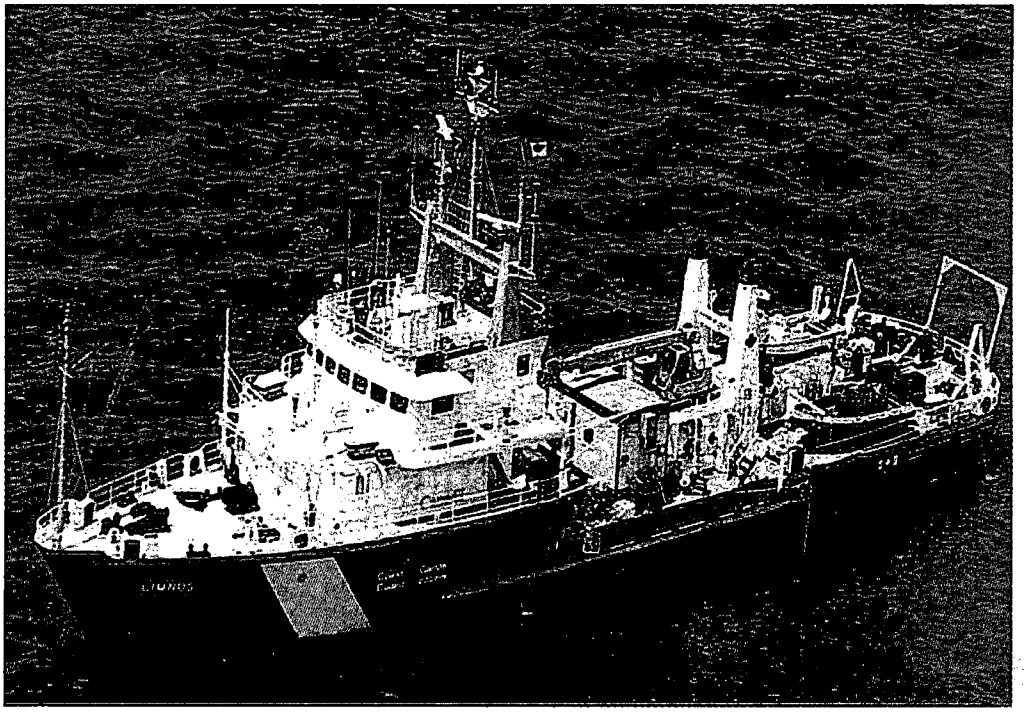
Environment Canada Environnement Canada

Canada

NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

2003
ANNUAL ACTIVITY SUMMARY
TECHNICAL OPERATIONS SERVICES
RESEARCH SUPPORT BRANCH
NATIONAL WATER RESEARCH INSTITUTE



CCGS LIMNOS

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INTRODUCTION

The mandate of Technical Operations Services at the National Water Research Institute at CCIW in Burlington, Ontario is to provide logistical and technical support to the scientific community at this Institute and to various other governmental and educational groups on a national scale.

The technical staff of this service is involved in shipboard programs which are carried out from major ships on the Great Lakes and in shore-based field projects, which puts them into field situations from coast to coast in North America, into the high Arctic and more recently overseas. As the scientific component of this Institute embraces global environmental problems and increasingly lends its resources and expertise to third world and other countries, this service finds itself conducting field programs on other continents. This unusual opportunity - to work and gain valuable field related experience in such a varied sphere of operation, develops within the service a tremendous collective wealth of technical expertise unique to this support group.

The Diving Operations Unit is ever expanding its capacity to give scientific programs the up-to-date technological support they require underwater - the most recent advances being in digital underwater video capability, including the edit and manipulation of both analog and digital video material. Annual diver training and certification courses are also conducted to maintain a high level of competence among CCIW divers.

Rigging Shop personnel provide for the repair and maintenance of the NWRI fleet of vehicles, as well as for trailers and mechanical field gear. They also handle heavy equipment transport to field sites, operate Field Stores and when required assist as members of field parties.

This report is intended as an overview of the field activities of this group during the 2003 field season.

STAFF LIST

RESEARCH SUPPORT BRANCH

Director	P. M. Healey
Executive Assistant	K. Faulkner
Manager, Finance & Administration	J. McAvella
Administrative Assistant	P. McDevitt

TECHNICAL OPERATIONS SERVICES

Manager	M. R. Mawhinney

OPERATIONS OFFICERS

B. H. Moore	OIC CCGS LIMNOS; Great Slave Lake, Northwest Territories
S. B. Smith	OIC CCGS LIMNOS; OIC CCGS SHARK; Detroit River; St. Clair River, North Channel, Ontario
B. L. Gray	Diving; OIC CCGS LIMNOS; Walpole Island; North Channel; Hamilton Harbour, Ontario
D. A. D. Gilroy	OIC CCGS LIMNOS; Groundwater; Hamilton Harbour; Walpole Island, Ontario

MARINE TECHNOLOGISTS

E. H. Walker	CCGS LIMNOS; Detroit/St. Clair Rivers; Parry Sound, Ontario; Peace River, Alberta; Charlevoix, Michigan, USA
G. G. LaHaie	OIC Turkey Lakes Watershed Site
K. J. Hill	CCGS LIMNOS; Hamilton Harbour; Detroit/St. Clair Rivers; Ontario; Mississippi River, IOWA; Sangamon River, Illinois
R. J. Hess	OIC CCGS LIMNOS; RV LAKE GUARDIAN, EPA, USA; Hamilton Harbour; Detroit/St. Clair Rivers; Mississippi River, IOWA; Sangamon River, Illinois

R. D. Neureuther	CCGS LIMNOS; Hamilton Harbour; Detroit/St. Clair Rivers; Groundwater, Moose Factory; Ontario; Great Slave Lake, Northwest Territories
C. H. Talbot	Groundwater; Moose Factory, Ontario; Lake Hazen, Nunavut
T. G. D. Breedon	Diving; CCGS LIMNOS; Hamilton Harbour; Lake Erie; Walpole Island, Ontario; Great Slave Lake, Northwest Territories

ASSISTANT MARINE TECHNOLOGISTS

L. M. Benner	Parental Leave April 1 - September 2; Diving; Ontario
D. P. Walsh	CCGS LIMNOS; Detroit River; St. Clair River, Ontario
B. Lalonde	CCGS LIMNOS; Hamilton Harbour, Ontario; Val D'or, Quebec
C. Yanch	CCGS LIMNOS; Hamilton Harbour; Ontario
T. Mamone	On Strength August 25, CCGS LIMNOS; Hamilton Harbour; Kingston, Ontario

RIGGING UNIT

C. J. Lomas	Senior Rigger; Ship Support
T. C. Gilliss	Vehicle Maintenance Co-ordinator

NWRI FIELD STORES

C. J. Lomas
T. C. Gilliss

SUMMER STUDENTS

A. Morden	CCGS LIMNOS; Hamilton Harbour, Ontario
J. Harrower	CCSS LIMNOS; Hamilton Harbour, Turkey Lakes, Ontario
M. Mordue	CCGS LIMNOS; Hamilton Harbour; Turkey Lakes, Ontario
B. Smith	CCGS LIMNOS; CCGS SHARK; Hamilton Harbour, Ontario
M. Skafel	CCGS LIMNOS; Hamilton Harbour, Ontario

YMCA INTERNSHIP

S. Cabezas	April 1 - August 4, CCGS LIMNOS, Hamilton Harbour
K. Kurjancic	On Strength October 21, Hamilton Harbour

CCGS LIMNOS

2003 JANUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

FEBRUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

MARCH 2003

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25 Outfitting Vessel	26 Outfitting Vessel	27 Outfitting Vessel	28	29

APRIL

SUN	MON	TUE	WED	THUR	FRI	SAT
		1 Lake Ontario Surveillance Richardson	2	3	4	CCIW
6 CCIW	7 Lake Ontario Sediment trap Moorings Marvin	8	9	10	11 CCIW	12 CCIW
13 CCIW	14 Detroit R, St. Clair R Contaminant Survey Lake Erie Moorings Schertzer Charlton	15	16	17	18 Sarnia	19 Sarnia
20 Sarnia	21 Sarnia	22 Det. R, St. Clair R Contaminants L.Erie Moorings Schertzer Charlton	23	24	25 CCIW	26 CCIW
27 CCIW	28 Lake Ontario LOLA Richardson	29	30			

MAY

SUN	MON	TUE	WED	THUR	FRI	SAT
				1 Lake Ontario LOLA	2	3
4 CCIW	5	6 Lake Erie Zebra Mussel	7	8 Effects Charlton	9	10 Amherstburg
11 Amherstburg	12 Detroit R, St. Clair R Contaminant Survey Marvin AEMRB	13	14 Lake Superior Surveillance Richardson	15	16	17
18	19	20	21 Lake Superior Surveillance Richardson	22	23	24
25 Alongside Sarnia	26	27 Alongside Sarnia	28	29 Transit	30 Amherstburg	31 Amherstburg

JUNE

SUN	MON	TUE	WED	THUR	FRI	SAT
1 Amherstburg	2	3 Lake Erie Roxann Elberhofer	4	5	6	7 Port Stanley
8 Port Stanley	9	10 Lake Erie Roxann Elberhofer	11	12	13	14 Amherstburg
15 Amherstburg	16 Detroit R, St. Clair R Contaminant Survey Marvin AEMRB	17	18	19	20 Port Colborne	21
22 Port Colborne	23 Lake Erie Zebra Mussel Effects Charlton	24	25	26	27 CCIW	28 CCIW
29 CCIW	30					

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
		1 CCIW	2 Vessel Non Operational	3	4	5 CCIW
6 CCIW	7	8 Lake Ontario Mun Contaminants	9	10	11	12 CCIW
13 CCIW	14	15 Lake Ontario Surveillance Richardson	16	17	18	19 CCIW
20 CCIW	21	22 Lake Erie UVB and Mussel Bioaccumulation	23	24	25	26 Amherstburg
27 Amherstburg	28	29 Detroit R, St. Clair R Contaminant Survey Marvin AEMRB	30	31		

AUGUST

SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2 Amherstburg
3 Amherstburg	4 Amherstburg	5 Lake Huron Arts	6	7 Johannsson Zooplankton	8	9
10	11	12 Lake Erie Zebra Mussel Effects Charlton	13	14	15	16
17 CCIW	18	19 Lake Ontario LOLA Richardson	20	21	22	23 CCIW
24 CCIW/SCIW	25	26 Lake Ontario Taste and Odour Charlton	27	28	29	30 CCIW

SEPTEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
	1 CCIW	2	3 Vessel Non Operational	4	5	6 CCIW
7 CCIW	8	9 Lake Superior Areas of Concern Grapentine	10	11	12	13
14	15	16 Lake Superior Areas of Concern Grapentine	17	18	19	20
21 Areas of Concern	22	23 Detroit R, St. Clair R Contaminant Survey Marvin AEMRB	24	25 Amherstburg	26 Amherstburg	27
28 Amherstburg	29	30 Lake Erie				

OCTOBER

SUN	MON	TUE	WED	THUR	FRI	SAT
			1 L Erie Zebra Mussel	2 Charlton	3	4 Port Colborne
5 Port Colborne	6	7 Lake Erie Moorings Schertzer	8	9	10	11 Port Colborne
12 Port Colborne	13 Port Colborne	14	15 Lake Erie Moorings Charlton	16	17	18 Sarnia
19 Sarnia	20	21 Detroit R, St. Clair R Contaminant Survey Marvin AEMRB	22	23	24	25 CCIW
26 CCIW	27 Lake Ontario Sediment Trap Moorings Marvin	28	29	30	31 CCIW	

NOVEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

DECEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

AEMRB | AERB | AEPRB | ECB EHD-OR | AEMRB/DFO | Non Operational

SHIPBOARD PROGRAMS

AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH

GREAT LAKES AREAS OF CONCERN
AEIRB STUDY 12211, DR. L. GRAPENTINE

This study was undertaken to collect mini box cores from representative stations in Jackfish Bay, Nipigon Bay and Spanish Harbour to verify the reference database related to assessment techniques used to include biological and chemical measures. Samples collected verify the reference database created to select key species and toxicity tests that show the most resilient predictive response for use in developing numerical biological sediment guidelines. These guidelines are in turn used to determine the need for sediment remediation based on the invertebrate fauna and bioassay responses. Work was done from the CCGS LIMNOS and from the CCGL PELICAN carried onboard the LIMNOS during the cruise, September 8 - 22, 2003.

At each station the following work was performed:

At all stations, a water sample was obtained from a depth of bottom -0.5 m from which samples were obtained for ammonia, nitrate + nitrite, total Kjeldahl nitrogen, total unfiltered phosphorus, alkalinity, pH, conductivity and dissolved oxygen. All samples were stored at 4°C.

A mini box core was collected and sub sampled in the following manner:

The box core was sub sampled using five 6.7 cm diameter tubes from which the top 10 cm were extruded into plastic cups. Samples were sieved using a 250 micron mesh sieve. Residue was placed in the containers provided and preserved in 5% Formalin.

At all Areas of Concern stations, the remainder of the top 5 cm of sediment in the box core was removed and placed in a glass dish. This sample was homogenized and tested in the following manner:

a) 125 ml was sampled for archiving in a hexane-rinsed glass bottle covered with a hexane-rinsed piece of tin foil before the lid is placed on.

b) 100 ml was sampled for particle size in a plastic pill jar.

c) 500 ml was sampled for major ions, metals, loss on ignition, total organic carbon, total nitrogen, total phosphorus and mercury in a plastic tub.

All samples were stored at 4°C.

d) 250 ml was sampled for organic contaminant analysis in a pre-cleaned amber jar.

Samples were stored at -20°C.

If no mini box core was able to be collected, four PONAR samples were obtained - three for community structure and one for sediment chemistry.

At all stations a picture was taken of sediment (in tray) with sample ID and date included.

At all Areas of Concern stations, five mini PONAR samples were obtained for bioassay experiments. Samples were placed in the bags provided and all air removed. Samples were stored at 4°C.

At stations 484 and 493 in Jackfish Bay, stations 499 and 505 in Nipigon Bay, and stations 534 and 543 in Spanish Harbour, triplicate samples for water and sediment chemistry were collected for Quality Assurance/Quality Control (QA/QC).

At all Areas of Concern stations sampled by the CCGS LIMNOS, the dissolved oxygen profiler was used to obtain a profile from surface to the bottom. The winch speed was reduced in the thermocline and hypolimnion areas.

At all stations, sampled by the CCGL PELICAN, a Hydrolab was used to obtain temperature, pH, conductivity, dissolved oxygen and depth parameters.

At all stations in Lake Superior, a sediment sample was collected by Shipek or mini box core for Dr. C. Marvin, AEMRB. The top 1 cm of material was removed and stored in the plastic containers provided. Samples were stored at 4°C.

STATION POSITIONS

AREAS OF CONCERN

SPANISH HARBOUR

2003 - 2004

STATION NUMBER	AEIRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING ZONE 17	EASTING ZONE 17
532	67MGI*	46° 09' 30"	82° 32' 35"	5112804.6	380859.6
533	67MAB	46° 11' 28"	82° 27' 54"	5116333.5	386930.4
534	67MWC*	46° 09' 50"	82° 28' 22"	5113321.7	386289.3
535	67MSI	46° 09' 07"	82° 24' 10"	5111890.0	391683.5
536	67MSRM	46° 11' 09"	82° 19' 03"	5115538.2	398324.5
537	67SRC03	46° 09' 24"	82° 32' 13"	5112614.9	381337.8
538	67SRC26	46° 09' 51"	82° 30' 35"	5113407.0	383453.6
539	67SRC08	46° 10' 18"	82° 20' 24"	5114005.1	396560.1
540	67SRC09	46° 08' 51"	82° 23' 54"	5111396.9	392015.3
541	67SRC10	46° 08' 27"	82° 28' 18"	5110753.4	386341.0
542	67SRC11	46° 08' 30"	82° 27' 15"	5110821.6	387695.1
543	67SRC13	46° 08' 45"	82° 26' 00"	5111253.9	389305.0
549	67SRC16	46° 10' 12"	82° 21' 54"	5113853.6	394636.9
550	67SRC17	46° 11' 06"	82° 28' 36"	5115673.6	386025.4
551	67EC10	46° 11' 06"	82° 20' 27"	5115476.3	396522.2

STATION (BOX CORE) POSITIONS

AREAS OF CONCERN

JACKFISH BAY

2003 - 2004

STATION NUMBER	AEIRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING ZONE 16	EASTING ZONE 16
481	69M701	48° 48' 38"	87° 00' 06"	5406393.1	499874.4
482	6956	48° 48' 49"	86° 57' 39"	5406741	502868
483	691M1	48° 48' 22"	86° 59' 59"	5405905.1	500030.0
484	691M2*	48° 48' 25"	86° 59' 59"	5405998.9	500011.9
485	691M3	48° 48' 31"	87° 00' 01"	5406179.5	499979.0
486	692M1	48° 47' 44"	86° 59' 34"	5404719	500537
487	692M2	48° 47' 46"	86° 59' 45"	5404799	500312
488	692M3	48° 47' 43"	86° 59' 38"	5404695	500443
489	693M2	48° 48' 41"	86° 57' 40"	5406497	502846
490	693M3	48° 48' 44"	86° 57' 44"	5406582	502774
491	694M1	48° 46' 48"	86° 58' 39"	5403003	501648
492	694M2	48° 46' 49"	86° 58' 46"	5403040	501508
493	694M3*	48° 46' 49"	86° 58' 55"	5403018	501325
493	694M3*	48° 46' 48"	86° 58' 55"	5403015	501324
493	694M3*	48° 46' 48"	86° 58' 55"	5403016	501326
494	6972	48° 46' 14"	87° 00' 37"	5401964	499236
495	6973	48° 46' 12"	87° 00' 32"	5401882	499352

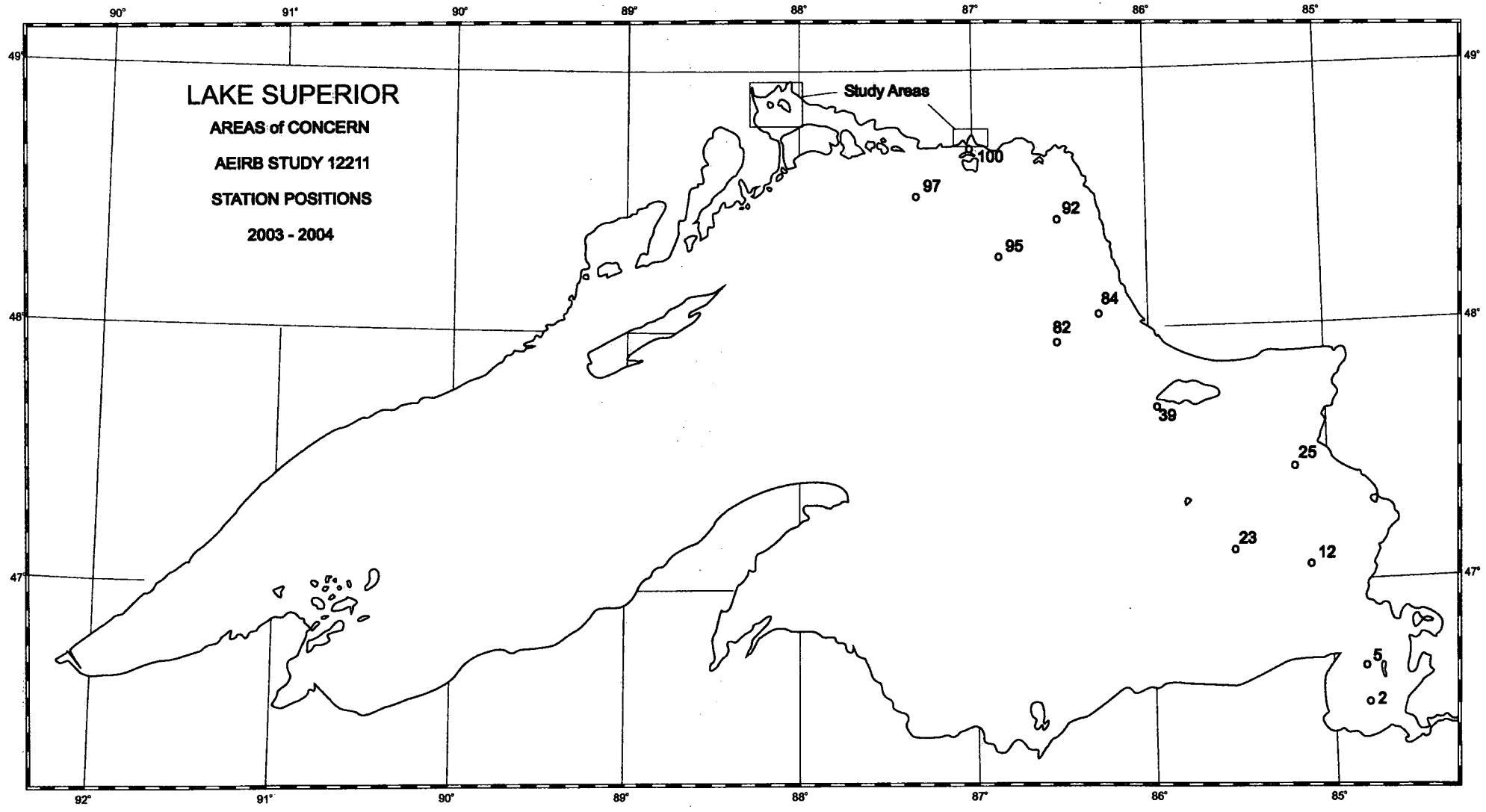
STATION POSITIONS

AREAS OF CONCERN

NIPIGON BAY

2003 - 2004

STATION NUMBER	AEIRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING ZONE 16	EASTING ZONE 16
496	69E4	48° 55' 51"	88° 14' 00"	5420504.0	409663.0
497	69E5	48° 55' 44"	88° 13' 42"	5420274.6	410026.9
498	69E6	48° 55' 16"	88° 13' 24"	5419418.5	410381.7
499	69E8*	48° 54' 43"	88° 12' 58"	5418388.6	410902.1
500	69E12	48° 52' 54"	88° 12' 01"	5414993	412007
501	69E14	48° 51' 10"	88° 08' 56"	5411739	415713
502	69E15	48° 48' 59"	88° 06' 33"	5407651	418569
503	69E16	48° 47' 45"	88° 05' 35"	5405334	419721
504	69R1	48° 57' 23"	88° 14' 33"	5423366	409045
505	69R4*	48° 55' 44"	88° 11' 50"	5420241	412301
505	69R4*	48° 55' 44"	88° 11' 50"	5420240	412299
505	69R4*	48° 55' 44"	88° 11' 51"	5420237	412297
506	69R7	48° 58' 42"	88° 01' 24"	5425543.5	425109.4
507	69R8	48° 58' 02"	88° 01' 31"	5424324	424958
508	69R9	48° 53' 14"	87° 55' 19"	5415343	432422
509	69R10	48° 52' 31"	87° 53' 19"	5413982	434842
510	6974	48° 58' 46"	88° 15' 16"	5425917.2	408211.2


LAKE SUPERIOR
AREAS of CONCERN
AEIRB STUDY 12211
STATION POSITIONS
2003 - 2004
Study Areas
100
97
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84
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47°

MICROBIAL ECOLOGY OF THE LAKE ERIE ECOSYSTEM
AEIRB STUDY 12382, DR. R. BOURBONNIERE

Current knowledge of the temporal heterogeneity of trace metals in the water column of Lake Erie is not known. However, there is evidence that low trace metal concentrations can induce growth limitations, e.g. iron limitation of phytoplankton growth.

A group of Canadian scientists along with researchers based in the United States collaborated again this year in a broad range of experiments to investigate the chemical, biological and physical controls which influence the cycling of carbon and trace metals in the Lake Erie water column.

Biological experiments included on deck incubations in flow through tanks. Experiments to assess the bio-availability of iron and zinc to plankton were conducted in NWRI's portable trace metal clean laboratory.

A trace metal clean sampling system (Teflon tubing, pneumatic diaphragm pump) was used at all the pelagic sampling stations to enable large volumes of lake water to be delivered directly into the clean lab in support of chemical and biological studies. In addition, collections were made to determine the distribution and character of viruses and their activity. Opportunities to sample for these occurred in all three basins of Lake Erie, as well as Long Point Bay.

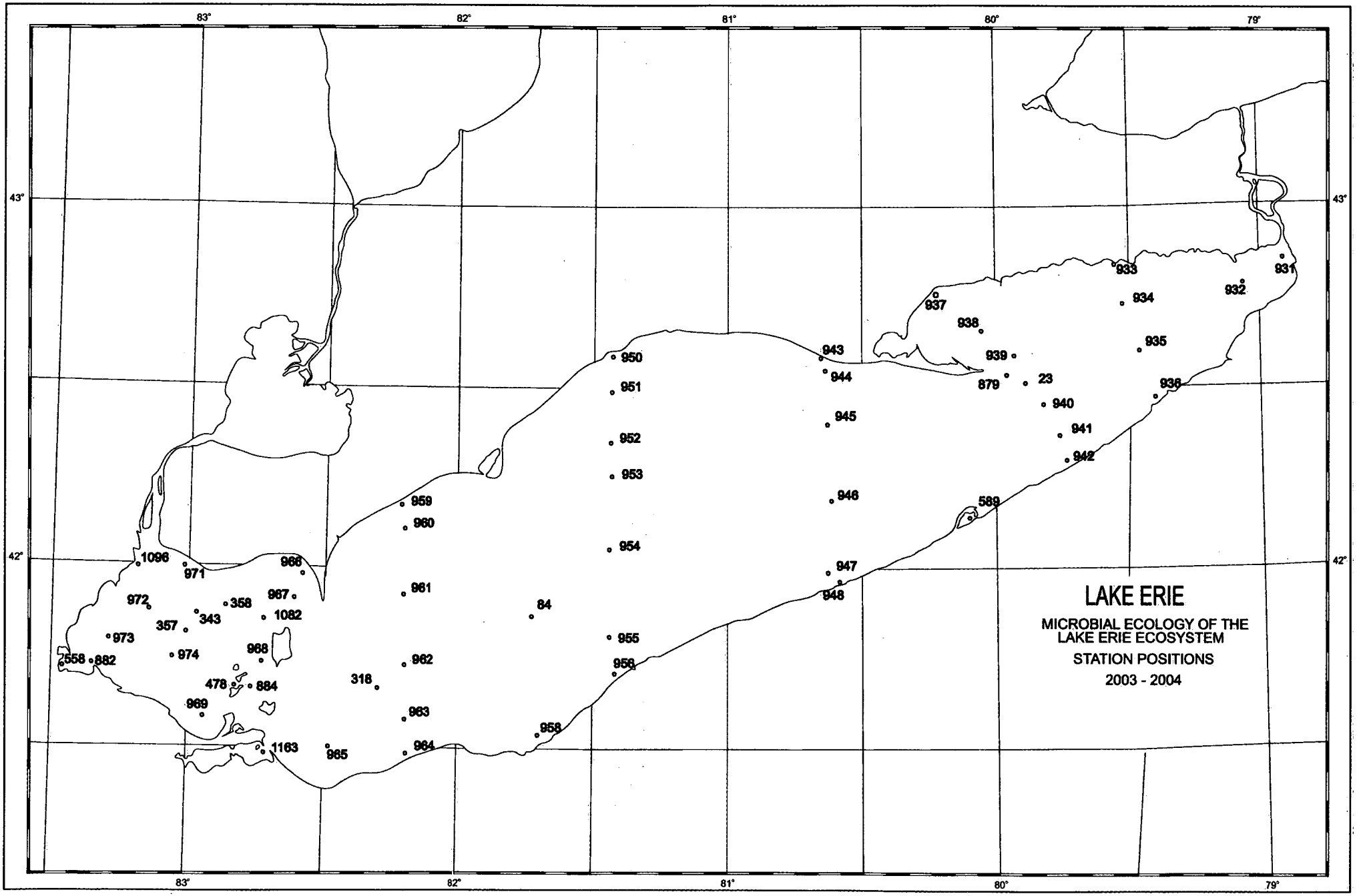
Water samples from 1m were collected at each station for cyanobacterial abundance and microcystin concentration.

STATION POSITIONS

LAKE ERIE

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 23"	79° 53' 37"
84	41° 56' 05"	81° 39' 38"
205	42° 20' 00"	80° 21' 59"
357	41° 48' 46"	82° 59' 01"
442	42° 50' 29"	79° 23' 33"
478 (Put in Bay)	41° 39' 36"	82° 48' 58"
558 (Maumee River)	41° 41' 57"	83° 27' 36"
589	42° 08' 42"	80° 06' 19"
882	41° 44' 05"	83° 23' 05"
885	41° 31' 12"	82° 38' 26"
934	42° 42' 29"	79° 30' 29"
937	42° 43' 01"	80° 14' 59"
949	42° 14' 44	81° 06' 51"
954	42° 01' 30"	81° 26' 27"
955	41° 47' 59"	81° 26' 30"
956	42° 41' 34"	81° 26' 31"
958	41° 31' 29"	81° 42' 27"
961	41° 54' 27"	82° 10' 58"
965	41° 30' 05"	82° 30' 01"
966	41° 58' 56"	82° 38' 26"
967	41° 53' 33"	82° 39' 58"
968	41° 44' 32"	82° 44' 01"
969	42° 36' 29"	82° 55' 28"
971	41° 56' 59"	83° 03' 16"
972	41° 52' 01"	83° 11' 57"
974	41° 43' 32"	83° 09' 01"
1138	42° 10' 01"	80° 09' 38"
1156	42° 02' 50"	83° 08' 06"
1163 (Sandusky)	41° 28' 10"	82° 42' 52"
1165	41° 59' 58"	82° 43' 49"


83°
82°
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80°
79°
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42°
LAKE ERIE
MICROBIAL ECOLOGY OF THE
LAKE ERIE ECOSYSTEM
STATION POSITIONS
2003 - 2004
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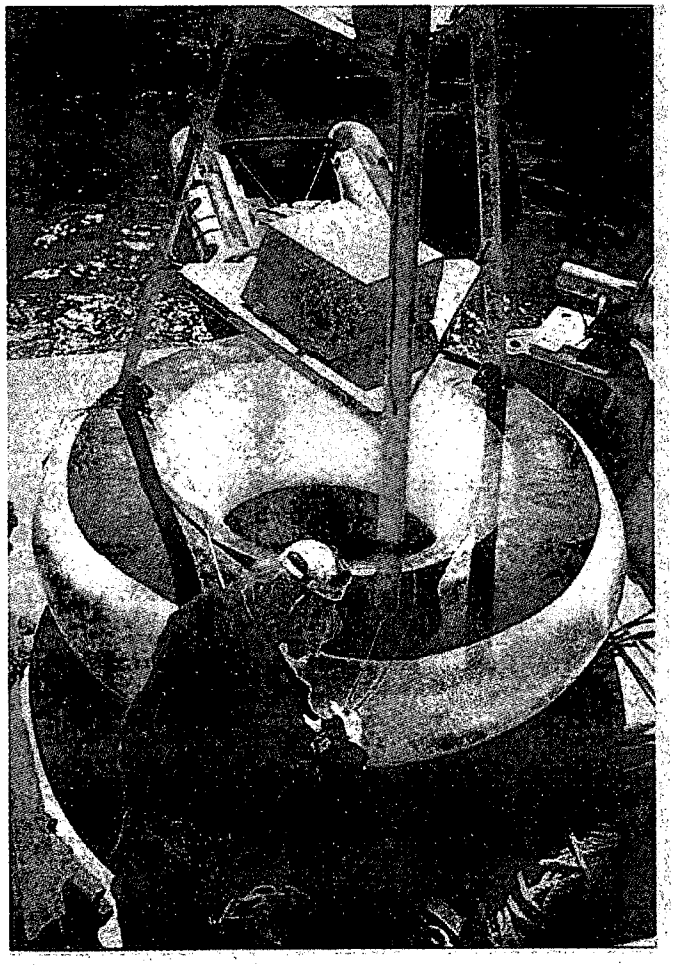
METEOROLOGICAL AND TEMPERATURE MOORINGS, GREAT SLAVE LAKE
AEIRB STUDY 14145, W. M. SCHERTZER

The purpose of this study was to deploy meteorological and temperature moorings to give detailed vertical temperature measurements on Great Slave Lake, NWT. To accomplish this, two meteorological buoys were installed at stations 1 and 2 during the June 10 - 21 cruise and were retrieved by the CCGS ECAKLOO, September 27. Temperature moorings were installed during the same time period at stations 1, 2, 3, 4, 5 and 7. The temperature moorings were retrieved between September 17 - 27, utilizing CCGC 775 and the CCGS ECAKLOO. A shore-based station was also set up at Hay River in the NTCL storage area. This was dismantled September 11 and reinstalled at the Coast Guard compound at the Hay River Airport for the winter.

