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Physical oceanographic data from the Miramichi Estuary, 1991-1993

A. Locke, S. Courtenay, K. Robichaud-LeBlanc and A. St-Hilaire

Science Branch
Fisheries and Oceans
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6

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A. Locke, S. Courtenay, K. Robichaud-LeBlanc and A. St-Hilaire

Science Branch,
Dept. of Fisheries and Oceans,
P.O. Box 5030,
Moncton, New Brunswick,
Canada, E1C 9B6

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TABLE OF CONTENTS

ABSTRACT

This report summarizes physical oceanographic and hydrological data collected in the course of plankton, beach-seining and beam-trawling investigations of the Miramichi Estuary, New Brunswick, during the ice-free seasons of 1991, 1992 and 1993. Nearshore surface temperature and salinity were measured by hand-held thermometer and refractometer during beach-seining surveys in 1991 and 1992. Vertical profiles of temperature and salinity were obtained from a Seabird CTD (conductivity-temperature-depth) profiler deployed in mid-channel during plankton and beam-trawling surveys in 1992 and 1993. Secchi depths and total suspended sediments were also measured. Tidal stage, predicted tidal amplitude, and mean daily freshwater discharge are reported for all dates sampled.

RÉSUMÉ

Le présent rapport résume les données océanographiques physiques et hydrologiques recueillies au cours des enquêtes relatives au plancton, à la pêche à la senne de rivage et au chalutage à perche dans l'estuaire de la Miramichi, au Nouveau-Brunswick, au cours des saisons libres de glace de 1991, de 1992 et de 1993. La température en surface et la salinité à proximité du rivage ont été mesurées à l'aide d'un thermomètre portatif et d'un réfractomètre, au cours des relevés sur la pêche à la senne de rivage en 1991 et en 1992. Les profils verticaux de la température et de la salinité ont été obtenus à l'aide d'une sonde CTD (conductivité - température - profondeur) de type Seabird déployée à mi chenal au cours des relevés sur le plancton et le chalutage à perche en 1992 et en 1993. Les profondeurs de disparition du disque de Secchi et le total des sédiments en suspension ont aussi été mesurés. Le progrès et la hauteur prévue de la marée ainsi que le débit journalier d'eau douce sont indiqués pour toutes les dates visées par l'échantillonnage.

INTRODUCTION

The Miramichi Estuary, located in the southwestern Gulf of St. Lawrence in the province of New Brunswick (Figure 1), is one of the largest estuaries in Atlantic Canada, draining 14000 km^2, and with a surface area of 300 km^2. During the ice-free seasons of 1991, 1992 and 1993, a study of finfish spawning and nursery areas was carried out in the estuary. In the course of this study, the Miramichi Estuary Project, data on temperature, salinity, Secchi depth, and total suspended solids were collected at stations from the head of tide in the Northwest Miramichi River to just outside the barrier islands separating Miramichi Bay from the Gulf of St. Lawrence. The most spatially and temporally comprehensive data, collected in 1992, were compared with historical data by Locke and Courtenay (1996). The present report summarizes the data collected in all three years of the study. These data may be obtained from the authors upon request, and are also archived with the Marine Environmental Data Service (Suite 1202, 200 Kent St., Ottawa, ON).

METHODS

Temperature, salinity, Secchi depth and total suspended sediments were determined at sites in and adjacent to the Miramichi Estuary. Locations of the sites are summarized in Table 1. Sampling was conducted from Red Bank on the Northwest Miramichi River, the upper extent of brackish water in this tributary, to the Outer Bay (Fig. 1), a distance of approximately 80 km.

Oceanographic variables were measured in the course of plankton, beam-trawl and beach-seining surveys. The methods and variables measured varied between the beach-seining and the other two surveys.

Plankton and beam-trawling surveys

All measurements obtained during plankton and beam-trawling surveys were collected in mid-channel from an anchored boat. Temperature and salinity were sampled within 1 m of the surface and bottom using a horizontally oriented Van Dorn sampling bottle, and immediately measured using a thermometer (Ertco No. 4652) and Aquafauna refractometer (Bio-marine Inc., Hawthorne, CA). With the exception of a few dates when the instrument was not available, a vertical profile of temperature and salinity was obtained using an SBE-19 Seacat Profiler (CTD) (Seabird Electronics Inc., Bellevue, WA). The temperatures and salinities measured by these two methods rarely differed by more than 1°C or 1 PSU (Practical Salinity Unit). Near-surface and near-bottom temperatures and salinities reported here were obtained from CTD readings except when these were not available.

A vertically integrated water sample (0.5 to 1 L) for determination of total suspended solid (TSS) concentration was

collected using a weighted Tygon tube (inside diameter 2.5 cm) to sample the water column from surface to near-bottom (maximum depth 9 m; few stations exceeded 10 m in depth). Upon return to the laboratory, this water sample was frozen, then later thawed and filtered onto a pre-weighed 0.45-µm cellulose nitrate filter, dried at 60°C for 24 hours, and weighed.

Water transparency (Secchi depth) was measured using a 20-cm black-and-white Secchi disk lowered on the shaded side of the boat. Secchi depth estimates compared among the three regular observers (A. Locke, S. Courtenay and K. Robichaud-LeBlanc) were similar within approximately 0.1-0.2m.

Beach-seining surveys

Only surface temperature and salinity were measured during beach-seining (BS) surveys. Measurements were obtained using the thermometer and refractometer described above, held by hand just under the water surface in water of approximately 1m depth.

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LITERATURE CITED

Locke, A. and S.C. Courtenay. 1996. Temperature, salinity and water clarity of the Miramichi Estuary, New Brunswick, during the ice-free season of 1992. Can. Tech. Rep. Fish. Aquat. Sci. xxxx: x + x p.

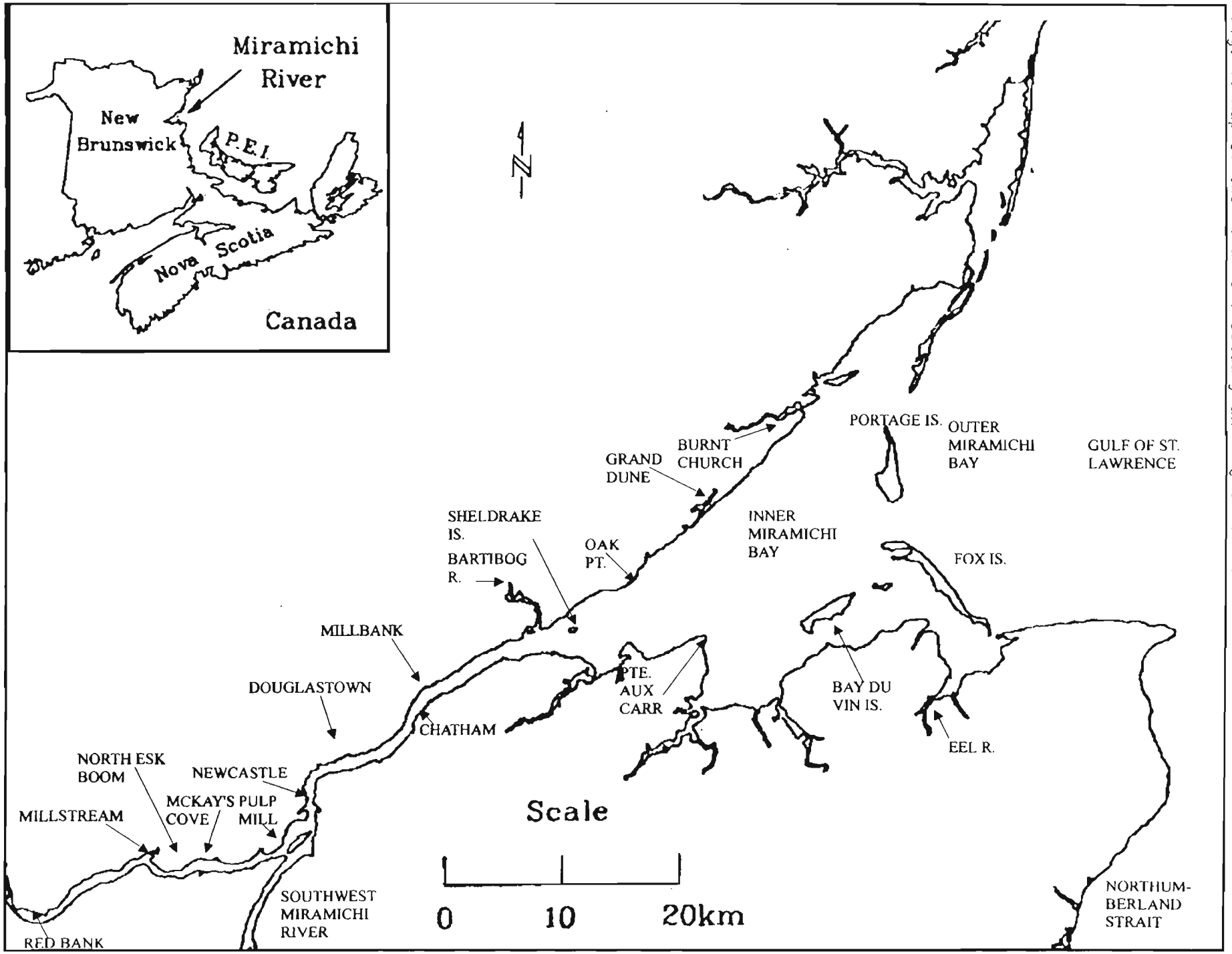

Fig. 1. Map of the Miramichi estuary and adjacent waters.

Table 1. Locations of sites in the Northwest Miramichi River, Main Miramichi River, Miramichi Inner Bay and Miramichi Bay at which beach seining (BS), plankton sampling (PL), and beam-trawling (BT) were conducted between 1991 and 1993. Site codes U1-U6, M1-M2, and L1-L6 designate 1991 beach seining sites. All other sites identified by M plus a number correspond to channel markers placed by the Canadian Hydrographic Service. Sampling indicated was not necessarily carried out in all years or at all times of year.

