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National Water Research Institute
Institut National de Recherche sur les Eaux

1985

ACTIVITY SUMMARY

TECHNICAL OPERATIONS DIVISION

NATIONAL WATER RESEARCH INSTITUTE

1985

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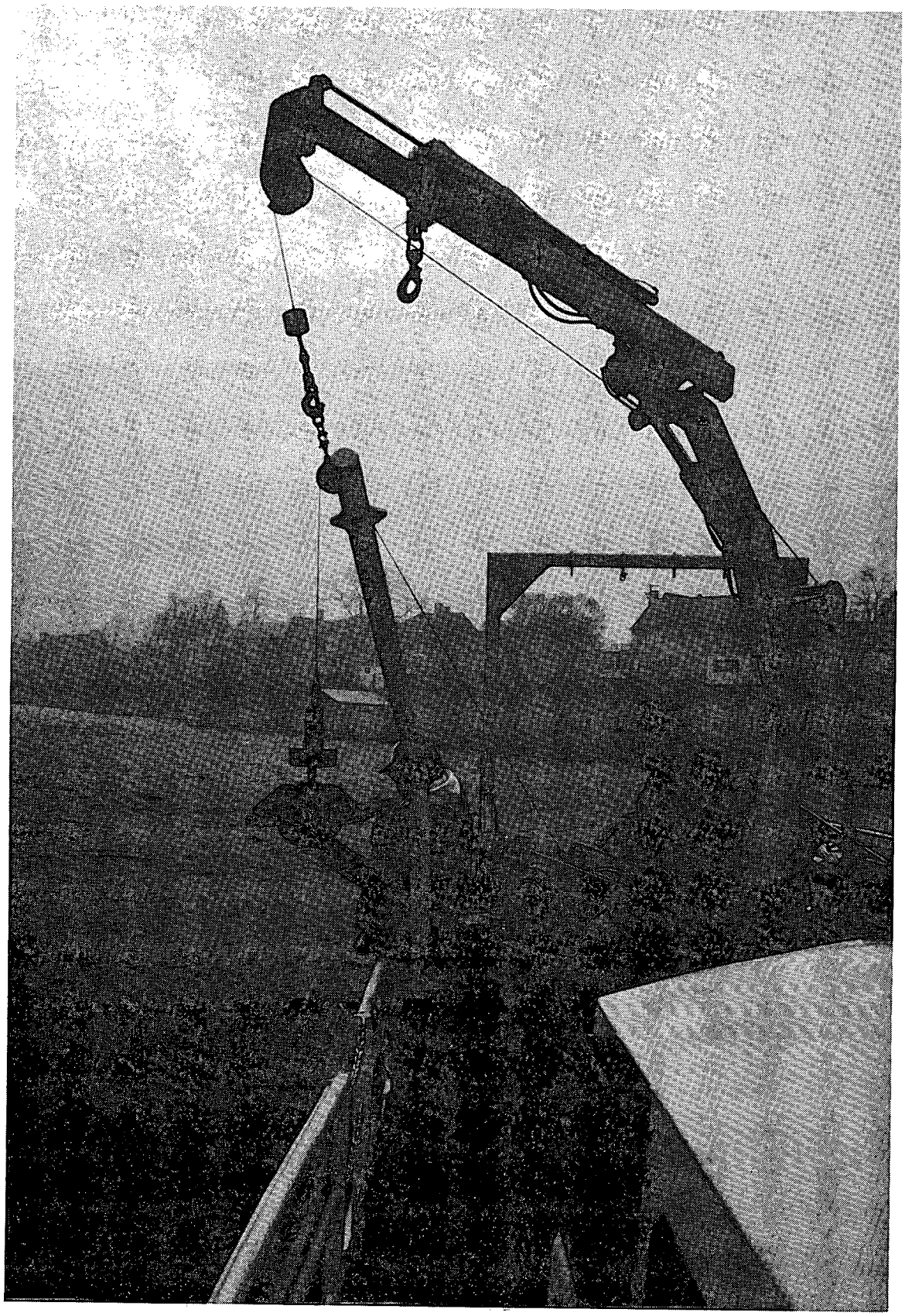

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INTRODUCTION

Technical Operations Division is a scientific support group within NWRI which gives technical assistance to the scientific community on a national scale. It supports field programs all across the country and shipboard programs from major ships on the Great Lakes and St. Lawrence River on a continuing basis.

The Division is structured in such a manner that it is able to respond immediately and effectively to urgent logistical and technical requirements in the field. The technical field staff is backed up by several support groups within the Division: The Limnological Instrumentation Section is constantly upgrading, repairing and refurbishing the electronic equipment so necessary these days for data collection. The Underwater Operations Unit is ever expanding its capabilities to give scientific programs the up-to-date technological support they require underwater. Annual diver certification and training programs are also conducted to maintain a high level of competence among the Institute's divers. The Rigging Shop provides for the maintenance and repair of mechanical field gear, handles heavy equipment transport to field sites, operates the field equipment stores, and services the NWRI fleet of vehicles, trailers and campers.

The Division's role of responsibility for the Institute's video studio has expanded greatly with the tremendous increase in the use of video technology by the scientific community.

This report summarizes in part the field activities of this Division during the 1985 field season.

STAFF LIST

Chief - Mr. H.B. Macdonald
Secretary - Ms. S.R. Mitchell
Administrative Officer - Mrs. C. Kennedy

Ship Survey Section

Head, Mr. P.M. Healey

Sr. Technologists:

Mr. B.H. Moore	-	OIC CSS LIMNOS
Mr. S.B. Smith	-	OIC Lake St. Clair (UGLCC), OIC CSS ADVENT
Mr. T.J. Carew	-	OIC Lac St. Louis, CSS LIMNOS Science Cruises
Mr. P.R. Youakim	-	OIC CSS BAYFIELD (Bioindex)
Mr. G.G. LaHaie	-	OIC CSS ADVENT, CSS LIMNOS Science Cruises

Technologists:

Mr. Y. Desjardins	-	OIC WAVES Tower, CSS LIMNOS Science Cruises
Mr. R.J. Hess	-	OIC CSS ADVENT Lake Erie, Lake St. Clair
Mr. J.A. Kraft	-	GLFRB Parry Sound, CSS LIMNOS Science Cruises, Sarnia
Miss C. Bisutti	-	Seconded to Water Quality National Laboratory

Field Surveys Section

Head, Mr. W.B. Taylor

Field Operations Unit

Head, Mr. M.R. Mawhinney	British Columbia, Lachine, Sudbury, Nova Scotia

Sr. Technologists:

Mr. L.E. Benner	-	CWS, CSS LIMNOS Science Cruises, Sarnia
Mr. E.H. Walker	-	Turkey Lakes, LRTAP

Technologists:

Mr. G.D. Bruce	-	Saskatchewan, Nova Scotia, 50 Mile Point, CSS LIMNOS Science Cruises
Mr. J.E. Tozer	-	CSS LIMNOS Science Cruises, Nova Scotia
Mr. K.J. Hill	-	Lake St. Clair, Nova Scotia

Rigging Unit

Foreman, Mr. L.J. Lomas

Mr. H.E. Greencorn
Mr. G.M. Perigo

Field Stores

Mr. W.D. Hunt

Underwater Operations Unit

Head, Mr. F.H. Don

Limnological Instrumentation Section

Head, Mr. J.A. Diaz

Current Meters & Data Abstraction Unit

Head, Mr. J.A. Tyler

Field Instruments & MET Systems Unit

Head, Mr. E.G. Smith

Students:

Mr. J.P. Haynes	-	CSS LIMNOS
Mr. A.K. Szitas	-	CSS LIMNOS
Mr. R.C. Ferguson	-	Shore Projects
Mr. K.V. Brown	-	Shore Projects
Miss K.L. Taylor	-	Secondment from Water Quality National Laboratory

SUPPORTED STUDIES

STUDY NO.	STUDY LEADER	STUDY
DIRECTOR'S OFFICE		
109	Sly	Habitat Studies
161	Pharo	Support to P&Y Detachment
170	Ongley	Support to W&N Detachment
ENVIRONMENTAL CONTAMINANTS DIVISION		
211	Oliver	Bioavailability of Organic Contaminants
212	Kaiser	Organics in the Great Lakes Basin
213	Oliver	Chlorinated Hydrocarbons in Great Lakes
220	Fox	L. Ont. Persistent Contaminants Transport
221	Nagy	Persistence of PAHs in Freshwater
223	Metcalfe	Aquatic Biota-Monitors of Envir.Contamin.
224	Strachan	Environmental Distrib. of Toxic Chemicals
225	Carey	Accumulation/Degradation of Organ.Contam.
230	Chau	Speciation of Alkyl Lead
233	Maguire	Fate of Amines in Aquatic Systems
234	Lum	Trace Elements-Aquatic Systems
236	Mudroch	Distribution and Availability of Metals
242	Joshi	Radioactivity and Uranium Mining
243	Platford	Partitioning Radionuclides
250	Semkin	Turkey Lakes - Acid Rain
251	Jeffries	Aquatic Response to Acid Rain
HYDRAULICS DIVISION		
320	Donelan	Air-Water Interaction
322	Coakley	Littoral Sedimentology
323	Coakley	Sediments - Toronto
324	Rukavina	Littoral/Fluvial Sediment
326	Donelan	Wave Dissipation in Shallow Water
345	Beltaos	Ice Jams and Flooding
369	Baird	Institute Equipment Manufacture, Mtnce.

STUDY NO.	STUDY LEADER	STUDY
AQUATIC ECOLOGY DIVISION		
405	Nriagu	Trace Metals Acid - Nova Scotia
406	Delorme	Climate Change - Water
413	Nriagu	Sulfur Isotopes - Acidification
414	Glooschenko	Algal Indicators of Lake Acidification
416	Bourbonniere	Origin of Organic Waters - Impact
420	Rosa	Sediment Phosphorus Regeneration L. Erie
422	Charlton	St. Lawrence River Contaminants
423	Kalas	Biological Assess. of W.Q.-Invertebrate
424	Dobson	UGLCC Data Compilation
428	Manning	Bioavailability of Phosphorus
429	Charlton	Thermocline Oxygen Dynamics
437	Murphy	Technology Transfer & Lake Restoration
438	Lean	Contaminant Nutrient Kinetics
439	Murphy	Sediment Dredging
490	Abbott	Phosphorus in Grand River Sediments
498	Painter	Cladophora - Biomonitoring Tool
AQUATIC PHYSICS & SYSTEMS DIVISION		
510	Murthy	UGLCC Connecting Channels
512	Boyce/Murthy	Circulation within Great Lakes Coast Zone
513	Murthy	Technology Transfer & Information Service
514	Murthy	Niagara River Plume
ANALYTICAL METHODS DIVISION		
610	Onuska	Determination of Nitrogen-Containing PAHs
622	Dutka	Great Lakes + UGLCC
626	Rao	Microbiology Responses
627	Rao	Biodegradation of Organic Matter
650	Aspila	IJC Quality Control
TECHNICAL OPERATIONS DIVISION		
801	Macdonald	Management & Administration
802	Taylor	Logistic Support
803	Healey	Open Lakes Surveillance
804	Taylor	Common-User Equipment Maintenance
805	Macdonald	Support to External Agencies
806	Diaz	Limnological and MET Instrumentation
807	Taylor	Underwater Operations and Remote Areas

ADDITIONAL TECHNICAL SUPPORT

As a result of study requirement reductions, additional help in the form of summer students, changes in timing of studies allowing the redeployment of technical staff and the effective utilization of O&M and overtime resources, this Division provided the additional resources required to support these new tasks and studies submitted after the 1985/1986 study plans were approved, on an if-and-whenever-possible basis:

AQUATIC ECOLOGY DIVISION

420	Rosa/Rathke	Current Meter Moorings
805	Bourbonniere	Field Support

ANALYTICAL METHODS DIVISION

405	Rao	Core Collection

ATMOSPHERIC ENVIRONMENT SERVICE

805	Kerman	Use of Tower Facility

DEPARTMENT OF FISHERIES & OCEANS

805	St. Jacques	Arctic Tide Gauge Recovery

ENVIRONMENTAL PROTECTION SERVICE

805	Dobson	5-ton to Ottawa
805	Dobson	Camper Lab
805	Wilson	Loan of Coring Equipment to Yellowknife

GREAT LAKES FISHERIES RESEARCH BOARD

805	Vallentyne	Driver for Truck to Malls

GULF OIL

805	Koenig	Drogue and Sextant Loan

HYDRAULICS DIVISION

805	Ford	Frazil Ice Recorder Removal

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

805	Schwab	Buoy Deployment

PARKS CANADA

805	Dalman	BAYFIELD and Robot Display
805	Dascoe	Vessel/Staff Support, Navy Island

TOTTEN SIMS

805	Baker	Equipment Loan

UNIVERSITY, McMASTER

805	Risk	Equipment Loan

UNIVERSITY OF TORONTO

805	Hoeniger	Equipment Loan

UNIVERSITY OF WESTERN ONTARIO

805	Green	Boat Loan

UNIVERSITY OF WINDSOR

805	Sanderson	Boat Loan to Great Lakes Institute

WATER PLANNING & MANAGEMENT

805	Clarke	Boat Tour of Niagara River
805	Cuthbert	Equipment Loan - Shaw

WATER QUALITY NATIONAL LABORATORY

805	Warry	Trailer Transport
805	Germain	Equipment Loan

SHIP PROGRAMS

CSS LIMNOS
1985

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JAN			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
FEB	27	28	29	30	31	1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
MAR	24	25	26	27	28	1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
APR	24 CCIW	25 LAKE	26 ONTARIO	27 SURVEILLANCE	28 LAKE	29 ONTARIO	30 CCIW
	31 CCIW	1 LAKE	2 ONTARIO	3 SURVEILLANCE	4 LAKE	5 ONTARIO	6 CCIW
	7 CCIW	8 CCIW	9 LAKE ONTARIO L.T.B.I.M.	10 LAKE ONTARIO L.T.B.I.M.	11 LAKE ONTARIO L.T.B.I.M.	12 CCIW	13 CCIW
	14 CCIW	15 CCIW	16 CCIW	17 CCIW	18 OPEN	19 MOUSE	20 OPEN
MAY	21 MOUSE	22 LAKE ONTARIO	23 SEDIMENT TRAP	24 MOORINGS	25 CCIW	26 CCIW	27 CCIW
	28 CCIW	29 LAKE	30 ERIE	1 SEDIMENT	2 HOMOGENITY	3 SARNIA	4 SARNIA
	5 SARNIA	6 LAKE	7 HURON	8 AND	9 GEORGIAN	10 BAY	11 UPPER
	12 LAKES	13 SURVEILLANCE	14 LAKE	15 SUPERIOR	16 SURVIELLANCE	17 LAKE	18 SUPERIOR
JUN	19 SURVEILLANCE	20 LAKE	21 SUPERIOR	22 CCIW	23 CCIW	24 CCIW	25 CCIW
	26 CCIW	27 CCIW	28 CCIW	29 CCIW	30 CCIW	31 CCIW	1 CCIW
	2 CCIW	3 LAKE ONTARIO	4 PERSISTENT	5 ORGANIC	6 CONTAMINATION	7 CCIW	8 CCIW
	9 CCIW	10 LAKE ONTARIO	11 PERSISTANT CONTAMINATION	12 CCIW	13 CCIW	14 CCIW	15 CCIW
	16 CCIW	17 LAKE ERIE	18 SEDIMENT AND	19 PHOSPHORUS	20 RESUSPENSION	21 LAKE ERIE	22 CCIW
JUL	23 CCIW	24 LAKE ONTARIO L.T.B.I.M.	25 LAKE ONTARIO L.T.B.I.M.	26 LAKE ONTARIO L.T.B.I.M.	27 LAKE ONTARIO L.T.B.I.M.	28 CCIW	29 CCIW
	30 CCIW	1 CCIW	2 LAKE ERIE	3 SEDIMENT AND	4 PHOSPHORUS	5 RESUSPENSION	6 LAKE ERIE
	7 CCIW	8 LAKE	9 ONTARIO	10 SURVEILLANCE	11 AND	12 L.T.B.I.M.	13 CCIW
	14 CCIW	15 LAKE ONTARIO	16 PERSISTENT	17 ORGANIC	18 CONTAMINATION	19 CCIW	20 CCIW
	21 CCIW	22 LAKE	23 ONTARIO	24 SEDIMENT	25 HOMOGENITY	26 CCIW	27 CCIW
AUG	28 CCIW	29 CCIW	30 CCIW	31 CCIW	1 CCIW	2 CCIW	3 CCIW
	4 CCIW	5 CCIW	6 LAKE	7 ONTARIO	8 SURVEILLANCE	9 LAKE	10 ONTARIO
	11 CCIW	12 LAKE	13 HURON	14 GEORGIAN	15 BAY	16 UPPER	17 LAKES
	18 SURVEILLANCE	19 LAKE	20 HURON	21 GEORGIAN	22 BAY	23 PORT STANLEY	24 PORT STANLEY
	25 PORT STANLEY	26 LAKE ERIE	27 SEDIMENT AND	28 PHOSPHORUS	29 RESUSPENSION	30 LAKE ERIE	31 CCIW
SEP	1 CCIW	2 CCIW	3 LAKE	4 ONTARIO	5 SURVEILLANCE	6 LAKE	7 ONTARIO
	8 CCIW	9 LAKE	10 ERIE	11 SEDIMENT AND	12 PHOSPHORUS	13 RESUSPENSION	14 LAKE ERIE
	15 CCIW	16 LAKE ONTARIO	17 PERSISTENT	18 ORGANIC	19 CONTAMINATION	20 CCIW	21 CCIW
	22 CCIW	23 CCIW	24 CCIW	25 CCIW	26 CCIW	27 CCIW	28 CCIW
OCT	29 CCIW	30 ST. LAWRENCE	1 RIVER	2 ORGANIC	3 AND	4 INORGANIC	5 CONTAMINATION
	6 ST. LAWRENCE	7 RIVER	8 ORGANIC	9 AND	10 INORGANIC	11 CONTAMINATION	12 ST. LAWRENCE
	13 RIVER	14 ORGANIC	15 AND	16 INORGANIC	17 CONTAMINATION	18 ST. LAWRENCE	19 CCIW
	20 CCIW	21 CCIW	22 LAKE ONTARIO	23 SEDIMENT TRAP	24 MOORING	25 CCIW	26 CCIW
NOV	27 CCIW	28 LAKE ONTARIO L.T.B.I.M.	29 LAKE ONTARIO L.T.B.I.M.	30 LAKE ONTARIO L.T.B.I.M.	31 CCIW	1 CCIW	2 CCIW
	3 CCIW	4 CCIW	5 CCIW	6 CCIW	7 LAKE	8 ERIE	9 SEDIMENT
	10 AND	11 PHOSPHORUS	12 REGENERATION	13 LAKE	14 ERIE	15 SEDIMENT AND	16 PHOSPHORUS
	17 REGENERATION	18 LAKE	19 ERIE	20 CCIW	21 CCIW	22 CCIW	23 CCIW
	24	25	26	27	28	29	30
DEC	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				

OPEN LAKES SURVEILLANCE

LAKE ONTARIO

TOD STUDY NO. 803, R. STEVENS, IWD-OR

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

This ongoing Program was supported during the field season by the completion of five cruises on Lake Ontario during the months of March, April, July, August and September. All cruises were organized and completed by Technical Operations Division staff for IWD-OR and were conducted from the CSS LIMNOS operated by Bayfield Laboratories for Marine Science & Surveys, DFO. The vessel was equipped with electronic bathythermograph, rosette/EBT water sampler, transmissometer, radar, Loran C positioning system and a variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during the cruises were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, ammonia, reactive silicate, major ions, alkalinity, meteorological observations and Secchi disc observations from the shaded side of the vessel.

During the March and April cruises, water samples were collected only from the 1-metre depth. Sampling depths for the remaining three cruises during July, August and September were:

Unstratified Conditions - 1 metre, 10 metres, 25 metres, bottom minus 10 metres and bottom minus 2 metres

Stratified Conditions - 1 metre, 1 metre above thermocline, mid-thermocline, 1 metre below thermocline, 10 metres above bottom and 2 metres above bottom

STATISTICS SUMMARY

SHIP CSS LIMNOS

DATES FROM March 25 TO September 7

LAKE ONTARIO

CRUISE TYPE Surveillance

N. MILES STEAMED 3438.4

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	479	Moorings Established	
EBT Casts	482	" Retrieved, Satellite	1
Rosette Casts	489	" Established	
Transmissometer Casts	478	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)	41	" Established	
Secchi Disc Observation	227	" Retrieved	
		" Serviced	
Zooplankton Hauls	34	" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	338	Primary Productivity Moorings	
Phytoplankton Samples	20		
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)	633	Cores Taken, Piston	
" " " (TP f)	1376	Cores Taken	
" " " (TP uf)	1376		
" " " (Major Ions)	1376	Grab Samples Taken	
" " " (Nutrients)	1344		
" " " ( )			
" " " ( )			
" " " ( )		Observations, Weather	147
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)	514	Solar Radiation	
" " " (POC/TPN)	694	Integrated Printout	
" " " (Seston)	56	Exotech Radiometer Boom	
" " " (TP f)	1376		
" " " (Nutrients)	1376	**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	6513
" " " ( )		Nutrients (WOB)	4920
" " " ( )		Microbiology	632
" " " ( )			

TOD 1983

On all Surveillance cruises, the Long Term Biological Index Monitoring Program in support of Great Lakes Fisheries Research Branch, PFF, was piggybacked. In support to this Program at Surveillance stations 41 and 81, additional samples were collected for: specific conductance, pH, total phosphorus filtered and unfiltered, soluble reactive phosphorus, ammonia, nitrate + nitrite, total Kjeldahl nitrogen, silica, chloride, alkalinity, chlorophyll a, particulate organic carbon, particulate organic nitrogen, phytoplankton, zooplankton and ash-free weight determinations.

On four of the five Surveillance cruises (March cruise excluded), water samples were collected for Microbiology Laboratories Section. These samples were processed onboard the vessel by MLS personnel for aerobic heterotrophs and bacterial biomass.

Some of the additional tasks supported during the Surveillance Program included: benthos coring in support of AED Study No. 428, bulk water samples in support of AMD Study No. 646, organochlorine contaminant sampling in support of IWD-OR, drogue retrieval in support of APSD Study No. 514.

LAKE HURON/GEORGIAN BAY

TOD STUDY NO. 803, MS. M. NEILSON, IWD-OR

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

Two cruises were conducted during the months of May and August in support of this Program. Both cruises were organized and completed by TOD staff for IWD-OR and were conducted from the CSS LIMNOS. The vessel was equipped with the usual scientific equipment: electronic bathythermograph, rosette/EBT water sampler, transmissometer, radar, Loran C positioning system and a variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during both cruises were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, ammonia, reactive silicate, major ions, alkalinity, meteorological observations and Secchi disc observations.

STATISTICS SUMMARY

SHIP CSS LIMNOS

DATES FROM May 6 TO August 20

LAKE HURON

CRUISE TYPE Surveillance

N. MILES STEAMED 2345.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	134	Moorings Established	
EBT Casts	134	" Retrieved	
Rosette Casts	134	" Established	
Transmissometer Casts	134	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)	10	" Established	
Secchi Disc Observation	74	" Retrieved	
		" Serviced	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	67	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (TP f)	526	Cores Taken	
" " " (TDS)	22		
" " " (Trace Metals)	20	Grab Samples Taken	
" " " (TP uf)	526		
" " " (Major Ions)	436		
" " " (Nutrients)	436		
" " " ( )		Observations, Weather	75
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)	74	Solar Radiation	
" " " (POC/TPN)	227	Integrated Printout	
" " " (Seston)		Exotech Radiometer Boom	
" " " (TP f)	526		
" " " ( )		**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	1347
" " " ( )		Nutrients (WOB)	1353
" " " ( )		Microbiology	
" " " ( )			

TOD 1983

STATISTICS SUMMARY

SHIP CSS LIMNOS

DATES FROM May 10 TO August 20 GEORGIAN BAY

CRUISE TYPE Surveillance N. MILES STEAMED 670

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	48	Moorings Established	
EBT Casts	48	" Retrieved	
Rosette Casts	48	" Established	
Transmissometer Casts	22	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)	15	" Established	
Secchi Disc Observation	14	" Retrieved	
		" Serviced	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m	24	Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (TP f)	184	Cores Taken	
" " " (TP uf)	184		
" " " (Major Ions)	184	Grab Samples Taken	
" " " (Nut.)	184		
" " " ( )			
" " " ( )			
" " " ( )		Observations, Weather	12
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)	21	Solar Radiation	
" " " (POC/TPN)	24	Integrated Printout	
" " " (Seston)		Exotech Radiometer Boom	
" " " (TP f)	184		
" " " ( )		**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	624
" " " ( )		Nutrients (WOB)	624
" " " ( )		Microbiology	
" " " ( )			

TOD 1983

During the May cruise, water samples were collected only from the 1-metre depth. Sampling depths for the August cruise were:

Unstratified Conditions - 1 metre, mid-depth if station depth was greater than 50 metres, bottom minus 10 metres and bottom minus 2 metres

Stratified Conditions - 1 metre, 2 metres above thermocline, mid-thermocline, 2 metres below thermocline, bottom minus 10 metres and bottom minus 2 metres

During the May cruise on both Lake Huron and Georgian Bay, additional water samples were collected from the 1-metre depth at selected stations. These samples were analyzed for total dissolved solids and trace metals.