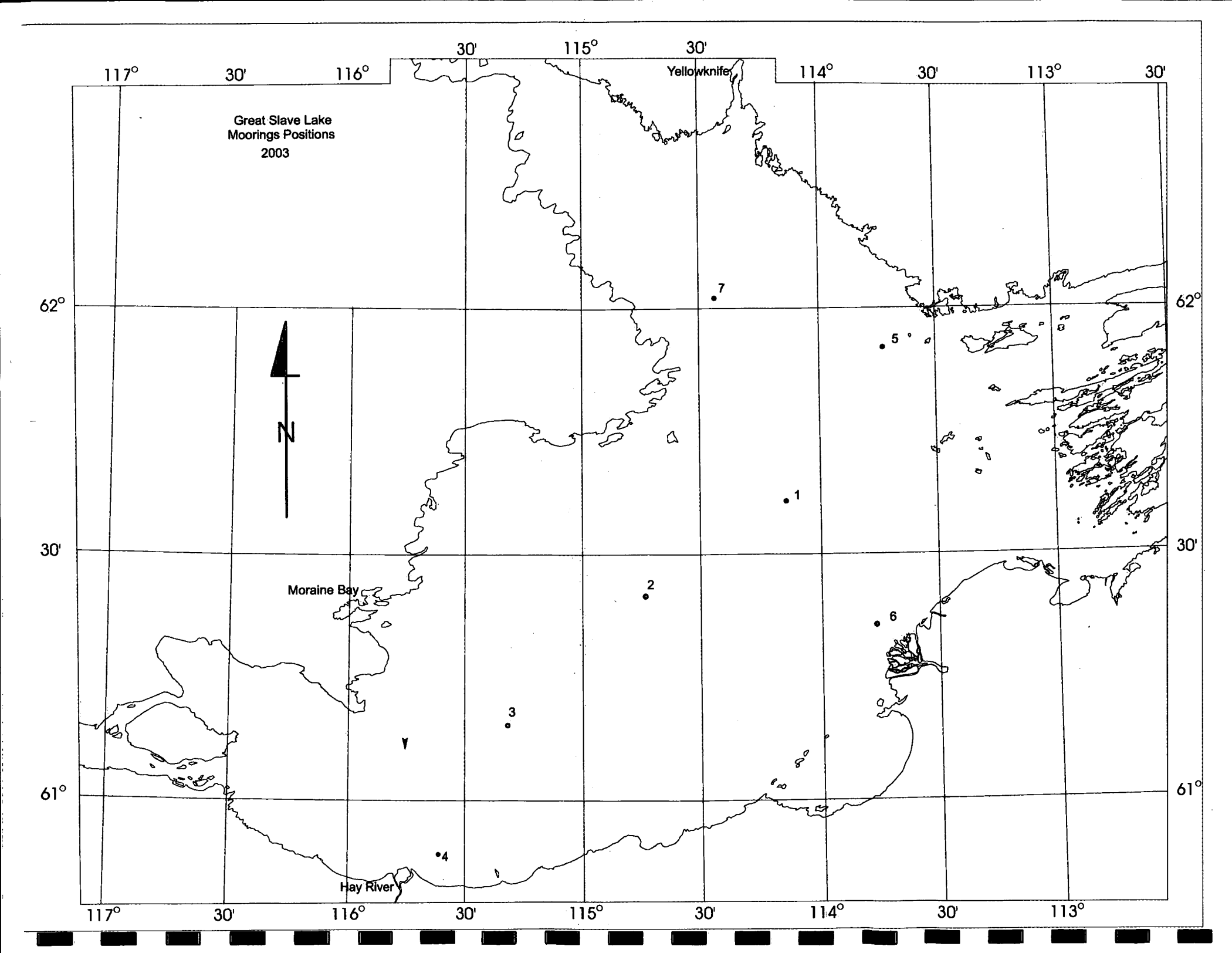


Meteorological Buoy Installation
Great Slave Lake

GREAT SLAVE LAKE

MOORING POSITIONS

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
1	2003-51T-01A	61° 38' 57"	114° 09' 32"	T (2,5,7.5,10, 13.5,15,20, 25,30,40,50, 75,100 m)
	2003-51T-01B	61° 39' 11"	114° 09' 30"	T (12,14,16, 20,30,50,75, 100 m)
	2003-51M-02A	61° 39' 02"	114° 09' 12"	MET
2	2003-51M-03A	61° 26' 46"	114° 46' 16"	MET
	2003-51T-04A	61° 26' 36"	114° 46' 33"	T (2,5,7.5,10, 13.5,15,20, 25,30,40,50, 56 m)
3	2003-51T-05A	61° 10' 12"	115° 13' 49"	T (2,5,7.5,10, 13.5,15,20, 25,30,40, 56 m)
	2003-51T-05B	61° 10' 22"	115° 13'11"	T (12,14,16, 20,25,30,40, 55 m)
4	2003-51T-06A	61° 54' 08"	115° 41' 53"	T (Surf,2,5, 7.5,10,12 m)
5	2003-51T-09A	61° 55' 34"	113° 45' 22"	T (Surf, 2,5, 7.5,10,13.5, 15,20,25,30, 40,50 m)
7	2003-51T-10A	61° 59' 13"	114° 29' 29"	T (Surf, 2,5, 7.5,10,13.5, 15,20, 25,30, 40,50,60 m)


Great Slave Lake
Moorings Positions
2003
Yellowknife
Moraine Bay
Hay River
N
1
2
3
4
5
6
7
117°
30'
116°
115°
114°
113°
62°
61°

AQUATIC ECOSYSTEM MANAGEMENT RESEARCH BRANCH

ROXANN™ SEDIMENT SURVEY, LAKE ERIE CENTRAL BASIN
AEMRB STUDY 12218, MR. H. BIBERHOFER

Technical Operations staff provided support to Mr. H. Biberhofer's RoxAnn™ Seabed Classification study on Lake Erie's Central Basin during the first two weeks of June, onboard the CCGS LIMNOS.

The purpose of this survey was to perform a shipboard survey using the RoxAnn seabed classification system for basin mapping of bottom sediment types in the Central Basin of Lake Erie. This cruise was used to aid in the development of a system of bottom-mapping that will provide a digital record of bottom sediment types in the Central Basin and near shore areas of Lake Erie and eventually other Great Lakes.

The LIMNOS completed a series of track lines around the perimeter of the Central Basin, during the first week of the cruise. The lines were run using a zigzag pattern from onshore to offshore and then back inshore. The survey lines were run inshore to about 10m and then offshore to just beyond the 20m depth contour. A series of lines was also run through the deeper waters of the Central Basin. During the second week of the cruise a number of selected sites were chosen to groundtruth the data using mini-boxcores and shipeks. The groundtruthing was used to confirm the data collected with the RoxAnn™ System.

Additional work was completed during the second week for the University of Windsor, and Bowling Green State University. The University of Windsor staff collected subsamples from selected Biberhofer boxcore stations and the samples were sieved for benthic invertebrate mass, using the OMNR sieving protocol. University staff also collected 14 Ropack containers of sediment at Station 357 in the Western Basin. Bowling Green State University staff collected 5m discrete water samples for chlorophyll a, and alkaline phosphatase assays. A small boat was also launched at Station 682 to collect 20 algal samples, for comparison with a LANDSAT satellite image being shot at the same time.

STATION POSITIONS

LAKE ERIE

2003-2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
601	42° 04' 30.27679"	83° 07' 09.57397"
602	41° 58' 14.19738"	83° 08' 06.88602"
603	41° 55' 11.63589"	82° 42' 26.47141"
604	41° 52' 32.35933"	82° 33' 46.48662"
605	41° 49' 17.81877"	82° 29' 31.06003"
606	41° 52' 05.68261"	82° 09' 50.17871"
607	41° 59' 33.36060"	82° 28' 21.62681"
608	42° 02' 22.51404"	82° 13' 31.82446"
609	42° 09' 03.67694"	82° 17' 36.85436"
610	42° 07' 31.96217"	82° 06' 58.58012"
611	42° 15' 06.68778"	82° 03' 14.91024"
612	42° 03' 46.51410"	81° 56' 23.17373"
613	42° 14' 40.32257"	81° 53' 39.63779"
614	42° 12' 31.30149"	81° 45' 46.93008"
615	42° 22' 10.81051"	81° 47' 54.81638"
616	42° 21' 14.41103"	81° 37' 21.30436"
617	42° 28' 29.95263"	81° 36' 44.18730"
618	42° 26' 47.41535"	81° 27' 22.73535"
619	42° 34' 26.79719"	81° 27' 09.81808"
620	42° 28' 28.19181"	81° 18' 50.53888"
621	42° 38' 18.32890"	81° 14' 01.41318"
622	42° 27' 15.24961"	81° 06' 45.61696"
623	42° 38' 08.77017"	80° 59' 54.89604"
624	42° 24' 46.84068"	80° 57' 39.50406"
625	42° 37' 05.65812"	80° 48' 09.69420"
626	42° 21' 44.37946"	80° 45' 47.24688"
627	42° 33' 56.48450"	80° 37' 07.95645"
628	42° 22' 40.40290"	80° 35' 23.55982"
629	42° 33' 11.51322"	80° 24' 13.31506"
630	42° 27' 16.52105"	80° 21' 41.94639"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
631	42° 20' 27.95978"	80° 33' 4.27745"
632	42° 20' 31.38364"	80° 17' 36.19157"
633	42° 14' 15.54585"	80° 29' 53.56864"
634	42° 16' 39.13236"	80° 14' 40.93608"
635	42° 10' 58.21500"	80° 33' 03.81676"
636	42° 10' 59.65314"	80° 29' 34.02718"
637	42° 09' 09.89270"	80° 13' 00.89185"
638	42° 03' 07.46085"	80° 19' 22.91145"
639	42° 08' 19.40050"	80° 25' 41.27926"
640	41° 59' 56.16870"	80° 29' 46.07354"
641	42° 04' 23.31367"	80° 39' 34.40545"
642	41° 56' 06.62385"	80° 43' 52.22516"
643	42° 00' 41.88950"	80° 51' 01.89130"
644	41° 53' 20.91603"	80° 54' 06.39196"
645	41° 56' 51.08250"	81° 01' 21.69725"
646	41° 50' 23.77901"	81° 06' 25.05221"
647	41° 53' 32.07640"	81° 14' 15.04251"
648	41° 45' 09.52922"	81° 20' 47.13369"
649	41° 47' 50.31131"	81° 30' 57.73196"
650	41° 39' 02.78352"	81° 30' 14.69705"
651	41° 43' 40.74192"	81° 37' 21.45211"
652	41° 31' 31.35158"	81° 41' 16.66516"
653	41° 40' 34.63292"	81° 49' 15.41664"
654	41° 31' 03.68979"	81° 57' 12.87517"
655	41° 44' 04.29063"	81° 59' 46.31407"
656	41° 30' 04.72344"	82° 09' 40.38278"
657	41° 34' 44.63563"	82° 39' 49.16154"
658	41° 45' 23.93797"	82° 05' 07.27936"
659	41° 25' 29.50823"	82° 30' 48.96657"
660	41° 44' 03.91720"	82° 31' 15.05604"
661	41° 48' 49.41083"	82° 10' 28.48854"
662	42° 01' 51.11531"	81° 35' 36.56734"
663	42° 18' 51.68290"	80° 28' 37.53279"
664	41° 59' 39.77381"	80° 45' 13.89596"
665	42° 27' 02.56420"	80° 39' 10.02735"

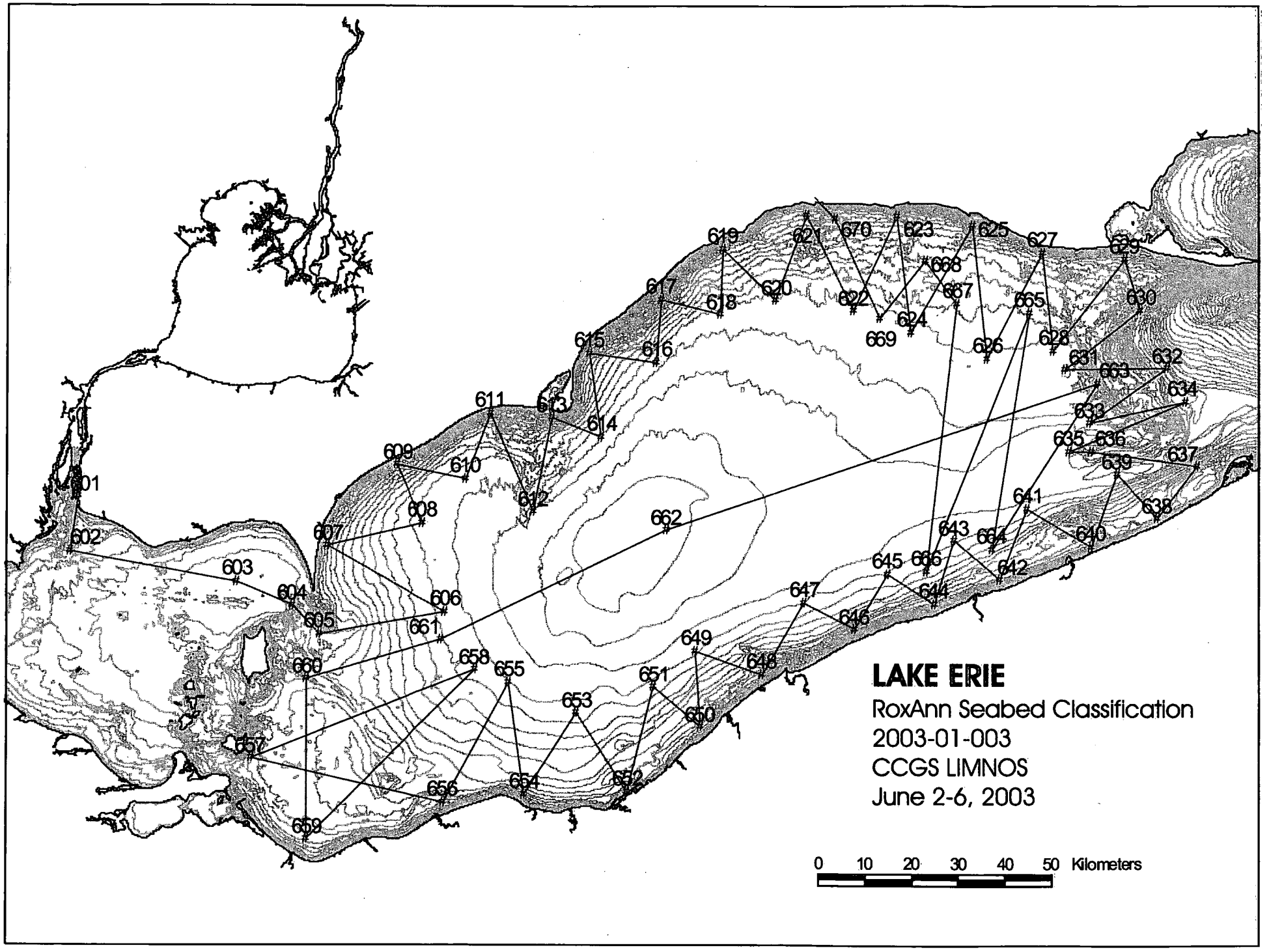
STATION NUMBER	LATITUDE N.	LONGITUDE W.
667	42° 28' 04.83142"	80° 50' 29.81370"
668	42° 33' 04.26683"	80° 55' 28.72560"
669	42° 26' 21.28592"	81° 02' 32.75360"
670	42° 37' 51.79742"	81° 09' 35.94611"
672	41° 50' 52.93476"	81° 07' 36.27263"
673	41° 52' 17.29414"	81° 04' 55.18809"
674	42° 09' 28.93066"	81° 05' 39.54502"
675	42° 27' 18.69109"	81° 06' 43.31823"
676	42° 32' 20.16182"	81° 06' 19.98358"
677	42° 38' 25.76395"	81° 05' 22.97137"
678	42° 33' 30.49256"	81° 03' 00.52205"
679	42° 29' 12.35195"	81° 04' 19.33877"
680	42° 26' 43.09913"	81° 02' 44.94617"
681	41° 51' 45.80383"	81° 00' 50.27861"
682	42° 33' 02.00623"	80° 55' 37.86238"
685	42° 14' 50.48224"	80° 45' 49.48141"
686	42° 11' 12.05474"	80° 42' 23.13217"
687	42° 08' 32.31042"	80° 46' 07.95096"
688	41° 54' 25.18959"	80° 49' 57.89410"
689	42° 00' 12.58012"	80° 44' 39.05007"
690	41° 58' 00.03275"	80° 35' 53.55852"
691	42° 08' 13.99267"	80° 32' 51.57175"
692	42° 01' 48.59975"	80° 23' 00.25088"
693	42° 09' 39.27045"	80° 16' 29.54018"
694	42° 13' 51.88470"	80° 12' 29.48133"
695	42° 15' 40.33147"	80° 18' 20.00800"
696	42° 15' 39.74277"	80° 21' 16.82721"
697	42° 18' 21.15667"	80° 27' 22.52909"
698	42° 20' 08.76771"	80° 12' 53.86762"
699	42° 22' 10.44268"	80° 16' 32.94377"
700	42° 25' 02.54252"	80° 29' 53.57193"
701	42° 26' 22.38330"	80° 22' 55.31896"
702	42° 28' 42.66313"	80° 12' 38.05497"
703	42° 32' 46.28820"	80° 19' 26.49205"
704	42° 27' 26.38370"	80° 27' 05.61323"

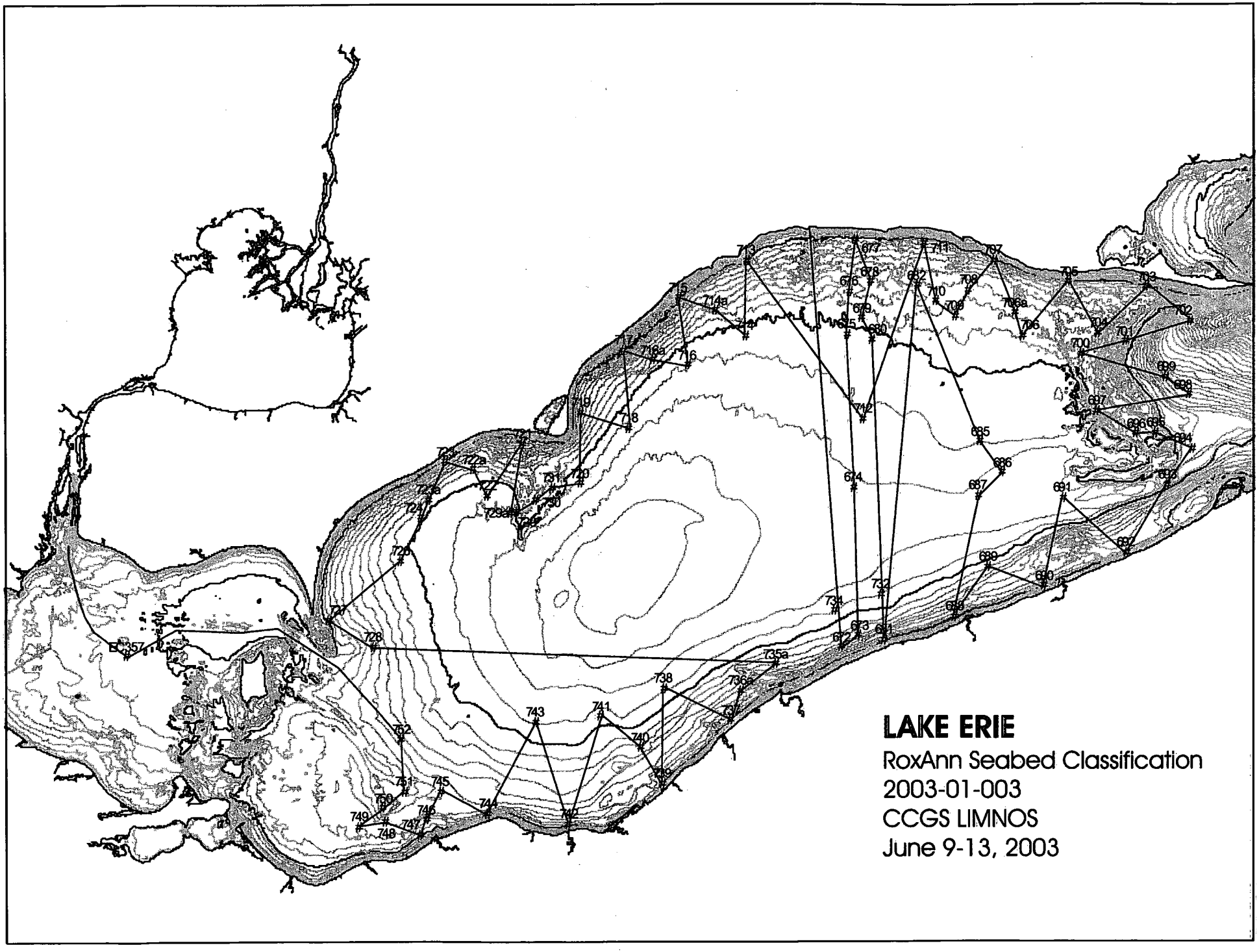
STATION NUMBER	LATITUDE N.	LONGITUDE W.
705	42° 33' 26.13005"	80° 31' 43.64374"
706	42° 27' 10.72600"	80° 39' 04.64594"
706a	42° 29' 47.59043"	80° 40' 15.88301"
707	42° 35' 59.32227"	80° 43' 33.63008"
708	42° 32' 28.57995"	80° 47' 30.55649"
709	42° 29' 25.13074"	80° 49' 44.18952"
710	42° 31' 13.52080"	80° 52' 43.22593"
711	42° 37' 57.61362"	80° 54' 32.46588"
712	42° 17' 28.48059"	81° 04' 06.39939"
713	42° 35' 55.03350"	81° 22' 28.59827"
714	42° 27' 07.77132"	81° 22' 41.72462"
714a	42° 30' 05.74468"	81° 27' 16.22796"
715	42° 31' 36.35919"	81° 33' 10.59520"
716	42° 23' 40.79223"	81° 31' 36.99599"
716a	42° 24' 16.08690"	81° 37' 11.17173"
717	42° 25' 25.99067"	81° 41' 47.83449"
718	42° 16' 21.03404"	81° 40' 49.08814"
719	42° 18' 06.35782"	81° 48' 28.06358"
720	42° 09' 49.41331"	81° 48' 26.55058"
721	42° 14' 22.38227"	81° 57' 33.33137"
722	42° 08' 18.02242"	82° 02' 55.71640"
722a	42° 11' 20.53221"	82° 05' 12.42350"
723	42° 12' 11.72767"	82° 09' 44.79498"
723a	42° 07' 41.68304"	82° 12' 18.78911"
724	42° 05' 41.11411"	82° 13' 28.23127"
726	42° 00' 34.76604"	82° 16' 36.26142"
727	41° 53' 36.92578"	82° 27' 53.44908"
728	41° 50' 28.51159"	82° 20' 48.53128"
729	42° 06' 29.01987"	81° 58' 14.73832"
729a	42° 06' 22.08137"	81° 59' 20.08504"
730	42° 07' 54.21526"	81° 55' 23.62811"
731	42° 09' 17.32081"	81° 52' 53.38271"
732	41° 57' 00.51277"	81° 01' 20.15216"
734	41° 55' 07.48403"	81° 08' 39.28538"
735a	41° 48' 53.69602"	81° 17' 42.28778"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
736a	41° 45' 45.64049"	81° 23' 14.05231"
737	41° 42' 22.84913"	81° 24' 42.58105"
738	41° 46' 03.08371"	81° 35' 11.83782"
739	41° 34' 57.15452"	81° 35' 17.83908"
740	41° 39' 05.69026"	81° 38' 42.51306"
741	41° 42' 43.83157"	81° 44' 57.12116"
742	41° 30' 11.55547"	81° 49' 49.04926"
743	41° 41' 57.21725"	81° 55' 07.67788"
744	41° 31' 17.73569"	82° 02' 23.65301"
745	41° 33' 47.03304"	82° 09' 59.38932"
746	41° 30' 32.07854"	82° 12' 09.82066"
747	41° 28' 46.87900"	82° 12' 58.31121"
748	41° 30' 13.60283"	82° 18' 32.61415"
749	41° 29' 34.55181"	82° 22' 40.29347"
750	41° 31' 46.75935"	82° 18' 54.54083"
751	41° 33' 43.47741"	82° 15' 36.31728"
752	41° 39' 47.62793"	82° 16' 15.55545"
681	41° 51' 45.80383"	81° 00' 50.27861"
682	42° 33' 02.00623"	80° 55' 37.86238"
685	42° 14' 50.48224"	80° 45' 49.48141"
686	42° 11' 12.05474"	80° 42' 23.13217"
687	42° 08' 32.31042"	80° 46' 07.95096"
688	41° 54' 25.18959"	80° 49' 57.89410"
689	42° 00' 12.58012"	80° 44' 39.05007"
690	41° 58' 00.03275"	80° 35' 53.55852"
691	42° 08' 13.99267"	80° 32' 51.57175"
692	42° 01' 48.59975"	80° 23' 00.25088"
693	42° 09' 39.27045"	80° 16' 29.54018"
694	42° 13' 51.88470"	80° 12' 29.48133"
695	42° 15' 40.33147"	80° 18' 20.00800"
696	42° 15' 39.74277"	80° 21' 16.82721"
697	42° 18' 21.15667"	80° 27' 22.52909"
698	42° 20' 08.76771"	80° 12' 53.86762"
699	42° 22' 10.44268"	80° 16' 32.94377"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
700	42° 25' 02.54252"	80° 29' 53.57193"
701	42° 26' 22.38330"	80° 22' 55.31896"
702	42° 28' 42.66313"	80° 12' 38.05497"
703	42° 32' 46.28820"	80° 19' 26.49205"
704	42° 27' 26.38370"	80° 27' 05.61323"
705	42° 33' 26.13005"	80° 31' 43.64374"
706	42° 27' 10.72600"	80° 39' 04.64594"
706a	42° 29' 47.59043"	80° 40' 15.88301"
707	42° 35' 59.32227"	80° 43' 33.63008"
708	42° 32' 28.57995"	80° 47' 30.55649"
709	42° 29' 25.13074"	80° 49' 44.18952"
710	42° 31' 13.52080"	80° 52' 43.22593"
711	42° 37' 57.61362"	80° 54' 32.46588"
712	42° 17' 28.48059"	81° 04' 06.39939"
713	42° 35' 55.03350"	81° 22' 28.59827"
714	42° 27' 07.77132"	81° 22' 41.72462"
714a	42° 30' 05.74468"	81° 27' 16.22796"
715	42° 31' 36.35919"	81° 33' 10.59520"
716	42° 23' 40.79223"	81° 31' 36.99599"
716a	42° 24' 16.08690"	81° 37' 11.17173"
717	42° 25' 25.99067"	81° 41' 47.83449"
718	42° 16' 21.03404"	81° 40' 49.08814"
719	42° 18' 06.35782"	81° 48' 28.06358"
720	42° 09' 49.41331"	81° 48' 26.55058"
721	42° 14' 22.38227"	81° 57' 33.33137"
722	42° 08' 18.02242"	82° 02' 55.71640"
722a	42° 11' 20.53221"	82° 05' 12.42350"
723	42° 12' 11.72767"	82° 09' 44.79498"
723a	42° 07' 41.68304"	82° 12' 18.78911"
724	42° 05' 41.11411"	82° 13' 28.23127"
726	42° 00' 34.76604"	82° 16' 36.26142"
727	41° 53' 36.92578"	82° 27' 53.44908"
728	41° 50' 28.51159"	82° 20' 48.53128"
729	42° 06' 29.01987"	81° 58' 14.73832"
729a	42° 06' 22.08137"	81° 59' 20.08504"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
730	42° 07' 54.21526"	81° 55' 23.62811"
731	42° 09' 17.32081"	81° 52' 53.38271"
732	41° 57' 00.51277"	81° 01' 20.15216"
734	41° 55' 07.48403"	81° 08' 39.28538"
735a	41° 48' 53.69602"	81° 17' 42.28778"
736a	41° 45' 45.64049"	81° 23' 14.05231"
737	41° 42' 22.84913"	81° 24' 42.58105"
738	41° 46' 03.08371"	81° 35' 11.83782"
739	41° 34' 57.15452"	81° 35' 17.83908"
740	41° 39' 05.69026"	81° 38' 42.51306"
741	41° 42' 43.83157"	81° 44' 57.12116"
742	41° 30' 11.55547"	81° 49' 49.04926"
743	41° 41' 57.21725"	81° 55' 07.67788"
744	41° 31' 17.73569"	82° 02' 23.65301"
745	41° 33' 47.03304"	82° 09' 59.38932"
746	41° 30' 32.07854"	82° 12' 09.82066"
747	41° 28' 46.87900"	82° 12' 58.31121"
748	41° 30' 13.60283"	82° 18' 32.61415"
749	41° 29' 34.55181"	82° 22' 40.29347"
750	41° 31' 46.75935"	82° 18' 54.54083"
751	41° 33' 43.47741"	82° 15' 36.31728"
752	41° 39' 47.62793"	82° 16' 15.55545"


LAKE ERIE
RoxAnn Seabed Classification
2003-01-003
CCGS LIMNOS
June 2-6, 2003
0 10 20 30 40 50 Kilometers


LAKE ERIE
RoxAnn Seabed Classification
2003-01-003
CCGS LIMNOS
June 9-13, 2003

ZEBRA MUSSEL EFFECTS
AEMRB STUDY 12240, M.N. CHARLTON

This was an ongoing study to determine the effects of zebra mussels on water quality in Lake Erie.

A total of six cruises were completed on the CCGS LIMNOS to support this study during the field season: April 14 - 24, May 5 - 9, June 23 - 27, August 11 - 15, September 29 - October 3 and October 20 - 24. An additional cruise was used to sample stations in the Eastern Basin, October 6 - 10 during the Lake Erie Thermograph and Metrological Moorings cruise. At each station, water samples were collected as follows: an integrated water sample from the surface to 1 m above the top of the thermocline or to 20 m if the epilimnion was deeper than 20 m or the water column was unstratified. In instances where the sampling depth extended to the substrate 2 m above the bottom was sampled. Parameters measured were: conductivity, pH, phytoplankton, bacteria, total phosphorus, total filtered phosphorus, soluble reactive phosphorus, nitrate + nitrite, ammonia, total suspended solids, chlorophyll a, particulate C/N, particulate P, particulate Si, chlorides and soluble reactive silicates. EBT/transmissometer profiles, DO profiles, Fluorometer profiles, surface bucket temperature and Secchi disc (30 cm) observations were also made at each station.

At stations 23, 931, 935, 936, 445, 938 and 448 in the Eastern Basin and stations 84, 944, 946, 947, 951, 953, 955, 960, 961, 962 and 963 in the Central Basin, duplicate metered 64 u zooplankton net hauls were taken from bottom -1 m to the surface and preserved in sugared formalin. Phytoplankton samples preserved with 5 mls of Lugol's solution and protozoa samples preserved with 10 mls of a glutaraldehyde solution were collected from the integrated sample for Dr. D. Culver, Ohio State University.

During the April 14 - 24 cruise, sediment trap moorings were installed at stations 23, 84, 357 and 449. These moorings were serviced during the above mentioned cruises or on the Contaminant cruises. Chlorophyll a and seston samples were collected at sediment trap depth during each cruise.

During the May 5 - 9 cruise, a meteorological buoy was installed at station 591. This mooring was monitored during all further cruises. Thermograph moorings were also installed at stations 591, 592 and 593. The thermograph mooring at station 593 was also equipped with a transmissometer. The thermistor string was found to be missing from station 593 when the transmissometer was cleaned, August 21. All moorings were removed during the Thermograph and Meteorological Moorings cruise, October 6 - 10.