Site	Latitude DD-MM-SS	Longitude DD-MM-SS	Km from Red Bank	Work Done
Red Bank	46-56-50	65-49-30	0	BS-PL
Williamstown Road	46-57-30	65-45-25	4.5	BS-PL
N.W. Millstream	46-58-10	65-42-35	8	BS-PL
Below N. Esk Boom	46-57-35	65-41-00	11	PL
N. Esk Boom	46-57-55	65-41-00	11	PL
Stewart Brook	46-57-35	65-39-30	12.4	BS
Above MacKay Cove	46-58-10	65-38-50	13.1	BS-PL
Below MacKay Cove	46-57-35	65-38-50	13.1	BS-PL
McKay Cove	46-58-05	65-38-50	13.1	BS-PL
Eel Ground	46-57-40	65-37-30	14	BS-PL
Derby Junction	46-57-40	65-36-55	15.8	BS
Repap Railway	46-58-00	65-36-00	16.5	PL
Enclosure Park (U1)	46-57-50	65-35-30	17.6	BS
Wilson's Pt.	46-57-55	65-34-95	18.3	BS
S.W. Beaubears I.	46-58-00	65-34-55	18.5	BS
Wilsons Pt. (U2)	46-57-50	65-34-55	18.7	BS
N.W.Beaubears I.	46-58-30	65-34-30	19.2	BS
Beaubears Island	46-58-30	65-34-30	19.2	PL
Flett Cove (U4)	46-57-55	65-33-50	19.7	BS
S. Beaubears I. (U3)	46-58-25	65-34-00	19.8	BS

Table 1. Continued.

Site	Latitude DD-MM-SS	Longitude DD-MM-SS	Km from Red Bank	Work Done
Beaubears Pt (U5)	46-58-45	65-33-35	20.4	BS
Strawberry Marsh (U6)	46-59-10	65-34-05	20.4	BS
Match-Its	46-59-10	65-34-05	20.4	PL
Newcastle	46-59-55	65-33-40	22.2	PL-BT
M97	47-00-15	65-33-40	22.9	PL-BT
M95	47-00-30	65-33-35	23.3	BT
O'Neil	47-00-50	65-33-10	24	PL-BT
Lower Chatham Head	47-00-35	65-32-45	24.1	PL-BT
French-Fort	47-00-55	65-32-55	24.5	PL-BT
M90	47-00-55	65-31-50	25.5	PL-BT
M88	47-01-00	65-30-55	26.6	PL-BT
M86	47-01-05	65-30-25	27.4	BT
Morrison Cove	47-01-05	65-30-10	27.6	BS-PL
M84	47-01-10	65-29-35	28.4	PL-BT
Chatham	47-01-45	65-28-25	30.2	PL-BT
M76	47-02-15	65-28-10	31.1	PL-BT
M75	47-03-05	65-27-50	32.6	PL-BT
Millbank	47-03-10	65-28-00	32.9	PL-BT
Middle I. (M1)	47-03-10	65-27-20	33	BS-PL
M73	47-03-15	65-27-25	33.3	PL-BT
M71	43-03-35	65-27-10	38.8	PL
M68	47-03-55	65-25-05	36.4	PL-BT
Gordon Pt. (M2)	47-04-45	65-23-35	38.8	BS-PL-BT
M65	47-04-40	65-23-30	38.9	PL-BT
M62	47-04-50	65-22-40	39.9	BT

Table 1. Continued.

Site	Latitude DD-MM-SS	Longitude DD-MM-SS	Km from Red Bank	Work Done
M61	47-04-55	65-21-50	40.8	PL-BT
Bartibog	47-05-20	65-21-05	42.1	PL-BT
M59	47-04-50	65-20-35	42.4	BT
East Pt. (L1)	47-04-40	65-20-30	42.6	BS
M58	47-04-50	65-19-50	43.4	PL-BT
S. Sheldrake I. (L2)	47-05-10	65-19-20	44	BS
Sheldrake Island	47-05-20	65-19-20	44	BS-PL
N. Sheldrake I. (L3)	47-05-25	65-19-20	44.2	BS
Bartibog/Sheldrake Marker(L4)	47-06-05	65-19-30	44.3	BS
M56-57	47-04-50	65-18-55	44.6	PL-BT
M54-55	47-05-00	65-17-40	46.1	BT
M52-53	47-05-45	65-17-10	46.9	PL-BT
The Willows (L7)	47-06-50	65-16-35	47.3	BS
Cheval Pt. (L5)	47-04-50	65-16-35	47.5	BS
M51	47-06-30	65-16-05	47.7	PL-BT
Oak Point	47-07-05	65-16-05	49.1	PL-BT
M48-49	47-06-45	65-14-50	50.3	PL-BT
M46-47	47-06-55	65-14-15	51.1	BT
M45	47-07-15	65-13-35	52.2	BT
Pt. Aux Carr (L6)	47-04-55	65-13-25	52.6	BS
M44	47-07-50	65-12-50	53.3	PL-BT
M43	47-08-05	65-12-20	54.1	PL-BT
M41	47-08-10	65-11-55	54.6	PL-BT
M40	47-08-05	65-10-50	55.8	PL-BT
M38	47-07-45	65-08-55	57.1	PL-BT
Bay Du Vin #1-1/2	47-04-05	65-08-35	57.6	BT

Table 1. Continued.

Site	Latitude DD-MM-SS	Longitude DD-MM-SS	Km from Red Bank	Work Done
Bay Du Vin #2	47-05-20	65-08-25	58.3	PL-BT
Bay Du Vin #1	47-03-00	65-09-10	58.5	PL-BT
M36	47-07-30	65-07-10	59	PL-BT
Burnt Church #2	47-10-20	65-07-35	60.7	PL-BT
Horseshoe Shoal	47-10-20	65-07-35	60.7	PL-BT
M30	47-07-20	65-05-40	60.9	PL-BT
Burnt Church #1	47-11-10	65-08-05	61.4	PL-BT
M29	47-07-25	65-05-05	61.7	PL-BT
M28	47-07-40	65-04-40	62.2	PL-BT
M26	47-08-20	65-04-05	63.1	PL-BT
M21	47-08-35	65-02-50	64.9	PL-BT
Portage Island	47-09-10	65-02-25	65.9	PL-BT
M19	47-08-35	65-01-45	66.3	PL-BT
ME8	47-08-35	65-00-05	70.2	PL-BT
ME4	47-09-15	64-58-15	72.7	PL-BT
15m-Station	47-10-00	64-56-00	77	PL-BT

Table 2. Daily maximum predicted tidal amplitudes at Escuminac, days past maximum spring tide (Canadian Hydrographic Service, 1991, 1992, 1993) and freshwater discharge at Trout Brook (station N001BQ001) on the Northwest Miramichi River (Environment Canada) on days during which sampling was carried out. Freshwater discharge (Q) may be extrapolated for the estuary using a ratio of drainage area of the estuary (14000 km^2):drainage area of Trout Brook (948 km^2), i.e. $Q_{estuary}=Q_{Trout\ Brook}$ x 14000 km^2/948 km^2.

Date (YYMMDD)	**Tidal Amp-litude(m)**	**Daily freshwater discharge($m^3 \cdot sec^{-1}$)**
910514	1.31	79.1
910515	1.46	66.3
910516	1.52	55.3
910523	0.52	29.3
910528	1.04	23.5
910530	1.10	20.5
910531	1.10	18.2
910610	1.04	9.6
910611	1.25	9.1
910613	1.49	21.0
910625	0.94	9.4
910626	0.97	9.0
910708	0.88	6.1
910709	1.07	6.5
910710	1.28	6.4
910711	1.43	6.3
910720	0.67	4.5
910722	0.73	4.0
910723	0.82	3.8
910724	0.88	3.8

Table 2. Continued.

Date (YYMMDD)	Tidal Amp-litude(m)	Daily freshwater discharge($m^3 \cdot sec^{-1}$)
910725	0.94	3.6
910806	1.07	4.0
910807	1.13	3.8
910808	1.22	3.0
910809	1.10	2.6
910819	0.73	4.4
910820	0.76	30.8
910821	0.79	36.6
910822	0.82	24.5
910909	0.97	4.3
910910	0.88	4.0
910911	0.97	4.5
911023	1.07	23.5
911024	1.19	21.5
911025	1.28	20.1
920506	1.28	54.0
920507	0.91	47.6
920508	1.07	52.7
920514	0.88	67.7
920515	1.04	69.1
920519	1.22	34.5
920520	1.13	29.7
920525	0.46	19.4

Table 2. Continued.

Date (YYMMDD)	Tidal Amp-litude(m)	Daily freshwater discharge($m^3 \cdot sec^{-1}$)
920528	0.58	16.2
920531	1.13	12.6
920602	1.37	12.3
920603	1.40	16.2
920604	1.37	14.4
920607	0.82	12.1
920610	0.67	9.8
920611	0.82	9.1
920614	1.07	11.2
920616	1.13	9.0
920617	1.13	8.1
920618	1.07	7.5
920619	0.97	7.0
920625	0.64	19.6
920626	0.64	29.0
920627	0.82	25.5
920628	1.04	23.5
920629	1.19	20.9
920702	1.40	29.8
920703	1.34	26.7
920708	0.70	19.2
920709	0.79	17.5
920714	1.00	31.0
920715	1.04	24.1

Table 2. Continued.

Date (YYMMDD)	Tidal Amp-litude(m)	Daily freshwater discharge($m^3 \cdot sec^{-1}$)
920716	1.04	19.0
920717	0.94	15.5
920721	0.49	12.6
920722	0.55	11.9
920723	0.61	10.5
920724	0.73	9.4
920727	1.04	11.7
920728	1.22	12.7
920729	1.04	10.8
920810	0.82	14.6
920812	0.88	13.5
920813	0.88	12.2
920814	0.85	11.1
920819	0.58	9.5
920820	0.67	10.5
920824	0.88	7.6
920825	1.04	7.0
920826	1.13	6.8
920827	1.16	6.7
920902	0.46	7.3
920903	0.76	7.4
920916	0.70	3.6
920917	0.73	3.6
920923	0.91	4.2

Table 2. Continued.

