THREE MILE ISLAND AQUATIC STUDY

MONTHLY REPORT FOR JULY 1982

by

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INTRODUCTION

The ecology of York Haven Pond near the Three Mile Island Nuclear Station (TMINS) has been under investigation since February 1974. Studies initiated in April 1974 include analysis of ambient water quality, ichthyoplankton (far-field), ichthyoplankton entrainment, macroinvertebrates, fish population dynamics, impingement of fishes, creel survey, and thermal plume mapping.

This report discusses the progress of investigations conducted in July 1982.

COMPLIANCE WITH ENVIRONMENTAL TECHNICAL SPECIFICATIONS (ETS)

Objective: To determine compliance with the nonradiological (aquatic) environmental monitoring programs specified in sections 3.1.1.a.(4), 3.1.2.a., 4.2, and 4.6.1 of the ETS and to insure that said programs are performed as detailed in the Generation Procedures Manual.

Progress: Compliance with all programs specified in the ETS and detailed in the Procedures Document was achieved in July (Table 1). The summer fish population estimate program initiated on 23 June was concluded on 28 July.

A program by program summary of the progress for July follows.

MACROINVERTEBRATES

Objective: To describe the diversity and distribution of the benthic macroinvertebrates occurring at the five benthos sampling stations in the vicinity of TMINS.

Progress: Replicate (4) benthos samples were taken on 12 and 26 July (Table 1). Enumeration, determination of dry weights, and identification of specimens have been completed through 26 July.

ICHTHYOPLANKTON

Objectives: (1) To determine the species composition, abundance, and distribution of ichthyoplankton in York Haven Pond; and (2) To investigate ichthyoplankton entrained at TMINS Unit 1 and 2 Intakes.

Far-Field

Progress: Day/night samples were taken on 6, 13, 20 and 27 July (Table 1). A total of 9,217 larval and young fish was collected (1,744 during the day and 7,473 at night). Most fish (4,824) were taken on 20 July. Species taken included the gizzard shad, common carp, golden shiner, comely shiner, spottail shiner, spotfin shiner, mimic shiner, bluntnose minnow, quillback, channel catfish, rock bass, redbreast

sunfish, pumpkinseed/bluegill, smallmouth bass, white crappie, black crappie, tessellated darter, and banded darter.

July day/night water temperatures averaged 25.7 C and 26.4 C, respectively.

Entrainment

Progress: Ichthyoplankton surveys were conducted at Units 1 and 2 on 6-7 and 20-21 July (Table 1). At Unit 1, eight ichthyoplanktors (3 surface, 5 oblique) were taken on 6-7 July. The banded darter was the most common species. The 20-21 July sample at Unit 1 yielded 105 specimens (67 surface, 38 oblique). Fishes most frequently taken were the pumpkinseed/bluegill, spotfin shiner, and mimic shiner.

At Unit 2, six ichthyoplanktors (4 surface, 2 oblique) were taken on 6-7 July. The spotfin shiner and banded darter were collected. The 20-21 July collection yielded 22 specimens (11 surface, 11 oblique). The pumpkinseed/bluegill and spotfin shiner were most abundant.

A computer program was written to print running tables for the annual report. This program was tested and found to be operational. Data for 1982 were coded and proofed through June.

TRAPNET

Objectives: (1) To determine the distribution and relative abundance of fishes in the Three Mile Island area vulnerable to trapnet; (2) To provide specimens for movements studies; (3) To monitor the occurrence of diseased fishes; (4) To provide specimens for radiation analysis; and (5) To determine reproductive status for fishes throughout the year.

Progress: Samples were taken on 7-9 and 19-21 July (Table 1). One hundred sixty-four fish of 12 species were taken on 7-9 July (Table 2). Most fish (64) were collected at Station 9B2, greatest biomass (6.32 kg) at 1A3, and most species (9) at 1A3 and 9B2. Common fishes included the white crappie (34.1% of the total catch), black crappie (26.2%), and

pumpkinseed (18.9%). One Lepomis hybrid (pumpkinseed X bluegill) was collected at 9B2 on 8-9 July. Leeches parasitized two channel catfish, one rock bass, one pumpkinseed, and one bluegill. One white crappie was found dead in the trapnet at 1A3. Three channel catfish, one brown bullhead, and one rock bass were sacrificed for radiation analysis. The following ripe fishes were observed: eight male and five female pumpkinseed, two male and one female bluegill, and one male redbreast sunfish.

A total of 210 fish of 11 species was taken on 19-21 July (Table 3). Most fish (103) were taken at Station 9B2 while greatest biomass (7.28 kg) occurred at 11A2. Stations 11A2, 11A3, and 9B2 each recorded seven species. The pumpkinseed (46.2% of the total catch), black crappie (21.9%), and white crappie (14.8%) were most numerous. One channel catfish was tagged. Anchor worms parasitized two pumpkinseed and leeches one pumpkinseed. Five pumpkinseed and two white crappie were found dead in the trapnets. Over 63% of the pumpkinseed were ripe; the ratio of males to females was 2.6:1. Other ripe fishes included one male common carp and eight male bluegill. Three brown bullhead, three rock bass, and one channel catfish were sacrificed for radiation analysis.

