
	Subtotal**	236.6	105.0	111.0	116.5	142.27	404.5	616.5	1436.6	2043.7	1125.31	135.2	558.0	243.7	242.0	302.23

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	21 June					27 June					10 July				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1															
	Stage 2															
	Stage 3									0.3	0.07					
	Surface															
	Bottom									0.5	0.13					
	Subtotal**									0.3	0.07					
Carp	Stage 1	0.7	1.3	0.6		0.64	5.2	0.6	2.4	3.5	2.92					
	Stage 2						3.9	0.6	6.0	2.0	3.15					
	Stage 3						0.4		0.4		0.19					
	Surface															
	Bottom	1.3	2.7	1.1		1.28	19.3	2.3	17.6	11.1	12.50					
	Subtotal**	0.7	1.3	0.6		0.64	9.5	1.2	8.8	5.5	6.25					
Emerald Shiner	Stage 1	3.9	2.2	5.6		2.94	0.9				0.22	0.3	3.1		1.1	1.10
	Stage 2	12.1	7.5	12.8		8.08						0.2	3.4	0.7		1.08
	Stage 3											0.2				0.06
	Surface											1.5	9.9	1.4	2.1	3.73
	Bottom	32.0	19.5	36.7		22.04	1.8				0.44		2.9			0.74
	Subtotal**	16.0	9.7	18.4		11.02	0.9				0.22	0.7	6.5	0.7	1.1	2.23
Freshwater Drum	Stage 1	48.9	53.4	203.2	47.4	88.22	821.6	70.7	596.8	340.1	457.30					
	Stage 2			10.8	1.7	3.12	29.2	34.3	23.0	17.5	26.01					
	Stage 3						6.8		7.6		3.59					
	Surface	2.9	10.9	50.3	14.2	19.61	797.1	31.0	442.6	58.7	332.35					
	Bottom	94.9	95.8	377.5	84.1	163.07	918.2	179.0	812.2	656.5	641.45					
	Subtotal**	48.9	53.4	213.9	49.1	91.34	857.6	105.0	627.4	357.6	486.90					
Gizzard Shad	Stage 1	117.2	110.8	188.9	58.8	118.91	649.6	80.1	475.6	280.5	371.47	4.5	1.9	0.5	2.0	2.22
	Stage 2	199.7	135.1	233.5	35.1	150.82	945.5	43.7	470.1	145.2	401.13	0.6	0.3	0.7		0.39
	Stage 3	38.3	38.8	34.6	17.6	32.34	460.2	10.7	402.3	34.7	226.99	5.3	3.4	3.2	1.3	3.30
	Surface	373.6	269.7	446.4	205.1	323.68	3638.3	178.6	2393.6	414.7	1656.32	20.3	10.6	7.0	5.5	10.84
	Bottom	336.9	299.7	467.5	17.9	280.48	472.4	90.4	302.5	506.2	342.85	0.5	0.6	1.7	1.1	0.97
	Subtotal**	355.2	284.7	456.9	111.5	302.08	2055.3	134.5	1348.0	460.5	999.59	10.4	5.6	4.4	3.3	5.91
Logperch Darter	Stage 1															
	Stage 2															
	Stage 3		0.2			0.06			0.5	3.7	1.05					
	Surface		0.5			0.12			1.1		0.27					
	Bottom									7.3	1.83					
	Subtotal**		0.2			0.06			0.5	3.7	1.05					
Rainbow Smelt	Stage 1															
	Stage 2															
	Stage 3													0.3		0.07
	Surface															
	Bottom													0.6		0.14
	Subtotal**													0.3		0.07
Spottail Shiner	Stage 1	0.3				0.07										
	Stage 2						0.4				0.11					
	Stage 3															
	Surface	0.6				0.15										
	Bottom						0.8				0.21					
	Subtotal**	0.3				0.07	0.4				0.11					
Unidentified	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Crappie	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	21 June					27 June					10 July				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2						7.7				1.93					
	Stage 3															
	Surface						15.4				3.86					
	Bottom															
	Subtotal**						7.7				1.93					
Unidentified Sunfish	Stage 1														0.3	0.07
	Stage 2															
	Stage 3															
	Surface														0.6	0.14
	Bottom														0.3	0.07
	Subtotal**															
Walleye	Stage 1															
	Stage 2															
	Stage 3								1.5	0.3	0.45					
	Surface									0.5	0.13					
	Bottom								3.1		0.77					
	Subtotal**								1.5	0.3	0.45					
White Bass	Stage 1				0.9	0.22	1.3	0.5	1.7	0.6	1.02	1.5		1.7	0.2	0.85
	Stage 2	8.4	6.2	11.0	2.6	7.03	3.1	2.2	4.1	6.4	3.95					
	Stage 3	5.4	6.3	16.9	5.1	8.45	71.7	1.1	2.1	5.1	20.0	1.7		3.1		1.20
	Surface	9.3	13.3	32.7	12.0	16.79	139.0	4.3	3.8	9.9	39.24	0.5			0.4	0.23
	Bottom	18.3	11.8	23.2	5.2	14.61	13.2	3.4	12.0	14.2	10.69	6.0		9.5		3.88
	Subtotal**	13.8	12.5	27.9	8.6	15.70	76.1	3.8	7.9	12.1	24.97	3.2		4.8	0.2	2.05
Whitefish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Yellow Perch	Stage 1															
	Stage 2															
	Stage 3	5.4	4.9	6.4		4.17	0.3			6.3	1.66					
	Surface						0.6				0.14					
	Bottom	10.8	9.8	12.8		8.34				12.7	3.17					
	Subtotal**	5.4	4.9	6.4		4.17	0.3			6.3	1.66					
TOTAL	Stage 1	171.0	167.7	398.2	107.0	211.00	1478.6	151.9	1076.6	624.7	832.92	6.2	4.9	2.2	3.3	4.16
	Stage 2	220.2	148.7	268.0	39.4	169.06	989.9	80.9	503.2	171.4	436.34	0.8	3.7	1.4	0.3	1.54
	Stage 3	49.1	50.3	57.8	22.8	45.02	539.4	11.8	414.4	50.1	253.92	7.3	3.4	6.5	1.3	4.63
	Surface	386.4	294.3	529.4	231.3	360.34	4590.4	213.9	2841.1	484.4	2032.45	6.5	20.5	8.5	8.0	14.80
	Bottom	494.2	439.2	918.7	107.2	489.81	1425.3	275.1	1147.3	1207.9	1013.92	22.2	3.5	11.8	1.7	5.87
	Subtotal**	440.3	366.8	724.0	169.2	425.08	3007.9	244.5	1994.2	846.2	1523.18	14.3	12.0	10.1	4.9	10.33