Date (YYMMDD)	Tidal Amp-litude(m)	Daily freshwater discharge($m^3 \cdot sec^{-1}$)
920924	0.91	5.3
920925	0.88	4.6
920929	0.97	3.7
921007	0.61	3.0
921008	0.58	3.0
921021	0.58	5.4
921022	0.70	5.1
930528	0.76	27.5
930531	0.61	88.9
930601	0.82	65.2
930602	1.00	81.2
930603	1.19	76.3
930615	0.55	27.9
930616	0.70	24.5
930617	0.82	22.1
930713	0.61	9.6
930714	0.73	9.5
930715	0.73	8.9
930716	0.79	8.9
931019	1.34	14.9
931020	1.19	13.0
931021	1.00	14.3
931022	0.85	33.5

Table 3. Physical data collected during plankton surveys of the Miramichi estuary in summer, 1992 and 1993. Predicted tidal stage was provided by Marine Environmental Data Service; observed tides were based on observations of water movement during sampling (hs: high slack, e: ebb, ls: low slack, f: flood). TSS: Total suspended sediments.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920506	Newcastle	1145-1250	hs	e	5.1	4.0	4.0	0	0	Yes	1.0	
920506	Lower Chatham Head	1300-1405	e	e	4.2	4.0	4.0	0	0	Yes	1.0	
920506	Chatham	1455-1535	e	ls	7.3	4.0	4.0	0	0	Yes	0.8	
920506	Millbank	1542-1643	e	ls	8.3	4.0	4.0	0	0	Yes	0.8	
920507	Bartibog	0945-1018	e	e	5.7	4.0	3.0	0	11	Yes	0.5	
920507	Sheldrake I.	1117-1200	e	e	9.3	4.0	3.0	1	19	Yes	0.5	
920507	Oak Pt.	1300-1340	e	e	6.2	5.0	3.0	5	20	Yes	0.8	
920507	M28	1730-1805	f	f	5.1	6.0	3.0	8	22	Yes	0.8	
920508	Bay du Vin #1	1035-1105	ls	e	4.4	5.0	4.0	9	11	Yes	0.8	
920508	Bay du Vin #2	1142-1214	e	e	5.5	6.0	3.0	8	17	Yes	1.0	
920508	Horseshoe Shoal	1410-1440	e	e	3.2	6.0	3.0	8	23	Yes	1.0	
920508	Burnt Church	1515-1550	e	ls	6.5	6.0	3.0	14	25	Yes	0.8	
920508	M30	1250-1325	e	e	8.5	6.0	2.0	6	28	Yes	1.0	
920515	NW Millstream	1253-1330	.	ls	3.2	9.0	9.0	0	0	Yes	1.0	
920515	N. Esk Boom	.		ls	4.4	9.0	9.0	0	1.8	Yes	1.8	
920515	McKay's Cove	1120-1220	e	ls	3.8	10.0	10.0	0	0	Yes	1.5	
920519	Lower Chatham Head	1910-1945	.	f	.	13.0	11.0	0	8	No	1.1	
920519	Chatham	1835-1905	.	f	.	13.0	11.0	1	10	No	1.0	
920519	Millbank	1745-1825	e	f	.	13.0	10.0	4	15	No	0.9	
920519	Bartibog	1645-1730	e	f		12.0	9.0	6	21	No	1.0	
920519	Sheldrake I.	1600-1630	e	f	.	12.0	7.0	8	25	No	1.0	
920519	Oak Pt.	1430-1533	e	f	.	12.0	7.0	12	27	No	1.5	
920520	Red Bank	1455-1520	e	e	.	13.0	13.0	0	0	No	2.0	
920520	Williamstown Rd.	1356-1425	e	e		13.0	13.0	0	0	No	2.5	
920520	NW Millstream	1310-1340	e	e		13.0	13.0	0	0	No	2.2	

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920520	N. Esk Boom	1220-1250	e	e	.	13.0	13.0	0	0	No	1.9	
920520	McKay's Cove	1130-1156	hs	e	.	13.0	13.0	0	0	No	0.9	
920520	Repap Railway	1041-1110	hs	e	.	13.0	12.0	0	1	No	0.9	
920525	N. Esk Boom	1505-1519	e	e	1.4	17.5	17.0	0	0	Yes	1.5	
920525	McKay's Cove	1246-1315	hs	e	9.7	16.0	16.0	0	2	Yes	1.0	
920525	Repap Railway	1150-1218	hs	e	7.3	16.0	14.0	1	3	Yes	1.0	
920525	Match-its	1600-1650	e	e	5.0	16.0	10.5	2	14	Yes	0.8	
920528	NW Millstream	1105-1130	ls	f	5.6	14.0	12.0	0	0	Yes	1.8	
920528	N. Esk Boom	.-1052	e	f	3.1	13.5	13.5	0	0	Yes	1.8	
920528	McKay's Cove	0950-1015	e	ls	8.0	14.0	14.0	0	0	Yes	1.5	
920528	Repap Railway	0845-0931	e	ls	5.9	14.5	15.5	0	1	Yes	1.2	
920528	Match-its	1225-1252	f	f	4.7	16.0	13.0	1	1	Yes	1.0	
920531	NW Millstream	1452-1520	f	f	4.1	18.0	17.0	0	0	Yes	1.9	
920531	N. Esk Boom	1419-1442	ls	f	8.8	17.0	17.0	0	0	Yes	2.0	
920531	McKay's Cove	1313-1341	e	ls	7.4	16.0	16.0	0	0	Yes	1.7	
920531	Repap Railway	1205-1302	e	ls	6.1	15.5	15.0	0	1	Yes	0.9	
920531	Match-its	1550-1615	f	f	3.0	16.0	16.0	1	1	Yes	0.8	
920602	NW Millstream	1552-1623	ls	f	3.3	17.0	17.0	0	0	Yes	2.2	
920602	N. Esk Boom	1512-1540	e	ls	3.7	17.0	17.0	0	0	Yes	1.8	
920602	Below McKay's Cove	1320-1356	e	ls	8.7	17.0	16.0	0	1	Yes	1.0	
920602	Above McKay's Cove	1436-1506	e	ls	3.7	17.0	17.0	0	0	Yes	1.0	
920602	Eel Ground	1823-1845	f	f	6.1	16.5	16.5	1	1	Yes	1.0	
920602	Repap Railway	1235-1305	e	e	6.5	17.0	16.0	1	5	Yes	0.9	
920602	Match-its	1148-1225	e	e	5.0	16.0	16.0	4	4	Yes	0.9	
920603	Newcastle	0950-1030	e	e	9.6	15.5	15.0	7	8	Yes	0.8	23.58
920603	O'Neil's	1100-1130	e	e	13.7	15.0	14.5	7	9	Yes	1.0	
920603	Waferboard Plant	1140-1149	.	e	.	.		8	18	No	.	

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920603	M73	1550-1620	e	f	8.0	15.5	15.0	7	9	No	.	29.09
920603	M65	1502-1530	e	ls	.	15.0	14.5	11	16	No		
920603	Bartibog	1402-1445	e	ls	.	14.5	14.0	12	16	No		70.40
920603	Sheldrake I.	1218-1255	e	e	9.2	14.0	14.0	15	18	No	.	48.23
920603	Oak Pt.	1308-1335	e	ls	9.7	14.0	12.5	19	24	No	.	13.02
920604	Red Bank	1730-1747	ls	f	.	16.0	16.0	0	0	No	2.5	
920604	Williamstown Rd.	1535-1555	e	ls	2.0	15.5	15.5	0	0	Yes	2.5	
920604	NW Millstream	1500-1523	e	ls	4.2	16.0	16.0	0	0	Yes	1.8	
920604	N. Esk Boom	1420-1455	e	ls	9.5	16.5	16.5	0	0	Yes	.	
920604	McKay's Cove	1245-1348	e	e	4.6	16.5	16.5	0	0	Yes	.	
920604	Eel Ground	1158-1230	e	e	8.4	16.5	16.5	1	1	Yes	.	
920604	Repap Railway	1110-1145	e	e	6.0	16.0	16.0	2	4	Yes	.	
920607	Red Bank	1130-1210	hs	e	2.6	15.5	15.5	0	0	Yes	4.0	
920607	Williamstown Rd.	1230-1251		e	2.6	16.5	16.0	0	0	Yes	2.0	
920607	NW Millstream	1300-1330	hs	e	5.7	17.0	16.5	0	0	Yes	1.8	
920607	N. Esk Boom	1340-1402	e	e	9.5	17.0	16.5	0	0	Yes	1.5	
920607	McKay's Cove	1420-1445	e	e	5.1	17.0	17.0	0	0	Yes	1.0	
920607	Eel Ground	1520-1540	e	e	7.4	17.5	17.0	0	0	Yes	1.5	
920607	Repap Railway	1615-1635	e	e	6.3	17.5	17.0	0	0	Yes	0.8	
920607	Match-its	1645-1730	e	ls	4.5	17.5	17.0	1	1	Yes	0.5	
920607	Newcastle	1812-1832	ls	ls	8.9	17.5	16.5	1	5	Yes	0.5	
920610	Red Bank	1204-1230	f	f	2.3	18.0	18.0	0	0	Yes	2.4	
920610	Williamstown Rd.	1240-1400	f	f	2.4	19.5	19.5	0	0	Yes	1.7	
920610	NW Millstream	1410-1440	f	hs	4.7	19.5	19.5	0	0	Yes	1.5	
920610	N. Esk Boom	1445-1525	f	hs	8.9	19.0	18.0	0	3	Yes		
920610	McKay's Cove	1535-1620	hs	e	8.5	18.5	17.5	1	4	Yes	1.2	
920610	Eel Ground	1645-1705	hs	e	7.8	19.0	18.0	1	3	Yes	1.2	
920610	Repap Railway	1715-1740	e	e	6.5	18.5	17.5	1	3	Yes	1.0	
920610	Match-its	1745-1810	e	e	5.9	18.0	16.0	4	12	Yes	1.0	

