

THREE MILE ISLAND AQUATIC STUDY
Monthly Report for December 1980

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 December 1980.

COMPLIANCE WITH ENVIRONMENTAL TECHNICAL SPECIFICATIONS (ETS)

Objectives: 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 the macroinvertebrate, water quality, and impingement programs specified in the ETS and detailed in the Procedures Document was achieved in December (Table 1). Compliance with all other programs was hampered by ice cover on York Haven Pond during the weeks of 14, 21, and 28 December.

The trapnet, seine, and electrofishing programs were conducted once in December; ice cover prevented additional sampling during the month.

The creel survey program was conducted in all areas on 4, 7, and 12 December. The third creel survey period (1701-2100 h) was not conducted on 4, 7, and 12 December at the East Dam, West Dam, and General Reservoir areas due to darkness. On 20 December the creel survey program was conducted only at the York Haven Generating Station; all other areas were inaccessible due to ice cover.

A program by program summary of the progress for December 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 1 and 15 December (Table 1). Enumeration and determination of dry weights and identification of specimens have been completed through 15 December.

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: Regression analyses were performed on 1980 data and work continued on graphical presentations. The first drafts of the methods and discussion sections of the 1980 annual report were completed.

ENTRAINMENT

Progress: Statistical analysis of 1980 data were completed. The first draft of the 1980 annual report was completed and submitted to the project director for review.

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 1-3 December (Table 1). River ice prevented a second sampling period later in December. Fifty-three fish of 11 species were taken on 1-3 December (Table 2). Most fish (20) were taken at Station 1A3, while most species (8) and greatest biomass (296 g) were found at 9B2. The spottail shiner and pumpkinseed were most abundant and comprised 30.2% and 24.5% of the total catch, respectively. Two rock bass were tagged. One margined madtom was parasitized by larval nematodes. Two of the eight collections yielded no fish.

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 December (Table 1). River ice prevented a second sampling later in December. A total of 3,032 fish of 8 species was taken on 2 December (Table 3). Most fish (1,587), most species (7), and greatest biomass (354.9 g) were recorded from Station 13B5. The spotfin shiner was most abundant and comprised 96.6% of the total catch. The following fishes exhibited slight black spot infections: spottail shiner and bluntnose minnow (1 specimen each) and spotfin shiner (99). Glochidia parasitized 39 spottail shiner, 1 swallowtail shiner, 82 spotfin shiner, 5 pumpkinseed, 2 bluegill, and 2 tessellated darter. One spottail shiner was missing both opercles and one spotfin shiner was parasitized by an anchor worm. No pattern of parasite infection 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 9-10 and 22-23 December at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 23 fish of 4 species weighing 53.1 g. Most fish were young and half of the total were dead (Tables 4 through 7). Fish biomass was highest highest during the 9-10 December survey and numbers were highest

during the 22-23 December survey. More fish were collected at 2000 h and 1200 h than during the 0400 h survey period. The estimated impingement for Unit 1 for December was 356 fish weighing 823.0 g (1.8 lb).

Unit 2 impinged 14 fish of 7 species weighing 72.1 g (Tables 8 through 11). Most fish were young or juvenile and all but 5 were dead. Fish biomass and numbers were highest during the 9-10 December survey. The estimated impingement for December from Unit 2 was 217 fish weighing 1,117.6 g (2.5 lb).

The total estimated impingement at TMINS during December was 573 fish weighing 1,940.6 g (4.3 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 two nights in December (Table 1). Ice on the river prevented a second sample later in December. Twelve collections in 12 zones yielded 108 specimens of 13 species (Table 12). The gizzard shad (29 specimens), pumpkinseed (17), rock bass (12), and walleye (12) were most abundant. Seven fish were 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: Nine fish were tagged in December; no previously tagged fish were recaptured.

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 4, 7, and 12 December and at York Haven Generating Station (YHGS) only on 20 December due to river ice. No 1701-2100 h surveys were conducted at the General Reservoir, West Dam, or East Dam throughout December due to darkness.

All thirteen anglers interviewed occurred at the YHGS (Tables 13 through 16). No fish were reported caught. All the anglers resided in York County and most reported 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 1 and 15 December at the five river stations (Table 1). Data were analyzed and tabulated; results are presented in Table 17.