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	17 July					29 July					8 August				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Carp	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom								0.3		0.08					
	Subtotal**								0.6		0.15					
									0.3		0.08					
Emerald Shiner	Stage 1		0.3		0.6	0.22										
	Stage 2	0.3		0.4		0.17	0.3				0.07					
	Stage 3	2.6	0.3	4.7	2.7	2.58	0.6				0.16					
	Surface	5.8	1.2	9.6	6.0	5.66	1.3				0.31					
	Bottom			0.6	0.8	0.28	0.6				0.15					
	Subtotal**	2.9	0.6	5.1	3.3	2.97	0.9				0.23					
Freshwater Drum	Stage 1											0.2				0.06
	Stage 2															
	Stage 3															
	Surface															
	Bottom											0.5				0.11
	Subtotal**											0.2				0.06
Gizzard Shad	Stage 1	13.2	19.1	10.4	8.0	12.70						0.2				0.06
	Stage 2	12.4	15.1	17.3	29.1	18.48	0.6	0.3	1.2	1.2	0.83					
	Stage 3	3.8	2.7	4.3	4.8	3.89	13.0	0.6	6.3	3.3	5.80				0.4	0.09
	Surface	38.4	38.6	54.6	64.1	48.94	25.4	1.8	12.7	7.1	11.73				0.7	0.18
	Bottom	20.5	35.2	9.5	19.6	21.21	1.8		2.3	1.8	1.47	0.5				0.11
	Subtotal**	29.4	36.9	32.0	41.9	35.07	13.6	0.9	7.5	4.5	6.63	0.2			0.4	0.15
Logperch Darter	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Rainbow Smelt	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Spottail Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified	Stage 1															
	Stage 2											0.2				0.06
	Stage 3															
	Surface															
	Bottom											0.5				0.11
	Subtotal**											0.2				0.06
Unidentified Crappie	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Shiner	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	17 July					29 July					8 August				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Unidentified Sunfish	Stage 1	0.3	0.3		0.3	0.23			0.3		0.08					
	Stage 2															
	Stage 3															
	Surface	0.6	0.6		0.6	0.47										
	Bottom								0.6		0.15					
	Subtotal**	0.3	0.3		0.3	0.23			0.3		0.08					
Walleye	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
White Bass	Stage 1				0.3	0.08										
	Stage 2															
	Stage 3															
	Surface															
	Bottom				0.6	0.15										
	Subtotal**				0.3	0.08										
Whitefish	Stage 1															
	Stage 2															
	Stage 3															
	Surface															
	Bottom															
	Subtotal**															
Yellow Perch	Stage 1		0.6		0.3	0.23										
	Stage 2															
	Stage 3															
	Surface		0.6		0.6	0.31										
	Bottom		0.6			0.15										
	Subtotal**		0.6		0.3	0.23										
TOTAL	Stage 1	13.6	20.3	10.4	9.5	13.46			0.6		0.15	0.5				0.11
	Stage 2	12.8	15.0	17.7	29.1	18.66	0.9	0.3	1.2	1.2	0.92	0.2				0.06
	Stage 3	6.4	3.2	9.0	7.5	6.46	13.6	0.6	6.3	3.3	5.98				0.4	0.09
	Surface	44.9	41.1	64.2	71.3	55.37	26.6	1.8	12.7	7.1	12.05				0.7	0.18
	Bottom	20.5	35.8	10.1	20.8	21.78	2.4		3.6	1.8	1.92	1.4				0.34
	Subtotal**	32.8	38.5	37.1	46.1	38.58	14.5	0.9	8.1	4.5	7.06	0.7	0.0	0.0	0.4	0.26