Dead fishes observed in the study area included 8 channel catfish, 3 smallmouth bass, 2 unidentified suckers, 2 walleye, 1 common carp, 1 northern hog sucker, 1 shorthead redhorse, and 1 redbreast sunfish. No pattern of parasite infection or dead fishes was observed with respect to the location of TMINS in July.

SEINE

Objectives: (1) To determine the species composition of fish upstream and downstream from the TMINS Discharge vulnerable to seine; (2) To determine the relative condition factor for important species; and (3) To determine the reproductive status for fishes throughout the year.

Progress: Collections were made at the 10 stations on 1 and 19 July (Table 1). A total of 1,652 fish of 17 species was taken on 1 July (Table 4). Most fish (471) and greatest biomass (123.8 g) were taken at Station 10B5 while most species (11) occurred at 4A2. The spottail shiner and spotfin shiner were most abundant and comprised 47.9% and 37.0% of the total catch, respectively. Slight black spot infestations were observed on 59 spotfin shiner, 11 bluntnose minnow, and 2 fallfish. Anchor worms parasitized three spotfin shiner and leeches one tessellated darter. One spotfin shiner exhibited scoliosis and one spotfin shiner had necrosis of the caudal fin. One male bluntnose minnow was tuberculate. No pattern of parasite infection or anomaly was observed with respect to the location of TMINS.

Collections taken on 19 July are currently being processed; results will be presented in the August progress report.

IMPINGEMENT OF FISH

Objectives: (1) To determine the numbers and species impinged on the river water intake screens; (2) To determine day-night differences in impingement frequency; and (3) To determine the extent of mortality of impinged fish.

Progress: Impingement surveys were conducted on 14-15 and 26-27 July at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 5 fish of 3 species weighing 4.9 g (Tables 5 through 8). All fish were young and dead. Fish numbers and biomass were highest during the 26-27 July survey. The estimated impingement for Unit 1 for July was 78 fish weighing 76.0 g (0.2 lb).

Unit 2 impinged 16 fish of 5 species weighing 79.3 g (Tables 9 through 12). Most fish were young and dead. Fish numbers and biomass were highest during the 26-27 July survey. The estimated impingement for Unit 2 was 248 fish weighing 1,229.2 g (2.7 lb).

The total estimated impingement at TMINS during July was 326 fish weighing 1,305.2 g (2.9 lb).

ELECTROFISHING

Objectives: (1) To provide specimens for radiation analysis and movements studies; and (2) To determine the relative abundance of fishes vulnerable to electrofishing in various parts of York Haven Pond.

Progress: Sampling was conducted on six nights in July (Table 1). Twenty-four collections in 12 zones yielded 663 specimens of 18 species (Table 13). The redbreast sunfish (168 specimens), pumpkinseed (132), quillback (110), and smallmouth bass (84) were most abundant. A total of 14 fish was tagged for movements studies; 33 fish were sacrificed for radiation analysis.

MOVEMENTS OF FISHES

Objective: To determine if fishes in waters receiving the TMINS effluent mix with fishes from other areas.

Progress: A total of 205 fish was tagged and 11 previously tagged fish were recaptured in July. Recaptures included 1 brown bullhead, 1 channel catfish, 5 rock bass, 3 smallmouth bass, and 1 largemouth bass. The brown bullhead moved 3.0 km downstream and over York Haven Dam. The channel catfish moved 0.5 km downstream. Two rock bass moved 5.0 km and 11.9 km upstream, one moved 3.0 km downstream and over York Haven Dam, and two were recaptured in the same areas in which they were tagged. One smallmouth bass moved 5.0 km upstream, one made a 0.3 km complex movement, and one was recaptured in the same area in which it was tagged. The largemouth bass was recaptured in the same area in which it was tagged.

CREEL SURVEYS

Objectives: (1) To determine the extent and success of sport fishing; and (2) To determine information on angler residence and use of catch.

Progress: Creel surveys were conducted in all areas on 6, 11, 16, and 31 July (Table 1). The 454 anglers interviewed fished 738.81 hours and caught 864 fish (Tables 14 through 17). The actual harvest was 163 fish or 18.9% of the total catch. The mean catch per effort (c/e) was 1.17. Most anglers (190) fished in the General Reservoir. The largest total catch (310) was recorded in the General Reservoir; most fish kept (83) and most hours fished (305.33) were recorded at the York Haven Generating Station. The highest c/e (2.55) was recorded at the West Dam.

Smallmouth bass (440 specimens) was the predominant species caught by anglers. Other species frequently caught included channel catfish (129), walleye (127), rock bass (74), and unidentified sunfish (53).

Approximately 63% of the anglers interviewed lived in York or Dauphin counties. Most of the anglers reported that they eat some of their catch.

AMBIENT WATER QUALITY

Objective: To determine concentrations of selected water quality parameters in ambient river areas and the TMINS effluent.

Progress: Water quality samples were collected on 12 and 26 July at the five river stations (Table 1). Data are currently being analyzed; results will be presented in the August progress report.

The water quality samples collected in June have now been analyzed; results are presented in Table 18. On 10 June values for sulfate and total and dissolved zinc were highest at Station 1A1 (located upstream of the TMINS Discharge); dissolved oxygen was highest at 1A2. Total dissolved solids were highest at Station 11A1 (TMINS Discharge).

