

THREE MILE ISLAND AQUATIC STUDY
MONTHLY REPORT FOR AUGUST 1982

by

Ichthyological Associates, Inc.
P.O. Box 223, Etters, PA 17319

George A. Nardacci, Project Leader

For

GPU Nuclear Corporation

Ichthyological Associates, Inc.
Edward C. Raney, Ph.D., President
301 Forest Drive
Ithaca, New York 14850

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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 August 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 August (Table 1). The 1982 ETS sampling requirements for ichthyoplankton (far-field and entrainment) were completed as of 31 August.

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

MACROINVERTEBRATES

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

Progress: Replicate (4) benthos samples were taken on 9 and 23 August (Table 1). Enumeration, determination of dry weights, and identification of specimens have been completed through 23 August.

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 3, 10, 16, and 24 August (Table 1); all samples have been sorted and identified. A total of 2,269 specimens was taken (488 during the day and 1,781 at night). Late larvae and young of the spotfin shiner and mimic

shiner were most common. Other species taken included the gizzard shad, golden shiner, yellow bullhead, channel catfish, rock bass, redbreast sunfish, pumpkinseed/bluegill, and smallmouth bass.

August water temperatures ranged from 21.2 C on 24 August to 25.9 C on 16 August.

The ETS sampling requirements for ichthyoplankton far-field for 1982 have been completed as of 31 August. Data processing and analysis are now in progress.

Entrainment

Progress: Ichthyoplankton surveys were conducted at Units 1 and 2 on 10-11 and 24-25 August (Table 1). At Unit 1, 139 ichthyoplanktors (162 surface, 27 oblique) were taken on 10-11 August. Six taxa were collected; the mimic shiner, spotfin shiner, and bluegill were most abundant. Dredging operations conducted by divers in the Unit 1 suction bay on 10 August caused a marked increase in water turbidity. The 24-25 August sample at Unit 1 yielded 15 specimens (11 surface, 4 oblique). Four taxa were collected; the mimic shiner and spotfin shiner were most abundant.

At Unit 2, 21 ichthyoplanktors (13 surface, 8 oblique) were taken on 10-11 August. Six species were collected; the spotfin shiner and mimic shiner were most abundant. The 24-25 August collection yielded 20 specimens (13 surface, 7 oblique). The spotfin shiner was the only species taken.

All specimens taken in 1982 collections have been identified. All data have been coded for computer generation of running tables.

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 2-4 and 18-20 August (Table 1). A total of 109 fish of 14 species was taken on 2-4 August (Table 2). Most fish (53) occurred at Station 9B2, greatest biomass (22.16 kg) at 11A3, and most species (8) at both 11A2 and 9B2. The white crappie (36.7% of the total catch), quillback (22.9%), and black crappie (17.4%) were most abundant. Leeches parasitized two channel catfish. Five rock bass were sacrificed for radiation analysis. One channel catfish was tagged. Two previously tagged fish were recaptured (one brown bullhead and one channel catfish). One male pumpkinseed was ripe.

One hundred twenty-one fish of 13 species were taken on 18-20 August (Table 3). Most fish (39) were collected at Station 11A2 while greatest biomass (6.94 kg) occurred at 1A3. Stations 1A3, 11A3, and 9B2 all recorded eight species. The pumpkinseed and black crappie were most numerous and comprised 46.3% and 15.7% of the total catch, respectively. Anchor worms parasitized four pumpkinseed and one bluegill. One pumpkinseed was parasitized by a leech. One channel catfish and one rock bass had necrosis of the caudal fin and dorsal fin, respectively. One black crappie was found dead in the net at Station 1A3. Three channel catfish and

eight rock bass were tagged. Five male pumpkinseed and three male bluegill were ripe.

Three channel catfish, one quillback, and one shorthead redhorse were observed dead in the study area. No pattern of parasite infection or dead fishes was observed with respect to the location of TMINS in August.

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 2 and 19 August (Table 1). Analysis of August collections is currently under way; results will be presented in a future progress report.

Collections taken on 19 July have now been processed; 1,281 fish of 21 species were taken (Table 4). Most fish (327) were taken at Station 10B5 while most species (9) and greatest biomass (152.0 g) occurred at 16A5. Common fishes included the spotfin shiner (45.6% of the total catch), brown bullhead (20.5%, all taken at 9B3), spottail shiner (16.2%), and tessellated darter (10.3%). Slight black spot infestations were observed on 46 spotfin shiner and 1 bluntnose minnow. Anchor worms parasitized 12 spotfin shiner, 1 spottail shiner, and 1 white sucker. One spotfin shiner had scoliosis and one spotfin shiner was pugheaded. No pattern of parasite infection or anomaly was observed with respect to the location of TMINS.

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 12-13 and 25-26 August at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 96 fish of 8 species weighing 30.2 g (Tables 5 through 8). All fish were young and most were dead. Fish numbers and biomass were highest during the 25-26 August survey. More fish were collected at 0400 h than during the other survey periods. The estimated impingement for Unit 1 for August was 1,488 fish weighing 468.1 g (1.0 lb).

Unit 2 impinged 31 fish of 9 species weighing 32.8 g (Tables 9 through 12). Most fish were young and all were dead. Fish numbers and biomass were highest during the 12-13 and 25-26 August surveys, respectively. The estimated impingement for Unit 2 was 480 fish weighing 508.4 g (1.1 lb).