LAKE SUPERIOR

TOD STUDY NO. 803, MS. M. NEILSON, IWD-OR

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

One cruise was conducted during the month of May from the CSS LIMNOS on Lake Superior. This cruise was organized and completed by TOD staff for IWD-OR. The vessel was equipped with the usual scientific equipment: electronic bathythermograph, rosette/EBT sampler, transmissometer, radar, Loran C positioning system and a variety of samplers and winches used for chemical and biological water sampling.

The parameters sampled during the cruise were: temperature profile, transmission profile, dissolved oxygen, specific conductance, pH, particulate nitrogen, total phosphorus filtered and unfiltered, soluble reactive phosphorus, total Kjeldahl nitrogen, nitrate and nitrite, ammonia, reactive silicate, alkalinity, major ions, meteorological observations and Secchi disc observations. At selected stations, additional water samples were collected for total dissolved solids and trace metals. All water samples were collected from the 1-metre depth during this cruise.

STATISTICS SUMMARY

CRUISE NO. 85-03-001 CONSECUTIVE NO. 301 SHIP CSS LIMNOS

DATES FROM May 13 TO May 19 LAKE SUPERIOR

CRUISE TYPE Surveillance N. MILES STEAMED 1198.0

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	55	Moorings Established	
EBT Casts	55	" Retrieved	
Rosette Casts	55	" Established	
Transmissometer Casts	55	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)	12	" Established	
Secchi Disc Observation	34	" Retrieved	
		" Serviced	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (TraceMetSuf)	23	Cores Taken	
" " " (TDS)	15		
" " " (TP uf)	96	Grab Samples Taken	
" " " ( )			
" " " ( )			
" " " ( )			
" " " ( )		Observations, Weather	42
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)		Solar Radiation	
" " " (POC/TPN)		Integrated Printout	
" " " (Seston)		Exotech Radiometer Boom	
" " " (TPN)	85		
" " " (TP f)	96	**ONBOARD ANALYSES**	
" " " (Trace Metals)	96		
" " " ( )		Manual Chemistry (TOD)	225
" " " ( )		Nutrients (WOB)	278
" " " ( )		Microbiology	
" " " ( )			

TOD 1983

SEDIMENT TRANSPORT & PHOSPHORUS REGENERATION IN LAKE ERIE

AED STUDY NO. 420, F. ROSA

Five Lake Erie cruises were carried out onboard CSS LIMNOS (June 17-21, July 2-6, August 26-30, September 9-14 and November 7-19) in support of this project. Two piggyback cruises were carried out onboard CSS ADVENT (August 14-16 and September 3-6) and one trip onboard CSL WHISTLER (October 9-11). On each cruise, minor meteorological observations were made every 3 hours and sediment cores were collected by divers and subsampled onboard to a depth of 30 cm. The following water chemistry profiles were collected every 6 hours and accompanied by an EBT profile to the bottom, Secchi disc observation and transmissometer profile to the bottom:

1. Integrated water samples were collected from 10 m for chlorophyll a, particulate organic carbon (POC), total phosphorus and seston weight

2. Water samples were collected from the rosette for: dissolved oxygen, conductivity, pH, chlorophyll a, particulate organic carbon, seston weight, total phosphorus (filtered and unfiltered), reactive silicate and chlorides

3. Near bottom water samples were collected at each station using the tripod water sampler (TWS) for: POC/N, chlorophyll a, TP filtered and unfiltered

4. Mid-thermocline water samples were collected using the TWS for: chlorophyll a, total phosphorus and nutrients

The following additional tasks were completed:

1. Three resuspension sediment sampler (RSS) moorings were installed

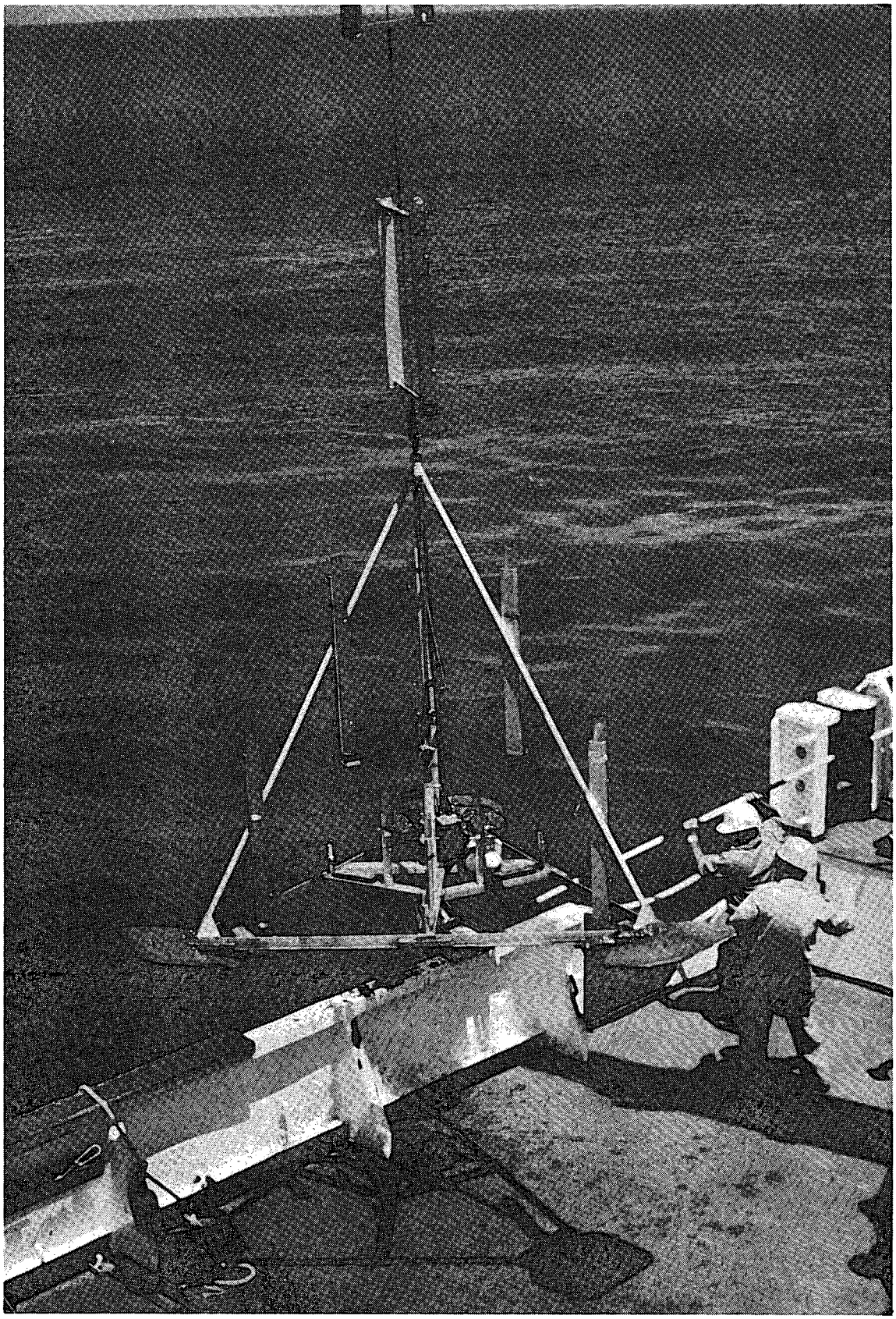
2. One sediment trap mooring was installed at station 84

3. Three peeper moorings were installed

4. One current meter mooring was installed

5. Three sediment trap/current meter moorings were installed in the Sandusky Basin

6. One RSS/current meter mooring was installed in the Sandusky Basin



TRIPOD SEDIMENT SAMPLER RETRIEVAL - LAKE ERIE

STATISTICS SUMMARY

SHIP CSS LIMNOS

DATES FROM June 17 TO November 19

LAKE ERIE

CRUISE TYPE Sediment Transport and Phosphorus Regeneration

N. MILES STEAMED 2554.9

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	84	Moorings Established, Sediment Trap	5
EBT Casts	110	" Retrieved, Sediment Trap	5
Rosette Casts	98	" Established, Sed. Trap & C.M.	5
Transmissometer Casts	110	" Retrieved, Sed. Trap & C.M.	5
Reversing Thermometer Obs.(No.ofTherm)	4	" Established, Current Meter	1
Secchi Disc Observation	35	" Retrieved, Current Meter	1
		" -Established, TWS	6
Zooplankton Hauls		" Retrieved, TWS	6
Integrator 10 m	47	" Established, RSS	11
Integrator 20 m		" Retrieved, RSS	11
Phytoplankton Samples		" Established, Peeper	3
		" Retrieved, Peeper	3
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Ph & Cond.)	170	Cores Taken, Benthos	25
" " " (TP)	120	Cores Taken, Diver	11
" " " (D.O.)	196	Grab Samples Taken	1
" " " ( )			
" " " ( )			
" " " ( )			
" " " ( )		Observations, Weather	166
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)	278	Solar Radiation	
" " " (POC/TPN)	266	Integrated Printout	
" " " (Seston)	245	Exotech Radiometer Boom	
" " " (TP)	120		
" " " (Nutrients)	33	**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	704
" " " ( )		Nutrients (WOB)	87
" " " ( )		Microbiology	
" " " ( )			

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7. Two 600L water samples were collected (1 m and bottom -1) at each station and centrifuged onboard for suspended particulate analysis

8. Peepers were installed and retrieved by TOD divers

9. TOD divers collected floculent material from the sediment/water interface

10. TOD divers recorded underwater operations using still photography

All diving operations were completed safely and effectively using three divers in rotation to minimize time spent at depth.

PERSISTENT ORGANIC CONTAMINATION

ECD STUDY NO. 220, M.E. FOX

The Niagara River Plume Survey was conducted to determine the seasonal characteristics of the Niagara River Plume in support of toxic contaminants and other related biochemical studies. The survey consisted of defining the plume extent by temperature and transmission profiles and by tracking drogues to determine movement, speed and direction of the plume. During each survey, six sediment trap moorings were installed and retrieved to collect suspended sediments. Three surveys were completed during the season: June 3 - 7, July 15 - 19, September 16 - 20.

Sampling was similar to the 1984/1985 field year. Daily drogues were tracked during daylight hours and retrieved prior to dusk. Simultaneously, the CSS LIMNOS was utilized to collect temperature and percent transmission profiles at all grid stations as well as collecting water samples from selected sites and depths.

NIAGARA RIVER GRID

STATION NUMBER	LATITUDE N.	LONGITUDE N.
246	43° 20' 32"	79° 10' 00"
247	43° 19' 32"	79° 10' 00"
248	43° 18' 32"	79° 10' 00"
249	43° 17' 32"	79° 10' 00"
250	43° 16' 32"	79° 10' 00"
251	43° 15' 32"	79° 10' 00"
252	43° 17' 00"	79° 04' 00"
253	43° 18' 00"	79° 04' 00"
254	43° 19' 00"	79° 04' 00"
255	43° 20' 00"	79° 04' 00"
256	43° 21' 00"	79° 04' 00"
257	43° 22' 00"	79° 04' 00"
258	43° 22' 40"	79° 00' 00"
259	43° 21' 40"	79° 00' 00"
260	43° 20' 40"	79° 00' 00"
261	43° 19' 40"	79° 00' 00"
262	43° 18' 40"	79° 00' 00"
263	43° 17' 40"	79° 00' 00"
276	43° 15' 12"	79° 03' 27"
601	43° 16' 00"	79° 08' 00"
602	43° 17' 00"	79° 08' 00"
603	43° 18' 00"	79° 08' 00"
604	43° 19' 00"	79° 08' 00"
605	43° 20' 00"	79° 08' 00"
606	43° 21' 00"	79° 08' 00"
607	43° 21' 30"	79° 06' 00"
608	43° 20' 30"	79° 06' 00"
609	43° 19' 30"	79° 06' 00"
610	43° 18' 30"	79° 06' 00"
611	43° 17' 30"	79° 06' 00"
612	43° 16' 30"	79° 06' 00"
613	43° 22' 20"	79° 02' 00"
614	43° 21' 20"	79° 02' 00"
615	43° 20' 20"	79° 02' 00"
616	43° 19' 20"	79° 02' 00"
617	43° 18' 20"	79° 02' 00"
618	43° 17' 20"	79° 02' 00"

SEDIMENT TRAP MOORINGS

STATION NUMBER	LATITUDE N.	LONGITUDE N.
85-00A-05	43° 17' 32"	79° 10' 00"
85-00A-06	43° 18' 45"	79° 02' 30"
85-00A-07	43° 20' 08"	78° 58' 40"
85-00A-08	43° 20' 27"	78° 55' 00"
85-00A-09	43° 20' 59"	78° 51' 30"
85-00A-10	43° 22' 21"	78° 45' 00"

STATISTICS SUMMARY

SHIP CSS LIMNOS

DATES FROM June 3 TO September 19

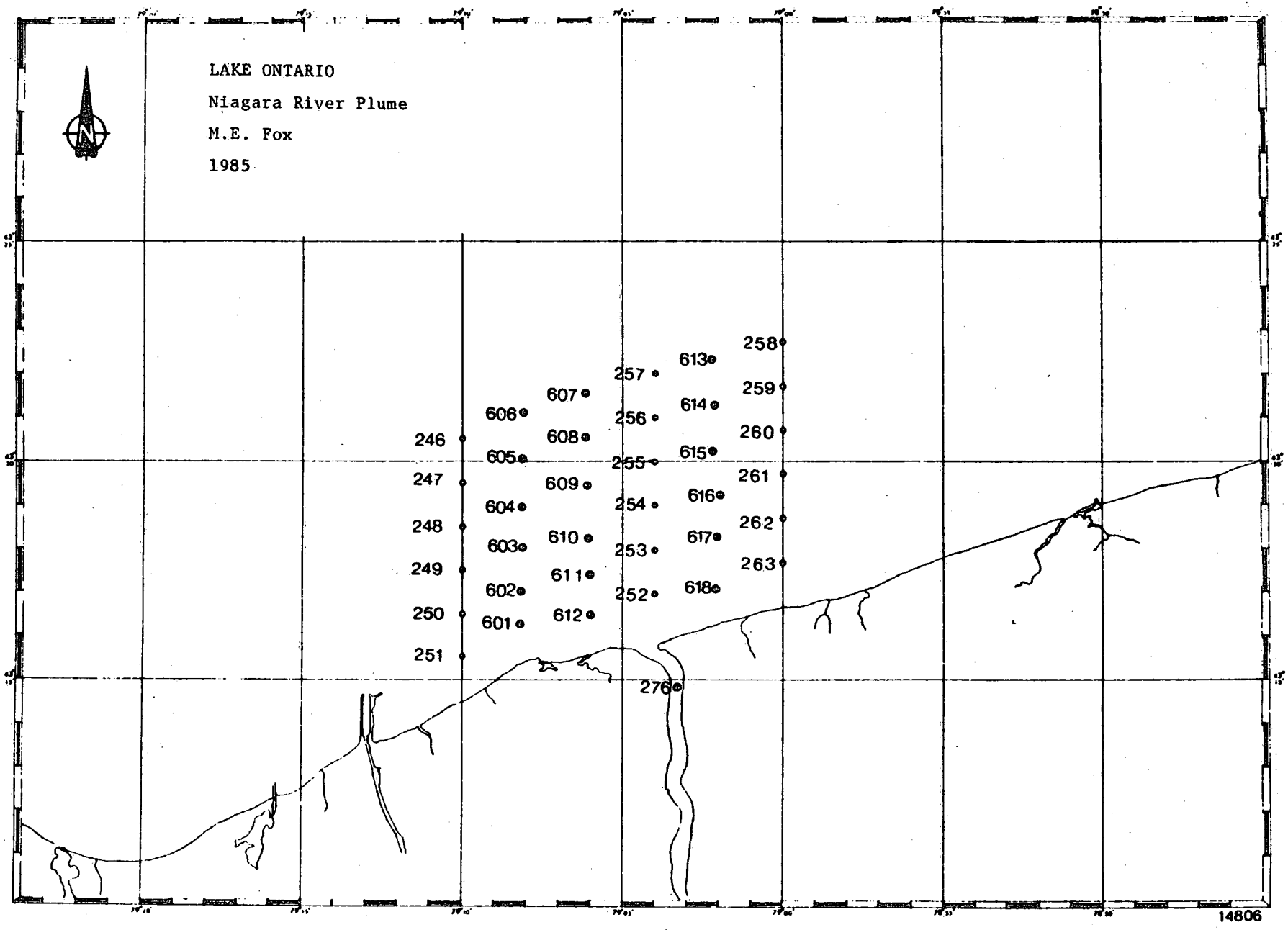
LAKE ONTARIO

CRUISE TYPE Persistent Organic Contaminants

N. MILES STEAMED 877.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	185	Moorings Established, Sediment Trap	18
EBT Casts	185	" Retrieved, Sediment Trap	18
Rosette Casts	149	" Established, Current Meter	4
Transmissometer Casts	222	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)	12	" Established	
Secchi Disc Observation	140	" Retrieved	
		" Serviced	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
		Cores Taken, Box	
		Cores Taken, Gravity	
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Cond.)	135	Cores Taken, Benthos	2
" " " (Organics)	118		
" " " ( )		Grab Samples Taken, Shipek	2
" " " ( )			
" " " ( )			
" " " ( )			
" " " ( )		Observations, Weather	
" " " ( )			
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)		Solar Radiation	
" " " (POC/TPN)		Integrated Printout	
" " " (Seston)		Exotech Radiometer Room	
" " " ( )			
" " " ( )		**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	135
" " " ( )		Nutrients (WOB)	
" " " ( )		Microbiology	
" " " ( )			

TOD 1983


LAKE ONTARIO
Niagara River Plume
M.E. Fox
1985
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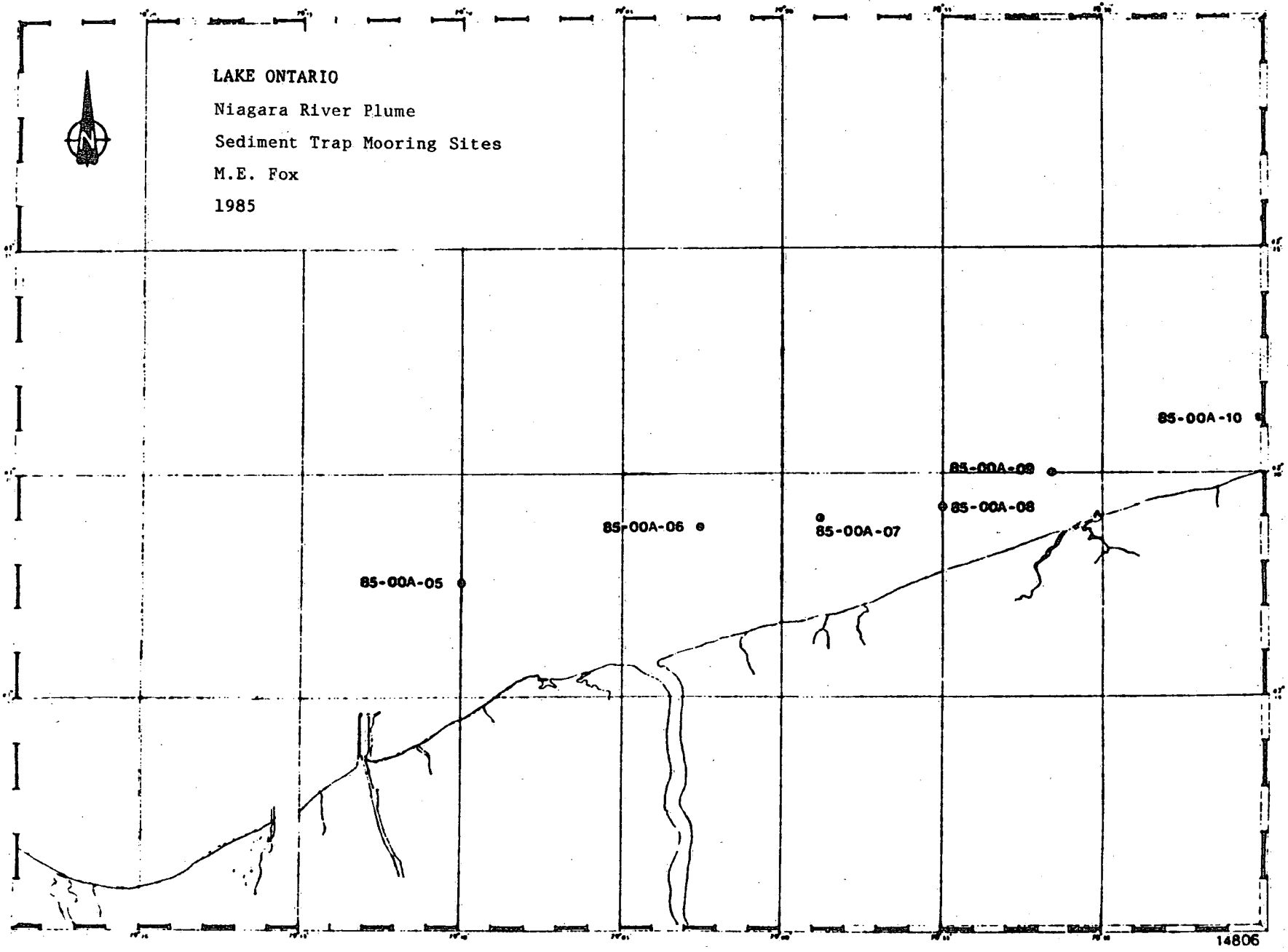

LAKE ONTARIO
Niagara River Plume
Sediment Trap Mooring Sites
M.E. Fox
1985
85-00A-10
85-00A-09
85-00A-08
85-00A-07
85-00A-06
85-00A-05
14806

ST. LAWRENCE RIVER

ORGANIC AND INORGANIC CONTAMINANTS

ECD STUDY NO. 234, DR. K. R. LUM
AED STUDY NO. 422, M.N. CHARLTON

Support to these studies consisted of one three-week cruise on the St. Lawrence River working from the Kingston Basin area to Pointe d'Alliance just below Quebec City. The purpose of the cruise was:

1. To determine the distribution, partitioning and availability of organic and inorganic contaminants in water and sediments of the St. Lawrence River from Lake Ontario to Quebec City and in the salt wedge of the upper estuary.

2. To determine the nature of nutrient contaminant interactions in the depositional zones of Lac St. François, Lac St. Louis, Lac des Deux Montagnes and Lac St. Pierre plus to carry out a preliminary survey of benthic invertebrates in the above lakes.

During the cruise, sampling was done from the CSS LIMNOS, MonArk and Boston Whaler. In water depths inaccessible to the LIMNOS, the smaller boats were utilized to collect water, sediment and centrifuged samples. During the three-week cruise, 25 stations were sampled for organic and inorganic contaminants plus trace element analysis. Eleven sediment trap moorings were installed and retrieved. At each of these major stations, an EBT/transmissometer profile was obtained. In addition, water samples were also collected from the centrifuge and sediment trap depths. Samples for volatiles, Microtox, fungi and yeast analysis were collected from 167 stations distributed between the Kingston Basin to Point d'Alliance in the estuary. At 94 stations distributed between the Kingston Basin and Trois Riviéres area, sediment samples were collected for benthic invertebrates. Benthos cores were collected from Lac St. François, Lac St. Louis, Lac Des Deux Montagnes and Lac St. Pierre. These cores were processed and stored onboard the vessel until delivered to CCIW for analysis.