On 21 June values for pH, turbidity, and sulfate were highest at Station 1A1; total dissolved solids were highest at 1A2. Values for dissolved zinc (11A1), total zinc (11A2), and dissolved oxygen and

alkalinity (9B1) were highest at stations located at or below the Discharge.

Except for pH and turbidity, parameters for which State water quality criteria have been established were not exceeded at any station on 10 or 21 June. Values for pH exceeded the upper limit (9.0) of the State criteria at Stations 1A1 and 11A1 on 10 June. Values for turbidity exceeded the State criteria (not more than 30 NTU during the period 30 May through 15 September) at all stations on 10 June. High turbidity values were attributed to the increase in river flow in the week preceeding 10 June.

POPULATION ESTIMATES OF FISHES

Objectives: (1) To determine if differences exist in fish populations between areas receiving the TMINS effluent; and (2) To estimate populations in other areas available for recruitment.

Progress: Summer population estimate sampling was conducted on 11 nights in July (Table 1). Sufficient recaptures were taken to compute estimates for four species in Zone 16A2 and for three species in Zone 10A3. Recaptures were too few in the other two zones to compute estimates. Data from summer population estimate samples will be tabulated and results presented in the 1982 annual report.

Table 1

Sampling conducted in compliance with the Generation Procedures Manual in July 1982.

PROGRAM	Jul 1-3	Jul 4-10	Jul 11-17	Jul 18-24	Jul 25-31
Macroinvertebrates			X		X
Ichthyoplankton:					
Far-Field		X	X	X	X
Entrainment		X		X	
Trapnet		X		X	
Seine	X			X	
Impingement of Fish			X		X
Electrofishing		X	X	X	
Movements of Fishes		X	X	X	
Creel Surveys		X	X		X
Ambient Water Quality			X		X
Population Estimates of Fishes	X	X	X	X	X

Table 2

Fishes taken by trapnet on 7-9 July 1982 near TMINS.

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	7-8	8-9	7-8	8-9	7-8	8-9	7-8	8-9		
Time	0945-1005	1007-0940	0934-0947	0951-0922	0927-0930	0933-0907	0917-0900	0902-0844		
Air Temp (C)	25.0, 28.5	28.5, 25.5	25.0, 27.5	27.5, 25.5	24.5, 27.5	27.5, 25.0	24.5, 27.5	27.5, 24.5		
Water Temp (C)	23.5, 25.5	25.5, 25.5	23.5, 25.5	25.5, 25.5	23.5, 25.5	25.5, 25.5	23.5, 25.0	25.0, 25.5		
Dissolved Oxygen (mg/l)	8.3, 8.6	8.6, 8.5	8.2, 8.7	8.7, 8.3	8.2, 8.5	8.5, 8.2	8.2, 8.2	8.2, 8.3		
pH	8.0, 7.5	7.5, 8.4	8.2, 7.8	7.8, 8.1	8.0, 7.6	7.6, 8.0	7.6, 7.6	7.6, 8.0		
Secchi Disc (cm)	48, 53	53, 38	51, 51	51, 36	53, 53	53, 36	48, 56	56, 43		
River Stage (m)	1.39, 1.33	1.33, 1.28	1.39, 1.33	1.33, 1.28	1.39, 1.33	1.33, 1.28	1.39, 1.33	1.33, 1.28		
Weather	Partly Cloudy, Clear	Clear, Haze	Partly Cloudy, Clear	Clear, Haze	Partly Cloudy, Haze	Haze, Haze	Partly Cloudy, Haze	Haze, Haze		
No. of Specimens	25	26	12	11	14	12	37	27	164	
No. of Species	5	8	5	7	6	4	6	7	12	
Golden shiner	-	-	-	-	-	-	2	1	3	1.8
Quillback	-	1	-	1	1	-	1	1	5	3.0
White catfish	-	-	-	-	-	-	1	-	1	0.6
Brown bullhead	-	1	-	-	-	-	-	-	1	0.6
Channel catfish	2	-	1	1	-	-	-	-	4	2.4
Rock bass	2	2	1	1	1	2	-	-	9	5.5
Redbreast sunfish	-	1	-	1	-	-	-	-	2	1.2
Pumpkinseed	5	9	-	1	3	1	9	3	31	18.9
Bluegill	-	1	2	1	2	-	-	1	7	4.3
Lepomis hybrid	-	-	-	-	-	-	-	1	1	0.6
White crappie	11	6	4	5	2	5	13	10	56	34.1
Black crappie	5	5	4	-	5	4	11	9	43	26.2
Yellow perch	-	-	-	-	-	-	-	1	1	0.6

Table 3

Fishes taken by trapnet on 19-21 July 1982 near [illegible].