A sediment trap mooring with six sediment traps was also serviced at station 403 in Lake Ontario. This mooring was refurbished in May and refurbished as a winter mooring at the end of October.

STATION POSITIONS

LAKE ERIE

2003-2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 06"	79° 53' 24"
84	41° 56' 09"	81° 39' 16"
205	42° 20' 00"	80° 22' 00"
311	41° 35' 00"	82° 28' 00"
318	41° 40' 00"	82° 17' 00"
438	42° 44' 48"	78° 57' 21"
439	42° 47' 17"	79° 04' 21"
440	42° 51' 12"	79° 10' 00"
441	42° 40' 00"	79° 05' 15"
442	42° 50' 30"	79° 23' 36"
443	42° 41' 12"	79° 16' 36"
444	42° 32' 36"	79° 15' 06"
445	42° 48' 06"	79° 42' 00"
446	42° 40' 00"	79° 44' 00"
447	42° 26' 00"	79° 38' 06"
448	42° 17' 42"	79° 42' 48"
449	42° 46' 03"	79° 58' 15"
450	42° 41' 51"	79° 57' 00"
451	42° 38' 54"	79° 53' 24"
452	42° 35' 00"	79° 55' 18"
489	42° 10' 00"	80° 18' 00"
931	42° 51' 00"	78° 56' 30"
934	42° 42' 30"	79° 30' 30"
935	42° 35' 30"	79° 28' 00"
936	42° 28' 30"	79° 24' 30"

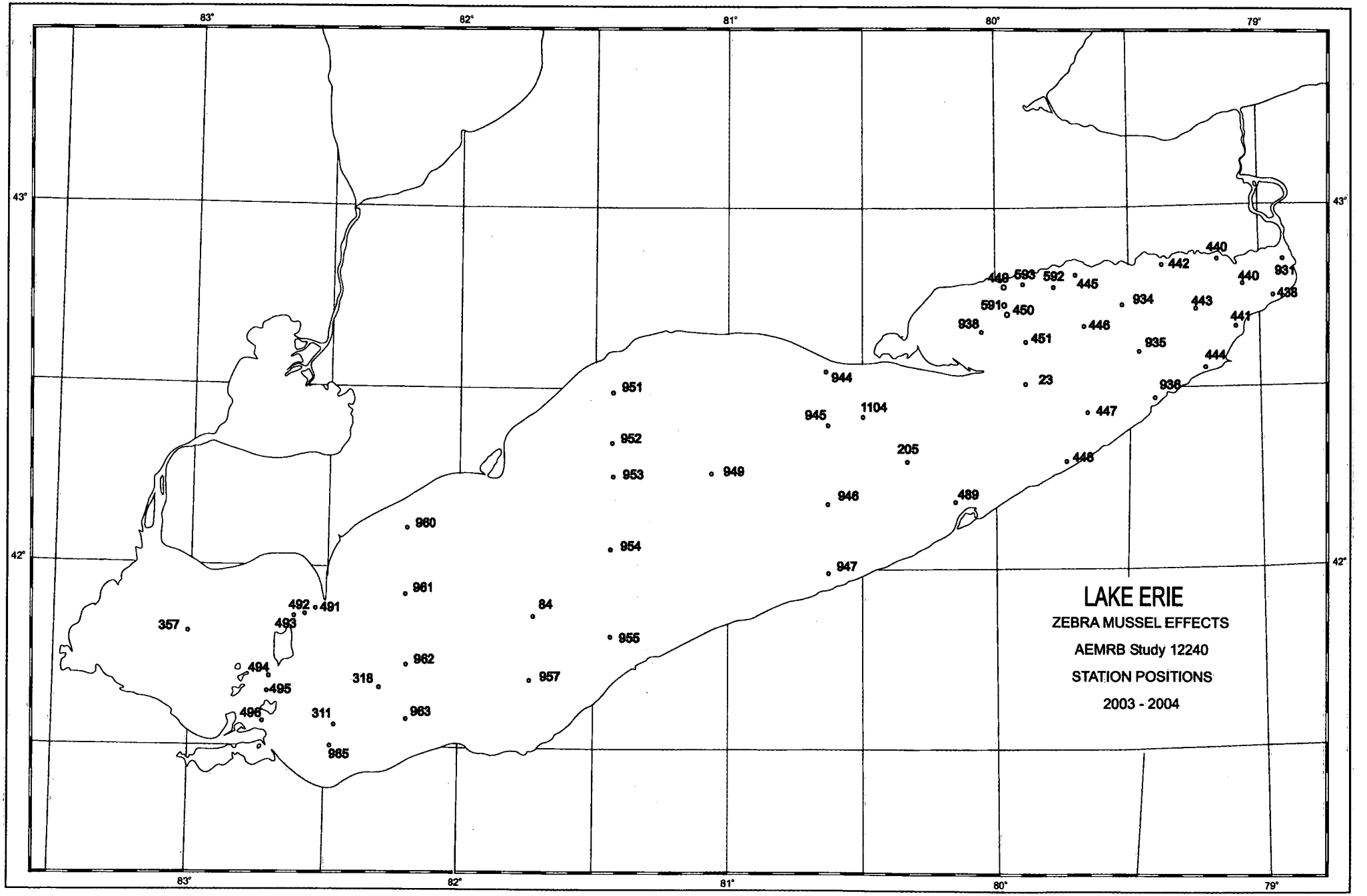
STATION NUMBER	LATITUDE N.	LONGITUDE W.
938	42° 38' 00"	80° 03' 30"
943	42° 34' 30"	80° 38' 30"
944	42° 32' 00"	80° 38' 30"
945	42° 24' 00"	80° 38' 30"
946	42° 10' 00"	80° 38' 30"
947	41° 59' 30"	80° 38' 30"
949	42° 15' 00"	81° 06' 30"
951	42° 28' 30"	81° 26' 30"
952	42° 21' 30"	81° 26' 30"
953	42° 12' 30"	81° 26' 30"
954	42° 01' 30"	81° 26' 30"
955	41° 48' 00"	81° 26' 30"
957	41° 41' 00"	81° 44' 30"
960	42° 06' 00"	82° 11' 00"
961	41° 54' 30"	82° 11' 00"
962	41° 43' 00"	82° 11' 00"
963	41° 34' 30"	82° 11' 00"
965	41° 30' 00"	82° 30' 00"
1104	42° 27' 00"	80° 30' 00"

MOORING POSITIONS

LAKE ERIE

2003 - 2004

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
23	2003-01A-02A	42° 30' 10"	79° 53' 06"	ST(20,40,50,59 m)
84	2002-01A-04A	41° 56' 18"	81° 39' 07"	ST (18, 21 m)
357	2002-01A-06A	41° 49' 21"	82° 59' 25"	ST (9.1 m)
449	2003-01A-32A	42° 46' 07"	79° 58' 17"	ST (9.4 m)
591	2003-01M-08A	42° 42' 27"	79° 58' 07"	
591	2003-01T-09A	42° 42' 24"	79° 58' 40"	T(2,4,6,8,10, 15,20,23 m)
592	2003-01T-10A	42° 44' 28"	79° 47' 38"	T(1,2,4,6,8,10 15,20,25 m)
593	2003-01T-11A	42° 46' 46	79° 53' 12"	T(1,2,3,4,6,7,8 10 m) XMS (11 m)


83°
82°
81°
80°
79°
43°
42°
LAKE ERIE
ZEBRA MUSSEL EFFECTS
AEMRB Study 12240
STATION POSITIONS
2003 - 2004
440
442
931
440
438
593
592
445
934
443
591
450
441
938
446
451
935
444
944
23
936
951
1104
945
447
952
205
448
953
949
946
489
960
954
947
961
84
492
491
357
493
955
494
962
318
957
495
496
311
963
965

DETROIT RIVER CONTAMINANT STUDY
AEMRB STUDY 12246, DR. C. MARVIN

A total of six cruises were carried out onboard the CCGS LIMNOS, April 14 - 24, May 12 - 13, June 16 - 19, July 28 - August 1, September 23 - 24, and October 20 - 24. The cruises were occasionally piggybacked with the Lake Erie Zebra Mussel mooring cruises. An additional cruise, August 25 - 27, was completed from the CCGS SHARK.

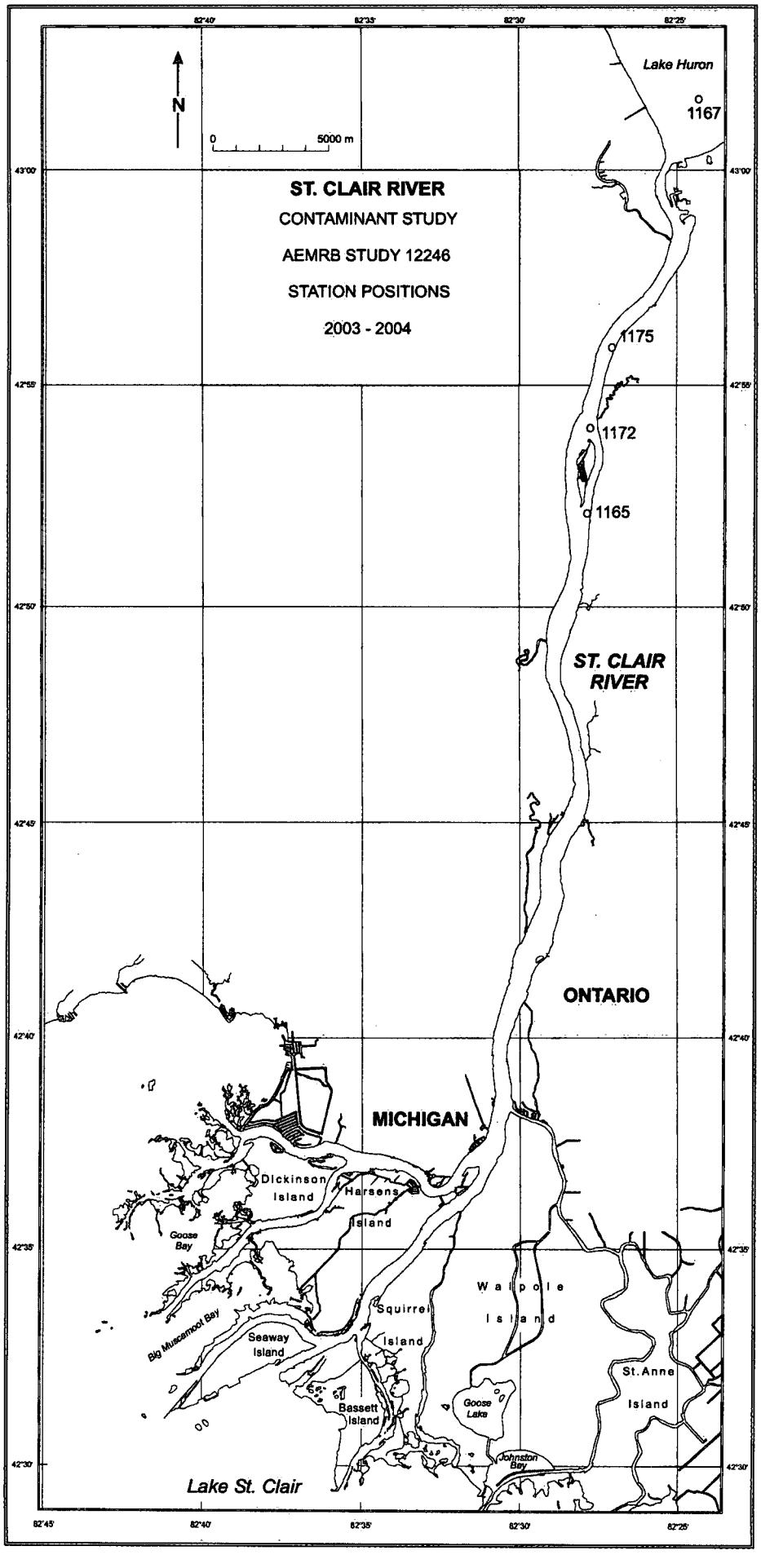
Sediment traps were installed for Dr. C. Marvin at six sites in the Detroit River, one site in Lake St. Clair, three sites in the St. Clair River and at one site in Lake Huron. Moorings were installed during the April cruise and serviced monthly as per the dates listed above.

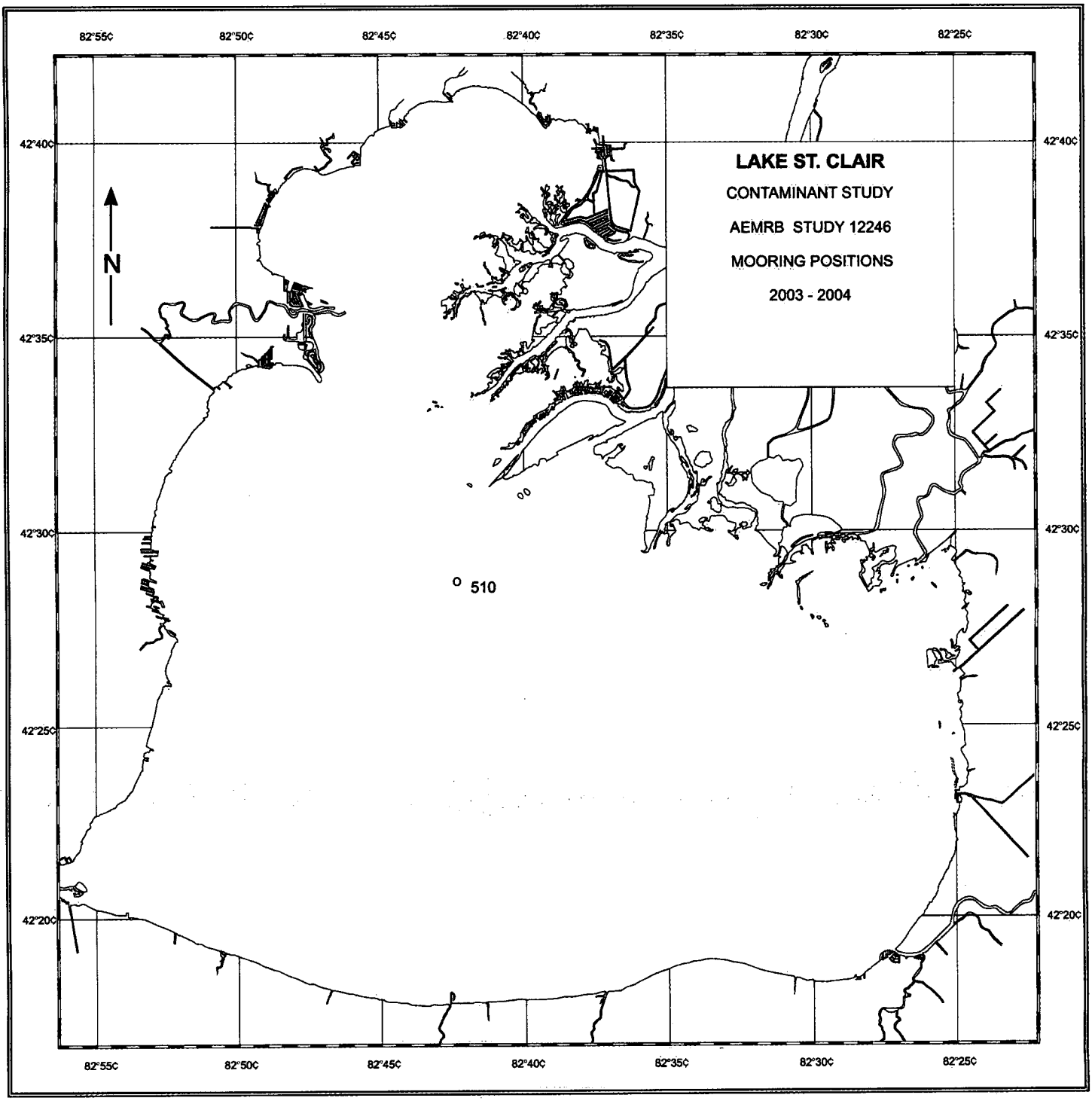
MOORING POSITIONS

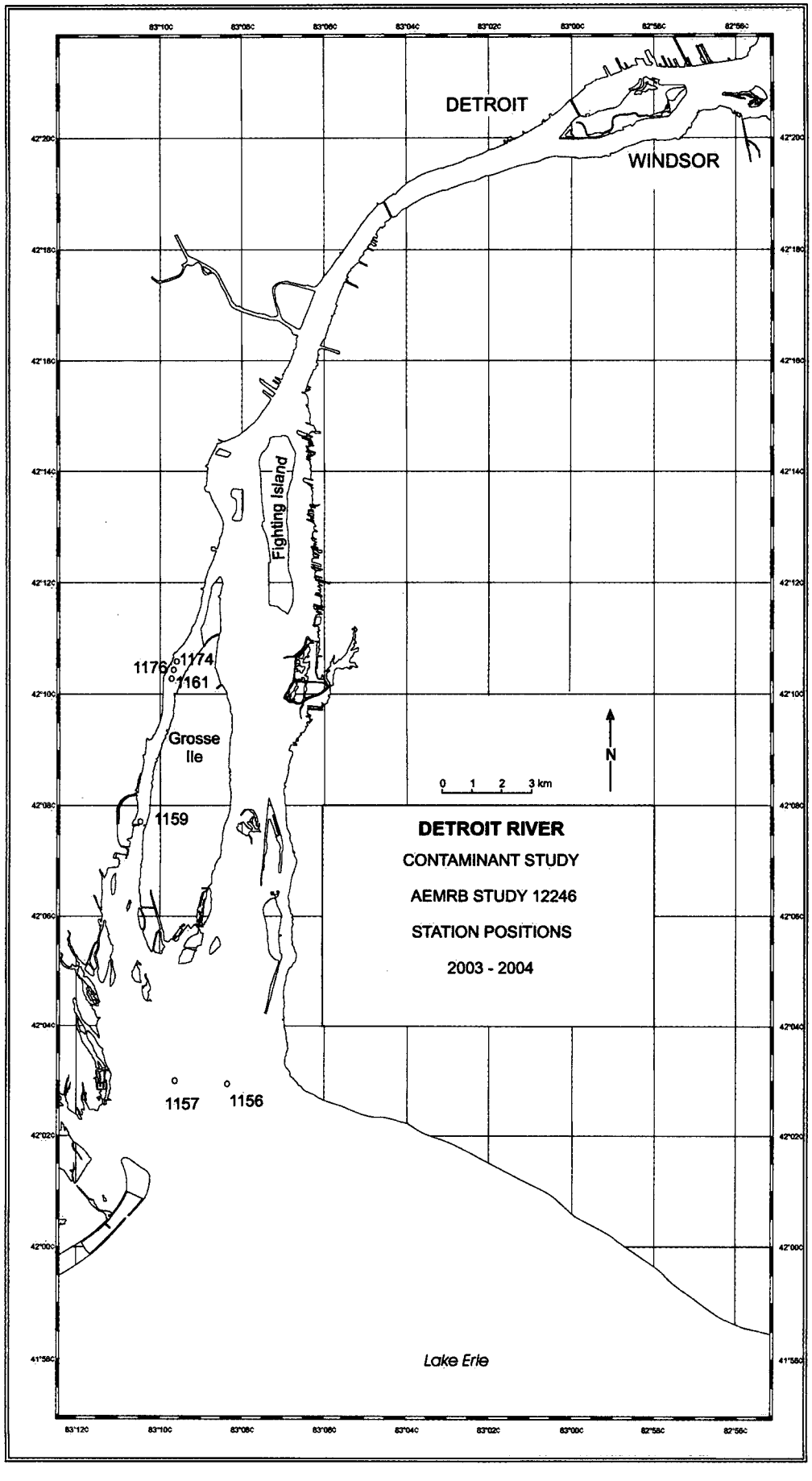
LAKE HURON
LAKE ST. CLAIR/ST. CLAIR RIVER
DETROIT RIVER

2003 - 2004

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
510	2003-04A-29A	42° 28' 41"	82° 42' 17"	ST (4.3 m)
510	2003-04A-30A	42° 28' 39"	82° 42' 16"	ST (4.3 m)
1156	2003-08A-09A	42° 02' 57"	83° 08' 12"	ST (4.4 m)
1157	2003-08A-10A	42° 02' 38"	83° 09' 35"	ST (2.9 m)
1159	2003-08A-12A	42° 07' 48"	83° 10' 32"	ST (4.4 m)
1161	2003-08A-24A	42° 10' 19"	83° 09' 51"	ST (6.7 m)
1164	2003-09S-23A	42° 39' 10"	82° 30' 28"	
1165	2003-09A-18A	42° 51' 19"	82° 27' 54"	ST (5.1 m)
1167	2003-02A-20A	42° 02' 48"	82° 24' 43"	ST (5.1 m)
1167	2003-02A-21A	42° 02' 45"	82° 24' 48"	ST (5.3 m)
1172	2003-09A-11A	42° 53' 58"	82° 27' 33"	ST (6.8 m)
1174	2003-08A-26A	42° 10' 37"	83° 09' 38"	ST (9.0 m)
1175	2003-09A-19A	42° 55' 40"	82° 27' 05"	ST (8.5 m)
1176	2003-08A-17A	42° 10' 29"	83° 09' 45"	ST (8.5 m)


ST. CLAIR RIVER
CONTAMINANT STUDY
AEMRB STUDY 12246
STATION POSITIONS
2003 - 2004
N
0
5000 m
Lake Huron
1167
1175
1172
1165
ST. CLAIR RIVER
ONTARIO
MICHIGAN
Dickinson Island
Harsens Island
Goose Bay
Big Muscamoot Bay
Seaway Island
Squirrel Island
Bassett Island
Walpole Island
St. Anne Island
Goose Lake
Johnston Bay
Lake St. Clair
82°40'
82°35'
82°30'
82°25'
43°00'
42°55'
42°50'
42°45'
42°40'
42°35'
42°30'
82°45'


82°55¢
82°50¢
82°45¢
82°40¢
82°35¢
82°30¢
82°25¢
42°40¢
42°35¢
42°30¢
42°25¢
42°20¢
N
LAKE ST. CLAIR
CONTAMINANT STUDY
AEMRB STUDY 12246
MOORING POSITIONS
2003 - 2004
510


DETROIT
WINDSOR
Fighting Island
1176
1174
1161
Grosse Ile
1159
1157
1156
Lake Erie
N
0 1 2 3 km
DETROIT RIVER
CONTAMINANT STUDY
AEMRB STUDY 12246
STATION POSITIONS
2003 - 2004

SEDIMENT TRAPS, LAKE ONTARIO
AEMRB STUDY 12246, Dr. C. MARVIN

Sediment traps were installed in Lake Ontario to measure sedimentation and regeneration rates of nutrients and contaminants to relate phytoplankton response to loading changes and the effect of eutrophication on contaminant management.

Six sediment trap moorings were installed at stations near the Niagara Bar. These stations had been sampled in the mid 1980's. Installation of the moorings was in early April with refurbishment as winter moorings in the early fall.

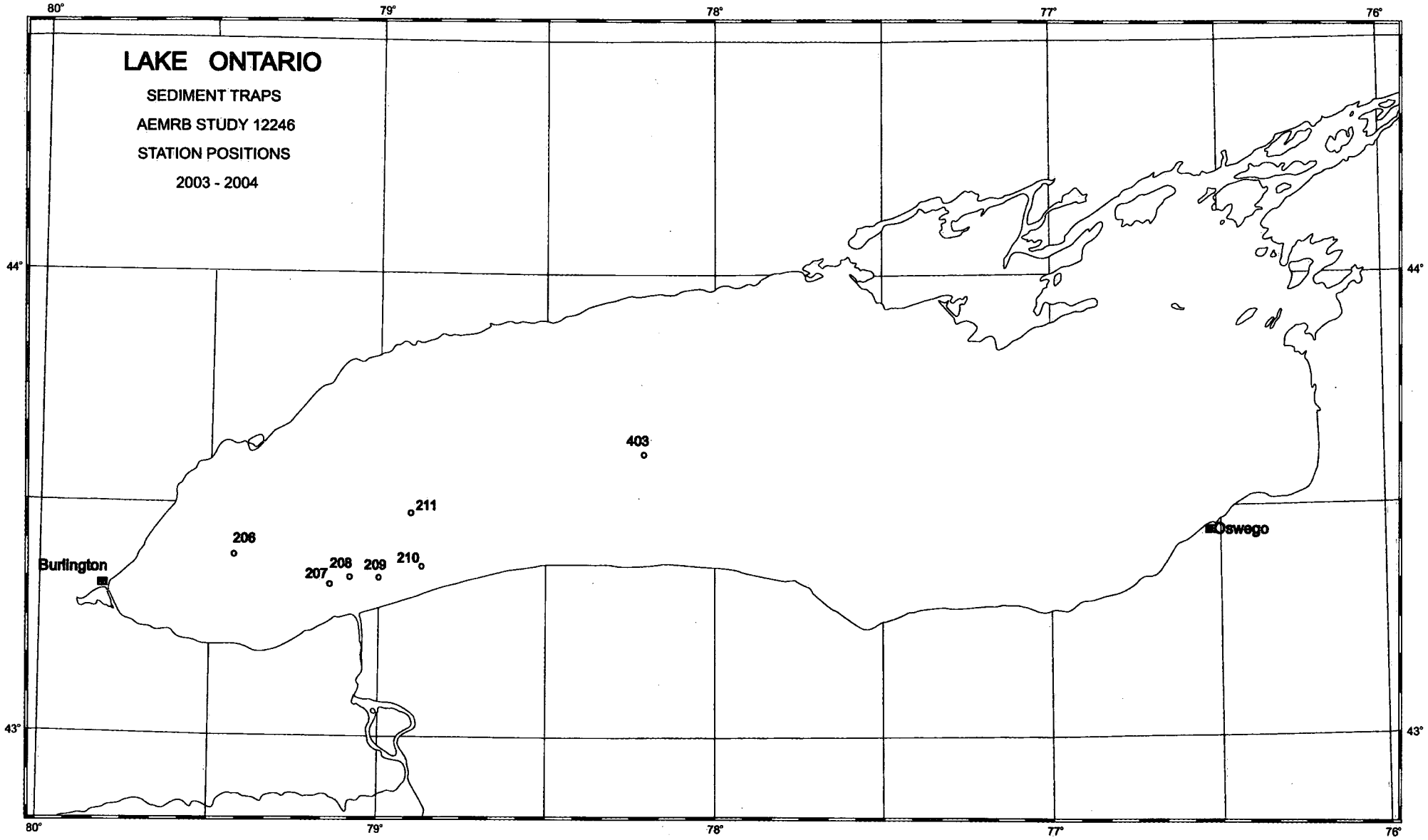
In addition, a sediment trap mooring with six sediment traps was also serviced at station 403 in Lake Ontario. This mooring was refurbished in April from a winter mooring to a summer mooring and refurbished back to a winter mooring at the end of October for M. N. Charlton, AEMRB Study 12240.

MOORING POSITIONS

LAKE ONTARIO

2003-2004

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
206	2003-00A-06A	43° 23' 59"	79° 27' 09"	ST (20,60,80,98 m)
207	2003-00A-07A	43° 19' 22"	79° 08' 45"	ST (20,40,60,66 m)
208	2003-00A-08A	43° 20' 13"	79° 04' 11"	ST (20,40,60,68 m)
209	2003-00A-09A	43° 20' 27"	78° 59' 39"	ST (20,40,60,65 m)
210	2003-00A-10A	43° 21' 34"	78° 51' 50"	ST (20,40,60,65 m)
211	2003-00A-11A	43° 28' 55"	78° 54' 59"	ST (20,60,100,131 m)
403	2002-00A-01B	43° 35' 34"	78° 13' 59"	ST(20,60,100,140, 166, 174 m)


LAKE ONTARIO
SEDIMENT TRAPS
AEMRB STUDY 12246
STATION POSITIONS
2003 - 2004
80°
79°
78°
77°
76°
44°
43°
403
211
206
207
208
209
210
Burlington
Oswego

TASTE AND ODOUR IN DRINKING WATER
AEMRB STUDY 12248, Dr. S. WATSON

The objective of this study was to determine the spatial distribution of taste and odour compounds in Lake Ontario and provide insight into the potential for control of taste and odour problems in drinking water.

To gain a better understanding of the triggering mechanisms of taste and odour compounds in drinking water supplies, the environmental dynamics of two compounds, geosmin and 2-methylisoborneol are being investigated in relation to the ecology of their production in Lake Ontario and the upper St. Lawrence River.

A single lakewide cruise was carried out on the CCGS LIMNOS from August 25 - 29 to determine the spatial distribution of these compounds in Lake Ontario. Water samples were collected by Rosette sampler from depths of 1 m and bottom -3 m for geosmin and MIB analysis, chlorophyll a , total phosphorus (filtered and unfiltered), soluble reactive phosphorus, nitrates and nitrites. An integrated water sample was also collected from the surface to 1m above the top of the thermocline or to 20m if the epilimnion was deeper than 20m or the water column was unstratified. In instances where the sampling depth extended to the substrate, sampling was carried out to 2m above the bottom for phytoplankton, picoplankton and bacterioplankton.

At all stations, 64μ mesh plankton net tow samples were collected from the surface for toxin analysis. Samples were collected by filtering on GF/C filters and frozen.

In the Kingston basin of the St Lawrence River, surficial samples were collected from 6 transects. Chlorophyll a samples were collected at the midstream stations.