On 1 December values for pH, turbidity, total copper, dissolved copper, and total zinc were highest at Station 1A1 (located above the TMINS Discharge). Values for sulfate and total dissolved solids were highest at Station 9B1 (located below the TMINS Discharge).

On 15 December values for pH, turbidity, and total zinc were highest at Station 1A1; alkalinity and total dissolved solids were highest at 1A2. Values for dissolved oxygen (11A2), total copper (11A1), and dissolved zinc (9B1) were highest at stations at or below the Discharge.

Water samples taken in November have now been analyzed; results are presented in Table 18. On 3 November values for sulfate and total dissolved solids were highest at Station 1A1; alkalinity was highest at 1A2. Values for pH and dissolved oxygen were highest at Station 11A1; total and dissolved zinc were highest at 9B1.

On 17 November values for pH, turbidity, sulfate, total copper, and total zinc were highest at Station 1A1; alkalinity was highest at 1A2. Values for dissolved oxygen, total dissolved solids, and dissolved copper were highest at Station 11A2.

Parameters, for which State water quality criteria have been established, were not exceeded at any station in November or December.

Table 1

Sampling conducted in compliance with the Generation Procedures Manual in December 1980.

PROGRAM	Dec 1-6	Dec 7-13	Dec 14-20	Dec 21-27	Dec 28-31
Macroinvertebrates	X		X		
Ichthyoplankton:					
Far-Field ¹					
Entrainment ¹					
Trapnet	X				
Seine	X				
Impingement of Fish		X		X	
Electrofishing	X	X			
Movements of Fishes	X	X			
Creel Surveys	X	X	X		
Ambient Water Quality	X		X		

¹ Program terminated for 1980 as of 31 August.

Table 2

Fishes taken by trapnet on 1-3 December 1980 near THINS.

Station	TH-AQF-1A3		TH-AQF-11A2		TH-AQF-11A3		TH-AQF-9B2		Total	% Catch
	1-2 1355-1405	2-3 1408-1443	1-2 1347-1355	2-3 1357-1415	1-2 1338-1346	2-3 1348-1357	1-2 1328-1335	2-3 1337-1328		
Date										
Time										
Air Temp (C)	13.5, 11.0	11.0, 2.0	14.0, 9.5	9.5, 2.0	14.0, 13.0	13.0, 3.5	15.0, 17.5	13.5, 3.0		
Water Temp (C)	4.0, 4.5	4.5, 3.0	3.5, 5.0	5.0, 3.5	4.0, 4.5	4.5, 4.0	4.0, .5	4.5, 3.5		
Dissolved Oxygen (mg/l)	12.3, 12.0	12.0, 12.8	12.3, 12.1	12.1, 12.6	12.3, 12.1	12.1, 12.6	12.3, 12.2	12.2, 12.8		
pH	7.4, 7.1	7.1, 7.2	7.5, 7.1	7.1, 7.5	7.5, 7.1	7.1, 7.3	7.6, 7.3	7.3, 7.4		
Secchi Disc (cm)	91, 104	104, 28	89, 102	102, 58	79, 97	97, 61	54, 104	104, NA		
River Stage (m)	1.34, 1.29	1.29, 1.26	1.34, 1.29	1.29, 1.26	1.34, 1.29	1.29, 1.26	1.34, 1.29	1.29, 1.26		
Weather	Partly Cloudy, Partly Cloudy, Partly Cloudy	Partly Cloudy, Clear	Partly Cloudy, Partly Cloudy, Partly Cloudy	Partly Cloudy, Clear	Partly Cloudy, Clear	Clear, Clear	Partly Cloudy, Clear	Clear, Clear		
No. of Specimens	10	10	-	14	-	1	2	16	53	
No. of Species	2	6	-	4	-	1	2	7	11	
Spottail shiner	9	2		4		-	1	-	16	30.2
Yellow bullhead	-	1		-		-	-	-	1	1.9
Channel catfish	-	-	NO	-	NO	-	-	6	6	11.3
Margined madtom	-	1		-		-	-	-	1	1.9
Rock bass	-	3		1		1	-	1	6	11.3
Redbreast sunfish	-	1	FISH	-	FISH	-	-	-	1	1.9
Pumpkinseed	1	2		7		-	-	3	13	24.5
Bluegill	-	-		-		-	-	1	1	1.9
White crappie	-	-	TAKEN	2	TAKEN	-	1	2	5	9.4
Yellow perch	-	-		-		-	-	2	2	3.8
Halleys	-	-		-		-	-	1	1	1.9

NA Not Available.