Station	TN-AOF-1A2		TN-AOF-11A2		TN-AOF-11A3		TN-AOF-9B2		Total	% Catch
Date	19-20	20-21	19-20	20-21	19-20	20-21	19-20	20-21		
Time	1431-1430	1434-1446	1412-1400	1407-1420	1405-1345	1351-1405	1351-1306	1312-1313		
Air Temp (C)	30.5, 24.5	24.5, 26.5	32.5, 25.0	25.0, 25.5	31.5, 25.0	25.0, 25.5	28.5, 27.0	27.0, 25.5		
Water Temp (C)	30.5, 27.5	27.5, 27.0	30.5, 28.0	28.0, 26.5	30.5, 28.0	28.0, 26.5	30.0, 28.0	28.0, 26.5		
Dissolved Oxygen (mg/l)	10.5, 7.9	7.9, 9.3	9.5, 7.8	7.8, 9.1	9.5, 7.6	7.6, 9.0	8.9, 7.0	7.0, 9.4		
pH	8.6, 8.4	8.4, 8.3	8.6, 8.5	8.5, 8.3	8.6, 8.3	8.3, 7.9	8.6, 8.3	8.3, 7.8		
Secchi Disc (cm)	56, 51	51, 51	46, 46	46, 56	51, 46	46, 43	48, 56	56, 58		
River Stage (m)	1.13, 1.12	1.12, 1.12	1.13, 1.12	1.12, 1.12	1.13, 1.12	1.12, 1.12	1.13, 1.12	1.12, 1.12		
Weather	Partly Cloudy, Overcast	Overcast, Clear	Partly Cloudy, Light Rain	Light Rain, Clear	Partly Cloudy, Overcast	Overcast, Clear	Partly Cloudy, Overcast	Overcast, Clear		
No. of Specimens	2	6	35	38	15	11	68	35	210	
No. of Species	1	2	6	6	6	5	5	6	11	
Common carp	-	-	-	1	-	1	-	-	1	0.5
Spotfin shiner	-	-	-	-	1	-	-	-	1	0.5
White catfish	-	-	-	-	-	-	-	-	1	0.5
Brown bullhead	-	-	-	-	-	-	3	-	3	1.4
Channel catfish	2	-	-	-	-	-	-	1	3	1.4
Rock bass	-	-	1	3	2	2	-	1	9	4.3
Redbreast sunfish	-	-	1	-	-	-	-	-	1	0.5
Pumpkinseed	-	4	24	23	1	2	31	12	97	46.2
Bluegill	-	-	2	3	2	2	4	4	17	8.1
White crappie	-	-	2	2	2	-	17	8	31	14.8
Black crappie	-	2	5	6	7	4	13	9	46	21.9

Table 4

Fishes taken by seine on 1 July 1982 near TMDRS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1212	0847	1147	1125	1105	1050	0955	0935	0915	1024		
Air Temp (C)	24.5	21.0	21.0	20.0	19.5	20.0	19.0	19.5	19.0	20.0		
Water Temp (C)	22.5	22.0	23.0	22.0	22.0	22.0	21.0	20.5	21.0	20.5		
Dissolved Oxygen (mg/l)	8.7	9.0	9.2	9.4	9.4	9.1	8.6	8.5	8.4	8.0		
pH	7.6	8.1	8.2	7.9	7.9	8.0	7.7	8.0	7.0	7.5		
Secchi Disc (cm)	46	51	64	56	56	46	58	61	64	94		
River Stage (m)	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40		
Weather	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear		
No. of Specimens	228	471	251	129	68	76	53	106	123	147	1652	
No. of Species	10	6	10	7	5	7	5	4	5	11	17	
No. of Hauls	4	4	4	5	4	4	4	4	4	4	43	
Gizzard shad	-	-	-	1	-	-	-	-	-	-	1	0.1
Comely shiner	-	-	1	3	2	-	-	-	-	-	6	0.4
Common shiner	-	-	-	-	1	-	-	-	-	-	1	0.1
Spottail shiner	60	194	150	41	17	46	20	91	79	93	791	47.9
Swallowtail shiner	2	-	1	-	-	-	-	-	-	-	3	0.2
Spotfin shiner	137	253	70	80	42	12	7	7	-	3	611	37.0
Mimic shiner	2	-	7	-	-	-	-	-	-	-	9	0.5
Bluntnose minnow	3	-	1	-	-	-	-	-	-	18	22	1.3
Fathead minnow	-	-	-	-	-	-	-	-	-	1	1	0.1
Creek chub	-	-	-	-	-	-	-	-	-	2	2	0.1
Fallfish	6	1	6	-	5	5	8	-	1	10	42	2.5
White sucker	7	7	3	2	-	4	13	2	6	10	54	3.3
Pumpkinseed	1	-	-	-	1	-	-	-	-	1	3	0.2
Smallmouth bass	-	3	2	1	-	1	-	-	-	2	9	0.5
Largemouth bass	-	-	-	-	-	-	-	-	-	1	1	0.1
Tessellated darter	8	13	10	1	-	7	5	6	36	6	92	5.6
Walleye	2	-	-	-	-	1	-	-	1	-	4	0.2

Table 5

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 14-15 July 1982.

Date	14		15		15			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	0.84		0.84		0.84			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Decay Heat	0		0		0			
Intake Velocity (cm/s)	-9		-9		-9			
River Flow (m^3/s)	393.6		393.6		393.6			
Air Temp (C)	28.0		23.5		31.0			
Water Temp (C)	28.0		27.0		26.5			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Tessellated darter	-	-	-	-	-	2	-	2
Total	-	-	-	-	-	2	-	2

Table 6

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 14-15 July 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Tessellated darter	26-35	2 Young	0.5	2
Total			0.5	2

Table 7

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 26-27 July 1982.