STATION POSITIONS

LAKE ONTARIO

2003

STATION NUMBER	LATITUDE N.	LONGITUDE W.	SURFACE TEMPERATURE
1	43° 18' 48"	79° 45' 07"	24.8
3	43° 16' 09"	79° 37' 11"	22.0
8	43° 37' 25"	79° 27' 11"	11.9
9	43° 34' 10"	79° 23' 22"	16.1
13	43° 25' 00"	79° 23' 58"	17.8
15	43° 19' 03"	79° 26' 30"	20.5
22	43° 17' 48"	79° 00' 21"	
28	43° 46' 30"	78° 51' 06"	13.4
29	43° 49' 48"	78° 52' 08"	12.1
33	43° 35' 48"	78° 48' 04"	20.0
34	43° 27' 41"	78° 45' 36"	21.4
35	43° 21' 39"	78° 43' 50"	22.5
46	43° 53' 08"	77° 41' 22"	18.1
48	43° 51' 42"	77° 31' 29"	19.4
55	43° 26' 32"	77° 26' 21"	18.8
61	43° 47' 09"	77° 09' 28"	17.0
71	43° 28' 35"	76° 31' 39"	23.1
1183 (Oswego)	43° 27' 54"	76° 30' 48"	24.4
75	43° 50' 36"	76° 21' 18"	19.6
81	44° 00' 56"	76° 40' 17"	18.4
82	44° 04' 00"	76° 48' 44"	21.6
83	44° 00' 01"	76° 50' 35"	21.2
84	43° 53' 16"	76° 44' 08"	18.5
86	43° 15' 18"	79° 11' 43"	
88	43° 35' 17"	76° 25' 00"	22.8
89	43° 41' 56"	76° 24' 55"	18.7
90	44° 08' 11"	76° 49' 36"	17.4
95	43° 18' 47"	77° 00' 03"	20.1
98	43° 56' 05"	76° 13' 56"	17.8
100	44° 08' 26"	76° 19' 48"	

STATION NUMBER	LATITUDE N.	LONGITUDE W.	SURFACE TEMPERATURE
101	44° 11' 36"	76° 18' 36"	
102	44° 12' 24"	76° 14' 30"	
103	44° 12' 10"	76° 32' 40"	17.4
737	43° 36' 31"	79° 25' 46"	14.5
738	43° 33' 41"	79° 23' 07"	18.0
739	43° 25' 20"	79° 15' 31"	22.6
740	43° 20' 24"	79° 09' 29"	22.0
741	43° 15' 22"	79° 03' 34"	20.6
742	43° 23' 05"	78° 11' 32"	18.7
743	43° 31' 24"	78° 11' 12"	17.9
744	43° 40' 01"	78° 10' 41"	18.0
745	43° 48' 24"	78° 10' 20"	18.2
746	43° 56' 54"	78° 10' 06"	13.8
750 (LV1)	43° 33' 15"	79° 32' 07"	24.0
752 (LV3)	43° 30' 03"	79° 28' 55"	24.9
756	43° 14' 02"	79° 34' 29"	18.0
757	43° 12' 57"	79° 20' 03"	18.9
1001	43° 17' 16"	79° 50' 30"	19.1
1184 (Henderson Harbour)	43° 51' 27"	76° 12' 23"	22.1
1185	44° 16' 03"	76° 10' 52"	17.8
1192	44° 03' 34"	76° 57' 57"	16.5
1193 (Glenora)	44° 03' 34"	77° 05' 11"	16.1
1194 (Hay Bay)	44° 06' 25"	77° 01' 50"	15.1
1195 (Long Reach)	44° 06' 02"	77° 04' 26"	15.1
1195 (Desoronto)	44° 10' 32"	77° 02' 46"	16.2

STATION POSITIONS

BATEAU CANAL

2003

STATION NUMBER Watson No.	NWRI No.	LATITUDE N.	LONGITUDE W.
BC 1A	1197	44°18.398'	76°11.774'
BC 1B	1198	44°18.315'	76°11.846'
BC 1C	1199	44°18.224'	76°11.912'
BC 1D	1200	44°18.174'	76°11.973'
BC 2	1201	44°18.281'	76°14.125'
BC 3A	1202	44°18.180'	76°18.264'
BC 3B	1203	44°18.132'	76°15.237'
BC 3C	1204	44°17.889'	76°15.275'
BC 3D	1205	44°17.833'	76°15.170'
BC 4	1206	44°17.948'	76°17.045'
BC 5A	1207	44°16.362'	76°20.212'
BC 5B	1208	44°16.202'	76°20.154'
BC 5C	1209	44°16.050'	76°20.042'
BC 5D	1210	44°15.966'	76°19.937'
BC 5D	1211	44°15.966'	76°19.937'
BC 6	1212	44°14.732'	76°23.695'
BC 7A	1213	44°14.438'	76°25.068'
BC 7B	1214	44°14.101'	76°24.752'
BC 7C	1215	44°13.839'	76°24.524'
BC 7D	1216	44°13.658'	76°24.345'

STATION POSITIONS

CATARAQUI RIVER

2003

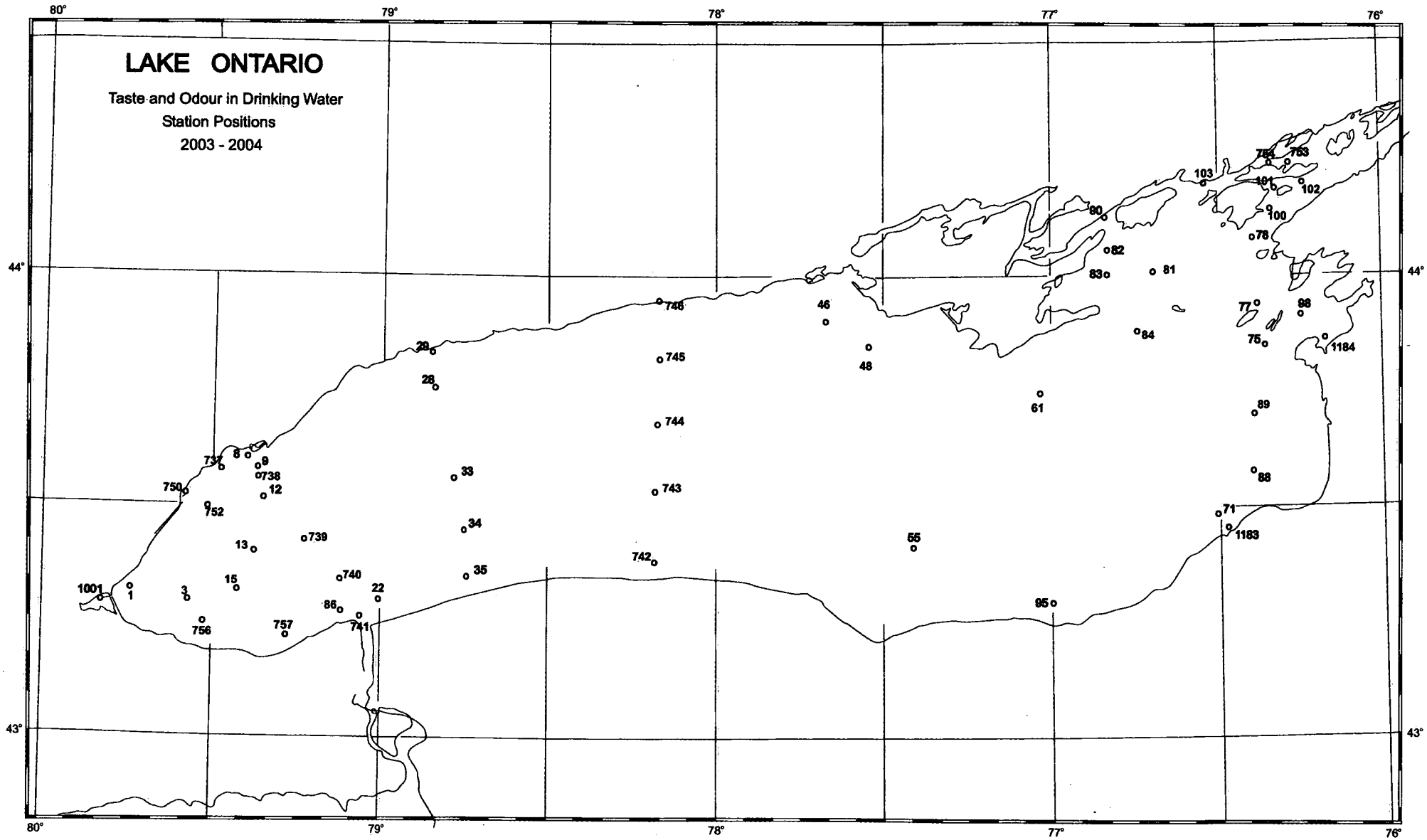
STATION NUMBER Watson No.	NWRI No.	LATITUDE N.	LONGITUDE W.
CR A	1217	44°14.710'	76°27.822'
CR B	1218	44°14.779'	76°27.930'
CR C	1219	44°14.815'	76°28.001'
CR D	1220	44°14.537'	76°28.103'
CR E	1221	44°14.159'	76°28.285'

STATION POSITIONS

WOLFE – HOWE CHANNEL

2003

STATION NUMBER Watson No.	NWRI No.	LATITUDE N.	LONGITUDE W.
WH 1	1222	44° 16' 03"	76° 10' 52"
WH 2	1223	44° 17' 57"	76° 11' 31"
WH 3	1224	44° 17' 00"	76° 12' 01"
WH 4	1225	44° 15' 32"	76° 16' 15"
WH 5	1226	44° 14' 49"	76° 21' 04"
WH 6	1227	43° 14' 52"	76° 21' 25"
WH 7	1228	44° 13' 30"	76° 28' 25"


LAKE ONTARIO
Taste and Odour in Drinking Water
Station Positions
2003 - 2004
80°
79°
78°
77°
76°
44°
43°
1001
1
3
15
13
731
8
9
738
12
750
752
739
740
22
86
741
756
757
29
28
746
745
744
743
742
33
34
35
46
48
61
55
95
103
104
753
102
100
80
78
82
83
81
84
77
98
75
1184
89
88
71
1183

MYSIDS AND ZOOPLANKTON SAMPLING, LAKE HURON
AEMRB STUDY 14176, DR. M. ARTS, DR. O. JOHANNSSON, Dr. M. MUNAWAR

Technical Operations supported this study onboard the CCGS LIMNOS during the first full week of August on northern Lake Huron.

The goal was to examine the impact of exotic invertebrates on foodweb structure in the Great Lakes, changes in the quality of planktonic food and the resultant growth rates of *Mysis* and *Diporeia*. These crustaceans are critical to the Great Lakes ecosystems in their ability to support healthy fisheries. RNA/DNA ratios and essential fatty acid (EFA) content were measured in animals collected from deep water (60m) stations in Lake Huron, west of the Bruce Peninsula and Manitoulin Island.

The core interest was to measure the relative growth rates and EFA contents of natural populations of *Mysis*, to relate EFA to growth rate and to gauge how *Mysis* growth rate and EFA composition and concentration vary temporally and spatially in the Laurentian Great Lakes. This information is a required component of models which predict; a) *Mysis* growth potential, b) potential fish yields and, c) sources of EFA to humans consuming fish from the Great Lakes.

Additional work is to examine the impacts of exotics on microbial food web production.

The parameters sampled during the cruise included: water temperature and transmission of light profiles (EBTT), dissolved oxygen profiles, *Mysid* net hauls, PONAR samples and mini-box core samples for *Diporeia* and *Dreissena,* integrated samples and Van Dorn samples for microbial foodweb analysis and examination of diurnal differences in the microbial community.

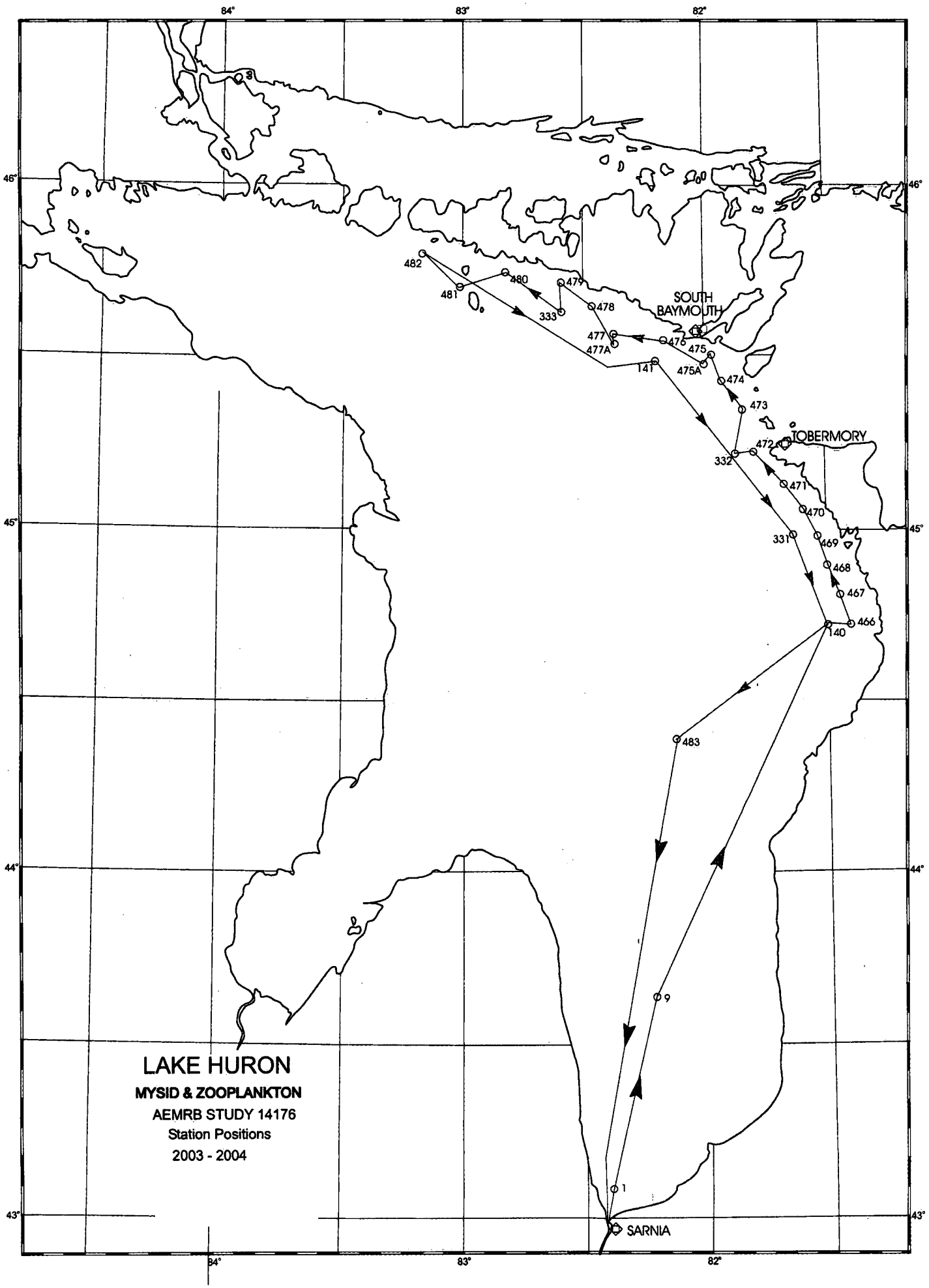
Additional samples were collected for Dr. B. Heath of Kent State University. These samples were collected at the GLLFAS stations and were also looking at microbial community differences.

STATION POSITIONS

LAKE HURON

2003-2004

STATION NUMBER	GLLFAS NUMBER	LATITUDE N.	LONGITUDE W.
140	LH10	44° 44' 32"	81° 30' 18"
141	LH18	45° 29' 59"	82° 07' 23"
331		44° 59' 00"	81° 36' 00"
332		45° 13' 30"	81° 51' 30"
333		45° 37' 30"	82° 35' 00"
466		44° 44' 24"	81° 25' 00"
467		44° 49' 45"	81° 26' 59"
468		44° 55' 02"	81° 30' 41"
469		44° 59' 01"	81° 32' 25"
470		45° 02' 39"	81° 34' 20"
471		45° 08' 38"	81° 40' 05"
472		45° 13' 26"	81° 48' 43"
473		45° 22' 12"	81° 49' 44"
474		45° 26' 32"	81° 53' 41"
475		45° 30' 39"	81° 57' 02"
475A		45° 30' 02"	81° 58' 06"
476		45° 32' 15"	82° 05' 25"
477		45° 33' 24"	82° 14' 34"
477A		45° 32' 35"	82° 13' 41"
478		45° 37' 58"	82° 22' 31"
479		45° 41' 07"	82° 33' 02"
480		45° 44' 42"	82° 49' 19"
481		45° 43' 24"	82° 59' 52"
482		45° 48' 29"	83° 09' 56"
483		44° 28' 43"	82° 08' 42"


84°
83°
82°
46°
45°
44°
43°
482
481
480
479
478
333
477
477A
476
475
475A
474
473
472
332
471
470
331
469
468
467
466
140
141
483
9
1
SOUTH BAYMOUTH
TOBERMORY
SARNIA
LAKE HURON
MYSID & ZOOPLANKTON
AEMRB STUDY 14176
Station Positions
2003 - 2004

AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH

LAKE ONTARIO, MERCURY AND TRACE METALS
AEPRB STUDY 12310, DR. D. MUIR

Cruise 2003 - 00 - 004 was carried out between July 7 - July 11, in order to collect water samples for the determination of total mercury (t-Hg) and methyl mercury (m-Hg) and to collect water and air samples for the determination of PCB's and other organic contaminants on Lake Ontario.

Total mercury in water samples were collected using recent, state-of the-art, clean methods. These samples complimented similar sample sets obtained in 2001 and 2002 and represented the first temporal baseline study of surface and sub-surface mercury in Lake Ontario, using clean methods. These recent t-Hg samples also accompanied water samples obtained for the determination of methyl mercury, the highly toxic, methylated species of mercury which is the main form of the metal found in fish. The m-Hg samples are to be used in the development of a newly proposed analytical method.

A comparison of three different sampling methodologies for polychlorinated biphenyls (PCB's) and other toxic organic contaminants in water were made at three stations. The three techniques included:

a) -the traditional method of pumping bulk water from stainless steel storage cans through XAD resin packed columns,
b) a new method where the water is pumped directly from the lake, through similar columns, and
c) -a third method of collection using commercial Infiltrex samplers, left to pump on station from deployed moorings.

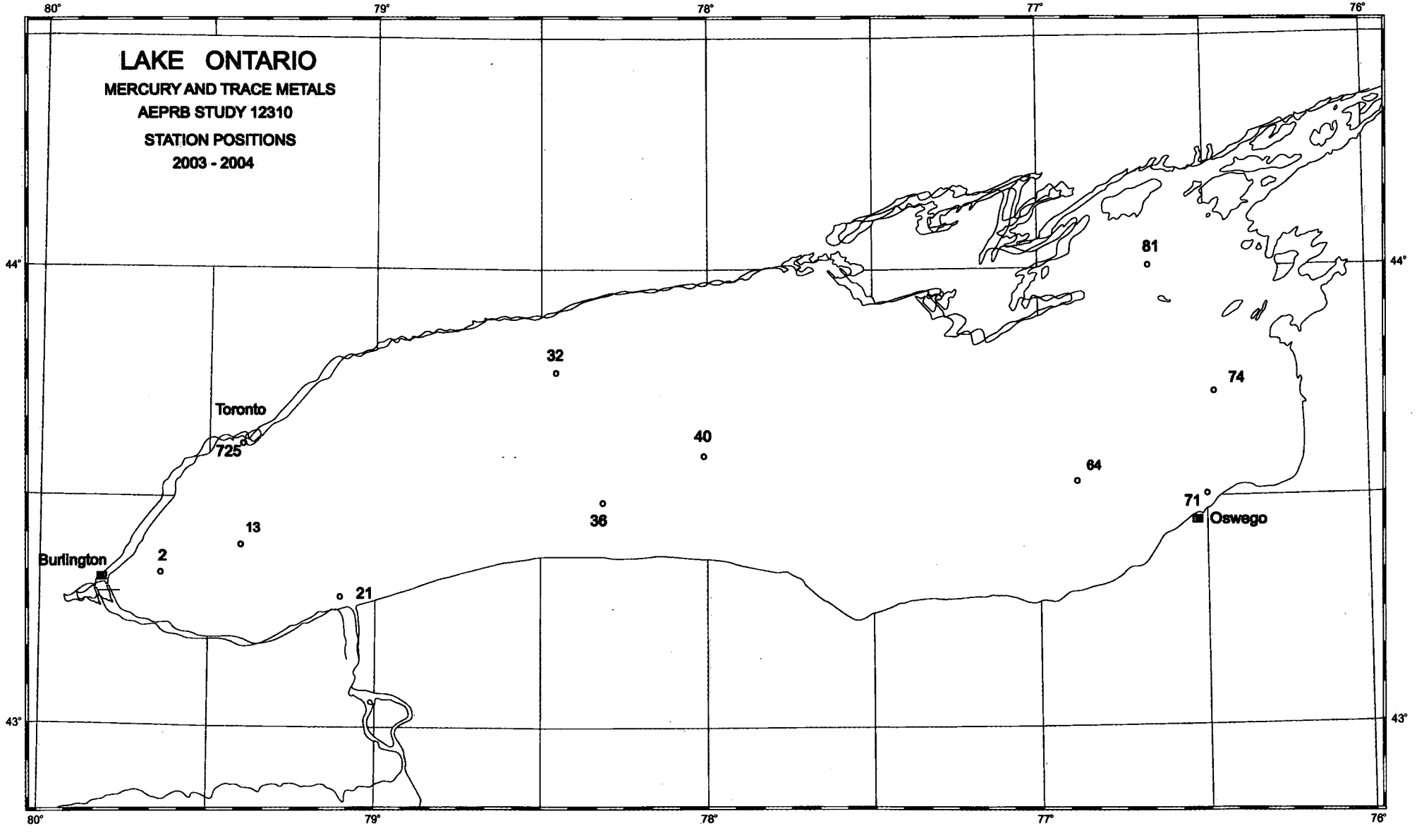
Also, high volume air samplers were used to collect organic contaminants while running three east-west transects across the lake.

STATION POSITIONS

LAKE ONTARIO

2003

STATION NUMBER	LATITUDE N.	LONGITUDE W.
2	43° 20' 24"	79° 39' 51"
3	43° 25' 00"	79° 24' 01"
21	43° 18' 01"	79° 07' 12"
32	43° 46' 58"	78° 26' 23"
36	43° 29' 33"	78° 23' 14"
40	43° 35' 21"	78° 00' 43"
64	43° 31' 30"	76° 55' 30"
71	43° 28' 30	76° 31' 33"
74	43° 45' 00"	76° 31'04"
81	44° 01' 03"	76° 40' 14"
725	43° 38' 15"	79° 21' 34"


LAKE ONTARIO
MERCURY AND TRACE METALS
AEPRB STUDY 12310
STATION POSITIONS
2003 - 2004
80°
79°
78°
77°
76°
44°
43°
Toronto
Burlington
Oswego
725
2
13
21
32
36
40
64
71
74
81

RESEARCH SUPPORT BRANCH

OPEN LAKES SURVEILLANCE, LAKES ONTARIO AND SUPERIOR
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR
RSB STUDY 12632, B.H. MOORE

The Open Lakes Surveillance Program was designed to provide a continuing report and long-term trend information on water quality and eutrophication parameters in the Great Lakes under the Canada/U.S. Agreement as input to the Water Quality Board Annual Report to the International Joint Commission.

Three cruises were conducted - two on Lake Ontario: March 31 - April 4, July 14 - 18 and one on Lake Superior: May 14 - 24, to support this program. All cruises were organized and completed by Technical Operations personnel for ECB-OR and were conducted from the CCGS LIMNOS. The vessel was equipped with the usual equipment: EBT, Rosette water sampler, transmissometer, radar, Loran C, GPS positioning systems and a variety of samplers and winches used for chemical and biological sampling.

The parameters sampled during all cruises were: temperature and transmission profiles, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorous filtered and unfiltered, soluble reactive phosphorous, total Kjeldahl nitrogen, alkalinity, SO_4, chloride, reactive silicate, major ions (Mg, K, Ka) as well as meteorological and Secchi disc observations.

During the April and May cruises, samples were collected from the 1-metre depth only. Sampling depths for the July cruise were:

Lake Ontario

Unstratified Conditions:
- 1 metre
- 10 metres
- 25 metres
- Bottom -10 metres
- Bottom -2 metres

Stratified Conditions:
- 1 metre
- 1 metre above the knee of the thermocline
- Mid-thermocline
- 1 metre below the knee of the thermocline
- Bottom -10 metres or Mid-Hypolimnion
- Bottom -2 metres

Additional tasks performed during the cruises included water samples from Lake Ontario were collected for Microcystins for Dr. G. Boyer, State University and Benthos cores were collected for Dr. S. Watson, AEMRB. In Lake Superior Microbial Loop samples were collected for Dr. M. Munawar, GLLFAS. On the return transit through Lake Huron Piston cores were collected for Dr. A. Crowe, AEMRB.

STATION POSITIONS

LAKE ONTARIO

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 18' 48"	79° 45' 06"
2	43° 20' 24"	79° 39' 54"
3	43° 16' 06"	79° 37' 12"
5	43° 25' 30"	79° 39' 30"
6	43° 28' 00"	79° 31' 48"
7	43° 32' 48"	79° 29' 18"
8	43° 37' 24"	79° 27' 12"
9	43° 35' 12"	79° 23' 42"
10	43° 40' 06"	79° 16' 00"
11	43° 35' 06"	79° 18' 42"
12	43° 30' 12"	79° 21' 12"
13	43° 25' 00"	79° 24' 00"
14	43° 23' 36"	79° 29' 12"
15	43° 19' 00"	79° 26' 36"
16	43° 16' 18"	79° 21' 36"
17	43° 13' 30"	79° 16' 18"
18	43° 18' 12"	79° 16' 42"
19	43° 23' 00"	79° 17' 06"
20	43° 20' 18"	79° 11' 48"
21	43° 18' 00"	79° 07' 12"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
22	43° 17' 48"	79° 00' 18"
23	43° 22' 12"	79° 04' 00"
24	43° 26' 24"	79° 07' 42"
25	43° 31' 00"	79° 04' 48"
26	43° 36' 30"	79° 01' 00"
27	43° 42' 12"	78° 57' 24"
28	43° 46' 30"	78° 51' 18"
29	43° 49' 48"	78° 52' 12"
30	43° 49' 48"	78° 39' 42"
31	43° 53' 12"	78° 27' 36"
32	43° 47' 00"	78° 26' 18"
33	43° 35' 48"	78° 48' 06"
34	43° 27' 42"	78° 45' 36"
35	43° 21' 36"	78° 43' 48"
36	43° 29' 30"	78° 23' 12"
37	43° 23' 30"	78° 22' 12"
38	43° 23' 00"	77° 59' 24"
39	43° 29' 12"	78° 00' 00"
40	43° 35' 24"	78° 00' 42"
41	43° 43' 00"	78° 01' 36"
42	43° 50' 24"	78° 02' 18"
43	43° 57' 00"	78° 03' 00"
44	43° 52' 54"	77° 54' 30"
45	43° 49' 12"	77° 47' 00"
46	43° 53' 06"	77° 41' 24"
47	43° 57' 06"	77° 35' 18"
48	43° 51' 42"	77° 31' 30"
49	43° 46' 18"	77° 26' 18"
52	43° 26' 00"	77° 42' 42"
53	43° 21' 00"	77° 42' 42"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
54	43° 24' 48"	77° 34' 30"
55	43° 26' 36"	77° 26' 18"
56	43° 21' 36"	77° 30' 54"
57	43° 16' 30"	77° 35' 30"
58	43° 19' 42"	77° 26' 18"
59	43° 22' 54"	77° 17' 54"
60	43° 34' 48"	77° 12' 00"
61	43° 47' 12"	77° 09' 30"
62	43° 52' 48"	77° 00' 00"
63	43° 43' 54"	77° 01' 00"
64	43° 31' 30"	76° 55' 36"
65	43° 25' 24"	76° 53' 00"
66	43° 20' 00"	76° 50' 24"
67	43° 24' 30"	76° 47' 42"
68	43° 31' 48"	76° 43' 54"
69	43° 36' 24"	76° 42' 48"
70	43° 32' 30"	76° 37' 06"
71	43° 28' 36"	76° 31' 36"
72	43° 33' 00"	76° 31' 30"
73	43° 38' 00"	76° 17' 18"
74	43° 45' 00"	76° 31' 06"
75	43° 50' 36"	76° 21' 18"
76	43° 57' 00"	76° 10' 30"
77	43° 57' 24"	76° 24' 30"
78	44° 05' 00"	76° 24' 24"
79	44° 04' 30"	76° 31' 18"
80	44° 08' 30"	76° 36' 36"
81	44° 01' 00"	76° 40' 18"
82	44° 04' 00"	76° 48' 42"
83	44° 00' 00"	76° 50' 36"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
84	43° 53' 12"	76° 44' 00"
85	43° 45' 00"	79° 05' 00"
86	43° 15' 18"	79° 11' 42"
87	43° 17' 54"	77° 31' 06"
88	43° 35' 18"	76° 25' 00"
89	43° 41' 54"	76° 25' 00"
90	44° 08' 11"	76° 49' 30"
91	43° 55' 12"	78° 18' 24"
93	43° 19' 36"	78° 52' 06"
94	43° 19' 30"	77° 13' 00"
95	43° 18' 48"	77° 00' 00"
96	43° 13' 24"	79° 26' 48"
97	43° 57' 42"	76° 07' 18"
98	43° 56' 06"	76° 13' 54"
104	43° 17' 15"	79° 50' 00"

STATION POSITIONS

HAMILTON HARBOUR

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
909	43° 16' 50"	79° 52' 22"
918	43° 17' 08"	79° 47' 38"
926	43° 18' 17"	79° 48' 54"
1001	43° 17' 12"	79° 50' 33"

STATION POSITIONS

TORONTO HARBOUR

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
725	43° 38' 18"	79° 21' 42"
726	43° 37' 56"	79° 22' 46"

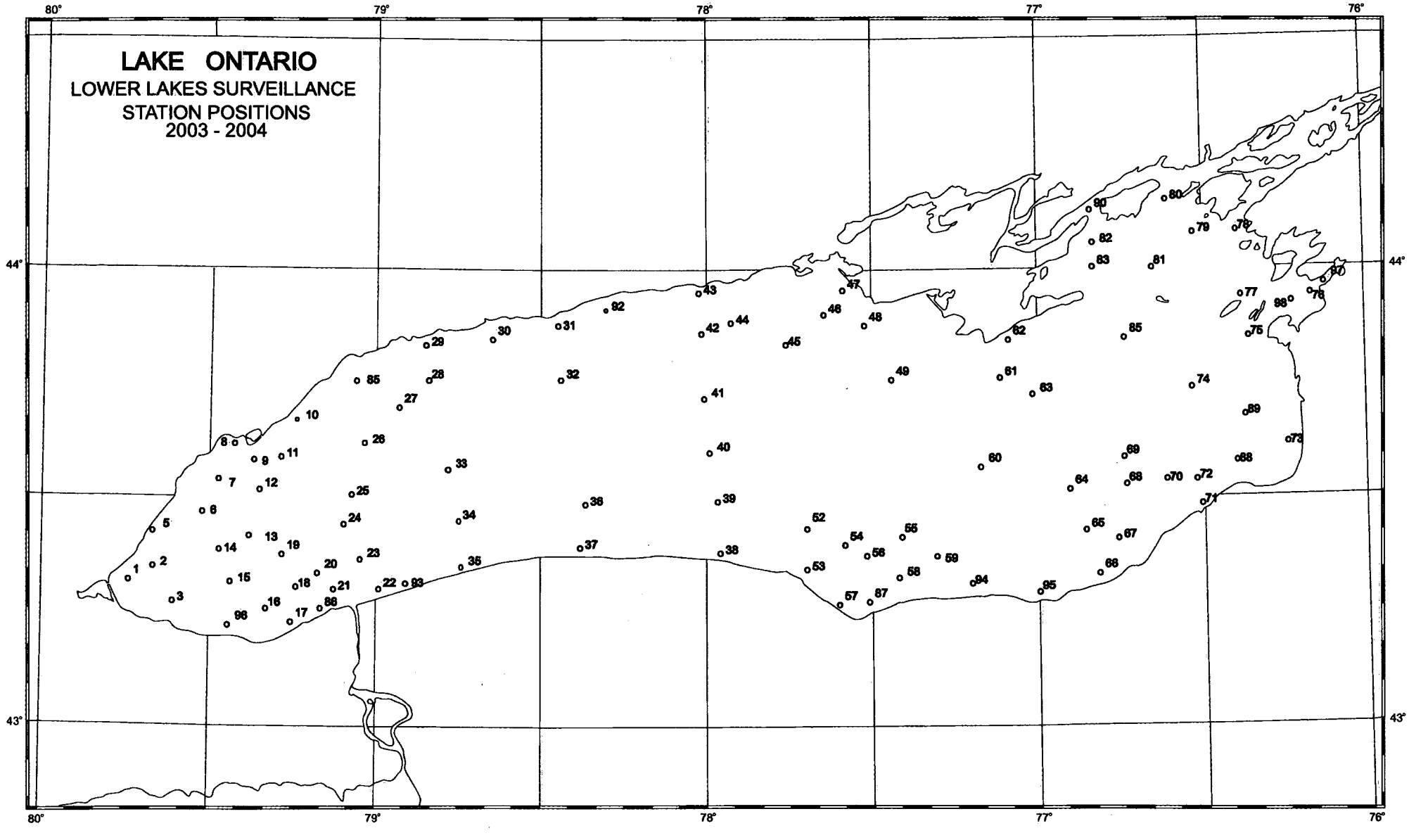
STATION POSITIONS

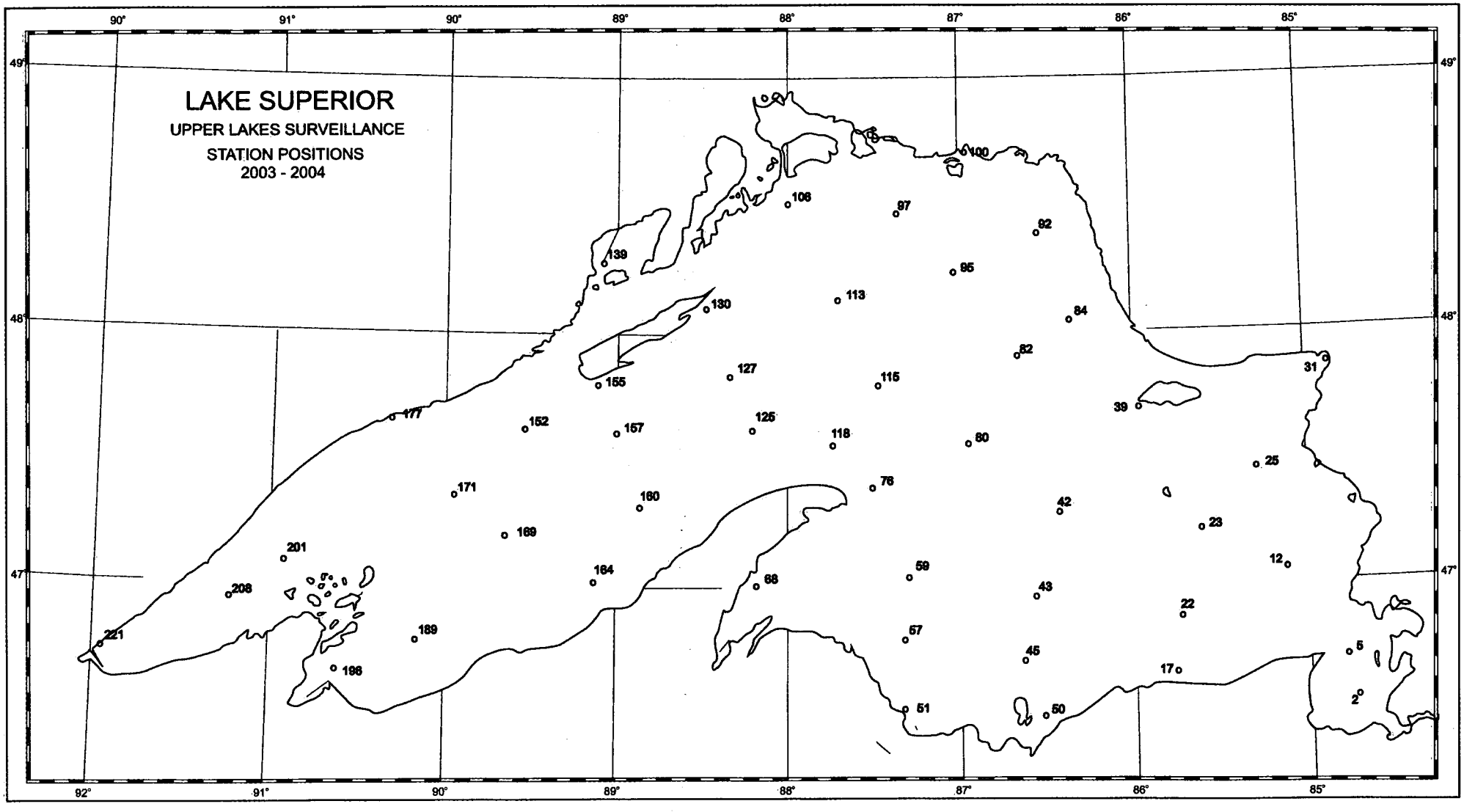
UPPER LAKES SURVEILLANCE

LAKE SUPERIOR
2003-2004

STATION NUMBER	LATITUDE N.	LONGITUDE W
2	46° 32' 36"	84° 44' 54"
12	47° 02' 12"	85° 06' 12"
22	46° 58' 06"	85° 43' 40"
23	47° 12' 48"	85° 38' 00"
25	47° 27' 18"	85° 16' 30"
31	47° 55' 06"	84° 54' 46"
39	47° 41' 24"	85° 58' 00"
42	47° 19' 30"	86° 22' 18"
43	47° 04' 48"	86° 28' 40"
45	46° 51' 24"	86° 34' 06"