The CSS LIMNOS, working together with the two small boats, proved to be an excellent method of conducting a program of this nature. The vessel allowed early morning starts and long working days for the small boats while simultaneously the ship was continuously working in close proximity. Without this type of working arrangement, a study of this magnitude could never be completed with the funds in the timeframe allotted.

STATISTICS SUMMARY

CRUISE NO. 85-07-001 CONSECUTIVE NO. 702 SHIP CSS LIMNOS

DATES FROM September 30 TO October 18 ST.. LAWRENCE RIVER

CRUISE TYPE Organic and Inorganic Contaminants N. MILES STEAMED 1086.7

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	238	Moorings Established, Sediment Trap	11
EBT Casts	64	" Retrieved, Sediment Trap	11
Rosette Casts		" Established	
Transmissometer Casts	61	" Retrieved	
Reversing Thermometer Obs.(No.ofTherm)		" Established	
Secchi Disc Observation		" Retrieved	
		" Serviced	
Zooplankton Hauls		" Serviced	
Integrator 10 m		" Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
Centrifuge Stations	32	Cores Taken, Box	
Phelex, Anion, Selenite, etc.	32	Cores Taken, Gravity	26
Water Samples Collected (Microbiology)		Cores Taken, Piston	
" " " (Radionuclides)	24	Cores Taken, Gravity (IWD, Quebec Region)	24
" " " (Volatiles)			
" " " (Fungi)		Grab Samples Taken	121
" " " (Microtox)	193		
" " " (Yeast)			
" " " (WQNL)	22		
" " " (QAMS)	300L	Observations, Weather	
" " " (Lum Bulk)	2		
" " " ( )		**CONTINUOUS OBSERVATIONS (days)**	
Water Samples Filtered (Chlorophyll)	22	Solar Radiation	
" " " (POC/TPN)	22	Integrated Printout	
" " " (Seston)	62	Exotech Radiometer Boom	
" " " (WQNL)	66		
" " " ( )		**ONBOARD ANALYSES**	
" " " ( )			
" " " ( )		Manual Chemistry (TOD)	322
" " " ( )		Nutrients (WOB)	
" " " ( )		Microbiology	
" " " ( )			

TOD 1983

ST. LAWRENCE RIVER

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
27	44° 14' 30"	76° 19' 19"	CBV
28	44° 07' 15"	76° 22' 08"	CBV
29	44° 38' 19"	75° 35' 51"	CBV
30	44° 59' 15"	74° 46' 15"	CBV
31	45° 00' 17"	74° 39' 35"	CBV
32	45° 01' 23"	74° 40' 50"	CBV
33	45° 01' 27"	74° 38' 14"	BV
34	45° 01' 39"	74° 38' 24"	BV
35	45° 01' 48"	74° 38' 32"	BV
36	45° 01' 58"	74° 38' 40"	BV
37	45° 01' 09"	74° 37' 01"	BV
38	45° 01' 14"	74° 37' 05"	BV
39	45° 01' 19"	74° 37' 11"	BV
40	45° 02' 02"	74° 36' 01"	T
41	45° 02' 39"	74° 34' 50"	CBV
42	45° 10' 36"	74° 18' 46"	BV
43	45° 10' 57"	74° 19' 06"	BV
44	45° 11' 19"	74° 19' 27"	CTBV
45	45° 11' 52"	74° 20' 00"	BV
46	45° 12' 10"	74° 11' 17"	BV
47	45° 12' 44"	74° 11' 45"	B
48	45° 13' 15"	74° 12' 16"	CTBV
49	45° 13' 54"	74° 12' 44"	B
50	45° 14' 30"	74° 13' 12"	BV
51	45° 13' 50"	74° 08' 37"	BC
52	45° 13' 45"	74° 00' 49"	B
53	45° 19' 26"	73° 54' 06"	C
54	45° 20' 14"	73° 55' 44"	CTB
55	45° 20' 10"	73° 53' 00"	TB
56	45° 22' 09"	73° 49' 35"	C
57	45° 24' 32"	73° 47' 30"	BV
58	45° 24' 38"	73° 48' 34"	B
59	45° 24' 43"	73° 49' 39"	CTBV
60	45° 24' 48"	73° 50' 37"	B
61	45° 24' 53"	73° 51' 33"	BV

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
62	45° 26' 52"	74° 03' 02"	CTBV
63	45° 26' 40"	74° 03' 50"	BV
64	45° 26' 57"	74° 03' 36"	B
65	45° 27' 14"	74° 03' 22"	BV
66	45° 24' 20"	73° 43' 44"	CBV
71	45° 41' 36"	73° 26' 42"	BV
72	45° 41' 32"	73° 26' 52"	BV
73	45° 41' 36"	73° 27' 15"	BV
73A	45° 41' 36"	73° 27' 24"	B
74	45° 41' 37"	73° 27' 32"	BV
79	45° 43' 22"	73° 25' 23"	CBV
80	45° 43' 30"	73° 25' 43"	B
81	45° 43' 44"	73° 26' 02"	B
82	45° 43' 54"	73° 26' 18"	CBV
83	46° 06' 48"	72° 56' 18"	B
85	46° 07' 09"	72° 56' 02"	CBV
87	46° 07' 31"	72° 55' 42"	B
89	46° 07' 56"	72° 55' 24"	B
90	46° 07' 14"	72° 55' 26"	B
92	46° 07' 40"	72° 55' 44"	BV
94	46° 07' 52"	72° 56' 05"	B
95	46° 07' 41"	72° 56' 56"	CTBV
97	46° 08' 38"	72° 56' 24"	B
98	46° 09' 14"	72° 57' 22"	B
100	46° 09' 37"	72° 57' 55"	B
101	46° 08' 45"	72° 52' 24"	B
102	46° 09' 36"	72° 52' 51"	B
103	46° 10' 18"	72° 53' 36"	B
104	46° 11' 21"	72° 53' 47"	CBV
105	46° 11' 40"	72° 54' 26"	B
106	46° 12' 08"	72° 54' 48"	B
107	46° 12' 36"	72° 55' 08"	B
108	46° 11' 27"	72° 48' 00"	BV
109	46° 12' 18"	72° 48' 42"	B
111	46° 14' 02"	72° 50' 24"	BV
112	46° 14' 11"	72° 45' 38"	CTBV
113	46° 13' 52"	72° 43' 18"	BV
114	46° 14' 24"	72° 43' 48"	B
115	46° 14' 53"	72° 44' 03"	BT
116	46° 15' 18"	72° 44' 40"	B

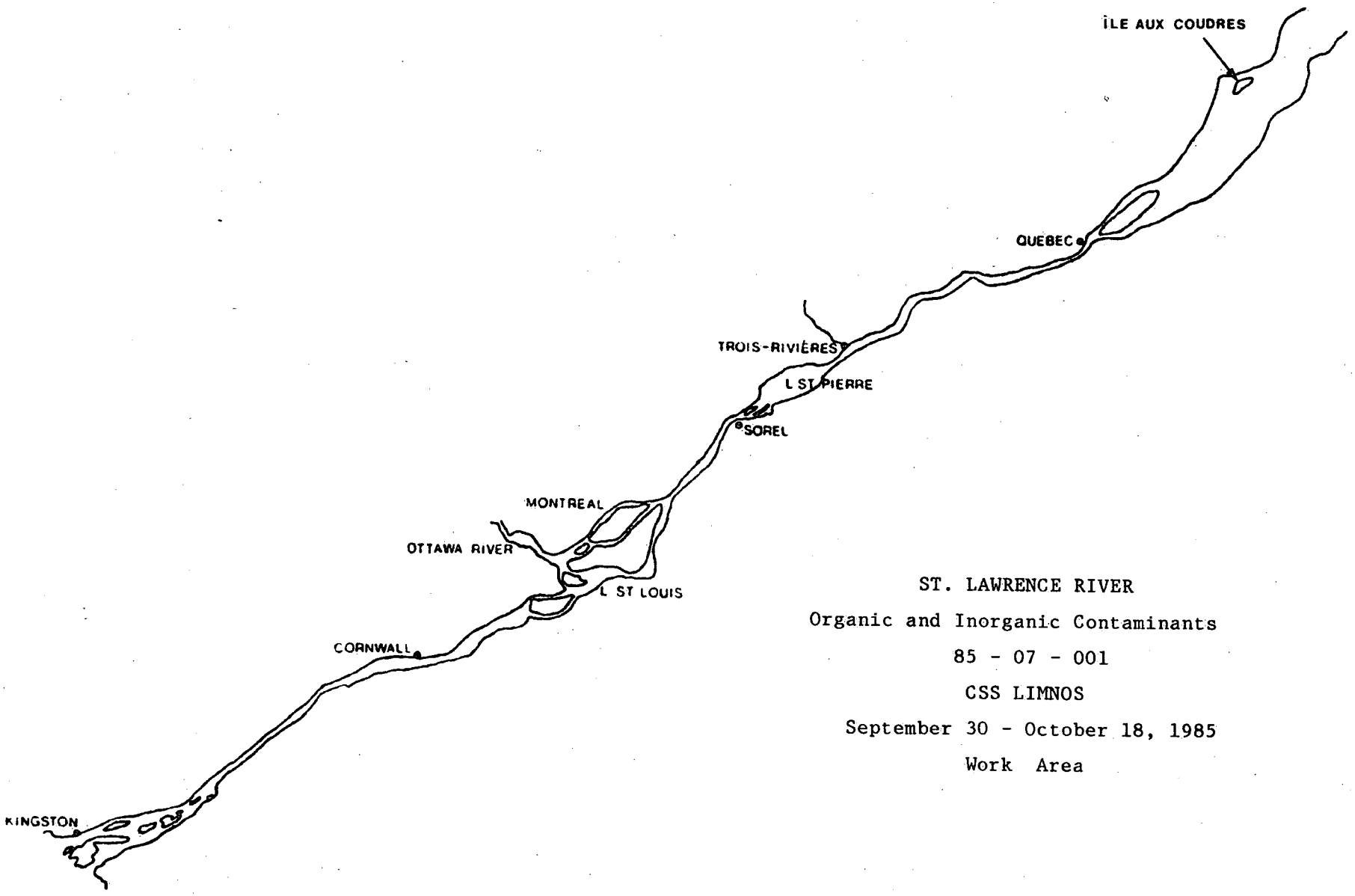
STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
117	46° 15' 48"	72° 45' 08"	BV
118	46° 15' 57"	72° 37' 50"	B
119	46° 16' 14"	72° 38' 06"	B
120	46° 16' 42"	72° 38' 06"	BT
121	46° 16' 32"	72° 38' 24"	B
122	46° 16' 42"	72° 38' 34"	B
123	46° 16' 19"	72° 37' 43"	BCV
124	46° 22' 36"	72° 28' 50"	BCV
125	46° 22' 30"	72° 27' 42"	B
126	46° 22' 50"	72° 27' 50"	B
127	46° 23' 03"	72° 27' 57"	B
128	46° 23' 13"	72° 28' 00"	B
131	44° 35' 03"	75° 41' 09"	V
132	44° 35' 18"	75° 39' 11"	V
133	44° 39' 34"	75° 34' 30"	VB
134	44° 40' 00"	75° 34' 00"	VB
135	44° 40' 36"	75° 33' 30"	VB
136	44° 42' 26"	75° 30' 57"	V
137	44° 41' 34"	75° 30' 32"	V
138	44° 41' 47"	75° 29' 56"	V
139	44° 42' 36"	75° 29' 12"	V
140	44° 42' 27"	75° 28' 48"	V
141	45° 02' 30"	74° 36' 27"	VB
142	45° 00' 05"	74° 38' 24"	V
143	44° 59' 26"	74° 41' 25"	V
144	44° 59' 19"	74° 43' 51"	V
145	44° 59' 14"	74° 44' 54"	V
146	44° 59' 11"	74° 46' 16"	V
147	44° 59' 16"	74° 46' 24"	V
148	45° 00' 10"	74° 45' 45"	V
149	45° 00' 37"	74° 44' 40"	V
150	45° 00' 57"	74° 42' 21"	V
151	45° 01' 10"	74° 41' 38"	V
152	45° 07' 26"	74° 26' 00"	B
153	45° 10' 56"	74° 22' 12"	V
154	45° 12' 24"	74° 18' 57"	V
155	45° 19' 03"	73° 53' 15"	V
156	45° 19' 02"	73° 52' 48"	BV
157	45° 24' 03"	73° 45' 08"	V
158	45° 25' 44"	73° 49' 03"	V

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
159	45° 26' 06"	73° 45' 04"	V
160	45° 26' 17"	73° 43' 27"	V
161	45° 25' 54"	73° 41' 46"	V
162	45° 24' 05"	73° 56' 06"	V
163	45° 24' 04"	73° 57' 18"	V
164	45° 31' 09"	74° 20' 06"	BV
165	45° 31' 35"	74° 20' 39"	BV
166	45° 31' 33"	74° 20' 54"	BV
167	45° 29' 54"	74° 18' 41"	BV
168	45° 28' 04"	74° 07' 28"	V
169	45° 27' 43"	74° 07' 38"	V
170	45° 29' 59"	73° 32' 45"	V
171	45° 30' 00"	73° 32' 56"	V
172	45° 30' 02"	73° 33' 04"	V
173	45° 30' 12"	73° 32' 58"	V
174	45° 30' 22"	73° 32' 58"	V
175	45° 30' 34"	73° 32' 25"	V
176	45° 30' 48"	73° 32' 50"	V
177	45° 31' 16"	73° 32' 40"	V
178	45° 31' 54"	73° 32' 27"	V
179	45° 32' 27"	73° 32' 00"	V
180	45° 32' 53"	73° 31' 38"	V
181	45° 33' 18"	73° 31' 17"	V
182	45° 33' 26"	73° 30' 20"	V
183	45° 33' 45"	73° 31' 10"	V
184	45° 34' 14"	73° 30' 51"	V
185	45° 34' 45"	73° 28' 51"	V
186	45° 34' 42"	73° 28' 40"	V
187	45° 35' 13"	73° 30' 16"	V
188	45° 36' 39"	73° 30' 22"	V
189	45° 37' 14"	73° 30' 05"	V
190	45° 37' 58"	73° 29' 25"	V
191	45° 38' 51"	73° 26' 50"	V
192	45° 39' 54"	73° 27' 51"	V
193	45° 40' 33"	73° 26' 42"	V
194	45° 41' 21"	73° 26' 37"	V
195	45° 42' 57"	73° 28' 54"	V
196	45° 42' 14"	73° 29' 14"	V
197	45° 42' 02"	73° 28' 32"	V
198	45° 43' 14"	73° 25' 39"	V

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
199	45° 42' 38"	73° 26' 00"	V
200	45° 59' 56"	73° 10' 25"	V
201	46° 00' 58"	73° 11' 02"	V
202	46° 02' 25"	73° 09' 02"	V
203	46° 02' 47"	73° 08' 35"	V
204	46° 02' 44"	73° 07' 12"	V
205	46° 02' 57"	73° 06' 54"	V
206	46° 04' 01"	73° 10' 48"	V
207	46° 05' 22"	73° 10' 00"	V
208	46° 07' 48"	73° 06' 53"	V
209	46° 09' 46"	73° 01' 04"	V
210	46° 04' 45"	72° 56' 45"	V
211	46° 04' 54"	72° 57' 58"	V
212	46° 06' 39"	72° 54' 26"	V
213	46° 07' 28"	72° 52' 46"	V
214	46° 13' 15"	72° 55' 28"	V
215	46° 15' 22"	72° 49' 34"	V
216	46° 15' 20"	72° 49' 03"	V
217	46° 15' 10"	72° 39' 09"	V
218	46° 19' 34"	72° 33' 04"	V
219	46° 20' 22"	72° 32' 22"	V
220	46° 20' 51"	72° 31' 44"	V
221	46° 21' 22"	72° 32' 18"	V
222	46° 21' 19"	72° 30' 46"	V
223	46° 21' 31"	72° 30' 51"	V
224	46° 21' 24"	72° 30' 25"	V
225	46° 22' 21"	72° 29' 32"	V
226	46° 22' 48"	72° 26' 06"	V
227	46° 24' 06"	72° 21' 30"	V
227A	46° 26' 44"	72° 16' 51"	V
228	46° 31' 14"	72° 14' 15"	V
229	46° 32' 51"	72° 11' 50"	V
230	46° 36' 32"	71° 58' 26"	V
231	46° 41' 14"	71° 52' 38"	V
232	46° 40' 04"	71° 44' 48"	V
233	46° 44' 46"	71° 20' 34"	V
234	46° 44' 32"	71° 16' 40"	V
235	46° 49' 57"	71° 09' 25"	V
236	46° 49' 55"	71° 11' 36"	V
237	46° 49' 37"	71° 12' 17"	V

STATION NUMBER	LATITUDE N.	LONGITUDE W.	TYPE
238	46° 49' 23"	71° 12' 35"	V
239	46° 49' 21"	71° 12' 47"	V
240	46° 45' 20"	71° 13' 54"	V
241	46° 47' 29"	71° 13' 27"	V
242	46° 49' 08"	71° 11' 59"	V
243	45° 58' 44"	73° 11' 32"	CV
244	45° 57' 12"	73° 12' 34"	V
245	45° 52' 08"	73° 15' 35"	V
246	45° 48' 04"	73° 19' 48"	V
247	45° 25' 35"	73° 59' 15"	V
248	45° 24' 21"	74° 00' 22"	V
249	45° 27' 18"	73° 59' 30"	V
250	45° 29' 06"	73° 57' 42"	V
SW (1-5)	46° 50' 08"	71° 09' 37"	CV
CR (1-10)	47° 09' 24"	70° 38' 39"	CV

B = Benthic Invertebrates
C = Centrifuge
T = Sediment Trap
V = Volatiles, Fungi, Yeast, Microtox



ST. LAWRENCE RIVER

Organic and Inorganic Contaminants

85 - 07 - 001

CSS LIMNOS

September 30 - October 18, 1985

Work Area

DYNAMICS OF SEDIMENT - TORONTO HARBOUR

HD STUDY NO. 323, DR. J.P. COAKLEY

The goal of this Study was to monitor and predict the transport, suspension and deposition of sediments and associated toxic elements in Toronto Harbour. The transfer of toxic substances in Toronto Harbour by wave currents is unknown in extent and rate. Information is required to assess the impact of dumped dredge spoil.

Samples of the surface sediment were collected using a Shipek sampler from the CSL SHARK and CSS LIMNOS. Sampling dates were September 23, 24 and October 28. A sample of the top 10 cm of sediment at each site was collected. After collection, a description of the sediment was logged and the samples were bagged and kept cool for transportation back to CCIW for grain size and chemical analysis. A total of 92 stations were sampled.

CSS BAYFIELD
1985

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JAN			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	1	2
FEB	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	1	2
MAR	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	1	2	3	4	5	6
APR	7	8	9	10	11	12	13
	14 CCIW	15 LAKE ONTARIO	16 L.T.B.I.M.	17 LAKE ONTARIO	18 CCIW	19 CCIW	20 CCIW
	21 CCIW	22 LAKE ONTARIO	23 L.T.B.I.M.	24 LAKE ONTARIO	25 CCIW	26 CCIW	27 CCIW
	28 CCIW	29 LAKE ONTARIO	30 L.T.B.I.M.	1 LAKE ONTARIO	2 CCIW	3 CCIW	4 CCIW
MAY	5 CCIW	6 LAKE ONTARIO	7 L.T.B.I.M.	8 LAKE ONTARIO	9 CCIW	10 CCIW	11 CCIW
	12 CCIW	13 LAKE ONTARIO	14 L.T.B.I.M.	15 LAKE ONTARIO	16 CCIW	17 CCIW	18 CCIW
	19 CCIW	20 CCIW	21 LAKE ONTARIO	22 L.T.B.I.M.	23 LAKE ONTARIO	24 CCIW	25 CCIW
	26 CCIW	27 LAKE ONTARIO	28 LONG TERM BIOLOGICAL	29 INDEX MONITORING	30 LAKE ONTARIO	31 CCIW	1 CCIW
JUN	2 CCIW	3 LAKE ONTARIO	4 NIAGARA RIVER PLUME	5 TEMPERATURE SURVEY	6 LAKE ONTARIO	7 L.T.B.I.M.	8 LAKE ONTARIO
	9 CCIW	10 LAKE ONTARIO	11 L.T.B.I.M.	12 LAKE ONTARIO	13 CCIW	14 CCIW	15 CCIW
	16 CCIW	17 LAKE ONTARIO	18 L.T.B.I.M.	19 LAKE ONTARIO	20 CCIW	21 CCIW	22 CCIW
	23 CCIW	24 CCIW	25 CCIW	26 CCIW	27 CCIW	28 CCIW	29 CCIW
	30 CCIW	1 CCIW	2 LAKE ONTARIO	3 L.T.B.I.M.	4 LAKE ONTARIO	5 CCIW	6 CCIW
JUL	7 CCIW	8 CCIW	9 CCIW	10 CCIW	11 CCIW	12 CCIW	13 CCIW
	14 CCIW	15 LAKE ONTARIO	16 L.T.B.I.M.	17 LAKE ONTARIO	18 CCIW	19 CCIW	20 CCIW
	21 CCIW	22 LAKE ONTARIO	23 L.T.B.I.M.	24 LAKE ONTARIO	25 CCIW	26 CCIW	27 CCIW
	28 CCIW	29 LAKE ONTARIO	30 L.T.B.I.M.	31 LAKE ONTARIO	1 CCIW	2 CCIW	3 CCIW
AUG	4 CCIW	5 CCIW	6 CCIW	7 CCIW	8 CCIW	9 CCIW	10 CCIW
	11 CCIW	12 LAKE ONTARIO	13 L.T.B.I.M.	14 LAKE ONTARIO	15 CCIW	16 CCIW	17 CCIW
	18 CCIW	19 LAKE ONTARIO	20 L.T.B.I.M.	21 LAKE ONTARIO	22 CCIW	23 CCIW	24 CCIW
	25 CCIW	26 LAKE ONTARIO	27 L.T.B.I.M.	28 LAKE ONTARIO	29 CCIW	30 CCIW	31 CCIW
SEP	1 CCIW	2 CCIW	3 CCIW	4 CCIW	5 CCIW	6 CCIW	7 CCIW
	8 CCIW	9 LAKE ONTARIO	10 L.T.B.I.M.	11 LAKE ONTARIO	12 CCIW	13 CCIW	14 CCIW
	15 CCIW	16 LAKE ONTARIO	17 L.T.B.I.M.	18 LAKE ONTARIO	19 CCIW	20 CCIW	21 CCIW
	22 CCIW	23 LAKE ONTARIO	24 L.T.B.I.M.	25 LAKE ONTARIO	26 CCIW	27 CCIW	28 CCIW
	29 CCIW	30 LAKE ONTARIO	1 L.T.B.I.M.	2 LAKE ONTARIO	3 CCIW	4 CCIW	5 CCIW
OCT	6 CCIW	7 LAKE ONTARIO	8 L.T.B.I.M.	9 LAKE ONTARIO	10 CCIW	11 CCIW	12 CCIW
	13 CCIW	14 CCIW	15 LAKE ONTARIO	16 L.T.B.I.M.	17 LAKE ONTARIO	18 CCIW	19 CCIW
	20 CCIW	21 LAKE ONTARIO	22 L.T.B.I.M.	23 LAKE ONTARIO	24 CCIW	25 CCIW	26 CCIW
	27	28	29	30	31	1	2
NOV	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
DEC	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				

CSS BAYFIELD

LONG TERM BIOLOGICAL INDEX MONITORING

TOD STUDY NO. 803, D.M. WHITTLE, DR. J.O. JOHANNSSON, GLFRB

Twenty-five cruises were completed by the research vessel, CSS BAYFIELD on Lake Ontario. Twenty-four cruises were in support of Long Term Biological Index Monitoring (Bioindex) and one cruise was in support of the NWRI Niagara River Plume-Temperature Survey.

There was a total of 29 Bioindex cruises on Lake Ontario during 1985. CSS BAYFIELD was utilized for 24 of these cruises and CSS LIMNOS for the remainder.

