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Collated by R. McNeely

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Critical reviewers
L. Dredge

Author's address

R. McNeely
Geological Survey of Canada
Terrain Sciences Division
601 Booth Street
Ottawa, Ontario K1A 0E8

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This date list, GSC XXXV, is the twenty-fourth to be published directly by the Geological Survey of Canada. Lists prior to GSC XII were published first in the journal *Radiocarbon* and were reprinted as GSC Papers. The lists through 1967 (GSC VI) were given new pagination, whereas lists VII to XI (1968 to 1971) were reprinted with the same pagination.

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GEOLOGICAL SURVEY OF CANADA RADIOCARBON DATES XXXV

McNeely, R., 2006: Geological Survey of Canada Radiocarbon Dates XXXV; Geological Survey of Canada, Current Research 2006-G, 151 p.

Abstract: This list presents 526 radiocarbon age determinations, 482 made by the Radiocarbon Dating Laboratory, Geological Survey of Canada (including 9 replicates) and 44 done by other laboratories (Alberta Environmental Centre, Vegreville [AECV]; Beta Analytic Inc. Miami, Florida [Beta]; Centre for Accelerator Mass Spectrometry [CAMS]; Geochron Laboratories Inc., Cambridge, Massachusetts [GX]; RadioIsotope Direct Detection Laboratory, Simon Fraser University [RIDDL]; University of Saskatchewan [S]; and IsoTrace Laboratory, University of Toronto [TO]). The distribution of the 492 samples is as follows: Newfoundland (42); Prince Edward Island (5); Nova Scotia (51); New Brunswick (15); Quebec (66); Ontario (10); Saskatchewan (22); Alberta (1); British Columbia (63); Arctic mainland (54); Arctic Archipelago, Northwest Territories (30) and Nunavut (129); international (4); and modern shell dates (25).

Résumé : Ce rapport présente les résultats de 526 datations au radiocarbone, dont 482 (y compris 9 mesures répétées) ont été effectuées par le laboratoire de datation au radiocarbone de la Commission géologique du Canada et 44, par d'autres laboratoires (Alberta Environmental Centre, Vegreville (AECV); Beta Analytic Inc., Miami, Floride (BETA); Centre for Accelerator Mass Spectroscopy (CAMS); Geochron Laboratories Inc., Cambridge, Massachussetts (GX); RadioIsotope Direct Detection Laboratory, Université Simon Fraser (RIDDL); Université de la Saskatchewan (S); et IsoTrace Laboratory, Université de Toronto (TO)). Les 492 échantillons proviennent des régions suivantes : Terre-Neuve (42); Île-du-Prince-Édouard (5); Nouvelle-Écosse (51); Nouveau-Brunswick (15); Québec (66); Ontario (10); Saskatchewan (22); Alberta (1); Colombie-Britannique (63); partie continentale de l'Arctique (54); archipel Arctique, Territoires du Nord-Ouest (30) et Nunavut (129); et international (4). Des datations sur des coquillages contemporains (25) sont également du nombre.

INTRODUCTION

This publication includes all samples that have been dated more than 2 years ago and not published in a 'date list'. This date list has been compiled by R. McNeely from descriptions of samples and interpretations of age determinations provided by the collectors and submitters. The presentation of dates within each section or subsection of this text is ordered from east to west. All GSC dates, up to and including GSC-6100, plus additional dates up to GSC-6569, are now accessible on a computer database. The 'Date Locator File' provides convenient, fast access to GSC dates by allowing the user to interactively select indexed parameters, such as laboratory number, submitter, locality, material, and age range, to retrieve sample data (McNeely, 1988). Supplementary information on this database is available from the Director, GSC Northern Canada.

Sample gas preparation and purification were carried out as described in Lowdon et al. (1977). Carbon dioxide gas proportional counting techniques have been discussed by Dyck (1967). For a review of laboratory operations, the reader is referred to Lowdon (1985).

Age calculations during the report period were based on a ^{14}C half-life of 5568 ± 30 years and 0.95 of the activity of the NBS oxalic acid standard. Ages are quoted in radiocarbon years before present (BP), where 'present' is taken to be 1950. The error assigned to each age has been calculated using only the counting errors of sample, background, and standard, and the error in the half-life of ^{14}C (Lowdon and Blake, 1973). Nonfinite dates (i.e. 'greater than' ages) are based on a 4-sigma criterion (99.9% probability), whereas finite dates are based on a 2-sigma criterion (95.5% probability). All GSC dates are therefore rounded according to the following criteria:

Age (years BP)	Significant figures
0–99	1
100–999	2
1000–9999	3
>10 000	3
nonfinite	2

If $^{13}C/^{12}C$ ratios ($\delta^{13}C$) were available, a 'correction' for isotopic fractionation was applied to the sample age, and the $\delta^{13}C$ value reported. For terrestrial and nonmarine organic materials and terrestrial and marine bones, the ages are conventionally normalized to a $\delta^{13}C$ = -25.0‰ relative to Pee Dee Belemnite (PDB), whereas marine shell ages are unconventionally corrected to a $\delta^{13}C$ = 0.0‰ PDB and normalized to a $\delta^{13}C$ = -25.0‰ PDB; freshwater shell ages are not corrected, but normalized to a $\delta^{13}C$ = -25.0‰ PDB. All $\delta^{13}C$ determinations were made on aliquots of the sample gas used for age determinations. Since 1989, all δ13C data have been determined under contract by the G.G. Hatch Isotope Laboratories, University of Ottawa, Ottawa-Carleton Geoscience Centre (OCGS), Ottawa, Ontario. From 1975 to 1989, the $\delta^{13}C$ data were determined under contract by R.J. Drimmie of the Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, or by Waterloo Isotope Analysts Inc., Kitchener, Ontario (R.J. Drimmie, chief analyst) using the same equipment as at the University of Waterloo. Prior to that time, some $\delta^{13}C$ determinations were done by the GSC Geochronology Section (R.K. Wanless, Head) and by Teledyne Isotopes, Westwood, New Jersey.

Acknowledgments

Appreciation is expressed to A.M. Telka (1980–1986), L.M. Maillé (1986–1989 and 1991–1992) and M. Leflar (1990), I.M. Robertson (1964–1989), J. Brennan (1989–1995), and R. McNeely (1996–2005) for the preparation, purification, and counting of samples in the laboratory. Supervision of laboratory operations has been as follows: W. Dyck (1960–1965), J.A. Lowdon (1965–1981), and R. McNeely (1981–2005).

Identification of materials used for dating or associated with the dated material has been carried out by the following specialists:

Arthropods (fossil): J.V. Matthews, Jr. and A.M. Telka

Macrofossils (plant): J.V. Matthews, Jr. and A.M. Telka

Molluscs: F.J.E. Wagner, C.G. Rodrigues, and J-M. Gagnon

Vertebrates: C.R. Harington

Wood: R.J. Mott and H. Jetté

The GSC clientele extend their sincere thanks to them.

GSC COUNTER REPRODUCIBILITY

Since the late 1980s, the GSC Radiocarbon Laboratory has taken every opportunity to provide internal quality assurance and quality control (QA-QC) for its clientele. Many of these results, showing internal counting consistency, have been reported in previous Date Lists and as part of international crosscheck exercises (http://gsc.nrcan.gc.ca/c14/international_qa_e.php, accessed August 30, 2006). The data (in excess of 60 samples) are considered extensive enough to consolidate and present as tables in this Date List (Tables 1 and 2). Also refer to http://gsc.nrcan.gc.ca/c14/crosschecks_e.php (accessed August 30, 2006) for a series of internal crosschecks on shells.

The data include replicate counts of the same gas preparation in the same counter and in different counters; replicate gas preparations of the same sample counted in the same counter or different counters; and replicate counts on 'mixed' gas preparations in both counters. About 90% of the replicate

Table 1. Replicate counts on single and duplicate gas preparations in both GSC counters.

Lab no.	Normalized age ± σ	Δ	Lab no.	Normalized age ± σ	Δ	Lab no.	Normalized age ± σ	Δ
Same preparation and counter			GSC-4676 (ICS)	2210 ± 50 2210 ± 60	0	GSC-6488 (FIRI)	11 800 ± 110 11 900 ± 140	100
GSC-6006	510 ± 80 420 ± 80	90	GSC-6521 (FIRI)	2410 ± 50 2410 ± 60	0	GSC-6486 (FIRI)	17 900 ± 170 18 200 ± 180	300
GSC-6632	930 ± 40 970 ± 50	40	GSC-6521 (FIRI)	2410 ± 50 2500 ± 70	90	GSC-6486 (FIRI)	18 100 ± 200 18 200 ± 180	100
GSC-6636	1120 ± 70 1210 ± 50	90	GSC-4672 (ICS)	3340 ± 50 3470 ± 60	130 *	GSC-5649 (TIRI)	18 200 ± 200 18 100 ± 210	100
GSC-6654	2000 ± 60 2110 ± 40	110 *	GSC-4671 (ICS)	3380 ± 60 3370 ± 60	10	GSC-5069HP	35 700 ± 320 37 600 ± 1610	1900
GSC-6759	3040 ± 50 3020 ± 70	20	GSC-5602 (TIRI)	3770 ± 60 3880 ± 90	110	GSC-4554	36 000 ± 1260 35 200 ± 920	800
GSC-6448	3620 ± 80 3560 ± 60	60	GSC-5604 (TIRI)	4440 ± 70 4400 ± 80	40	GSC-4554	36 300 ± 1330 33 700 ± 1020	2600 *
GSC-5241	8750 ± 80 8730 ± 80	20	GSC-5604 (TIRI)	4520 ± 90 4400 ± 80	120	**Different preparation, same counter**		
GSC-6631	9120 ± 100 9320 ± 90	200 *	GSC-6489 (FIRI)	4400 ± 60 4460 ± 90	60	GSC-6030	300 ± 80 290 ± 90	10
GSC-6703	9290 ± 90 9210 ± 90	80	GSC-6487 (FIRI)	4480 ± 60 4500 ± 80	20	GSC-4667	650 ± 50 700 ± 50	50
GSC-5068 (IAEA)	11 700 ± 160 11 800 ± 120	100	GSC-5079 (IAEA)	7100 ± 100 7150 ± 100	50	GSC-5650 (TIRI)	1690 ± 70 1750 ± 80	60
GSC-6488 (FIRI)	11 800 ± 110 11 800 ± 110	0	GSC-5870	7590 ± 70 7700 ± 120	110	GSC-6651	3320 ± 60 3240 ± 60	80
GSC-6486 (FIRI)	17 900 ± 170 18 100 ± 200	200	GSC-5066	7940 ± 90 7910 ± 120	30	GSC-6646	3590 ± 60 3670 ± 70	90
GSC-6622	10 600 ± 100 10 700 ± 90	100	GSC-5037	10 600 ± 100 10 600 ± 120	0	GSC-6650	3700 ± 60 3670 ± 70	20
GSC-6624	10 900 ± 110 11 000 ± 140	100	GSC-5036	10 800 ± 90 10 800 ± 120	0	GSC-6633	7810 ± 90 7720 ± 80	70
GSC-6738	21 400 ± 240 21 900 ± 220	500 *	GSC-5646 (TIRI)	10 900 ± 120 11 300 ± 130	400 *	GSC-6522 (FIRI)	10 800 ± 330 11 300 ± 140	500 *
Same preparation, different counter			GSC-5646 (TIRI)	10 900 ± 120 11 100 ± 160	200	GSC-4554	36 000 ± 1260 36 300 ± 1330	300
GSC-4673 (ICS)	70 ± 50 150 ± 60	80	GSC-5611 (TIRI)	11 100 ± 110 11 100 ± 120	0	**Different preparation and counter**		
GSC-4674 (ICS)	280 ± 50 340 ± 60	60	GSC-5611 (TIRI)	11 100 ± 110 11 200 ± 110	100	GSC-6045	40 ± 60 260 ± 90	220 *
GSC-6044	570 ± 50 570 ± 80	0	GSC-5647 (TIRI)	11 200 ± 110 11 000 ± 120	200	GSC-6655	930 ± 50 970 ± 80	40
GSC-4667	650 ± 50 720 ± 60	70	GSC-6522 (FIRI)	11 300 ± 100 11 300 ± 140	0	GSC-6402	2010 ± 70 2070 ± 100	60
GSC-6275	1230 ± 60 1230 ± 80	0	GSC-6570	11 700 ± 110 11 500 ± 130	200	GSC-6508	10 400 ± 90 10 400 ± 120	0
GSC-5648 (TIRI)	1610 ± 50 1510 ± 70	100	GSC-5068 (IAEA)	11 700 ± 110 11 700 ± 160	0	GSC-6296	11 100 ± 120 11 300 ± 160	200
GSC-4677 (ICS)	2140 ± 60 2290 ± 70	150 *	GSC-5068 (IAEA)	11 700 ± 110 11 800 ± 120	100	GSC-4554	36 300 ± 1330 35 200 ± 920	1100
GSC-6491 (FIRI)	2200 ± 50 2180 ± 80	20	GSC-6488 (FIRI)	11 800 ± 110 11 900 ± 140	100			

Δ, difference between counts
999 * difference beyond combined sigmas
Abbreviations: FIRI, Fourth International Radiocarbon Intercomparison; GSC, Geological Survey of Canada; HP, high pressure; IAEA, International Atomic Energy Agency; ICS, International Collaborative Study; TIRI, Third International Radiocarbon Intercomparison

counts on the standard gas preparations (Table 1) are within their combined errors (sigmas). Differences greater than the combined sigmas are denoted by an '*'. All but one replicate are less than 3 sigma.

The 'mixed gas' preparations (Table 2) require multiple estimates of the gas volumes and are therefore less precise, especially for older samples. Although the mixing ratio (MR) should provide an estimate of the confidence in the precision of the data, this is not necessarily the case, as illustrated in Table 2. Of the 'mixed gas' preparations, 40% of the data (6 of 15) are beyond their combined sigmas, with most ranging between 3 and 4 sigma. One replicate, on different gas preparations, is almost 7 sigma apart and, if it had not been an international crosscheck sample, one might suspect sample variability rather than counter and processing variances.

Table 2. Replicate counts on 'mixed' gas preparations in both GSC counters.