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920614	Red Bank	1603-1622	f	f	1.7	18.5	18.5	0	0	Yes	3.0	
920614	Williamstown Rd.	1531-1551	f	f	1.7	18.5	18.5	0	0	Yes	2.5	
920614	NW Millstream	1453-1520	ls	f	4.7	18.5	17.5	0	0	Yes	1.9	
920614	N. Esk Boom	1422-1445	e	f	7.6	18.5	17.5	1	6	Yes	1.6	
920614	McKay's Cove	1325-1410	e	ls	7.0	18.5	18.0	2	5	Yes	.	
920614	Eel Ground	1238-1300	e	ls	6.2	18.5	17.5	3	6	Yes	1.2	
920614	Repap Railway	1205-1228	e	ls	5.5	18.5	18.0	4	5	Yes	1.2	
920614	Match-its	1123-1204	e	e	5.5	18.0	18.0	4	5	Yes	0.6	
920616	Match-its	1445-1513	ls	ls	4.2	18.5	18.0	2	2	Yes	1.0	17.12
920616	Newcastle	1527-1558	ls	ls	13.1	18.5	17.5	2	5	Yes	1.4	11.45
920616	Waferboard Plant	1610-1637	ls	ls	5.5	18.0	17.0	4	8	Yes	1.0	11.38
920616	Chatham	1740-1812	ls	ls	12.5	17.5	16.5	7	12	Yes	1.3	25.88
920616	M71	1654-1732	ls	f	9.5	17.5	16.0	8	14	Yes	1.0	15.03
920617	Bartibog	1636-1715	f	f	8.3	19.0	15.5	9	21	Yes	1.5	15.19
920617	Sheldrake I.	1544-1620	ls	f	7.6	18.5	15.5	10	21	Yes	1.5	11.51
920617	Oak Pt.	1459-1531	e	f	10.4	18.5	14.5	16	24	Yes	2.0	10.00
920617	Bay du Vin #1	1114-1149	e	e	4.3	17.0	15.5	20	22	Yes	2.1	10.80
920617	Bay du Vin #2	1225-1254	e	e	6.5	18.0	14.0	20	25	Yes	2.8	7.18
920617	M36	1013-1054	e	e	6.5	15.5	14.0	23	26	Yes	2.0	7.30
920617	Burnt Church #2	1401-1434	e	ls	5.2	18.0	14.0	21	26	Yes	2.5	9.39
920617	Burnt Church #1	1314-1350	e	ls	5.1	16.5	14.0	21	26	Yes	2.0	11.45
920618	Red Bank	1620-1642	ls	ls	1.2	20.0	20.0	0	0	Yes	2.0	13.18
920618	Williamstown Rd.	1545-1610	e	ls	1.9	20.5	20.5	0	0	Yes	1.8	19.09
920618	NW Millstream	1500-1534	e	ls	5.1	19.5	19.5	0	0	Yes	1.3	13.12
920618	N. Esk Boom	1430-1500	e	e	9.9	19.5	19.5	0	0	Yes	1.1	11.88
920618	McKay's Cove	1353-1420	e	e	3.3	19.0	19.0	1	1	Yes	1.4	19.26
920618	Eel Ground	1315-1345	e	e	6.1	20.0	19.5	1	2	Yes	1.0	30.33
920618	Repap Railway	1230-1300	e	e	5.0	19.5	18.5	2	4	Yes	1.0	20.27
920618	M61	0915-0945	hs	e	9.1	17.0	15.0	16	23	Yes	1.8	7.41

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920625	Red Bank	1505-1528	hs	e	2.8	15.5	15.5	0	0	Yes	0.7	
920625	Williamstown Rd.	1430-1453	hs	e	2.4	17.0	17.0	0	0	Yes	1.5	
920625	NW Millstream	1400-1419	f	e	5.5	16.5	17.5	0	1	Yes	1.3	
920625	N. Esk Boom	1314-1340	f	hs	9.9	17.0	19.0	0	4	Yes	1.1	
920625	McKay's Cove	1238-1303	f	hs	6.1	17.5	19.5	1	5	Yes	1.1	
920625	Eel Ground	1203-1230	f	hs	6.7	17.5	19.0	1	7	Yes	1.3	
920625	Repap Railway	1129-1200	f	f	6.7	18.0	19.0	1	3	Yes	1.1	
920625	Match-its	1052-1121	ls	f	4.9	18.5	18.5	1	13	Yes	1.2	
920702	Red Bank	1452-1515	e	ls	.	16.0	16.0	0	0	No	1.3	13.21
920702	Williamstown Rd.	1415-1441	e	ls	.	16.5	16.5	0	0	No	1.8	15.08
920702	NW Millstream	1342-1410	e	ls	.	16.5	16.5	0	0	No	1.1	13.70
920702	N. Esk Boom	1312-1335	e	e	.	17.5	17.5	0	0	No	1.0	20.38
920702	McKay's Cove	1233-1300	e	e	.	17.5	17.5	0	0	No	0.9	26.10
920702	Eel Ground	1203-1225	e	e	.	17.5	17.5	0	0	No	0.6	21.00
920702	Repap Railway	1128-1155	e	e		17.0	17.5	0	0	No	0.6	25.38
920702	Match-its	1050-1120	e	e	.	17.0	17.5	0	2	No	0.5	66.91
920703	Newcastle	1015-1055	e	e	.	17.0	17.5	0	5	No	1.0	17.85
920703	M88	1105-1130	e	e	.	17.0	17.5	2	9	No	0.8	10.97
920703	M76	1145-1215	e	e	.	17.0	17.5	5	10	No	0.8	9.35
920703	M65	1320-1345	e	e	.	17.5	17.0	8	17	No	0.9	22.16
920703	M61	1355-1442	e	ls	.	17.5	17.0	8	18	No	0.8	19.53
920703	M56	1550-1614	f	f	.	17.5	17.0	8	16	No	0.8	18.93
920703	Oak Pt.	1505-1535	ls	f		17.5	16.5	14	21	No	1.0	12.91
920709	Red Bank	1343-1405	f	hs	.	18.0	17.5	.	.	No	2.1	24.44
920709	Williamstown Rd.	1315-1335	f	hs	.	18.5	18.5		.	No	2.5	14.85
920709	NW Millstream	1245-1305	f	hs	.	18.5	18.5	.	.	No	1.9	20.00
920709	N. Esk Boom	1205-1225	f	f		18.0	17.5	.	.	No	1.9	9.18
920709	McKay's Cove	1136-1155	f	f	.	17.5	17.0	.	.	No	1.8	14.00
920709	Eel Ground	1110-1130	f	f		17.5	17.0	.	.	No	1.6	21.67

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920709	Repap Railway	1044-1105	ls	f	.	17.5	17.5	.	.	No	1.2	24.91
920709	Match-its	1010-1035	ls	f	.	17.5	17.5	.	.	No	0.5	27.88
920715	Red Bank	.	e	ls	2.1	16.5	16.5	0	0	Yes	2.0	13.71
920715	Williamstown Rd.	1340-1405	e	ls	5.0	16.0	16.0	0	0	Yes	2.0	18.27
920715	NW Millstream	1303-1335	e	ls	8.5	15.5	15.5	0	0	Yes	1.2	17.74
920715	N. Esk Boom	1234-1300	e	e	5.2	16.5	16.0	0	0	Yes	1.0	18.27
920715	McKay's Cove	1140-1205	e	e	5.8	17.5	17.0	0	0	Yes	0.9	8.24
920715	Eel Ground	1110-1135	e	e	.	18.5	18.5	0	0	Yes	1.0	15.12
920715	Repap Railway	1035-1105	e	e	5.8	17.0	17.0	0	0	Yes	0.7	29.32
920715	Match-its	1000-1030	e	e	5.6	17.0	17.0	2	6	Yes	0.9	21.41
920716	Match-its #1	0941-1025	e	e	6.0	16.5	17.0	0	0	Yes	1.2	12.58
920716	Match-its #2	1033-1100	e	e	6.1	16.5	17.0	3	11	Yes	1.0	16.18
920716	Newcastle	1130-1200	.	e	5.2	16.5	16.0	0	0	Yes	.	
920716	M56	1315-1330	.	ls	6.0	17.0	17.0	5	12	Yes	.	12.12
920717	Bartibog	1154-1225	e	e	9.1	17.5	16.0	8	22	Yes	1.5	14.24
920717	M58	1104-1137	e	e	9.0	17.0	16.0	9	23	Yes	1.2	10.42
920717	M53	1022-1050	e	e	9.2	17.0	16.0	12	23	Yes	2.0	11.14
920717	M51	0915-1010	hs	e	11.2	17.0	15.5	13	24	Yes	2.0	12.91
920721	Chatham	1238-1305	e	e	9.1	19.0	17.0	4	18	Yes	1.0	9.29
920721	Millbank	1332-1355	e	e	9.3	19.0	17.0	4	19	Yes	1.1	7.05
920721	Gordon Pt.	1425-1450	e	ls	5.3	19.0	16.5	6	21	Yes	1.2	6.20
920721	Bartibog	1518-1540	e	ls	6.6	19.5	16.5	7	23	Yes	1.2	9.42
920721	Sheldrake I.	1605-1630	e	ls	9.9	19.0	16.0	9	23	Yes	1.2	10.13
920721	M53	1702-1725	ls	f	8.4	19.0	16.0	15	24	Yes	1.0	6.88
920722	M29	1600-1625	ls	ls	8.4	20.0	15.5	17	25	Yes	2.0	13.02
920722	M26	1508-1530	e	ls	9.1	19.5	15.5	20	25	Yes	2.5	10.85
920722	M21	1418-1440	e	e	10.9	19.0	16.0	22	25	Yes	3.8	10.48
920722	ME8	1333-1400	e	ls	7.3	16.5	15.5	24	26	Yes	4.1	12.75
920722	ME4 #1	1155-1220	e	e	8.1	16.5	16.0	26	26	Yes	7.0	12.47

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (°C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920722	ME4 #2	1252-1314	e	e	7.8	16.5	15.0	26	27	Yes	5.5	15.80
920723	Newcastle	1554-1612	f	e	7.5	20.0	17.5	4	16	Yes	1.0	12.53
920723	M90	1500-1525	f	e	8.8	18.5	17.0	12	21	Yes	1.1	12.18
920723	M51	1245-1305	f	e	8.0	18.0	16.0	20	24	Yes	2.5	6.42
920723	M44	1130-1150	hs	e	7.7	17.0	16.0	23	24	Yes	2.5	5.55
920723	M40	1044-1105	f	hs	8.7	17.0	15.5	21	25	Yes	2.5	10.50
920723	M36	0948-1010	f	hs	8.3	18.0	16.0	17	24	Yes	2.0	8.75
920727	Red Bank	1222-1248	e	f	1.9	21.0	21.0	0	0	Yes	2.0	
920727	Williamstown Rd.	1255-1320	e	f	4.8	21.0	20.0	0	3	Yes	2.6	1.84
920727	NW Millstream	1327-1350	ls	f	10.1	21.0	19.0	1	9	Yes	2.0	4.87
920727	N. Esk Boom	1357-1420	ls	f	4.3	21.0	19.5	3	9	Yes	2.0	6.79
920727	McKay's Cove	1430-1450	ls	f	4.8	21.0	20.0	5	8	Yes	1.8	7.86
920727	Repap Railway	1503-1525	f	f	.	21.5		6	.	No	1.6	8.62
920813	Red Bank	1056-1130	e	e	.	18.0	18.0	0	2	No	2.8	22.86
920813	Williamstown Rd.	1144-1215	e	e	.	19.5	19.5	0	3	No	2.5	40.59
920813	NW Millstream	1249-1310	ls	ls	.	20.0	20.0	0	3	No	1.2	8.00
920813	N. Esk Boom	1315-1340	f	ls	.	21.0	20.0	5	8	No	1.7	6.90
920813	Below N. Esk Boom	1350-1420	.	ls	.	20.0	21.0	2	5	No	1.4	7.14
920813	Newcastle	1455-1525	f	f	.	21.0	19.0	5	16	No	1.1	20.79
920813	M90	1530-1555	f	f	.	20.0	20.0	6	17	No	1.1	8.11
920813	M84	1635-1705	f	f	.	20.0	19.0	8	15	No	1.2	9.62
920813	Chatham	1605-1630	f	f	.	20.0	20.0	12	18	No	1.4	13.88
920813	M75	1715-1805	f	f		20.0	19.0	14	23	No	1.1	18.64
920814	M51	0910-0940	hs	e	.	19.0	18.0	22	28	No	1.9	8.84
920814	M49	0947-1015	e	e	.	19.0	18.0	20	24	No	2.5	17.42
920814	M47	1020-1050	e	e	.	19.0	17.5	20	26	No	2.1	9.89
920825	Red Bank	1431-1450	f	f	2.1	23.0	22.5	0	0	Yes	3.0	13.33
920825	Williamstown Rd.	1400-1424	f	f	2.1	22.0	21.5	0	0	Yes	2.5	7.95
920825	NW Millstream	1325-1351	f	f	4.9	21.5	19.0	2	8	Yes	1.7	11.78