The total estimated impingement at TMINS for August was 1,968 fish weighing 976.5 g (2.1 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 four nights in August (Table 1). Twenty-four collections in 12 zones yielded 544 specimens of 16 species and one hybrid (Table 13). The pumpkinseed (107 specimens), quillback (102), redbreast sunfish (90), and smallmouth

bass (70) were most abundant. A total of 49 fish was tagged for movements studies.

MOVEMENTS OF FISHES

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

Progress: A total of 61 fish was tagged and four previously tagged fish were recaptured in August. Recaptured fishes included one brown bullhead that was recaptured in the same area in which it was tagged, one channel catfish that moved 3.2 km upstream, one rock bass that made a 0.2 km complex movement, and one smallmouth bass that 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 5, 14, 22, and 30 August (Table 1). The 359 anglers interviewed fished 766.97 hours and caught 883 fish (Tables 14 through 17). The actual harvest was 159 fish or 18.0% of the total catch. The mean catch per effort (c/e) was 1.15. Most anglers (167) fished at the York Haven Generating Station (YHGS). The largest total catch (569), most hours fished (375.37), and highest c/e (1.52) were recorded at the General Reservoir; however, the most fish kept (100) were recorded at the YHGS.

Smallmouth bass (479) was the predominant species caught by anglers. Other species frequently caught included the channel catfish (183), rock bass (105), and unidentified sunfish (47).

Approximately 67% of the anglers interviewed lived in York or Dauphin counties. Most anglers reported that they eat some of their catch.

AMBIENT WATER QUALITY

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

Progress: Water quality samples were collected on 9 and 23 August at the five river stations (Table 1). Data are currently being analyzed; results will be presented in the September progress report.

The water quality samples collected in July have now been analyzed; results are presented in Table 18. On 12 July values for total dissolved solids and total and dissolved copper were highest at Station 11A1 (TMINS Discharge); water temperature and turbidity values were highest at 9B1. Sulfate, alkalinity, and dissolved zinc results were highest at Stations 1A1, 1A2, and 11A2, respectively.

On 26 July values for sulfate and dissolved zinc were highest at Station 1A1; dissolved oxygen and alkalinity values were highest at 1A2. Values for total dissolved solids (11A1), total zinc and turbidity (11A2), and pH (9B1) were highest at stations located at or below the Discharge.

Parameters, for which State water quality criteria have been established, were not exceeded at any station on 12 or 26 July.

THERMAL PLUME MAPPING

Objectives: (1) To determine temperature data; (2) To define the discharge plume; and (3) To check the accuracy of the analytical plume model.

Progress: Thermal plume mapping was conducted on 6 August (Table 1) in conformance with the requirement that a plume map be done once during the summer low river flow (less than 10,000 cfs; 283.2 m³/s); no ΔT was determinable (Table 19). River water temperature varied little (± 1.0 C) between the Unit 1 Intake and 1900 m downstream of the TMINS Discharge. No plume was evident.

Table 1

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

PROGRAM	Aug 1-7	Aug 8-14	Aug 15-21	Aug 22-28	Aug 29-31
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	
Movements of Fishes	X	X	X	X	
Creel Surveys	X	X		X	
Ambient Water Quality		X		X	X
Thermal Plume Mapping	X			X	

Table 2

Fishes taken by trapnet on 2-4 August 1982 near THINS.

Station	TM-AQF-1A2		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
	2-3 1355-1436	3-4 1439-1411	2-3 1345-1421	3-4 1424-1353	2-3 1338-1406	3-4 1410-1330	2-3 1326-1337	3-4 1341-1305		
Date										
Time										
Air Temp (C)	28.0, 25.0	25.0, 29.5	28.0, 26.0	26.0, 28.5	27.5, 25.0	25.0, 29.0	27.5, 25.5	25.5, 28.5		
Water Temp (C)	25.5, 24.5	24.5, 26.5	26.0, 24.5	24.5, 25.5	26.0, 24.5	24.5, 25.5	26.0, 24.5	24.5, 26.5		
Dissolved Oxygen (mg/l)	9.6, 7.7	7.7, 11.1	9.5, 7.7	7.7, 9.3	9.5, 7.5	7.5, 9.6	9.6, 7.7	7.5, 10.0		
pH	8.5, 7.6	7.6, 8.3	8.4, 7.8	7.8, 8.1	8.1, 7.8	7.8, 8.3	8.0, 8.1	8.1, 8.6		
Secchi Disc (cm)	33, 18	18, 28	25, 20	20, 25	36, 20	20, 26	36, 10	20, 25		
River Stage (m)	1.19, 1.16	1.16, 1.10	1.19, 1.16	1.16, 1.10	1.19, 1.16	1.16, 1.10	1.19, 1.16	1.16, 1.10		
Weather	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy	Haze, Partly Cloudy		
No. of Specimens	4	5	7	8	8	24	31	22	109	
No. of Species	3	4	5	5	5	5	5	6	14	
Common carp	1	-	-	-	-	-	-	-	1	0.9
Golden shiner	-	-	-	-	-	-	-	-	1	0.9
Quillback	-	-	1	-	2	19	1	2	25	22.9
White sucker	-	1	-	1	-	-	-	-	2	1.8
White catfish	-	-	-	-	-	-	-	-	1	0.9
Yellow bullhead	-	-	-	1	-	1	-	-	1	0.9
Brown bullhead	-	-	-	-	-	-	-	-	1	0.9
Channel catfish	-	-	1	-	1	2	-	-	4	3.7
Rock bass	-	1	1	1	3	-	-	1	7	6.4
Pumpkinseed	-	1	2	-	-	-	-	2	5	4.6
Bluegill	2	-	-	-	-	-	-	1	1	0.9
White crappie	1	2	2	3	1	-	22	10	40	36.7
Black crappie	-	-	-	2	1	1	6	6	19	17.4
Walleye	-	-	-	-	-	1	-	-	1	0.9

Table 3

Fishes taken by trapnet on 18-20 August 1982 near TMDNS.