Lab no.	Normalized age ± σ	Δ	MR[1]	Lab no.	Normalized age ± σ	Δ	MR[1]
Same preparation and counter				**Different preparation and counter**			
GSC-6521 (FIRI)	2500 ± 70 2570 ± 90	70	2.06	GSC-6142	130 ± 50 180 ± 60	50	3.50
GSC-6521 (FIRI)	2500 ± 70 2510 ± 120	10	3.41	GSC-6596	260 ± 50 190 ± 110	70	4.13
Different preparation, same counter				GSC-6653	1220 ± 50 1320 ± 130	120	3.98
GSC-6554	970 ± 60 1010 ± 60	40	1.32	GSC-6598	7940 ± 90 7480 ± 140	460 *	2.01
GSC-6629	4890 ± 80 4950 ± 100	70	1.71	GSC-6488 (FIRI)	11 800 ± 110 11 300 ± 210	500 *	2.16
GSC-6641	11 800 ± 130 11 300 ± 320	400	4.41	GSC-6488 (FIRI)	11 900 ± 120 10 700 ± 230	1200 *	3.43
GSC-6640	11 900 ± 130 11 700 ± 170	200	1.99	GSC-6570	11 500 ± 130 12 000 ± 300	500 *	3.43
GSC-6488 (FIRI)	11 900 ± 140 11 300 ± 210	600 *	2.16	GSC-6570	11 500 ± 130 12 100 ± 210	60 *	2.01

[1]Mixing ratio of small samples

Abbreviations: FIRI, Fourth International Radiocarbon Intercomparison; GSC, Geological Survey of Canada; HP, high pressure; IAEA, International Atomic Energy Agency; ICS, International Collaborative Study; TIRI; Third International Radiocarbon Intercomparison

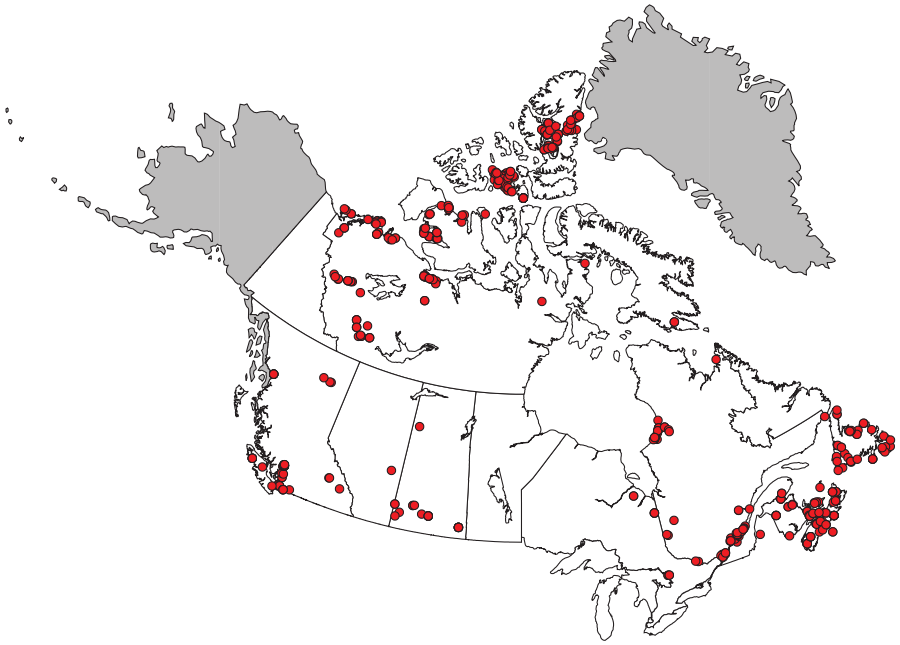

Figure 1. Radiocarbon-dated sites in Canada.

EASTERN CANADA

Newfoundland

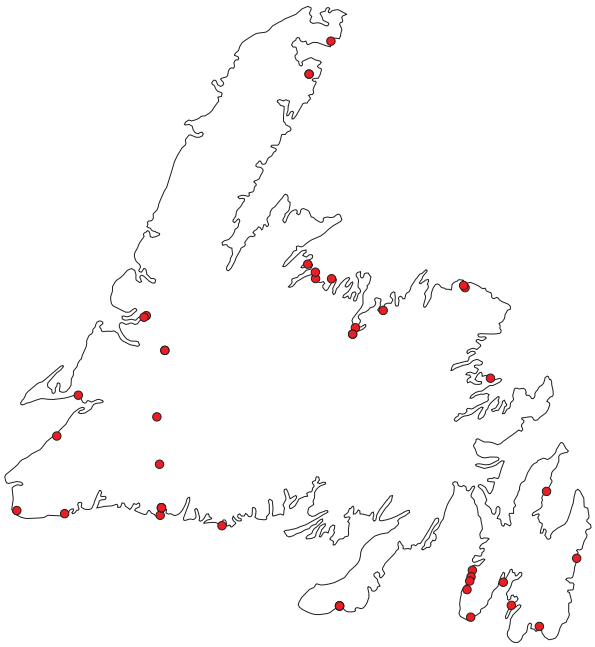

Figure 2. Radiocarbon-dated sites in Newfoundland.

GSC-5836. Mobile

normalized age:	310 ± 50
$\delta^{13}C$:	-24.3‰
uncorrected age:	300 ± 50

The wood, a rooted stump of *Picea* (identified by H. Jetté in unpublished GSC Wood Report 94-85) was enclosed in marine gravel. Sample Mobile 1 was collected by N.R. Catto, S. Jones, and G. Catto on September 16, 1994, along the shoreline north of the delta of the Mobile River at Mobile, 38 km south-southwest of St. John's, Newfoundland (47°15′N, 52°51′W), at an elevation of 0.1 m. The sample was submitted by N.R. Catto to gain information on sea-level change, specifically submergence along the Atlantic coast of the Avalon Peninsula.

The sample (9.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 7.86 L of CO_2 gas. The age estimate is based on one count for 3840 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.320 ± 0.094, 2.149 ± 0.033, and 28.371 ± 0.131 counts/minute (cpm), respectively.

Comment (N.R. Catto): This stump was submerged at high tide and exposed at low tide. The top of stump was about 10 cm above mean sea level. There was some decay and modern boring organisms noted along the surface of the wood where it was buried by more than 5 cm of gravel. The sample is part of a rooted stump (dimensions of root system 2.65 m by 2.40 m, completely excavated) found upright, buried by marine gravel. The underlying material consists of organic detritus, which resembles a modern forest soil. Three other rooted stumps were noted between high and low tide in the vicinity. Subsequent investigations have identified more than 20 stumps below high-tide level. These stumps provide the only geological evidence for rising sea level along the Atlantic shoreline of the Avalon Peninsula. See Catto (1994b) for additional comments.

GSC-5414. 'Biscay Bay Brook'

normalized age:	750 ± 90
$\delta^{13}C$:	-25.8‰
uncorrected age:	770 ± 90

The peat was overlying a sand unit and was overlain by modern marine sand. Sample BB-91-2 was collected at a depth of 0.5 m by N.R. Catto on August 10, 1991 from the outlet of 'Biscay Bay Brook', Newfoundland (46°54′N, 53°17′W) . The sample was submitted by N.R. Catto to gain information on sea-level change.

The sample (255.9 g wet weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (13.1 g) yielded 2.45 L of CO_2 gas. The age estimate is based on two counts for 1915 minutes in the 2 L counter with a mixing ratio of 1.78. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.650 ± 0.14, 1.209 ± 0.024, and 18.316 ± 0.145 cpm, respectively.

Comment (N.R. Catto): The sample, overlain by modern marine sand, was below sea level. The peat sample overlies a sand unit and is overlain by a unit of modern marine sand to a thickness of 20 cm. Thus, the sample dates recent marine transgression. See Catto (1994b) for additional comments.

GSC-5351. La Haye Point

normalized age:	7630 ± 80
$\delta^{13}C$:	-30.2‰
uncorrected age:	7720 ± 80

The basal peat was overlying a diamicton. Sample PHL-91-8 (1.75 m) was collected by N.R. Catto on August 10, 1991 from La Haye Point Provincial Park, Newfoundland (46°54′N, 53°37′W), at an elevation of 3 m. The sample was submitted by N.R. Catto to gain information on sea-level change and the age of the marine terrace.

The sample (142.8 g wet weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (27.8 g) yielded 8.15 L of CO_2 gas. The age estimate is based on one count for 3730 minutes in

the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.762 ± 0.067, 2.215 ± 0.033, and 28.129 ± 0.131 cpm, respectively.

Comment (N.R. Catto): The peat sample was taken from the base of a 1.75 m thick unit in a fresh marine bluff exposure, and was underlain by a diamicton that extended to sea level. This sample dates a Holocene marine terrace that is part of a study of Holocene sea levels along the southern parts of the Avalon Peninsula. See Catto (1994b) for additional comments.

GSC-5535. Salmon Cove

normalized age:	4250 ± 130
$\delta^{13}C$:	-24.7‰
uncorrected age:	4240 ± 130

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 93-14) was enclosed in 5 m of eolian sand. Sample Sc-92-W1 was collected by N.R. Catto on August 16, 1992 from Salmon Cove Provincial Scenic Area, Salmon Cove, Newfoundland (47°47′N, 53°10′W), at an elevation of 2 m. The sample was submitted by N.R. Catto to gain information on the initiation of a dune sequence.

The sample (4.90 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.4 g) yielded 2.1 L of CO_2 gas. The age estimate is based on two counts for 2225 minutes in the 2 L counter with a mixing ratio of 2.06. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.789 ±0.153, 1.214 ± 0.024, and 18.297 ± 0.145 cpm, respectively.

Comment (N.R. Catto): The wood was obtained from the base of a sand dune, in a temporary cut exposed as a result of storm activity and deflation. The collection site is 2 m a.s.l. and is overlain by 5 m of eolian sand. The sample dates the base of an eolian dune sequence. See Catto (1994a) for additional comments.

GSC-5429. Dog Cove

normalized age:	7620 ± 80
$\delta^{13}C$:	-25.6‰
uncorrected age:	7630 ± 80

The peat was lying on top of a 2 m thick marine-terrace deposit. Sample DC-2-91-9 was collected by N.R. Catto on August 8, 1991 from Dog Cove, Newfoundland (47°05′N, 53°42′W), at an elevation of 2 m. The sample was submitted by N.R. Catto to gain information on sea-level change and the age of the marine terrace.

The sample (185.9 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.6 g) yielded 8.29 L of CO_2 gas. The age estimate is based on two counts for 2190 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.943 ± 0.081, 2.106 ± 0.025, and 28.293 ± 0.128 cpm, respectively.

Comment (N.R. Catto): The sample was collected from a marine-terrace exposure that overlies marine-terrace deposits, 2 m thick, which extend to sea level. This sample dates the Holocene marine terrace that is part of a study of Holocene sea levels along the southern parts of the Avalon Peninsula. See Catto (1994b) for additional comments.

GSC-5413. St. Chads

normalized age:	12 800 ± 110
corrected age:	12 400 ± 110
$\delta^{13}C$:	+1.66‰
uncorrected age:	12 300 ± 110

The marine shells (*Hiatella arctica*, identified by M. Batterson) were enclosed in marine diamicton. Sample 92MB001 was collected by K. Lane on May 15, 1991 from St. Chads, Bonavista Bay, Newfoundland (48°41.1′N, 53°46.7′W), at an elevation of 14 m. The sample was submitted by M. Batterson to gain information on sea-level change.

The sample (53.2 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (36.0 g) yielded 8.15 L of CO_2 gas. The age estimate is based on one count for 3925 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.080 ± 0.059, 2.197 ± 0.037, and 28.267 ± 0.155 cpm, respectively.

Comment (M. Batterson): The shells were collected during the hand-digging of a water well, 1.0 to 1.5 m below the surface. They were collected from a 0.5 m thick diamicton unit that was overlain by gravel. No shell dates are available from this part of Bonavista Bay, and any shell dates are rare from eastern Newfoundland. This is a significant find that should shed some light on the timing of deglaciations and the marine submergence for this area of the province.

GSC-5572. Point Lance

normalized age:	5380 ± 60
$\delta^{13}C$:	-27.6‰
uncorrected age:	5420 ± 60

The peat was enclosed in sand. Sample LC-92-1 was collected by N.R. Catto on April 16, 1992 from 100 m east of the community of Point Lance, Lance Cove, Newfoundland (46°49′N, 54°05′W), at an elevation of 4 m. The sample was submitted by N.R. Catto.

The sample (140.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (16 g) yielded 13.3 L of CO_2 gas. The age

estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.339 ± 0.074, 2.168 ± 0.035, and 28.159 ± 0.131 cpm, respectively.

Comment (N.R. Catto): A dune complex was built on marine sediments (sand and coarse silt) at 4 m a.s.l. The eolian sediments range from 0 to 2 m thick and are actively deflating. An excavation in the base of an eolian blowout exposed a peat overlying marine sand, and underlying dune material. The peat unit is a maximum of 8 cm thick and is laterally discontinuous. The sample dates a sea-level stand at Point Lance, and provides an age for the initiation of eolian sedimentation. See Catto (1994a) for additional comments.

GSC-5306. Ship Cove

normalized age:	1340 ± 70
$\delta^{13}C$:	-28.1‰
uncorrected age:	1390 ± 70

The peat was overlying coastal-bar deposits and sand, and overlain by peat and marine silt. Sample SC-91-3a was collected by N.R. Catto, R. Boger, and R. House on July 26, 1991 from a coastal bar at Ship Cove, Newfoundland (47°06′N, 54°05′W), at an elevation of 0 m. The sample was submitted by N.R. Catto to gain information on coastal-bar development.

The sample (192.9 g wet weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (30.3 g) yielded 8.10 L of CO_2 gas. The age estimate is based on two counts for 1780 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 23.720 ± 0.169, 2.107 ± 0.027, and 28.215 ± 0.129 cpm, respectively.

Comment (N.R. Catto): A peat exposure in a coastal bar was underlain by coastal-bar deposits to a total thickness of 25 cm. The peat was overlain by sand (thickness 30 cm), then an additional 35 cm of peat and marine silt (10 cm). The sample dates Holocene coastal-bar development and is part of a study of Holocene sea levels along the southern parts of the Avalon Peninsula. See Catto (1994b) for additional comments.

GSC-5319. 'Great Barachoix'

normalized age:	3480 ± 60
$\delta^{13}C$:	-27.9‰
uncorrected age:	3530 ± 60

The (?)basal peat was overlying a diamicton. Sample GBS-91-3 was collected by N.R. Catto, R. Boger, and R. House on July 26, 1991 from a coastal bluff at 'Great Barachoix', Newfoundland (47°08′N, 54°04′W), at an elevation of 2 m. The sample was submitted by N.R. Catto to gain information on sea-level change.

The sample (125.4 g dry weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (20.5 g) yielded 8.10 L of CO_2 gas. The age estimate is based on one count for 3790 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.281 ± 0.081, 2.231 ± 0.034, and 28.364 ± 0.176 cpm, respectively.

Comment (N.R. Catto): Peat, from a fresh exposure in a coastal bluff, overlies a diamicton extending to sea level, thus forming a cap on the marine terrace. The sample dates sea level in the 'Great Barachoix' area and represents part of a study of Holocene sea levels along the southern parts of the Avalon Peninsula. See Catto (1994b) for additional comments.

GSC-5580. 'Little Barachoix'

normalized age:	5600 ± 60
$\delta^{13}C$:	-26.5‰
uncorrected age:	5620 ± 60

The peat, sample LB-92-03, was collected by N.R. Catto and N. Thistle on January 18, 1992 from 'Little Barachoix', Newfoundland (47°11′N, 54°03′W), at an elevation of 10 m. The sample was submitted by N.R. Catto.

The sample (174.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (20 g) yielded 15.1 L of CO_2 gas. The age estimate is based on one count for 3910 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.985 ± 0.073, 2.168 ± 0.035, and 28.159 ± 0.131 cpm, respectively.

Comment (N.R. Catto): The peat bed was 55 cm thick in a coastal exposure that was freshly exposed. It overlies a glaciomarine diamicton along an erosional contact, interpreted as a marine erosional surface, and is overlain by 5 to 20 cm of loess, which extends to the surface. The peat provides a minimum age of a sea-level stand, and dates loess deposition. This date serves as a check on other ^{14}C dates from the Placentia Bay shore, specifically GSC-5158 (6130 ± 80), GSC-5319 (3480 ± 60), GSC-5306 (1340 ± 70), and GSC-5431 (7660 ± 80). See Catto (1994b) for additional comments.