The purpose of the Bioindex Program was to provide time intensive chemical and biological data on selected stations in Lake Ontario for the long-term monitoring of the biological community and chemical-physical environment. Therefore, chemical and biological data were collected simultaneously at two selected stations in Lake Ontario on a weekly basis. The Program continued from mid-April until the end of October. The final cruise (the last week of October) was carried out onboard the CSS LIMNOS. During the weeks of June 24, July 8, August 6 and September 3, the Bioindex Program was combined with the Lake Ontario Open Lakes Surveillance onboard the CSS LIMNOS.

Since temporal variability is of much greater significance than spatial variability for most areas of concern, it is important to establish more precisely the seasonal trends of those parameters. GLFRB initiated this prolonged study in 1981 to investigate this situation with the objective of determining an optimum sampling strategy over the next few years.

The two major Bioindex stations--41 and 81, were sampled for biological and chemical data. The biological work included the collection of integrated water samples and of temperature-related specified depth samples for phytoplankton, chlorophyll a, particulate organic carbon, particulate organic nitrogen, ash-free weight and the collection of zooplankton net hauls from every station. Once or twice a month, mysis net casts were obtained after complete darkness from station 41. The chemical parameters included the basic manual lab work of dissolved oxygen measurement, pH and conductivity and the processing of water samples for water quality analyses. Water samples were processed for major ions, nutrients and total phosphorus, filtered and unfiltered.

Additional work by the CSS BAYFIELD included the support of many different projects originating from the Department of Environment or the Department of Fisheries & Oceans. This support can be summarized under the following points:

1. Picoplankton and in situ toxicity studies were carried out to assess the effects of stress from sediment associated toxic substances on algal metabolism, especially picoplankton and ultraplankton. GLFRB Project 042: Bioassessment of Sediment Associated Contaminants - Station 41. Integrated water samples were usually obtained twice (on the upbound and downbound trips) from station 41 in support of this Study

2. Two meteorological buoys--02A and 03A off Niagara-on-the-Lake were regularly serviced - APSD Study No. 512

3. AMD Study No. 626, Microbiology Responses: Samples were collected from both stations 41 and 81 in support of this Study. Samples were processed onboard and delivered to CCIW, Microbiology Laboratories every week

4. Additional stations 81A, 41A and 63 were visited to collect mysis samples during a number of Bioindex cruises

5. Niagara River Plume Temperature Survey June 3 - 6: In support of APSD Study No. 514, a grid of stations on 3 different transects was surveyed in the Niagara-on-the-Lake area. All positioning was conducted using a mini-ranger system and the ship's radar

6. In support of AMD Study No. 650, large carboys of water samples were collected for chemical lab analyses

7. Benthic sampling: From both stations 41 and 81A, sediment samples were collected for Mr. R. Dermott, GLFRB, PFF Project 099

8. Zooplankton net calibrations in support of the Bioindex Program were carried out approximately once a month

9. ECD Study No. 220: Water, zooplankton and sediment samples were collected in August in support of this Study

10. Retrieval of satellite-tracked drogue in support of APSD co-operative studies

11. Participation in a number of Open House activities as required throughout the season. This was highlighted by participating in National Parks Centennial Celebrations at Toronto's Harbourfront during the period July 11 to 14

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE N.
41	43° 43' 00"	78° 01' 36"
81	44° 01' 00"	76° 40' 81"

BIOINDEX SAMPLING

Unstratified Conditions

	Phyto	TP(uf)	TP(f)	NUT	MI	ChlA	PON/POC	SS	pH	Cond	DO_2
0-20(Int.)	**	*	*	*	*	**	**	**	**	**	
1 m		*	*	*	*				*	*	*
10 m									**	**	**
25 m		*	*	*	*	**		**	**	**	**
Stn 41 Bottom-10 m Stn 81 Bottom- 2 m		*	*	*	*	**		**	**	**	**

Stratified Conditions

	Phyto	TP(uf)	TP(f)	NUT	MI	ChlA	PON/POC	SS	pH	Cond	DO_2
0-1 m above Thermocline(Int.)	**	*	*	*	*	**	**	**	**	**	
1 m		*	*	*	*				*	*	*
Mid-Epi									**	**	**
Thermocline+1 m		*	*	*	*	**		**	**	**	**
Stn 41 Bottom-10 m Stn 81 Bottom- 2 m		*	*	*	*	**		**	**	**	**

* single sample
** duplicate sample
Note: ChlA duplicates are for both GF/C and Millipore filters

MICROBIOLOGY RESPONSES

AMD STUDY NO. 626, DR. S.S. RAO

STUDY GOAL

To define temporal and spacial distributions of Microbial Biomass in Lake Ontario and to develop a Bioindex Parameter for Surveillance (Lake Ontario Task Force).

PERFORMANCE INDICATORS

To perform analyses and to collect data from 22 weekly sampling cruises at 2 (two) Lake Ontario stations (stations 41 and 81) and 3 (three) Surveillance cruises.

At each station, water samples were collected for microbiological analyses from the following sampling depths:

Unstratified Conditions

Station 41 - 25 metres and bottom -10 metres
Station 81 - 25 metres and bottom -2 metres

Stratified Conditions

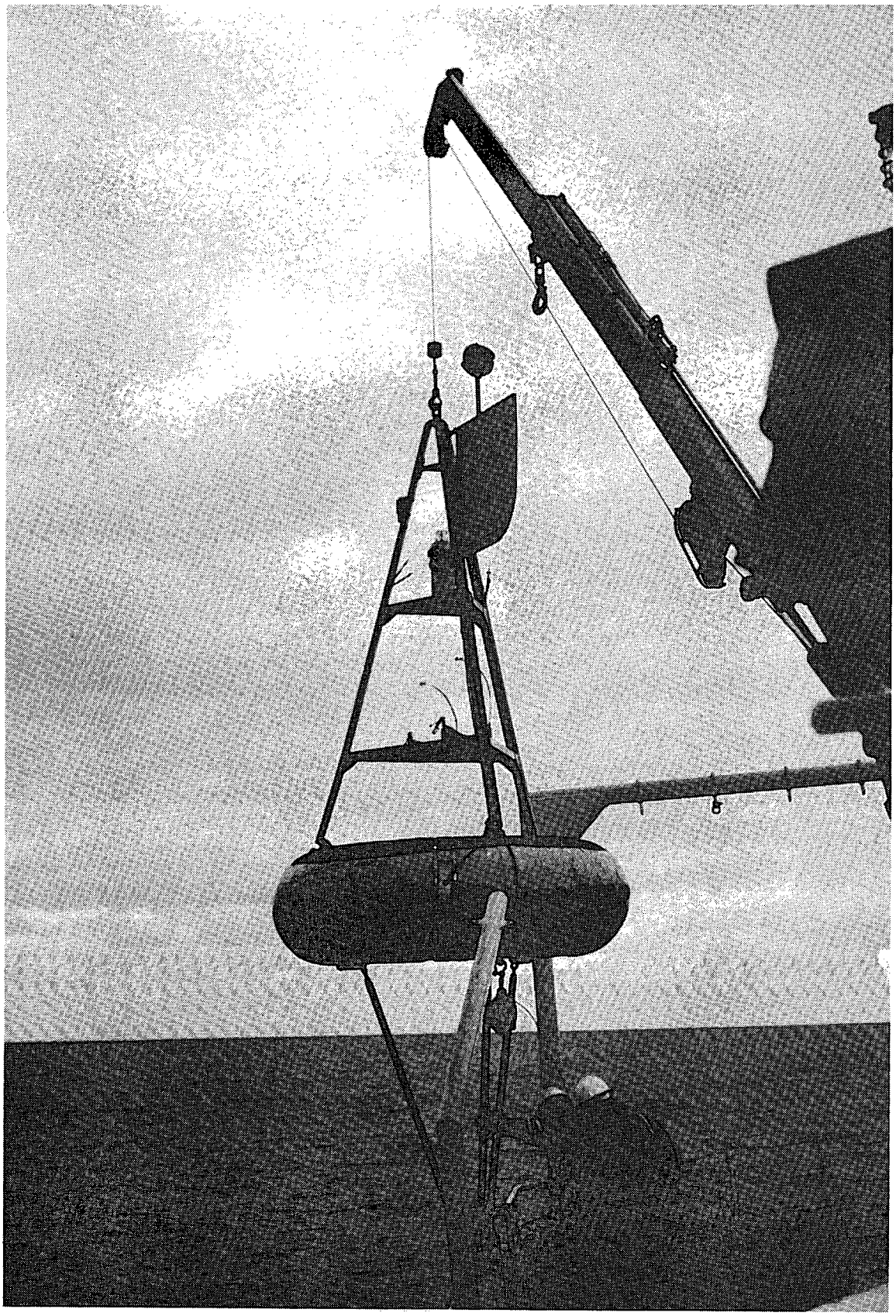
Station 41 - 1 metre below the thermocline and bottom -10 metres
Station 81 - 1 metre below the thermocline and bottom -2 metres

In addition, a 1-metre (surface) sample was obtained.

From each depth, a 500 ml sample was collected in the supplied sterile bottles from the rosette water sampler. A 10 ml aliquot was pipetted from each 500 ml sample into a pretreated screw-cap test tube. These samples were then incubated in the dark at room temperature for 20 minutes. After the 20-minute incubation period, 0.1 ml of 37% formaldehyde was added to the samples and shaken. Both the 10 ml test tube samples and the 500 ml samples were refrigerated until delivered back to Microbiology Laboratories, CCIW for analysis.

CSS ADVENT
1985

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
JAN			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	1	2
FEB	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	1	2
MAR	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	1	2	3	4	5	6
APR	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	1	2	3	4
MAY	5	6 ST. LAWRENCE	7 RIVER	8 DISSOLVED	9 AND PARTICULATE	10 TRACE	11 ELEMENTS
	12 DISSOLVED	13 AND PARTICULATE	14 TRACE	15 ELEMENTS	16 ST. LAWRENCE	17 RIVER	18
	19	20	21 LAKE	22 ST. CLAIR	23 UPPER	24 GREAT	25 LAKES
	26 CONNECTING	27 CHANNELS	28 U.O.L.C.C.	29 LAKE	30 ST. CLAIR	31 U.O.L.C.C.	1 UPPER
JUN	2 GREAT	3 LAKES	4 CONNECTING	5 CHANNELS	6 LAKE	7 ST. CLAIR	8
	9	10 LAKE	11 ERIE	12 SURVEILLANCE	13 LAKE	14 ERIE	15
	16	17	18	19	20	21	22
	23	24 L. ST. CLAIR	25 U.O.L.C.C.	26 U.O.L.C.C.	27 L. ST. CLAIR	28	29
	30	1	2 LAKE ERIE	3 SURVEILLANCE	4 LAKE ERIE	5	6
JUL	7	8 LAKE	9 ST. CLAIR	10 U.O.L.C.C.	11 UPPER	12 GREAT	13 LAKES
	14 CONNECTING	15 CHANNELS	16 U.O.L.C.C.	17 LAKE	18 ST. CLAIR	19	20
	21	22	23 LAKE ERIE	24 SURVEILLANCE	25 SURVEILLANCE	26 LAKE ERIE	27
	28	29 LAKE	30 ST. CLAIR	31 U.O.L.C.C.	1 UPPER	2 GREAT	3 LAKES
AUG	4 CONNECTING	5 CHANNELS	6 LAKE	7 ST. CLAIR	8 LAKE	9 ERIE	10 SURVEILLANCE
	11 LAKE ERIE	12 SURVEILLANCE	13 LAKE	14 ERIE	15 SURVEILLANCE	16 LAKE	17 ERIE
	18	19 LAKE	20 ST. CLAIR	21 U.O.L.C.C.	22 UPPER	23 GREAT	24 LAKES
	25 CONNECTING	26 CHANNELS	27 U.O.L.C.C.	28 LAKE	29 ST. CLAIR	30	31
SEP	1	2	3 LAKE ERIE	4 SURVEILLANCE	5 SURVEILLANCE	6 LAKE ERIE	7
	8	9 LAKE	10 ST. CLAIR	11 U.O.L.C.C.	12 UPPER	13 GREAT	14 LAKES
	15 CONNECTING	16 CHANNELS	17 U.O.L.C.C.	18 LAKE	19 ST. CLAIR	20 U.O.L.C.C.	21 UPPER
	22 GREAT	23 LAKES	24 CONNECTING	25 CHANNELS	26 LAKE	27 ST. CLAIR	28
	29	30	1	2 LAKE ERIE	3 BIOAVAILABILITY OF PHOSPHORUS	4 LAKE ERIE	5
OCT	6	7	8 L. ST. CLAIR	9 U.O.L.C.C.	10 U.O.L.C.C.	11 L. ST. CLAIR	12
	13	14	15 L. ST. CLAIR	16 U.O.L.C.C.	17 U.O.L.C.C.	18 L. ST. CLAIR	19
	20	21 L. ST. CLAIR	22 U.O.L.C.C.	23 L. ST. CLAIR	24 U.O.L.C.C.	25 L. ST. CLAIR	26
	27	28 LAKE	29 ST. CLAIR	30 U.O.L.C.C.	31 UPPER	1 GREAT	2 LAKES
NOV	3 CONNECTING	4 CHANNELS	5 LAKE	6 ST. CLAIR	7 U.O.L.C.C.	8 U.O.L.C.C.	9 LAKE
	10 ST. CLAIR	11 UPPER	12 GREAT	13 LAKES	14 CONNECTING	15 CHANNELS	16 U.O.L.C.C.
	17 LAKE	18 ST. CLAIR	19 ST. CLAIR	20 RIVER	21 CORING SURVEY	22 ST. CLAIR RIVER	23 CORING SURVEY
	24 ST. CLAIR	25 RIVER	26 L. ST. CLAIR	27 U.O.L.C.C.	28 U.O.L.C.C.	29 L. ST. CLAIR	30
DEC	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				



MET BUOY RETRIEVAL - LAKE ST. CLAIR

LAKE ST. CLAIR

UPPER GREAT LAKES CONNECTING CHANNELS

As the Upper Great Lakes Connecting Channels has been delegated a Class "A" area of concern both from toxic contaminants and eutrophication, several studies were incorporated into one Work Plan to provide information on contaminant sources and sinks and historical loading patterns and also to help develop a better understanding of factors and chemical properties which control environmental distributions.

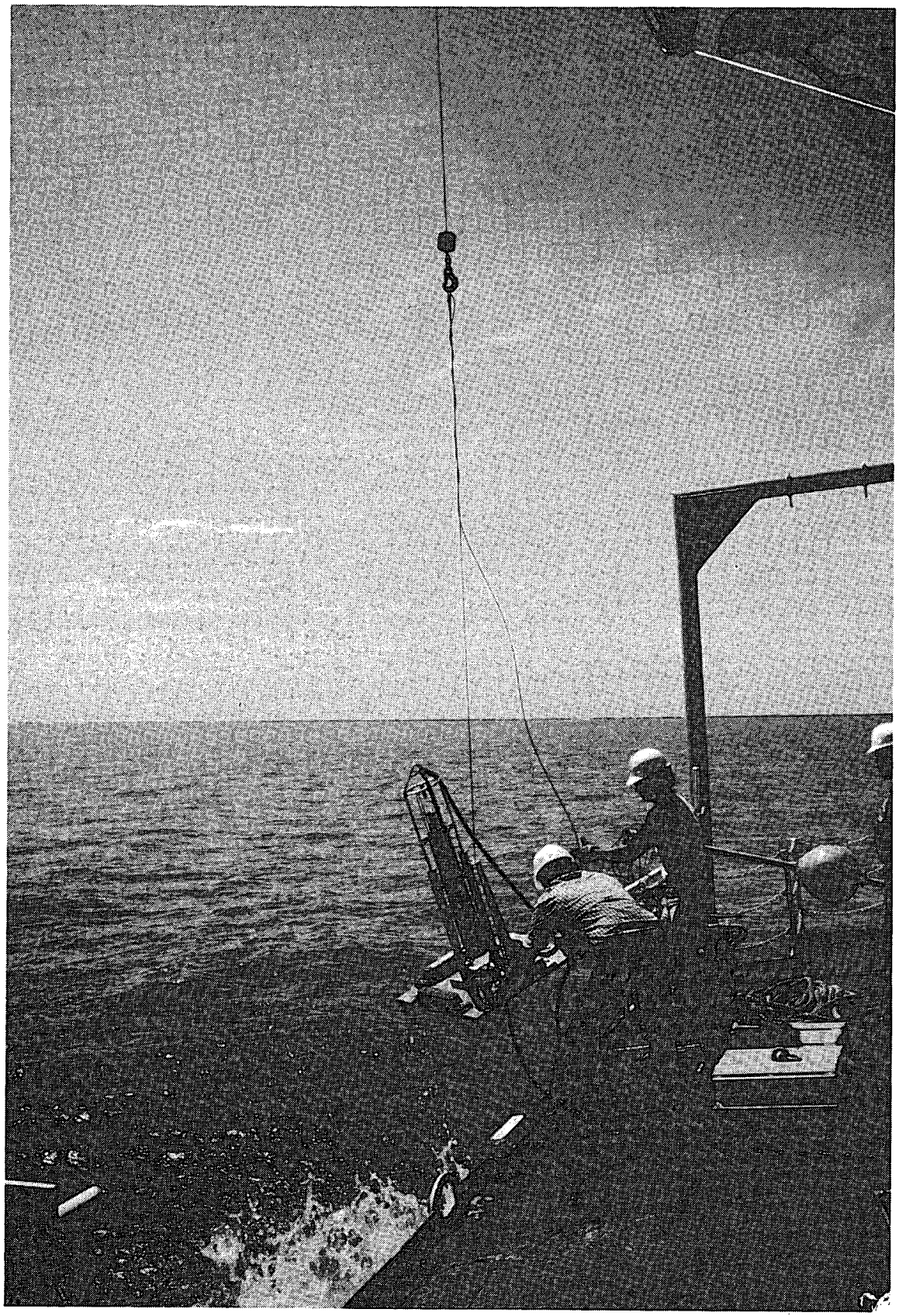
Aquatic Physics and Systems Division Study No. 510 and Aquatic Ecology Division studies 424 and 428 were incorporated into this Work Plan utilizing the CSS ADVENT and the CSL HERON. They were used to measure circulation patterns in Lake St. Clair, to estimate the water quality effects of various water models on the lake and to develop a sediment distribution map and the historical loading pattern of the lake. Information concerning the importance of the long range transport of toxic organics and trends in water quality parameters was collected. Sediment cores were also taken for non-appetite inorganic phosphorus and iron analysis.

APSD STUDY NO. 510, DR. C.R. MURTHY

This Study was to measure the circulation patterns for the lake to enable estimates of the effects of various water models entering the lake. This was done through the use of meteorological systems, current meters, tide gauges, CATTS systems, Kenney and re-suspension samplers, drogues, wave and tide recorders and EBT and transmissometer surveys.

A total of four meteorological buoys were moored in the lake--moorings 85-04M-01 to 85-04M-04. Moorings 85-04M-01 through 85-04M-03 were instrumented on May 22 and were run continuously until November 6 with the exception of Mooring 85-04M-01 which was not removed until December 5. These moorings were all instrumented with the conventional meteorological systems. Mooring 85-04M-04 was instrumented with a MET II system which records on tape but also transmits to satellite, making data available instantly at CCIW, Burlington. The MET II system was instrumented on June 4 and removed on December 4.

Moorings 85-04M-01 and 85-04M-04 were left in until December to help support Hydraulics Division Study No. 326. Damage to both systems was found due to high wind and sea conditions as well as icing conditions. Mooring 85-04M-04--the MET II system, was found damaged with the data box flooded. This damage appears to have been done on



BOTTOM-MOUNTED NEIL BROWN CURRENT METER - LAKE ST. CLAIR

November 28 when high winds (in excess of 75 kph) were evident. After retrieving Mooring 85-04M-01 on December 5 and finding this mooring completely upside-down and coated with 2 to 5 cm of ice but still working, it was assumed that the moorings had both iced up with spray and been blown over in the strong winds. Mooring 85-04M-01 did not turn over until December 2 at which time Mooring 85-04M-04 was probably turned back to its original upright position and accumulated more ice.

A total of twelve current meter moorings were also launched and serviced. Nine new type Neil Brown current meters were placed in the lake in early June--moorings 85-04C-14 to 85-04C-22. These moorings were in place until removal in early November. Data return on the instruments appears to be in excess of 90% good data. A tenth Neil Brown current meter was launched in mid-October to support this Study as well as HD Study No. 326. Two Geodyne current meters--moorings 85-04C-40 and 85-04C-41, were launched near sediment traps 85-04A-13 and 85-04A-12, respectively. All current meters were bottom-mounted.

Six water level or tide gauge moorings were deployed around the perimeter of the lake--moorings 85-04P-29 to 85-04P-32, 85-04P-38 and 85-04P-39. Three moorings were equipped with Applied Microsystems meters while the other three were equipped with Aanderaa meters on loan from the Tides and Water Levels Section, BLMSS, DFO.

Two current and temperature system (CATS) moorings and one M-CATS mooring were also launched in the lake. Mooring 85-04S-23--a CATS mooring, was in place from late May until mid-November. The second CATS system--Mooring 85-04S-52 and the M-CATS Mooring 85-04S-51 were launched in early September to co-ordinate with the intensive sampling period during the month of September. These two moorings were removed in mid-October.

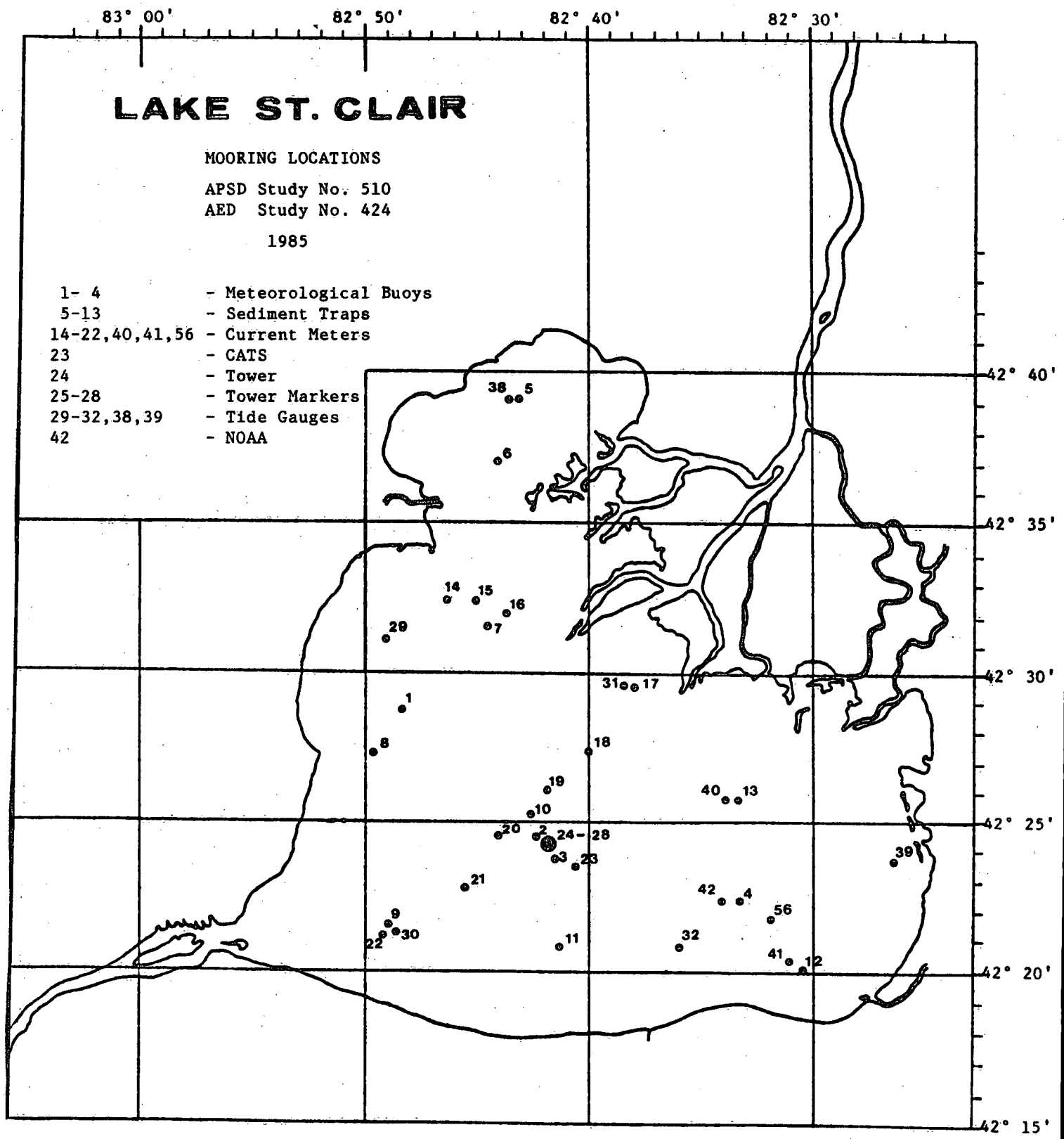
A 10 m tower--Mooring 85-04R-24, was erected in late May with Technical Operations dive support. This tower was mounted with a rack to hold a Sea-Data wave and tide recorder. The rack enabled the recorder to be serviced without diver support. During the intensive sampling period in September, a Kenney sampler was also mounted on the tower. This sampler was serviced when weather permitted on approximately a one-week average.