Table 3

Fishes taken by seins on 2 December 1980 near THINS.

Station	TM-AQE-13B5	TM-AQE-10B5	TM-AQE-16A5	TM-AQE-1A2	TM-AQE-16A1	TM-AQE-10A2	TM-AQE-9B5	TM-AQE-9A1	TM-MIE-9B1-	TM-AQE-4B2	Total	% Catch
Time	1213	0912	1155	1132	1045	1025	1002	0957	0934	1110		
Air Temp (C)	9.5	4.0	9.0	6.5	6.0	5.0	4.5	4.0	4.0	9.5		
Water Temp (C)	4.5	4.0	4.0	4.5	4.0	4.0	4.0	4.0	4.0	5.0		
Dissolved Oxygen (mg/l)	12.3	12.0	12.5	12.0	12.2	12.4	12.1	12.2	12.1	11.8		
pH	7.5	7.4	7.3	7.4	7.4	7.4	7.4	7.4	7.4	7.4		
Secchi Disc (cm)	124	107*	81	91	86	84	86	69	86	152*		
River Stage (m)	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29		
	Overcast	Partly Cloudy	Overcast	Partly Cloudy	Clear	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Clear		
No. of Specimens	1587	6	15	1110	37	165	53	12	2	45	3032	
No. of Species	7	2	2	4	2	3	1	2	1	5	8	
No. of Hauls	3	6	5	3	4	4	4	3	4	4	51	
Spottail shiner	1	3	1	6	32	23	-	4	-	10	80	2.6
Swallowtail shiner	1	-	-	-	-	-	-	-	-	-	1	+
Spotfin shiner	1580	3	14	1102	5	141	53	8	2	20	2928	96.6
Mimic shiner	2	-	-	-	-	-	-	-	-	-	2	0.1
Bluntnose minnow	1	-	-	1	-	1	-	-	-	-	3	0.1
Pumpkinseed	1	-	-	1	-	-	-	-	-	11	13	0.4
Bluegill	-	-	-	-	-	-	-	-	-	3	3	0.1
Teysseled darter	1	-	-	-	-	-	-	-	-	1	2	0.1

* Clear to bottom at indicated depth.

+ Less than 0.05%.

Table 4

Numbers of fishes impinged at the Unit 1 Intake during a 24-h impingement survey on 9-10 December 1980.

Date	9	10	10							
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)	-20.0	-20.0	-20.0							
River Flow (m ³ /s)	546.9	528.1	521.0							
Air Temp (C)	5.0	5.0	5.5							
Water Temp (C)	6.5	6.0	6.5							
Condition of Fish	Alive		Dead		Alive		Dead		Total	
Margined madtom	1	-	1	-	-	-	-	2	-	
Pumpkinseed	2	-	1	1	2	1	5	2		
Bluegill	1	-	-	-	-	-	1	-		
Total	4	-	2	1	2	1	8	2		

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Table 5

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 1 Intake on 9-10 December 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Margined madtom	76-80, 126-130	1 Juvenile, 1 Adult	20.6	2
Pumpkinseed	36-66	5 Young, 2 Juvenile	15.7	7
Bluegill	56-60	1 Juvenile	3.5	1
Total			39.8	10

Table 6

Numbers of fishes impinged at the Unit 1 Intake during a 24-h impingement survey on 22-23 December 1980.