GSC-5431. Patrick's Cove

normalized age:	7660 ± 80
$\delta^{13}C$:	-27.3‰
uncorrected age:	7700 ± 80

The peat was overlying marine sediments. Sample PC-91-14 was collected by N.R. Catto on August 22, 1991 from Patrick's Cove, Newfoundland (47°02′N, 54°07′W), at an elevation of 0 m. The sample was submitted by N.R. Catto to gain information on sea-level change, specifically a transgression.

The sample (168.6 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.2 g) yielded 8.24 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.854 ± 0.085, 2.106 ± 0.025, and 28.293 ± 0.128 cpm, respectively.

Comment (N.R. Catto): Terrestrial peat, at sea level on a marine-terrace exposure, overlies marine sediments. The peat sample dates a marine transgression. See Catto (1994b) for additional comments.

GSC-5558. Ragged Harbour

normalized age:	1040 ± 50
$\delta^{13}C$:	-25.4‰
uncorrected age:	1050 ± 50

The wood (*Larix*, identified by H. Jetté in unpublished GSC Wood Report 93-22) was enclosed in peat. Sample 806 was collected by N.R. Catto and M. Munro on August 10, 1992 from Ragged Harbour, 6 km west of Musgrave Harbour, Newfoundland (49°24′N, 54°03′W), at an elevation of 41 m. The sample was submitted by N.R. Catto.

The sample (41.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.7 g) yielded 7.3 L of CO_2 gas. The age estimate is based on one count for 3731 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 24.736 ± 0.100, 2.208 ± 0.053, and 28.186 ± 0.139 cpm, respectively.

Comment (N.R. Catto): The sample was taken from the base of a peat bog (1.5 m thick) directly overlying marine gravel, about 50 cm behind the surface of a natural peat bog exposure. The enclosing material was wet peat, and only the larger pieces of wood were chosen for dating. This date provides a minimum age of the sea-level stand. See Munro and Catto (1993) for additional comments.

GSC-5559. Ladle Cove

normalized age:	2930 ± 80
$\delta^{13}C$:	-26.1‰
uncorrected age:	2950 ± 80

The peat sample was enclosed in peat. Sample 822 was collected by N.R. Catto and M. Munro on August 10, 1992 from Ladle Cove, Newfoundland (49°25′N, 54°04′W), at an elevation of 5.5 m. The sample was submitted by N.R. Catto.

The sample (194.6 g wet weight) was treated with hot base, hot acid (slightly noncalcareous), and distilled water rinses. The treated sample (28.0 g) yielded 11.7 L of CO_2 gas. The age estimate is based on two counts for 1895 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 19.530 ± 0.174, 2.208 ± 0.053, and 28.186 ± 0.139 cpm, respectively.

Comment (N.R. Catto): The sample was taken from the base of a peat bog (1 m thick) directly overlying marine gravel, about 50 cm behind the surface of a natural exposure of peat. Thus the date provides a minimum age for a sea-level stand. See Munro and Catto (1993) for additional comments.

'Lansey Barque' Series

A series of wood samples was collected by D.G.E. Liverman on July 7, 1993 from Lansey Bank Cove (referred to as 'Lansey Barque' by local inhabitants), 3.2 km southwest of the town of Lawn, Newfoundland (46°55.2′N, 55°34.4′W), at an elevation of 0.85 m. These samples were submitted by D.G.E. Liverman to gain information on sea-level change (and tsunami deposits?).

GSC-5728. 'Lansey Barque' (I)

normalized age:	400 ± 90
$\delta^{13}C$:	-24.3‰
uncorrected age:	380 ± 90

The wood sample BURIN 93-1 (5.3 g dry weight; *Populus*, identified by H. Jetté in unpublished GSC Wood Report 94-19), enclosed in woody peat (8 cm thick) with sand below and sand and peaty sand above, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.0 g) yielded 4.60 L of CO_2 gas. The age estimate is based on two counts for 2170 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.407 ± 0.096, 1.218 ± 0.025, and 18.260 ± 0.170 cpm, respectively.

GSC-5717. 'Lansey Barque' (II)

normalized age:	560 ± 90
$\delta^{13}C$:	-25.0‰
uncorrected age:	560 ± 90

The wood sample BURIN 93-2 (7.5 g dry weight; *Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-15), enclosed in peat (4–5 cm thick) between two basal sand beds, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.9 g) yielded 6.69 L of CO_2 gas. The age estimate is based on two counts for 2100 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.031 ± 0.097, 1.218 ± 0.025, and 18.260 ± 0.170 cpm, respectively.

GSC-5708. 'Lansey Barque' (III)

normalized age:	920 ± 60
$\delta^{13}C$:	-24.1‰
uncorrected age:	910 ± 60

The wood sample BURIN 93-3 (8.8 g dry weight; *Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-71), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.2 g) yielded 5.11 L of CO_2 gas. The age estimate is based on two counts for 2165 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.466 ± 0.094, 1.217 ± 0.025, and 18.431 ± 0.104 cpm, respectively.

GSC-5706. 'Lansey Barque' (IV)

normalized age:	960 ± 50
$\delta^{13}C$:	-23.7‰
uncorrected age:	940 ± 50

The wood was collected from the outlet of a back-beach lagoon below the Lawn to Roundabout road (west side of cove), at an elevation of 0.5 m. Sample BURIN 93-4 (12.2 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 94-68), enclosed in peat about 1 m below the top of the section with peat above, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 7.69 L of CO_2 gas. The age estimate is based on two counts for 2165 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 24.998 ± 0.116, 2.258 ± 0.029, and 28.094 ± 0.130 cpm, respectively.

Comment (D.G.E. Liverman): This sequence of dates is from a section exposed in a cutbank of a small stream draining the lagoon behind the barrier beaches of Lansey Bank Cove (referred to as 'Lansey Barque' by local inhabitants). The beach system here consists of a relatively high gravel barrier lying to the east of a small island (known locally as the Cabbage Head), and a lower sandy beach to the west. The section lies behind the sandy beach. The base of the section lies between high and low tide, and is likely close to current mean sea level. The section shows a sequence of rooted tree stumps at the base, overlain by 50 cm of woody peat, which contains many large pieces of wood. Two beds of well sorted fine sand are found within the peat, approximately 30 cm above the rooted tree stumps. Overlying this is 20 cm of interbedded sandy peat and well sorted fine sand, which is in turn overlain by 35 cm of well sorted fine sand, with some soil development toward the top, and an 8 cm organic A horizon at the surface. Individual sand beds within the peat-sand sequence can be traced laterally over 1 to 2 m of exposure, and are consistent in thickness. Date GSC-5706 is from the rooted stumps at the base, GSC-5708 is from just below the first sand bed in the sequence, GSC-5717 is from between the two lowermost sand beds, and GSC-5728 is from the top of the woody peat.

Date GSC-5706 is comparable to GSC-2616 (1080 ± 50) from Little St. Lawrence, and GSC-4670 (970 ± 80) from Lawn. Both these dates were on rooted trees lying close to or below modern sea level, from sites located 4 to 15 km east of Lansey Bank Cove. The similarity in elevation and age suggests that rising sea level caused the death of these trees approximately 1000 years ago. Given the modern geomorphology, it is suggested that the trees were growing in a peaty area lying adjacent to a lagoon, behind a barrier beach. Salinization of water in the rooting zone of the trees would then result in their death. Assessment of absolute sea-level rise is difficult. The modern system is not a good analogue, as use of the back-barrier area for pasture and gardens means that the distribution and elevation of modern trees are not natural. Given that the roots lie 0.5 to 1 m below high-tide level, the best estimate is that sea level has risen at least 1 m in the last 1000 years. The similarity between the lower two dates may be due to trees remaining in growth position after death and continuing to contribute material to the underlying peat. The broken-off stumps at Lansey Bank Cove indicate that a major storm event may have affected the area, possibly related to the lowermost sand bed and thus dated to between 920 and 560 years BP. Discrete sand beds are interpreted as being deposited through overwash during storm events. There is also likely an eolian input of sand to the area. The increasing proportion of sand upsection reflects movement of the barrier beach toward the coast, and rising sea levels resulting in more frequent overwash. The soil development at the surface indicates stability for a considerable period of time. This may relate to stabilization of the beach system during retreat, when it intercepted the small island known locally as the 'Cabbage Head' that currently cuts the beach system into two distinct segments. The section is an area that is known to have been affected by the 1929 tsunami that caused considerable damage on the Burin Peninsula. No clear evidence of this event is seen in the section, although it is possible that some of the upper sand was deposited in this event.

GSC-5253. St. Anthony

normalized age:	6750 ± 100
$\delta^{13}C$:	-26.7‰
uncorrected age:	6770 ± 100

The lake sediment, a basal detrital peat, was enclosed in dark grey silty clay below and dark brown gyttja above. Sample AP-85-3 (350–360 cm) was collected by T.W. Anderson on July 06, 1985 from 4.5 km southwest of St. Anthony, on the east side of Highway 73, Newfoundland (51°20′48″N, 55°38′30″W), at an elevation of 84 m. The sample was submitted by T.W. Anderson to gain information on the rate of peat accumulation, and deglaciation.

The sample (123.2 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (25.5 g) yielded 6.18 L of CO_2 gas. The age estimate is based on two counts for 2550 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.908 ± 0.064, 1.213 ± 0.021, and 18.379 ± 0.137 cpm, respectively.

Comment (T.W. Anderson): The date is on detritus gyttja that overlies grey silty clay. The clay is interpreted to represent a marine inundation of the area. The date provides a maximum age for sea-level retreat in the St. Anthony area, as the elevation of the lake (84 m) is well below the local marine (postglacial) limit (122 m).

GSC-5566. Burnt Bay

normalized age:	1190 ± 50
$\delta^{13}C$:	-26.6‰
uncorrected age:	1210 ± 50

The peat was enclosed in sand and peat. Sample 353 was collected by N.R. Catto and C. Mackenzie on July 25, 1992 from 1 km west of Highway 340, Burnt Bay, Lewisporte, Newfoundland (49°14′N, 55°02′W), at an elevation of 3 m. The sample was submitted by N.R. Catto.

The sample (296.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (21.5 g) yielded 15.3 L of CO_2 gas. The age estimate is based on one count for 3855 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 24.233 ± 0.098, 2.208 ± 0.053, and 28.186 ± 0.139 cpm, respectively.

Comment (N.R. Catto): In a fresh coastal exposure, a sample was taken from the base of a peat unit that directly overlies gravel beach deposits. This date provides a minimum age of the sea-level stand. See Mackenzie and Catto (1993) for additional comments.

GSC-5542. Botwood (I)

normalized age:	2350 ± 60
$\delta^{13}C$:	-25.7‰
uncorrected age:	2360 ± 60

The basal wood (*Larix*, identified by H. Jetté in unpublished GSC Wood Report 93-21) was enclosed in peat directly overlying marine silt and clay. Sample 3591 was collected by N.R. Catto and C. Mackenzie on July 27, 1992 about 2 km east of Highway 350, Botwood, Newfoundland (49°03′N, 55°24′W), at an elevation of 13.5 m. The sample was submitted by N.R. Catto to gain information on sea-level change.

The sample (11.80 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.6 g) yielded 8.4 L of CO_2 gas. The age estimate is based on one count for 3905 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.091 ± 0.092, 2.176 ± 0.051, and 28.307 ± 0.186 cpm, respectively.

Comment (N.R. Catto): The wood sample was taken from the base of a peat unit in a fresh exposure in a ditch. The wood directly overlies marine silt and clay, and therefore provides a minimum age for the sea-level stand. See Mackenzie and Catto (1993) for additional comments.

GSC-5527. Botwood (II)

normalized age:	11 900 ± 110
corrected age:	11 500 ± 110
$\delta^{13}C$:	+1.02‰
uncorrected age:	11 500 ± 110

The marine shells (*Hiatella arctica*, identified by C. Mackenzie) were enclosed in organic marine mud that was underlain by clay and overlain by a fluvial diamicton. Sample 343 was collected by N.R. Catto and C. Mackenzie on August 4, 1992 about 500 m east of Highway 350, Botwood, Newfoundland (49°06′N, 55°22′W), at an elevation of 17 m. The sample was submitted by N.R. Catto to gain information on deglaciation and sea-level change.

The sample (29.10 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.4 g) yielded 5.3 L of CO_2 gas. The age estimate is based on one count for 3715 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.331 ± 0.046, 1.214 ± 0.024, and 18.146 ± 0.102 cpm, respectively.

Comment (N.R. Catto): In an old riverbank exposure, a section was cleared back about 10 cm and shells were taken from the fresh surface in organic marine mud, 1.1 m thick. The mud was underlain by rhythmically bedded clay and overlain by 2.2 m of fluvial diamicton. The date provides an age for the sea-level stand, and a minimum age estimate for deglaciation. See Mackenzie and Catto (1993) for additional comments.

GSC-5576. Botwood (III)

normalized age:	2730 ± 50
$\delta^{13}C$:	-26.6‰
uncorrected age:	2760 ± 50

The peat, sample 3592, was collected by N.R. Catto and C. Mackenzie on July 27, 1992 about 2 km east of Highway 350, Botwood, Newfoundland (49°03′N, 55°24′W), at an elevation of 13.5 m. The sample was submitted by N.R. Catto.

The sample (300.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (16 g) yielded 13.7 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 19.973 ± 0.085, 2.168 ± 0.035, and 28.159 ± 0.131 cpm, respectively.

Comment (N.R. Catto): The peat sample was taken from the base of a peat unit in a fresh exposure in a ditch. The wood directly overlies marine silt and clay, and therefore provides a minimum age for the sea-level stand. See Mackenzie and Catto (1993) for additional comments.

Notre Dame Bay Series

GSC-5906. Dogfish Point

normalized age:	9790 ± 100
corrected age:	9390 ± 100
$\delta^{13}C$:	+0.56‰
uncorrected age:	9380 ± 100

The marine shell fragments (mostly *Macoma bathica* and *M. calcarea,* identified by J. Maunder) were enclosed in a glaciomarine diamicton. Sample 94/070 was collected by D.G.E. Liverman on August 5, 1994 about 0.1 km west from Highway 380 toward Dogfish Point, 3 km west of Triton West, Triton Island, Notre Dame Bay, Newfoundland (49°31′20″N, 55°39′40″W), at an elevation of 7.5 m. The sample was submitted by D.G.E. Liverman to gain information on sea-level change.

The sample (24.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (21.2 g) yielded 4.87 L of CO_2 gas. The age estimate is based on one count for 3890 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.682 ± 0.049, 1.233 ± 0.025, and 18.272 ± 0.104 cpm, respectively.

GSC-5908. Crescent Lake

normalized age:	11 900 ± 100
corrected age:	11 500 ± 100
$\delta^{13}C$:	+0.74‰
uncorrected age:	11 500 ± 100

The marine shells (*Hiatella arctica*, identified by J. Maunder) were enclosed in a glaciomarine diamicton, with gravel above and a diamicton and sand/silt below. Sample 94/011 (2–4 m the below surface) was collected by D.G.E. Liverman on July 24, 1994 from Crescent Lake gravel pit, 4 km southwest of the community of Roberts Arm and southeast of a dump and campground, less than 1 km south of Highway 380, west of Notre Dame and Badger Bays, Newfoundland (49°29′15″N, 55°50′20″W), at an elevation of 14.5 m. The sample was submitted by D.G.E. Liverman to gain information on sea-level change.

The sample (42.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (33.8 g) yielded 7.66 L of CO_2 gas. The age estimate is based on one count for 3650 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.725 ± 0.060, 2.218 ± 0.035, and 28.217 ± 0.131 cpm, respectively.