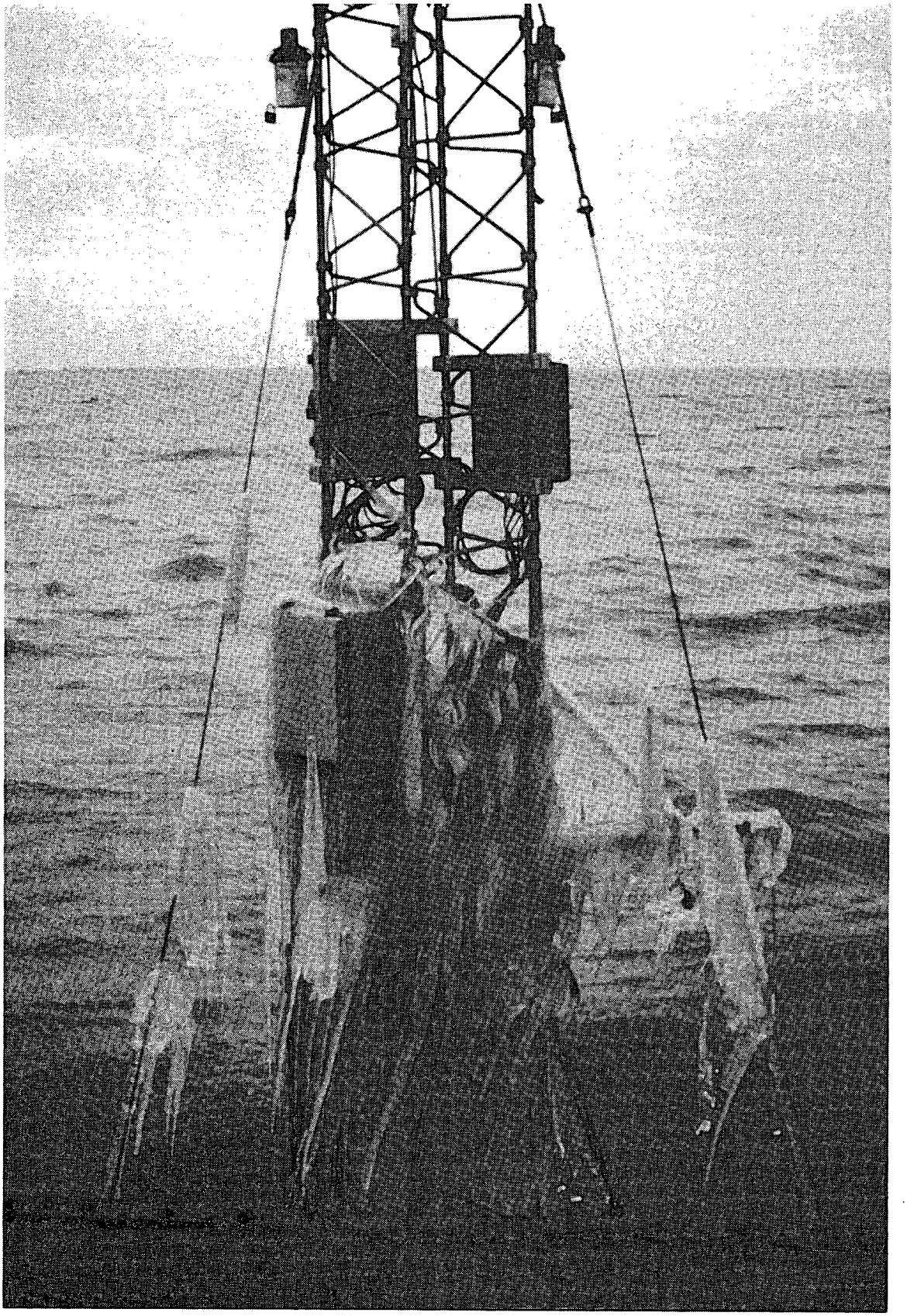
An underwater sampling system or Bedford sampler was also mounted on the tower during the September intensive period. This system was installed and maintained by personnel from Ohio State University on contract to Aquatic Physics & Systems Division.

MOORING POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
85-04M-01	42° 28' 45"	82° 48' 14"
85-04M-02	42° 24' 35"	82° 42' 11"
85-04M-03	42° 23' 57"	82° 41' 33"
85-04M-04	42° 23' 31"	82° 33' 20"
85-04A-05	42° 39' 12"	82° 43' 00"
85-04A-06	42° 37' 10"	82° 44' 00"
85-04A-07	42° 31' 47"	82° 44' 13"
85-04A-08	42° 27' 22"	82° 49' 33"
85-04A-09	42° 21' 36"	82° 49' 04"
85-04A-10	42° 25' 15"	82° 42' 32"
85-04A-11	42° 20' 48"	82° 41' 26"
85-04A-12	42° 20' 18"	82° 30' 23"
85-04A-13	42° 25' 50"	82° 33' 13"
85-04C-14	42° 32' 41"	82° 46' 15"
85-04C-15	42° 32' 36"	82° 44' 57"
85-04C-16	42° 32' 12"	82° 43' 44"
85-04C-17	42° 29' 46"	82° 38' 01"
85-04C-18	42° 27' 27"	82° 40' 00"
85-04C-19	42° 26' 10"	82° 41' 59"
85-04C-20	42° 24' 45"	82° 43' 56"
85-04C-21	42° 22' 50"	82° 45' 38"
85-04C-22	42° 21' 19"	82° 48' 57"
85-04S-23	42° 23' 29"	82° 40' 43"
85-04R-24	42° 24' 17"	82° 41' 49"
85-04S-25	42° 24' 16"	82° 41' 49"
85-04S-26	42° 24' 17"	82° 41' 50"
85-04S-27	42° 24' 18"	82° 41' 49"
85-04S-28	42° 24' 17"	82° 41' 48"
85-04P-29	42° 31' 13"	82° 48' 59"
85-04P-30	42° 21' 17"	82° 48' 46"
85-04P-31	42° 20' 39"	82° 35' 57"
85-04P-32	42° 24' 46"	82° 38' 15"
85-04P-38	42° 39' 04"	82° 43' 07"
85-04P-39	42° 23' 59"	82° 26' 26"
85-04C-40	42° 25' 45"	82° 33' 23"

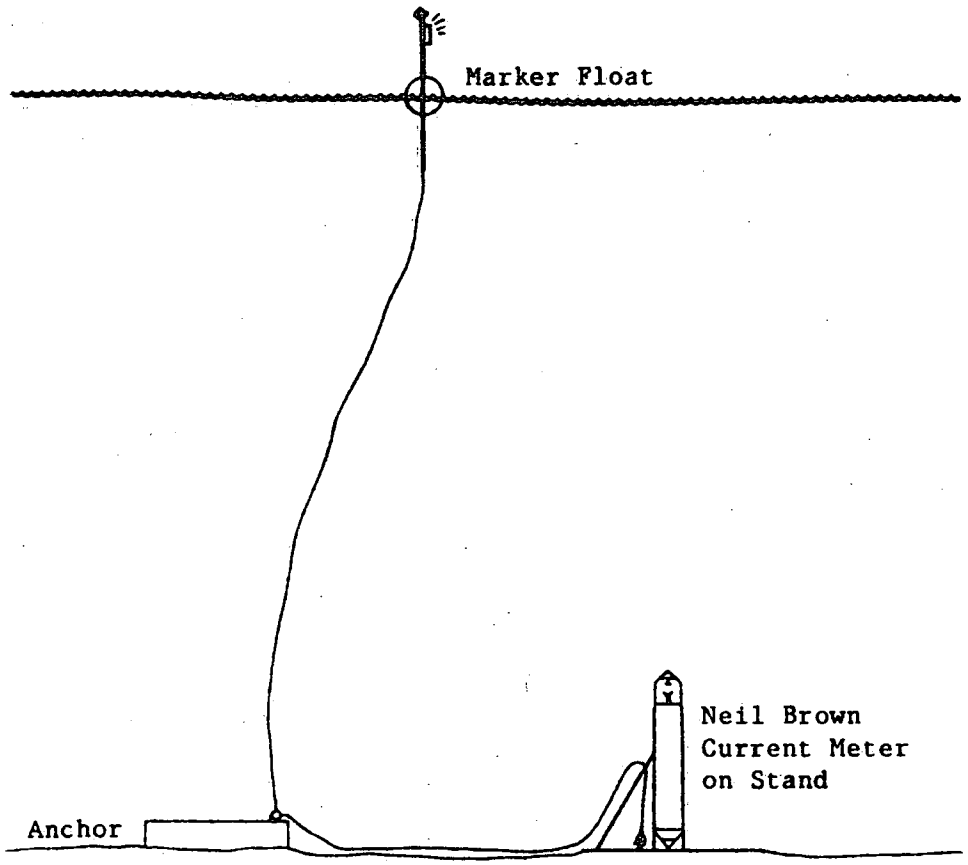
STATION NUMBER	LATITUDE N.	LONGITUDE W.
85-04C-41	42° 20' 25"	82° 30' 32"
85-04S-42	42° 23' 25"	82° 34' 05"
85-04R-43	42° 23' 10"	82° 34' 45"
85-04R-44	42° 25' 11"	82° 40' 25"
85-04R-45	42° 20' 10"	82° 33' 09"
85-04R-46	42° 20' 25"	82° 26' 30"
85-04R-47	42° 21' 09"	82° 28' 52"
85-04R-48	42° 22' 04"	82° 31' 50"
85-04S-49	42° 31' 32"	82° 44' 26"
85-04S-50	42° 24' 33"	82° 41' 45"
85-04S-51	42° 24' 11"	82° 41' 34"
85-04S-52	42° 24' 08"	82° 41' 45"
85-04A-53	42° 24' 58"	82° 40' 28"
85-04S-54	42° 21' 46"	82° 49' 09"
85-04A-55	42° 22' 01"	82° 31' 57"
85-04C-56	42° 22' 04"	82° 31' 48"


LAKE ST. CLAIR
MOORING LOCATIONS
APSD Study No. 510
AED Study No. 424
1985
1- 4 - Meteorological Buoys
5-13 - Sediment Traps
14-22,40,41,56 - Current Meters
23 - CATS
24 - Tower
25-28 - Tower Markers
29-32,38,39 - Tide Gauges
42 - NOAA
83° 00'
82° 50'
82° 40'
82° 30'
42° 40'
42° 35'
42° 30'
42° 25'
42° 20'
42° 15'

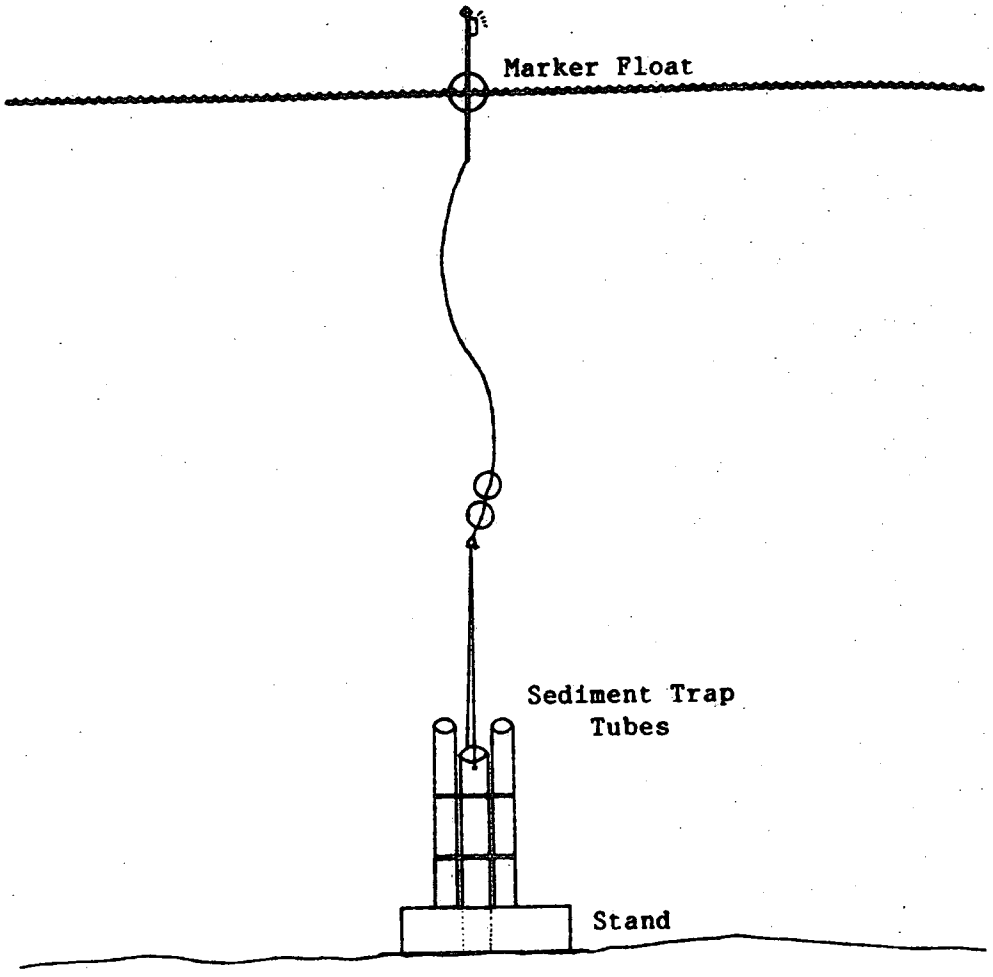


WAVE RECORDING TOWER - LAKE ST. CLAIR

CURRENT METER MOORING



SEDIMENT TRAP MOORING



During the intensive sampling period in September, two overflights were carried out by aircraft from the U.S. Environmental Protection Agency. A radiometer mounted on the bow of the CSS ADVENT was run while doing stations for seston and pH analysis from the L'Anse Crevse Bay to the mouth of the Thames River.

A modified resuspension sampler (RSS) was also launched and retrieved several times during the September intensive period. This mooring was a standard RSS mooring with a 2 m Kenney type sampler added. This mooring was lost when the marker buoy came adrift in high sea conditions in early October and weather and water conditions did not allow divers to search for this mooring during the October and November recovery periods. This was the only equipment lost in Lake St. Clair.

During the periods when the CSS ADVENT was occupied in Lake Erie on the Surveillance Continuity Study, the CSL HERON was utilized to track drogues, monitor meteorological buoys, change batteries in marker lights and conduct EBT and transmissometer surveys. Three Hermes drogues and two Polar Research Laboratories drogues were released from the HERON in the Northern portion of the lake on Monday. These drogues were all satellite-tracked with only random checks made during the week before being picked up on the Friday.

EBT and transmissometer surveys were carried out to coincide with Landsat satellite overflights whenever possible. Profiles were obtained at mooring positions in all portions of the lake.

Since this was a joint study with the United States, moorings were installed several times for the Great Lakes Environmental Research Laboratory in Ann Arbour, Michigan. GLERL is a division of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. These moorings were either current, temperature and transmission (CTT) moorings, temperature and transmission (TT) moorings or current and temperature (CT) moorings. These moorings were located near current meter moorings and will provide comparison data.

UPPER GREAT LAKES CONNECTING CHANNELS DATA

AED STUDY NO. 424, H.F.H. DOBSON

A total of eleven sediment trap moorings were deployed in support of this Study--nine in Lake St. Clair and two in Lake Erie. Sediment traps were deployed in late May and early June in Lake St. Clair and late June in Lake Erie.

Sediment traps were bottom-mounted with six sediment trap tubes attached to each mooring stand. Of the six samples collected from each mooring servicing, one sample was processed for contaminant

analysis (Environmental Contaminants Division), one sample was processed for sedimentology (Hydraulics Division) and the remaining four samples were for nutrient analysis (Aquatic Ecology Division).

Lake St. Clair sediment traps were serviced on a 2-3 week basis as ship time and other Lake St. Clair work scheduling permitted. All sediment trap moorings with the exception of 85-04A-11 and 85-04A-12 were serviced nine times including removal during the period October 30 to November 16. Moorings 85-04A-11 and 85-04A-12 were missed being serviced in mid-September due to poor weather conditions.

Larger sediment samples were collected at mooring locations 85-04A-09, 85-04A-11 and 85-04A-12 after periods of strong Westerly and Northwesterly winds. Samples in each tube in these instances filled or nearly filled the sample cup in the bottom of the tube.

Two sediment trap moorings were placed in Lake Erie and serviced at the start of a Lake Erie Surveillance Continuity Study. The two moorings--85-01A-50 and 85-01A-51 were serviced three times before Mooring 85-01A-50 was lost when the surface marker was lost and the mooring could not be located by divers. Mooring 85-01A-51 was retrieved at the end of November while the CSS ADVENT was in transit to CCIW, Burlington.

Water samples were obtained at all mooring locations for the following parameters: pH, conductivity, particulate organic carbon, chlorophyll a, total phosphorus (filtered and unfiltered), chlorides, silicates, alkalinity, seston, nitrate, nitrite, ammonia and soluble reactive phosphorus.

To determine the ambient levels of trace organic compounds at the confluences of the St. Clair River, the St. Clair River and Lake St. Clair were surveyed four times between August and October. On each survey, water and suspended sediment samples were collected at mid-depth from thirteen stations for organic analysis. At each station, using a March pump and a Westfalia centrifuge, a 40L water sample was collected as well as a separate 8L sample for phenol analysis. Suspended sediments were frozen for later analysis.

TRACE ORGANIC

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	42° 00' 19"	82° 25' 37"
2	42° 00' 15"	82° 25' 15"
3	42° 39' 25"	82° 30' 23"
4	42° 39' 23"	82° 30' 29"
5	42° 39' 21"	82° 30' 35"
6	42° 39' 23"	82° 30' 37"
7	42° 39' 26"	82° 30' 41"
8	42° 39' 27"	82° 30' 45"
9	42° 38' 12"	82° 30' 07"
10	42° 36' 42"	82° 31' 59"
11	42° 36' 27"	82° 31' 22"
12	42° 21' 20"	82° 55' 38"
13	42° 20' 42"	82° 55' 43"

BIOAVAILABILITY OF PHOSPHORUS

AED STUDY 428, DR. P.G. MANNING

The purpose of this project was to determine the binding capacities of sediments and of suspended sediments for phosphorus and the relationship between these capacities sampled in Lake Erie in a transect line beginning at the mouth of the Grand River and ending approximately seven miles offshore. In the Grand River, three stations were sampled between Dunnville and Port Maitland. At each station, a 600L water sample was collected from 2 metres below the surface and 2 metres above the sediment-water interface. The collected sediments were frozen for later suspended particulate matter analysis.

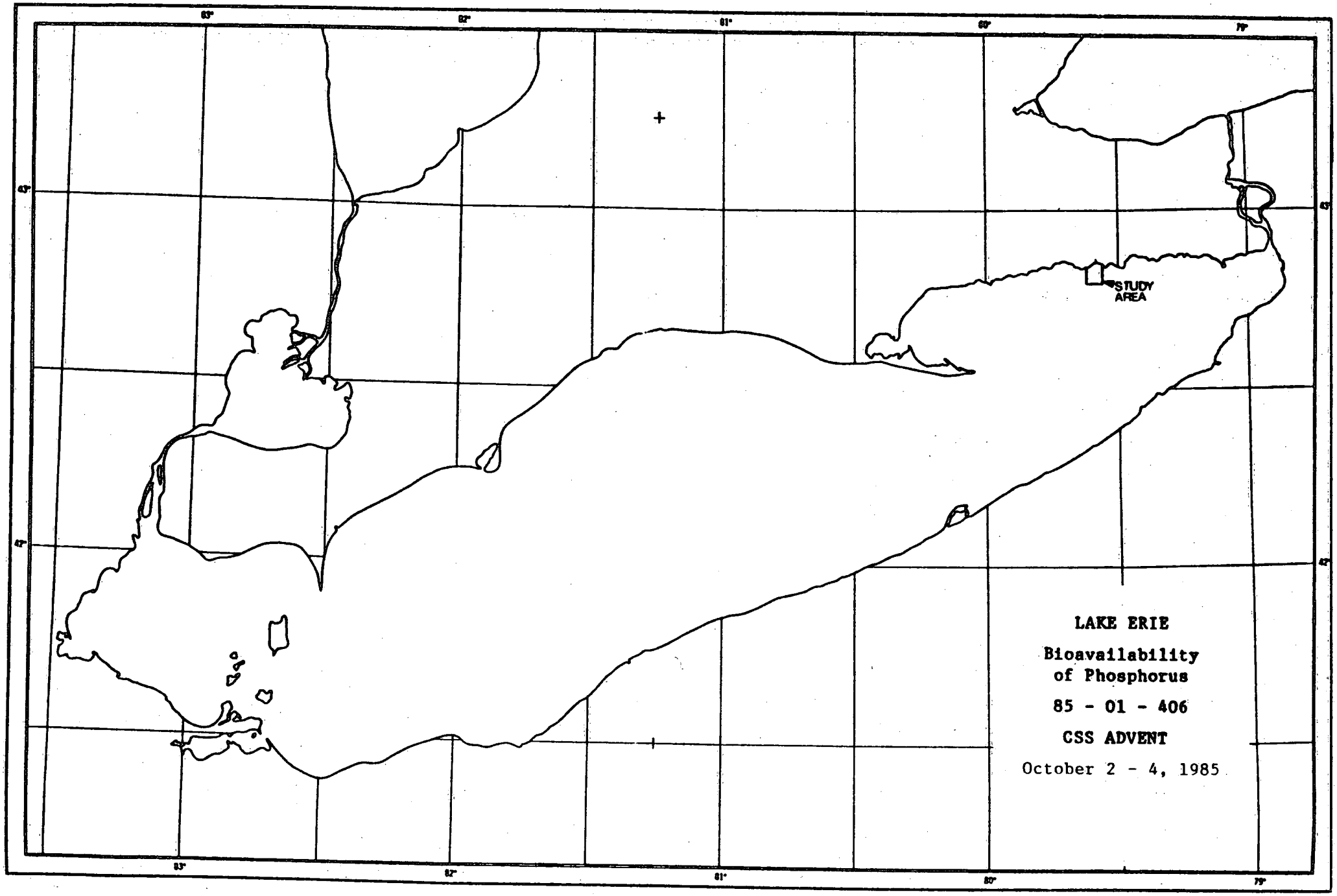
Cores and water samples were collected from Lake St. Clair during the week of October 21 - 25. Bulk water samples (300L) were collected from ten stations in the main portion of the lake. Samples were centrifuged onboard the CSS ADVENT and the particulate saved and frozen before returning to CCIW for analysis. Benthos gravity cores were obtained from five stations and were sectioned and preserved by Dr. P.G. Manning before returning to CCIW.