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	18-19	19-20	18-19	19-20	18-19	19-20	18-19	19-20		
Time	0942-1001	1003-0954	0931-0937	0939-0935	0923-0910	0916-0919	0909-0849	0853-0856		
Air Temp (C)	21.0, 21.5	21.5, 24.0	21.0, 20.0	20.0, 24.0	21.0, 19.0	19.0, 23.0	20.0, 18.5	18.5, 21.0		
Water Temp (C)	23.0, 23.0	23.0, 24.0	23.5, 23.5	23.5, 24.5	23.5, 23.5	23.5, 24.0	24.0, 24.0	24.0, 24.5		
Dissolved Oxygen (mg/l)	8.2, 8.3	8.3, 9.6	8.2, 8.7	8.7, 9.4	8.1, 8.4	8.4, 9.1	8.0, 8.3	8.3, 9.2		
pH	8.2, 8.6	8.6, 8.9	8.2, 8.2	8.2, 8.3	8.2, 8.0	8.0, 8.9	8.4, 8.7	8.7, 8.6		
Secchi Disc (cm)	56, 41	41, 46	48, 38	36, 36	51, 38	38, 38	64, 46	46, 46		
River Stage (m)	1.01, 1.01	1.01, 1.01	1.01, 1.01	1.01, 1.01	1.01, 1.01	1.01, 1.01	1.01, 1.01	1.01, 1.01		
Weather	Clear, Clear	Clear, Partly Cloudy	Clear, Clear	Clear, Partly Cloudy	Clear, Clear	Clear, Clear	Clear, Clear	Clear, Clear		
No. of Specimens	21	8	20	19	16	12	8	17	121	
No. of Species	6	6	5	5	8	4	4	7	13	
Common carp	-	-	-	-	-	-	-	1	1	0.8
Golden shiner	-	-	-	-	-	-	-	1	1	0.8
Quillback	-	-	-	-	3	1	1	-	5	4.1
White sucker	-	-	-	-	1	-	-	-	1	0.8
Northern hog sucker	1	-	-	-	-	-	-	-	1	0.8
Yellow bullhead	-	1	-	-	-	-	-	-	1	0.8
Channel catfish	-	3	-	1	1	-	-	-	5	4.1
Rock bass	1	-	1	2	1	-	1	4	10	8.3
Redbreast sunfish	-	-	1	-	-	-	-	-	1	0.8
Pumpkinseed	11	1	11	14	5	9	3	2	56	46.3
Bluegill	2	1	3	1	1	1	-	3	12	9.9
White crappie	3	1	-	-	2	1	-	1	8	6.6
Black crappie	3	1	4	1	2	-	3	5	19	15.7

Table 4

Fishes taken by seine on 19 July 1982 near THINE.

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
Tide	0843	1149	0907	0939	1024	1039	1100	1116	1131	1005		
Air Temp (C)	29.5	33.0	28.5	27.5	29.0	28.5	28.5	28.5	29.5	29.5		
Water Temp (C)	29.0	31.5	29.5	28.5	29.0	28.5	28.5	29.0	29.5	29.5		
Dissolved Oxygen (mg/l)	10.6	14.6	7.1	7.6	7.6	7.6	7.8	8.1	7.9	11.0		
pH	8.7	9.1	8.7	8.2	8.3	8.2	8.2	8.3	8.2	8.6		
Secchi Disc (cm)	41	36	66*	64	64	46	56	58	56	89		
River Stage (m)	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13		
Weather	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear		
No. of Specimens	88	327	211	69	11	56	136	9	297	77	1281	
No. of Species	6	7	9	7	6	6	7	3	6	5	21	
No. of Hauls	4	6	6	5	4	4	4	4	4	5	46	
Common carp	-	-	-	-	1	-	-	-	-	-	1	0.1
Comely shiner	-	-	25	-	-	1	-	-	-	-	26	2.0
Common shiner	-	1	-	-	-	-	-	-	-	-	1	0.1
Spottail shiner	49	75	6	5	1	6	56	-	9	-	207	16.2
Swallowtail shiner	1	-	-	-	-	-	-	-	-	-	1	0.1
Spotfin shiner	21	234	169	40	4	43	22	5	-	46	584	45.6
Mimic shiner	-	-	1	-	-	1	-	-	-	1	3	0.2
Bluntnose minnow	-	13	2	-	-	-	3	-	1	-	19	1.5
Creek chub	-	-	-	-	-	-	-	-	-	1	1	0.1
Fallfish	7	-	4	1	-	1	1	-	-	-	14	1.1
Quillback	-	-	-	-	1	-	-	-	-	-	1	0.1
White sucker	3	-	-	12	-	-	1	-	-	-	16	1.2
Northern hog sucker	-	-	1	1	-	-	-	-	-	-	2	0.2
Shorthead redhorse	-	-	1	-	-	-	-	-	-	-	1	0.1
Brown bullhead	-	-	-	-	-	-	-	-	262	-	262	20.5
Channel catfish	-	-	-	-	-	-	-	1	-	-	1	0.1
Pumpkinseed	-	1	-	-	-	-	-	-	-	-	1	0.1
Smallmouth bass	-	1	-	1	1	-	1	-	-	1	5	0.4
Black crappie	-	-	-	-	-	-	-	-	2	-	2	0.2
Pomoxis spp.	-	-	-	-	-	-	-	-	1	-	1	0.1
Jessellated darter	7	2	2	9	3	4	52	3	22	28	132	10.3

* Clear to bottom at indicated depth.