GSC-5925. Port Anson

normalized age:	12 100 ± 140
corrected age:	11 700 ± 140
$\delta^{13}C$:	+1.09‰
uncorrected age:	11 700 ± 140

The marine shell fragments of *Hiatella arctica* (identified by J. Maunder) were enclosed in stony clay glaciomarine diamicton, beneath bedded sand and gravel. Sample 94/008 was collected by D.G.E. Liverman on July 23, 1994 from behind the Pentecostal Church adjacent to Highway 380, in the community of Port Anson, Sunday Cove Island, Notre Dame Bay, Newfoundland (49°32′14″N, 55°50′30″W), at an elevation of 12 m. The sample was submitted by D.G.E. Liverman to gain information on sea-level change and deglaciation.

The sample (15.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (11.9 g) yielded 2.58 L of CO_2 gas. The age estimate is based on one count for 3880 minutes in the 2 L counter with a mixing ratio of 1.68. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.291 ± 0.063, 1.292 ± 0.021, and 18.357 ± 0.102 cpm, respectively.

See GSC-5898 for comments.

GSC-5898. Little Bay mine

normalized age:	12 600 ± 110
corrected age:	12 200 ± 110
$\delta^{13}C$:	+1.27‰
uncorrected age:	12 200 ± 110

The marine shell fragments of *Hiatella arctica* and *Mya truncata* (identified by J. Maunder) were enclosed in a glaciomarine diamicton over polished bedrock, overlain by thin gravel. Sample 94/381 was collected by D.G.E. Liverman on September 5, 1994 from 2 km northeast of Highway 392 on a gravel road near Little Bay mine, north of the mine waste dump, on the west side of Notre Dame Bay, Newfoundland (49°36′00″N, 55°56′00″W), at an elevation of 40 m. The sample was submitted by D.G.E. Liverman to gain information on sea-level change and deglaciation.

The sample (54.2 g dry weight) was treated with an acid leach to remove the outer 40%. The treated sample (31.7 g) yielded 7.36 L of CO_2 gas. The age estimate is based on one count for 3850 minutes in the 5 L counter with a mixing ratio

of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.262 ± 0.058, 2.233 ± 0.034, and 28.468 ± 0.135 cpm, respectively.

Comment (D.G.E. Liverman): Reference to typical depth, temperature, and salinity ranges of modern species allows some assessment of paleoenvironmental marine conditions (Wagner, 1970; Peacock, 1993). Three sites have a similar faunal assemblage, typically *Hiatella arctica*, *Mya truncata*, *Macoma calcarea*, and *Balanus crenatus*, with *Astarte striata* and *Balanus balanus* also common. Site 94070 (GSC-5096) stands out as having a different species composition, with *Mytulis edulis*, *Mya areneria*, and *Macoma balthica* present only at this site and *Hiatella arctica* and all *Balanus* species absent. Paleoenvironmental interpretations must be considered indications only, as many shells were recovered as fragments and reworking is a distinct possibility at some sites. The usual *Hiatella-Mya-Macoma-Balanus* assemblage suggests water depths of at least 10 m, but more likely at least 40 m, given the depth preferences of *Balanus crenatus*. The preferred range of *Mya truncata* suggests that most of these samples were deposited in 40 to 50 m of water. The presence of *Hiatella arctica* and *Mya truncata* indicates salinities not less than 8 to 17‰ (Wagner, 1970; Peacock, 1993), and the possibly stenohaline *Trichotropis borealis* also indicates moderate salinity. The species composition at site 94070 suggests shallower water, as *Mytulis edulis* has a depth range of 0 to 10 m, and the various *Balanus* species are absent in this sample. The absence of *Hiatella arctica* and the presence of *Macoma balthica* also suggest a more brackish environment.

Date GSC-5898 is interpreted as being related to a sea-level stand of approximately 80 m a.s.l. and provides the oldest age. Date GSC-5096 dates a shallow-water faunal assemblage and likely relates to a sea-level stand at approximately 20 m a.s.l. It also is the youngest date of the four. Together, the four dates help constrain the sea-level history of northeastern Newfoundland.

GSC-5241. Tom Roses Pond

normalized age:	8730 ± 80
$\delta^{13}C$:	-26.3‰
uncorrected age:	8750 ± 80

The basal peat was enclosed in peat above, and dark grey sand and stony clay below. Sample AP-85-10 (200 cm) was collected by T.W. Anderson on July 15, 1985 east of Tom Roses Pond, 13 km southeast of Main Brook, Newfoundland (51°05′20″N, 55°54′50″W), at an elevation of about 75 m. The sample was submitted by T.W. Anderson to gain information on the peat, and on deglaciation.

The sample (100.3 g wet weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (25.4 g) yielded 6.6 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.533 ± 0.061, 2.055 ± 0.028, and 28.334 ± 0.123 cpm, respectively.

GSC-5241. second count

normalized age:	8750 ± 80
$\delta^{13}C$:	-26.3‰
uncorrected age:	8770 ± 80

The age estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.492 ± 0.066, 2.196 ± 0.038, and 28.279 ± 0.131 cpm, respectively.

Comment (T.W. Anderson): The date is on basal peat, which had started to accumulate during early Holocene warming. The date indicates there may be a time lag of up to 1250 years between the end of the Younger Dryas cool interval (10.0 ka BP) and the onset of peat deposition. Compared with the date of 8.0 ka BP (GSC-4333) at the top of the Anguille Mountains, the 8.7 ka BP date suggests that the northern high elevations of the Long Range Mountains may have been deglaciated earlier than equivalent elevations to the south.

GSC-5206. Hermitage

normalized age:	10 600 ± 140
$\delta^{13}C$:	-19.1‰
uncorrected age:	10 500 ± 140

The basal gyttja lake sediment sample AP-82-4A was collected by T.W. Anderson on August 20, 1982 about 1.5 km south of town of Hermitage, south coast of Newfoundland (47°32′45″N, 56°55′30″W), at an elevation of 3.5 m. The sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation.

The sample (32.6 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (24.5 g) yielded 3.80 L of CO_2 gas. The age estimate is based on one count for 2515 minutes in the 2 L counter with a mixing ratio of 1.17. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.965 ± 0.062, 1.065 ± 0.026, and 18.277 ± 0.188 cpm, respectively.

Comment (T.W. Anderson): The date is at the base of an upper gyttja unit that overlies a downward sequence of banded grey silty clay, gyttja interspersed with silt and clay bands, and grey sandy stony clay at the bottom. A date of 12.6 ka BP (GSC-5008) at the top of the lower gyttja suggests this gyttja unit predates the Younger Dryas cool interval (10.0–11.0 ka BP). The date GSC-5206 postdates the Younger Dryas cool interval, which is represented by the grey silty

clay unit. The upper gyttja probably commenced during post–Younger Dryas warming, and the date is therefore too old by a few hundred years because of hard-water error.

South Brook Valley Series

A series of wood and sediment samples was collected by T.W. Anderson on August 11, 1986 from South Brook valley, 11.5 km south of Pasadena, Newfoundland (48°54′48″N, 57°37′37″W), at an elevation of 111 m.

TO-5707. South Brook Valley (I)

normalized age:	9540 ± 90

The twigs, sample AP-86-4 (263–265 cm; *Salix*, identified by T.W. Anderson), were enclosed in banded detrital gyttja that overlies grey sandy clay. This sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation. The age was normalized assuming a $\delta^{13}C = -25.0‰$.

GSC-5302. South Brook Valley (II)

normalized age:	13 100 ± 220
$\delta^{13}C$:	-26.3‰
uncorrected age:	13 200 ± 220

The basal gyttja lake sediment was enclosed in banded detrital gyttja that overlies a grey sandy clay. Sample AP-86-4 (261.5–268 cm) was collected by T.W. Anderson on August 11, 1986.

The sample (245.8 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (91.5 g) yielded 5.49 L of CO_2 gas. The age estimate is based on two counts for 2100 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 3.571 ± 0.089, 1.188 ± 0.059, and 18.396 ± 0.155 cpm, respectively.

Comment (T.W. Anderson): This date was checked by the accelerator mass spectrometry (AMS) technique on *Salix* twigs that were extracted from 263 to 265 cm in a separate core. The *Salix* twigs yielded a date of 9.5 ka BP (TO-5707). This date of 13.1 ka BP is therefore too old by up to 3600 years, probably because of hard-water error. The AMS date provides an age for isolation of a small lake from an arm of a larger glacial lake that is believed to have occupied the South Brook valley and the present-day Deer Lake basin (Batterson et al., 1983).

'Woody Hill Brook Pond' Series

A series of lake sediment samples was collected by T.W. Anderson on August 1, 1989 from a pond, locally known as 'Woody Hill Brook Pond', alongside Highway 480, about 7 km north of Burgeo, Newfoundland (47°40'45″N; 57°37'40″W), at an elevation of 165 m. The samples were submitted by T.W. Anderson to gain information on deglaciation and the pollen spectra.

GSC-5315. 'Woody Hill Brook Pond' (I)

normalized age:	8460 ± 120
$\delta^{13}C$:	-26.1‰
uncorrected age:	8480 ± 120

The lake sediment sample AP-89-2D (87–93 cm; 80.6 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (15.8 g) yielded 3.82 L of CO_2 gas. The age estimate is based on two counts for 2070 minutes in the 2 L counter with a mixing ratio of 1.18. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.360 ± 0.075, 1.288 ± 0.028, and 18.276 ± 0.111 cpm, respectively.

Comment (T.W. Anderson): The date falls within a consistent pollen assemblage dominated by *Betula,* with lesser amounts of *Picea*, *Pinus*, *Myrica*, *Alnus*, grasses, heaths, sedges, club mosses, and ferns. The sample provides an early Holocene time horizon to compute sedimentation rates and pollen influx.

GSC-5309. 'Woody Hill Brook Pond' (II)

normalized age:	9720 ± 110
$\delta^{13}C$:	-23.4‰
uncorrected age:	9690 ± 110

The lake sediment sample AP-89-2C (120–122.5 cm; 87.4 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (19.9 g) yielded 3.69 L of CO_2 gas. The age estimate is based on one count for 3770 minutes in the 2 L counter with a mixing ratio of 1.21. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.469 ± 0.058, 1.288 ± 0.028, and 18.276 ± 0.111 cpm, respectively.

Comment (T.W. Anderson): The date provides an age for a brief early Holocene cool interval documented by a peak in *Picea* and corresponding decreases in *Pinus* and *Betula*. The sample provides a time horizon to compute sedimentation rates and estimates of pollen influx.

GSC-5281. 'Woody Hill Brook Pond' (III)

normalized age:	11 900 ± 140
$\delta^{13}C$:	-25.9‰
uncorrected age:	11 900 ± 140

The basal detrital gyttja lake sediment sample AP-89-2B (167–170 cm; 262.6 g wet weight), enclosed in sandy clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (89.7 g) yielded 3.16 L of CO_2 gas. The age estimate is based on one count for 3730 minutes in the 2 L counter with a mixing ratio of 1.44. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.095 ± 0.060, 1.216 ± 0.026, and 18.122 ± 0.101 cpm, respectively.

Comment (T.W. Anderson): This date is from stratified detritus gyttja overlying basal sandy clay and underlying Younger Dryas–deposited clay. The date falls within a pollen assemblage dominated by shrub pollen of *Salix* and Ericaceae, and herb pollen such as *Oxyria digyna*, *Artemisia*, grasses, and sedges. The pollen assemblage indicates gradual warming since deglaciation. The gyttja sequence and warming trend are interrupted by a clay unit and corresponding brief cold interval, the Killarney Oscillation of Levesque et al. (1993), which is estimated here at 11.2 ka BP from rates of sedimentation. Post–Killarney Oscillation warming gave way to the Younger Dryas cool interval, dated 11.1 and 10.4 ka BP, respectively, at the base and top of the clay unit (Shaw et al., 2000).

GSC-5268. Aaron Arm

normalized age:	9630 ± 150
$\delta^{13}C$:	-25.6‰
uncorrected age:	9640 ± 150

The basal gyttja lake sediment was enclosed in gyttja overlying noncalcareous, blue-grey silty clay. Sample AP-89-1 (635–643 cm) was collected by T.W. Anderson on July 30, 1989 from 1500 m north of Burgeo, 250 m off the left side of Highway 480 in the widest part of Aaron Arm, Newfoundland (47°37′11″N, 57°38′23″W), at an elevation of 15.6 m. The sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation.

The sample (133.0 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (21.5 g) yielded 5.27 L of CO_2 gas. The age estimate is based on two counts for 2565 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.684 ± 0.058, 1.224 ± 0.025, and 18.875 ± 0.273 cpm, respectively.

Comment (T.W. Anderson): The sample is from basal gyttja just above banded light grey and blue-grey clay. The clay is interpreted as glacial in origin and was deposited during a period of high sea level. The gyttja represents sediments of a freshwater-lake phase in Aaron Arm. This lake came into existence when sea level lowered and the lake was isolated as a separate basin above the sill connection to Cabot Strait. This freshwater lake existed in the area until well into the late Holocene.

GSC-5272. 'Buck Pond'

normalized age:	10 400 ± 180
$\delta^{13}C$:	-18.4‰
uncorrected age:	10 300 ± 180

The basal gyttja lake sediment sample AP-89-7 (428–436 cm) was collected by T.W. Anderson on August 11, 1989 from 'Buck Pond', 55 km north of Burgeo, Newfoundland (48°01′10″N, 57°39′40″W), at an elevation of about 391 m. The sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation.

The sample (140.3 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (50.5 g) yielded 2.29 L of CO_2 gas. The age estimate is based on one count for 3400 minutes in the 2 L counter with a mixing ratio of 1.94. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.260 ± 0.082, 1.224 ± 0.025, and 18.875 ± 0.273 cpm, respectively.

Comment (T.W. Anderson): The sample was taken from the basal gyttja overlying clay. The underlying clay unit relates to glaciation during the Younger Dryas cool interval; the date thus provides a minimum age for retreat of Younger Dryas ice in southwestern Newfoundland (Shaw et al., 2000).

GSC-5257. Stephenville

normalized age:	11 300 ± 160
$\delta^{13}C$:	-16.4‰
uncorrected age:	11 200 ± 160

The basal gyttja lake sediment was enclosed in grey and buff banded silty clay below and reddish brown gyttja above. Sample AP-89-5 (308–311 cm) was collected by T.W. Anderson on August 5, 1989 from 95 km east of Stephenville, on the south side of Highway 480, Newfoundland (48°23′27″N, 57°42′16″W), at an elevation of 287 m. The sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation.

The sample (144.6 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (28.1 g) yielded 4.12 L of CO_2 gas. The age estimate is based on two counts for 2420 minutes in the 2 L counter with a mixing ratio of 1.09. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.704 ± 0.059, 1.224 ± 0.025, and 18.875 ± 0.273 cpm, respectively.

Comment (T.W. Anderson): The sample was taken from the base of a gyttja unit above banded silty clay. The silty clay is tentatively correlated with the Younger Dryas cold interval. The sample should date the post–Younger Dryas warming episode (i.e. 10–10.5 ka BP). The date is therefore believed to be too old by up to 1000 years due to hard-water error.