Date	26		27		27			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	0.84		0.84		0.84			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Decay Heat	0		0		0			
Intake Velocity (cm/s)	-7		-7		-7			
River Flow (m^3/s)	393.1		366.7		356.8			
Air Temp (C)	30.5		27.0		31.0			
Water Temp (C)	29.0		27.0		28.5			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Shorthead redhorse	-	1	-	-	-	-	-	1
Channel catfish	-	1	-	-	-	-	-	1
Tessellated darter	-	-	-	1	-	-	-	1
Total	-	2	-	1	-	-	-	3

Table 8

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 26-27 July 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Shorthead redhorse	61-65	1 Young	3.8	1
Channel catfish	31-35	1 Young	0.4	1
Tessellated darter	31-35	1 Young	0.2	1
Total			4.4	3

Table 9

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 14-15 July 1982.

Date	14		15		15			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	-10		-10		-10			
River Flow (m^3/s)	393.6		393.6		393.6			
Air Temp (C)	27.5		24.5		30.0			
Water Temp (C)	28.0		26.5		27.5			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Total	NO FISH TAKEN							

Table 10

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 14-15 July 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Total	NO FISH TAKEN			

Table 11

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 26-27 July 1982.

Date	26		27		27			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	-5		-5		-5			
River Flow (m^3/s)	393.1		366.7		356.8			
Air Temp (C)	31.0		27.5		32.0			
Water Temp (C)	29.0		28.5		29.0			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Spottail shiner	-	1	-	-	-	-	-	1
Channel catfish	-	5	-	4	-	2	-	11
Margined madtom	-	-	-	-	-	1	-	1
Rock bass	-	-	-	-	-	1	-	1
Tessellated darter	-	1	-	-	-	1	-	1
Total	-	7	-	4	-	5	-	16

Table 12

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 26-27 July 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spottail shiner	41-45	1 Young	0.7	1
Channel catfish	26-45, 181-185	10 Young, 1 Juvenile	77.0	11
Margined madtom	31-35	1 Young	0.5	1
Rock bass	16-20	1 Young	0.1	1
Tessellated darter	36-40	2 Young	1.0	2
Total			79.3	16

Table 13

Fishes captured by the AC electrofisher near THINS in July 1982.

Zone	15B2	16B8	4A1	16A2	15A2	15A1	13A1	10A3	11B1	10B3	10B1	9B5
Date	7 Jul	7 Jul	7 Jul	7 Jul	8 Jul	8 Jul	13 Jul	13 Jul	14 Jul	14 Jul	14 Jul	14 Jul
Time	2125	2212	2259	2331	0010	0040	2251	2328	2057	2130	2207	2355
Duration (min)	17	14	17	19	17	17	18	18	18	18	14	20
Air Temp (C)	25.0	25.0	21.0	24.5	25.5	26.0	23.5	24.0	25.0	26.0	25.5	24.5
Water Temp (C)	25.5	25.5	26.0	25.5	25.5	25.5	27.5	28.0	27.5	28.5	28.5	28.0
Dissolved Oxygen (mg/l)	10.2	9.9	10.0	10.0	10.1	10.0	NA	NA	14.8	11.0	11.0	10.8
pH	8.6	8.8	8.4	8.3	8.6	8.6	9.3	9.2	9.1	9.2	9.3	8.5
Conductivity (microohms/cm)	300	175	275	275	181	178	375	360	300	250	260	350
Secchi Disc (cm)	86	112	46	41	46	51	63	56	51	58	61	69
Volts	185	195	180	175	180	185	165	170	185	185	180	165
Amps	6.5	4.5	6.5	6.5	5.0	5.0	7.0	7.5	6.5	7.0	6.5	7.5
Gizzard shad	-	-	2	-	-	-	-	-	-	-	-	-
Common carp	-	1	-	-	-	-	-	-	-	-	-	-
Bullfish	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	7	3	2	1	2	-	3	1	1	4	9	2
White sucker	-	6	-	1	-	2	3	1	-	-	-	-
Shorthead redhorse	-	1	-	4	-	2	-	-	-	-	-	-
Channel catfish	-	1	-	-	-	-	-	-	-	-	-	-
Rock bass	3	13	-	5	-	3	4	3	-	-	1	3
Redbreast sunfish	23	39	-	4	5	19	7	10	-	-	5	5
Green sunfish	1	-	-	-	-	-	-	-	-	-	-	-
Pumpkinseed	16	-	5	9	1	1	11	9	2	6	5	11
Bluegill	1	-	-	1	-	1	-	1	1	20	2	3
Smallmouth bass	6	13	2	9	2	4	9	4	-	-	1	3
Largemouth bass	2	-	-	-	-	-	-	-	1	2	-	-
White crappie	-	-	1	-	-	-	1	-	-	-	-	1
Black crappie	-	-	-	1	-	-	-	1	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	1	1	-	1	-	-	1	1	-	-	-	-
No. of Specimens	60	78	12	36	10	32	40	31	5	32	23	28
No. of Species	9	9	5	10	4	7	9	9	4	4	6	7

Table 13 continued.