Table 5

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 12-13 August 1982.

Date	12	13	13							
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)	-5	-5	-5							
River Flow (m ³ /s)	328.9	310.1	303.0							
Air Temp (C)	19.0	17.5	24.5							
Water Temp (C)	22.5	21.0	21.5							
Condition of Fish	Alive		Dead		Alive		Dead		Total	
Common carp	-	-	-	-	-	1	-	-	-	1
Spottail shiner	-	1	-	-	-	1	-	-	-	2
Yellow bullhead	-	1	-	-	-	1	-	-	-	2
Rock bass	-	3	-	-	-	-	-	-	-	3
Lepomis spp.	-	22	-	10	-	7	-	-	-	39
Total	-	27	-	10	-	10	-	-	-	47

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Table 6

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 12-13 August 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Common carp	41-45	1 Young	1.0	1
Spottail shiner	46-50	2 Young	2.3	2
Yellow bullhead	26-30, 41-45	2 Young	1.7	2
Rock bass	16-25	3 Young	0.7	3
Lepomis spp.	16-30	39 Young	8.2	39
Total			13.9	47

Table 7

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 25-26 August 1982.

Date	25	26	26						
Time	2000	0400	1200	Total		Total		Total	
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)	-6	-6	-6						
River Flow (m ³ /s)	165.0	166.7	167.4						
Air Temp (C)	23.5	17.5	25.0						
Water Temp (C)	25.0	22.5	22.5						
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total		
Spottail shiner	-	2	-	3	-	-	-	5	
Channel catfish	-	-	-	-	1	-	1	-	
Rock bass	1	1	-	-	-	-	1	1	
Pumpkinseed	-	2	-	12	-	3	-	17	
Bluegill	-	3	1	18	-	2	1	23	
Total	1	8	1	33	1	5	3	46	

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Table 8

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 25-26 August 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spottail shiner	26-35	5 Young	1.2	5
Channel catfish	61-65	1 Young	3.1	1
Rock bass	31-40	2 Young	1.6	2
Pumpkinseed	16-35	17 Young	4.1	17
Bluegill	16-35	24 Young	6.3	24
Total			16.3	49

Table 9

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 12-13 August 1982.

Date	12	13	13							
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)	-3	-3	-3							
River Flow (m ³ /s)	328.9	310.1	303.0							
Air Temp (C)	19.0	18.0	25.0							
Water Temp (C)	22.0	21.5	22.0							
Condition of Fish	Alive Dead		Alive Dead		Alive Dead		Total			
Common carp	-	-	-	2	-	1	-	-	-	3
Spotfin shiner	-	1	-	-	-	2	-	-	-	3
Yellow bullhead	-	-	-	3	-	-	-	-	-	3
Channel catfish	-	-	-	-	-	1	-	-	-	1
Lepomis spp.	-	2	-	2	-	3	-	-	-	7
Tessellated darter	-	1	-	-	-	1	-	-	-	2
Total	-	4	-	7	-	8	-	-	-	19

Table 10

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 12-13 August 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Common carp	31-35, 41-45, 51-55	3 Young	4.2	3
Spotfin shiner	21-25, 46-50, 61-65	1 Young, 1 Juvenile, 1 Adult	3.8	3
Yellow bullhead	21-25, 36-45	3 Young	2.5	3
Channel catfish	51-55	1 Young	1.9	1
Lepomis spp.	16-30	7 Young	1.5	7
Tessellated darter	36-45	1 Young, 1 Juvenile	1.2	2
Total			15.1	19

Table 11

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 25-26 August 1982.

Date	25	26	26					
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)	-2	-2	-2					
River Flow (m ³ /s)	165.0	166.7	167.4					
Air Temp (C)	23.5	17.5	29.5					
Water Temp (C)	25.0	22.5	23.0					
Condition of Fish	Alive		Dead		Alive		Dead	
Spottail shiner	-	-	-	1	-	1	-	2
Spotfin shiner	-	-	-	1	-	-	-	1
Yellow bullhead	-	-	-	1	-	-	-	1
Channel catfish	-	1	-	1	-	-	-	2
Margined madtom	-	-	-	2	-	-	-	2
Pumpkinseed	-	2	-	-	-	-	-	2
Tessellated darter	-	1	-	1	-	-	-	2
Total	-	4	-	7	-	1	-	12

17

Table 12

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 25-26 August 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spottail shiner	21-30	2 Young	0.3	2
Spotfin shiner	51-55	1 Juvenile	2.1	1
Yellow bullhead	71-75	1 Juvenile	5.0	1
Channel catfish	51-55, 61-65	2 Young	5.1	2
Margined madtom	36-40, 46-50	2 Young	1.7	2
Pumpkinseed	26-35	2 Young	1.0	2
Tessellated darter	46-50	2 Juvenile	1.9	2
Total			17.7	12

Table 13

Fishes captured by the AC electrofisher near TMINS in August 1982.