Date	22	23	23						
Time	2000	0400	1200						
Volumetric Flow Rate (m ³ /s)	1.21	1.21	1.21						
Number of River Water Pumps:									
Nuclear Service	2	2	2						
Secondary Service	1	1	1						
Decay Heat	0	0	0						
Intake Velocity (cm/s)	NA	NA	NA						
River Flow (m ³ /s)	165.5	170.8	172.7						
Air Temp (C)	-4.0	-5.0	-2.0						
Water Temp (C)	0.0	0.0	1.0						
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	
Channel catfish	-	-	-	-	-	1	-	1	
Pumpkinseed	1	3	-	2	2	2	3	7	
Bluegill	-	1	-	-	1	-	1	1	
Total	1	4	-	2	3	3	4	9	

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Table 7

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 1 Intake on 22-23 December 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	41-45	1 Young	0.7	1
Pumpkinseed	31-50	10 Young	10.9	10
Bluegill	26-30, 41-45	2 Young	1.7	2
Total			13.3	13

Table 8

Numbers of fishes impinged at the Unit 2 Intake during a 24-h impingement survey on 9-10 December 1980.

Date	9	10	10							
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)	-12.0	-12.0	-12.0							
River Flow (m ³ /s)	546.9	528.1	521.0							
Air Temp (C)	5.0	5.0	5.5							
Water Temp (C)	6.0	5.5	6.5							
Condition of Fish	Alive		Dead		Alive		Dead		Total	
Channel catfish	-	-	-	-	-	1	-	-	1	1
Margined madtom	2	-	-	-	1	-	-	-	3	-
Redbreast sunfish	-	-	-	1	-	-	-	-	-	1
Green sunfish	-	-	-	-	-	1	-	-	-	1
Pumpkinseed	1	-	-	1	-	3	-	-	1	4
Bluegill	-	-	-	1	-	-	-	-	-	1
Tessellated darter	1	-	-	-	-	-	-	-	1	-
Total	4	-	-	3	1	5	-	-	5	8

Table 9

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 2 Intake on 9-10 December 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	91-95	1 Juvenile	8.7	1
Margined madtom	101-105, 111-115, 136-140	2 Juvenile, 1 Adult	41.2	3
Redbreast sunfish	41-45	1 Young	1.5	1
Green sunfish	61-65	1 Juvenile	4.6	1
Pumpkinseed	21-25, 31-35, 46-50, 56-60	4 Young, 1 Juvenile	8.5	5
Bluegill	56-60	1 Juvenile	3.0	1
Tessellated darter	41-45	1 Juvenile	0.7	1
Total			68.2	13

Table 10

Numbers of fishes impinged at the Unit 2 Intake during a 24-h impingement survey on 22-23 December 1980.

Date	22	23	23							
Time	2000	0400	1200							
Volumetric Flow Rate (m ³ /s)	2.09	2.09	2.09							
Number of River Water Pumps:										
Nuclear Service	1	1	1							
Secondary Service	2	2	2							
Intake Velocity (cm/s)	NA	NA	NA							
River Flow (m ³ /s)	165.5	170.8	172.7							
Air Temp (C)	-4.5	-5.0	0.5							
Water Temp (C)	0.0	0.0	0.5							
Condition of Fish	Total		Total		Total		Total			
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead		
Channel catfish	-	1	-	-	-	-	-	-	-	1
Total	-	1	-	-	-	-	-	-	-	1

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Table 11

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 2 Intake on 22-23 December 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	66-70	1 Young	3.9	1
Total			3.9	1

Table 12

Numbers of fishes captured by AC electrofisher near THINS in December 1980.