Zone	4A1	15B2	16B8	16A2	13A1	15A2	15A1	11B1	10B3	10B1	10A3	9B5	Total
Date	19 Jul	21 Jul	21 Jul	21 Jul	21 Jul	21 Jul	22 Jul	22 Jul	22 Jul	22 Jul	22 Jul	23 Jul	
Time	2117	2104	2151	2230	2304	2344	0015	2122	2151	2221	2251	0000	
Duration (min)	14	18	15	18	18	18	13	15	15	14	16	16	
Air Temp (C)	27.5	22.0	22.0	20.5	20.0	19.5	18.0	25.0	26.0	26.0	24.0	21.0	
Water Temp (C)	30.5	27.5	27.5	27.0	27.0	27.5	27.0	28.0	30.0	29.0	27.0	27.0	
Dissolved Oxygen (mg/l)	10.6	13.6	11.8	10.2	10.0	10.2	10.0	15.4	10.2	10.6	10.0	9.7	
pH	8.9	9.0	9.2	8.1	8.2	9.0	8.7	8.9	8.7	8.9	8.5	8.4	
Conductivity (microohms/cm)	400	325	250	400	400	290	275	290	290	300	390	390	
Secchi Disc (cm)	61	38	58	51	46	66	63	36	69	56	36	41	
Volts	175	185	195	165	175	175	175	170	170	170	170	170	
Amps	9.0	7.0	4.5	7.0	7.0	6.0	5.0	6.0	4.5	5.5	7.0	7.0	
Gizzard shad	-	2	-	-	-	-	-	-	-	-	-	1	5
Common carp	-	1	1	-	-	-	1	2	5	-	-	-	11
Bullfish	-	-	-	-	-	-	1	-	-	-	-	-	2
Quillback	-	12	2	10	8	1	4	13	4	2	3	16	110
White sucker	-	-	-	-	-	-	-	-	-	-	-	-	13
Shorthead redhorse	-	-	-	-	-	-	-	-	-	-	-	-	7
Channel catfish	-	-	-	-	-	-	-	-	-	-	-	-	2
Rock bass	-	2	1	1	6	-	3	-	-	1	-	-	54
Redbreast sunfish	3	2	6	2	6	9	13	-	-	10	-	-	168
Green sunfish	-	-	-	-	-	-	-	-	-	-	-	-	1
Pumpkinseed	12	13	2	5	6	6	1	1	2	7	-	-	132
Bluegill	-	3	1	1	2	1	-	1	-	6	1	1	50
Smallmouth bass	2	1	6	3	2	4	9	-	-	2	2	2	84
Largemouth bass	-	-	-	-	-	-	-	-	-	-	-	-	5
White crappie	-	-	-	1	1	-	-	-	-	-	-	-	5
Black crappie	-	-	-	-	1	-	-	-	-	-	-	-	3
Yellow perch	-	3	-	-	-	-	-	-	-	-	-	-	3
Walleye	-	-	1	-	1	-	-	-	-	-	1	-	8
No. of Specimens	17	39	20	23		21	32	17	14	4	36	20	663
No. of Species	3	9	8	7	8	5	7	4	4	2	8	4	18

Table 14

Creel survey data from the GR for each survey day in July 1982.

Day	6 Tue			11 Sun			16 Fri			31 Sat			
Weather	Clear			Overcast, Partly Cloudy			Haze			Overcast, Heavy Rain			
River Stage (m)	4.65			3.99			3.84			3.91			
Air Temperature (C)	21.5	25.5	27.5	25.0	27.0	26.0	28.0	31.5	31.5	26.5	28.5	24.5	
Water Temperature (C)	22.5	23.0	23.0	27.0	27.0	27.5	28.5	29.5	29.5	25.5	26.5	25.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	12	13	12	37	43	20	6	7	7	24	9	-	190
Fish Caught	25	36	2	104	40	31	15	23	-	26	8	-	310
Fish Kept	10	-	-	17	12	8	-	-	-	4	2	-	53
Hours Fished	24.66	9.18	10.25	58.75	61.90	35.32	6.50	20.00	2.25	43.50	14.00	-	286.31
Catch/Effort (h)	1.01	3.92	0.20	1.77	0.65	0.88	2.31	1.15	-	0.60	0.57	-	1.08
Day Totals:													
Anglers		37			100			20			33		
Fish Caught		63			175			38			34		
Fish Kept		10			37			-			6		
Hours Fished		44.09			155.97			28.75			57.50		
Catch/Effort (h)		1.43			1.12			1.32			0.59		
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Muskellunge	-	-	-	-	-	-	-	1R	-	-	-	-	-	1R	1
Common carp [1]	-	-	-	1R	1R	-	-	-	-	1K	-	-	1K	2R	3
Brown bullhead	-	-	-	-	-	1R	-	-	-	-	-	-	1K	-	1
Channel catfish	-	-	-	1R 1K	1K 2R	1K 1R	-	2R	-	1K	1R	-	4K	7R	11
Rock bass	8K	10R	-	6K 6R	5K 7R	-	1R	-	-	-	-	-	11K	32R	43
Pumpkinseed	-	-	-	-	-	-	-	-	-	-	-	-	2K	-	2
Bluegill	-	-	-	-	1K	-	-	-	-	-	2K	-	1K	-	1
Smallmouth bass	9K 1R	2R	-	1R	-	3R	-	-	-	2K	-	-	9K	9R	18
Crappies (Pomoxis spp.)[1]	1K 6R	24R	2R	10K 78R	5K 18R	6K 19R	14R	17R	-	2K 20R	5R	-	24K	203R	227
	-	-	-	-	-	-	-	3R	-	-	-	-	-	3R	3