Zone	15B2	16B8	4A1	16A2	15A1	15A2	13A1	10A3	9B5	10B1	10B3	11B1
Date	9 Aug	9 Aug	9 Aug	9 Aug	12 Aug	12 Aug	12 Aug	12 Aug	12 Aug	12 Aug	12 Aug	13 Aug
Time	2059	2136	2215	2250	2036	2111	2137	2203	2234	2306	2333	0008
Duration (min)	17	14	16	14	14	14	17	17	17	16	19	17
Air Temp (C)	21.0	22.0	21.5	21.0	20.5	19.5	19.5	19.0	17.5	17.0	18.0	16.5
Water Temp (C)	26.0	26.5	25.0	25.0	24.0	24.0	23.0	22.5	22.5	24.0	24.0	23.5
Dissolved Oxygen (mg/l)	10.6	10.4	8.0	7.8	12.0	11.9	7.8	7.9	8.5	11.8	11.8	3.8
pH	8.9	9.0	8.5	8.5	9.1	8.6	8.1	7.8	7.7	8.8	9.0	8.4
Conductivity (micromhos/cm)	340	325	440	340	350	340	240	240	275	340	330	330
Secchi Disc (cm)	25	61	25	5	61	58	33	30	38	61	58	64
Volts	175	185	170	190	195	190	200	200	195	190	190	195
Amps	6.5	7.0	7.5	5.0	7.0	7.5	5.5	5.5	6.5	8.0	8.5	7.5
Gizzard shad	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	1	-	2	3	1	-	-	-	-	-	-	1
Quillback	11	3	4	1	5	7	4	4	8	2	2	5
White sucker	-	-	-	-	-	-	1	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	1	-	1	-	-	-	-	1
Redbreast sunfish	-	-	3	3	2	-	1	-	1	-	-	-
Green sunfish	3	4	-	2	18	1	4	4	-	1	1	-
Pumpkinseed	1	-	-	-	-	-	-	-	-	-	-	-
Bluegill	3	5	4	8	5	2	2	2	5	3	5	1
Lepomis hybrid	2	1	2	-	-	1	-	-	5	2	5	2
Smallmouth bass	-	-	-	-	-	-	-	-	-	-	-	-
Largemouth bass	1	5	4	10	5	2	-	2	4	-	1	-
Black crappie	1	-	-	-	-	-	-	-	-	-	2	-
Yellow perch	-	3	-	-	-	-	-	-	-	-	-	1
Walleye	-	-	-	-	-	-	-	-	-	-	-	-
No. of Specimens	23	21	23	27	37	13	15	15	25	9	18	11
No. of Species	8	6	7	6	7	5	8	5	6	5	8	6

Table 13 continued.

Zone	15B2	16B8	15A2	15A1	10B3	11B1	4A1	16A2	13A1	10A3	9B5	10B1	Total
Date	23 Aug	23 Aug	23 Aug	23 Aug	23 Aug	24 Aug	25 Aug	25 Aug	25 Aug	25 Aug	25 Aug	25 Aug	
Time	2030	2119	2206	2242	2326	0002	2029	2102	2130	2214	2255	2325	
Duration (min)	18	16	16	14	18	19	18	14	17	17	17	15	
Air Temp (C)	21.5	21.0	20.0	20.0	20.0	18.0	22.5	22.5	22.0	20.5	20.5	19.0	
Water Temp (C)	24.0	23.5	23.0	23.0	22.0	21.5	23.5	23.5	23.5	23.0	23.5	23.5	
Dissolved Oxygen (mg/l)	17.4	10.6	10.8	10.5	10.4	10.7	11.4	11.0	10.5	10.6	9.4	9.3	
pH	9.0	9.1	9.3	9.1	9.0	8.9	8.8	8.8	8.9	8.4	8.6	9.0	
Conductivity (micromhos/cm)	275	290	350	325	310	310	360	360	380	400	410	340	
Secchi Disc (cm)	64	69	61	51	46	28	33	33	33	38	41	61	
Volts	190	200	185	195	190	190	185	175	175	175	165	175	
Amps	6.0	5.0	6.5	6.5	8.0	6.0	7.5	8.0	7.0	7.5	7.5	7.5	
Gizzard shad	14	-	-	-	-	-	-	-	-	-	-	-	15
Common carp	1	2	1	1	3	1	-	-	1	1	1	-	22
Quillback	11	7	8	5	2	2	1	1	2	1	5	1	102
White sucker	-	-	-	-	-	-	-	1	-	-	-	-	2
Shorthead redhorse	-	2	-	-	-	-	-	-	1	-	-	-	6
Channel catfish	-	1	-	1	-	-	-	-	1	-	-	-	2
Rock bass	2	4	-	8	1	1	1	4	6	3	-	-	40
Redbreast sunfish	-	3	3	-	-	-	-	-	-	-	-	-	6
Green sunfish	-	-	-	22	-	-	1	2	12	9	-	-	90
Pumpkinseed	-	-	-	-	-	-	-	-	-	-	-	-	1
Bluegill	4	8	9	1	4	1	10	2	4	16	2	1	107
Lepomis hybrid	-	7	2	1	5	1	-	1	2	3	2	3	47
Smallmouth bass	9	12	2	2	2	-	-	-	-	-	-	-	2
Largemouth bass	1	-	-	-	-	-	-	2	4	1	-	1	70
Black crappie	-	-	-	-	-	2	-	-	-	-	-	-	5
Yellow perch	2	-	-	-	-	1	-	-	-	-	1	-	5
Walleye	2	1	-	-	-	-	-	-	-	-	-	-	3
No. of Specimens	46	48	23	42	17	11	13	17	32	38	11	7	544
No. of Species	9	11	6	5	6	8	4	8	8	8	5	5	17