Zone	1582 4 Dec	1688 4 Dec	1682 4 Dec	15A2 4 Dec	15A1 4 Dec	13A1 8 Dec	10A3 8 Dec	985 8 Dec	10B1 8 Dec	10B3 8 Dec	11B1 8 Dec	Total
Date	1740	1816	1911	1938	2005	1740	1805	1832	1900	1928	1955	
Time	16	11	14	15	17	17	16	16	16	12	15	
Duration (min)	0.0	1.0	1.0	-1.0	-0.5	15.5	12.0	11.0	14.5	10.5	13.5	
Air Temp (C)	1.5	1.5	1.5	1.0	1.0	4.5	4.5	4.5	4.5	4.5	5.0	
Water Temp (C)	13.8	14.0	13.0	14.0	15.7	12.5	12.4	12.4	12.6	12.4	12.6	
Dissolved oxygen (mg/l)	8.2	8.4	8.3	8.4	8.3	8.5	8.5	8.5	8.4	8.3	8.5	
pH	300	250	340	240	240	250	250	250	200	185	240	
Conductivity (micromhos/cm)	152	117	94	76	86	91	86	91	91	112	122	
Secchi Disc (cm)	195	200	195	200	200	200	205	205	210	210	215	
Volts	4.5	3.0	5.0	3.0	2.5	4.0	4.5	4.0	2.5	3.0	5.0	
Amps	-	-	28	-	-	1	-	-	-	-	-	29
Gizzard shad	-	-	-	-	-	-	-	-	1	-	-	1
Muskellunge	-	NO	-	NO	-	-	-	-	-	-	1	1
Carp	-	-	-	-	-	-	-	-	-	-	1	1
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
White sucker	-	-	-	-	-	-	-	1	-	-	-	1
Rock bass	-	FISH	2	FISH	1	1	1	1	1	1	5	12
Pumpkinseed	2	-	-	-	-	-	-	-	-	-	14	14
Bluegill	4	-	-	-	-	-	-	-	-	-	6	11
Largemouth bass	2	TAKEN	-	TAKEN	-	-	-	-	-	-	2	4
White crappie	10	-	-	-	-	-	-	-	-	-	5	11
Black crappie	2	-	-	-	-	-	-	-	-	-	7	7
Yellow perch	-	-	-	-	-	2	1	7	2	-	-	12
Walleye	-	-	-	-	-	-	-	-	-	-	-	-
No. of specimens	20	0	32	2	1	4	2	8	4	1	34	108
No. of Species	5	0	5	1	0	3	2	2	3	1	7	13

Table 13

Creel survey data from the GR for each survey day in December 1980.

Day	4 Thu			7 Sun			12 Fri			20 Sat ¹			
Weather	Partly Cloudy			Overcast			Overcast						
River Stage (m)	1.28			1.39			1.28			1.39			
Air Temperature (C)	0.0	3.0	NA	9.0	10.0	NA	1.0	2.0	NA				
Water Temperature (C)	1.5	2.0	NA	3.5	4.0	NA	3.5	3.5	NA				
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	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY				
Fish Caught	-	-		-	-		-	-					
Fish Kept	-	-		-	-		-	-					
Hours Fished	-	-		-	-		-	-					
Catch/Effort (h)	-	-		-	-		-	-					
Day Totals:													
Anglers		-			-			-					
Fish Caught		-			-			-					
Fish Kept		-			-			-					
Hours Fished		-			-			-					
Catch/Effort (h)		-			-			-					
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total

¹ Surveys not conducted due to ice.
 NA Not Available.

Table 14

Creel survey data from the West Dam for each survey day in December 1980.

Day	4 Thu			7 Sun			12 Fri			20 Sat ¹		
Weather	Partly Cloudy			Overcast			Overcast			1.39		
River Stage (m)	1.28			1.39			1.28					
Air Temperature (C)	0.5	5.0	NA	7.0	9.0	NA	0.0	3.0	NA			
Water Temperature (C)	3.0	5.0	NA	3.0	3.2	NA	3.5	3.5	NA			
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	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	
Fish Caught	-	-		-	-		-	-		-	-	
Fish Kept	-	-		-	-		-	-		-	-	
Hours Fished	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	
Catch/Effort (h)	-	-		-	-		-	-		-	-	
Day Totals:												
Anglers		-			-			-			-	
Fish Caught		-			-			-			-	
Fish Kept		-			-			-			-	
Hours Fished		-			-			-			-	
Catch/Effort (h)		-			-			-			-	
Species	a	b	c	a	b	c	a	b	c	a	b	c
Total												

¹ Surveys not conducted due to ice.
NA Not Available.

Table 15

Creel survey data from the East Dam for each survey day in December 1980.