1 General Identification.
K Kept.
R Released.

Table 15

Creel survey data from the West Bay for each survey day in July 1982

Day	6 Tue			11 Sun			16 Fri			31 Sat			
Weather	Clear			Overcast			Haze			Overcast, Heavy Rain			
River Stage (m)	4.65			3.99			3.84			3.91			
Air Temperature (C)	20.5	26.0	27.5	25.5	27.0	27.0	28.0	33.0	32.0	26.5	29.5	24.5	
Water Temperature (C)	21.0	22.5	24.0	26.5	27.0	28.0	28.5	32.0	31.0	25.0	26.5	26.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	-	1	3	4	5	14	6	-	-	3	2	-	38
Fish Caught	-	2	12	41	44	31	10	-	-	26	-	-	166
Fish Kept	-	-	-	1	-	4	3	-	-	-	-	-	8
Hours Fished	-	0.25	9.00	10.00	6.50	24.75	6.00	-	-	7.50	1.00	-	65.00
Catch/Effort (h)	-	8.00	1.33	4.10	6.77	1.25	1.67	-	-	3.47	-	-	2.55
Day Totals:													
Anglers		4			23			6			5		
Fish Caught		14			116			10			26		
Fish Kept		-			5			3			-		
Hours Fished		9.25			41.25			6.00			8.50		
Catch/Effort (h)		1.51			2.81			1.67			3.06		
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Common carp	-	-	-	-	-	-	-	-	-	1R	-	-	-	1R	1
Channel catfish	-	1R	4R	26R	11R	-	1K 3R	-	-	15R	-	-	1K	60R	61
Rock bass	-	1R	1R	2R	3R	-	2K	-	-	-	-	-	2K	7R	9
Sunfishes (Lepomis spp.)[1]	-	-	-	1R	-	1R	-	-	-	5R	-	-	-	7R	7
Smallmouth bass	-	-	6R	8R	18R	21R	4R	-	-	5R	-	-	-	62R	62
Walleye	-	-	1R	1K 3R	12R	4K 5R	-	-	-	-	-	-	5K	21R	26

1 General Identification.
K Kept.
R Released.

Table 16

Creel survey data from the East Dam for each survey day in July 1982.

Day	6 Tue			11 Sun			16 Fri			31 Sat			
Weather	Clear			Overcast, Partly Cloudy			Haze			Partly Cloudy, Heavy Rain			
River Stage (m)	4.65			3.99			3.84			3.31			
Air Temperature (C)	21.5	25.5	30.0	25.0	27.5	26.5	31.5	27.5	31.5	26.5	29.5	24.0	
Water Temperature (C)	21.5	22.5	23.5	26.5	26.5	26.5	29.5	27.0	29.5	26.0	26.0	26.0	
Times:	a	b	c	a	b	c	a	b	c	a	b	c	Total
a) morning (0900-1300)													
b) afternoon (1301-1700)													
c) evening (1701-2100)													
Total Per Time Period:													
Anglers	9	7	10	1	10	8	4	1	-	7	3	-	60
Fish Caught	36	9	22	1	21	7	16	7	-	7	4	-	131
Fish Kept	8	1	2	1	1	1	2	2	-	1	-	-	19
Hours Fished	20.67	7.50	7.25	1.50	16.00	7.00	4.25	1.50	-	13.00	3.00	-	82.17
Catch/Effort (h)	1.74	1.20	2.93	0.67	1.31	1.00	3.76	4.67	-	0.54	1.33	-	1.59
Day Totals:													
Anglers		26			19			5			10		
Fish Caught		68			29			23			11		
Fish Kept		11			3			4			1		
Hours Fished		35.42			24.50			5.75			16.0		
Catch/Effort (h)		1.89			1.18			4.00			0.69		
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Muskellunge	1K	-	-	-	-	-	-	-	-	-	-	-	1K 1
Channel catfish	-	-	-	-	-	-	-	-	-	-	-	-	- -
Rock bass	2K	1K	3K	-	5K	1K 1R	-	-	-	1K 3R	2R	-	2K 11R 13
Bluegill	-	-	-	-	-	-	-	-	-	-	-	-	- - -
Sunfishes (Lepomis spp.)[1]	1K	2K	1K	-	1K	-	1K	-	-	-	-	-	2K 4R 6
Smallmouth bass	3K 6R	3R	5R	1K	1K 14R	5R	2K 12R	-	-	1K	2R	-	- 1R 1
Largemouth bass	1K	-	-	-	-	-	-	-	-	2R	-	-	14R 14
Black crappie	-	-	-	-	-	-	-	-	-	-	-	-	7K 52R 59
Walleye	2K 20R	1K 2R	2K 6R	-	-	-	-	2K	-	-	-	-	1K - 1
1 General identification.							1R	-	-	-	-	-	2K - 2
K Kept.													5K 29R 34
R Released.													

Table 17

Creel survey data from the Yhos for each survey day in July 1982.