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	19 August					27 August					Mean				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Bluntnose Minnow	Stage 1														0.02	<0.01
	Stage 2															
	Stage 3														0.03	0.01
	Surface															
	Bottom														0.02	<0.01
	Subtotal**															
Carp	Stage 1											0.39	0.11	0.21	0.21	0.23
	Stage 2											0.23	0.04	0.35	0.16	0.19
	Stage 3											0.02		0.02		0.11
	Surface											0.04		0.04	0.07	0.04
	Bottom											1.24	0.30	1.14	0.65	0.83
	Subtotal**											0.64	0.15	0.58	0.36	0.43
Emerald Shiner	Stage 1											0.38	0.48	0.46	0.16	0.37
	Stage 2											0.76	0.80	0.81		0.59
	Stage 3											0.20	0.02	0.40	0.16	0.20
	Surface											0.57	1.17	1.16	0.61	0.88
	Bottom											2.11	1.43	2.19	0.03	1.44
	Subtotal**											1.34	1.30	1.68	0.32	1.16
Freshwater Drum	Stage 1											51.38	8.58	47.13	22.88	32.49
	Stage 2											1.74	2.04	2.19	1.13	1.77
	Stage 3											0.40	0.07	0.46	0.04	0.24
	Surface											47.14	4.89	29.11	4.37	21.38
	Bottom											59.90	16.48	70.45	43.72	47.64
	Subtotal**											53.52	10.68	47.78	24.04	34.51
Gizzard Shad	Stage 1											72.31	47.43	75.46	120.83	79.01
	Stage 2											78.51	42.95	90.53	35.80	61.95
	Stage 3											32.68	9.16	37.83	6.82	21.62
	Surface											301.45	115.22	346.65	264.53	256.97
	Bottom											65.54	83.82	60.98	62.36	68.17
	Subtotal**											183.50	99.54	203.81	163.44	162.57
Logperch Darter	Stage 1															
	Stage 2												0.02			0.01
	Stage 3												0.02	0.09	0.22	0.08
	Surface												0.03	0.10		0.03
	Bottom												0.05	0.07	0.43	0.14
	Subtotal**												0.04	0.09	0.22	0.09
Rainbow Smelt	Stage 1															
	Stage 2													0.02		<0.01
	Stage 3													0.02		<0.01
	Surface													0.04		0.01
	Bottom													0.03		0.01
	Subtotal**													0.04		0.01
Spottail Shiner	Stage 1											0.02				<0.01
	Stage 2											0.02				0.01
	Stage 3															
	Surface											0.03				0.01
	Bottom											0.05				0.01
	Subtotal**											0.04				0.01
Unidentified	Stage 1															
	Stage 2													0.05		0.01
	Stage 3											0.01				<0.01
	Surface															
	Bottom													0.05		0.01
	Subtotal**											0.03		0.04		0.02
												0.01		0.05		0.02
Unidentified Crappie	Stage 1															
	Stage 2												0.02			0.01
	Stage 3													0.02		<0.01
	Surface															
	Bottom												0.04	0.04		0.02
	Subtotal**												0.02	0.02		0.01
Unidentified Shiner	Stage 1											0.13			0.02	0.04
	Stage 2															
	Stage 3														0.04	0.01
	Surface															0.07
	Bottom											0.26				
	Subtotal**											0.13			0.02	0.04