STATION NUMBER	LATITUDE N	LONGITUDE W
51	46° 31' 00"	87° 20' 12"
57	46° 56' 00"	87° 18' 18"
59	47° 09' 33"	87° 16' 54"
68	47° 01' 00"	88° 11' 00"
76	47° 24' 06"	87° 24' 42"
80	47° 35' 00"	86°57' 06"
82	47° 51' 30"	86° 38' 00"
95	48° 13' 06"	87° 01' 00"
97	48° 26' 18"	87° 15' 12"
100	48° 45' 24"	86° 58' 33"
113	48° 08' 42"	87° 42' 12"
115	47, 50' 48"	87° 27' 24"
118	47° 36' 24"	87° 42' 36"
125	47° 36' 18"	88° 13' 00"
127	47° 50' 54"	88° 20' 12"
139	48° 15' 12"	89° 10' 48"
152	47° 41' 18"	89° 28' 00"
155	47° 48' 12"	89° 08' 48"
157	47° 36' 48"	89° 00' 00"
160	47° 22 00"	88° 49' 06"
164	47° 01' 36"	89° 02' 18"
169	47° 12' 24"	89° 40' 00"
177	47° 44' 48"	90° 14' 06"
196	46° 44' 54"	90° 42' 12"
221	46° 46' 54"	92° 03' 15"


LAKE ONTARIO
LOWER LAKES SURVEILLANCE
STATION POSITIONS
2003 - 2004
80°
79°
78°
77°
76°
44°
43°


LAKE SUPERIOR
UPPER LAKES SURVEILLANCE
STATION POSITIONS
2003 - 2004
90°
91°
90°
89°
88°
87°
86°
85°
49°
48°
47°
92°
91°
90°
89°
88°
87°
86°
85°
100
106
97
92
139
95
113
130
84
82
31
127
155
115
39
177
152
157
125
118
80
25
171
160
76
42
23
169
201
164
68
59
43
12
208
22
221
189
57
5
45
17
196
2
51
50

LAKE ONTARIO LOWER FOODWEB ASSESSMENT
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR
STUDY 12632, V. RICHARDSON

This study provided an assessment of the status of the Lower Foodweb in Lake Ontario. This was a binational cooperative monitoring effort that supported the Lake Ontario Lakewide Management Plan (LaMP) and the Great Lakes Fishery Commissions Lake Ontario Committee.

Two cruises were conducted on Lake Ontario: April 28 - May 3 and August 18 - 22. All cruises were organized and completed by Technical Operations personnel for ECB-OR and were conducted from the CCGS LIMNOS. The vessel was equipped with the usual equipment: EBT, Rosette water sampler, transmissometer, radar, Loran C, GPS positioning systems and a variety of samplers and winches used for chemical and biological sampling.

All samples were collected from the Integrator 0 to 20m. The parameters sampled during both cruises were: temperature and transmission profiles, chlorophyll a, total phosphorous filtered and unfiltered, soluble reactive phosphorous, reactive silicate, microbial loop as well as meteorological and Secchi disc observations.

Zooplankton and Mysid net hauls were also collected at selected stations. During the August cruise benthic samples were collected using a PONAR grab sampler.

The USA EPA vessel R/V LAKE GUARDIAN completed two cruises in support of this program. The partial summer cruise was completed during August 10 - 11 and the fall cruise during September 18 - 26. Integrated water samples were collected from 1m above the thermocline or bottom -2m, depending on the station depth at all stations for total phosphorus filtered and unfiltered and soluble reactive phosphorus using both Canadian and U.S. methodologies. Triplicate chlorophyll a samples were also collected by integrated water casts using both protocols.

During daylight hours, zooplankton samples were collected at all stations using a 64 µ net from 0 to 1m above the thermocline. A 153 µ net was used to sample from 0 to bottom -2 m. At selected stations, samples were collected for phytoplankton, ciliates, rotifers, microbial loop and flow cytometry. Benthos samples were collected by PONAR sampler for full community assessment. After sunset, net hauls were taken for mysid collection.

STATION POSITIONS

LAKE ONTARIO

CCGS LIMNOS

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
8	43° 37' 23"	79° 27' 10"
9	43° 35' 12"	79° 23' 40"
12	43° 30' 12"	79° 21' 11"
17	43° 13' 29"	79° 16' 19"
18	43° 18' 13"	79° 16' 41"
19	43° 23' 01"	79° 17' 07"
33	43° 35' 47"	78° 48' 03"
33a	43° 33' 02"	78° 40'36"
33b	43° 33' 57"	78° 35' 51"
33c	43° 34' 33"	78° 31' 58"
38	43° 23' 00"	77° 59' 22"
39	43° 29' 12"	78° 00' 00"
39a	43° 26' 16"	77° 59' 57"
40	43° 35' 25"	78° 00' 39"
40a	43° 32' 56"	78° 00' 36"
41	43° 42' 54"	78° 01' 35"
42	43° 50' 27"	78° 02' 17"
43	43° 57' 00"	78° 02' 59"
49	43° 46' 14"	77° 26' 18"
61	43° 47' 12"	77° 09' 30"
62	43° 52' 48"	76° 59' 58"
63	43° 43' 52"	77° 00' 57"
64	43° 31' 30"	76° 55' 39"
65	43° 25' 24"	76° 53' 00"
65a	43° 27' 35"	76° 53' 02"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
66	43° 19' 59"	76° 50' 21"
71	43° 28' 38"	76° 31' 37"
72	43° 33' 01"	76° 31' 30"
72a	43° 38' 09"	76° 30' 01"
74	43° 44' 59"	76° 31' 07"
77	43° 57' 2509"	76° 24' 31"
80	44° 08' 09"	76° 36' 35"
81	44° 00' 59"	76° 40' 30"
84	43° 53' 12"	76° 44' 00"
89	43° 41' 54"	76° 24' 59"
715	43° 38' 08"	76° 58' 10"
715a	43° 35' 00"	76° 57' 00"
1123	43° 35' 00"	76° 36' 56"
1124	43° 37' 27"	76° 38' 03"
1125	43° 56' 39"	78° 08' 02"
1126	43° 47' 57"	77° 58' 44"

STATION POSITIONS

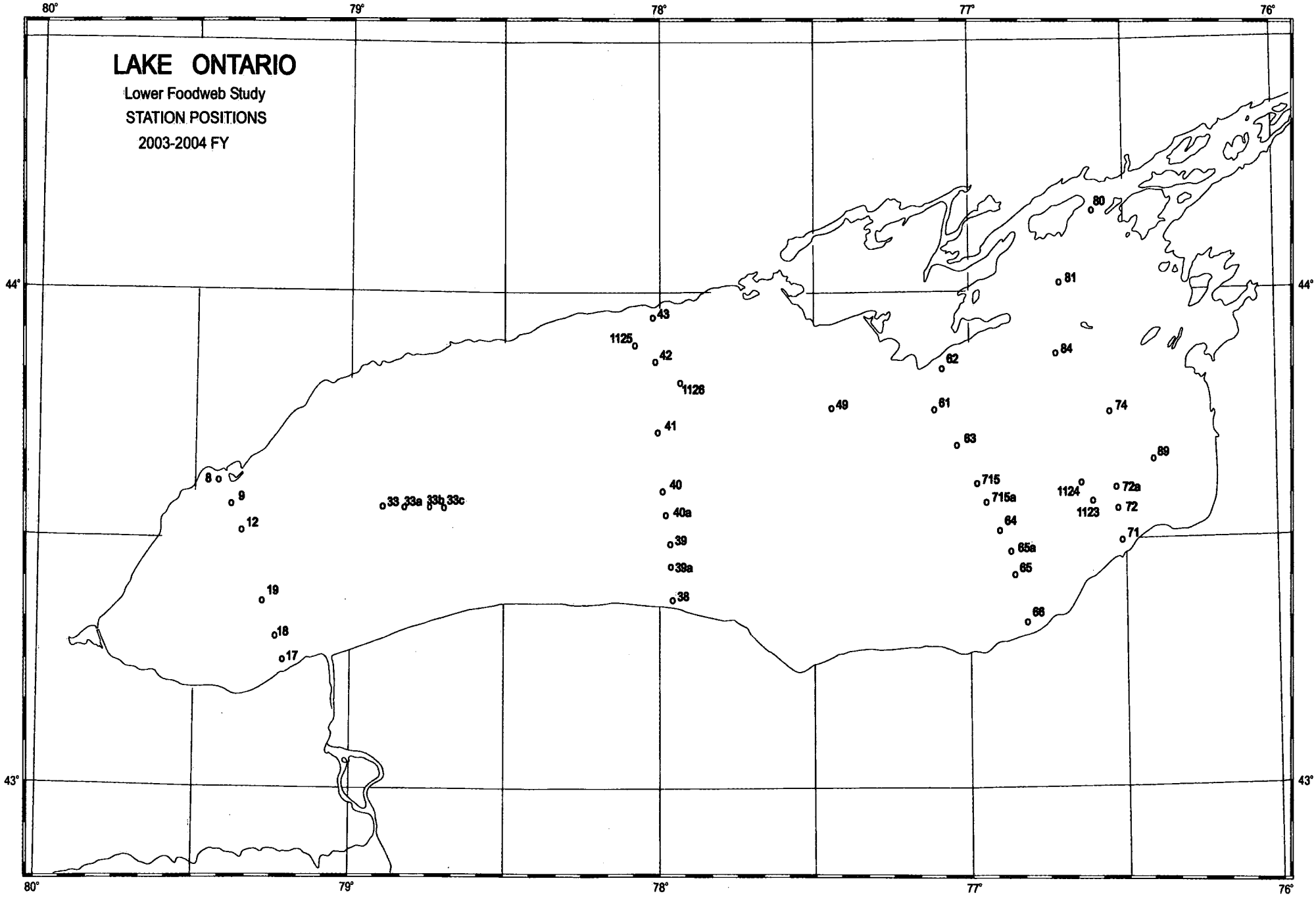
LAKE ONTARIO

LAKE GUARDIAN

2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
8	43° 37' 24"	79° 27' 12"
9	43° 35' 12"	79° 23' 42"
12	43° 30' 12"	79° 21' 12"
17	43° 13' 30"	79° 16' 18"
18	43° 18' 12"	79° 16' 42"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
19	43° 23' 00"	79° 17' 06"
28	43° 46' 30"	78° 51' 18"
29	43° 49' 48"	78° 52' 12"
33	43° 35' 48"	78° 48' 06"
35	43° 21' 36"	78° 43' 48"
38	43° 23' 00"	77° 59' 24"
39	43° 29' 12"	78° 00' 00"
40	43° 35' 24"	78° 00' 42"
41	43° 43' 00"	78° 01' 36"
42	43° 50' 24"	78° 02' 18"
49	43° 46' 18"	77° 26' 18"
55	43° 26' 36"	77° 26' 18"
58	43° 19' 42"	77° 26' 18"
61	43° 47' 12"	77° 09' 30"
62	43° 52' 48"	77° 00' 00"
63	43° 43' 54"	77° 01' 00"
64	43° 31' 30"	76° 55' 36"
65	43° 25' 24"	76° 53' 00"
66	43° 20' 00"	76° 50' 24"
71	43° 28' 36"	76° 31' 36"
72	43° 33' 00"	76° 31' 30"
74	43° 45' 00"	76° 31' 06"
77	43° 57' 24"	76° 24' 30"
80	44° 08' 30"	76° 36' 36"
81	44° 01' 00"	76° 40' 18"
89	43° 41' 54"	76° 25' 00"
715	43° 38' 08"	76° 58' 02"


LAKE ONTARIO
Lower Foodweb Study
STATION POSITIONS
2003-2004 FY
80°
79°
78°
77°
76°
44°
43°
8
9
12
19
18
17
33
33a
33b
33c
43
1125
42
1126
41
40
40a
39
39a
38
49
62
61
63
80
81
84
74
89
715
715a
1124
1123
72a
72
64
65a
65
71
66

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	Lake Ontario
CRUISE TYPE		**N.MI. STEAMED**	4582.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	412	Moorings Established, Sediment Trap	6
EBTT Casts	368	Moorings Refurbished, Sediment Trap	8
Rosette Casts	95	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)	6	Moorings Retrieved	
Secchi Disk Observations	151	Moorings Established	
Transmissometer Casts	52	Moorings Retrieved	
Zooplankton Hauls, 64μ	100		
Zooplankton Hauls, 153μ	95		
Integrator 10 m	61		
Integrator 20 m	278	Primary Productivity Moorings	
Phytoplankton Samples	101	Mysids Hauls	66
D.O. Profiles	103	Rotifers	31
Water Samples Collected (Microbiology)	60	Cores Taken, Box	
Water Samples Collected (Water Quality)	52	Cores Taken, Mini Box	4
Water Samples Collected (D.O.)	117	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	525	Cores Taken, Benthos	11
Water Samples Collected (TP uf)	666	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)	524	Grab Samples Taken, PONAR	42
Water Samples Collected (Metals - Go-Flo)	24	Bulk Centrifuge Samples	6
Water Samples Collected (Mercury)	26		
Water Samples Collected (Trace Metals)	26	Observations, Weather	
Water Samples Filtered (Chlorophyll a)	448		
Water Samples Filtered (POC/TPN)	221	Water Samples Collected , Microbial Loop	15
Water Samples Filtered (Seston)	6	Water Samples Collected , Ciliate	15
Water Samples Filtered (TP f)	660	Water Samples Collected , Cytometry	15
Water Samples Filtered (Nutrients)	74		
Water Samples Filtered (Major Ions)	524	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	1195
Water Samples Filtered (Silica)	31	Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered (SRP)	62	Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	Lake Erie
CRUISE TYPE		**N.MI. STEAMED**	5860.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	258	Moorings Established, Sediment Trap	4
EBTT Casts	254	Moorings Retrieved, Sediment Trap	3
Rosette Casts	58	Moorings Refurbished, Sediment Trap	11
Reversing Thermometer Obs. (No. of Therm)		Moorings Established, Thermograph	3
Secchi Disk Observations	148	Moorings Retrieved, Thermograph	3
Transmissometer Casts	73	Moorings Established, Meteorological	1
Zooplankton Hauls, 64µ	134	Moorings Retrieved, Meteorological	1
Protozoa	27		
Integrator 10 m	98		
Integrator 20 m	120	Primary Productivity Moorings	
Phytoplankton Samples	130		
D.O. Profiles	235		
Water Samples Collected (Microbiology)		Cores Taken, Box	1
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	27
Water Samples Collected (D.O.)	5	Cores Taken, Piston	6
Water Samples Collected (Cond/pH)	162	Cores Taken, Benthos	
Water Samples Collected (TP uf)	248	Grab Samples Taken, Shipek	122
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Bacteria)	52	Bulk Sediment Samples	1
Water Samples Collected (Algal)	20		
Water Samples Collected (Alkaline Phosphate)	8	Observations, Weather	
Water Samples Filtered (Chlorophyll a)	364		
Water Samples Filtered (POC/TPN)	59	Water Samples Filtered (Particulate P)	119
Water Samples Filtered (Seston)	48		
Water Samples Filtered (TP f)	248		
Water Samples Filtered (Nutrients)	248		
Water Samples Filtered (Major Ions)	144	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC/DIC)	92	Manual Chemistry, Tech. Ops.	324
Water Samples Filtered (Particulate C/N)	59	Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered (Particulate Si)	118	Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	Detroit River
CRUISE TYPE		**N.MI. STEAMED**	505.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	30	Moorings Established, Sediment Trap	6
EBTT Casts	30	Moorings Retrieved, Sediment Trap	6
Rosette Casts		Moorings Refurbished, Sediment Trap	30
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	30	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls			
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected ( )		Bulk Centrifuge Samples	
Water Samples Collected ( )			
Water Samples Collected ( )		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	L. St. Clair & St. Clair R.
CRUISE TYPE		**N.MI. STEAMED**	373.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	20	Moorings Established, Sediment Trap	5
EBTT Casts	20	Moorings Retrieved, Sediment Trap	5
Rosette Casts		Moorings Refurbished, Sediment Trap	25
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	16	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls			
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected ( )		Bulk Centrifuge Samples	
Water Samples Collected ( )			
Water Samples Collected ( )		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	Lake Huron
CRUISE TYPE		**N.MI. STEAMED**	888.1

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	59	Moorings Established, Sediment Trap	2
EBTT Casts	44	Moorings Retrieved, Sediment Trap	2
Rosette Casts		Moorings Refurbished, Sediment Trap	10
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	32	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 64µ	81		
		Hydrolab Casts	15
Integrator 10 m	51		
Integrator 20 m	20	Primary Productivity Moorings	
Phytoplankton Samples	15		
D.O. Profiles	6		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	19
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)	19	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	148
Water Samples Collected (Alkalinity)	19	Grab Samples Taken, mini PONAR	75
Water Samples Collected (Nutrients)	19		
Water Samples Collected (DIC/DOC)	15	Sediment Samples Collected (Organics)	19
Water Samples Filtered (Chlorophyll a)	15	Sediment Samples Collected (Archive)	19
Water Samples Filtered (POC/TPN)	15	Sediment Samples Collected (Particle Size)	19
Water Samples Filtered (Seston)		Sediment Samples Collected (TM, HG, LOA)	19
Water Samples Filtered (TP f)	15		
Water Samples Filtered (Nutrients)	15		
Water Samples Filtered (Major Ions)	15	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM	**TO**	**REGION**	Lake Superior
CRUISE TYPE		**N.MI. STEAMED**	2112.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	89	Moorings Established	
EBTT Casts	81	Moorings Retrieved	
Van Dorn Casts	46	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)	8	Moorings Retrieved	
Secchi Disk Observations	56	Moorings Established	
Hydrolab Casts	10	Moorings Retrieved	
Zooplankton Hauls			
Integrator 50 m	45		
Integrator 20 m	21	Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	20		
Water Samples Collected (Microbial Loop)	20	Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	38
Water Samples Collected (D.O.)	46	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	66	Cores Taken, Benthos	
Water Samples Collected (TP uf)	84	Grab Samples Taken, Shipek	12
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	10
Water Samples Collected (Alkalinity)	38	Grab Samples Taken, mini PONAR	140
Water Samples Collected (Nutrients)	38		
Water Samples Collected (Ciliates)	20	Sediment Samples Collected (Organics)	38
Water Samples Filtered (Chlorophyll a)	46	Sediment Samples Collected (Archive)	38
Water Samples Filtered (POC/TPN)	46	Sediment Samples Collected (Particle Size)	38
Water Samples Filtered (Seston)		Sediment Samples Collected (TM, HG, LOA)	38
Water Samples Filtered (TP f)	46	Sediment Samples Collected (Marvin)	42
Water Samples Filtered (Nutrients)	46		
Water Samples Filtered (Major Ions)	46	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	158
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

SHORE PROGRAMS

AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH

BIO-ACCUMULATION OF METALS IN AQUATIC SYSTEMS, VAL D'OR AND MATAGAMI, QUÉBEC
AEIRB STUDY 12211, DR. L. GRAPENTINE

B. Lalonde provided support to Dr. L. Grapentine, AEIRB and to Dr Y. Couillard, Risk Assessment Directorate from June 4 - July 4, 2003.

The objective of this study was to evaluate the bioaccumulation of metals by exposing groups of test organisms (amphipods *Hyalella azteca*) to water and substrate *in situ*. Two rivers impacted by mining effluent in the Abitibi and James Bay area were selected for the experiment. The first study area was the rivière Colombière near Val d'Or and the second study area was the rivière Allard near Matagami. The bioaccumulation experiment was duplicated on both water systems.

Habitat Attributes
Water chemistry of the stream water was performed on samples collected at the time of the experiment for the following analytes: total and dissolved metals major ions and dissolved organic carbon.

The following stream conditions were measured at each site throughout the bioaccumulation experiment: water temperature, conductivity, pH, dissolved oxygen, stream channel width and depth and current speed.

At each experimental site, the benthic invertebrate community was sampled by kick net. Triplicate cores of sediment were collected from all sites and the top 2 to 5 cm were extruded for grain size analyses.

Collection of amphipod food
Before the start of the study food naturally consumed by amphipods was collected from each of the study sites.

Caging amphipods
A group of 15 amphipods were transferred in pre-labeled cages. Approximately 3 g of food was distributed to each cage in random order before the cages were closed. The cages were made of two sections of clear acrylic that fit securely together (7.6 cm diameter, 7.6 long) and are sealed at each end by 500 µm mesh screen.

Deployment of cages into study sites
The cages were deployed in the stream the same day of the caging operation. The cages were secured to a plastic tent peg and pushed in the stream bottom with the screens oriented horizontally and parallel to the current.

Post-exposure handling
In the laboratory the amphipods were extracted from the cages and counted. All amphipods from the same cage were placed into a depurating solution for 24 hours and then dried at 60°C for 3 days. The dried amphipods were placed in cryovials for subsequent analysis at CCIW.

Amphipod food transplantation
Concurrent with and in the same sites as the amphipod bioaccumulation experiment, cages of amphipod food were deployed to account for changes in metal concentrations in food over time. The food cages were deployed in the streams at the same time and in the same fashion as the amphipods. The food cages were retrieved at the end of the experiment and the food was extracted out of the cages and dried in an oven at 60°C.

The stations identified for the experiments were:

CO for Colombière and AL for Allard
CO-1 and AL-12; Low concentration of contaminants
CO-7 and AL-9; Intermediate concentration of contaminants
CO-4 and AL-5; High concentration of contaminants

Site Name	Latitude	Longitude
CO-1	48° 08' 18.8"	77° 28' 45.9"
CO-4	48° 08' 42.6"	77° 37' 05.5"
CO-7	48° 09' 09.9"	77° 38' 05
AL-5	49° 47' 24.1"	77° 49' 58.2"
AL-9	49° 48' 23.8"	77° 50' 11.3"
AL-12	49° 49' 35.7"	77° 47' 37.9"

LONG RANGE TRANSPORT OF AIRBORNE POLLUTANTS AT THE TURKEY LAKES WATERSHED SITE
AEIRB STUDY 12333, MR. R. SEMKIN

The Turkey Lakes Watershed Study is an ongoing project monitoring the movements and effects of Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems of the watershed. The chemical and hydrological monitoring of the study area began in 1980 and has been supported by Technical Operations staff throughout this period.

The study site is located on the Canadian Shield, 50 km north of Sault Ste. Marie and 25 km east of Lake Superior. The watershed consists of five small lakes from 6 ha to 52 ha in size. The area is in the very rugged Algoma Highlands, totally forested, uninhabited and receiving the highest amounts of precipitation in Canada, east of the Rockies.

Technical Operations staff support consisted of one full-time technician stationed in Sault Ste. Marie. Equipment support included one full-time 4-wheel drive vehicle used for transport to the study area. In addition, nine snowmobiles and four all-terrain vehicles were supplied and maintained for use as transportation throughout the watershed. All tools, sampling and safety equipment for the study were also supplied. Due to renovations to the camp over the summer and fall seasons the Skidoos were removed from the camp and put into storage and were returned to the camp in December.

A security system on the camp at the work site and a 2-way radio system were operated by Technical Operations staff and maintained by Quattra Communications in Sault Ste. Marie. The security system has been redesigned to accommodate the numerous changes to the camp infrastructure in 2001. Additional trailers which have been delivered to the Turkey Lakes this year and the remainder of the buildings at the camp will be incorporated into the alarm system the summer of 2004. All roads and trails in the watershed were maintained with assistance from the Canadian Forestry Service at Sault Ste. Marie.

The Department of Fisheries & Oceans support consisted of six small aluminium boats and one canoe (14 - 16 ft.). One outboard motor and items to make the boats safe and operational were also supplied. Technical Operations supplied two electric motors.

Technical Operations staff supported AEIRB staff in chemical and hydrological monitoring of the watershed. Hydrological monitoring consisted of gauging and sampling eight stream locations throughout the watershed on a weekly basis. The samples were analyzed for numerous chemical parameters. Five lakes were sampled on a bi-weekly schedule for the same chemical parameters with the exception of the spring and fall when they were sampled once a week. During the winter, snow cores were collected at 14 locations on a weekly basis. During the year, rain and snow

volume samplers (Nipher) were measured and changed weekly. Isco samplers at three locations in the watershed are operated year round. Samples were collected every 12 hours. In addition, groundwater wells throughout the entire watershed were sampled in the late spring and early summer. This study is completed once per year and groundwater wells at basin CFS47 were sampled once per month. Groundwater wells at CFS 47, 50, and 50-up were sampled throughout the year and sampling was based upon precipitation events.

To supplement hydrological and chemical data, a full meteorological station and solar radiation unit were operated on a year round basis. A MET III system is in operation. This system allows data to be dumped to a disk and the data is then sent electronically to CCIW. The MET III system also allows MET program changes to be made on site and the MET data logger can be erased to provide continued use with no interruption of data collection. This system also includes a UVB and UVA sensor with continuous data recorded on the Campbell data logger CR23X.

The Batchawana Lake Basin CFS47 data logger site has been in operation all year. A Campbell Data logger records hourly measurements of snow temperature during the winter months and soil moisture and soil temperature values year round. The data logger is solar powered and the storage module is downloaded at the end of each month and the data is electronically sent to CCIW for processing.

Service was provided by Technical Operations to two Campbell data loggers, three storage modules and two solar power panels.

A snow melt cave constructed at the Batchawana Lake location will once again be in service during the winter months until the end of the spring runoff period. In addition, at this same location, a bulk precipitation sampler will be serviced year round on a weekly basis. At the cave site a 30 Watt solar panel has been installed. From this solar panel, one 12 volt battery will be kept charged to power a 25 watt light bulb in the cave melt sampling cubicle. This bulb will be left "ON" to keep the cubicle above freezing and to prevent the sampling line from freezing and thus interfering with the collection of a snow melt sample.

All maintenance and repairs to equipment, buildings and vehicles were performed by Technical Operations staff. The TOS staff member on site is the representative on the Turkey Lakes Watershed Joint Health Safety Committee.

Two portable radio systems for the Turkey Lakes Watershed were used by personnel when working alone. These radios allow calls to be made to Sault Ste. Marie from anywhere in the watershed. A Globalstar Satellite radio has been issued by TOS to the study. This can be used to place an emergency call out from anywhere within the watershed. It will also be carried with EC employees when working alone.

Ongoing Nitrate sampling in support of John Spoelstra, University of Waterloo was continued this year by AEIRB and TOS staff at the Turkey Lakes Watershed site. This study is being done in co-operation with R. Semkin, AEIRB.

The first two weeks of the 2003 spring runoff started off slow with cool temperatures. Then over the Easter weekend warm temperatures combined with a lot of rainfall caused the Chippewa River to flood and the snow melt sampling intensified for the following week. After that week additional staff from NWRI were sent home and the regular staff (Graham and Roy) continued with the sampling protocol. Mr. D. Walsh, TOS, assisted with this year's runoff.

The Joint Turkey Lakes Safety Committee is still in place and active over 2003. The safety board consists of one representative each from Environment Canada, Fisheries and Oceans and Natural Resources Canada. An onsite safety inspection was completed this year. The safety committee has implemented a sign-in board at the camp for personnel to use who are working in the watershed. The board consists of a large map of the watershed with everyone's work areas posted. There are magnetic name tags which are placed on the persons work location at the beginning of the work day and removed at the end of the work day. This helps provide instant knowledge of where a person is working in the watershed if immediate safety issues requires locating them.

No serious ATV or Skidoo incidents occurred this year. Signs are presently being printed to warn the public of ongoing work taking place in the watershed seven days per week and also of the potential hazards of using any structures within the watershed for their personal use.

All stream monitoring sites now have operational Sutron data loggers. Periodic downloading of the Sutron data will take place throughout the year to retrieve water level data and check on the performance of the Sutrons. All work was completed with the assistance of Water Survey, MSC, North Bay.

Two students from TOS were at the camp for two weeks completing various tasks. This included rebuilding the landing on Lower Batchawana Lake with a 14X18 foot platform. Also, the upper floor in the garage was painted, numerous Skidoo/ATV bridges were repaired, and some of the trail system was brushed back. The buildings at the camp were also cleaned with a pressure washer.

A new/used accommodation trailer was purchased and delivered to the camp. This was a necessary acquisition after the existing accommodation trailer was condemned as unfit for living. The trailer was levelled and blocked by staff just prior to winter and hydro and propane were connected. It consists of five rooms with two bunks each and all the furniture.

Since the condemned trailer also contained the cooking facilities we are still in the process of converting an older accommodation/washroom trailer into a cookhouse. This

trailer was relocated on the grounds, blocked and levelled and hydro and propane connected just prior to winter setting in for the season. C. Lomas, TOS was at the camp for seven days to begin the modifications to the trailer. At present, both G. LaHaie and and Roy Neureuther are attempting to complete the modifications before spring runoff while still maintaining the sampling protocol. A trench was dug from the water pump to the cookhouse and the conduit was buried. The water line along with a heater cable will be purchased and installed in the conduit the summer of 2004 when funds become available.

A new washroom trailer was delivered to the camp and became operational just prior to Christmas.

A new MSC building was constructed this fall to replace the two existing MSC sheds presently at the site. The plan is to complete the electrical wiring, AC/Heating system, and move the MSC and NWRI instrumentation to the new building in the Spring/Summer of 2004.