Day	6 Tue			11 Sun			16 Fri			31 Sat			
Weather	Clear			Overcast, Partly Cloudy			Haze			Overcast, Rain			
River Stage (m)	4.65			3.99			3.84			3.31			
Air Temperature (C)	23.5	26.0	27.5	27.0	28.5	25.5	30.5	31.0	30.5	28.5	30.0	24.5	
Water Temperature (C)	23.5	24.5	24.5	26.5	27.0	26.5	29.0	30.0	29.0	27.0	27.0	25.5	
Times:	a	b	c	a	b	c	a	b	c	a	b	c	TOTAL
a) morning (0900-1300)													
b) afternoon (1301-1700)													
c) evening (1701-2100)													
Total Per Time Period:													
Anglers	8	12	27	19	26	19	8	7	13	11	12	4	166
Fish Caught	4	34	46	44	28	17	59	6	4	4	11	-	252
Fish Kept	-	6	41	8	11	9	14	2	2	3	1	-	83
Hours Fished	29.00	32.16	36.75	42.00	38.16	40.51	23.00	6.00	21.50	17.00	18.25	1.00	305.33
Catch/Effort (h)	0.14	1.06	1.25	1.05	0.73	0.42	2.56	1.00	0.19	0.24	0.60	-	0.84
Day Totals:													
Anglers		47			64			28			27		
Fish Caught		84			89			69			15		
Fish Kept		33			28			18			4		
Hours Fished		97.91			120.67			50.50			36.25		
Catch/Effort (h)		0.86			0.74			1.37			0.41		
Species	a	b	c	a	b	c	d	b	c	a	b	c	Total
Muskellunge	-	-	-	-	-	-	1R	-	-	-	-	-	- 1R 1
Common carp	2R	6R	-	-	1K	6R	-	-	-	-	-	-	- 7K 8R 15
Channel catfish	-	2R	12R 1R	3K 9R	1K	1K 2R	1R	2K 4R	1K 1R	2K	2R	-	24K 20R 44
Rock bass	-	-	10R	4R	1R	-	-	-	-	1K	-	-	11K 5R 16
Redbreast sunfish	-	-	2R	-	-	-	-	-	-	-	-	-	2K - 2
Bluegill	-	-	-	-	-	-	-	-	-	-	1K	-	1K - 1
Sunfishes (Lepomis spp.)[1]	-	3K 1R	1R	1K	1K 4R	1R 2R	-	-	-	-	-	-	6K 8R 14
Smallmouth bass	2R	19R	2K 11R	4K 14R	11R	1K 2R	7K 8R	-	1K 1R	1R	8R	-	15K 77R 92
Crappies (Pomoxis spp.)[1]	-	-	2R	-	-	2R	-	-	-	-	-	-	- 4R 4
Yellow perch	-	1K	-	-	-	-	-	-	-	-	-	-	1K - 1
Walleye	-	2R	1K 4R	9R	8K 1R	-	7K 35R	-	-	-	-	-	16K 51R 67
1 General identification.													
K Kept.													
R Released.													

Table 18

Summary of selected physicochemical parameters taken on 10 and 21 June 1982 near the TMINS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (NTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (NTU)	Alkalinity as $CaCO_3$	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TM-AQI-1A1	10 Jun	17.0	9.1	8.9	58.0	26.1	30.5	111	0.006	0.002	0.048	0.008
TM-AQI-1A2		17.0	9.0	10.2	60.0	27.1	28.0	107	0.009	0.002	0.044	0.006
TM-AQI-11A1		17.0	9.1	9.2	65.0	27.6	30.0	114	0.010	0.002	0.045	0.004
TM-AQI-11A2		17.0	8.6	9.1	62.0	27.1	28.0	107	0.011	0.002	0.035	0.003
TM-AQI-9B1		17.0	8.3	9.7	65.0	27.6	27.6	108	0.011	0.002	0.043	0.004
TM-AQI-1A1	21 Jun	20.0	8.5	8.6	16.0	44.0	35.0	149	0.005	0.002	0.020	0.005
TM-AQI-1A2		20.5	8.3	8.6	14.0	45.0	34.2	150	0.003	0.001	0.019	0.006
TM-AQI-11A1		20.5	8.1	8.7	15.0	46.0	30.0	143	0.005	0.002	0.021	0.007
TM-AQI-11A2		20.5	8.0	8.6	15.5	45.5	23.0	147	0.005	0.002	0.023	0.006
TM-AQI-9B1		20.5	8.0	9.0	10.0	46.5	31.0	148	0.003	0.002	0.017	0.005
						MEAN VALUES FOR JUNE 1982						
TM-AQI-1A1	Jun	18.5	-	8.8	37.0	35.0	32.8	130	0.006	0.002	0.034	0.006
TM-AQI-1A2		18.8	-	9.4	37.0	36.0	31.1	128	0.006	0.002	0.032	0.006
TM-AQI-11A1		18.8	-	9.0	40.0	36.8	30.0	128	0.008	0.002	0.033	0.006
TM-AQI-11A2		18.8	-	8.8	38.8	36.3	25.5	127	0.008	0.002	0.029	0.004
TM-AQI-9B1		18.8	-	9.4	37.5	37.0	29.3	126	0.007	0.002	0.030	0.004