BIOAVAILABILITY OF PHORPHORUS

STATION POSITIONS

1985-1986

STATION NUMBER	LATITUDE N.	LONGITUDE W.
LE-1	42° 51' 38"	79° 34' 32"
LE-2	42° 49' 40"	79° 35' 00"
LE-3	42° 48' 39"	79° 35' 12"
LE-4	42° 47' 36"	79° 35' 19"
LE-5	42° 46' 23"	79° 35' 30"
LE-6	42° 45' 11"	79° 35' 32"
LE-7	42° 43' 59"	79° 35' 52"
GR-1	42° 53' 56"	79° 37' 06"
GR-2	42° 53' 40"	79° 36' 04"
GR-3	42° 52' 15"	79° 34' 15"
Drogue Deployed	42° 50' 10"	79° 35' 24"
Drogue Retrieved	42° 50' 14"	79° 35' 28"


STUDY AREA
LAKE ERIE
Bioavailability of Phosphorus
85 - 01 - 406
CSS ADVENT
October 2 - 4, 1985

LAKE ERIE THERMOCLINE OXYGEN DYNAMICS

AED STUDY NO. 429, M.N. CHARLTON

The goal of this Study is to conduct a simple and inexpensive sampling program to provide historical data suitable for the detection of important changes in Lake Erie. By using the digital oxygen profiling system, accurate profiles can be recorded to study the reaeration of the hypolimnion and to determine the importance of decomposition in the thermocline as an indication of eutrophication in the Great Lakes. Sixteen stations in the Eastern and Central basins were to be occupied by the CSS ADVENT during five cruises from June to September. This year, a constant temperature bath was used to calibrate the oxygen probe. The bath had been constructed during the winter months and worked satisfactorily throughout the field season.

The surveillance parameters recorded during these cruises were: dissolved oxygen and temperature profiles, pH, conductivity, particulate organic carbon, chlorophyll, seston, total phosphorus, nutrients, percent transmission and Secchi disc observations.

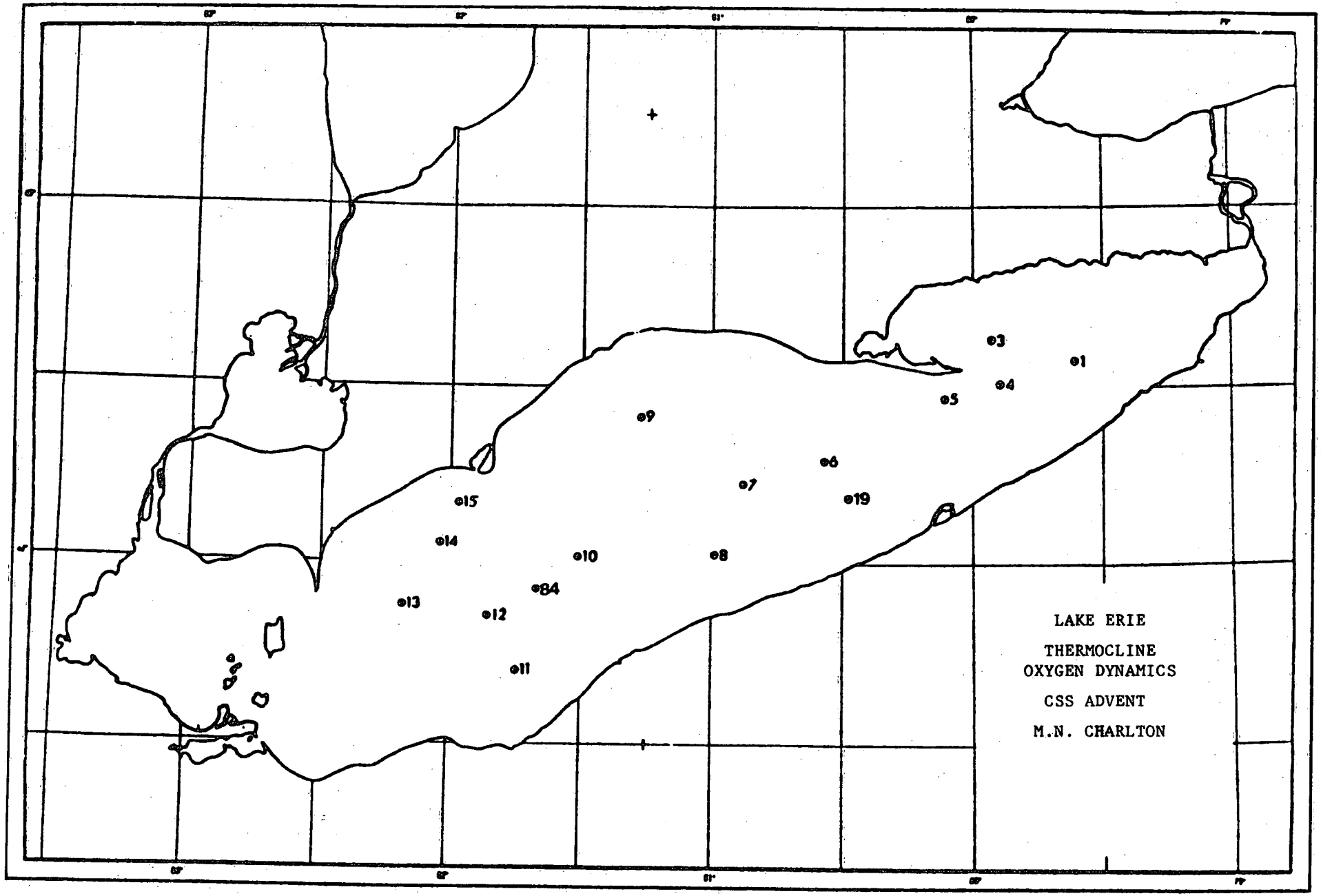
During each cruise, biological sampling was conducted at stations 1, 7 and 13 for phytoplankton and zooplankton. The purpose was to develop a background data base to compare future observations with known annual and seasonal variations in the vertical zooplankton distribution.

Lake Erie Thermocline Oxygen Dynamics cruises were done on the following dates:

June 10 - 14
June 27 - July 4
July 19 - 26
August 8 - 17
August 29 - September 6

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE N.
1	42° 34' 07"	79° 35' 33"
3	42° 37' 40"	79° 54' 08"
4	42° 31' 03"	79° 53' 09"
5	42° 28' 00"	80° 05' 42"
6	42° 18' 24"	80° 33' 21"
7	42° 14' 09"	80° 51' 39"
8	42° 01' 41"	80° 57' 58"
9	42° 25' 04"	81° 15' 52"
10	42° 01' 56"	81° 29' 30"
11	41° 43' 06"	81° 44' 10"
12	41° 51' 39"	81° 50' 12"
13	41° 52' 52"	82° 09' 58"
14	42° 03' 13"	82° 00' 24"
15	42° 09' 37"	81° 50' 06"
19	42° 08' 30"	80° 29' 25"
84	41° 55' 58"	81° 39' 34"


LAKE ERIE
THERMOCLINE
OXYGEN DYNAMICS
CSS ADVENT
M.N. CHARLTON

ST. LAWRENCE RIVER

DISSOLVED AND PARTICULATE TRACE METALS

ECD STUDY NO. 234, DR. K.R. LUM

The initial cruise on the St. Lawrence River system was conducted by the CSS ADVENT during the period May 6 to 17. This Study (in its first year) was a preliminary characterization of the suspended load of toxic and nutrient elements. There is considerable concern for contamination from Lake Ontario and the Ottawa River as well as from input along the river which has resulted in public recognition of the St. Lawrence as a polluted body of water.

A total of 26 stations were occupied between Kingston and Quebec City. At these stations, large volume water samples (up to 1200L) were collected and centrifuged for: trace metal analysis, nutrient and particle dynamic studies. In addition, transmissometer and conductivity transects were completed across the river at various sites as an aid in station selection. Filtering of water samples was completed for calculating suspended load. Sample locations were located in the main river channel and alongshore in plumes from creeks, rivers and industrial outfalls.

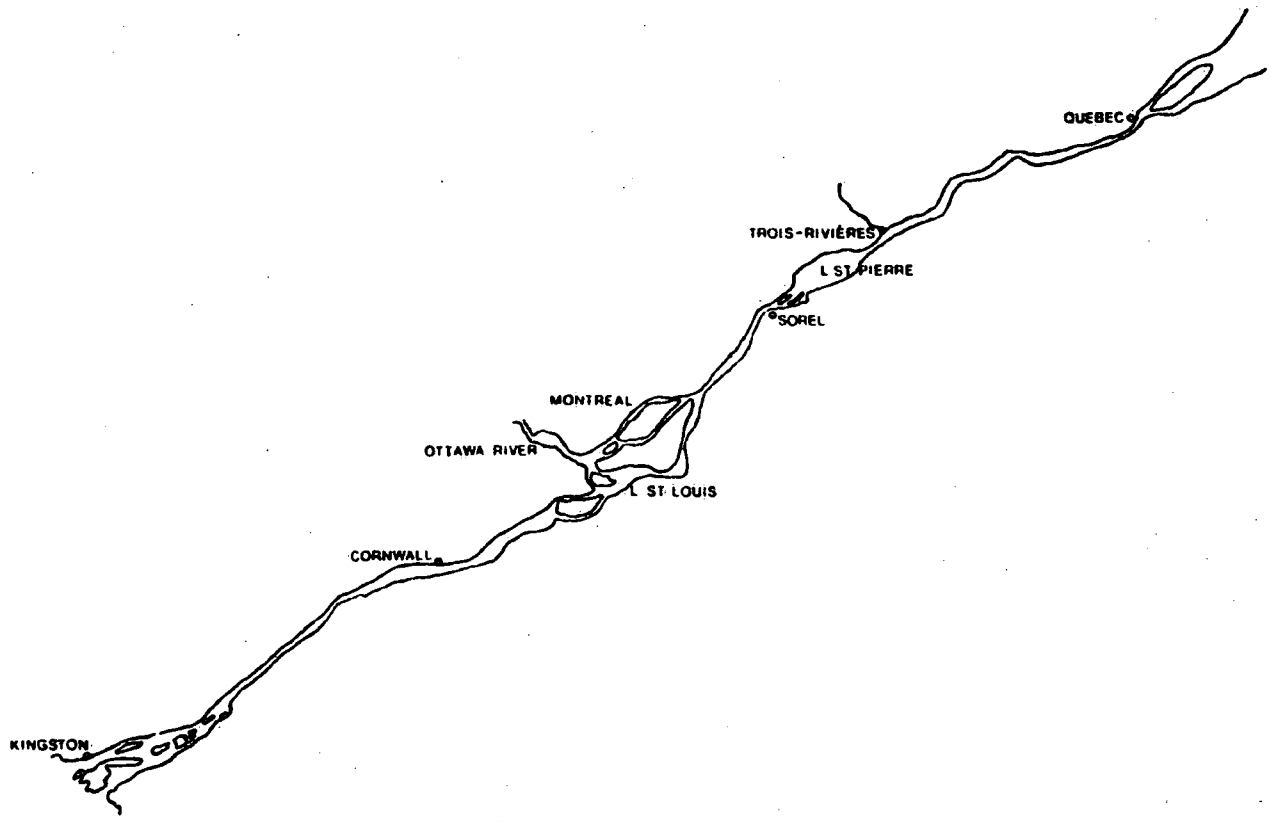
DISSOLVED AND PARTICULATE TRACE ELEMENTS

STATION POSITIONS

1985-1986

STATION NUMBER	LATITUDE N.	LONGITUDE N.
SL1	44° 07' 14"	76° 22' 08"
SL2	44° 14' 28"	76° 19' 20"
SL3	44° 40' 46"	75° 33' 07"
SL4	44° 42' 53"	75° 28' 22"
SL5	45° 01' 28"	74° 40' 45"
SL6	45° 13' 42"	74° 08' 35"
SL7	45° 19' 26"	73° 54' 02"
SL8	45° 22' 04"	73° 49' 34"
SL9	45° 24' 16"	73° 43' 39"
SL10	45° 24' 26"	73° 34' 44"
SL11	45° 24' 05"	73° 57' 03"
SL12	45° 43' 10"	73° 26' 32"
SL13	45° 44' 12"	73° 26' 11"
SL14	45° 59' 11"	73° 10' 53"
SL15	46° 06' 21"	72° 58' 13"
SL16	46° 22' 37"	72° 28' 52"
SL17	46° 51' 06"	71° 09' 07"
SL18	46° 50' 36"	71° 05' 17"
SL19	46° 44' 32"	71° 20' 05"
SL20	45° 35' 51"	73° 30' 30"
SL21	45° 31' 34"	73° 33' 32"
SL22	45° 27' 26"	74° 06' 00"
SL23	45° 29' 27"	73° 57' 26"
SL24	45° 09' 32"	74° 21' 55"
SL25	45° 02' 41"	74° 34' 49"
SL26	44° 59' 13"	74° 46' 18"

STUDY AREA
85-07-401
ST LAWRENCE RIVER
MAY 6 - MAY 17, 1985
CSS ADVENT



SHORE PROGRAMS

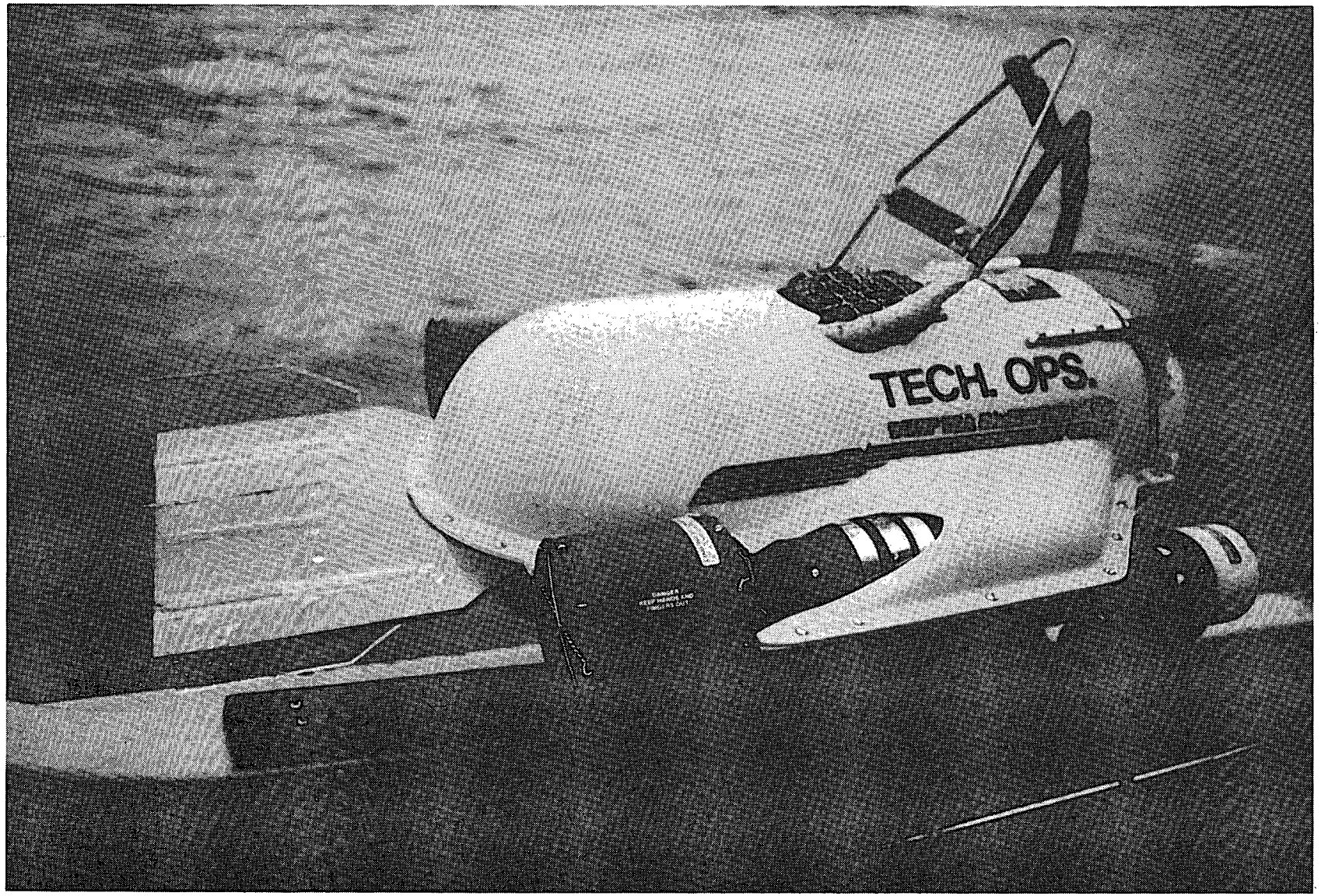
DIRECTOR'S OFFICE

HABITAT STUDIES

D.O. STUDY NO. 109, DR. P.G. SLY

Support to this Study involved the installation October 2-4 of twelve sediment traps and sixteen peepers at three sites in Eastern Lake Ontario. Retrieval of the equipment was made November 24-28.

Underwater video tapes were taken in Lake Opeongo, Algonquin Park October 21-25. Video recordings were made of shoal sites, diver operations and of lake trout spawning.



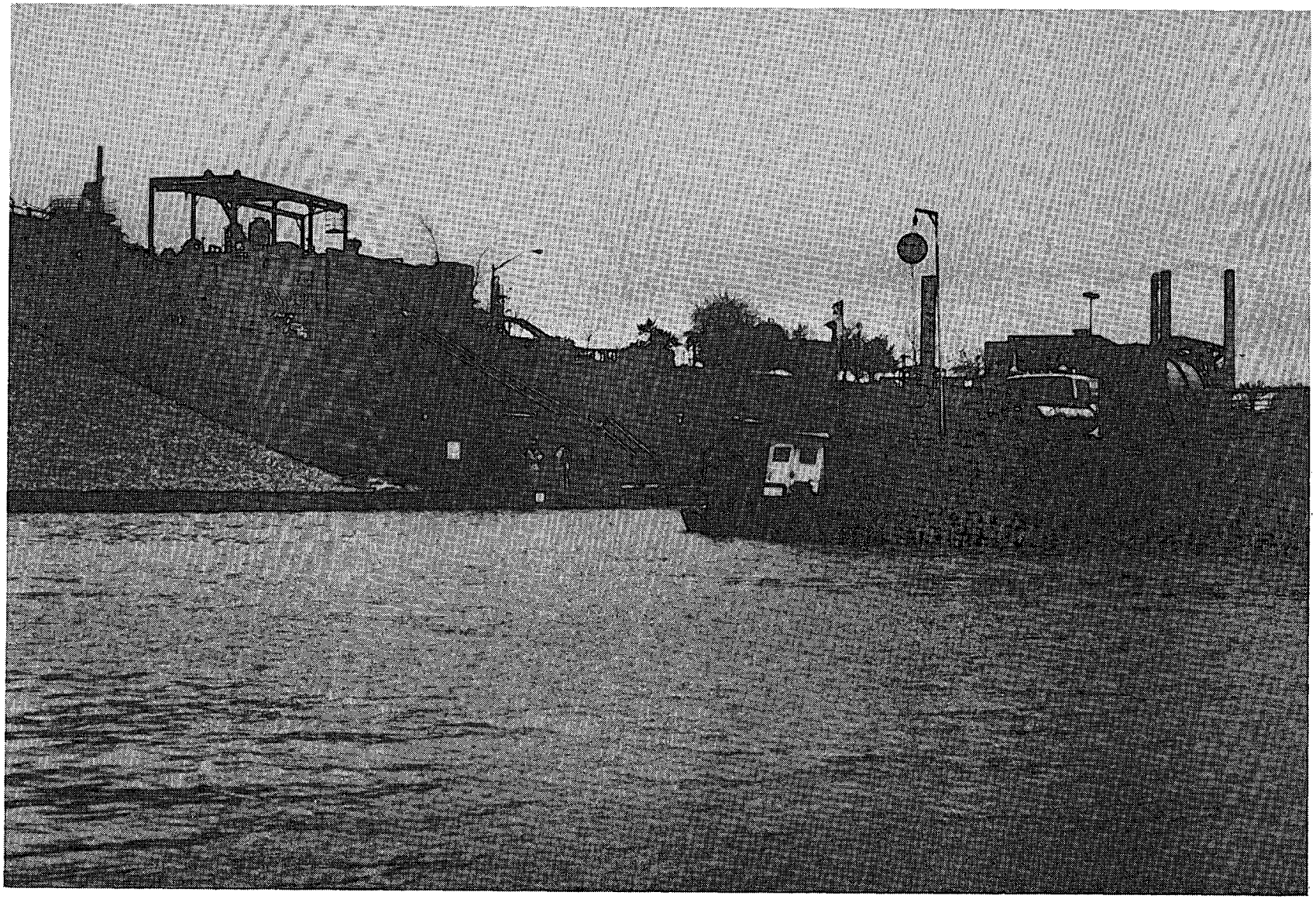
MURV - MOBILE UNDERWATER RECONNAISSANCE VEHICLE

ST. CLAIR RIVER CONTAMINANT STUDY

DR. G.K. RODGERS

In order to define the contamination resulting from a spill of perchlorethylene into the St. Clair River at Sarnia, this Division began a survey program which included sediment coring, water sampling and underwater camera operations. Technical Operations Division assumed the responsibility for all on-water field sampling for Environment Canada on November 4th when NWRI directed an investigation of oily tar puddles found near the spill site.

The CSS ADVENT was utilized to conduct the sediment coring and water sampling work at twenty-one stations in the upper eight kilometers of the St. Clair River as well as four stations in the Chenal Ecarte (Northern boundary of Walpole Island) November 19 - 26. With the use of a Deep Sea MiniROVER underwater television camera, the contaminant puddles were located and an inspection routine undertaken of the spill site and clean-up operations. The resulting video tapes were edited and a tape highlighting the events during the survey was produced by this Division. The video tape presentation accompanied the Department of Environment submission documenting its efforts in this matter for inclusion in the Minister's report to the House of Commons. Further video tape inspections of the site and clean-up activities are planned for the month of February 1986.



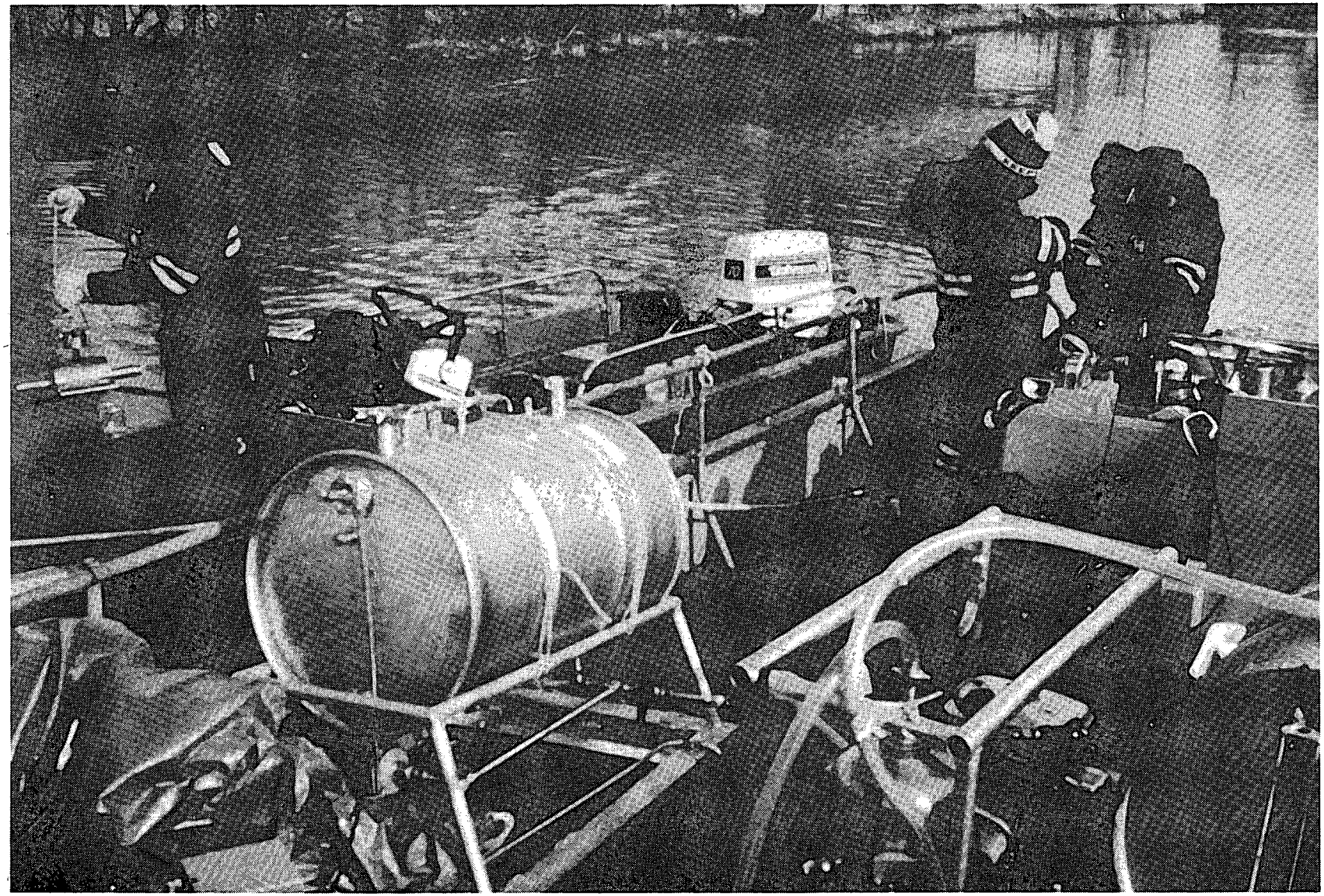
ST. CLAIR RIVER SURVEY - INTENSIVE SITE

ENVIRONMENTAL CONTAMINANTS DIVISION

BIOAVAILABILITY OF ORGANIC CONTAMINANTS, ORGANICS IN THE GREAT LAKES BASIN, CHLORINATED HYDROCARBONS IN THE GREAT LAKES

ECD STUDY NOS. 211, 212, 213, DRS. K.L.E. KAISER, B.G. OLIVER

Technical Operations Division assisted with the collection of water samples from the Detroit and St. Clair rivers during March and April. Twenty-six stations were occupied in the Detroit River and twenty-three in the St. Clair River. Most of the stations were along the American shore. A Boston Whaler was utilized to locate the exact sampling sites. Most of the stations were located at effluent outfalls from different industries and hydro plants. Onboard the launch SEA TRUCK using power from a gas-driven 1500 W generator, water was pumped from various depths (usually 1 m) using a small submersible pump through the portable gas-driven centrifuge at a rate of 6L/minute. The outflow from the centrifuge was then collected in the A.P.L.E. extractor until a volume of 200L was reached. Two jugs (8L) of methylene chloride solvent was added to the A.P.L.E. extractor and scrubbed through the water for approximately one and one-half hours via the internal spray bar and external pump. After being allowed to settle for one-half hour, the heavier solvent was drawn off the bottom and retained for analysis back at CCIW. The suspended solids collected in the centrifuge bowl were also washed into a sample bottle and kept for analysis. 1L samples for volatiles, microtox and fungi were collected directly from the pump at all stations. Microlayer water samples and 1L water samples were collected in the River Rouge for lead analysis.