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
920825	N. Esk Boom	1256-1300	ls	f	10.0	21.0	19.0	3	10	Yes		
920825	McKay's Cove #1	1226-1250	ls	f	5.6	20.5	19.0	4	11	Yes	1.5	1.57
920825	McKay's Cove #2	1615-1620	f	hs	5.2	21.5	19.5	5	10	Yes		
920825	Eel Ground	1625-1633	f	hs	8.0	21.5	19.5	7	10	Yes		
920825	Repap Railway #1	1150-1215	ls	f	5.3	21.0	19.5	5	10	Yes	1.3	
920825	Repap Railway #2	1436-1605	f	f	6.2	20.5	20.0	8	9	Yes	1.3	9.62
920825	Match-its #1	1115-1145	e	f	4.5	20.0	19.5	7	11	Yes	1.0	8.89
920825	Match-its #2	1642-1707	f	hs	5.0	20.0	19.0	11	14	Yes	1.4	13.19
920827	Sheldrake I.	1356-1425	ls	f	.	20.5	20.5	18	21	No	1.3	
920827	M88	1125-1155	e	ls	8.6	19.5	19.0	12	14	Yes	0.8	26.34
920827	M65	1223-1255	ls	ls	8.5	19.5	19.0	16	18	Yes	0.7	23.20
920827	M61	1300-1325	ls	f	8.3	19.5	19.0	16	18	Yes	0.7	15.73
920827	Red Bank	1020-1050	e	e	.	13.0	13.0	0	0	No	3.0	15.37
920924	Williamstown Rd.	1100-1125	e	ls	.	14.5	14.0	0	0	No	2.5	24.84
920924	NW Millstream	1132-1205	ls	f	.	16.0	16.0	2	5	No	2.1	6.97
920924	N. Esk Boom	1211-1245	ls	f	.	16.5	17.5	5	12	No	2.0	7.67
920924	McKay's Cove	1322-1350	ls	f	.	16.0	17.0	8	11	No	1.2	9.38
920924	Repap Railway	1356-1425	f	f	.	17.0	17.0	9	10	No	1.0	10.00
920924	Newcastle	1441-1510	f	f	.	17.0	17.0	13	18	No	1.0	13.08
920924	M91	1515-1545	e	f	.	18.0	17.0	15	20	No	1.0	
920924	Chatham	1556-1620	f	hs	.	17.0	17.0	17	21	No	1.4	21.01
920924	Millbank	1629-1700	f	e	.	17.0	17.0	20	20	No	1.5	13.12
920925	M68	1000-1030	e	ls	.	16.0	16.0	18	20	No	0.8	68.84
920925	M51	0900-0930	e	ls	.	15.0	15.0	23	26	No	2.5	12.88
930615	Portage I.	1135-1230	f	f		15.0	10.5	23	30	Yes	2.8	.
930615	ME8	1405-1440	f	hs		18.5	10.0	22	31	Yes	3.5	
930615	MF4	1256-1330	f	hs		15.0	9.5	23	30	Yes	3.1	

Table 3. Continued.

Date YMD	Site	Time	Tidal Stage		Max. Depth (m)	Temperature (·C)		Salinity (PSU)		CTD done?	Secchi depth (m)	TSS (mg/L)
			Observed	Predicted		Surface	Bottom	Surface	Bottom			
930616	M73	1600-1621	f	hs	.	18.5	12.5	6	19	Yes	1.1	
930616	M65	1500-1532	.	hs	.	17.5	13.0	8	22	Yes	1.5	
930616	M56	1410-1440	f	hs	.	17.0	13.0	8	23	Yes	1.2	
930616	M51	1223-1350	f	f	.	14.5	12.0	15	23	Yes	1.5	
930616	M41	1130-1212	f	f	.	14.0	11.5	22	27	Yes	2.3	
930616	M38	1047-1115	e	ls	.	16.5	10.5	11	27	Yes	1.4	
930616	M29	1003-1037	e	ls	.	17.5	11.0	9	27	Yes	1.5	
930617	M97 #1	1020-1055	e	ls	.	19.5	13.5	2	18	Yes	1.5	
930617	M97 #2	1318-1430	ls	f	.	20.0	13.5	2	17	Yes	1.1	
930617	M91	1100-1130	e	ls		19.5	13.5	3	18	Yes	.	
930617	Waferboard plant	1145-1215	e	f	.	18.5	13.5	5	18	Yes	1.5	
930617	Chatham	0917-0951	e	ls	.	17.5	13.0	6	18	Yes	1.2	
930713	ME4	1340-1420	e	e	9.2	18.0	14.0	21	26	Yes	2.8	19.14
930713	15m stn	1203-1245	hs	hs	15.4	17.0	10.5	25	27	Yes	4.0	29.90
930714	M97	1315-1345	f	ls	9.8	21.0	17.5	5	18	Yes	1.3	10.11
930714	French Fort	1435-1515	f	e	10.2	22.5	17.0	3	18	Yes	1.3	6.80
930714	Waferboard plant	1545-1613	hs	e	7.9	22.0	17.0	5	19	Yes	.	8.33
930715	Chatham	1635-1705	e	ls	8.0	21.5	17.0	6	20	Yes	1.8	7.21
930715	M41-43	1416-1520	e	hs	9.0	19.5	17.5	20	23	Yes	2.8	7.41
930715	M36-38	1331-1407	hs	hs	9.1	20.0	16.5	16	23	Yes	2.7	7.76
930715	M19	1122-1150	s	hs	12.0	19.0	14.0	18	26	Yes	2.8	9.66
930716	M73	1430-1506	f	f	.	19.0	17.0	10	20	No	2.0	7.68
930716	M65	1352-1422	f	f	9.8	19.5	17.0	12	21	Yes	2.0	25.43
930716	M56	1145-1215	f	f	10.5	20.0	17.5	11	21	Yes	2.3	7.91
930716	M51	1019-1055	f	f	8.7	19.0	17.5	18	22	Yes	2.8	9.50

Table 4. Physical data collected during beam-trawling and plankton surveys on large vessels in Miramichi estuary, 1992-1993.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (°C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
VESSEL: OSBORNE											
Newcastle(M97)	920506	1145	High Slack	Ebb	5.1	4	4	0	0	1	Yes
Lower Chatham Head	920506	1300	Ebb	Ebb	4.2	4	4	0	0	1	Yes
Chatham(M78)	920506	1455	Ebb	Ebb	7.3	4	4	0	0	0.8	Yes
Bartibog(M61)	920507	0945	Ebb	Ebb	5.7	4	3	0	11	0.5	Yes
Sheldrake I.(M56)	920507	1117	Ebb	Ebb	9.3	4	3	1	19	0.5	Yes
Oak Point(M51)	920507	1300	Ebb	Ebb	6.2	5	3	5	20	0.8	Yes
Millbank(M75)	920507	1542	Ebb	Ebb	8.3	4	4	0	0	0.8	Yes
M28	920507	1730	Flood	Flood	5.1	6	3	8	22	0.8	Yes
Bay Du Vin #1	920508	1035	Ebb	High Slack	4.4	5	4	9	11	0.8	Yes
Bay Du Vin #2	920508	1142	Ebb	Ebb	5.5	6	3	8	17	1	Yes
M30	920508	1250	Ebb	Ebb	8.5	6	2	6	28	1	Yes
Horseshoe Shoal	920508	1410	Ebb	Ebb	3.2	6	3	8	23	1	Yes
Burnt Church	920508	1515	Low Slack	Ebb	6.5	6	3	14	25	0.8	Yes
VESSEL: NAVICULA											
Newcastle(M97)	920627	0930	Ebb	Low Slack	10.8	16.5	17.5	2	19		Yes
Douglastown(M88)	920627	1155	Ebb	Flood	8.5	17.5	17.5	4	18		Yes
Chatham Bridge(M78)	920627	1255	Ebb	Flood	7.9	18	17.5	3	18		Yes

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (·C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Bartibog(M61)	920627	1445	Low Slack	High Slack	6.6	18.5	16.5	8.5	22.5		Yes
Sheldrake I.(M56)	920628	910	Ebb	Ebb	4.1	17	17	7	17.5		Yes
Sheldrake I.(M58)	920628	940	Ebb	Low Slack	9.6	17	16.5	8	23.5		Yes
East Point(M59)	920628	1015	Ebb	Low Slack	8.4	17	16.5	9.5	23		Yes
Grand Dune(M38)	920628	1135	Low Slack	Low Slack	10.1	17	16.5	12	22.5		Yes
Grand Dune(M40)	920628	1145	Low Slack	Low Slack	8.4	16.5	15.5	18	25		Yes
Grand Dune(M43)	920628	1155	Low Slack	Low Slack	8.2	17	15.5	19	25		Yes
Grand Dune(M45)	920628	1230	Low Slack	Flood	7.7	17	15.5	20	25		Yes
Oak Point(M48)	920628	1245	Low Slack	Flood	7.9	16.5	16	21	25		Yes
Oak Point(M51)	920628	1300	Flood	Flood	8.3	17	16	15	24.5		Yes
Sheldrake I.(M54)	920628	1337	Slack	Flood	9.9	17	16	13	24		Yes
Sheldrake I.(M58)	920628	1350	Slack	Flood	9	17	16	13.5	24		Yes
Sheldrake I.(M54)	920628	1420	Flood	Flood	8.4	17.5	16.5	10	23.5		Yes
Bartibog(M61)	920628	1445	Flood	Flood	9.4	17.5	16	11	24		Yes
Chat. Wharf(M76)	920629	715	Ebb	Ebb	10.6	17	17	5.5	16.5		Yes
Waferboard(M86)	920629	800	Ebb	Ebb	9.6	16	17	4	16		Yes
Sheldrake I.(M58)	920629	910	Ebb	Ebb	8.9	17	16.5	11	23		Yes
Bartibog(M61)	920629	930	Ebb	Ebb	9.2	17	17	6.5	20.5		Yes
Sheldrake I.(M58)	920629	950	Ebb	Ebb	8.4	17.5	16.5	8.5	22.5		Yes