ICE JAMS, PEACE RIVER, ALBERTA
AEIRB STUDY 14146, DR. S. BELTAOS

Technical Operations provided support to this study 14146 during the period September 29 - October 8. Support consisted of one technician from NWRI in Burlington and one staff member from NWRI in Saskatoon, as well as necessary equipment to carryout the work. Two boats - a river boat to travel to Peace Point and a 16 foot jet boat to negotiate the rapids were supplied by Wood Buffalo National Park in Fort Chipeweyan as well as a Park Warden. The work area was located at Boyer Rapids, on the Peace River, in Wood Buffalo National Park. This site had a major ice jam in the spring of 2003 and the survey was to collect data on the physical characteristics of the river at this location.

This ongoing study is looking at the causes of ice jams on the Peace River with the hope of creating ice jams in the future that would flood and recharge the Peace-Athabasca Delta.

E. Walker flew from Hamilton to Fort Chipeweyan, Alberta on September 29 and stayed at the Wood Buffalo National Park accommodation unit that night. The next day was utilized to gather equipment and supplies together and the following day was used to travel up the Peace River to the Park's cabin at Carlson's Landing. On October 2, Earl traveled up the Peace River to the Park's cabin at the Jackfish River, above the Boyer Rapids, which was the base of operation for the survey work for the next four days. The work consisted of matching maximum ice levels to aerial photographs taken during the spring ice jam. These high water marks were then surveyed into the present water level and all of these sites tied together by surveying from above the Boyer Rapids to downstream of the Rapids. This data is utilized to prepare a river slope and bottom profile of the ice jam site.

NAVIGATIONAL AND SAFETY TRAINING and BOAT TRANSFER
AEIRB STUDY 14160, DR. J. CULP

Technical Operations Services provided support to Dr. Joseph Culp during the period July 2-July 5. There was no actual field sampling support given to this study. All the logistical provided was for training field staff from Environment Canada and University of New Brunswick staff in Fredericton, N. B. seamanship and navigational skills including the safe operation of a jet propelled boat transferred from Saskatoon. In November, a Boston Whaler which was transferred to TOS from the Environmental Protection Services was transferred to Dr. Culp's inventory in Fredericton.

NATIVE MUSSEL INVENTORY OF THE SYDENHAM RIVER and IT'S TRIBUTARIES
AEIRB STUDY 14194, J. SMITH

During the weeks of August 11, August 25 and September 2 the native mussel inventory survey of the major tributaries of the Sydenham River took place. This study is being used to create a number of index sites which will monitor changes in mussel populations, especially the rare and endangered species. This work and its results will also yield data that will be used in improving methodologies for similar studies of this kind in the future.

After accessing the river, a site was chosen and setup for sampling. The sampling consisted of carefully hand searching a small section of the river bed to enumerate, measure and identify mussels that were found. The search area of the river was marked in a grid pattern, both across and along the river. The grid dimensions were 3 meters by 5 meters. Three one meter squares were randomly chosen from within each grid quadrant and thoroughly searched. This was repeated until 26 quadrants or approximately $400m^2$ of river was covered. Each of the outer corners of the survey site had positions taken for future sampling references.

A total of five sites were surveyed throughout the Sydenham River by field and dive teams. The sampling methodologies and setup remained the same for both above and underwater operations. The final results form the sampling produced thousands of mussels and identified 23 different species. Although this type of study will continue throughout areas of Ontario, this was the final year on the Sydenham River.

Site #1- Brigden, Ontario

1) **N** 42° 65.038, **W** 82° 00.900
2) **N** 42° 65.028, **W** 82° 00.883
3) **N** 42° 65.028, **W** 82° 00.874
4) **N** 42° 65.023, **W** 82° 00.890

Site #2- Flourance, Ontario

1) **N** 42° 84.886, **W** 82° 21.326
2) **N** 42° 84.895, **W** 82° 21.327
3) **N** 42° 84.867, **W** 82° 21.397
4) **N** 42° 84.860, **W** 82° 21.391

Site #3- Alvinston, Ontario

1) **N** 42° 80.678, **W** 81° 84.703
2) **N** 42° 80.663, **W** 81° 84.691
3) **N** 42° 80.705, **W** 81° 84.711
4) **N** 42° 80.704, **W** 81° 84.686

Site#5-Tupperville, Ontario

1) **N** 42° 59.182, **W** 82° 26.751
2) **N** 42° 59.182, **W** 81° 26.801
3) **N** 42° 59.176, **W** 82° 26.761
4) **N** 42° 59.155, **W** 81° 26.813

Site #4 –Shetland, Ontario

1) **N** 42° 69.904 **W** 81°98.893
2) **N** 42° 69.889 **W** 81°98.906
3) **N** 42° 69.915 **W** 81°98.920
4) **N** 42° 69.901 **W** 81°98.938

AQUATIC ECOSYSTEM MANAGEMENT RESEARCH BRANCH

CONTAMINANT STUDY, ROUYN-NORANDA AND HAMILTON HARBOUR
AEMRB STUDY 12212, F. ROSA

ROUYN-NORANDA

Results from previous reconnaissance surveys of sediments from 100 lakes in the vicinity of the Horne smelter in Rouyn-Noranda (Quebec, Canada) indicate that metal concentrations are elevated in modern-day sediments in comparison with pre-industrial layers. Similar patterns of metal enrichment in surface sediments have been widely reported in the literature and have been attributed to increased anthropogenic metal loading and/or to diogenite metal remobilization.

The rationale for studying early diagenesis in fresh water systems is to increase our ability to interpret geochemical profiles of lake sediments. The metal distributions observed in sediment cores may not necessarily represent the order of their initial deposition. Results of this study will help to identify the natural processes (e.g., driven by oxidation-reduction reactions) that control metal redistribution.

This field sampling was in support of a collaborative study in the Rouyn-Noranda region by AEMRB and the Geological Survey of Canada (GSC). One field trip, on July 15-17, was undertaken by Technical Operation divers.

At Lac Perron (Blue Lake), two Hydrolab sondes were removed from bottom minus 1 m and replaced with a single sonde.

At Lac Pepinniere (Meteor Lake), a single sonde was retrieved and replaced with a new unit. A download at the site indicated that data had been acquired over the winter from both lakes, from all sondes. Divers then proceeded to sample 20L of bottom minus 1m water using a VanDorn sampler. Twelve diver cores were then taken from the deep hole and later forwarded to GSC.

STATION POSITIONS

ROUYN/NORANDA

2003-2004

LAKE	MOORING NUMBER	LATITUDE N	LONGTITUDE W	Depth(m)
Lac Perron	2003-SLE-01A	47° 50.470'	78° 14.725'	15.5
Lac Pepiniere	2003-SLE-02A	48° 35.595'	78° 16.587'	10

HAMILTON HARBOUR

In 1995, the Hamilton Harbour Remediation Program targeted a 100 square meter test site west of the LaSalle marina. The sediment at this site was chosen for "sandcapping", a method of containing and isolating contaminated sediment by applying a covering layer of clean sand. The effectiveness of this technology has been monitored since then. The long term assessment of contaminant migration through the sand layer has been continued with peeper installation and staggered removals. Upward migration, by molecular diffusion, of pore water contaminants will determine the efficiency of the sand cap as a remediation technique. Some upward migration seems to be occurring through the first 15 to 20cm of the 35cm thick sand cap. Pore water profile also show that lowest concentrations occur toward the middle (10 to15 cm) of the sand cap and increase toward the surface. This clearly shows that downward diffusion is also occurring. This downward diffusion may be due to a net sediment accumulation of contaminated Harbour sediments, over the sand layer of the cap. To monitor the rate of sediment accumulation at the sand cap site (R9); sediment traps were refurbished monthly from April to December, 2003. The mooring was then re-deployed to measure the winter (December, 2003 to April, 2004) sediment accumulation.

Results show that a net sediment accumulation over the sand cap is occurring, with concentrations of inorganic contaminants which are similar to the mean concentrations of surficial Harbour sediments.

Diver hand cores were also taken over the field season to confirm deposition rates.

STATION POSITIONS

HAMILTON HARBOUR SAND CAP

2003-2004

STATION NUMBER	MOORING NUMBER	LATITUDE N	LONGTITUDE W
9026 (R9)	2003-50A-10F	43° 17.733'	079° 50.900'

MARATHON AOC, WALPOLE ISLAND CURRENT MODELLING
AEMRB STUDY 12218, H. BIBERHOFER

MARATHON/ PENINSULA HARBOUR

Researchers are presently investigating sediment characteristics in Peninsula Harbour, an AOC site in Lake Superior. A comprehensive sediment sampling and characterization trip was undertaken during the weeks of October 20 and October 27, by TOS divers and H. Biberhofer, AEMRB.

The study has three main elements:

1) An experiment was initialized at 2 test plots to assess the dynamic mixing depth of the in-place sediments as a function of biotic and abiotic processes. A mineral slurry containing enriched elements was applied to the test plots as an artificial horizon to the sediment strata. Entrainment of this horizon by the natural mixing processes through the following year and subsequent sampling and analyses in the fall of 2004 is expected to provide information on the depth of the dynamic layer of the sediment deposits.
2) Sediment stability of two zones within the study area is being assessed by determining the resistance to shear at the sediment-water interface. Special cores were collected which can be directly inserted in a rotary flume. The core interface is then exposed to a sequential gradient of shear stress to determine the amount of energy required to erode the core at the interface and resuspend the sediment into the water column. The energy value will be compared to ambient current measurements collected on site.
3) A series of sediment cores were collected at 11 sites. The cores are being processed and analyzed for a suite of physical and chemical parameters to further characterize the sediment quality within the Harbour.

Staff spent a total of two weeks onsite, characterizing and then choosing test plot and coring sites. Site/test plot preparation and application of test slurry, diver coring and site filming consumed a considerable amount of time over the two weeks. Approximately one half of the cores collected were extruded in the field in order to accommodate the next days sampling.

PENINSULA HARBOUR
TEST PLOTS
2003-2004

SITE	LATITUDE N.	LONGTITUDE W.	UTMs NORTHING	UTMs EASTING	DEPTH m
Site 1 (H5)	48° 43'15.957"	86° 23' 35.914"	5396630	544622	4.1
Site 2(EC-CS-14)	48°43' 18.001"	86° 23' 42.791"	5396692	544481	8.1

WALPOLE ISLAND

Research efforts are underway to review, assess and advance restoration and protection efforts for Lake St. Clair and its watershed. Data collected will help guide the development of a comprehensive management plan being prepared by a team of Canadian and American agencies and stakeholders. The status and trends of five major issues related to the environmental health of Lake St. Clair and its watershed: water quality, human health and the environment, habitat and biodiversity, land use and costal management, and recreational boating and commercial navigation are being examined.

Data collected from a station south of the Bassett and Chematogan Channels, off Walpole Island, will be used to model current and storm dynamics in this area. The effects of current and storm events on sediment transport and mussel health and diversity will be examined for H. Biberhofer and J. Smith respectively.

On June 14th a TOS dive team installed 2 moorings in a shallow channel south of Walpole Island. This site is situated on a vast shallow delta south of the islands that is sheltered from the lake proper by sandbars running along its southern extremes.

ADCP and OBS moorings were set into the bottom sediment using a combination of shoveling and water jetting. The technique proved effective and fast; however beyond a sediment depth of approximately 0.6 m, the water jet could no longer offset the migration of sand back into the excavation. This provided the working depth, leaving the OBS mooring protruding a little higher than the target depth. The mooring was situated in 2 m of water. Using a bottom mounted, upward looking ADCP proved challenging, as this technique has not been documented in the past. After consultation with the manufacturer and a few trips (August 22nd, September 4th and September 16th) to the site R. Rowsell of Engineering Services, RSB, was able to adapt the electronics

software to the site conditions. Instruments and moorings were retrieved on November 17th.

Keenan Johnson the Environmental Officer for Walpole Island First Nations acted as the guide in the area and proved extremely helpful. Field operations were launched from the Mitchell's Bay Marina.

STATION POSITIONS
WALPOLE ISLAND, LAKE ST. CLAIR
2003-2004

STATION NUMBER	LATITUDE N.	LONGTITUDE W.	DEPTH m
239 (ADCP)	42° 28.3063'	082° 33.4916'	2.01
239 (OBS)	42° 28.3100'	082° 33.4965'	2.01

SHOAL STUDIES CHARLEVOIX, LAKE MICHIGAN
AEMRB STUDY 12218, H. BIBERHOFER

Technical Operations supported H. Biberhofer's project 12218 during the period July 7-July 11. Support consisted of one technician and a vehicle to tow the CCGL PUFFIN. This study was in conjunction with the Michigan Department of Fisheries.

Staff departed CCIW on July 7 and drove to Charlevoix, Michigan. The next three days were utilized running sounding lines, to enlarge the RoxAnn data base of two shoals in Lake Michigan.

The shoal areas were Big Shoal located approximately ten kilometers NW of Charlevoix and Fisherman's Shoal located a few kilometers SW. Work had been done the previous year and this years work consisted of filling in missing gaps and expanding the areas covered.

Fifteen locations at Big Shoal were investigated using the underwater video camera to compare visual images with the RoxAnn data. All staff returned to CCIW on July 11.

MICHIPICOTEN BAY SURVEY
AEMRB STUDY 12218, H. Biberhofer

A survey of Michipicoten Bay was conducted from September 9 to September 16 to carry out aquatic substrate mapping and characterization of the area to determine existing fish habitat.

Arriving in Wawa on September 9, a survey of the perimeter of the bay was completed using the RoxAnn Seabed Classification system. From September 10 to September 14, different areas of the bay were surveyed and transect lines were completed. On the September 14 and September 15, video ground truthing was completed at selected areas. On September 16, sediment samples were collected at various sites with a Shipek sampler.

SEDIMENT SAMPLING IN HAMILTON HARBOUR
AEMRB STUDY 12218, H. BIBERHOFER

Technical Operations supported AEMRB project 12218 for H. Biberhofer during the period December 4 - December 15. The purpose of the sampling was the collection of Benthos cores from Randle Reef and Windermere Basin in Hamilton Harbour for the Ministry of the Environment and the Hamilton Harbour Remediation Committee.

Three Technical Operations staff, H. Biberhofer and the CCGS SHARK were utilized on December 4th to collect 10 Benthos cores from the Randle Reef area in Hamilton Harbour. The sites had been previously done with the AEMRB Stinger and it was determined that the longest cores would be obtained at these sites. All cores were taken with 80 kilograms of weight for comparison values. The Novatel GPS positioning system was used to accurately locate all the coring stations. These cores were returned to CCIW and stored in coolers. Another core was taken, photographed and inspected but not kept for future analysis.

The other segment of the work was the collection of two Benthos cores from 25 sites in the Windermere Basin of Hamilton Harbour. To accomplish this work in the final weeks of the field year the launches Petrel and Puffin were both fitted with Novatel GPS positioning systems and benthos coring equipment with 40 kilograms of weight. Both boats with three men crews collected cores on December 10th, 11th and 12th and finished on the 15th. The cores were capped and returned for storage at CCIW. The mini-box corer was used to collect bulk samples from four sites in Hamilton Harbour.

WATER QUALITY, HAMILTON HARBOUR
AEMRB STUDY 12240, M. CHARLTON

Hamilton Harbour, Water Quality Monitoring, Station 1001:

Monitoring of a number of water quality parameters has continued in Hamilton Harbour over the 2003 field season. This data is critical in effecting appropriate, focused policy for harbour remediation. A major focus is the study of temporal trends and the response of Hamilton Harbour to nutrient loading reductions.

Weekly sampling continued at Station 1001 and was carried out over the winter months when weather permitted. This station remains the primary monitoring site for a snapshot of chlorophyll a, nutrients, total phosphorus filtered and unfiltered in the Harbour. Hydrolab casts provided temperature, PH, conductivity and dissolved oxygen profiles, helping to identify turnover events and harbour stratification. Secchi readings and bucket thermometer readings were also acquired.

Hamilton Harbour, Net Hauls:

In response to concerns over the health of zooplankton in Hamilton Harbour, a brief monitoring program was undertaken in 2000 for Dr. M. Evans, AEPRB, NWRI, Saskatoon. Again in 2003, samples will provide quantitative and qualitative data on harbour populations.

Hamilton Harbour, Fecal Coliform Sampling:

In response to concerns over water quality in and around Hamilton Harbour, Burlington and Hamilton beaches, a fecal coliform survey was initiated in 2000. The weekly survey continued this field season between April and October. The survey consisted of five stations off each beach; in Hamilton Harbour (Bay Front Park), Burlington and Hamilton (north of Confederation Park).

Additional Hamilton Harbour Sampling:

Charlton Study 12240, Cladaphora Moorings:

Researchers are examining a link between Cladaphora dynamics in Lake Ontario and taste and odour events. In an attempt to complement current taste and odour sampling programs, Cladaphora and Zebra Mussel biomass and growth will be monitored in western Lake Ontario. Ceramic tiles were placed in the Lake as substrate and sampled over the summer.

Mooring stations started in six meters of water and worked out to the 30 meter contour. All moorings were set up so that sampling surfaces (ceramic tiles) were deployed at a depth of five meters.

HAMILTON HARBOUR
WEEKLY WATER QUALITY MONITORING POSITIONS
2003-2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CHARLTON PROFILING, STUDY 12240		
1001 (Hamilton Harbour)	43° 17' 15"	79° 50' 17"

STUDY DESIGNATION	STATION NUMBER	LATITUDE N.	LONGITUDE W.
CHARLTON, NET HAULS, STUDY 12240			
HH19	9053	43° 17' 16"	79° 50' 26"
HH20	1001	43° 17' 53"	79° 50' 35"
HH51	9054	43° 16' 50"	79° 52' 22"
HH53	9055	43° 17' 08"	79° 47' 38"
LO902	9056	43° 18' 33"	79° 46' 16"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CHARLTON FECAL COLIFORM, STUDY 12240		
Burlington Beach		
9034	43° 18' 31"	79° 47' 56"
9035	43° 18' 31"	79° 47' 55"
9036	43° 18' 32"	79° 47' 54"
9037	43° 18' 32"	79° 47' 52"
9038	43° 18' 33"	79° 47' 46"

Hamilton Beach		
9039	43° 16' 22"	79° 46' 37"
9040	43° 16' 22"	79° 46' 36"
9041	43° 16' 23"	79° 46' 35"
9042	43° 16' 25"	79° 46' 31"
9043	43° 16' 27"	79° 46' 27"
Lax (HH)		
9044	43° 16' 18"	79° 52' 29"
9045	43° 16' 18"	79° 52' 30"
9046	43° 16' 19"	79°
52' 31"		
9047	43° 16' 20"	79° 52' 33"
9048	43°16'24"	79° 52'38"

CHARLTON/EVANS NETS, STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
9031 (HH51)	43 ° 16' 49"	79 ° 52' 22"
9032 (HH52)	43 ° 17' 10"	79 ° 50' 34"
9033 (HH33)	43 ° 17' 07"	79 ° 45' 30"

LAKE HURON INITIATIVES
AERMB STUDY 12240, M. N. CHARLTON

The Lake Huron Initiatives study had two purposes, 1) to determine why the beaches in the Goderich and Kincardine areas were closed on a repetitive basis and 2) to determine why there was a large amount of algal growth along these beach areas. To assist this study, three field trips were completed, July 28 - 31, August 19 - 22 and October 14 - 16. On each field trip, one TOS staff assisted AEMRB personnel.

During the July and August trips, water and bacteria samples were taken from a launch in the nearshore zone extending out from shore to depths of 15 m and an underwater camera was used to capture a view of the bottom strata to determine if any algae was present. Samples were also taken from the beach areas where a hole was dug in the sand inshore from the surf zone and a bacteria sample collected. Several streams and rivers south of Kincardine were also sampled on the July trip. At stations where

bacteria samples were collected, a 500 ml plastic bottle was filled and stored at 4°C. At stations where bulk water was collected, a 4 litre plastic jug was filled. Samples were processed at the end of each day. Bacteria samples were poured onto Coli plates and placed in an incubator for 24 hours to obtain counts for fecal coliforms and E.coli. Bulk water samples were sampled for total phosphorus filtered and unfiltered, nutrients and chlorophyll a. Samples were stored at 4°C.

During the October trip, only beaches in the Goderich and Kincardine areas were sampled. Samples were obtained for bacteria at all sites sampled. Water quality samples were obtained at each beach area

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	DEPTH (m)
	Water Transects			
349	Point Clark	44° 04' 39"	81° 46' 20"	3.6
350		44° 04' 38"	81° 46'09"	
497		44° 04' 36"	81° 45' 53"	3.2
498		44° 04' 30"	81° 45' 24"	0.6
499	Lurgan Beach	44° 05' 57"	81° 45' 48"	7.9
517		44° 05' 50"	81° 45' 18"	5.0
518		44° 05' 28"	81° 44' 36"	1.0
439		44° 05' 25"	81° 44' 30"	1.0
383	Bruce Beach	44° 07' 30"	81° 44' 06"	6.6
384		44° 06' 54"	81° 43' 32"	3.8
385		44° 06' 35"	81° 42' 50"	2.0
386		44° 06' 37"	81° 43' 01"	0.5
531		44° 06' 30"	81° 43' 15"	0.8
404	Poplar Beach	44° 09' 14"	81° 42' 15"	11.8
407		44° 08' 57"	81° 41' 40"	8.5
417		44° 08' 42"	81° 41' 07"	2.5
519		44° 09' 08"	81° 41' 58"	11.0
520		44° 08' 48"	81° 41' 22"	5.0
521		44° 08' 44"	81° 41' 02"	0.8
391	Station Beach	44° 10' 42"	81° 39' 08"	9.4
392		44°10'37"	81°38'59"	7.3
393		44° 10' 33"	81° 39' 51"	5.8
394		44° 11' 54"	81° 40' 03"	15.5
395		44° 11' 27"	81° 39' 18"	12.7
396		44° 10' 44"	81° 38' 51"	6.9
522		44° 10' 37"	81° 38' 36"	5.0
523		44° 10' 35"	81° 38' 33"	1.4
524		44° 10' 34"	81° 38' 31"	0.5
397	Penetangore River	44°10'41"	81°38'37"	3.2
398		44° 10' 40"	81° 39' 30"	2.4
399		44° 10' 35"	81° 38' 14"	1.9
402		44° 10' 30"	81° 38' 10"	0.0
525	Lorne Beach	44° 12' 18"	81° 37' 37"	0.8

526		44° 12' 28"	81° 38' 01"	2.0
527		44° 12' 55"	81° 38' 50"	15.0
528	Amberley Beach	44° 03' 01"	81° 44' 40"	0.6
529		44° 02' 59"	81° 45' 06"	2.0
418	Horton Pt.	44°11'13"	81°39'15"	11.9
419		44° 11' 12"	81° 38' 42"	4.7
420		44° 11' 09"	81° 38' 34"	0.5
426	South Rotary Park Beach	43° 43' 48"	81° 44' 17"	9.0
427		43°43'39"	81°43'53"	4.0
428		43° 43' 35"	81° 43' 46"	0.0
429	Rotary Park Beach	43° 43' 59"	81° 44' 09"	7.5
430		43° 44' 05"	81° 43' 41"	2.5
431		43°44'04"	81°43'38"	0.0
432		43° 44' 03"	81° 43' 36"	0.0
433		43° 44' 02"	81° 43' 34"	0.0
434		43°44' 01"	81° 43' 32"	0.0
435	Maitland River Goderich	43° 44' 54"	81° 43' 24"	0.4

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	COMMENTS
	Shoreline Transects			
440	Station Beach	43° 10' 33"	81° 38' 34"	hole in beach
441	Station Beach	43° 10' 34"	81° 38' 35"	hole in beach
442	Station Beach	44° 10'35"	81° 38'36"	waded in water
443	Station Beach	44° 10' 36"	81° 38' 37"	hole in beach
444	Station Beach	44° 10' 37"	81° 38' 38"	hole in beach
445	Station Beach	44° 10' 38"	81° 38' 39"	waded in water
446	Station Beach	44° 10' 39"	81° 38' 40"	hole in beach
447	Station Beach	44° 10' 40"	81° 38' 41"	hole in beach
448	Station Beach	44° 10'41"	81° 38'42"	waded in water
449	Station Beach	44° 10' 42"	81° 38' 43"	hole in beach
450	Station Beach	44° 10' 43"	81° 38' 44"	hole in beach
451	Station Beach	44° 10' 44"	81° 38' 45"	
484	Station Beach	44° 10' 35"	81° 38' 31"	
485	Station Beach	44° 10' 31"	81° 38' 32"	
486	Station Beach	44° 10' 26"	81° 38' 34"	
487	Amberley Beach	44° 02' 37"	81° 44' 26"	1.2 km from beach access
488	Amberley Beach	44° 02' 50"	81° 44' 32"	0.8 km from beach access
489	Amberley Beach	44° 03' 01"	81° 44' 38"	0.4 km from beach access
490	Amberley Beach	44° 03' 14"	81° 44' 45"	in line with water transect at beach access
351	Point Clark Beach	44° 04' 10"	81° 45' 30"	waded in water
355	Point Clark Beach	44° 04' 26"	81° 45' 26"	south end of beach
356	Point Clark Beach	44° 04' 36"	81° 45'20"	hole in beach
455	Point Clark Beach	44° 04'30"	81° 45'26"	hole in beach
456	Point Clark Beach	44° 04' 31"	81° 45' 27"	hole in beach
457	Point Clark Beach	44° 04' 32"	81° 45' 28"	waded in water

458	Point Clark Beach	44° 04' 33"	81° 45' 29"	hole in beach
459	Point Clark Beach	44° 04' 34"	81° 45' 30"	hole in beach
460A	Point Clark Beach	44° 04'35"	81° 45'31"	waded in water
460B	Point Clark Beach	44° 04' 36"	81° 45' 32"	hole in beach
461	Point Clark Beach	44° 04' 37"	81° 45' 33"	hole in beach
462	Point Clark Beach	44° 04' 38"	81° 45' 34"	waded in water
463	Point Clark Beach	44° 04'39"	81° 45'35"	hole in beach
464	Point Clark Beach	44° 04' 40"	81° 45' 36"	hole in beach
465	Point Clark Beach	44° 04' 41"	81° 45' 37"	waded in water
491	Point Clark Beach	44° 04' 32"	81° 45' 18"	north end of beach
492	Point Clark Beach	44° 04' 27"	81° 45' 22"	middle of beach
493	Lurgan Beach	44° 05' 26"	81° 44' 35"	west side of Pine River
494	Lurgan Beach	44° 05' 25"	81° 44' 37"	100 m south of 493 in line with water transect
495	Bruce Beach	44° 06' 28"	81° 43' 13"	in line with water transect
560	Bruce Beach	44° 06' 30"	81° 43' 10"	
561	Bruce Beach	44° 06' 24"	81° 43' 20"	
496	Poplar Beach	44° 08' 40"	81° 40' 33"	in line with water transect
425	Rotary Beach, Goderich	43° 44'21"	81°43'38"	waded in water
423	Rotary Beach, Goderich	43° 44' 22"	81° 43' 34"	hole in beach
554	Rotary Beach, Goderich	43° 43' 54.7"	81° 43' 37"	
555	Rotary Beach, Goderich	43° 43' 56.9"	81° 43' 33.6"	
556	Rotary Beach, Goderich	43° 44' 01.3"	81° 43' 33.7"	
557	S of Rotary Beach, Goderich	43° 43' 50.9"	81° 43' 33.7"	
421	Main Beach Goderich	43° 44' 28"	81° 43' 31"	hole in beach
422	Main Beach Goderich	43°44' 26"	81° 43' 33"	waded in water
558	Main Beach Goderich	43° 44' 38.4"	81° 43' 35.5"	
559	Main Beach Goderich	43° 44' 41"	81° 43' 36.4"	
436	Nine Mile Creek	43° 52'38"	81° 42'19"	
437	Kerry's Creek	43° 57' 26"	81° 42' 11"	
438	Kintail Beach	43° 57'50"	81°43'46"	waded in water
439	Pine River	43° 05' 25"	81° 44' 30"	
452	Royal Oak Creek	44° 06' 44"	81° 39'46"	
453	South Pine River	44° 05' 24"	81° 40' 51"	
454	Clark Creek	44° 03' 19"	81° 42' 28"	

AQUACULTURE STUDIES IN PARRY SOUND AND THE NORTH CHANNEL
AEMRB STUDY 12240, M. CHARLTON

Technical Operations supported the various aquaculture studies for M. Charlton at different sites and at different times throughout 2003. These studies in collaboration with the Ministry of the Environment are quantifying the effects of large scale aquaculture sites on the adjacent sediment and water quality.

The large aquaculture site near Depot Harbour in Parry Sound was sampled during the period of February 17-21, 2003. At this site a North-South and an East-West transect with 50 meter spacing on the ice was positioned over the summer fish pen site. Three Benthos cores were taken from each sample station. Two were used for bottom fauna and the other sub-sectioned for return to CCIW. Water samples and Hydro-labs were done at four stations. The site in Depot Harbour in Parry Sound was again visited during the period May 5-9, 2003. Many of the same sample stations were again sampled along with additional stations on the East-West transect. Again water samples were collected for chemistry and YSI profiles taken along with the four stations where the video camera and penetrating rod were used to determine the accumulation of material from the fish farm.

The deactivated aquaculture site just north of Little Current on La Cloche Island was sampled during the period of March 3-7, 2003. This site has been studied over the last four years to determine the decline of deposits below the old aquaculture farm. Fifty five holes were drilled through the ice at stations used in previous years and a video camera attached to a heavy steel rod lowered into the sediment to determine the thickness of the layer of aquaculture residue. Ekman Dredge samples were collected at five sites for later analysis. YSI profiles were done at three stations.

One day of the March trip was utilized to sample the aquaculture site located at Wolsey Lake which is also part of the ongoing studies. Three stations had Benthos cores taken and sub-sectioned on site as well as eight sediment samples taken with an Ekman Dredge. Water samples and YSI profiles were also completed. This site was sampled again during the period of July 15-17. Water samples were obtained from a North-South transect of the lake as well as from the fish cage area. Sediment cores were collected from between the cages as well as by diver from several of the fish cages. All cores were extruded for ammonia analysis. Pictures of the water/shoreline interface were taken at 100 to 200 m intervals around Lake Wolsey where solid strata was present using a 35mm and digital camera. This was done to document the presence and non-presence of algae along the shoreline. A GPS fix was obtained to correspond to the photos. Shoreline photos were also obtained at aquaculture sites at Manitowaning Bay, the East Rous Island Fishery and the Cold Water Fisheries sites on the east side of La Cloche Island.