GSC-5516. Northwest Cove

normalized age:	12 300 ± 120
corrected age:	11 900 ± 120
$\delta^{13}C$:	+1.70‰
uncorrected age:	11 900 ± 120

The marine shells (*Mya truncata*, identified by J. Maunder) were enclosed in silty clay and fine sand, 0.5 to 1.5 m below the present surface. Sample 924057 was collected by M. Batterson on July 15, 1992 from within Northwest Cove, Goose Arm, about 23 km north of Corner Brook, Newfoundland (49°10.14′N, 57°53.08′W), at an elevation of 26.5 m. The sample was submitted by M. Batterson to gain information on deglaciation and sea-level change.

The sample (24.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.5 g) yielded 4.21 L of CO_2 gas. The age estimate is based on one count for 3558 minutes in the 2 L counter with a mixing ratio of 1.04. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.182 ± 0.048, 1.213 ± 0.025, and 18.316 ± 0.104 cpm, respectively.

Comment (M. Batterson): This site was a relatively new (2–5 years old when sampled) roadside ditch exposure. Marine shells were exposed in the sides and at the base of the ditch. The enclosing material was interbedded silty clay and fine to very fine sand. The sediment was moist at time of collection and contained rare rootlets. No contaminants were noted, apart from rare rootlets that were not in contact with shells. The sampling site was 0.5 to 1.5 m below the modern surface. Enclosing sediment was consistent over the extent of the ditch.

Dates from this part of the west coast of Newfoundland are rare. Grant has a date of 10 600 ± 100 (GSC-4400) at 7 m a.s.l. about 9 km to the southwest. This date, from the head of Goose Arm, should provide a refinement of the minimum date for deglaciation and help improve the understanding of glacial history in the area.

GSC-5538. Goose Arm

normalized age:	12 500 ± 130
corrected age:	12 100 ± 130
$\delta^{13}C$:	+2.15‰
uncorrected age:	12 100 ± 130

The marine shells (*Nuculana pernula buccata*, identified by J. Maunder) were enclosed in marine silty clay and fine sand. Sample 924081 was collected by M. Batterson on July 14, 1992 from Goose Arm, about 23 km north of Corner Brook, Newfoundland (49°10.9′N, 57°51.4′W), at an elevation of 7 m. The sample was submitted by M. Batterson to gain information on deglaciation and sea-level change.

The sample (32.50 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (28.5 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 3880 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.072 ± 0.044, 1.214 ± 0.024, and 18.297 ± 0.145 cpm, respectively.

Comment (M. Batterson): This site was a relatively new (2–5 years old when sampled) roadside ditch exposure. Marine shells were exposed in the sides and at the base of the ditch. The enclosing material was interbedded silty clay and fine to very fine sand. The sediment was moist at time of collection and contained rare rootlets. No contaminants were noted, apart from rare rootlets that were not in contact with shells. The sample was exposed within 1 m of the modern surface and, although there was some disturbance at the site, the stratigraphic position was confidently determined. The marine silt and clay are consistent over the extent of the ditch.

This date, at the head of Goose Arm, should provide a minimum age for deglaciation. It should complement a date of 10 600 ± 100 (GSC-4400) from a site, also at 7 m a.s.l., located about 11 km to the southwest, and also a submitted sample (GSC 5516), from 26.5 m a.s.l., located near this site. Dates from this part of the west coast are rare, and more are required to define deglacial history.

GSC-5942. Kippens

normalized age:	13 000 ± 120
corrected age:	12 600 ± 120
$\delta^{13}C$:	+0.72‰
uncorrected age:	12 600 ± 120

The marine shells, whole articulated valves of *Hiatella arctica* (identified by J. Maunder), were enclosed in sandy gravel. Sample 94-4009 was collected by M. Batterson on September 3, 1994 from a coastal exposure on the cliffs below the end of Seaside Drive in Kippens, immediately west of Stephenville on the north shore of St. George's Bay, Newfoundland (48°32.57′N, 58°38.00′W), at an elevation of 21 m. The sample was submitted by M. Batterson to gain information on sea-level change and deglaciation or Robinsons Head glacial readvance.

The sample (33.3 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (22.8 g) yielded 4.66 L of CO_2 gas. The age estimate is based on one count for 3670 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 3.807 ± 0.045, 1.212 ± 0.025, and 18.348 ± 0.104 cpm, respectively.

Comment (M. Batterson): This sample was from a coastal exposure in which the section is currently unstable and eroding landward at a rate of about 0.5 m/a. The collection site is within a sandy gravel unit that was dry at the time of sampling, although it is subject to periodic wetting and drying. The site was unoxidized and free of any plant growth. There were no obvious on-site factors that could produce an anomalous age. The shell sample was associated with granular material. Kippens is an important site in the deglacial history of the Stephenville area. The sand and gravel units have been interpreted by Brookes (1974) as representing the Robinsons Head readvance ca. 12.6 ka BP. Dates from Romaines to the west are inconsistent with this interpretation. If the submitted shells are determined to be within kame gravel, they would provide an accurate date of timing of this event. If an alternative interpretation, that the sediments were deposited as part of a deglacial sequence in an isostatically rising coast, is adopted, the date would provide further dating control for deglaciation of this area.

GSC-5267. Rose Blanche

normalized age:	10 800 ± 170
$\delta^{13}C$:	-25.6‰
uncorrected age:	10 800 ± 170

The basal gyttja lake sediment was enclosed in dark brown-black gyttja overlying banded grey and black, silty to fine sandy clay. Sample AP-89-11 (280.5–286 cm) was collected by T.W. Anderson on August 15, 1989 from 8 km west of Rose Blanche, on the north side of Highway 84, Newfoundland (47°36′41″N, 58°44′40″W), at an elevation of 2.5 m. The sample was submitted by T.W. Anderson to gain information on deglaciation and the rate of organic accumulation.

The sample (143.4 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (14.8 g) yielded 3.02 L of CO_2 gas. The age estimate is based on one count for 3775 minutes in the 2 L counter with a mixing ratio of 1.47. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.897 ± 0.063, 1.224 ± 0.025, and 18.875 ± 0.273 cpm, respectively.

Comment (T.W. Anderson): The sample was taken from the base of gyttja above a layered, silty sandy clay. The silty sandy clay is correlated with glaciation during the Younger Dryas cold interval. It was expected that the sample would date the post–Younger Dryas warming at about 10 to 10.5 ka BP. Instead, the date is a few hundred years too old because of hard-water error.

GSC-6041. St. David's

normalized age:	7480 ± 80
$\delta^{13}C$:	-26.14‰
uncorrected age:	7490 ± 80

The basal wood, a whole tree trunk of *Abies balsamea* (identified by G. Warren) was rooted in basal peat and marl. Sample RH-03-O-9501 was collected by T. Bell and D. Liverman on July 1, 1995 from a coastal cliff north-northeast of St. David's, 300 m southwest of Crabbes Head and the mouth of the Crabbes River, St. George's Bay, Newfoundland (48°13′N, 58°52.1′W), at an elevation of 14 m. The sample was submitted by T. Bell to gain information on peat development and coastal emergence.

The sample (11.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.2 g) yielded 6.9 L of CO_2 gas. The age estimate is based on one count for 2310 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.180 ± 0.080, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

Comment (T. Bell): Peat deposits containing plant debris, rooted tree stumps, and leaf litter were found at several sites along the coast of southern St. George's Bay. The peat accumulated between 1 and 3.5 ka BP after postglacial marine emergence of the coast. Date GSC-6041 dates one such deposit that consists of 3 to 4 m of thick woody peat overlying 3 to 6 cm of marl and 30 cm of (?)marine clay. The deposit appears to occupy a kettle-hole depression in the underlying coarse gravel, which is interpreted to represent ice-contact subaqueous outwash (Bell et al., 2001). The former sea level during initial peat development is interpreted to have been roughly 20 to 25 m below present (Bell et al., 2003). Radiocarbon dates on other peat deposits exposed along the coast range between 7.3 and 10.6 ka BP (Brookes, 1974).

GSC-5946. Cape Ray Cove

normalized age:	290 ± 60
$\delta^{13}C$:	-26.5‰
uncorrected age:	320 ± 60

The driftwood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 95-11) was underlain by well decomposed peat and overlain by sand and gravel with peat interbeds. Sample Ruffman 94-75 (46–50 cm) was collected by A. Ruffman on August 29, 1994 from 0.5 km east of Cape Ray light house, Cape Ray Cove, Cabot Strait, Newfoundland (47°37.24′N, 59°17.87′W), at an elevation of about 0.3 m. The sample was submitted by D.R. Grant to gain information on a possible tsunami deposit.

The sample (6.7 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.4 g) yielded 5.45 L of CO_2 gas. The age estimate is based on two counts for 2130 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.946 ± 0.100, 1.253 ± 0.031, and 18.665 ± 0.106 cpm, respectively.

Comment (D.R. Grant): Wave erosion at high-tide level has cut a small cliff in surficial sediments, exposing the following 180 cm thick sequence: granite bedrock is overlain by about 10 cm of granular saprolite (grus) in which a 'forest' of small trees (as stumps) is rooted (GSC-5044: 3980 ± 60 years BP on a tree stump at base of peat sequence at same locality provides maximum age on inception of paludification). The 'forest' is overlain abruptly by a variable thickness of bog peat, which is 179 cm thick at the sampling site. The lower approximately 120 cm is heavy dark brown and well decomposed; the upper approximately 50 cm is mainly sand and gravel with interbeds of peat. The contact between the peat and mineral sediment is a layer of broken branches and trunks, interpreted to be driftwood that was washed onto the peat bog before deposition of the sand and gravel. The surface of the bog is still vegetated with grasses, sedges, and various creeping berry bushes. The base of the sequence is about 1.0 m below the average annual high tide (spring tide) and the top is about 0.8 m above. The field sample was from the largest piece of wood debris, consisting of the inner 5 cm of a 15 cm long segment of a small tree trunk. The outer part, stained with brown humic matter, was removed to reveal nearly fresh wood.

The sample provides an age for the first and major marine inundation of this coastal peat bog. If the inundation was a tsunami, the date, together with a basal date of 3980 years BP (GSC-5044), will provide a recurrence interval for large earthquakes in the region.

This date is in support of a paleotsunami study by A. Ruffman (Geomarine Associates), with assistance from T.W. Anderson (GSC), that is aimed at determining the recurrence interval of large earthquakes, as represented by the effects of seismic sea waves (tsunamis) that have deposited mineral layers in coastal peat bogs. The study focuses on the Burin Peninsula, which was hit by a tsunami caused by the 1929 Grand Banks earthquake, but is also looking at adjacent areas of southern coastal Newfoundland. The sample is submitted by Grant because it came from a sequence discovered by him in 1980.

This information is also pertinent to the Stephenville–Port aux Basques map area (Grant, 1991).

Prince Edward Island

GSC-5609. 'Maclaughlin Pond'

normalized age:	6350 ± 80
$\delta^{13}C$:	-30.6‰
uncorrected age:	6440 ± 80

The gyttja lake sediment sample AP-78-2A (137–143 cm) was collected by T.W. Anderson and R. Mott on August 1, 1978 from 'Maclaughlin Pond', 5.6 km east-northeast of Mt. Stewart, 2 km northeast of the community of Cherry Hill, Prince Edward Island (46°23′00″N, 62°47′48″W), at an elevation of 36.5 m. The sample was submitted by T.W. Anderson to gain information on the pollen spectra.

Figure 3. Radiocarbon-dated sites in Prince Edward Island.

The sample (32.2 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (6.1 g) yielded 4.95 L of CO_2 gas. The age estimate is based on one count for 3880 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.207 ± 0.054, 1.223 ± 0.023, and 18.286 ± 0.110 cpm, respectively.

Comment (T.W. Anderson): The lake sediment sample dates the first rise in the well known *Tsuga* pollen profile and the upward decline of *Pinus*. The date provides a middle Holocene time horizon to derive estimates of sedimentation rates and pollen influx.

Tracadie Bay Series

A series of marine shell samples was collected by D.L. Forbes on October 14, 1999 from the inner shelf seaward of Tracadie Bay, Prince Edward Island (46°26.506′N, 63°01.105′W), at an elevation of about 19 m. These samples were submitted by D.L. Forbes to gain information on sea-level change.

GSC-6457. Tracadie Bay (I)

normalized age:	5960 ± 160
corrected age:	5560 ± 160
$\delta^{13}C$:	-2.93‰
uncorrected age:	5610 ± 160

The marine shell sample 99049-0048 VC (101–107 cm depth; 7.5 g dry weight; *Mya arenaria*, identified by J-M. Gagnon), enclosed in massive brown fine-grained sand

beneath olive-grey fine-grained sand and overlying banded reddish brown fine-grained sand, was treated with an acid leach to remove the outer 10%. The treated sample (6.75 g) yielded 1.38 L of CO_2 gas. The age estimate is based on one count for 2445 minutes in the 2 L counter with a mixing ratio of 2.94. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.931 ± 0.166, 1.125 ± 0.038, and 17.960 ± 0.111 cpm, respectively.

Comment (D.L. Forbes): Both samples were taken from a unit of massive brown fine sand, about 1 m thick, containing marine bivalves and wood fragments. This sand overlies a thin unit of banded reddish brown fine sand and clayey silt, which in turn overlies stiff, reddish brown, massive, gritty silt clay and very fine sandy silt, interpreted as a glacial ice-contact or proglacial deposit. The brown sand containing the samples is overlain by 0.4 m of dark olive-grey fine sand, in turn overlain by dark olive-grey silty clay. The latter is truncated at the seabed, where it is overlain by a discontinuous veneer of brown medium sand and penetrated by small burrows. The core collection site was in the floor of a very extensive shallow seafloor pit surrounded by vertical walls, up to 1 m or more high, cut into estuarine, organic-rich, finely laminated silt clay (Forbes and Manson, 2002). The sand is interpreted as an estuarine-margin or tidal-inlet facies deposited in a setting comparable to the modern Tracadie Bay lagoon, which lies behind a barrier beach and dune complex about 3 km landward of the coring site. The age of the submerged estuarine unit represented by these two samples is consistent with estimates of shoreline recession averaging 0.5 m/a over the past 6000 calendar years (Forbes and Manson, 2002) and interpretations of long-term relative-sea-level rise amounting to about 0.3 m/ka, decelerating with time but matched again over the past 96 years, based on Charlottetown tidal records that show a mean rate of 3.2 mm/a (Parkes et al., 2002).

GSC-6480. Tracadie Bay (II)

normalized age:	5200 ± 60
$\delta^{13}C$:	-25.52‰
uncorrected age:	5210 ± 60

The wood sample 99049-0048 VC (087–088 cm depth; 11.7 g dry weight; not identified), enclosed in massive brown fine-grained sand beneath olive-grey fine-grained sand and overlying banded reddish brown fine-grained sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.4 g) yielded 7.1 L of CO_2 gas. The age estimate is based on one count for 5145 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.750 ± 0.066, 2.066 ± 0.034, and 28.207 ± 0.135 cpm, respectively.

GSC-6456. Rustico Bay

normalized age:	5140 ± 90
corrected age:	4740 ± 90
$\delta^{13}C$:	+0.74‰
uncorrected age:	4720 ± 90

The marine shell (*Mercenaria mercenaria*, identified by J-M. Gagnon) was enclosed in an erosional unconformity beneath 0.12 m of sand underlain by interbedded grey fine-grained sand. Sample 99049-0027 (12–13 cm depth) was collected by D.L. Forbes on October 11, 1999 from the inner shelf off Rustico Bay, Prince Edward Island (46°28.364′N, 63°12.220′W), at an elevation of 21.7 m. The sample was submitted by D.L. Forbes to gain information on sea-level change.