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

Day	5 Thu			14 Sat			22 Sun			30 Mon			
Weather	Haze			Partly Cloudy			Clear, Partly Cloudy			Overcast, Partly Cloudy, Windy			
River Stage (m)	3.55			3.52			3.26			3.24			
Air Temperature (C)	28.0	32.0	32.0	24.0	25.5	24.5	17.0	20.0	21.5	16.5	21.5	23.0	
Water Temperature (C)	27.0	27.5	29.0	23.5	24.5	24.0	22.5	24.0	24.0	20.0	21.5	22.5	
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 Per Time Period:													TOTAL
Anglers	8	2	7	28	5	4	42	29	14	5	5	17	166
Fish Caught	33	2	17	86	1	-	167	157	37	28	1	20	569
Fish Kept	1	-	11	16	-	-	2	2	6	2	-	2	42
Hours Fished	12.75	2.00	14.00	71.50	8.25	1.00	113.02	63.17	24.84	18.50	2.00	44.34	375.37
Catch/Effort (h)	2.59	1.00	1.21	1.20	0.12	-	1.85	2.48	1.49	1.51	0.50	0.45	1.52
Day Totals:													
Anglers	17			37			85			27			
Fish Caught	52			87			381			49			
Fish Kept	17			16			10			4			
Hours Fished	28.75			80.75			201.03			64.84			
Catch/Effort (h)	1.81			1.08			1.90			0.76			
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Common carp	-	-	-	-	-	-	-	2R	-	-	-	-	2R
Fallfish	-	-	-	1R	-	-	-	-	-	-	-	-	1R
Channel catfish	1K 26R	-	1K	1K 1R	-	-	14R	17R	1K 1R	-	-	1R	4K 60R 64
Rock bass	1R	-	3K	5K 5R	-	-	42R	32R	1K 2R	-	-	2R	9K 84R 93
Redbreast sunfish	-	-	-	-	-	-	-	-	-	-	-	1R	1R
Sunfishes (Lepomis spp.) ¹	-	1R	-	2K 1R	-	-	12R	6R	2R	-	-	6R	2K 28R 30
Smallmouth bass	5R	1R	7K 6R	8K 60R	1R	-	2K 116R	2K 97R	4K 26R	2K 26R	-	2K 9R	27K 347R 374
Crapplins (Pomoxis spp.) ¹	-	-	-	-	-	-	1R	1R	-	-	-	-	2R 2
Walleye	-	-	-	2R	-	-	-	-	-	-	-	-	2R 2

¹ General identification.
 K Kept.
 R Released.

Table 15

Creel survey data from the West Dam for each survey day in August 1982.

Day	5 Thu			14 Sat			27 Sun			30 Mon			
Weather	Haze			Partly Cloudy			Clear, Partly Cloudy, Overcast			Overcast, Partly Cloudy, Windy, Clear			
River Stage (m)	3.55			3.52			3.26			3.24			
Air Temperature (C)	27.0	32.0	31.5	23.0	27.0	26.0	16.0	21.0	22.0	17.0	21.5	22.5	
Water Temperature (C)	26.0	29.5	31.5	24.0	27.5	26.5	21.0	24.5	25.0	18.5	20.5	22.5	
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 Per Time Period:													TOTAL
Anglers	-	-	-	4	3	7	1	2	-	-	-	-	17
Fish Caught	-	-	-	6	4	-	-	3	-	-	-	-	13
Fish Kept	-	-	-	-	-	-	-	-	-	-	-	-	-
Hours Fished	-	-	-	28.50	6.00	-	1.00	1.50	-	-	-	-	37.00
Catch/Effort (h)	-	-	-	0.21	0.67	-	-	2.00	-	-	-	-	0.35
Day Totals:													
Anglers	-			14			3			-			
Fish Caught	-			10			3			-			
Fish Kept	-			-			-			-			
Hours Fished	-			34.50			2.50			-			
Catch/Effort (h)	-			0.29			1.20			-			
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Channel catfish	-	-	-	5R	4R	-	-	-	-	-	-	-	9R 9
Smallmouth bass	-	-	-	1R	-	-	-	1R	-	-	-	-	2R 2
Walleye	-	-	-	-	-	-	-	2R	-	-	-	-	2R 2

K Kept.
 R Released.

Table 16

Creel survey data from the East Dam for each survey day in August 1981.