TABLE 1 CONT.

ICHTHYOPLANKTON DENSITIES AT LOCUST POINT - 1980*

SPECIES	STATION	19 August					27 August					Mean				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2											0.45				0.11
	Stage 3															
	Surface											0.91				0.23
	Bottom															
	Subtotal**											0.45				0.11
Unidentified Sunfish	Stage 1											0.02	0.02	0.02	0.02	0.02
	Stage 2														0.02	<0.01
	Stage 3															
	Surface											0.04	0.04		0.04	0.03
	Bottom													0.04	0.03	0.02
	Subtotal**											0.02	0.02	0.02	0.03	0.02
Walleye	Stage 1											0.76	0.41	0.62	1.06	0.71
	Stage 2													0.04	0.04	0.02
	Stage 3													0.15	0.05	0.05
	Surface													0.04	0.07	0.03
	Bottom											1.51	0.82	1.57	2.25	1.54
	Subtotal**											0.76	0.41	0.81	1.16	0.78
White Bass	Stage 1											0.85	0.38	1.12	1.00	0.84
	Stage 2											0.77	0.63	1.06	0.64	0.77
	Stage 3											5.44	0.58	2.83	1.62	2.62
	Surface											10.56	1.92	4.73	4.28	5.37
	Bottom											3.55	1.28	5.30	2.26	3.10
	Subtotal**											7.05	1.60	5.01	3.27	4.23
Whitefish	Stage 1											0.03	0.02	0.05		0.02
	Stage 2															
	Stage 3														0.03	0.01
	Surface											0.05	0.05	0.05	0.06	0.05
	Bottom													0.04		0.01
	Subtotal**											0.03	0.02	0.05	0.03	0.03
Yellow Perch	Stage 1											14.65	4.63	6.37	7.12	8.19
	Stage 2											0.50		0.13	0.39	0.25
	Stage 3											1.52	3.13	4.45	8.68	4.45
	Surface											15.39	4.59	11.61	24.04	13.91
	Bottom											17.95	10.94	10.28	8.35	11.88
	Subtotal**											16.67	7.76	10.95	16.20	12.90
TOTAL	Stage 1											140.89	62.09	131.48	153.30	121.94
	Stage 2											82.99	46.47	95.14	38.19	65.70
	Stage 3											40.28	12.98	46.26	17.62	29.28
	Surface											376.19	127.90	393.58	298.13	298.95
	Bottom											152.13	115.15	152.18	120.08	134.88
	Subtotal**	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	264.16	121.54	272.88	209.11	216.92

*Data presented as no./100 m^3. Stage 1 = proto-larvae, no rays in fin/finfold. State 2 = meso-larvae, first ray seen in median fins. Stage 3 = meta-larvae, pelvic fin bud is visible.