The sample (29.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.0 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 2200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.974 ± 0.081, 1.125 ± 0.038, and 17.960 ± 0.111 cpm, respectively.

Comment (D.L. Forbes): This sample was taken from a 0.05 m unit of shell and lag gravel underlying 0.12 m of sand and resting on an erosional unconformity interpreted as the active marine erosion surface. This was underlain by almost 4 m of interbedded grey fine sand and finely laminated dark olive-grey organic-rich silt clay and sandy mud, interpreted to represent two facies of estuarine fill in the flooded seaward extension of the Wheatley River valley on the inner shelf (Forbes and Manson, 2002). The sandy facies is interpreted as representing distal tidal-inlet or flood-delta deposits. The laminated silt clay and sandy mud contain scattered shells, wood fragments, eel grass (*Zostera marina* Linné), and other macrofossils, with scattered peaty concentrations of plant material, and are interpreted as estuarine-basin deposits. High-resolution, shallow seismic-reflection profiles demonstrate the truncation of the estuarine sediments on the valley flank, suggesting that the sample was reworked from the underlying estuarine facies and providing an approximate age for active estuarine sedimentation at this depth and distance (4.6 km) seaward of the modern coast.

GSC-6564. Brackley Point

normalized age:	120 ± 60
$\delta^{13}C$:	-26.32‰
uncorrected age:	140 ± 60

The wood was enclosed in muddy sand in a bog that unconformably overlies till and underlies dune deposits. Sample 2000307-0002 was collected by G.K. Manson on November 2, 2000 from a fresh wave-cut exposure at the back of the beach at Brackley Point, about 500 m west-northwest of the Prince Edward Island National Park

facilities at the intersection of Highway 15 with the road to 'Rustab Island', Prince Edward Island (46°25.8′N, 63°12.4′W), at an elevation of 3 m,. The sample was submitted by D.L. Forbes to gain information on eolian processes, specifically the age of the dune deposits.

The sample (4.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.7 g) yielded 3.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.37. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.776 ± 0.090, 1.105 ± 0.023, and 18.091 ± 0.108 cpm, respectively.

Comment (D.L. Forbes): The sample was collected from a shallow bog deposit in an exposure cut by the major storm of October 29, 2000 (Manson et al., 2002). This event was the cause of extensive beach downcutting and erosion of underlying till along much of the north shore of Prince Edward Island. Although a radiocarbon age of 120 years has limited interpretive value, it is interesting to note that historical evidence suggests an age between 70 and 120 years for rebuilding of the dune at this site (Forbes and Manson, 2002).

Nova Scotia

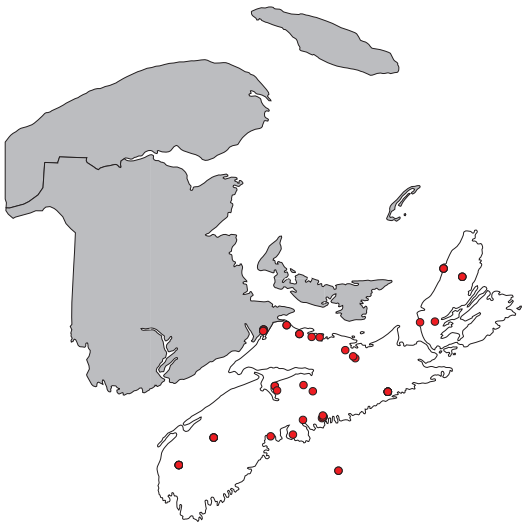

Figure 4. Radiocarbon-dated sites in Nova Scotia.

Timber Lake Series

A series of gyttja lake sediment samples was collected by R.J. Mott on July 6, 1990 from Timber Lake, about 7 km northwest of Tarbot, southern Cape Breton Highlands, Nova Scotia (46°22′46″N, 60°39′55″W), at an elevation of about 386 m. Timber Lake is a small, relatively shallow lake in an area of shallow drift over bedrock in the southern Cape Breton Highlands. Dark brown to black gyttja occurs to 253 cm below the mud-water interface in the core, and overlies mottled clay to 273 cm, pink-grey clay to 278 cm, and stiff grey silty clay to 284 cm. The corer could not penetrate below 284 cm depth. These samples were submitted by R.J. Mott to gain information on the microfossils and the pollen assemblage.

Beta-66130. Timber Lake (I)

normalized age:	5340 ± 130

The gyttja lake sediment sample 90-MS-06 (138–142 cm) was enclosed in gyttja. This sample was submitted by H. Jetté to gain information on the pollen record. Beta-66130 dates the pollen assemblage of the time.

GSC-6172. Timber Lake (II)

normalized age:	8730 ± 180
$\delta^{13}C$:	-29.39‰
uncorrected age:	8800 ± 180

The gyttja lake sediment sample 90-MS-06 (200–203 cm; 46.7 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.0 g) yielded 1.5 L of CO_2 gas. The age estimate is based on one count for 3675 minutes in the 2 L counter with a mixing ratio of 2.82. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.058 ± 0.118, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

GSC-5259. Timber Lake (III)

normalized age:	11 200 ± 200
$\delta^{13}C$:	-22.0‰
uncorrected age:	11 100 ± 200

The basal clayey gyttja lake sediment sample 90-MS-06 (245–248 cm; 91.7 g wet weight), enclosed in brown gyttja above and mottled clay below, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (23.5 g) yielded 2.36 L of CO_2 gas. The age estimate is based on two counts for 2260 minutes in the 2 L counter with a mixing ratio of 1.88. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.711 ± 0.090, 1.224 ± 0.025, and 18.875 ± 0.273 cpm, respectively.

Comment (R.J. Mott): Date GSC-5259 is probably about 1000 years too old, but suitable terrestrial material for AMS dating could not be obtained from the basal sediments for corroboration. The lack of stratigraphic changes, similar to those found in many areas of the Maritimes and indicative of a late-glacial climatic oscillation correlative with the Allerød–Younger Dryas oscillation, also suggests that this date is too old (Stea and Mott, 1989). Therefore, this area was probably covered by ice until about 10 ka BP or was an area of renewed

glaciation during the Younger Dryas cold interval. Date GSC-6172 (8730 ± 180 years BP) is from material higher in the core and dates the pollen assemblage at the time when the main components seen in the extant forest were present.

Pembroke Lake Series

A series of basal clayey gyttja lake sediment samples was collected by R.J. Mott on July 7, 1990 from Pembroke Lake, about 8 km northwest of Kingross, Cape Breton Island, Nova Scotia (46°29′46″N, 60°59′45″W), at an elevation of about 406 m. Pembroke Lake comprises a series of small, irregular, interconnected lakes along the western edge of the Cape Breton Highlands. The core was taken with a modified Livingstone corer in 12 m of water in the deepest basin of the lake. The corer penetrated to 6.0 m below the mud-water interface. The core shows stiff, pink, banded clay and silt from the bottom to 563 cm, overlain by 9 cm of pink clay. Banded pink and black, slightly organic sediment to 526 cm is overlain by pinkish grey clay to 505 cm and then by dark brown gyttja to the surface. The samples were submitted by R.J. Mott to gain information on the microfossils and pollen.

GSC-6177. Pembroke Lake (I)

normalized age:	3340 ± 100
$\delta^{13}C$:	-28.07‰
uncorrected age:	3390 ± 100

The gyttja lake sediment sample MS-90-07 (250–253 cm; 48.1 g wet weight), enclosed in gyttja and clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.1 g) yielded 1.7 L of CO_2 gas. The age estimate is based on one count for 3720 minutes in the 2 L counter with a mixing ratio of 2.46. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.885 ± 0.122, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

GSC-6176. Pembroke Lake (II)

normalized age:	6590 ± 150
$\delta^{13}C$:	-29.21‰
uncorrected age:	6660 ± 150

The algal gyttja lake sediment sample MS-90-07 (383–386 cm; 47.3 g wet weight), enclosed in gyttja and clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.8 g) yielded 1.4 L of CO_2 gas. The age estimate is based on one count for 3830 minutes in the 2 L counter with a mixing ratio of 2.94. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.914 ± 0.126, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

GSC-6175. Pembroke Lake (III)

normalized age:	8980 ± 160
$\delta^{13}C$:	-28.15‰
uncorrected age:	9030 ± 160

The algal gyttja lake sediment sample MS-90-07 (460–463 cm; 52.3 g wet weight), enclosed in gyttja and clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.8 g) yielded 1.7 L of CO_2 gas. The age estimate is based on one count for 3720 minutes in the 2 L counter with a mixing ratio of 2.37. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.888 ± 0.101, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

GSC-5185. Pembroke Lake (IV)

normalized age:	10 700 ± 190
$\delta^{13}C$:	-24.6‰
uncorrected age:	10 700 ± 190

The basal clayey gyttja lake sediment sample MS-90-07 (500–503 cm; 105.7 g wet weight), enclosed in gyttja and clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment (it was noncalcareous) was omitted. The treated sample (28.5 g) yielded 2.51 L of CO_2 gas. The age estimate is based on two counts for 2100 minutes in the 2 L counter with a mixing ratio of 1.77. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.967 ± 0.089, 1.224 ± 0.025, 18.875 ± 0.273 cpm, respectively.

Comments (R.J. Mott): Date GSC-5185, reported previously in McNeely and Atkinson (1996), is reinterpreted in light of more recent evidence. The age of 10 700 ± 190 years BP on the basal organic sediments is probably anomalously old by 700 years, judging by the usual age of about 10 000 years BP for this contact at many other sites. The mineral sediment below the dated interval has only minimal organic content, is slightly calcareous, and does not have the organic layer seen at many sites throughout the Maritimes, where the sequence has been interpreted as being correlative with the Allerød– Younger Dryas climatic oscillation (Mott et al., 1986; Stea and Mott, 1989). Samples GSC-6175, -6176 and -6177 provide chronological control for various levels in the core that can be related to future palynological study.

GSC-6520. River Denys

normalized age:	11 400 ± 100
$\delta^{13}C$:	-28.52‰
uncorrected age:	11 500 ± 100

The peat was enclosed in silty clay. It was underlain by diamicton and overlain by a red-brown silty diamicton. Sample RS-167(a) was collected by R.R. Stea and R.J. Mott on October 11, 2000 from the south side of River Denys

Road, about 1 km west of River Denys, Cape Breton Island, Nova Scotia (45°50′N, 61°12′W), at an elevation of 15 m. The sample was submitted by R.R. Stea to gain information on climate change, specifically the pre–Younger Dryas warm interval.

The sample (60.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (15.3 g) yielded 6.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.748 ± 0.059, 2.136 ± 0.034, and 28.079 ± 0.132 cpm, respectively.

Comment (R.R. Stea): This site is characterized by a till-like diamicton overlying Allerød-age peat. Further excavation of this occurrence by backhoe showed that the diamicton increases in thickness upslope to almost 2 m over the peat layer. In northern Nova Scotia, along the Maritimes and Northeast Pipeline route, another four sites were found with till overlying peat (cf. GSC-6435). These data bolster the hypothesis of the readvance of Younger Dryas glaciers in northern Nova Scotia, as postulated by Stea and Mott (1989).

GSC-6518. Judique

normalized age:	11 200 ± 120
$\delta^{13}C$:	-26.99‰
uncorrected age:	11 200 ± 120

The *Salix* wood (identified by R.J. Mott) was enclosed in peat overlain by clay and silty clay (≥1m), and overlying silty clay and diamicton. Sample RS/117 (a) was collected by R.J. Mott and R.R. Stea on October 10, 2000, about 3 km south southeast of Judique, Cape Breton Island, Nova Scotia (45°50′N, 61°28′W), at an elevation of 30 m. The sample was submitted by R.R. Stea to gain information on climate change, specifically the pre–Younger Dryas.

The sample (9.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.6 g) yielded 7.7 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.456 ± 0.054, 1.112 ± 0.024, and 18.004 ± 0.104 cpm, respectively.

Comment (R.R. Stea): This site is one of several in the area that feature subaqueous silty clay and sand facies over Allerød-age peat. Damming a water body to levels of 30 to 60 m against the Creignish Mountain requires a glacier in the Gulf of St. Lawrence, as postulated by Grant (1994). Horizontal lamination and graded beds in the sand facies of the upper subaqueous unit suggest deposition from suspension in a distal glacier setting, but the associated massive clay facies are puzzling. Rhythmic bedding of silt/sand and clay is inherent to glacial lakes in a distal or proximal setting, except in shallow water (Ashley, 1995). The extent and elevations of these deposits, however, suggest water depths exceeding 50 m. Ice buildup in the lowland shelf areas and suppressed melting may explain this phenomenon. There are two phases of glacial-lake development, before and during the Younger Dryas. A more complete description of the glacial Lake Dawson hypothesis and the Younger Dryas shelf-glacierization hypothesis is available in Stea and Mott (1998). In summary, the sequence of events can be listed as follows:

1) Ice retreat ca. 12 ka BP (ca. 14 ka cal. BP) and development of glacial Lake Dawson (phase 1)

2) Drainage of glacial Lake Dawson (phase 1) and ice retreat to a small ice cap localized in the emergent Gulf of St. Lawrence; biota migration across the deglaciated landscape from ca. 11.5 to 10.8 ka BP (ca. 13.4– 13.0 ka cal. BP)

3) Climate cooling and increasing storm intensity with the advance of a remnant ice cap in the Gulf of St. Lawrence; formation of glacial Lake Dawson (phase 2) ca. 10.8 to 10.0 ka BP (ca. 13–11.5 ka cal. BP)

4) Drainage of glacial Lake Dawson (phase 2) and climate amelioration after 10.0 ka in southwestern Cape Breton Island

Pye Lake Series

Pye Lake is located on the east coast of Nova Scotia, about 0.75 km northwest of town of Marie Joseph (44°58′30″N, 62°05′27″W), at an elevation of 5 m. The lake, with a maximum depth of 8 m, occupies a shallow bedrock basin in a glaciated terrane with some low drumlins. The core, obtained with a modified Livingstone corer by R.J. Mott on July 12, 1990, totalled 606 cm of sediment. Dark brown gyttja to a depth of 513 cm overlies 22 cm of slightly organic clay, which in turn overlies organic silty clay grading to black and grey clay to 568 cm. Beneath, grey clay and pink clay changes to stiff banded clay at 606 cm. Samples were submitted by R.J. Mott to gain information on the pollen spectra.

GSC-4684. Pye Lake (I)

normalized age:	1140 ± 80
$\delta^{13}C$:	-29.0‰
uncorrected age:	1210 ± 80

The gyttja lake sediment sample 90-MS-11 (85–90 cm; 63.2 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (6.3 g) yielded 2.9 L of CO_2 gas. The age estimate is based on two counts for 2040 minutes in the 2 L counter with a mixing ratio of 1.48. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.590 ± 0.124, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

Comment (R.J. Mott): The date gives the age for a prominent birch decline and rise in spruce and fir seen near the top of the pollen diagram. Previously published in McNeely and Atkinson (1996).

GSC-6171. Pye Lake (II)

normalized age:	2570 ± 120
$\delta^{13}C$:	-31.00‰
uncorrected age:	2660 ± 120

The gyttja lake sediment sample 90-MS-11 (214–217 cm; 53.7 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (6.3 g) yielded 2.3 L of CO_2 gas. The age estimate is based on one count for 1000 minutes in the 2 L counter with a mixing ratio of 1.81. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.012 ± 0.174, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

Comment (R.J. Mott): The date provides an age for the decline in *Betula* and rise in *Abies* and *Picea*.