Day	5 Thu			14 Fri			22 Sun			30 Mon			
Weather	Baze			Partly Cloudy			Clear, Partly Cloudy, Overcast			Partly Cloudy, Windy, Clear			
River Stage (m)	3.55			3.52			3.26			3.26			
Air Temperature (C)	26.0	31.5	32.5	26.0	28.5	24.0	15.0	19.0	21.5	17.0	22.5	23.5	
Water Temperature (C)	26.0	28.0	31.5	23.5	27.5	26.5	22.0	24.0	23.5	21.0	22.0	22.5	
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 For Time Period:													TOTAL
Anglers	-	-	-	-	-	-	-	1	4	-	4	-	9
Fish Caught	-	-	-	-	-	-	-	-	19	-	1	-	20
Fish Kept	-	-	-	-	-	-	-	-	17	-	-	-	17
Hours Fished	-	-	-	-	-	-	-	-	11.00	-	8.00	-	19.00
Catch/effort (h)	-	-	-	-	-	-	-	-	1.73	-	0.12	-	1.05
Day Totals:													
Anglers	-	-	-	-	-	-	-	5	-	-	4	-	9
Fish Caught	-	-	-	-	-	-	-	19	-	-	1	-	20
Fish Kept	-	-	-	-	-	-	-	17	-	-	-	-	17
Hours Fished	-	-	-	-	-	-	-	11.00	-	-	8.00	-	19.00
Catch/effort (h)	-	-	-	-	-	-	-	1.73	-	-	0.12	-	1.05
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Channel catfish	-	-	-	-	-	-	-	-	3K 1R	-	-	-	3K 1R 4
Rock bass	-	-	-	-	-	-	-	-	3K	-	-	-	3K - 3
Redbreast sunfish	-	-	-	-	-	-	-	-	2K	-	-	-	2K - 2
Pumpkinseed	-	-	-	-	-	-	-	-	2K	-	-	-	2K - 2
Bluegill	-	-	-	-	-	-	-	-	3K	-	-	-	3K - 3
Sunfishes (<i>Lepomis</i> spp.) ¹	-	-	-	-	-	-	-	-	1R	-	1R	-	2R 2
Smallmouth bass	-	-	-	-	-	-	-	-	3K	-	-	-	3K - 3
Walleye	-	-	-	-	-	-	-	-	1K	-	-	-	1K - 1

¹ General identification.

K Kept.

R Released.

Table 17

Creel survey data from the YNGS for each survey day in August 1982.

Day	3 Thu			14 Sat			22 Sun			30 Mon			
Weather	Baze			Partly Cloudy			Clear, Partly Cloudy			Partly Cloudy, Clear			
River Stage (m)	3.55			3.52			3.26			3.26			
Air Temperature (C)	28.5	33.0	30.5	26.0	28.5	20.5	17.0	21.5	21.0	20.0	22.5	21.5	
Water Temperature (C)	28.0	30.0	28.5	25.5	25.5	23.0	23.0	24.5	22.5	20.5	23.0	22.0	
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 For Time Period:													TOTAL
Anglers	2	19	20	10	13	21	12	18	26	3	9	16	167
Fish Caught	-	17	21	17	5	14	17	129	46	2	6	13	281
Fish Kept	-	14	16	16	2	5	6	15	0	2	4	8	100
Hours Fished	7.00	42.50	41.50	28.00	19.75	48.50	18.25	48.00	46.00	3.00	11.68	21.42	335.60
Catch/effort (h)	-	0.40	0.51	0.61	0.25	0.29	0.60	2.69	1.09	0.67	0.51	0.51	0.83
Day Totals:													
Anglers		41			44			54			28		127
Fish Caught		38			36			186			21		201
Fish Kept		30			23			33			14		77
Hours Fished		91.00			96.25			112.25			36.10		225.60
Catch/effort (h)		0.42			0.37			1.66			0.53		0.83
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Common carp	-	-	-	-	-	1R	6K	-	1R	-	-	-	6K 2R 4
Quillback	-	-	-	-	-	-	-	2K	-	-	-	-	2K - 2
Channel catfish	-	6R 2R	6R 2R	16R	1R 2R	3K	3K 2R	10K 50R	1K 2R	-	-	-	44K 60R 17R
Rock bass	-	3K	3K	-	-	1K	-	1K	-	-	1R	-	9K 1R 5
Redbreast sunfish	-	-	-	-	-	-	-	-	-	1K	1K	-	2K - 2
Pumpkinseed	-	-	-	-	-	-	-	-	-	-	1R	-	1R - 1
Bluegill	-	-	-	-	-	-	-	-	-	-	-	5K	5K - 5
Sunfishes (<i>Lepomis</i> spp.) ¹	-	4K	-	1R	-	3R	-	2K	3R	-	-	2R	6K 9R 15
Smallmouth bass	-	1R	1R 1R	-	1R	4R	-	61R	6K 23R	-	2R	2R	5K 95R 100
Largemouth bass	-	-	1K	-	-	-	-	-	-	-	-	-	1K - 1
White crappie	-	-	5K	-	-	-	-	-	-	-	-	-	5K - 5
Black crappie	-	-	-	-	-	1R	-	-	1K	1K	1K	1K 1R	5K 1R 4
Crookers (<i>Pomoxis</i> spp.) ¹	-	1K	-	-	-	-	-	-	3K	-	-	-	4K - 4
Yellow perch	-	-	-	-	-	1K	-	-	-	-	-	1K	1K 1R 2
Walleye	-	-	2R	-	1K	-	-	3R	8R	-	1K	-	2K 13R 13

¹ General identification.

K Kept.

R Released.