**This is the subtotal of the larval stages. It is the mean of the surface and bottom densities.

TABLE 2

RESULTS OF ICHTHYOPLANKTON COLLECTIONS AT TOUSSAINT REEF - 1980*

SPECIES	DATE	APRIL 25	MAY 2	MAY 9	MAY 16	JUNE 6	JUNE 14	JUNE 21	JUNE 27	JULY 10	JULY 17	AUG 8	AUG 19	AUG 27	MEAN
Emerald Shiner	Stage 1						1.1	11.4	1.0	8.3	0.3				1.70
	Stage 2					0.9	8.9	0.8	0.3	25.7					2.81
	Stage 3						1.8				1.9				0.28
	Surface					1.7	23.6	19.6	2.6	65.8	4.4				9.05
	Bottom							4.8		2.1					0.53
	Subtotal**					0.9	11.8	12.2	1.3	33.9	2.2				4.79
Freshwater Drum	Stage 1					3.8		1.5	61.5						5.14
	Stage 2						0.5	0.3							0.06
	Stage 3														
	Surface					2.2		3.6	68.8						5.74
	Bottom					5.4	1.1		54.3						4.67
	Subtotal**					3.8	0.5	1.8	61.5						5.20
Gizzard Shad	Stage 1			3.3		143.3	20.3	143.8	278.1	3.8	0.6				45.64
	Stage 2					13.8	39.8	70.6	148.8	2.5	0.9				21.26
	Stage 3						10.1	11.0	7.4	4.6					2.55
	Surface			6.6		15.9	62.4	103.8	223.7	20.5					33.30
	Bottom					298.3	78.1	346.9	645.1	1.4	2.9				105.59
	Subtotal**			3.3		157.1	70.2	225.4	434.4	10.9	1.5				69.45
Logperch Darter	Stage 1					0.3		1.5							0.15
	Stage 2							0.3							0.02
	Stage 3							0.7	0.3						0.08
	Surface							4.2	0.6						0.37
	Bottom					0.7		0.7							0.11
	Subtotal**					0.3		2.5	0.3						0.25
Mottled Sculpin	Stage 1			0.5											0.04
	Stage 2	0.6													0.04
	Stage 3	1.2													0.09
	Surface			0.9											0.07
	Bottom	3.6													0.28
	Subtotal**	1.8		0.5											0.17
Rainbow Smelt	Stage 1							1.6							0.12
	Stage 2						0.2	2.0	0.3						0.20
	Stage 3						0.5								0.04
	Surface							7.3	0.7						0.61
	Bottom														
	Subtotal**						0.2	3.6	0.3						0.32
Spottail Shiner	Stage 1														
	Stage 2						0.4								0.03
	Stage 3														
	Surface						0.7								0.06
	Bottom														
	Subtotal**						0.4								0.03
Walleye	Stage 1			0.7											0.05
	Stage 2														
	Stage 3														
	Surface														0.11
	Bottom			1.4											0.05
	Subtotal**			0.7											
White Bass	Stage 1					5.4		19.9	13.4						2.98
	Stage 2							2.9	43.4						3.57
	Stage 3							8.8	0.3						0.70
	Surface							2.2	7.2						0.72
	Bottom					10.9		61.0	107.1						13.77
	Subtotal**					5.4		31.6	57.1						7.25
Yellow Perch	Stage 1			25.3	15.1										3.11
	Stage 2					1.1									0.09
	Stage 3					1.1		0.3							0.11
	Surface			13.8		4.4									1.40
	Bottom			36.8	30.1			0.6							5.20
	Subtotal**			25.3	15.1	2.2		0.3							3.30
TOTAL	Stage 1			29.7	15.1	152.8	21.4	178.2	354.1	12.1	0.9				58.79
	Stage 2	0.6				15.8	49.6	76.4	192.6	28.2	0.9				28.00
	Stage 3	1.2				1.1	12.2	22.8	8.4	4.6	1.9				4.01
	Surface			21.2		24.2	87.2	133.4	302.9	86.3	4.3				50.74
	Bottom	3.6		38.2	30.1	315.2	79.2	421.3	807.1	3.5	3.4				130.91
	Subtotal**	1.8	0.0	29.7	15.1	169.7	83.2	277.4	555.0	44.9	3.7	0.0	0.0	0.0	90.83