GSC-4683. Pye Lake (III)

normalized age:	4440 ± 90
$\delta^{13}C$:	-29.6‰
uncorrected age:	4510 ± 90

The gyttja lake sediment sample 90-MS-11 (323–327 cm; 70.0 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (8.8 g) yielded 2.7 L of CO_2 gas. The age estimate is based on one count for 3470 minutes in the 2 L counter with a mixing ratio of 1.70. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.332 ± 0.099, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

Comment (R.J. Mott): The date provides an age for the prominent hemlock decline seen in the pollen diagram. Previously published in McNeely and Atkinson (1996).

Beta-66120 (CAMS-9322). Pye Lake (IV)

normalized age:	6000 ± 60
$\delta^{13}C$:	-30.9‰
uncorrected age:	6100 ± 60

The gyttja lake sediment sample 90-MS-11 (368–372 cm), enclosed in gyttja, was picked free of rootlets prior to submission.

Comment (R.J. Mott): The date provides an age for the decline in *Betula* and rise in *Abies* and *Picea*.

GSC-5552. Pye Lake (V)

normalized age:	8120 ± 140
$\delta^{13}C$:	-30.5‰
uncorrected age:	8200 ± 140

The gyttja lake sediment sample 90-MS-11 (423–427 cm; 71.6 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (12.8 g) yielded 2.1 L of CO_2 gas. The age estimate is based on one count for 3731 minutes in the 2 L counter with a mixing ratio of 2.05. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.526 ± 0.101, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

Comment (R.J. Mott): The date provides an age for a prominent birch and spruce decline and rise in pine seen in the pollen diagram. Previously published in McNeely and Atkinson (1996).

GSC-5249. Pye Lake (VI)

normalized age:	10 000 ± 160
$\delta^{13}C$:	-25.3‰
uncorrected age:	10 000 ± 160

The clayey gyttja lake sediment sample 90-MS-11 (511–513 cm; 96.0 g wet weight), enclosed in gyttja above and 22 cm of silty clay below, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (34.8 g) yielded 2.15 L of CO_2 gas. The age estimate is based on one count for 3530 minutes in the 2 L counter with a mixing ratio of 2.09. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.266 ± 0.088, 1.110 ± 0.028, and 18.388 ± 0.133 cpm, respectively.

Comment (R.J. Mott): The sample dates the return to organic sedimentation following an interval of minerogenic sedimentation and the beginning of the dominance of tree pollen, as seen in the pollen profile. Previously published in McNeely and Atkinson (1996).

GSC-5242. Pye Lake (VII)

normalized age:	10 800 ± 190
$\delta^{13}C$:	-25.6‰
uncorrected age:	10 800 ± 190

The clayey gyttja lake sediment sample 90-MS-11 (535–541 cm; 100.3 g wet weight), enclosed in 22 cm of clay above and organic sediment below, was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (12.1 g) yielded 1.69 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 2 L counter with a mixing ratio of 2.61. The count rates for

the sample (net) and for monthly backgrounds and standards (net) were 4.765 ± 0.102, 1.110 ± 0.028, and 18.388 ± 0.133 cpm, respectively.

Comment (R.J. Mott): The sample dates the change from organic- to mineral-dominated sedimentation and a change from shrub to herb pollen domination, as seen in the pollen diagram. Previously published in McNeely and Atkinson (1996).

GSC-5543. Pye Lake (VIII)

normalized age:	12 200 ± 220
$\delta^{13}C$:	-23.3‰
uncorrected age:	12 200 ± 220

The clayey gyttja lake sediment sample 90-MS-11 (549.5–553 cm; 97.60 g wet weight), enclosed in clayey gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (41.4 g) yielded 1.6 L of CO_2 gas. The age estimate is based on one count for 3915 minutes in the 2 L counter with a mixing ratio of 2.81. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.003 ± 0.100, 1.214 ± 0.024, and 18.297 ± 0.145 cpm, respectively.

Comment (R.J. Mott): This date provides a minimum age for deglaciation of the site and for the beginning of organic deposition. Previously published in McNeely and Atkinson (1996).

Pye Lake is one of a number of sites along the eastern seaboard of Nova Scotia that indicate the region was deglaciated relatively early (prior to 12.0 ka BP). The site also records sedimentation changes in the basal sediments characteristic of a late-glacial climatic oscillation that has been correlated with the Allerød–Younger Dryas climatic event of Europe (Mott et al., 1986). Pollen analysis corroborates this interpretation, with a change from shrub to herb domination that is dated in the core at 10.8 ka BP. Organic sedimentation resumed after the cool interval, dated at 10.0 ka BP, when pollen analysis shows a reversion to shrub vegetation and then the migration of trees into the area. By about 8 ka BP, white pine began to increase at the expense of birch and spruce. Hemlock followed but crashed prior to 4.4 ka BP and birch proliferated. Declining birch and increasing balsam fir and spruce culminated about 1.1 ka BP with the dominance of these latter taxa.

Pipeline Series

GSC-6567. Centredale

normalized age:	10 700 ± 100
$\delta^{13}C$:	-27.81‰
uncorrected age:	10 800 ± 100

The peat sample was taken from a peat layer in grey sand overlying till and overlain by red/brown diamicton. Sample RS-99-107 was collected by R.R. Stea on July 17,1999 from a pipeline excavation near Centredale, Pictou County, Nova Scotia (45°24′39″N, 62°38′57″W), at an elevation of 110 m. The sample was submitted by R.R. Stea to gain information on deglaciation and, specifically, the Younger Dryas.

The sample (59.8 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (14.0 g) yielded 7.3 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net), and for monthly backgrounds and standards (net) were 7.445 ± 0.069, 2.039 ± 0.048, and 28.411 ± 0.140 cpm, respectively.

Comment (R.R. Stea): The site is another in a series of buried organic paleosols discovered along the route of the Maritimes and Northeast Pipeline. At this site, a buried peat-paleosol was found at the base of the pipeline ditch in a region of relatively steep topographic relief, on the side of a west-facing hill. The organic layer was found at the base of 2.5 m of strongly compacted, reddish brown, silty, matrix-supported diamicton. This peat-paleosol layer could be traced about 50 m along the ditch where it disappeared beneath a thickening blanket of drift. The peat-paleosol layer is 5 to 10 cm thick and is underlain by sand and clay, and another diamicton.

The diamicton overlying the paleosol is interpreted as till, as the deposit thickens upslope and is overcompacted. The Pipeline Series of sites provides an accurate geochronometer of ice retreat and late-glacial (Younger Dryas) ice advance for the region. The thin continuous paleosol indicates ice retreat just before 11 ka ^{14}C BP and an ice advance from the Gulf of St. Lawrence bracketed between 10.7 ka ^{14}C BP and the Holocene. This and other till-buried sites along the 'great ditch' of Nova Scotia have enabled a more accurate assessment of the Younger Dryas ice-sheet limits.

GSC-6569. Lorne

normalized age:	8720 ± 90
$\delta^{13}C$:	-26.80‰
uncorrected age:	8740 ± 90

The wood was enclosed in clayey peat with abundant wood, overlying till and overlain by diamicton. Sample RS-99-96 was collected by R.R. Stea on June 22, 1999 from a pipeline excavation near Lorne, Pictou County, Nova Scotia (45°26′07″N, 62°41′12″W), at an elevation of 152 m. The sample was submitted by R.R. Stea to gain information on deglaciation, specifically the Younger Dryas.

The sample (51.6 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.0 g) yielded 11.4 L of CO_2 gas. The age estimate is based on one count for 3775 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.565 ± 0.073, 2.039 ± 0.048, and 28.411 ± 0.140 cpm, respectively.

Comment (R.R. Stea): This site was found along the Maritimes and Northeast Pipeline route in northern Nova Scotia and is one of a growing number of early Holocene buried organic sites that have been found in the Maritime Provinces. These sites feature gravelly fluvial deposits, thin clay deposits, and debris-flow diamictons, as at this site, that overlie organic, wood-bearing beds. The organic sites range in age from 8.7 to 10 ka BP and may record the early Holocene climatic optimum, whereas the overlying inorganic sediments indicate a later period of climatic and landscape instability, perhaps cooling. A correlation with the 8.2 ka BP cooling event in the Greenland ice-core proxies (Alley et al., 1997) is suggested.

GSC-6435. Millbrook

normalized age:	10 900 ± 110
$\delta^{13}C$:	-23.51‰
uncorrected age:	10 800 ± 110

The wood was enclosed in peat and sand. Sample 99-387-4 was collected by R.R. Stea and A. Ford on August 4, 1999 from 2 km northwest of Millbrook, Nova Scotia (45°31′01″N, 62°49′22″W), at an elevation of 106 m. The sample was submitted by R.R. Stea to gain information on climate change, specifically the Younger Dryas.

The sample (7.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.7 g) yielded 5.2 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.656 ± 0.046, 1.171 ± 0.025, and 17.959 ± 0.103 cpm, respectively.

Comment (R.R. Stea): The site is another in a series of buried organic paleosols discovered along the Maritimes and Northeast Pipeline route. The pipeline ditch was on the north side of a bedrock-cored hill where it cut across a couple of linear drift ridges, which can be traced to near the top of the hill summit. These ridges are composed of a reddish, silty, matrix-supported diamicton. Approximately 5 m below the surface of one of the ridges, the ditch intersected a 1 to 5 cm thick subhorizontal peat layer, which could be traced for 200 to 300 m along the ditch. Sand lenses are intercalated with the peat. In the peat layer, a large willow (*Salix*) branch was found that was submitted for radiocarbon dating.

The overlying diamicton is interpreted as till. It is overconsolidated, has many bullet-shaped striated stones and forms what appears to be a drift 'tail', which can be traced to the summit of a larger bedrock-cored hill. Parallel till fabric also suggests a glaciogenic origin, with an eastward direction of ice flow indicated.

The site provides an accurate geochronometer of ice retreat and late-glacial (Younger Dryas) ice advance for the region. The thin continuous paleosol indicates ice retreat just before 11 ka ^{14}C BP and an ice advance bracketed between 10.7 ka ^{14}C BP and the Holocene. This and other till-buried sites along the 'great ditch' of Nova Scotia have enabled a more accurate assessment of the Younger Dryas ice-sheet limits.

GSC-6566. Tatamagouche

normalized age:	11 100 ± 110
$\delta^{13}C$:	-29.16‰
uncorrected age:	11 200 ± 110

The peat was enclosed between grey clay and sand above and a grey/brown diamicton below. Sample RS-99-253 was collected by R.R. Stea on July 17, 1999 from a pipeline excavation near Tatamagouche, Cumberland County, Nova Scotia (45°41′12″N, 63°16′35″W), at an elevation of 38 m. The sample was submitted by R.R. Stea to gain information on regional glacial history, specifically the Younger Dryas.

The sample (42.9 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.6 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 3965 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.037 ± 0.067, 2.039 ± 0.048, and 28.411 ± 0.140 cpm, respectively.

Comment (R.R. Stea): The site is another in a series of buried organic paleosols discovered along the Maritimes and Northeast Pipeline route. At this site, a buried peat paleosol was found at the base of the pipeline ditch in a region of relatively flat topographic relief, broken by a few drift mounds or ridges. The peat layer was found to be cut off by the overlying drift landform as the pipeline ditch followed the topographic undulations.

At the base of the ditch was a 1 to 5 cm thick undulating peat paleosol, sandwiched between 5 cm thick grey clay layers. The overlying diamicton is reddish brown, silty, and matrix supported, with sandstone clasts. The till has a strong preferred north-south fabric.

The till fabric and the constructional landform overlying the paleosol strongly suggest a glacial origin. The Pipeline Series sites provide an accurate geochronometer of ice retreat and late-glacial (Younger Dryas) ice advance for the region. The thin continuous paleosol indicates ice retreat just before 11 ka ^{14}C BP and an ice advance from the Gulf of St. Lawrence bracketed between 10.7 ka ^{14}C BP and the Holocene. This and other till-buried sites along the 'great ditch' of Nova Scotia have enabled a more accurate assessment of the Younger Dryas ice-sheet limits.

GSC-6419. Mattatall Lake

normalized age:	10 800 ± 120
$\delta^{13}C$:	-28.97‰
uncorrected age:	10 900 ± 120

The wood was enclosed in peat. Sample 99-232-2 was collected by R.R. Stea and C. Jessome on September 16, 1999 from Mattatall Lake, 10 km east of Wentworth, Nova Scotia (45°41′35″N, 63°25′05″W), at an elevation of 60.9 m. The sample was submitted by R.R. Stea to gain information on ice retreat and late-glacial ice advance in the region.

The sample (17.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.2 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3370 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.622 ± 0.045, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

Comment (R.R. Stea): The site is another in a series of buried organic paleosols discovered along the Maritimes and Northeast Pipeline route. At this site, a buried peat paleosol was found at the base of the pipeline ditch in a region of relatively flat topographic relief, broken by a few drift mounds or ridges. The peat layer was found to be subhorizontal, traceable from one side of the drift landform to the other, as the pipeline ditch followed the topographic undulations.

The peat layer rests on 30 cm of grey silty clay and a greyish red diamicton. The peat is 5 to 8 cm thick and somewhat compressed, with flattened twig fragments. It is overlain by 10 cm of fine sand and 5 cm of grey clay. Two to three metres of reddish brown, silty, matrix-supported diamicton overlies the peat layer, forming the drift ridge or mound.

The overlying diamicton is interpreted as till and the drift landform as one of a series of linear flutes or small drumlins, which are visible on air photographs. Mass wasting can be ruled out as a process of formation for this diamicton, as the mounds are constructional landforms built on top of the peat-paleosol layer.

The site provides an accurate geochronometer of ice retreat and late-glacial (Younger Dryas) ice advance for the region. The thin continuous paleosol indicates ice retreat just before 11 ka ^{14}C BP and an ice advance from the Gulf of St. Lawrence bracketed between 10.7 ka ^{14}C BP and the Holocene. This and other till-buried sites along the 'great ditch' of Nova Scotia have enabled a more accurate assessment of the Younger Dryas ice-sheet limits.

GSC-6448. 'Shipimicas Bridge'

normalized age:	3620 ± 80
δ^{13}C:	-28.27‰
uncorrected age:	3670 ± 80

The wood was enclosed in peat underlying 1.2 m of sand. Sample 99-56-4 was collected by R.R. Stea and C. Jessome on June 8, 1999 from 'Shipimicas Bridge', near Amherst, Nova Scotia (45°50′46″N, 63°51′46″W), at an elevation of 22 m. The sample was submitted by R.R. Stea to gain information on climate change.

The sample (9.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 7.9 L of CO_2 gas. The age estimate is based on one count for 6130 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.448 ± 0.050, 1.152 ± 0.020, and 18.077 ± 0.147 cpm, respectively.

GSC-6448. (replicate)

normalized age:	3560 ± 60
δ^{13}C:	-28.27‰
uncorrected age:	3610 ± 60

This recount of the original gas preparation provides a comparative age estimate based on one count for 5200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.448 ± 0.053, 1.120 ± 0.021, and 17.939 ± 0.098 cpm, respectively.

Comment (R.R. Stea): This site is another in a series of buried organic paleosols discovered along the Maritimes and Northeast Pipeline route. The pipeline ditch crossed a broad flood plain with a misfit stream (John Smith Brook). At the base of the pipeline excavation is a red-brown till, overlain by 50 cm of fibrous black peat. Overlying the peat is 20 cm of grey plastic clay and 100 to 150 cm of medium to coarse, horizontally laminated sand, intercalated with reddish silty clay.