Table 18

Summary of selected physicochemical parameters taken on 12 and 26 July 1982 near the THINS. 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
TH-AQ1-1A1	12 Jul	26.0	8.6	6.8	4.5	50.0	71.0	200	0.002	0.002	0.013	0.005
TH-AQ1-1A2		26.0	8.7	7.8	7.0	82.5	32.9	214	0.002	0.001	0.016	0.006
TH-AQ1-11A1		26.0	8.7	7.7	6.5	78.0	68.0	226	0.006	0.003	0.014	0.005
TH-AQ1-1A2		26.0	8.6	8.1	6.0	78.5	49.4	222	0.003	0.002	0.012	0.008
TH-AQ1-9B1		26.5	8.6	8.1	8.5	77.5	51.0	213	0.003	0.002	0.012	0.006
TH-AQ1-1A1	26 Jul	27.0	8.7	8.4	5.5	55.5	93.6	239	0.004	0.003	0.013	0.011
TH-AQ1-1A2		27.0	8.6	9.0	10.0	88.0	66.3	234	0.003	0.002	0.013	0.008
TH-AQ1-11A1		27.0	8.6	8.7	11.0	82.0	67.9	263	0.006	0.003	0.018	0.009
TH-AQ1-11A2		27.0	8.7	8.5	13.0	83.5	63.8	269	0.006	0.002	0.020	0.010
TH-AQ1-9B1		27.0	8.5	8.7	10.0	82.5	70.0	258	0.004	0.002	0.014	0.008
					MEAN VALUES FOR JULY 1982							
TH-AQ1-1A1	Jul	26.5	-	7.6	5.0	52.8	82.2	220	0.003	0.002	0.013	0.008
TH-AQ1-1A2		26.5	-	8.4	8.5	85.2	49.6	224	0.002	0.002	0.014	0.007
TH-AQ1-11A1		26.5	-	8.2	8.8	80.0	57.0	244	0.006	0.003	0.016	0.007
TH-AQ1-11A2		26.5	-	8.3	9.5	81.0	56.6	236	0.004	0.002	0.016	0.009
TH-AQ1-9B1		26.8	-	8.4	9.2	80.0	50.5	238	0.004	0.002	0.013	0.007

Table 19

Thermal plume temperature data (C) taken at 0.5 m intervals surface (S) to bottom at 5 m, 20 m, and 40 m offshore, above and below the THINS Discharge, 6 August 1982.

Air Temp (C):		Dew Point (C):	
Wind Speed (km/h):		Wind Direction:	
River Flow (m ³ /s): 240.7		River Elevation (m): 84.7	
Time:	Start	Finish	
	1038	1227	
Station Operation Level (I):	Secondary Service Pumps:		Start
Unit 1	0	0	1
Unit 2	0	0	1
Nuclear Service Pumps:	Decay Heat Pumps:		Finish
Unit 1	1	1	0
Unit 2	1	1	0
			Effluent Rate (m ³ /s): 1.58
			Intake Temp (C): 25.9
			Effluent Temp (C): 26.5
			27.4
			27.6
Distance From Three Mile Island Shore			
40 m	20 m	5 m	Depth
26.5	26.6	25.7	S
26.5	26.6	25.6	0.5 m
26.5	26.5	25.6	1.0
26.5	26.5	25.6	1.5
		25.6	2.0
26.3	26.2	26.3	S
26.3	26.2	26.3	0.5
26.3	26.2	26.2	1.0
26.3			1.5
26.3			2.0
26.3	26.2	26.2	S
26.3	26.2	26.2	0.5
26.2	26.2	26.2	1.0
26.2			1.5
			2.0
25.8	26.1	26.3	S
25.8	26.1	26.3	0.5
25.8	26.1	26.2	1.0
25.8	26.1		1.5
25.8	25.8	25.9	S
25.8	25.8	25.8	0.5
25.8	25.8		1.0
25.8	25.8		1.5
25.9	25.8	25.8	S
25.9	25.8	25.8	0.5
25.9	25.8	25.8	1.0
25.9	25.8		1.5
26.0	25.9	25.9	S
26.0	25.9	25.9	0.5
26.0	25.9		1.0
26.0	25.9		1.5
26.1	26.0	26.0	S
26.1	26.0	26.0	0.5
26.1	26.0		1.0
26.1			1.5
Distance From Three Mile Island Shore			
40 m	20 m	5 m	Depth
26.2	26.1	26.0	S
26.1	26.1	26.0	0.5
26.1	26.1		1.0
26.1			1.5
26.1	25.8	25.9	S
26.1	25.8	25.8	0.5
26.0	25.8		1.0
	25.8		1.5
26.3	26.0	25.9	S
26.3	26.0	25.8	0.5
26.3	25.9		1.0
26.2	25.9		1.5
26.2	25.9		2.0
26.3	25.8	25.9	S
26.3	25.8	25.9	0.5
26.3	25.8		1.0
26.3	25.8		1.5
26.2			2.0
26.5	26.3	26.4	S
26.5	26.3	26.4	0.5
26.5	26.3		1.0
26.4	26.2		1.5
26.3			2.0
26.5	26.3	26.1	S
26.5	26.3	26.1	0.5
26.5	26.3		1.0
26.5	26.3		1.5
26.7	26.7	26.8	S
26.7	26.7	26.7	0.5
26.7	26.7	26.7	1.0
26.7	26.6		1.5
26.7			2.0