VOLATILE ORGANIC CONTAMINANT SAMPLING - DETROIT RIVER

EFFECTS OF CONTAMINANTS ON AQUATIC BIOTA

ECD STUDY NO. 223, J.L. METCALFE

To establish an ongoing program to monitor contaminants, sampling was conducted in the Ottawa and North Saskatchewan rivers. This was done to determine contaminant levels in various aquatic compartments and compare the results with previous data. As a result, the most suitable media to sample will be found.

Four sites were sampled on the Ottawa River. At Petawawa, Castleford and Treadwell, the main stream of the river and both shore zones were sampled. At the Lemieux Island site only the settling basin for the water treatment plant was sampled. Also, four sites were visited on the North Saskatchewan River between Edmonton and Amelia to the Northeast.

Compartments sampled included water, suspended solids, bottom sediment and biota. Biota samples were made up of benthic invertebrates and forage fish. Each of the compartments will be analyzed for metals and organic contaminants.

PATHWAYS OF ORGANIC CONTAMINANTS IN FLUVIAL SYSTEMS

ECD STUDY NO. 225, DR. J.H. CAREY

The purpose of this project was twofold: First to research the concentration and distribution of chlorophenols in water, sediment and biota of the North arm of the Fraser Estuary and second to research concentrations and distribution of chlorophenols and other contaminants in the North Saskatchewan River. The project was divided into two field trips. The first field trip was to Edmonton, Alberta in August and the second trip was to Vancouver in September.

While at Edmonton, the North Saskatchewan River was sampled on 4 transects from the E.L. Smith Water Treatment Plant in West Edmonton to Vinca Bridge (Hwy 38) East of Fort Saskatchewan. Water samples were collected from each transect. At both river banks on each transect samples of fish and any other aquatic life found were collected and analyzed for organics. At each transect a slope measurement was done, a depth profile conducted, flow rates measured and a temperature/conductivity/depth profile was carried out at 5 equidistant sites across the transect. The four transects sampled were: 1) E.L. Smith Water Treatment Plant, 2) at the Capital Water Pollution Control Bridge, 3) between the railway bridge and the highway bridge at Fort Saskatchewan and 4) at the Vinca Bridge (Hwy 38).

While in Vancouver, B.C., the North arm of the Fraser River was sampled from its mouth to the highway bridge at Mission. Sampling on the Fraser was the same as on the North Saskatchewan with the exception that no flow measurements were made and transmissometer profiles were collected. The sampling sites (transects) were: 1) below the sewage treatment plant approximately 3/4 miles downstream from the highway bridge at Mission, 2) at Buoy S40 above the Pattullo Bridge, 3) at Buoy S32 off the Western tip of Annacis Island, 4) 180 metres upstream of the Dinsmore Bridge and 5) at the Western tip of Deering Island.

All samples were returned to CCIW, Burlington or WQB, Vancouver for analysis.

FATE OF AMINES IN AQUATIC SYSTEMS

ECD STUDY NO. 233, R.J. MAGUIRE

Technical Operations Division was involved in helping to determine the fate of amines in aquatic systems. Aromatic amines are on the Environmental Contaminants Act Canadidate Chemicals List which means that information is required on environmental occurrence, persistence and toxicity. Amines, in general, are high-volume industrial chemicals and many are carcinogenic. This is a new project and may continue until 1988.

The area chosen for the field investigation was the Yamaska River on the South shore of the St. Lawrence River in the Province of Quebec. At each of 16 sites selected in the Yamaska River Basin, 200L of water were centrifuged into the A.P.L.E. sampler and 2 sets of extractions made--one in an acidic medium and one in a basic medium. Physical parameters were noted; i.e., location, depth, width, air and water temperature, weather, dissolved oxygen, Eh and pH of water and of sediment. Using an Ekman sampler and by wading, sediment and biota was collected. In the evening, purgeables were extracted, suspended sediments filtered and biota specimens prepared and frozen for transport to CCIW.

DISTRIBUTION AND AVAILABILITY OF METALS

ECD STUDY NO. 236, A. MUDROCH

The goal of this project was to assess the pollution potential and toxicity of bottom sediments to recommend remedial options to minimize the environmental impact on an aquatic ecosystem.

The support given this project in Nova Scotia was to collect water and sediment samples from 5 lakes near Waverley just North of Halifax. The lakes sampled were: Powder Mill, Muddy Point, Lake William, Lake Thomas and Three Mile Lake. Sixteen Ekman dredges were collected from the deep hole of each lake and sieved for benthic organisms. Water samples were collected from 1 metre off the bottom and returned to CCIW for analysis. Last, a Technical Operations corer was used to collect a core from each lake. These cores were kept in a vertical position and returned to CCIW for subdivision and anlysis.

PARTITIONING RADIONUCLIDES

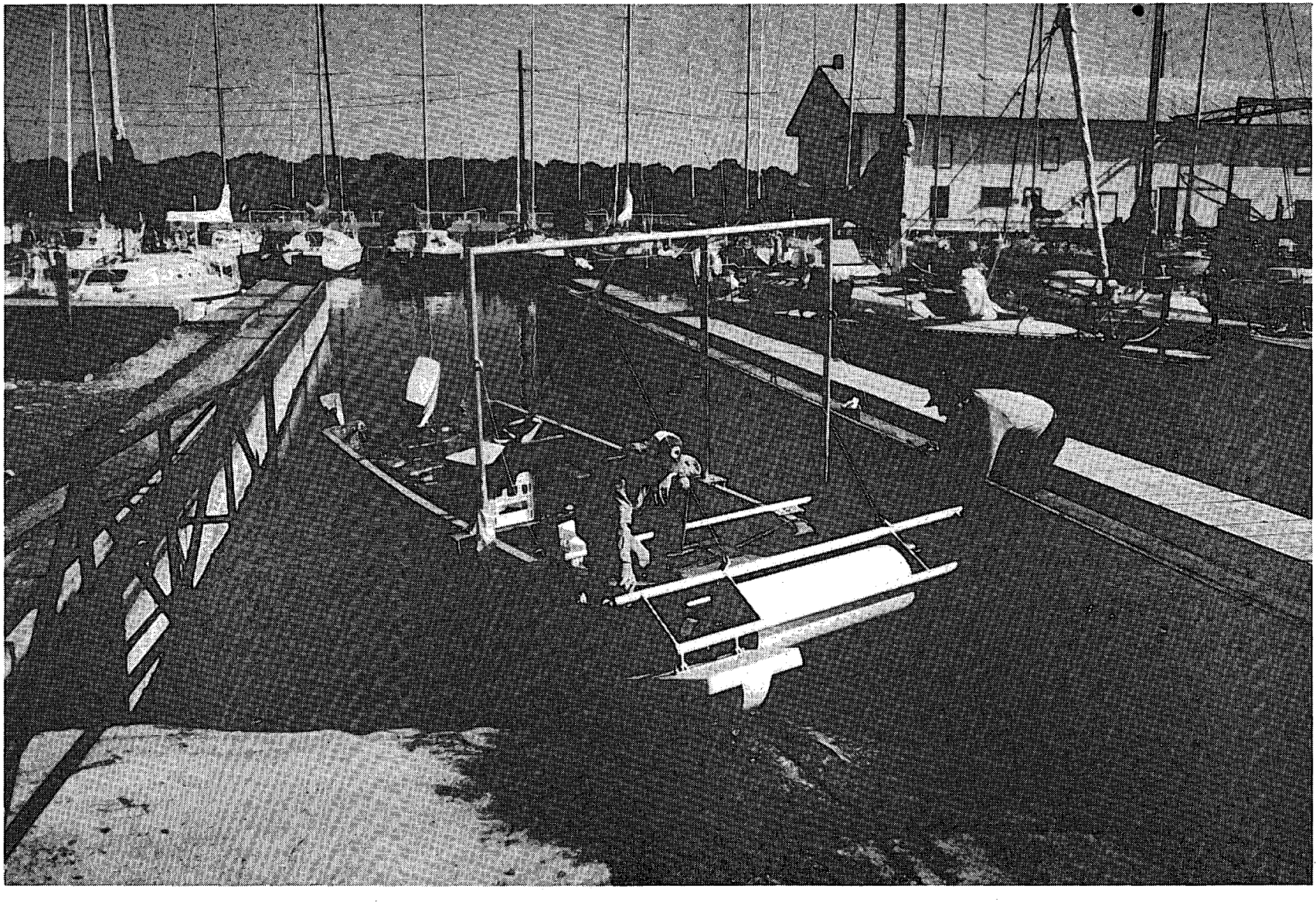
ECD STUDY NO. 243, Dr. R.F. PLATFORD

The pathway by which airborne radio-active contaminants such as Cs 137, Sr 90 and Pb 210 ultimately end up in the sediment and the identification of the environmental reservoirs along this pathway are the object of this Study.

These contaminants exist in the air and water column at levels that are barely detectable. However, the water's surface film contains levels 100 - 1000 times as high as the water column which makes them much easier to detect.

The NWRI surface microlayer sampler was used to obtain a 50-litre sample from the Niagara River mouth and one from the Niagara River 100 m upstream of the Water Quality Branch trailer at Niagara-on-the-Lake.

A centrifuge bowl was also run for 30 hours to obtain a 100cc particulate sample using the centrifuge housed in the trailer.



SURFACE MICROLAYER SAMPLER - NIAGARA-ON-THE-LAKE

THE TURKEY LAKES WATERSHED

ECD STUDY NO. 250, R. SEMKIN

The purpose of this project is to study the movements and effects of Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems found in the Turkey Lakes Watershed. The chemical and hydrological monitoring of the Study area began in 1980 and has been supported throughout by TOD.

The Turkey Lakes Watershed is located on the Canadian Shield 50 km North of Sault Ste. Marie and 25 km East of Lake Superior. The area of the basin is 10.5 km^2 and consists of a chain of five small lakes from 6 ha to 52 ha in size. The area is very rugged Algoma Highlands, totally forested and uninhabited.

TOD support consisted of one full-time technician stationed in Sault Ste. Marie. Also, two full-time vehicles (both being 4-wheel drive during winter months), four snowmobiles and three all-terrain vehicles were used for transport to the Study area and in the Watershed.

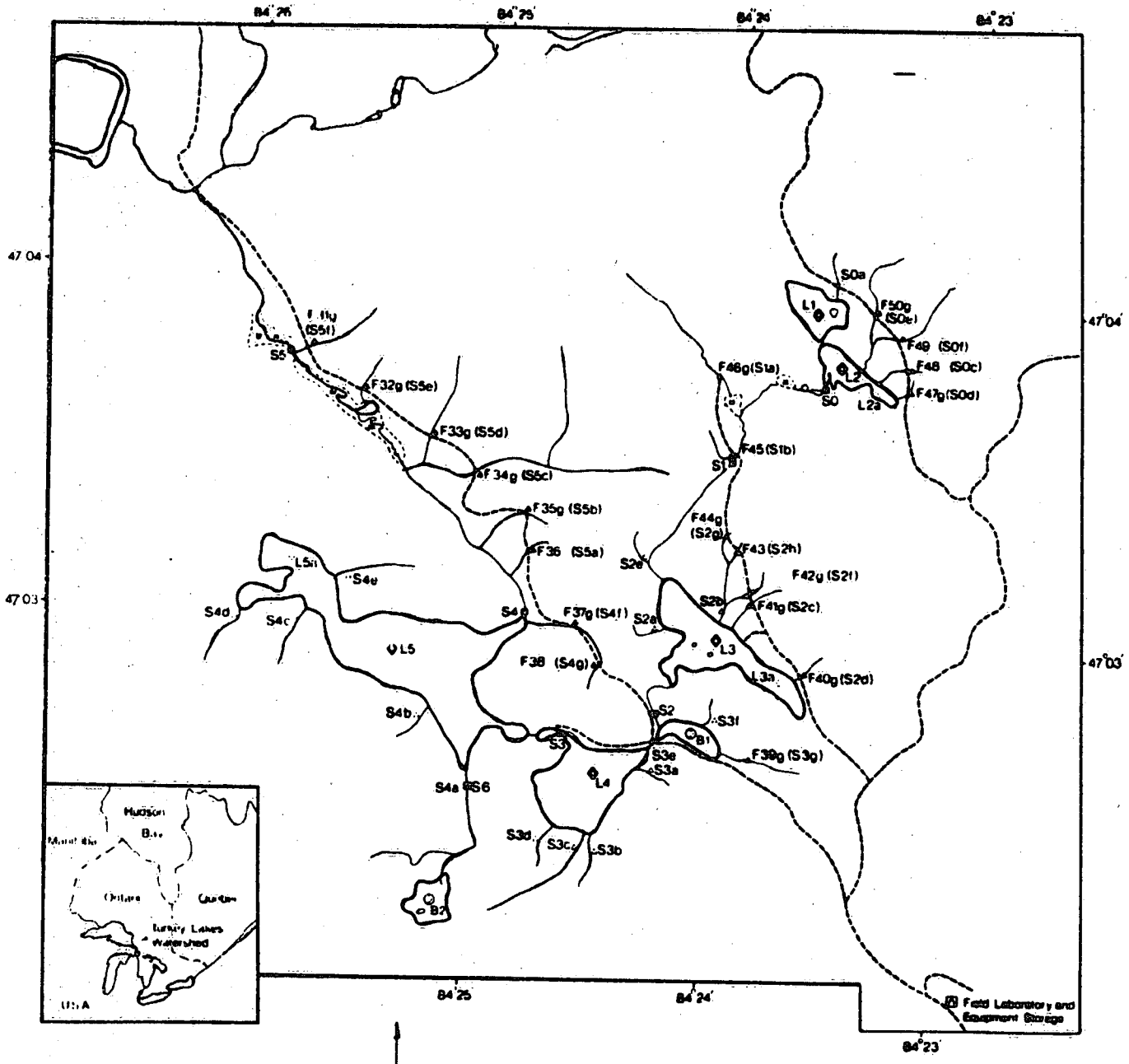
The Department of Fisheries & Oceans support consisted of eight small boats, two outboard motors and other small items to make the boats operational.

TOD supported ECD staff in the chemical and hydrological monitoring of the Watershed. The hydrological monitoring consisted of gauging seven stream locations throughout the Watershed on a weekly basis and sampling these locations for chemical parameters. The lakes were sampled at six locations on a bi-weekly basis for the same chemical parameters. All of the above sampling occurred on a year round basis.

To supplement the hydrological and chemical data, a meteorological station and solar radiation unit were operated on a year round basis by TOD.

Other TOD support was provided during intensive periods of work. Two TOD staff supported the project during the "Spring Runoff" period (March 26 - April 25) and again for work on the "Slope" project (November 4 - 8).

The only major new work was the location and construction of a new stream gauging site (#6) and accompanying trail on a major tributary stream into Big Turkey Lake.



Sampling Locations in the Turkey Lakes Watershed (1)

LEGEND

- WSC stream gauging station and NWRI sampling site (S4)
- Primary NWRI lake sampling site (L2)
- GLFRC stream sampling site (F32 'g' added when flow gauging structure at site). NWRI site number (S3a,b etc) also indicated
- Additional NWRI stream sampling sites (S2a,b etc)
- Additional NWRI lake sampling sites (L2a, etc)
- NWRI beaver pond sampling site (B1,2)
- Roadway or trail

AQUATIC RESPONSE TO ACID RAIN

ECD STUDY NO. 251, DR. D.S. JEFFRIES

The Aquatic Response to Acid Rain for Dr. D. Jeffries was again supported by Technical Operations Division. The Study site was the Turkey Lakes Watershed, 50 km North of Sault Ste. Marie where an ongoing Acid Rain Project is in operation.

The Study is primarily interested in very closely monitoring the Aquatic System of the Turkey Lakes Watershed when the winter snowpack melts in the spring and releases large amounts of acidification in the watershed in a short period of time.

Sampling of the decreasing snowpack and chemical monitoring of the streams are carried out on a daily basis to indicate transfer of acidity from the snowpack to the lake systems. Lakes were sampled for chemical parameters on a regular three-day rotation.

Technical Operations supplied two additional personnel from March 26 until April 25 to carry out all the extra sampling for Study No. 251. The vehicles, as well as snowmobiles and all the related sampling equipment and maintenance equipment were utilized from the Turkey Lakes Acid Rain Program No. 250.

HYDRAULICS DIVISION

AIR-WATER INTERACTION

HD STUDY NO. 320, DR. M.A. DONELAN

The 1985 field season saw the start of a 3-year project on the WAVES tower titled Air-Water Interaction. The data collected will assist Dr. Donelan in discovering or developing theories and/or models to describe and predict the interaction of wind and water, surface waves, roughness of the interface, fluxes of mass and energy, turbulence and wave-generated mixing.

Technical Operations Division, as the WAVES tower manager for NWRI, acted as a link between several groups at CCIW and outside agencies in organizing the installation of scientific instruments, logistic and technical support.

The first installation was made on August 8th and the dismantling finished on December 11th. During that period, 98 boat trips on 65 different occasions with as little as two or as many as 14 individuals from Hydraulics Division, Mantec, Engineering Services, Fisheries & Oceans, Wood's Hole Oceanographic Institute, Rondar, Gandolf and TOD were present. The installation and fine-tuning of all the components took 3 months and data was collected for 6 weeks from November 1st to December 10th.

To facilitate the housing of the electronics and analog components of the data acquisition, a new data acquisition box was installed in September. Because of its size and weight, McKeil Work Boats' Cargo Master was utilized to install it on the tower. The remainder of the transportation of equipment and personnel was made utilizing small boats; i.e., Boston Whaler, CABOT, MonArk. When the barges GOOSE I and GOOSE II were not available, use of CSL SHARK was made to transport the larger pieces of bracketry.

FOUR-METRE LIGHTWEIGHT CORER - HELENE LAKE, SASKATCHEWAN

LITTORAL SEDIMENTOLOGY

HD STUDY NO. 322, DR. J.P. COAKLEY/DR. N.A. RUKAVINA

The Study area is located offshore from Green's Road, Stoney Creek. The sediment in this area is glacial till clay. A thin sand layer is present from the shoreline to a point approximately 200 m offshore.

Seven stations were installed in a line with the aid of a theodolite and distomat. T-frames were installed into anchors left from the 1984 field season. Electronic transducers and monitor cables were installed on each T-frame. Monitoring from a small boat gave measurements from the transducer to the sediment interface. These measurements were calibrated with diver measurements on a bi-monthly basis. Changes in these measurements can be used to determine erosional processes.

LAC ST. LOUIS SEDIMENT SURVEY

HD STUDY NO. 324, DR. N.A. RUKAVINA

This Study is part of ongoing investigations of the sources, transport and accumulation of pollutants in the St. Lawrence River. NWRI, in co-operation with IWD-Quebec and CHS-Quebec Region, organized a survey of the sediments and bathymetry of Lac St. Louis. CHS-Quebec Region conducted a sounding survey, established and maintained navigational aids and produced mini-ranger distances from UTM co-ordinates for station positions. IWD-Quebec collected temperature and conductivity profile data from the SEA TRUCK at each sampling station, assisted with the sediment sampling and boat handling and drew samples from selected sites. TOD surveyed the sediments according to procedures developed at NWRI for the Nearshore Survey Program by mapping the sediments and bathymetry by echo sounding with gain settings adjusted to provide optimum recordings of substrate and sub-bottom geology and obtaining sediment samples of the upper 10 cm of lake bottom with a double-Shipek sampler. Processing of the samples took place immediately as follows: labelled and photographed; described geologically using a pocket cassette recorder; sub-sampled with stainless steel utensils for grain-size analysis, organics and inorganics and stored in insulated containers.

One hundred and fifty stations on a 1 km grid were successfully occupied by the SEA TRUCK, positioned by mini-ranger.

WAVE DISSIPATION IN SHALLOW WATER

HD STUDY NO. 326, DR. M.A. DONELAN

This Study, under the direction of Dr. Mark Donelan, was designed to measure changes in the spectrum and the rate of energy loss for wind-waves propagating in shallow water. This was a joint program between NWRI, GLERL, Ann Arbor, Michigan and AES, Downsview.

Six free-standing towers were installed and instrumented in Lake St. Clair for the period September 9 to December 4. Three of the towers supported NWRI wave measurement instrumentation and three were used by GLERL under the direction of Mr. H.K. Soo.

Two meteorological buoy systems and one current meter mooring were left from APSD Study No. 510 to support this Study.

Although the two MET buoys' instrumentation suffered severe damage due to ice and some wave staffs were lost, a significant amount of data was collected and the newly-designed free-standing towers for shallow water were considered a total success.

ICE JAMS AND FLOODING

HD STUDY NO. 345, DR. S. BELTAOS

The purpose of this Study was to better understand and predict ice jams, to develop theories and models for ice jams and ice breakup and to develop methods to improve the management of ice-covered rivers in order to reduce flooding. Ice jams constitute a flooding threat which is difficult to quantify at present. In addition, the interbasin transfer of water and the installation of hydro electric power plants and control structures require an assessment of the change in the ice regime.

To help in creating models, field observations in the Thames and Grand rivers were conducted in the winter and spring of 1985. At selected transects on the Grand River in January, the ice thickness, water elevation and water depth were measured.

On the Thames and Grand rivers during breakup, video records were made of ice jams and ice movement. With the help of photographs, notes as to time and location were taken of the height of the water and ice. In May these photos were used to locate marks on trees and shrubs in order to take elevations of the ice jams or water. These marks were surveyed, using a series of temporary bench marks previously established along the river banks.

AQUATIC ECOLOGY DIVISION

TRACE METAL DYNAMICS IN ACID-SENSITIVE LAKES OF NOVA SCOTIA

AED STUDY NO. 405, DR. J.O. NRIAGU, H.K.T. WONG

A major contribution of pollutant metal and acid input in the remote lakes of Nova Scotia comes from atmospheric deposition. This project studies how trace metals travel through the lakewater and bottom sediments and how this relates to lake acidification.