*Data presented as no./100m^3. Stage 1 = proto-larvae, no rays in fin/finfold. Stage 2 = meso-larvae, first ray seen in median fins. Stage 3 = meta-larvae, pelvic fin bud is visible.

**This is the subtotal of the larval stages. It is the mean of the surface and bottom densities.

SPECIES	STATION	19 August					27 August					Mean				
		3	8	13	29	Mean	3	8	13	29	Mean	3	8	13	29	Mean
Unidentified Sucker	Stage 1															
	Stage 2											0.45				0.11
	Stage 3															
	Surface											0.91				0.23
	Bottom															
	Subtotal**											0.45				0.11
Unidentified Sunfish	Stage 1											0.02	0.02	0.02	0.02	0.02
	Stage 2														0.02	<0.01
	Stage 3															
	Surface											0.04	0.04		0.04	0.03
	Bottom													0.04	0.03	0.02
	Subtotal**											0.02	0.02	0.02	0.03	0.02
Walleye	Stage 1											0.76	0.41	0.62	1.06	0.71
	Stage 2													0.04	0.04	0.02
	Stage 3													0.15	0.05	0.05
	Surface													0.04	0.07	0.03
	Bottom											1.51	0.82	1.57	2.25	1.54
	Subtotal**											0.76	0.41	0.81	1.16	0.78
White Bass	Stage 1											0.85	0.38	1.12	1.00	0.84
	Stage 2											0.77	0.63	1.06	0.64	0.77
	Stage 3											5.44	0.58	2.83	1.62	2.62
	Surface											10.56	1.92	4.73	4.28	5.37
	Bottom											3.55	1.28	5.30	2.26	3.10
	Subtotal**											7.05	1.60	5.01	3.27	4.23
Whitefish	Stage 1											0.03	0.02	0.05		0.02
	Stage 2															
	Stage 3														0.03	0.01
	Surface											0.05	0.05	0.05	0.06	0.05
	Bottom													0.04		0.01
	Subtotal**											0.03	0.02	0.05	0.03	0.03
Yellow Perch	Stage 1											14.65	4.63	6.37	7.12	8.19
	Stage 2											0.50		0.13	0.39	0.25
	Stage 3											1.52	3.13	4.45	8.68	4.45
	Surface											15.39	4.59	11.61	24.04	13.91
	Bottom											17.95	10.94	10.28	8.35	11.88
	Subtotal**											16.67	7.76	10.95	16.20	12.90
TOTAL	Stage 1											140.89	62.09	131.48	153.30	121.94
	Stage 2											82.99	46.47	95.14	38.19	65.70
	Stage 3											40.28	12.98	46.26	17.62	29.28
	Surface											376.19	127.90	393.58	298.13	298.95
	Bottom											152.13	115.15	152.18	120.08	134.88
	Subtotal**	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.00	264.16	121.54	272.88	209.11	216.92

*Data presented as no./100 m^3. Stage 1 = proto-larvae, no rays in fin/finfold. State 2 = meso-larvae, first ray seen in median fins. Stage 3 = meta-larvae, pelvic fin bud is visible.

**This is the subtotal of the larval stages. It is the mean of the surface and bottom densities.