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (°C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Bartibog(M61)	920629	1000	Ebb	Ebb	9.4	17	16.5	8.5	20		Yes
Sheldrake I.(M58)	920629	1010	Ebb	Ebb	8.5	17	16.5	10.5	22		Yes
Bartibog(M61)	920629	1030	Ebb	Ebb	10.1	17	16.5	7.5	21		Yes
Sheldrake I.(M58)	920629	1040	Ebb	Low Slack	8.4	17	16.5	10.5	21.5		Yes
Bartibog(M61)	920629	1105	Ebb	Low Slack	9.2	17.5	16.5	6.5	21		Yes
Sheldrake I.(M58)	920629	1110	Ebb	Low Slack	8.4	17	16.5	12	21		Yes
Bartibog(M61)	920629	1135		Low Slack	8.9	17	17	6.5	20		Yes
Sheldrake I.(M58)	920629	1143		Low Slack	8.2	16.5	16.5	10	20		Yes
VESSEL. NAVICULA											
Chatham(M76-78)	920721	1238	Ebb	Ebb	9.1	19	17	4	18	1	Yes
Millbank(M75)	920721	1332	Ebb	Ebb	9.3	19	17	4	19	1.1	Yes
Gordon Point(M65)	920721	1425	Ebb	Low Slack	5.3	19	16.5	6	21	1.2	Yes
Bartibog(M61)	920721	1518	Ebb	Low Slack	6.6	19.5	16.5	7	23	1.2	Yes
Shel. I.(M55/56)	920721	1605	Ebb	Low Slack	9.9	19	16	9	23	1.2	Yes
Cheval Point(M53)	920721	1702	Low Slack	Flood	8.4	19	16	15	24	1	Yes
Portage Chan.(ME-4#1)	920722	1155	Ebb	Ebb	8.1	16.5	16	26	26	7	Yes
Portage Chan.(ME-4#2)	920722	1252	Ebb	Ebb	7.8	16.5	15	26	28	5.5	Yes
Portage Channel(ME-8)	920722	1333	Ebb	Ebb	7.3	16.5	15.5	24	26	4.1	Yes

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (·C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Portage Island(M21)	920722	1418	Ebb	Ebb	10.9	19	16	22	25	3.8	Yes
Horse Shoe Shoal(M26)	920722	1508	Ebb	Low Slack	9.1	19.5	15.5	20	25	2.5	Yes
(M29)	920722	1600	Low Slack	Low Slack	8.4	20	15.5	17	25	2	Yes
(M36)	920723	948	Flood	High Slack	8.3	18	16	17	24	2	Yes
Grand Dune(M40)	920723	1044	Flood	High Slack	8.7	17	15.5	21	25	2.5	Yes
Grand Dune(M44)	920723	1130	High Slack	Ebb	7.7	17	16	23	24	2.5	Yes
Oak Point(M51)	920723	1245	Flood	Ebb	8	18	16	20	24	2.5	Yes
(M90)	920723	1500	Flood	Ebb	8.8	18.5	17	12	21	1.1	Yes
Newcastle(M97)	920723	1554	Flood	Ebb	7.5	20	17.5	4	16	1	Yes
VESSEL: NAVICULA											
North of ME-4	930528	1238		Ebb	10	10		30			No
North of ME-4	930528	1257		Ebb	10	10		30			No
North of Bay Du Vin I.	930528	1400		Ebb	11	13.5		12			No
North of Bay Du Vin I.	930528	1436		Ebb	10	14		10			No
Oak Point(M51)	930528	1522		Ebb	10	14		7			No
Newcastle(M97)	930531	948		Low Slack	13	9	9	0	0		No
Newcastle(M97)	930531	1011		Flood	13	9	9	0	0		No
Newcastle(M97)	930531	1050		Flood	13	9	9	0	0		No

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (°C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
French-Fort(M91)	930531	1117		Flood	13	9	9	0	0		No
Chatham(M76-78)	930531	1329		Flood	12	9	9	0	0		No
Lower Newcastle	930531	1424		High Slack	11	10.5	11.5	2	5		No
East Point(M59)	930531	1504		High Slack	13	11.5	11.5	1	16		No
Grand Dune	930601	915		Low Slack	9	11	10	5	21		No
Grand Dune	930601	1320		High Slack	11	11	9	4	20		No
Bartibog(M61)	930601	1443		High Slack	10.5	10.5	10	0	15		No
Sheldrake I.(M55-56)	930602	925		Low Slack	12	10	11	3	20		No
Sheldrake Is.(M55-56)	930602	944		Low Slack	12.5	10.5	11	2	20		No
Newcastle(M97)	930603	1330		Low Slack	13	11	13	2	3		No
French-Fort(M91)	930603	1345		Flood	10	11	10.5	5	6		No
VESSEL: OPILIO											
Portage Island(M21)	930615	1135	Flood	Flood	13	15	10.5	23	30	2.8	Yes
Portage Channel(ME-4)	930615	1256	Flood	High Slack	9	15	9.5	23	30	3.1	Yes
Portage(ME-8)	930615	1405	Flood	High Slack	7	18.5	10	22	31	3.5	Yes
(M29)	930616	1003	Ebb	Low Slack	9	17.5	11	9	27	1.5	Yes
Grand Dune(M38)	930616	1047	Ebb	Low Slack	9	16.5	10.5	11	27	1.4	Yes
Grand Dune(M41)	930616	1130	Flood	Flood	9	14	11.5	22	27	2.3	Yes

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (°C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Oak Point(M51)	930616	1223	Flood	Flood	9	14.5	12	15	23	1.5	Yes
Sheldrake Island(M56)	930616	1410	Flood	High Slack	8	17	13	8	23	1.2	Yes
Gordon Point(M65)	930616	1500		High Slack	9	17.5	13	8	22	1.5	Yes
Middle Island(M73)	930616	1600	Flood	High Slack	11	18.5	12.5	6	19	1.1	No
Chatham(M76)	930617	917	Ebb	Ebb	8	17.5	13	6	18	1.2	No
Newcastle(M97)	930617	1020	Ebb	Low Slack	11	19.5	13.5	2	18	1.5	No
FrenchFort(M91)	930617	1100	Ebb	Low Slack	9	19.5	13.5	3	18		No
Waferboard Plant(M86)	930617	1145	Ebb	Low Slack	11	18.5	13.5	5	18	1.5	No
Newcastle(M97)	930617	1318	Ebb	Flood	10	20	13.5	2	17	1.1	No
Newcastle(M97)	930617	1450	Low Slack	Flood	10	19.5	13.5	3	18	1.1	No
VESSEL: OPILIO											
15m-Station	930713	1203	Ebb	High Slack	15.4	17	10.5	25	27	4	Yes
Portage Channel(ME-4)	930713	1340	Ebb	Ebb	9.2	18	14	21	26	2.8	Yes
Newcastle(M97)	930714	1315	Flood	High Slack	9.8	21	17.5	5	18	1.3	Yes
French-Fort(M91)	930714	1435	Flood	High Slack	10.2	22.5	17	3	18	1.3	Yes
Waferboard Plant(M86)	930714	1545	High Slack	Ebb	7.9	22	17	5	19		Yes
Portage Island(M19)	930715	1122	High Slack	Flood	12	19	14	18	26	2.8	Yes
Grand Dune(M36-38)	930715	1331	High Slack	High Slack	9.1	20	16.5	16	23	2.7	Yes

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (·C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Grand Dune(M41-43)	930715	1416	Ebb	High Slack	9	19.5	17.5	20	23	2.8	Yes
Chatham(M76-78)	930715	1635	Ebb	Ebb	8	21.5	17	6	20	1.8	Yes
Oak Point(M51)	930716	1019	Flood	Low Slack	8.7	19	17.5	18	22	2.8	Yes
Sheldrake Island(M56)	930716	1145	Flood	Flood	10.5	20	17.5	11	21	2.3	Yes
Gordon Point(M65)	930716	1352	Flood	Flood	9.8	19.5	17	12	21	2	Yes
Middle Island(M73)	930716	1430	Flood	High Slack	9	19	17	10	20	2	No
VESSEL: NAVICULA											
Barrier	931019	1132		Ebb	14	9	9	25	28		No
Barrier	931019	1221		Ebb	13	8	8	25	27		No
Barrier	931019	1242		Ebb	13	8	8	26	25		No
(M28)	931019	1303		Low Slack	11	7		25	25		No
(M36)	931019	1336		Low Slack	10	8.3	7.8	23	23		No
Grand Dune(M40)	931019	1405		Flood	10	8	7.8	22	25		No
Grand Dune(M43)	931019	1428		Flood	10	7.9	7.7	21	24		No
Oak Point(M47)	931020	915		High Slack	11	6.8	7.3	20	23		No
East Point(M59)	931020	952		High Slack	13	6.9	7.5	12	21		No
Sheldrake Island(M56)	931020	1220		Low Slack		7.5	7.8	15	23		No
Loggieville(M62)	931020	1325		Ebb	12	7.7	7.8	12	22		No

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (°C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Gordon Point(M68)	931020	1345		Ebb	10	7	7.7	10	21		No
Millbank(M75)	931020	1415		Low Slack	13	7.7	7.5	5	15		No
Chatham(M76)	931020	1432		Low Slack	11	7.1	7.3	5	10		No
Chatham Bridge(M78) 9	931020	1600		Low Slack		7.7	7.2	4	7		No
Chatham(M78)	931021	836		Flood	11	6.2	7.1	4	11		No
Chatham Bridge(M78)	931021	911		Flood		6.5	7.2	4	15		No
Newcastle Bridge	931021	950		Flood		6.5	7	0	7		No
Newcastle(M97)	931021	1030		High Slack	10	6.8	6.9	0	2		No
French-Fort(M91)	931021	1050		High Slack	9	6.8	7	0	8		No
Newcastle(M95)	931021	1230		Ebb	10	6.5	7	2	7		No
Newcastle Bridge	931021	1250		Ebb	11	7	7.2	4	12		No
Douglastown(M88)	931021	1345		Ebb	11	6.8	7.2	2	13		No
Chatham(M76)	931021	1430		Low Slack		6.7	7.2	5	14		No
Chatham(M76)	931022	810		Flood	10	7	7.3	5	14		No
Middle Island(M73)	931022	845		Flood		6.9	7.4	7	20		No
Sheldrake Island(M57)	931022	937		High Slack	11	6.5	7.3	10	20		No
Sheldrake Island(M55)	931022	1015		High Slack	13	6.8	7.4	11	22		No
East Point(M59)	931022	1035		High Slack		7.1	7.7	11	23		No
East Point(M59)	931022	1049		High Slack		7.4	7.7	11	20		No

Table 4. Continued.