Day	4 Thu			7 Sun			12 Fri			20 Sat		
Weather	Partly Cloudy			Overcast			Overcast			1.19		
River Stage (m)	1.28			1.39			1.28					
Air Temperature (C)	-2.0	3.0	NA	7.0	7.0	NA	0.5	4.0	NA			
Water Temperature (C)	1.0	3.0	NA	3.0	3.0	NA	3.2	4.5	NA			
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	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY			
Fish Caught	-	-		-	-		-	-				
Fish Kept	-	-		-	-		-	-				
Hours Fished	-	-		-	-		-	-				
Catch/Effort (h)	-	-		-	-		-	-				
Day Totals:												
Anglers		-			-			-				
Fish Caught		-			-			-				
Fish Kept		-			-			-				
Hours Fished		-			-			-				
Catch/Effort (h)		-			-			-				
Species	a	b	c	a	b	c	a	b	c	a	b	c
TOTAL												

1 Survey not conducted due to ice.
 NA Not Available.

Table 16

Creel survey data from the YIKS for each survey day in December 1980.

Day	4 Thu			7 Sun			12 Fri			20 Sat			
Weather	Partly Cloudy			Partly Cloudy, Overcast			Overcast						
River Stage (m)	1.28			1.39			1.28			1.39			
Air Temperature (C)	1.0	3.0	3.5	10.5	11.0	8.0	2.0	6.0	5.5	-6.5	-3.0	-5.5	
Water Temperature (C)	2.0	2.0	2.0	4.0	4.0	3.5	4.0	4.5	4.0	0.0	0.0	-1.0	
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
Total Per Time Period:													
Anglers	-	-	-	1	6	4	-	-	-	-	2	-	13
Fish Caught	-	-	-	-	-	-	-	-	-	-	-	-	-
Fish Kept	-	-	-	-	-	-	-	-	-	-	-	-	-
Hours Fished	-	-	-	0.25	3.65	5.00	-	-	-	-	2.00	-	10.90
Catch/Effort (h)	-	-	-	-	-	-	-	-	-	-	-	-	-
Day Totals:													
Anglers		-			11			-			2		
Fish Caught		-			-			-			-		
Fish Kept		-			-			-			-		
Hours Fished		-			8.90			-			2.00		
Catch/Effort (h)		-			-			-			-		
Species	a	b	c	a	b	c	a	b	c	a	b	c	TOTAL

Table 18

Summary of selected physicochemical parameters taken on 3 and 17 November 1980 near the TRHS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (JTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (JTU)	Alkalinity as CaCO ₃	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TH-AQI-1A1	3 Nov	7.0	8.3	10.4	6	79	137	306	0.006	0.003	0.014	0.006
TH-AQI-1A2		7.0	8.4	10.7	4	86	107	305	0.004	0.003	0.013	0.007
TH-AQI-11A1		7.0	8.5	10.8	4	81	112	302	0.004	0.003	0.016	0.009
TH-AQI-11A2		6.5	8.4	10.6	5	82	108	303	0.006	0.003	0.015	0.009
TH-AQI-981		6.5	8.4	10.6	6	77	119	303	0.005	0.003	0.017	0.010
TH-AQI-1A1	17 Nov	4.5	8.7	11.2	7	58	113	261	0.014	0.004	0.026	0.011
TH-AQI-1A2		5.0	8.2	12.2	4	91	90	260	0.007	0.007	0.013	0.010
TH-AQI-11A1		5.0	8.3	12.2	4	78	97	257	0.010	0.003	0.011	0.009
TH-AQI-11A2		5.0	8.1	12.6	4	77	100	266	0.009	0.008	0.014	0.011
TH-AQI-981		5.0	8.1	11.9	4	76	101	261	0.004	0.003	0.012	0.009
MEAN VALUES FOR NOVEMBER 1980												
TH-AQI-1A1	Nov	5.8	-	10.8	6	68	125	284	0.010	0.004	0.020	0.008
TH-AQI-1A2		6.0	-	11.4	4	88	98	282	0.006	0.005	0.013	0.008
TH-AQI-11A1		6.0	-	11.5	4	80	104	280	0.007	0.003	0.014	0.009
TH-AQI-11A2		5.8	-	11.6	4	80	104	284	0.008	0.006	0.014	0.010
TH-AQI-981		5.8	-	11.2	5	75	110	282	0.004	0.003	0.014	0.010