Depot Harbour Sites

Station #	Grid #	Northing	Easting	Latitude N.	Longitude W.
97	A-4	5018934	569802	45° 19' 14"	80° 06' 34"
98	B-4	5018984	569802	45° 19' 15"	80° 06' 34"
99	C-4	5019036	569802	45° 19' 17"	80° 06' 34"
100	E-4	5019136	569802	45° 19' 20"	80° 06' 34"
101	F-4	5019186	569802	45° 19' 22"	80° 06' 34"
104	D-0	5019086	569602	45° 19' 18"	80° 06' 43"
105	D-2	5019086	569702	45° 19' 18"	80° 06' 34"
106	D-5	5019086	569852	45° 19' 18"	80° 06' 31"
107	D-8	5019086	570002	45° 19' 18"	80° 06' 25"
108	A-2	5018936	569702	45° 19' 14"	80° 06' 38"
110	C-2	5019036	569702	45° 19' 17"	80° 06' 38"
111	G-4	5019236	569802	45° 19' 23"	80° 06' 34"
	Z-4	5018884	569802	45° 19' 12"	80° 06' 34"
	D-3	5019086	569752	45° 19' 19"	80° 06' 36"
	D-6	5019086	569902	45° 19' 18"	80° 06' 29"
	D-7	5019086	569952	45° 19' 18"	80° 06' 27"

Lake Wolsey Sites

Station #	Latitude N.	Longitude W.	Northing	Easting
220	45° 50' 30"	82° 31' 41"		
224	45° 50' 00"	82° 31' 30"		
225	45° 49' 00"	82° 32' 00"		
226	45° 48' 31"	82° 31' 59"		
227	45° 48' 05"	82° 32' 02"		
228	45° 47' 28"	82° 32' 02"		
229	45° 47' 01"	82° 32' 15"		
232	45° 48' 07"	82° 32' 54"	5073197	379696
233	45° 48' 07"	82° 32' 53"	5073189	379700
257	45° 48' 07"	82° 32' 53"	5073196	379702
258	45° 48' 07"	82° 32' 53"	5073193	379698
259	45° 48' 07"	82° 32' 54"	5073190	379695
334	45° 48' 06"	82° 32' 48"	5073160	379813
335	45° 48' 05"	82° 32' 48"	5073145	379808
336	45° 48' 05"	82° 32' 49"	5073153	379792
337	45° 48' 06"	82° 32' 49"	5073171	379783
338	45° 48' 05"	82° 32' 49"	5073154	379780
339	45° 48' 06"	82° 32' 53"	5073185	379714
340	45° 48' 06"	82° 32' 53"	5073189	379712
341	45° 48' 07"	82° 32' 53"	5073193	379709
342	45° 48' 06"	82° 32' 52"	5073191	379715
343	45° 48' 06"	82° 32' 53"	5073185	379708
344	45° 48' 06"	82° 32' 50"	5073156	379760
345	45° 48' 06"	82° 32' 50"	5073160	379757
346	45° 48' 06"	82° 32' 51"	5073165	379753
347	45° 48' 06"	82° 32' 51"	5073163	379762
348	45° 48' 06"	82° 32' 51"	5073156	379749

Little Current Sites

Station #	Northing	Easting
D-4	439261.4	5096469.3
D-5	439269.3	5096469.1
D-6	439279.9	5096468.9
D-7	439288.8	5096469.1
D-8	439297.4	5096468.9
D-9	439311.3	5096468.8
E-2	439227.1	5096484.0
E-3	439244.5	5096481.2
E-4	439260	5096482.6
E-5	439268	5096481.0
E-6	439280	5096477.4
E-7	439288.9	5096477.0
E-8	439298.4	5096476.4
E-9	439312	5096476.8
F-4	439261.6	5096488.7
F-5	439269.3	5096487.4
F-6	439279.4	5096486.5
F-7	439287.8	5096486.9
F-8	439297.4	5096486.4
F-10	439327.6	5096485.3
G-2	439229.2	5096496.6
G-3	439246.2	5096495.8
G-4	439260.2	5096495.0
G-5	439268.1	5096494.4
G-6	439278.7	5096494.3
G-7	439287.4	5096494.0
G-8	439296.4	5096493.0
H-4	439260.6	5096501.1
H-5	439268	5096500.9
H-6	439280.4	5096500.0
H-7	439288.4	5096500.0
H-8	439297.7	5096499.8
I-2	439232.2	5096511.3
I-3	439248.1	5096510.5
I-4	439261.1	5096509.8
I-5	439268.1	5096509.8
I-6	439280.2	5096509.7
I-7	439288.4	5096509.6
I-8	439297.4	5096509.5
I-9	439316.5	5096509.1
J-4	439261.5	5096518.7

Station #	Northing	Easting
J-5	439269.8	5096518.8
J-6	439280.2	5096519.3
J-7	439287.7	5096519.2
J-8	439297.5	5096518.2
J-9	439318.3	5096518.4
K-4	439260.9	5096529.5
K-6	439280.2	5096529.7
K-8	439297.3	5096530.3
K-9	439321.9	5096531.8

CURRENT, WAVE AND STORM PROFILING, WESTERN LAKE ONTARIO, HAMILTON HARBOUR
AEMRB STUDY 12243, DR. M. SKAFEL

WESTERN LAKE ONTARIO

BURLINGTON BAY WATERFRONT

Research efforts are underway to monitor near shore waves and currents in the Burlington Bay waterfront of western Lake Ontario. Data collected will support ongoing studies on shoreline attached algae and the City of Burlington Pier and Marina project.

On October 14, TOS staff identified the 5m contour, an active zone for wave and sediment interactions, off the Travelodge Hotel, in Burlington, Ontario. A low profile ADCP was rigged with extra weight and a second drag anchor, in order to stabilize the mooring during strong easterlies. Storm and wave events derived from strong easterlies were of particular interest.

The first installation, from October 14 to December 8 experienced electronic problems and was therefore refurbished and redeployed on December 15. The instrument will be left in as late as ice conditions allow into 2004.

BURLINGTON BAY WATERFRONT
MOORING LOCATIONS
2003 - 2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
2003-00C-34A	43° 19' 21"	79° 47' 22"

A multi-disciplinary team has been formed to address the issue of *Cladophora* fouling of beaches each summer in Lake Ontario. One research focus is spring algal dynamics. It is postulated that there may be a significant opportunity for vigorous growth during the spring thermal bar evolution. The thermal bar is a shore parallel front which separates descending warm inshore from cold offshore waters at or near the freshwater temperature of maximum density (4°C) during spring and fall seasons. The thermal bar is important because of its influence on mixing, cross-shore exchanges and variability of biotic factors in the coastal zone.

An intensive field study was undertaken in 2003 to document the thermal bar evolution at the west end of Lake Ontario. On a profile running from the 10 m contour to the 80 m contour off Oakville, Ontario, seven moorings were deployed to monitor and track temperature and currents during the thermal bar evolution. Instruments deployed included ADCP's, MAVS, transmissometers and temperature loggers.

Weekly YSI profiles and water samples were also taken from a small launch, to complement this study. By April 24th the thermal bar was well established at about the 20 m contour and persisted there until May 14th. By May 26th, the 4°C isotherm had moved offshore. The nearshore waters appeared to maintain their integrity well into the early summer providing opportunity for significant nutrient input and algal growth.

THERMAL BAR AND WATER QUALITY STATIONS
LAKE ONTARIO
2003 -2004

			Water Quality Sites				
			Spar	Spar	Instrument	Instrument	Actual
Instruments	Station #	Mooring #	Lat	Long	Lat	Long	Depth
N/A	798	N/A	43-27.175	79-39.035	N/A	N/A	4.5m
N/A	799	N/A	43-27.113	79-38.665	N/A	N/A	6.5m
Hydra	791	2003-00S-20A	43-26.983	79-38.510	43-26.981	79-38.544	11m
ADCP	792	2003-00S-21A	43-26.684	79-37.058	43-26.716	79-37.994	22 m
TR100/TidBits	792	2003-00S-22A	43-26.705	79-38.094	43-26.734	79-38.043	21m
MAVS/TRANS/ TR1000/TidBits	793	2003-00S-23A	43-26.484	79-37.732	43-26.512	79-37.719	31.2 m
ADCP/TR1000/ TidBits	794	2003-00S-24A	43-26.133	79-37.171	43-26.174	79-37.100	41m
MAVS/TR1000/ TidBits	795	2003-00S-25A	43-26.816	79-36.583	4325.894	79-36.562	51.9 m
ADCP/TR1000/ TidBits	796	2003-00S-26A	43-25.503	79-35.770	43-25.435	79-35.742	62 m
ADCP/TRANS/ TR1000/TidBits	797	2003-00S-27A	43-24.266	79-33.654	43-24.200	79-38.654	82m

HAMILTON HARBOUR

As well, research efforts continue to monitor near shore currents in the Burlington Bay area of western Lake Ontario. Data collected will support ongoing studies addressing water quality issues on recreational beaches in the harbour. On July 11, ADCP and MAVS moorings were deployed in the western end of Hamilton Harbour to help model current dynamics in and around recreational properties. Moorings were retrieved on October 17th.

HAMILTON HARBOUR
MOORINGS
2003 - 2004

MOORING	INSTRUMENT	LATITUDE N.	LONGTITUDE W.	DEPTH m
2003-50C-20A	ADCP	43° 16.60'	79° 52.30'	11
2003-50C-21A	MAVS	43° 16.45'	79° 52.13'	6

HAMILTON HARBOUR SEDIMENT TRAP MOORINGS
AEMRB STUDY 12246, DR. C. MARVIN

Five sediment trap moorings were placed in Hamilton Harbour and were sampled on a monthly basis. The collected sediment was analysed for organic contaminants (polycyclic aromatic hydrocarbons) as well as metals.

STATION NUMBER	LATITUDE N.	LONGITUDE W.
9030	43° 18' 12"	79° 49' 54"
9031	43° 16' 47"	79° 52' 18"
9032	43° 17' 16"	79° 50' 13"
9033	43° 17' 11"	79° 47' 11"
Windermere	43° 16' 08"	79° 46' 54"

AQUACULTURE SITES, NORTH CHANNEL and HAMILTON HARBOUR
AEMRB STUDY 12249, DR. R. YERUBANDI

NORTH CHANNEL

Research efforts continue examining the effects of intensive aquaculture operations on water and sediment quality in the North Channel of Georgian Bay.

As in 2002 ADCP and Thermistor moorings were installed south of the "Glofcheskie Fish Farm", in the Waubuno Channel of Georgian Bay. Installations were carried out on June 09th by TOS staff.

On October 30th the dive crew of Mike Benner and Bruce Gray met up with Carl Yanch in Little Current, on Manitoulin Island to retrieve the moorings. The former were returning from a dive job on Lake Superior, while Carl had traveled up with the equipment and mooring winch from CCIW.

Weather was spectacular for the retrieval, with temperatures in and around 10 deg. C and winds almost calm. The CCGL PINTAIL was stripped of gear from the previous job, a mooring winch installed and the moorings retrieved by mid-afternoon.

NORTH CHANNEL, GEORGIAN BAY

MOORINGS

2003 - 2004

MOORING NUMBER	LATITUDE N	LONGITUDE W
2003-02T-30A	46° 01 34.526'	81° 57 33.594'
2003-02T-31A	46° 01 34.567'	81° 57 34.581'

HAMILTON HARBOUR

Dr. Yerubandi was involved in a study of the vertical mixing taking place in the central basin of Hamilton Harbour. This information will be used in the study of blue-green algae blooms which have taken place over the last few years. A temperature logger and a current meter were placed in the central basin on June 13 and removed on October 22.

MOORING NUMBER	TYPE	LATITUDE N.	LONGITUDE W.
2003-50T-17	TEMP	43° 17' 15"	79° 50' 15"
2003-50C-18	ADCP	43° 17' 15"	79° 50' 16"

GROUNDWATER REMEDIATION PROJECT
AEMRB Study 12263, Dr. C. Ptacek

Technical Operations staff supported the Groundwater Remediation Study#12263 at the Royal Botanical Gardens in Hamilton. Twenty-five wells were installed between July and December of this year at Royal Botanical Gardens property around Cootes Paradise, to determine the quality and quantity of groundwater entering Cootes Paradise. The Groundwater Remediation Project's drill rig was used for these installations. Soil samples were obtained at each location at two foot intervals. These samples were collected from the lead auger flights which were pulled up at each depth. Two five foot cores were obtained from the marsh area by CH21 and 22 using the Technical Operations' Vibra-corer. Well Logs will be submitted to the Ontario Ministry of

Environment and the new well tags will be installed on each well. Ownership of these wells is hoped to be transferred to the Royal Botanical Gardens early in 2004. This is a co-operative study between Environment Canada, Ontario Ministry of the Environment and the Royal Botanical Gardens.

Royal Botanical Gardens Wells

Well	Type	Elevation	Northing	Easting	Location
CP 01	1.25", deep muli-level	80.727	4790954	588461	south shore, west trail(Caleb's Walk) by creek
CP 02	1.25", shallow	80.696	4790954	588461	south shore, west trail(Caleb's Walk) by creek
CP 03	1.25", shallow	83.93	4790931	588485	south shore, west trail(Caleb's Walk), halfway
CP 04	1", deep muli-level	84.28	4790931	588485	south shore, west trail(Caleb's Walk), halfway
CP 05	1", shallow	97.233	4790920	588554	south shore, west trail(Caleb's Walk), top of hill
CP 06	1", shallow	80.056	4791150	588693	south shore, east trail(Ravine road trail), midway
CP 07	1.25", shallow	77.502	4791245	588643	south shore, east trail(Ravine road trail), eastside of creek
CP 08	1.25", shallow	77.434	4791248	588661	south shore, east trail(Ravine road trail), westside of creek
CP 09	1.25", shallow	88.068	4791000	588823	south shore, east trail(Ravine road trail), top at turn
CP 10	1" piezometer	77.559	4792634	588590	Arboretum, west trail, centre well
CP 11	1.25" piezometer	78.096	4792677	588574	Arboretum, west trail, west well
CP 12	1.25" piezometer	76.958	4792529	588682	Arboretum, west trail, east(marsh) well
CP 13	1.25" piezometer	78.3	4792902	589280	Arboretum, east trail, west well
CP 14	1.25", shallow	76.679	4792880	589334	Arboretum, east trail, east(marsh) well
CP 15	1.25", shallow	78.209	4792894	589301	Arboretum, east trail, centre well
CP 16	1", deep	80.113	4791150	588693	south shore, east trail, midway
CP 17	5' drive point	n/a	4791297	588705	south shore, east trail, marsh
CP 18	5' drive point	n/a	4791295	588709	south shore, east trail, marsh
CP 19	5' drive point	n/a	4791264	588678	south shore, east trail, marsh
CP 20	5' drive point	n/a	4791272	588680	south shore, east trail, marsh
CP 21	5' drive point	n/a	4791280	588660	south shore, east trail, marsh
CP 22	1.25", deep	77.622	4791245	588643	south shore, east trail, eastside of creek
CP 23	1", deep	87.985	4791000	588823	south shore, east trail, top at turn
CP 24	1", shallow	77.19	4790972	585917	end of Desjardins canal south side(closest to canal)
CP 25	1", shallow	77.241	4790967	585916	end of Desjardins canal south side

Note:
WGS 84 datum used for all positions.
Elevations taken from Canadian Geological Survey Benchmarks 65U022 (George Allan School), 75U005 (Dundas Sewage Treatment Plant), 75U009 (house #556 York Road).

RBG Survey

GROUNDWATER REMEDIATION PROJECT
AEMRB Study 12266, Dr. S. Lesage

Technical Operations staff supported the Groundwater Remediation Study #12266 throughout the year at Clarkson, Moose Factory, Kingston and Smithville. Equipment support consisted of two permanently assigned vehicles and three laboratory trailers at Moose Factory, Clarkson and Smithville.

Burlington

Along with general maintenance of equipment and preparation for field operations, assistance has been given to AEMRB staff as required in the Groundwater Remediation Laboratory (Aqua-ref.). Also general maintenance and annual safety inspections have been performed on the drill rig and trailer and the hydraulic testing trailer.

Clarkson

Along with regular maintenance, sampling and downloading of data from loggers, many Point Dilution, Tracer and Constant Head tests were conducted throughout the year to monitor the background and effects of a Nutrient Injection test performed February 12 - March 20.

A safety inspection of the site was conducted by representatives of the CCIW safety committee on January 23.

E. Smith ES, RSB, has installed GFCI electrical connections to provide power to the outside of the laboratory trailer at Clarkson. The work at Clarkson is being done in support of Dr. N. Ross, GRP, AEMRB who is investigating the bio-stimulation of groundwater micro-organisms, by the injection of nutrients in order to bio-clog a fracture plane.

Smithville

At Smithville on December 15, the Drill rig was utilized to remove a jammed packer from Borehole 54B. This and the rest of the packers in the north cluster site have had the packers removed to allow abandonment early in 2004 by a contracted Drilling company. The land on which they are on has been sold. Periodic inspection and maintenance of the trailer still on site at the south cluster has been done. Due to the age of the trailer and the chance of future projects, it has been left on site.

Moose Factory

The 1972 thirty foot Ivey laboratory trailer is to be used to house the portable treatment system used in Moose Factory. In the winter of this year the trailer was pulled out of storage and gutted to facilitate renovations undertaken by Niagara Relocatable Buildings and Rondar Maintenance systems. The trailer was then hauled by Department of Fisheries and Oceans personnel to Cochrane, Ontario where it was put on a train for Moose Factory. Technical Operations staff maintained and operated this treatment facility from August 4 - August 29 of this year.

At Moose Factory from October 24 - November 2 four new two inch wells EC 31, 32, 33 and 34 were installed ranging in depth from nine to twelve feet. These locations were cored continuously to the bottom using split spoon samplers. All augers and samplers were washed with soap and water between each depth and location. GRP's drill rig was taken to Moose Factory for these installations. Ontario well records will be submitted to the Ministry in the New Year when the new provincial logs arrive. Well tags will then be forwarded to be installed by contract personnel on site. Relative elevations and positions of all new wells were obtained. Well ASTF10 which had been damaged was dug up, repaired and re-surveyed. All wells were sampled and geo-chemistry monitored using an YSI multi-probe through a flow cell. A tracer test was also conducted in the treatment area using a bromide tracer. Three ten foot continuous cores were obtained in the treatment area; one using split spoons and a sledge hammer the other two using the Vibra corer.

Drs. S. Lesage and D. Van Stempvoort are investigating the application of humic acid solution for the remediation of ground water and soils contaminated with Petroleum Hydrocarbons. This is being conducted at the above ground storage tank farm (ASTF) area of Weeneebayko General Hospital at Moose Factory, Ontario.

Kingston

While in Kingston November 18-19 for Dr. J. Marsalek AEMRB, a side trip was made to Cataraqui Park. Level loggers were downloaded from wells, reset and reinstalled, and two loggers that were experiencing communication problems were returned to Burlington. The logger installed in a Willow tree to monitor sap flow rates was also downloaded. This was done for Dr. D. Van Stempvoort, AEMRB, who is investigating the potential use of phytoremediation as a passive management approach to contaminants from the old landfill site at Cataraqui Park.

URBAN POND RUNOFF STUDIES IN TORONTO AND KINGSTON
AEMRB STUDY 12440, DR. J. MARSALEK

Technical Operations staff supported the urban runoff studies of Dr. J Marsalek, at locations in Toronto and Kingston during the 2003 field season. These studies are looking at the deposition of sediment and contamination in catchment basins of streams in urban areas.

Two trips were made to a pond located in western Kingston along Gardiners Road to collect sediment samples and carryout other tasks. The first trip occurred from January 15 – January 17 and included the collection of 17 short Benthos cores from the main pond and 3 more cores from a nearby small basin which collects runoff from a shopping mall. The other task was the profiling of the deposition bar at the stream entrance into the pond. This was accomplished with a level and the laying out of a grid on the ice of the pond. A second trip occurred, to the same pond, during the period between November 17 -19. Mini-Ponar samples were collected at the same locations as the previous trip.

Urban ponds in the north end of Toronto near Victoria Street and the 401 and a pond located north of Richmond Hill were sampled. On January 20 the pond in Richmond Hill had 16 Benthos cores collected through the ice and returned to CCIW for extraction. The next sample date was January 24 when the two connected ponds of Terraview and Willowfield at the 401 were sampled for water chemistry and Hydro-labs were taken. Benthos coring was started in the Willowfield Pond and completed on January 27 coring began on the Terraview Pond. The coring was finished on the Terraview Pond the following day which completed the winter sampling of these ponds.

The Terraview and Willowfield Ponds were sampled again during the period of July 14 – July 16. During this period five sites in each pond were sampled for water chemistry and Hydro-lab profiles and Benthos cores were taken.

SEDIMENT SAMPLES, HAMILTON HARBOUR
AEMRB STUDY 12450, DR. I. DROPPO

Technical Operations supported Dr. Droppo during the period August 13 - 14. Sediment samples were collected from Hamilton Harbour using the mini Box-corer and Barge Goose III. Samples were collected from two stations or the study of geochemistry of the harbour sediments and to determine sampling sites for a future intensive survey.

DROPPO SEDIMENT SURVEY, STUDY 12450

STATION NUMBER	LATITUDE N.	LONGITUDE W
NST1	43° 16' 54.5"	79° 53' 04.7"
7002	43° 16' 32.8"	79° 47' 49.4"

NORTH TORONTO AND ETOBICOKE SEWAGE TREATMENT PLANT, ONTARIO
AEMRB STUDY 12451, DR. J. MARSALEK

Technical Operations supported Dr. Marsalek during the period February 13, July 21, 23, November 3, 7, 12. Support consisted of one TOS person, a vehicle with trailer hitch and miscellaneous equipment required to supplement already supplied tools and equipment. Process monitoring trailers and equipment were set up, electrical conduit was laid and barrels of combined sewer overflow (CSO) water were transported back to CCIW after rain events.

TERRAVIEW AND WILLOWFIELD PONDS - NORTH TORONTO, ONTARIO
AEMRB STUDY 12440, DR. J. MARSALEK

Technical Operations provided support to Dr. Marsalek during the period July 14 - 16, 2003. Support consisted of two TOS personnel, the "Sea Nymph" (flat bottom boat), a vehicle with trailer hitch, a Brown's corer, mini PONAR, hydrolab and additional miscellaneous equipment. Cores were extracted and water and sediment samples were collected and returned to CCIW.

URBAN WATER MANAGEMENT PROJECT
AEMRB STUDY 14181, DR. A. CROWE

Technical Operations provided support to Dr. A. Crowe, AEMRB at Point Pelee National Park with monthly monitoring of water levels of the marsh and wells at the Park gate, North-west Beach and Camp Henry cross-sections.

From October 7 - 9 a trip to Point Pelee was made to install 28 groundwater sampling tubes, at 14 sites (2 per site). The area was located within the Point Pelee National Park at the previously studied remediation plot. Fourteen tubes were installed at a depth just below the seasonal low water table level and the remaining fourteen were installed just below the seasonal high water table. The two levels will facilitate sampling of groundwater very close to the water table throughout the year, enabling a better assessment of DDT mobilization within the subsurface. All sampling tubes are situated within 3 metres of the edge of the existing plot.

A 1.5" water table well was also installed in the vicinity of the remediation plot to facilitate the exact determination of the depth to the water table.

The wells were made of 3/8" diameter Teflon tubing, with an aluminum drive point attached to the lower end. The sampling tubes were installed using a small 3" hand auger and the drive point system. The wells were back filled with clean sand.

Once the wells were established, fourteen 1 litre samples were obtained. These samples are to be sent to National Laboratory for Environmental Testing (NLET) for organochlorine pesticide analysis.

This is being done as part of a continuing study of the groundwater at the Park.

AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH

ONTARIO WIDE SAMPLING OF LAKES FOR PESTICIDE ANALYSES
AEPRB 12310, Dr. D. Muir

On May 20, 2003 a proposed three year study began to determine the spatial and temporal trends of currently used pesticides in surface waters and precipitation. This project would encompass ten lakes (see list) that have been chosen throughout Ontario ranging from north to south. The project, headed by Dr. Muir, examined approximately 45 target analytes. These have been selected based on the criteria's of Pesticide Management Regulatory Act priorities, semi-volatile properties, long range transport potential, as well as previous reports of Canadian surface water and precipitation.

There were three field trips scheduled for this project for each of primary spraying months of May, June and July. The sampling that took place at the selected lakes included 1000L of centrifuged water @ 6L /min (at specified sites), zooplankton net haul, water quality samples, Hydrolab profile and 20L water sample filtered through a GFF filter from depths determined from the Hydrolab. The filtered water that was collected was spiked with d5-Atrazine then pumped through a resin column to extract the analyates. These columns were labeled and kept on ice. The water samples that were collected for water quality included Chlorophyll, TN unfiltered, TN filtered, TP filtered, TP unfiltered and CHN. These were processed during the extraction procedure and then stored according to established procedures for the specific sample. Two wet-only precipitation samplers were also installed at two locations. These locations included the Dorset Research Centre and the Turkey Lakes Watershed Project exclusively. These samplers had been fitted with a resin column that would allow the precipitation collected to run through by gravity. After running through the column the water was collected in a reservoir to determine the amount that had been filtered. These samplers were refurbished during each of the field trips with the results recorded.

Samples were also collected in support of Dr. B. Scott's, Haloacetic Acid study, AEPRB Study #12334.

During the first two field trips only nine of the lakes were visited. It was not until trip three that Windy Lake was sampled to obtain a larger data set for that area. The southern area lakes were sampled using a small 14ft aluminum boat with a 9.9 horsepower motor due to the horsepower restriction rule in effect on Bells Lake. An inflatable Zodiac boat was used during centrifuging at Bells Lake whereby the centrifuge and generator was set up in the Zodiac then towed behind the small boat. This method was stable and was a definite asset given the sampling and space situation. Lake Wawanaosh had a restriction on gas powered engines; therefore an electric motor was used to complete the sampling.

During the initial trip to the central/northern region, a Boston Whaler combined with the Zodiac was used to access and sample the chosen lakes. It was found that it was

effective but time consuming in many different aspects, so for the following two trips the CCGL PETREL was utilized for sampling as an all in one boat. The sampling that was performed at the Turkey Lakes was completed using on site equipment. Boats, electric motors ATV's and the lab were a definite asset that allowed for the sampling to be completed and processed effectively.

During the length of the project, sampling methodologies and positions were kept consistent during each of the field trips. After completing a total analysis of the results, it will be decided whether this study will continue into the next two years.

Lake and Location	**Position (WGS 84)**
Turnbull Lake, Ayr, ON	43° 16.023 80° 25.028
Lake Wawanosh, Lucknow, ON	43° 52.964 81° 29.452
Bells Lake North Durham, ON	44° 19.384 80° 44.179
Plastic Lake Dorset, ON	45° 10.866 78° 49.231
Lake Opeongo Algonquin Park, ON Wavy Lake Sudbury, ON	45° 41.059 78° 22.382 46° 17.918 81° 05.866
Windy Lake Sudbury, ON	46° 36.427 81° 27.281
Flack Lake Mississagi Provincial Park, ON	46° 35.527 82° 47.068
Batchawana Lake Turkeys Lakes Project, ON	47° 03.825 84° 23.508
Big Turkey Lake Turkey Lakes Project, ON	47° 02.913 84° 25.325

PESTICIDE SAMPLING ALGONQUIN PARK
AEPRB STUDY 12310, DR. D. MUIR

Technical Operations supported AEPRB Study 12310 during the period between August 20 and August 21. Support consisted of two technicians, a truck and trailer, the CCGL PEEWEE, Hydrolab, centrifuge, generator and other necessary sampling equipment.

Staff departed CCIW the morning of August 20 and drove to Lake Opeongo in Algonquin Park. The Peewee was launched at the Harkness Research Laboratory and then taken to the sampling location (45° - 41' - 27" 78° - 22' - 12"), located in the deepest area of the lake approximately 7 kilometers north of the Research Center. Two Benthos cores were collected at this site and returned to the lab for sub-sectioning.

The next day, at the same site, water samples using a VanDorn, a Hydro-Lab profile, and zooplankton net hauls were collected. In the afternoon a large volume water sample was centrifuged and collected in Pepsi cans to be run through organic extraction columns at the Harkness Lab.

Hydrolab for Dr. D. Muir, AEPRB

ATMOSPHERIC CONTAMINANTS IMPACTS PROJECT
AEPRB STUDY 12310, DR. D. MUIR

Technical Operations staff supported Dr. D. Muir, AEPRB, NWRI in obtaining Arctic Char, cores and water samples at Hazen, Char, Amituk and Resolute Lakes.

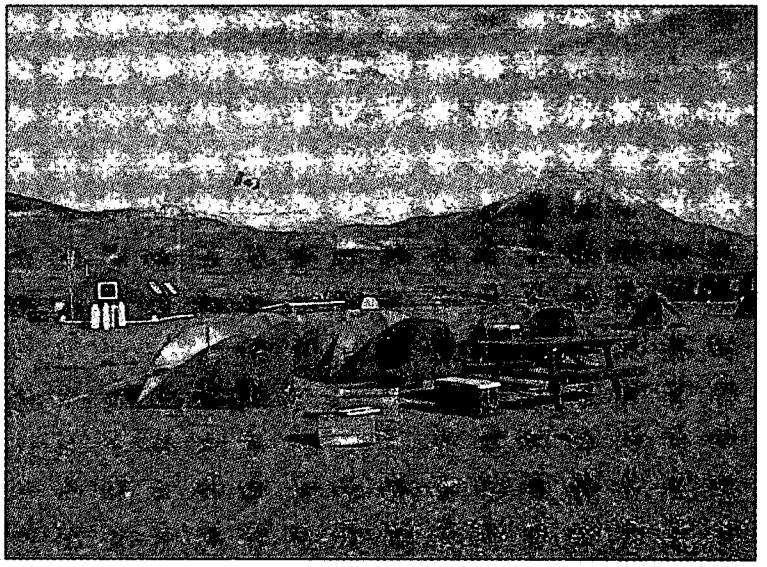
The purpose of this project, which began in 1999, is to investigate changes in concentrations of contaminants over time in Arctic Char collected from Char, Resolute, and Amituk Lakes on Cornwallis Island and monitor contaminants at Lake Hazen on Ellesmere Island. A bathymetric survey of Lake Hazen was also to be attempted.

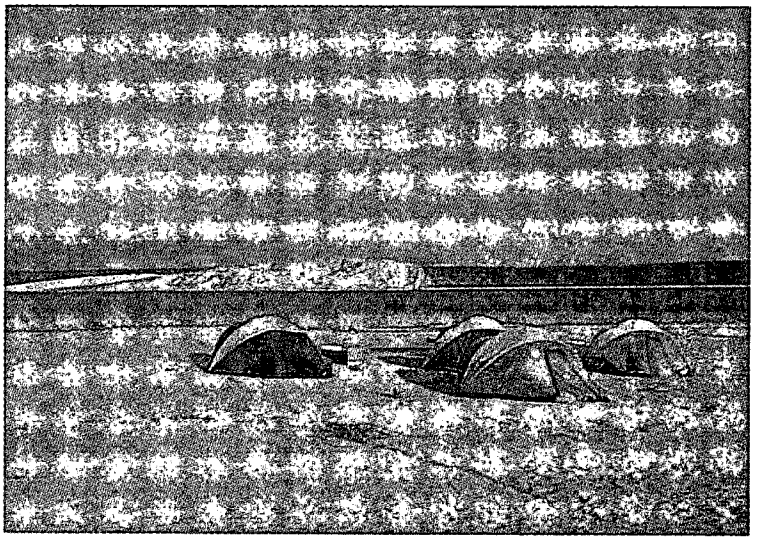
Cores were collected from Amituk, Char and Resolute Lakes using the Technical Operations 6.7cm and 10cm diameter corer. The top 12 cm of the cores were

sectioned at 0.5 cm intervals in the laboratory at Polar Continental Shelf Project (PCSP). Water samples from depths of 1 metre depth and bottom less 1 metre were taken for metals using the Kemmerer sampler. Samples were also taken from the surface for mercury and water chemistry. Cores, water samples and a bathymetric survey were not obtained from Lake Hazen because wind and ice conditions made small boat work impossible. A number of ponds and tributaries to Lake Hazen were sampled for mercury and water chemistry.

Arctic Char were collected from all lakes using gillnets strung out from shore. The Char were then dissected and sub-sampled.

CAMP AT LAKE HAZEN





AUGUST AT RESOLOUTE

TWENTY MILE CREEK SAMPLING
AEPRB STUDY 12344, DR. J. PARROTT

Weekly water samples were collected from Twenty Mile Creek for Dr. J. Parrott, at a spot upstream of Jordan Harbour. The water has been tested for pesticides and herbicides which are used extensively in the fruit growing industry of the Niagara Peninsula. Fat head minnows are being raised in the water and researchers are studying the effects these chemicals may have on fish reproduction. Studies will determine if the fish are able to produce eggs and if the fish fry are deformed in any way.

SEDIMENT TOXICITY IN HAMILTON HARBOUR
AEPRB STUDY 12350, DR. M. KOHLI

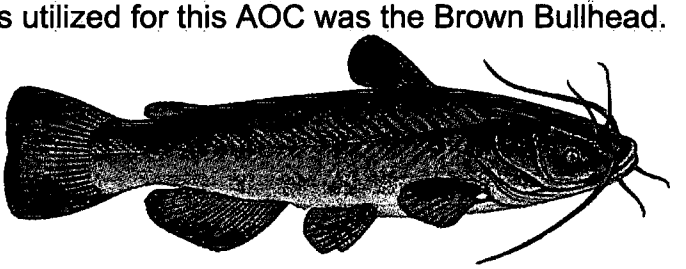
This project is being undertaken to study the toxic, hormonal and immunological effects of freshwater harbour sediment on aquatic life. Four sediment samples were collected in the harbour using a mini PONAR sampler on October 24, 2003.