Site	Date (YYMMDD)	Time	Tidal stage		Max. Depth	Temperature (·C)		Salinity (PSU)		Secchi Depth (m)	CTD Done?
			Observed	Predicted	(m)	Surface	Bottom	Surface	Bottom		
Millbank(M75)	931022	1130		High Slack	11	7.1	7.7	6	18		No

Table 5. Physical data collected during beach-seining in Miramichi estuary in 1991.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
U2	910514	1530	30	Flood	13.4	0.0
U3	910514	1630	70	Flood	15.9	0.0
L4	910515				16.2	8.0
L1	910515				15.7	10.5
L3	910515		35	Ebb	14.5	9.5
U6	910515	0900	74	Ebb	11.2	0.0
U1	910515	1030	30	Ebb	12.2	
U3	910515	1115	10	Ebb		
U4	910515	1150	-5	Ebb	12.8	
U5	910515	1215	-13	Ebb	13.2	
L2	910515	1447	19	Ebb	11.9	7.0
L5	910516	0930	109	Ebb	11.0	4.0
L6	910516	1000	78	Ebb	11.2	9.0
L7	910516	1040	50	Ebb	9.7	11.0
L3	910523	1400	96	High Slack	14.2	9.0
L5	910523	1540	14	Ebb	12.2	8.0
U6	910528	1300	6	Ebb	14.7	1.5
U1	910528	1400	-3	Ebb	14.5	1.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
U2	910530	0800	149	Ebb	15.6	0.0
U3	910530	0850	130	Ebb	15.8	0.0
U5	910530	1000	100	Ebb	15.5	1.0
U4	910530	1200	45	Ebb	16.1	0.0
M1	910530	1300	26	Ebb	20.2	11.0
M2	910530	1400	41	Ebb	18.5	5.0
L2	910530	1500	13	Low Slack	20.4	8.0
L3	910531	0830	130	Ebb		9.0
L1	910531	0930	100	Ebb	18.0	15.0
L7	910531	1100	67	Ebb		
L5	910531	1230	30	Ebb	16.0	16.0
U2	910610	1030	0	Low Slack	19.0	0.0
U3	910610	1140	10	Flood	19.0	3.0
U4	910610	1245	-20	Flood	20.0	3.0
U5	910610	1330	40	Flood	19.0	1.0
U1	910610	1430	50	Flood	23.0	0.0
U6	910610	1515	65	Flood	23.1	8.0
L7	910611				18.5	19.0
L3	910611				22.5	12.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
L2	910611				16.5	14.0
L4	910611					18.0
L1	910611					14.0
L6	910611	1030	15	Low Slack	19.0	16.0
L7	910611	1115	11	Low Slack	21.0	12.0
M1	910613	0900	107	Ebb	16.8	12.0
M2	910613	1015	63	Ebb	16.7	14.0
L5	910625	1000	22	Ebb	20.1	14.0
L7	910625	1100	13	Low Slack	20.3	18.0
L2	910625	1130	13	Low Slack	21.5	16.5
L3	910625	1400	34	Flood	21.0	17.0
L1	910625	1500	50	Flood	23.2	19.0
L4	910625	1545	60	Flood	23.4	19.0
L6	910625	1630	65	Flood	22.5	14.0
U4	910626	0930	40	Ebb	22.5	4.0
M2	910626	1000	56	Ebb	20.1	10.0
M1	910626	1100	15	Ebb	22.0	10.0
U2	910708	1400	44	Flood	20.0	5.0
U1	910708	1500	54	Flood	20.0	8.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
U5	910708	1540	60	Flood		11.0
U3	910708	1630	60	High Slack		7.0
M2	910709	1400	46	Flood	20.1	15.0
L6	910709	1500	67	High Slack	17.4	18.0
L4	910709	1545	63	Ebb	20.3	18.0
L3	910709	1645	55	Ebb	18.8	19.0
L2	910709	1700	50	Ebb	17.5	17.0
U4	910710	0830	68	Ebb	18.3	8.0
U6	910710	0930	30	Ebb	19.7	9.0
L1	910710	1330	20	Flood	18.0	20.0
M1	910710	1610	50	Flood	18.0	14.0
L5	910711	1030	15	Ebb		18.0
L7	910711	1230	1	Low Slack		18.3
L1	910722	1225	45	Flood	21.0	17.0
M2	910722	1330	65	Flood	24.0	15.0
U3	910722	1440	50	Flood	23.0	11.0
U1	910722	1515	55	High Slack	23.0	5.0
M1	910723	0915	30	Ebb	22.5	15.0
L7	910723	1125	20	Low Slack	25.0	23.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
L5	910723	1255	30	Flood	22.0	18.0
L2	910723	1400	55	Flood	20.0	17.0
L3	910723	1440	60	Flood	21.0	20.0
U4	910724	1020	20	Ebb	22.0	10.0
U2	910724	1130	0	Low Slack	20.5	10.0
L6	910724	1330	35	Flood	24.0	15.0
U5	910724	1330	10	Low Slack	23.5	11.0
U6	910724	1500	30	Flood	21.0	10.0
U2	910806	1145	25	Flood	24.0	2.0
U3	910806	1310	45	Flood	22.8	2.0
U4	910806	1410	50	Flood	27.0	6.0
U5	910806	1520	50	High Slack	24.0	5.0
U1	910806	1700	43	Ebb	24.0	9.0
U6	910806	1830	35	Ebb	23.0	7.0
L1	910807	1200	27	Flood	22.0	18.0
L3	910807	1315	40	Flood		
L2	910807	1400	52	Flood	24.0	21.0
L5	910807	1500	56	Ebb	23.5	19.0
L7	910807	1630	52	Ebb	23.0	23.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
M1	910808	1030	10	Ebb	22.0	14.0
L4	910808	1345	30	Flood	22.0	21.0
L6	910808	1445	54	High Slack	26.5	19.0
L7	910808	1445	60	Flood	26.5	19.0
M2	910819	1630	65	Ebb	21.0	16.0
M1	910819	1730	42	Ebb	21.0	11.0
U4	910820	1030	15	Flood	21.0	8.0
U3	910820	1130	18	Flood	22.0	5.0
U5	910820	1230	35	Flood	20.5	8.0
U2	910820	1315	45	Flood	21.5	4.0
U1	910820	1400	50	Flood	22.0	7.0
U6	910820	1515	50	High Slack	21.5	8.0
L6	910821	1100	33	Flood		21.5
L1	910821	1140	40	Flood	20.0	15.0
L3	910821	1250	50	Flood	20.5	16.0
L4	910821	1345	57	Flood	20.0	16.0
L7	910821	1430	60	Flood	20.5	17.0
L5	910821	1515	55	High Slack		16.0
L2	910821	1600	62	High Slack	21.5	12.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
L7	910822				20.5	17.0
L5	910822				22.0	16.0
L4	910822				19.0	16.0
U4	910910	0900	119	High Slack	17.5	5.0
U3	910910	0945	102	Ebb	17.5	4.0
U2	910910	1017	87	Ebb	18.0	3.0
U1	910910	1130	57	Ebb	18.0	3.0
U6	910910	1205	43	Ebb	16.5	5.0
U5	910910	1240	32	Ebb	18.0	4.0
M1	910910	1500	32	Flood	18.0	9.0
M2	910911	0930	105	High Slack	16.5	16.0
L4	910911	1030	63	Ebb	16.0	18.0
L3	910911	1115	52	Ebb	16.0	19.0
L6	911023	1040	51	Low Slack	8.5	8.0
L4	911023	1217	74	Flood	8.4	9.0
L7	911023	1358	113	Flood	9.0	16.0
L5	911023	1508	137	Flood	8.4	9.0
L2	911023	1608	148	High Slack	9.4	4.0
L3	911023	1713	144	High Slack	9.2	11.0

Table 5. Continued.

Site	Date (YYMMDD)	Time	Predicted height of tide (cm)	Predicted Tidal Stage	Surface	
					Temp. (°C)	Salinity (PSU)
U5	911024	1320	34	Flood	7.1	0.0
U4	911024	1445	69	Flood	9.7	0.0
U3	911024	1602	111	Flood		0.0
U2	911024	1645	132	Flood	6.0	0.0
U1	911024	1804	153	High Slack	6.8	0.0
M1	911025	1315	42	Low Slack	8.8	5.0
L1	911025	1453	107	Flood	10.2	10.0
M2	911025	1610	108	Flood	9.2	9.0

Table 6. Physical data collected during beach-seining in Miramichi estuary in 1992.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (-C)	Salinity (PSU)
McKay Cove (downstream)	920611	1600	75	High Slack	.	.
Eel Ground (opposite)	920611	1645	69	Ebb	.	.
McKay Cove (opposite)	920611	1700	66	Ebb	.	.
Wilsons Pt.	920611	1730	59	Ebb	.	.
Eel Ground (opposite)	920617	1048	58	Ebb	19.2	0.0
McKay Cove	920617	1240	34	Ebb	20.4	0.0
Stewart Brook (upstream)	920617	1500	-12	Low Slack	21.2	0.0
N.W. Millstream	920617	1640	0	Flood	20.3	0.0
Wilsons Pt.	920617	1810	35	Flood	0.0	.
S.W. Beaubears	920619	1001	126	High Slack	19.5	6.0
Beaubears Pt.	920619	1145	87	Ebb	21.0	5.0
Strawberry Marsh	920619	1320	47	Ebb	21.0	8.0
N.W. Beaubears	920619	1435	25	Low Slack	21.5	5.0
Williamstown Rd. (N. shore)	920626	1021	22	Low Slack	16.0	0.0
Williamstown Rd. (S. shore)	920626	1135	48	Flood	16.0	0.0
McKay Cove	920626	1305	65	Flood	18.0	0.0
McKay Cove (S. shore)	920626	1400	71	High Slack	18.0	1.0
Wilsons Pt.	920626	1510	69	High Slack	18.0	0.0
N.W. Millstream	920703	1300	33	Ebb	.	0.0
Williamstown Road	920703	1415	9	Low Slack	.	0.0
Red Bank	920703	1515	0	Low Slack	.	0.0
McKay Cove	920708	1000	58	Flood	18.5	0.0
Derby Jct.	920708	1150	79	High Slack	18.5	0.0
N.W. Beaubears	920708	1420	66	Ebb	19.5	1.0
Wilsons Pt.	920708	1542	48	Ebb	19.5	.
Red Bank	920714	1100	59	Ebb	16.0	0.0
Williamstown Road	920714	1200	0	Ebb	17.0	.