Three (3) lakes in Kejimkujik National Park were selected for the Study--Kejimkujik Lake, Mountain Lake and George Lake. Support to this project involved the establishment of six (6) sediment trap moorings (2 per lake) in April, which were then sampled once each month by TOD personnel.

Porewater samplers (peepers) were installed near the deep hole of Kejimkujik Lake by TOD divers in June and these were sampled and replaced during July, August and September.

In addition to the peeper and sediment trap work, three lightweight cores were collected from Kejimkujik Lake and Mountain Lake which were subdivided immediately and later returned to CCIW for analysis.

Launch support for this Study was provided by Canadian Wildlife Service, Halifax (2 cartoppers) and Parks Canada.

Following is the 1985 field schedule for AED Study No. 405:

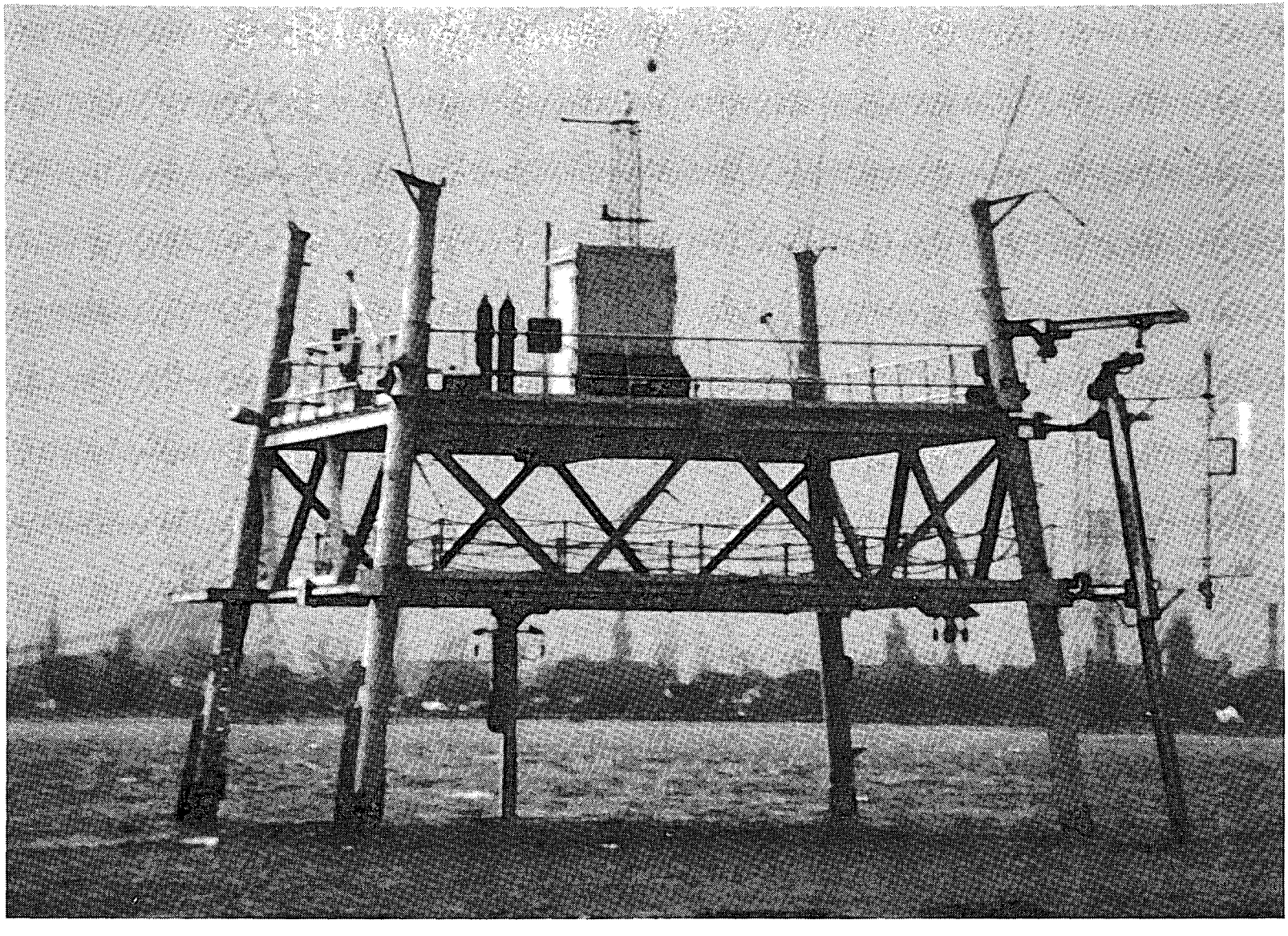
April 29 - May 2	- Established sediment trap moorings
May 27 - 30	- Refurbished sediment trap moorings
June 24 - 27	- Refurbished sediment trap moorings; established peeper moorings
June 30 - August 2	- Refurbished sediment trap and peeper moorings; 3 lightweight cores from Kejimkujik Lake
August 19 - 22	- Refurbished sediment trap and peeper moorings
September 16 - 19	- Refurbished sediment trap and peeper moorings
October 15 - 18	- Refurbished sediment trap moorings; 3 lightweight cores from Mountain Lake
November 12 - 15	- Refurbished sediment trap moorings
December	- Cancelled due to ice

PALEOLIMNOLOGY OF ONTARIO, SASKATCHEWAN AND ALBERTA LAKES

AED STUDY NO. 406, DR. L.D. DELORME

As a continuation of previous studies to determine historical climatic change and water quality, several lakes in Southern Ontario and the prairie provinces were sampled. To acquire this historical data, sediment cores to a length of four metres were required. An extension modification was added to the lightweight corer and diver assistance was required to achieve cores of that length. Also, three sections of scaffolding and planks were utilized to lift and extrude a four-metre core tube. This apparatus was set up on the ice cover of the Southern Ontario lakes and on a specially-designed platform/catamaran configuration for the Western region lakes.

In February, three lakes--Pinehurst, Little and Whittaker were sampled in Southern Ontario. Twelve lakes were visited in May and June in the provinces of Saskatchewan and Alberta. The Saskatchewan lakes sampled were: Birch Bark, Helene, Lizard and Clearwater. Sampling was prevented by high winds and rough water on Buffalo Pound and Lovering lakes. In Alberta, Raft, Jackfish, Pine, Narrow, Amisk and Gooseberry lakes were sampled.



WAVES TOWER - VAN WAGNER'S BEACH

SULPHUR ISOTOPES-ACIDIFICATION

AED STUDY NO. 413, DR. J.O. NRIAGU

The Study of Sulphur Isotopes in the Turkey Lakes Watershed for Dr. J. Nriagu was again supported by Technical Operations staff. The Study required the collection of water samples and the changing of sediment trap moorings every six weeks.

Two locations in the Turkey Lakes Watershed had moorings in place. One was located on Lower Batchawana Lake and had traps located at 3 and 9-metre depths while the second mooring was located on Big Turkey Lake and had traps located at 5, 12, 22 and 32-metre depths.

The mooring on Lower Batchawana Lake was refurbished eight times during the year while the mooring on Big Turkey Lake was refurbished seven times. The one lost period on Big Turkey was due to ice conditions in January.

USE OF ALGAL INDICATORS TO INTERPRET LAKE ACIDIFICATION HISTORIES

AED STUDY NO. 414, DR. W.A. GLOOSCHENKO

The purpose of the Study is to further understand the acidification history of lakes. This Study will determine the value of diatom distribution in sediment cores as a paleoindicator of lake acidification.

Technical Operations support consisted of assisting Dr. Irena Kaczmariska of Waterloo University with the collection of two lightweight cores from each of four Canadian Shield lakes. The lakes sampled were Hamilton Lake, East of Chapleau; Silver and Clearwater lakes near Sudbury and Ruth-Roy Lake in Killarney Provincial Park. Each core was subdivided into half-centimeter sections for subsequent analysis of diatoms. Analysis of metals in the sediments will be run by Dr. W.A. Glooschenko.

ORIGIN OF ORGANIC WATERS AND THEIR IMPACT ON AQUATIC ECOSYSTEMS

AED STUDY NO. 416, DR. R.A. BOURBONNIERE

Natural organic acidity has been recognized as a significant contributor to the total acidity of Nova Scotia rivers. As such, it affects the understanding of the degree to which airborne pollutants impact those waters. The organic matter, by its interaction, influences the toxicity of metals such as aluminum. Thus, there is a tie to the potential impact on aquatic biota.

The purpose of the Study was to characterize the chemical composition, both organic and inorganic of lake and river waters from LRTAP sites in Nova Scotia to show how natural organic acidity contributes to the total acidity. Specific compounds of interest are hydrophobic and hydrophilic organic acids, toxic metals such as aluminum, lead and mercury and other components which interact with toxic constituents.

TOD support was provided for the period of August 12 - 25. A van loaded with sampling equipment, coolers and a chest freezer was driven to Nova Scotia. Two peat cores were obtained--one from the Barrington Bog near Shelburne and one from the Pebbleloggitch Bog in Kejimkujik Park. Bulk water samples were also collected in the park from both Pebbleloggitch Lake and Beaverskin Lake.

The coolers with ice packs and the freezer were used to transport all samples back to CCIW.

BIOAVAILABILITY OF PHOSPHORUS

AED STUDY NO. 428, DR. P.G. MANNING

The purpose of this project in British Columbia was to collect cores from three lakes for analysis of various metals, particularly iron in its various forms.

Core samples were collected from 3 lakes--Kootenay, Chain and Frisken. The cores were collected using a modified Moore's corer and a Technical Operations corer. Both corers required a 2 5/8"I.D. x 2 7/8"O.D. core tube. All cores were subdivided into 1 cm subsections for analysis. The samples were then sent to CCIW, Burlington for subsequent analysis along with cores from the Qu'Appelle Valley, Saskatchewan.

LAKE RESTORATION

ECD STUDY NO. 437, T.P. MURPHY

The purpose of this project was to develop better guidelines to distinguish which lakes are appropriate for lime addition or lake aeration.

The support this year for this project was to collect water and sediment samples from two lakes in the Southern interior of British Columbia. The lakes sampled were Chain and Frisken.

A core of 3 metres in length was collected from Chain Lake and subdivided into 1 cm sections for analysis while a core of 1 metre was collected from Frisken Lake. Water samples were collected from top, middle and bottom of the water column. This project was completed in conjunction with Study No. 428, Sample Collection for Kootenay Lake, British Columbia.

JACK LAKE

AED STUDY NO. 438, DR. D.R.S. LEAN

Jack Lake - Latitude 44° 41' 20" N.
Longitude 78° 02' 48" W.

Instrument - Eppley Model PSP Radiometer

Recorder - Campbell Scientific CRS Integrator

Jack Lake is situated about 62 km North-Northwest of Peterborough near the village of Apsley.

The solar radiation recorder is housed in a lab type trailer on the property of Tom Mann and the solar Eppley sensor is located along the shoreline of Sharp's Bay (part of Jack Lake).

The field schedule was to visit the site every 3 weeks, in conjunction with a monitor trip to the Dorset site, to maintain and collect the data from the solar radiation unit.

The Jack Lake solar site was decommissioned October 10th at 1400 hours GMT and all solar integrator, sensor and signal cables were removed from the site.

AQUATIC PHYSICS & SYSTEMS DIVISION

NIAGARA RIVER PLUME

APSD STUDY NO. 514, DR. C.R. MURTHY

The Niagara River mouth has been identified as a critical and serious source of toxic contaminants to Lake Ontario. The purpose of this Study was to study the physical parameters of current and temperature during three experiments timed in conjunction with the Persistant Organic Contaminants (Fox, ECD 220) cruises onboard the CSS LIMNOS.

The experiments were conducted June 3 - 7, July 15 - 19 and September 16 - 20. The mini-ranger positioning system was used with transponders located at the Pt. Weller Light and the Niagara River Lighthouse. The drogues (10) were released in the river mouth each morning and tracked until dusk, using CSL CADET.

During the drogue tracking, CSL SHARK conducted EBT surveys using a twenty-five square mile grid.

Mr. K. Miners of APSD kept in close contact with Mr. M.E. Fox onboard CSS LIMNOS to keep him apprised of the results of the drogue and EBT surveys.

ANALYTICAL METHODS DIVISION

ORGANIC CONTAMINANT AND LEGIONELLA SAMPLING

AMD STUDY NO. 622, B.J. DUTKA

The objective of this project, led by Mr. B.J. Dutka, AMD, is to produce a map of the Canadian shoreline of Lake Ontario indicating areas of organic contamination from industrial or sewage sources to be used as a reference to indicate which contaminants might be expected in any particular area. Water samples were also collected for the legionella bacterium. Fifty-seven sampling sites were selected along the shorelines of Lake Ontario and the Bay of Quinte.

Two vehicles were required--both with 110 volt generators. The Ford cargo van was set up with the large refrigerator and lab equipment and the GMC crewcab carried two small incubators and was used to launch the boat (CABOT #1). This arrangement required two people on shore to drive the vehicles and two in the boat at all times.

Surface water samples were collected for coliforms, toxicity and fecal sterols using a galvanized steel pail. Sediment samples were collected by mini-Shipek or Ekman dredge for toxicity, fecal sterols and dehydrogenase analyses. Sample incubations of 12 and 24 hours duration were conducted onboard the crewcab.

For future display purposes, a video tape was made of the entire process from sample collection to analysis in the lab.

ACIDIFICATION AND HEAVY METAL INTERACTIONS IN MICRO-ORGANISMS

AMD STUDY NO. 627, DR. S.S. RAO

PURPOSE

This Study is required to provide high priority data to the LRTAP Program to fill information gaps in the area of environmental contaminants. The effects of low pH on the cell physiology of microbes will be studied and how the role these microbes play in mobilization of heavy metals and selenium changes in the presence of low pH will be assessed. The role of selenium in the reduction of heavy metal toxicity will also be studied.

Sediment cores from acid stressed and non-acid stressed lakes will be analyzed for microbial population composition, sediment activity and heavy metal content. Laboratory experiments will be conducted to assess the effects of low pH on metal release from sediments and acid stress on microbial populations and activity. The electron microscope will be used to ascertain changes in cell physiology and toxic metal affinity to microbes caused by acid stress.

McFarlane and Clearwater lakes in the Sudbury area and Big Turkey Lake near Sault Ste. Marie were chosen for sampling as examples of acid stressed lakes.

SAMPLING REQUIREMENT

A total of six KB cores from the deep hole were required from each lake. One core was sampled for pH and Eh at every centimeter of its length. Two cores were subdivided at every centimeter down to 10 cm and every two centimeters from there to the bottom. Subsections of the same depth were then combined. The remaining three cores were similarly subdivided and combined.

Water samples were also collected from each deep hole of the lakes studied. The water samples were given to Microbiology staff for bacteria analysis and water quality analysis.

TECHNICAL OPERATIONS DIVISION

LOGISTICAL SUPPORT

TOD STUDY NO. 802, W.B. TAYLOR

RIGGING UNIT

The Rigging staff, shop, outdoor compounds and highbay warehouse facilities provided direct and indirect support to most NWRI field activities.

Services were provided at dockside for loading and off-loading ships. Buoys, hardware, winches, generators, mooring arrays and other equipment were prepared for the field. Forklift, heavy-truck driving and trailer-towing services were provided. Assistance in the field ranged from Saskatchewan to Prince Edward Island.

Another major responsibility has been the maintenance of NWRI's 25-unit vehicle fleet. This past year, the fleet mileage totalled 390,000 km, covering operations in all provinces, with the exception of Newfoundland/Labrador and Northwest Territories, as well as most states bordering the Great Lakes. Heavy involvement in the Sarnia/St. Clair River "Spill" added an additional $1600 to vehicle fuel expenditures.

Two new GMC crewcabs (4x4) were purchased this year and two older units were turned over to the Crown Assets Disposal Corporation. As a result of Court Action concerning the theft of Vehicle 84-113 from a local dealership, replacement of this vehicle is pending. It was decided to refurbish Vehicle 79-005 and retain it in the fleet until this matter is resolved.

FIELD STORES UNIT

This Unit maintained, issued and received a store of field sampling and support equipment. The inventory of over 500 line items was in constant use by field staff of NWRI and, as approved, by staff of the other components of CCIW. The scheduling and issue of 5 vehicles for short-term use by NWRI staff was also provided.

GREAT LAKES FISHERIES RESEARCH BRANCH, PARRY SOUND

TOD STUDY NO. 805, DR. M.G. JOHNSON

The Department of Fisheries & Oceans LRTAP Headquarters in Owen Sound has for the past few years studied the effects of airborne pollutants on two cascading watersheds in the Parry Sound area. The object of the Study was to assess the changes that occur in water chemistry as well as in fish and benthos communities as acid-burdened water travels through the watersheds and to gather data on metal compartmentalization. A synoptic survey was done on some 200 lakes in the Seguin and Shawanaga River watersheds. Of these, nine headwater lakes were chosen for indepth study. They displayed the widest range of pH, colour, conductivity and alkalinity found in the watersheds. Cochrane, Carruthers, Lane and Pender lakes are situated in the Seguin River watershed and Crow, Lady, Raven, K7 and Orange lakes are found in the Shawanaga River watershed.

Primary productivity experiments, the capture-mark-release and recapture of fish and the collection of sediment samples were done on some of these lakes. The primary productivity experiments were carried out on Carruthers, Cochrane, Crow, Lane, K7, Orange and Raven lakes. They involved the insitu incubation of water with a C_{14} spike at each metre of depth. At each station, a Secchi disc reading was taken, a temperature profile and a zooplankton net haul were done. Water samples were collected at various depths which would best describe the characteristics of the water column for chlorophyll, pH, conductivity, dissolved oxygen and alkalinity titrations, major ions, nutrients, trace metals, total phosphorus and total Kjeldahl nitrogen. In order to obtain fish population estimates in some of these lakes, trap nets and Windermere traps were used. The fish were captured and removed from the traps, then marked by a fin clip--either a right or left pelvic fin, and returned to the spot from which they were captured. Since the fish from one end of each lake were marked by the removal of a different pelvic fin than fish captured on the other end, information about fish movement in the lake as well as species composition and numbers could be collected. Four-foot trap nets were used to accomplish this on Cochrane and Carruthers lakes and Windermere traps on Crow and Raven lakes. These traps were visited on a daily basis while they were actively fishing in order that damage to the fish while in the traps was minimized.

In order to obtain benthic fauna population estimates, duplicate Ekman dredge samples were collected from Cochrane, Raven, K7

and Lady lakes. These lakes were sampled from the deep hole and at 1 metre depth intervals to shore in the direction giving the greatest spatial distribution. The samples were screened onboard to separate the organisms and coarse debris from the bulk of the sample. A mini-Shipek sample was taken from each site for organic content analysis.

In addition to the work done in the Parry Sound area, similar C_{14} experiments were run in Collins Inlet and sediment collection done in the Turkey Lakes in October.

WAVES TOWER

TOD STUDY NO. 805

Technical Operations Division was involved with 2 projects which made use of the WAVES tower situated at the Western end of Lake Ontario off Van Wagner's Beach in Hamilton. These projects were:

1. AES/ARQL Dissolved Oxygen Experiment
   Brian R. Kerman, A/Chief, Boundary Layer
   Research Division, AES, Toronto
   Project Leader

2. Ambient Air Aerosol Sampling
   Dr. H. Sievering, P. Eng.
   Governors State University
   Park Forest South, Illinois, U.S.A.
   Mr. Mark Watka, Project Leader

The two projects were conducted during the latter part of June and all of July. TOD was involved in the installation and removal of the bracketry needed and in the case of Dr. H. Seivering's Ambient Air Aerosol sampling, small boat support was also provided. For B. Keirman's Dissolved Oxygen Experiment, a small boat was made available for use by his technicians. For these two projects, the tower was visited on 25 different occasions, necessitating 32 boat trips.

LIMNOLOGICAL INSTRUMENTATION SECTION

The ongoing demands for instrumentation and equipment support were met for NWRI and outside agencies. With the advent of the new breed of state-of-the-art equipment, the technical upgrading of staff skills is in progress.

METEOROLOGICAL AND SHIPBOARD SYSTEMS

Meteorological data acquisition was continued at the Turkey Lakes, Dorset and Burlington Pier. This year, five meteorological buoys and eight land or tower meteorological sites were established and serviced by LIS. This task required the preparation of sixty-two Hymet recording systems in addition to seven solar radiation systems as follows:

NWRI - year round
Turkey Lakes - year round
Dorset (Par and Global) - year round
Jack Lake - January - October
Two units overhauled and loaned to Hydraulics Division, NWRI for field use
Great Lakes Fisheries Research Branch, PFF, Owen Sound

Four net solar sensors and eight global sensors were serviced and sent for calibration to Atmospheric Environment Service, Downsview.

Five shipboard winch systems were commissioned by LIS staff.

The following shipboard electronic systems were overhauled, serviced and kept operational by LIS staff:

Five winch systems
Four EBT systems
Two rosette systems
Four transmissometer systems
Five portable EBT systems

Contract administration was completed for a new winch under manufacture with a local vendor.

CURRENT METER SYSTEMS

Twenty current meters were overhauled with seventeen shipped for deployment. Three digitizers were overhauled and shipped for

deployment. Eight acoustic release units were overhauled and shipped for deployment. The modified cage for temperature, depth and transmissometer sensors was designed and installed on CSS LIMNOS. The new system eliminated the use of one winch with all three analog signals being recorded on a single chart. A new locally manufactured battery pack was designed and is being used on the acoustic release units with significant cost savings. Work is in progress for the design and manufacture of two digital data monitor systems for the new breed of Sea Data data acquisition systems. Evaluation tests were completed on a new lightweight acoustic release unit manufactured by a U.S. firm. Initial tests were not very successful. However, various design changes were suggested to the manufacturer for incorporation into the Phase II model for testing. Various special underwater cable assemblies were built for NWRI studies under contract with a local vendor. Four tide gauges were pre-field tested and shipped for field use.

UNDERWATER OPERATIONS

The Underwater Operations Unit provided national support to various scientific studies in areas of diver observation, inspections, installations and retrievals, sample collection, underwater photography, underwater television surveys with video documentation, land and beach surveys, equipment demonstrations/lectures, equipment trials, search and recovery and diver training. The Underwater Operations Unit supported twenty divers located at Burlington, Winnipeg, Vancouver and Owen Sound. Four hundred and seventy accident-free hours were logged in support of projects for: NWRI, Water Quality Branch and GLFRB, BLMSS and CHS, DFO. An additional two hundred and fifty-six hours were logged during the Pool Training Program.

The Underwater Operations Unit represented research/scientific diving as a member of the CSA Standards Technical Committee on Diving and Caisson Systems and the Ontario Commercial Diving Council (Ontario Construction Safety Association). In April, Mr. F.H. Don chaired the Annual Meeting of the Department of Environment Diving Safety Committee in Cornwall, Ontario.

The Underwater Operations Unit has a complete inventory of modern diving and dive support equipment which, when used and operated by highly-skilled divers can complete even the most difficult subsea operations.

Projects supported in 1985 included:

Study No. 109 - Habitat Studies, Lake Opeongo, Lake Ontario and Seneca Lake, N.Y.

Study No. 211 - Bioavailability Organics, Lake St. Clair

Study No. 320 - Air-Water Interaction, WAVES Tower, Lake Ontario

Study No. 322 - Littoral Sedimentology, Lake Ontario (Stoney Creek), Lake Erie (Pt. Burwell)

Study No. 324 - Littoral/Fluvial Sediment, Lake Ontario (Stoney Creek)

Study No. 405 - Metals, Acid, Nova Scotia, Kejimikujik National Park

Study No. 406 - Climate Change - Water, Saskatchewan and Alberta

Study No. 420 - Sediment Phosphorus Regeneration, Lake Erie

Study No. 510 - Upper Great Lakes Connecting Channels, Detroit River, Lake St. Clair and St. Clair River

Study No. 805 - Support to External Agencies
- GLFRB, Owen Sound
- Water Survey of Canada, Burlington Pier
- BLMSS, Resolute Bay

Study No. 807 - DOE Dive Safety Meetings, Cornwall Ontario