STATION NUMBER	LATITUDE N.	LONGITUDE W.
7002	43° 16' 34.4"	79° 47' 44.7"
7014	43° 16' 47.5"	79° 48' 16.0"
70M4	43° 17' 11.1"	79° 48' 00.1"
7008	43° 18' 22.8"	79° 49' 33.2"

FISH COLLECTION IN AREA'S OF CONCERN, TORONTO HARBOUR AND SARNIA
AEPRB STUDY 12460, Dr. S. Brown, Dr. J. Sherry , Dr. M. McMaster

Areas of Concern (AOC's) have been established for the Great Lakes Basin. AOC's are found near populated centers with industries, mills and/or refineries on the shores of the Great Lakes. These areas are suspected of having poor or compromised water quality, and contaminated flora and fauna life. Sampling includes catching by means of electro fishing, or netting two fish species, one a bottom feeder and the other a column feeder. Ideally, 20 mature males and 20 mature females of each species are sacrificed, dissected and analyzed for reproductive health indicators.

Technical Operations Services supported this project between the dates of October 14 - November 21, 2003. Toronto Harbour was the first AOC to be sampled; two areas within the Harbour and one reference site were required. Only one species of fish was decided upon for this AOC due to difficulty in catching enough specimens of a second species. The species utilized for this AOC was the Brown Bullhead.

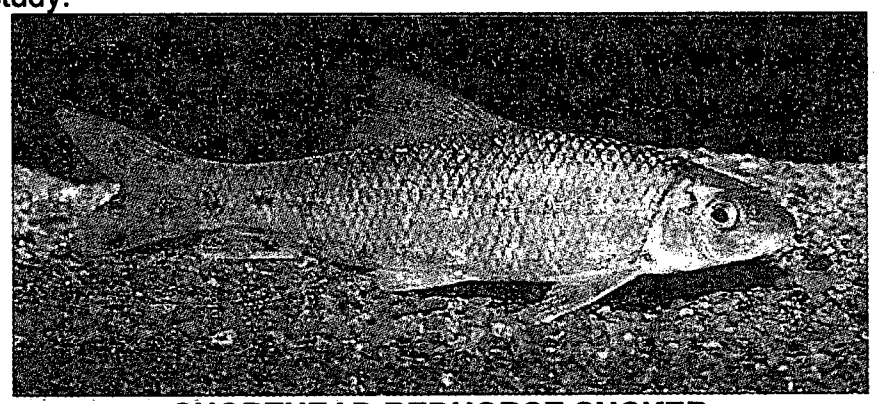


Brown Bullhead

An attempt to use the Rouge River as the reference site was nullified due to insufficient habitat and low fish numbers. The reference site that was fished next was Frenchman's

Bay in Oshawa. The field crew caught the required number of Bullhead to complete the reference site. The two areas inside Toronto Harbour that were fished were Tommy Thompson Park and Blockhouse Bay. These locations were visited a number of times to collect the number of Brown Bullhead required to complete the site. It was found that the majority of the fish being caught were male. The female fish that were being caught were underdeveloped reproductively and could not be used in this study. The site was finally completed and the focus came onto Sarnia.

The Sarnia site that was to be fished was located on the outskirts of Stag Island, near the town of Corunna. The reference site that would be used for this location was Lake Huron. The fish for this reference site were provided by a local fishing operation. Some fishing was completed on the initial day but a large storm front moved in and the crew stopped field work due to the severe weather conditions. For this particular site both Perch and Shorthead-Redhorse Suckers were collected. The collection of fish continued the following day until a malfunctioning electro fishing boat had the crew returning home with only half of the Perch needed and two Suckers. The boat problem turned out to be a minor electrical problem and the crew returned to Sarnia. All of the male Suckers and all the Perch were caught in two days. The somewhat elusive female Suckers were finally caught on the last day. It was to the dismay of the field team that after dissection; only 17 of the many female fish caught were mature fish, able to be used in this study.



SHORTHEAD REDHORSE SUCKER

COOTES PARADISE, ONTARIO
AEPRB STUDY 12464, Dr. T. MAYER

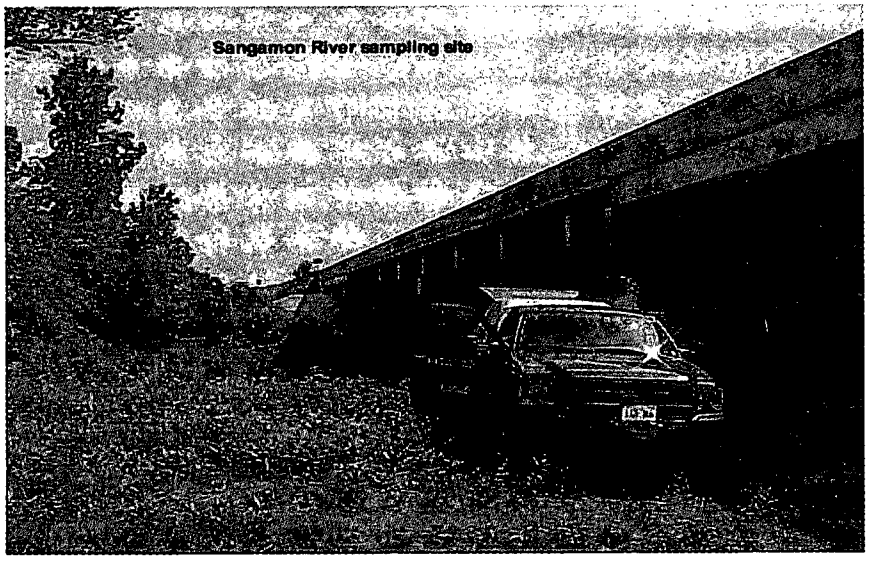
Technical Operations provided support to Dr. T. Mayer on October 7th, 2003. Support consisted of two divers and Robert Stephens, AEIRB who collected a sample in Cootes Paradise for a shear stress analysis of the sediment. A shear stress analysis gives a scientist an indication of the degree that the sediment will move during wave events. The sample was collected from 1.7 meters and returned to NWRI for analysis. A small boat from the Royal Botanical Gardens was used in the operation.

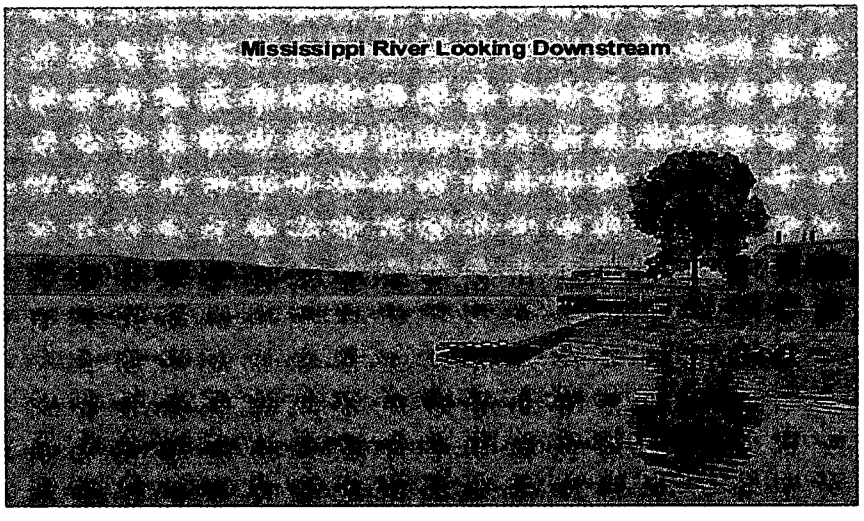
Position	Northing	Westing	Depth
Site #3	43-16.900	79-53.828	1.7m

NATIONAL LABORATORY FOR ENVIRONMENTAL TESTING

INTERLABORATORY QUALITY ASSURANCE PROGRAM, UNITED STATES
NLET STUDY 12180, H. ALKEMA

As part of an ongoing interlaboratory proficiency testing program, large volume water samples were collected at two sites located on the Mississippi River in Iowa and the Sangamon River in Illinois. These samples will be used to provide performance evaluation check samples and standards to agencies such as the Canadian Association for Environmental Analytical Laboratories (CAEAL), MITE-RN, GEMS and other associated agencies. NLET also conducts specific Interlaboratory Quality Assurance Studies, designed, prepared and distributed, on a cost recovery basis, to several hundred environmental laboratories in Canada and around the world. Studies cover lake and river water, precipitation, and sediments for both inorganic and organic constituents, and they define the parameter-specific performance of laboratories for long-term environmental monitoring and surveillance programs.

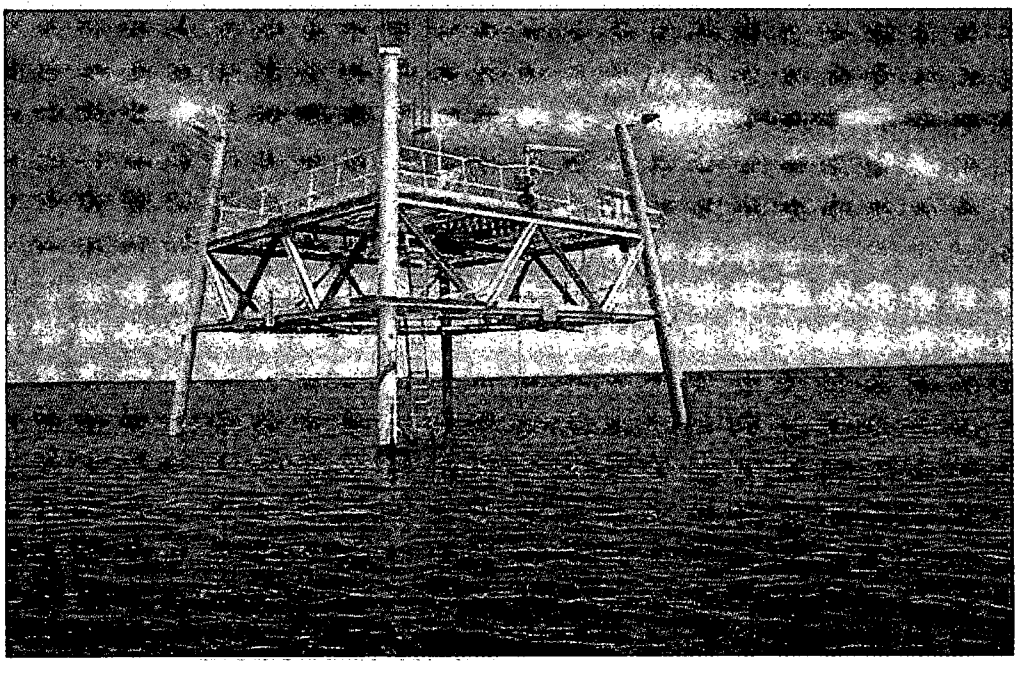




WAVES TOWER
BPTS STUDY 12702, S. PETITT

This tower has been utilized over the past 28 years as a platform for a variety of studies ranging from atmospheric, weather and climate to lake, wave and sediment dynamics. The facility is supported by shore power and has the ability to house weather sensitive electronics on its decks. As such, it has been utilized by Institute staff as well as various outside agencies as a unique platform on a large body of water.

J. Gabriele, K. Davis, ES and C. Lomas, TOS carried out the end of season inspection on the Waves Tower. The battery for the navigation light was checked and the light tested. The main electrical panel was opened and preventive maintenance done then sealed for the winter. All four white perimeter flood lights were replaced late in the summer and were working well. No structural problems were observed; the crane, booms and davits were all secure. Two bolts had corroded on a maintenance platform at the upper mezzanine on the outside of the tower leg and for safety reasons the platform was removed. TOS divers visually inspected the underwater structure. The inspection's focus was the structural integrity of welded joints at the 20 and 40 foot levels and the surface integrity of the (4) support columns at the low-high water interface. Underwater imaging of the inspection was collected. Joint surfaces were first wire brushed by divers to remove cladophora growth. This allowed divers to visually inspect the integrity of the epoxy coating applied by TOS divers in 1992. A minor corrosion problem was observed on the south piling at the water line. This will be repaired during the summer 2004.



WAVES TOWER

RESEARCH SUPPORT BRANCH

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT
RSB STUDY 12629, J.A. BULL

The Lake Victoria Environmental Management Project (LVEMP) was a regional project implemented by three East African countries, Kenya, Tanzania and Uganda. The project was aimed at addressing the increasing environmental degradation and continued deterioration of the water quality of the lake. The degradation has been manifested through the frequent out-breaks of massive algal blooms resulting from eutrophication, increasing problem of anoxia, frequent fish kills and recurrent infestation of the lake with the Water Hyacinth.

LVEMP is comprised of 10 components, one of which is the Water Quality and Ecosystem Management Component (WQESC). The lead agency for the implementation of activities under the WQESC is the Directorate of Water Development (DWD) through the Water Resources Management Department (WRMD). The component comprises of five sub-components, Management of Eutrophication, Sedimentation Pilot Study, Hydraulic Conditions Pilot Study, Lake Victoria Water Quality Model, and Water Quantification.

The major aim of the WQESC of the LVEMP is to elucidate the nature and dynamics of the lake ecosystem by providing detailed information on the characteristics of the waters of the lake. In addition, this component also aims to provide details of limnological changes, model and predict their short and long-term consequences, and provide guidelines for ameliorating potentially disastrous lake ecological changes.

The scientific analysis required to support the above component of the LVEMP requires that field measurements be undertaken for the limnological parameters of interest. This, in turn, requires the deployment of various measurement and sampling systems in designated areas of Lake Victoria that are representative of the spatial and time scales of physical processes being studied. The resultant data bases will provide the background information necessary to interpret the physical regime in the areas of study and serve to verify the results of hydrodynamic models.

Under the Contract between UNU-INWEH and the Government of Uganda, UNU-INWEH was to organize and, in collaboration with the Ugandan LVEMP and WRMD, provide qualified technical personnel to train Ugandan staff on the use of specialized equipment required to carry out a small-scale field measurement and sampling program in the Ugandan sector of Lake Victoria. UNU-INWEH was also to supply the necessary measurement and sampling equipment as specified in the Contract. The resultant observational and sampling program included meteorological measurements, water quality measurements, water temperature/depth profiles, current profiles, suspended sediment measurements and sediment coring.
The activities to be carried out are designed as a capacity building exercise for the Ugandan WRMD and will provide staff of the WRMD with the training and hands-on

experience necessary to service, maintain, deploy and retrieve a number of physical measurement and sampling systems and to use such equipment effectively. Additionally, the field data gathered through the agreed activities will contribute to a physical database for Lake Victoria that can be used by researchers. The long term goal here is to provide the capacity to sustain a lake measurement and sampling capability, managed and funded locally.

Under the terms of the Contract, UNU-INWEH personnel organized training sessions and provided equipment. In addition, UNU-INWEH personnel traveled to Uganda for a total of 4 periods. The first "Inception" trip and the first working trip were accomplished in 2001. Two follow-up trips in March and April/ May 12, 2002, were accomplished to complete the program. Problems were encountered with vessel support and personnel available for training on each trip and necessary training on the physical components was not completed. Technical training on instrumentation was completed satisfactorily.

The LVEMP National Executive Secretary was responsible for funding of the contract, for the appointment of a Technical Liaison Officer as the contact person between WRMD staff and UNU-INWEH personnel as well as for the provision of suitable training facilities, casual labour, transport for goods and UNU-INWEH personnel within Uganda and a suitable mooring vessel for each of the three operational periods.

The activities, including the organization, training and field measurements were conducted over an 18 month period commencing in April, 2001 and ending in June 2002.

Over the training periods in 2001 and 2002, UNU-INWEH's technical representatives, Mr. S. Smith, TOS, RSB, and Mr. R. Rowsell, IS, ES, RSB, worked on-site at the WRMD facility in Entebbe conducting training sessions and equipment demonstrations which were attended by a number of WRMD staff.

It is noted that, although the moorings were eventually established as planned, the proposed mooring demonstrations and practicing of such deployments by WRMD staff were not undertaken due to mechanical problems with the main support vessel and the charter vessel.

A fourth operational trip was contracted through UNU-INWEH for the period of February 27 - March 15, 2003. During this period, the moorings that had been deployed in May of 2002 were retrieved from stations UP-6 and UP-8. Problems with support vessel scheduling and finance again became a factor and no additional training was able to be completed. Problems with fishing nets becoming entangled with the moorings proved to be a problem once again and will continue to be a problem unless a better mooring system can be designed and the local fishermen educated on the WRMD efforts.

WRMD staff had no indication of further funding to deploy future moorings. No further thermistor/sediment trap moorings may be deployed until additional sub-surface and surface floats are secured.

While in Uganda, support was given to Dr. D. Muir, AEPRB, in assisting with air sampler calibration, delivery of sampling equipment and the transport back to Canada of air and precipitation samples.

DETROIT RIVER, ST. CLAIIR RIVER INFILTREX SAMPLING
RSB STUDY 12631, R McCrea, EHD, ECB-OR

Sampling in the Detroit River and St. Clair River during this field season is in response to the binational RAP plan between Canada and USA. Sampling is used to create bench marks in the RAP agreement and to assess progress of beneficial uses. Infiltrex are In-situ resin column and filter based samplers used in the determination of organic chemicals. Other water samples collected during all field surveys were for Phosphorus, Trace metals, Mercury, Arsenic/Selenium, Nutrients, and Major Ions.

This is a continuation of the sampling which began two years ago and is projected to continue for the next two years. Seven surveys were completed on both rivers throughout the year. Following is a list of station numbers and location descriptions. Single infiltrex were installed at each station with the exception of stations 2210 and 5000 in which double infiltrex were required due to low contamination levels.

DETROIT RIVER STATIONS

1. Site #2240, Lower Detroit River, Amherstburg Channel (Canadian side)
2. Site #1120, Upper Detroit River, Fleming Channel (mid-river)
3. Site #2210, Lower Detroit River, Trenton Channel, (U.S. Side)

ST. CLAIR RIVER STATIONS

1. Site #5140, Downstream of Port Lambton, (Canadian Side)
2. Site #5110, Upstream of Port Lambton on green navigational buoy #37, (U.S. Side)
3. Site #5000, Lake Huron on red buoy #2, upstream of the Bluewater Bridge.

COMMON-USER SUPPORT
RSB STUDY 12633, S. B. Smith

RIGGING SHOP

The Rigging Shop was operated by two shop personnel with the assistance of other Technical Operations staff members.

Rigging Shop staff are responsible for the care of shop facilities, warehouse storage, outside storage shed and long-term outside storage areas as well as maintaining all mooring equipment, buoys, generators, power tools, winches, forklifts, vehicles and various other pieces of research equipment.

Rigging Shop staff is responsible for the delivery of scientific equipment to major ships and field programs throughout the Great Lakes Basin and the St. Lawrence River. They erect towers; operate boats, forklifts and a heavy crane truck while assisting with scientific studies when required.

DIVING OPERATIONS
RSB STUDY 12634, B. GRAY

The Diving Operations Unit of Technical Operations Services provided national and international support to various scientific studies. Support included diver certification, inspections, installations and retrieval of hardware, sample collection, underwater video and still photography, equipment demonstrations/trials, search and recovery, lectures and diver training. The Diving Operations Unit supported 8 divers at Burlington. A total of 201 hours (accident free) were logged in support of scientific projects for: NWRI, DOE/OR-EHD, BLMSS, DOE/OR-RPD and GLLFAS.

The season saw MURV, the remotely operated (mini-rover) underwater vehicle, pressed into service on a CCGS LIMNOS SAR call off Toronto in July. After receiving rough coordinates from the Toronto Marine Unit, MURV was able to locate and positively identify a downed aircraft in 69 m of water.

MURV is used for deep water and long duration video recording. Projects have included wreck mapping, sonar surveys, documentation of geological formations and live educational documentaries.

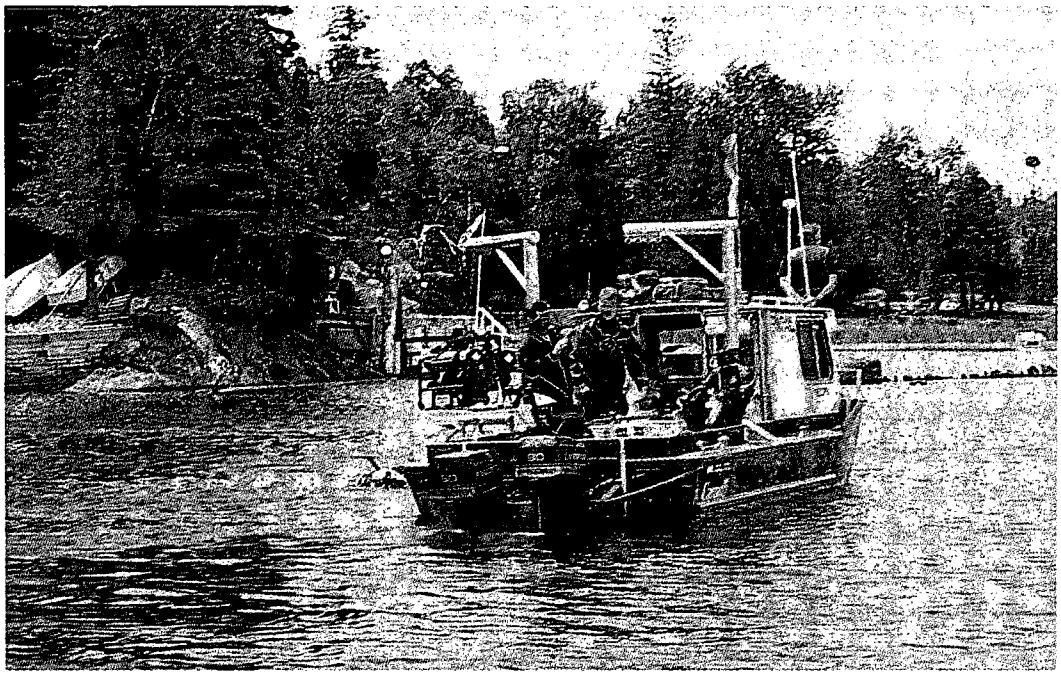
The Dive Video Studio has the capability to edit raw video and still footage for scientific presentations or publications.

The Diving Operations Unit has a complete inventory of modern diving and dive support equipment, as well as the logistical expertise to tackle the most difficult marine operations.

This field season marked the first year divers were able, as a group, to travel to Tobermory and undergo a week of intensive training. Experienced staff took part in refresher training, while new divers were introduced to an array of equipment, gear, safety training and protocol.

In partnership with Parks Canada, underwater archeology unit (Ottawa), diving operations spent a weeks training on the use of a Marine Sonics side scan sonar. This unit has been made available to staff when not in use by Parks staff.

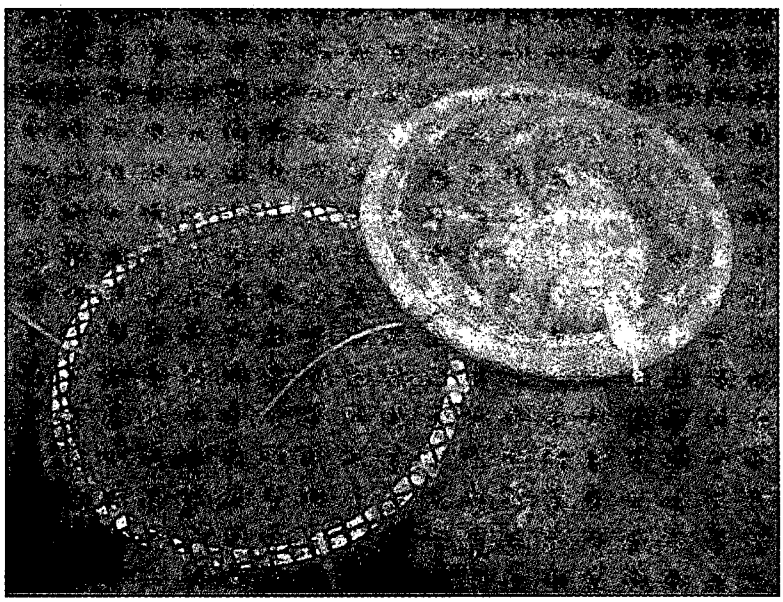
Another initiative with Parks Canada, is the joint training on Nitrox, oxygen enriched compressed air. Both dive units are examining the feasibility of including this form of compressed gas into their diving capabilities to enhance diver safety. Staff is currently examining cost/benefit analyses as well as capital costs of various compressor configurations.



CCGL PINTAIL

Projects supported during 2003-04 included:

STUDY #			STUDY TITLE
12240	Charlton	AEMRB	Lake Ontario, Hamilton Harbour
12212	Rosa	AEMRB	Rouyn-Noranda, Hamilton Harbour
12243	Skafel	AEMRB	Hamilton Harbour/ L. Ontario
12245	Yerubandi	AEMRB	North Channel
12246	Marvin	AEMRB	St. Clair River
12218	Biberhofer	AEMRB	Hamilton Harbour, Detroit River, Marathon, Walpole Island
14173	Smith	AEIRB	Mussels, Syndenham River
12632	Harrison	AEPRB	Niagara On The Lake, Port Lambton
12464	Mayer	AEPRB	Cootes Paradise
12702	Pettit	BPTS & ES	Waves Tower
Outside Agencies			
12631	Fitzsimons	DFO/ GLLFAS	Fish Habitat Studies Parry Sound, Port Weller, Stoney Creek, Tobermory
			CCCG/MTSB, Hull inspections/repairs
12634		Parks Canada	Tobermory



EGG NETS AT PORT WELLER

VEHICLE SUMMARY - 2003 FIELD SEASON

RSB Study 12638, M. R. Mawhinney

The field season was extremely busy again this year. Mechanical repair time on any vehicle was very minimal.

Vehicle support was utilized for several different operational functions. These operational functions range from the transportation of various types of scientific samples and equipment as well as the movement of personnel to and from common and remote field sites and for shipboard operations. At present the fleet consists of: three station wagons, one sedan, two passenger vans, seven full size vans, four crew cabs, four extended cab 4x4 pick up trucks and a variety of other specialized vehicles

The Institute has changed alternative fuel system vendors this past year. The change took place due in part to the unreliable operation of the fuel systems that were being supplied and the lack of customer support. The turn around time for repairs to vehicles through the supplier was extremely slow.

The new system for alternate fuel vehicles seem to be working out very well. A much more reliable system is being installed into the Institute's vehicles. Customer service, support and follow up with this new vendor and supplier seems to be above average, with a good turn around time on repairs.

The four remote natural gas refueling stations have been removed because of age and unreliability and replaced with a modern state of the art refueling appliance and to date the new system has worked extremely well. Other machines are to be installed at a further date, as soon as it is financially feasible.

The 2003 field season saw the implementation of commercial driver log books become mandatory for use by NWRI staff operating vehicles with a registered gross weight of

4500 kg or higher. Not only is the driver log book mandatory, its use is heavily enforced by provincial traffic laws. A senior enforcement officer with the Ministry of Transportation gave staff a part day information session on: how to use the driver log book correctly; sections of the of the Highway Traffic Act pertaining to the Institute's needs and answered any questions or concerns of NWRI staff.

A.R.I. Canada, "Automotive Rentals Incorporated", are still handling vehicle fleet billing. A.R.I. is responsible for the upkeep and maintenance of all vehicle records such as mileage, fuel consumption, incidentals, repair costs, etc and for the payment of all associated repair costs. Records are still kept internally by Technical Operations Services. Vehicle mileage is sent to A.R.I. on a monthly basis. This company continues to be a very professional organization with which to deal. It has cut down considerably on the amount of time and effort spent on doing monthly paper work for each vehicle in the fleet.

The extensive geographical area covered this field season ranged from locations in New Brunswick, Nova Scotia, Quebec and Ontario. Some U.S destinations covered were various locations throughout the states of New York, Michigan, Illinois and Georgia.

From April 1, 2003 to November 30, 2003, the NWRI fleet travelled a combined mileage of 457197 km.

PRINTED IN CANADA
IMPRIMÉ AU CANADA
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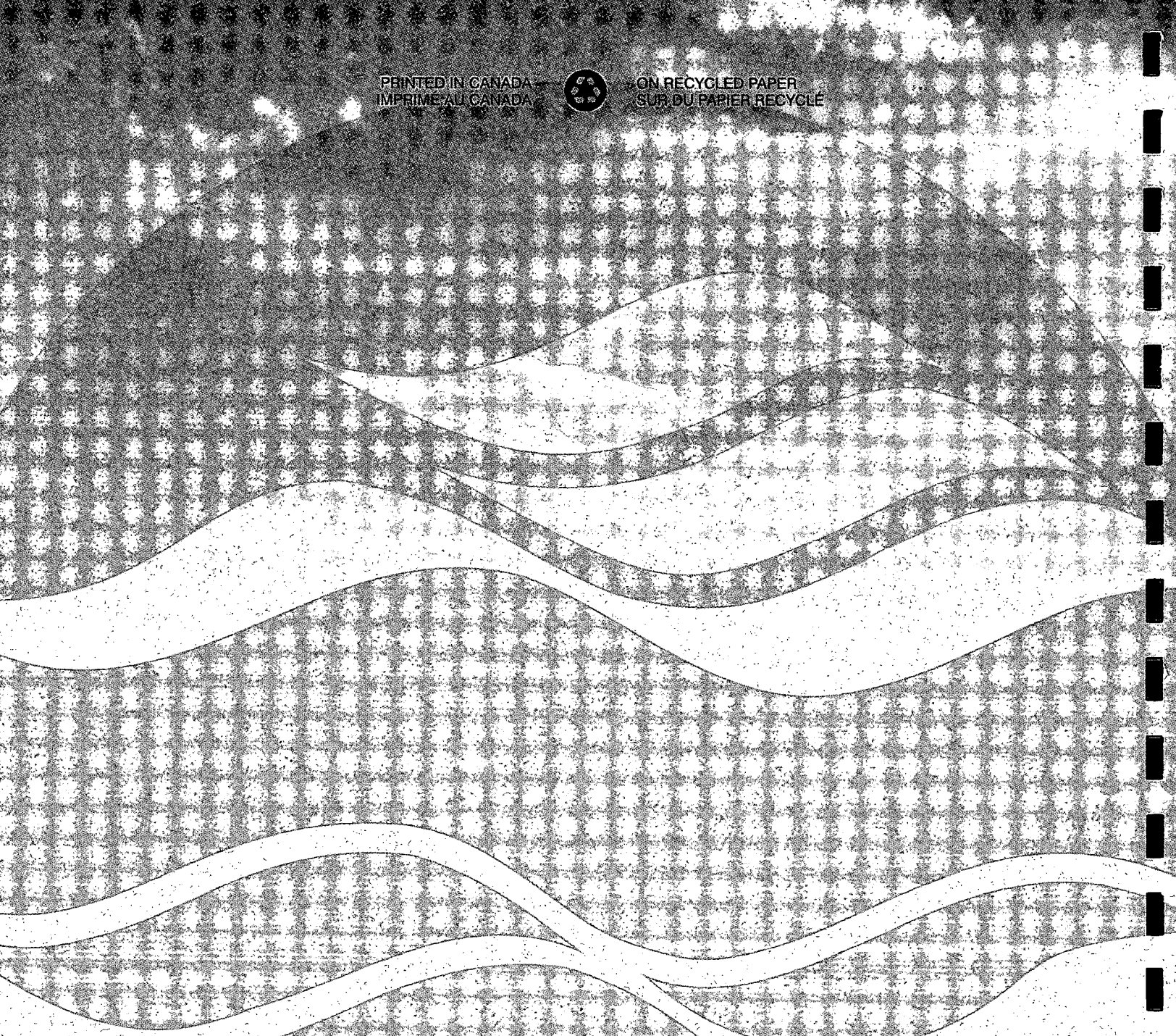

National Water Research Institute
Environment Canada
Canada Centre for Inland Waters
P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
L7R 4A6 Canada

National Hydrology Research Centre
11 Innovation Boulevard
Saskatoon, Saskatchewan
S7N 3H5 Canada

NATIONAL WATER RESEARCH INSTITUTE
INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

Institut national de recherche sur les eaux
Environnement Canada
Centre canadien des eaux intérieures
Case postale 5050
867, chemin Lakeshore
Burlington, Ontario
L7R 4A6 Canada

Centre national de recherche en hydrologie
11, boul. Innovation
Saskatoon, Saskatchewan
S7N 3H5 Canada

Environment Canada Environnement Canada

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