Table 6. Continued.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (°C)	Salinity (PSU)
N.W. Millstream	920714	1300	-16	Low Slack	17.5	.
McKay Cove	920714	1440	-6	Flood	17.5	.
N.W. Beaubears	920716	0945	104	Ebb	.	1.0
Strawberry Marsh	920716	1115	61	Ebb	.	2.0
Beaubears Pt.	920716	1230	26	Ebb	.	1.0
Canadian Pt. (opposite)	920716	1410	-2	Low Slack	.	2.0
Morrison Cove (upstream)	920716	1530	10	Low Slack	.	2.0
McKay Cove	920724	0945	51	Flood	20.5	0.0
Beaubears Pt.	920724	1030	61	Flood	21.5	0.0
Middle I.	920724	1140	74	High Slack	21.5	8.0
Gordon Pt.	920724	1305	114	Ebb	20.5	14.0
Sheldrake I. (W.)	920724	1355	45	Low Slack	21.0	15.0
Williamstown Road	920728	1055	-3	Low Slack	22.5	0.0
Red Bank (beach area)	920728	1230	-5	Low Slack	21.0	0.0
McKay Cove	920728	1345	11	Flood	24.5	4.0
N.W. Beaubears	920728	1455	34	Flood	25.0	6.0
Beaubears Pt.	920728	1545	49	Flood	24.0	3.0
Canadian Pt. (opposite)	920729	0955	38	Ebb	21.5	7.0
Middle I.	920729	1215	0	Low Slack	22.5	12.0
Gordon Pt.	920729	1315	24	Low Slack	22.5	13.0
Williamstown Road	920810	1125	-2	Low Slack	21.5	0.0
N.W. Millstream	920810	1245	7	Low Slack	22.5	0.0
McKay Cove	920810	1400	27	Flood	22.0	1.0
Wilsons Pt.	920810	1500	46	Flood	22.0	1.0
N.W. Beaubears	920810	1540	54	High Slack	22.0	3.0
Beaubears Pt.	920812	1233	-3	Low Slack	.	.
Canadian Pt. (opposite)	920812	1317	-3	Low Slack	22.0	6.0
Middle I.	920812	1430	23	Flood	22.0	10.0

Table 6. Continued.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (°C)	Salinity (PSU)
Gordon Pt.	920812	1525	72	Flood	21.0	14.0
Gordon Pt.	920819	1120	75	Ebb	20.0	16.0
Sheldrake I.	920819	1200	48	Low Slack	21.0	15.0
Willows	920819	1230	46	Low Slack	22.0	22.0
Cheval Pt.	920819	1405	43	Low Slack	23.0	15.0
Sheldrake I. (S.)	920819	1435	45	Low Slack	21.0	15.0
Williamstown Road	920820	1105	85	High Slack	20.5	0.0
Red Bank (sandy beach)	920820	1150	73	Ebb	21.0	0.0
Red Bank (S. side)	920820	1225	63	Ebb	21.0	0.0
Williamstown Road (S. shore)	920820	1337	42	Ebb	20.0	0.0
N.W. Millstream	920820	1407	35	Ebb	21.0	1.0
McKay Cove	920820	1450	25	Ebb	20.5	2.0
Derby Jct.	920820	1530	21	Low Slack	21.0	2.5
Wilsons Pt.	920820	1636	22	Low Slack	21.0	3.0
Williamstown Road	920824	1130	28	Flood	21.5	0.0
N.W. Millstream	920824	1220	39	Flood	21.5	2.0
McKay Cove	920824	1330	51	Flood	25.5	3.0
Wilsons Pt.	920824	1415	57	High Slack	23.0	5.0
N.W. Beaubears	920824	1455	60	High Slack	24.5	6.0
Beaubears Pt.	920824	1545	59	High Slack	23.0	8.0
Canadian Pt. (opposite)	920826	1115	0	Low Slack	20.5	11.0
Middle I.	920826	1220	19	Flood	20.0	16.0
Gordon Pt.	920826	1312	51	Flood	19.5	17.0
Willows	920826	1407	69	Flood	20.5	23.0
Cheval Pt.	920826	1540	76	High Slack	21.0	20.0
East Pt.	920826	1655	90	High Slack	20.5	19.0
Canadian Pt. (opposite)	920902	1025	88	High Slack	20.0	5.0
Middle I.	920902	1111	80	High Slack	19.5	11.0

Table 6. Continued.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (°C)	Salinity (PSU)
Gordon Pt.	920902	1200	77	High Slack	19.0	17.0
Willows	920902	1245	51	Ebb	20.0	20.0
Pt. aux Carr	920902	1408	44	Low Slack	19.0	22.0
Cheval Pt.	920902	1440	46	Low Slack	19.0	18.0
East Pt.	920902	1525	48	Low Slack	19.0	14.0
Red Bank (beach)	920903	1155	70	High Slack	17.5	0.0
Red Bank (S. side)	920903	1235	65	High Slack	17.0	0.0
Williamstown Road (S. side)	920903	1315	55	Ebb	17.5	0.0
Williamstown Road	920903	1430	45	Ebb	18.5	0.0
N.W. Millstream	920903	1512	41	Low Slack	19.0	0.0
McKay Cove	920903	1608	41	Low Slack	19.5	2.0
Wilsons Pt.	920903	1650	44	Low Slack	18.5	1.0
Red Bank	920916	1030	80	Ebb	19.5	0.0
Williamstown Road	920916	1120	60	Ebb	20.5	3.0
N.W. Millstream	920916	1210	48	Ebb	20.5	6.0
McKay Cove	920916	1318	31	Low Slack	20.5	7.0
N.W. Beaubears	920916	1415	25	Low Slack	21.5	9.0
Beaubears Pt.	920916	1500	26	Low Slack	22.0	10.0
Willows	920917	1100	47	Low Slack	18.5	22.0
Cheval Pt.	920917	1206	42	Low Slack	19.5	22.0
East Pt.	920917	1300	55	Low Slack	19.5	20.0
Gordon Pt.	920917	1400	52	Low Slack	19.0	20.0
Middle I.	920917	1457	38	Low Slack	19.5	15.0
Canadian Pt. (opposite)	920917	1550	33	Low Slack	20.5	12.0
Willows	920923	1212	68	Flood	17.0	21.0
Cheval Pt.	920923	1320	78	Flood	16.5	20.0
Gordon Pt.	920923	1440	91	High Slack	18.0	18.0
Beaubears Pt.	920923	1650	80	High Slack	18.0	9.0

Table 6. Continued.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (°C)	Salinity (PSU)
Cheval Pt.	920925	1355	83	Flood	16.0	22.0
East Pt.	920925	1435	113	Flood	20.0	22.0
McKay Cove	920925	1610	107	Flood	19.5	10.0
Willows	920929	1130	48	Low Slack	16.0	25.0
Cheval Pt.	920929	1225	44	Low Slack	15.5	23.0
East Pt.	920929	1335	47	Low Slack	16.5	21.0
Gordon Pt.	920929	1430	55	Low Slack	17.0	20.0
Middle I.	920929	1530	55	Flood	17.0	16.0
Canadian Pt. (opposite)	920929	1630	75	Flood	17.0	10.0
Red Bank	921007	1000	18	Low Slack	8.5	0.0
Williamstown Road	921007	1045	24	Low Slack	9.5	1.5
N.W. Millstream	921007	1140	36	Flood	11.5	5.0
McKay Cove	921007	1300	57	Flood	13.0	6.5
N.W. Beaubears	921007	1340	67	Flood	13.0	9.0
Beaubears Pt.	921007	1420	73	High Slack	12.0	13.0
Canadian Pt. (opposite)	921007	1500	78	High Slack	13.5	9.0
Willows	921008	1035	54	Low Slack	11.5	25.0
Cheval Pt.	921008	1120	76	Flood	11.5	21.0
East Pt.	921008	1250	83	Flood	12.5	20.0
Gordon Pt.	921008	1345	90	Flood	12.5	20.0
Middle I.	921008	1435	81	Flood	13.0	17.0
Willows	921021	1200	86	High Slack	9.5	18.0
Cheval Pt.	921021	1320	89	High Slack	9.0	16.0
East Pt.	921021	1410	94	High Slack	9.5	14.0
Gordon Pt.	921021	1435	91	High Slack	9.0	13.0
Middle I.	921021	1510	84	High Slack	10.0	8.0
Canadian Pt. (opposite)	921021	1545	78	Ebb	10.0	9.0
Red Bank (beach)	921022	0950	14	Low Slack	6.0	0.0

Table 6. Continued.

Site	Date (YYMMDD)	Time	Tide (cm)	Predicted Tidal Stage	Surface	
					Temperature (°C)	Salinity (PSU)
Red Bank (channel)	921022	1030	33	Flood	6.5	0.0
Williamstown Road	921022	1130	53	Flood	7.5	0.0
N.W. Millstream	921022	1203	65	Flood	7.5	0.0
McKay Cove	921022	1305	86	Flood	9.0	3.5
N.W. Beaubears	921022	1400	100	High Slack	9.5	4.0
Beaubears Pt.	921022	1433	103	High Slack	9.5	7.0
Wilsons Pt.	921022	1508	106	High Slack	9.0	5.0