The sediments overlying the late Holocene peat can be interpreted as flood-plain deposits but suggest a much different hydrological regime than that of today. The lack of organic material in the overlying sediments is very puzzling and needs more work.

For a more complete story on the 'ditch' discoveries, including photos and additional descriptions, refer to http://www.gov.ns.ca/natr/meb/field/ditch.htm#ditch (accessed August 30, 2006).

GX-18453. Chezzetcook Inlet

uncorrected age:	2495 ± 115

The marine oyster shells were enclosed in peat. The sample was collected by D.B. Scott before 1995 from the western marsh at the head of Chezzetcook Inlet, Nova Scotia (approx. 44°42′N, 63°15′W), at an depth of about 0.85 m. The sample was submitted by D.B. Scott to gain information on the Late Maritime Woodland archeological period.

See GSC-6495 for comments.

Beta-28285. Seaforth

normalized age: 760 ± 80

The freshwater peat sample Seaforth CH001 (16 cm depth) was collected by W. Carter, J. Orford, and S. Jennings before 1991 from Seaforth, in the vicinity of Chezzetcook Inlet, Nova Scotia (approx. 44°40′N, 63°16′W), at a depth of 1.34 m. The sample was submitted by W. Carter to gain information on sea-level change, specifically lagoonal submergence (terrestrial to estuarine).

See GSC-6495 for comments.

GSC-5560. Cape Antrim

normalized age:	590 ± 60
$\delta^{13}C$:	-25.9‰
uncorrected age:	600 ± 60

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 93-25) was enclosed in peat overlying till. Sample 92/1/Antrim was collected by S. Jennings on August 3, 1992 from Cape Antrim, at the western entrance to Chezzetcook Inlet, 1.6 km southeast of Grand Desert and 1.6 km northeast of Seaforth, Halifax County, Nova Scotia (44°41′N, 63°14′W), at an elevation of 0 m,. The sample was submitted by J. Shaw to gain information on geomorphic processes, specifically the rate of coastal change.

The sample (13.5 g dry weight) was treated with hot base, hot acid, and distilled water rinses (it was noncalcareous). The treated sample (8.8 g) yielded 8.4 L of CO_2 gas. The age estimate is based on two counts for 2145 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 26.141 ± 0.127, 2.208 ± 0.053, and 28.186 ± 0.139 cpm, respectively.

Comment (J. Shaw): The wood was in growth position and was embedded in 20 cm of peat overlying till, together with other tree and shrub remains. This indicates a freshwater to brackish environment behind a barrier attached to Cape Antrim, at a period when relative sea level was about 1.5 m lower than today. Thus, the tree grew just above the former high-tide level. The barrier has migrated landward, exposing the peat and wood on the foreshore. See GSC-6495 for additional comments.

GSC-6495. Grand Desert

normalized age:	1130 ± 60
corrected age:	730 ± 60
$\delta^{13}C$:	+2.12‰
uncorrected age:	700 ± 60

The marine shells of *Mya arenaria* (identified by A.S. Dyke) were enclosed in an organic deposit with large tree stumps. Sample 98300-001 was collected by R.B. Taylor on December 2, 1998 from the shoreline near the base of a cliff, about 1.75 km seaward of Grand Desert, Nova Scotia (44°40.68′N, 063°14.91′W), at an elevation of 2.568 m above geodetic datum. The sample was submitted by R.B. Taylor to gain information on water-level changes within the lagoon behind an extensive barrier beach that extended between Gaetz Head and Cape Antrim (also called Cape Entry).

The sample (35.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (27.6 g) yielded 6.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.400 ± 0.072, 1.138 ± 0.025, and 17.890 ± 0.105 cpm, respectively.

Comment (R.B. Taylor): Radiocarbon dates on material collected from the vicinity of Chezzetcook Inlet suggest a rate of sea-level rise between 2 and 4 mm/a during the last 5000 years (Carter et al., 1992). A sample of freshwater peat from -1.34 m elevation at Seaforth, close to the shell site, had an age of 760 ± 80 years BP (Beta-28285). Also, wood from an in situ stump at 0.0 m elevation, embedded in peat overlying till, was 590 ± 60 years BP (normalized age). The tree would have grown when sea level was 1.5 m lower than present.

There is no evidence of higher-than-present sea levels, which suggests the dated shells were the result of human activity (Stein, 1992). It is concluded that they do not indicate higher water levels in the lagoon. A further investigation of the site resulted in the discovery of gastropod shells and a couple of pipe stems. One pipe stem had a larger diameter bore, indicating that it predates the 1800s and is possibly from the 16th or 17th century. The site could date to early contact period (ca.1500–1600); it is not possible at this time to provide the age based on the pipe stems alone (S. Powell, Nova Scotia Museum, pers. comm., 2003). Further archeological investigations are planned at the site.

Situated on a low shore at the edge of a drumlin on the western headland to Chezzetcook Inlet, the site would have been an attractive place to stop or camp. At present, the shells are exposed in a fresh wave-cut bank composed of wave washover sand overlying beach sand. The shells lie on glacial till extending from the drumlin. The present shoreline has retreated 56 m landward between 1988 and 2003, indicating a rate of 3.8 m/a.

This is not the first evidence of older human activity in the Chezzetcook area. Scott et al. (1995) observed oyster shells dated at 2495 ± 115 years BP (GX-18453; Scott et al., 1995), 5.5m below the surface of a core collected in the west marsh at the head of Chezzetcook Inlet. They suggested that no oysters lived along the Atlantic coast of Nova Scotia at that time. Oysters were available in the Gulf of St. Lawrence, so they attributed the oysters to trade between coastal Indians and tribes from the Gulf of St. Lawrence.

GSC-6010 HP. Carrolls Corner

normalized age:	8610 ± 60
$\delta^{13}C$:	-26.91‰
uncorrected age:	8640 ± 60

The wood (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 96-01) was enclosed in peat. Sample 0-30-83, 0-31-83 was collected by R.J. Mott in October 1983 from the National Gypsum Company quarry, Carrolls Corner, near East Milford, Nova Scotia (45°00′30″N, 63°25′00″W), at an elevation of 35 m. The sample was submitted by R.J. Mott to gain information on the age of the deposit.

The sample (38.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (29.9 g) yielded 28.5 L of CO_2 gas. The age estimate is based on one count for 4930 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 34.380 ± 0.094, 2.817 ± 0.037, and 100.845 ± 0.339 cpm, respectively.

Comment (R.J. Mott): It was originally thought that the material could possibly be of mid-Wisconsinan age, because the wood is associated with what appears to be till. The date shows that the sample is of Holocene age. The wood was probably incorporated into the diamicton that slumped into a depression in the karst topography of the gypsum quarry.

GSC-6330. Upper Nine Mile River

normalized age:	14 500 ± 180
$\delta^{13}C$:	-27.10‰
uncorrected age:	14 500 ± 180

The organic (gyttja?) lake sediment was enclosed in convoluted sand overlying glacial sand-silt rhythmites and underlying peat and gyttja. Sample stop 198-5 was collected by R. Stea on July 10, 1998 from the West Indian Road silica quarry, about 3.5 km east-northeast of Upper Nine Mile River, east of Kennetcook, Nova Scotia (45°05′20″N, 63°34′50″W), at an elevation of 76 m. The sample was submitted by R.R. Stea to gain information on climatic change, specifically the Younger Dryas.

The sample (585.0 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (100.2 g) yielded 2.7 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.52. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 2.965 ± 0.057, 1.267 ± 0.024, and 18.031 ± 0.134 cpm, respectively.

Comment (R.R. Stea): The exposure in the West Indian Road silica quarry was a road cut through a small bog, which had lake sediment underlying the peat. The age is anomalously old when compared with other data on the deglaciation of the area, not surprising given the presence of limestone in the quarry area. The sample should be examined for macrofossils and, if possible, re-dated by AMS to obtain a valid age.

Wigmore Lake Series

A series of lake sediment samples was collected by R.J. Mott on June 30, 1990 from Wigmore Lake, about 5 km north of the town of Mahoneys Corner (formerly Leroy), in the lowland between Northumberland Strait and the Cobequid Highlands, Cumberland County, Nova Scotia (45°44.0′N, 63°38.16′W), at an elevation of about 73 m.

Wigmore Lake is a small, shallow lake (maximum water depth 2 m) in the lowland between Northumberland Strait and the Cobequid Highlands. A core taken with a modified Livingstone corer showed that dark algal gyttja gradually decreases in organic content below 300 cm depth beneath the mud-water interface to form a medium brown silty gyttja to 517 cm depth. Organic content is low but variable toward the base and increases slightly just above 517 cm. The organic sediments overlie 27 cm of noncalcareous pink clay and calcareous red sand to the base of the core at 568 cm depth. These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen assemblage, organic accumulation, and a minimum age for deglaciation.

Beta-66119. Wigmore Lake (I)

normalized age:	6590 ± 170

The gyttja lake sediment sample 90-MS-05 (276–280 cm) was enclosed in gyttja.

GSC-6174. Wigmore Lake (II)

normalized age:	9680 ± 140
$\delta^{13}C$:	-29.62‰
uncorrected age:	9750 ± 140

The silty gyttja lake sediment sample MS-90-05 (436–440 cm; 66.9 g wet weight), enclosed in silty gyttja and red clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (25.3 g) yielded 2.4 L of CO_2 gas. The age estimate is based on one count for 3715 minutes in the 2 L counter with a mixing ratio of 1.69. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.383 ± 0.076, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

Comment (R.J. Mott): The basal date for Wigmore Lake (GSC-5567) and Beta-66119 were commented on previously in McNeely (2002, p. 15). A sample from 436 to 440 cm depth produced an age of 9.7 ka BP. Date GSC-6174 was dated to provide an age for the return to organic sedimentation following a sediment interval with lower organic content. If this age is valid, it marks the increase in organic sedimentation at the beginning of the Holocene.

GSC-5567. Wigmore Lake (III)

normalized age:	11 400 ± 140
$\delta^{13}C$:	-24.8‰
uncorrected age:	11 400 ± 140

The silty gyttja lake sediment sample 90-MS-05 (513–517 cm; 70 g wet weight), enclosed in silty gyttja and red clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (31 g) yielded 2.6 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 2 L counter with a mixing ratio of 1.73. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.464 ± 0.065, 1.179 ± 0.020, and 18.355 ± 0.109 cpm, respectively.

Comment (R.J. Mott): Within the organic sediments overlying the basal mineral sediments, the slightly greater organic content at the base, followed by an interval of sediments of less organic content and then by highly organic sediments, is reminiscent of the stratigraphy in numerous lakes throughout the Maritimes, where this sediment sequence has been correlated with the Allerød–Younger Dryas climatic oscillation (Mott et al., 1986; Stea and Mott, 1989). If the basal date is valid, then the chronology corroborates this interpretation. The area must have been free of ice for only a short time, however, before reversion of the climate to cooler conditions during the Younger Dryas interval. Further dating and pollen analysis are required to verify this interpretation.

GSC-6377. Prospect Bay

normalized age:	4150 ± 80
$\delta^{13}C$:	-24.01‰
uncorrected age:	4140 ± 80

The wood (*Pinus strobus*, identified by C. Keith) was in growth position in sand on the sea floor. Sample Prospect 99-1 was collected by R. Dorion on April 1, 1999 at the mouth of Prospect Bay, Prospect, Nova Scotia (44°28′N, 63°46.8′W), at a depth of 10.7 m. The sample was submitted by J. Shaw to gain information on sea-level change, specifically submergence.

The sample (11.25 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 7.25 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.795 ± 0.076, 1.315 ± 0.027, and 18.066 ± 0.133 cpm, respectively.

Comment (J. Shaw): Divers have reported numerous tree stumps in growth position on the sea floor in this area, an observation that was confirmed by the late D.R. Grant (pers. comm., 2002). This evidence is consistent with the relative-sea-level curve for Halifax, which shows rising sea level from the late Holocene to the present. Also refer to http://gsca.nrcan.gc.ca/coastweb/sealevel/modern_e.php (accessed August 30, 2006). This sea-level rise is mostly due to crustal subsidence, a lingering effect from the last ice age.

GSC-6306. Fundy Gypsum quarry

normalized age:	8830 ± 160
$\delta^{13}C$:	-27.92‰
uncorrected age:	8880 ± 160

The wood was enclosed in peaty organic material in clay, overlying gypsum and underlying stony diamicton (4–6m). Sample stop 142-2/98 was collected by R. Stea in July 1998 from a sinkhole in the Fundy Gypsum quarry, about 1.5 km northeast of Miller Creek, Nova Scotia (45°01′30″N, 64°03′W), at an elevation of 49 m. The sample was submitted by R.R. Stea to gain information on climate change, specifically the warmer, pre–Younger Dryas interval.

The sample (2.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (1.9 g) yielded 1.6 L of CO_2 gas. The age estimate is based on one count for 3600 minutes in the 2 L counter with a mixing ratio of 2.55. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.910 ± 0.107, 1.285 ± 0.027, and 17.842 ± 0.107 cpm, respectively.

Comment (R.R. Stea): The author examined a section at the Miller Creek quarry in 1998 that featured a sinkhole covered by up to 4 m of diamicton. Unlike glaciogenic diamictons, this unit was not indurated or overconsolidated and had few clasts. The exposure was located on the edge of the quarry site, in a bog depression. This site is one of a growing number of early Holocene buried organic sites that have been found in the Maritime Provinces. These sites feature gravelly fluvial deposits, thin clay deposits, and debris-flow diamictons, as at this site, overlying organic wood-bearing beds. The organic sites range in age from 8.7 to 10 ka BP and may record the early Holocene climatic optimum, whereas the overlying inorganic sediments indicate a later period of climatic and landscape instability, perhaps cooling. A correlation with the 8200 ka BP cooling event in Greenland ice-core proxies (Alley et al., 1997) is suggested.

Lily Lake Series

A series of silty clay gyttja lake sediment samples was collected by R.J. Mott, T.W. Anderson, and R. Stea on June 19, 1995 from Lily Lake, about 4 km east of Hantsport, Nova Scotia (45°04.9′N, 64°05.3′W), at an elevation of about 22.8 m. The site is located in a lowland area with rolling topography south of Minas Basin; maximum water depth is about 4.5 m. These samples were submitted by R.J. Mott to gain information on the pollen assemblage and the sediment change from less to more organic rich.

GSC-6178. Lily Lake (I)

normalized age:	9360 ± 190
$\delta^{13}C$:	-30.17‰
uncorrected age:	9440 ± 190

The silty clay gyttja lake sediment sample MS-95-01 (395–398 cm; 52.9 g wet weight), enclosed in organic lake sediment, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (12.8 g) yielded 1.6 L of CO_2 gas. The age estimate is based on one count for 2600 minutes in the 2 L counter with a mixing ratio of 2.61. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.595 ± 0.120, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

Beta-177456. Lily Lake (II)

normalized age:	10 780 ± 70
$\delta^{13}C$:	-27.1‰

The seed and needle sample MS-95-01 (468–470 cm; *Picea*, identified by A. Telka) was enclosed in organic lake sediment. Calibrated ages are 13 000 to 12 780 and 12 760 to 12 630 years BP.

GSC-6179. Lily Lake (III)

normalized age:	11 200 ± 190
$\delta^{13}C$:	-26.01‰
uncorrected age:	11 300 ± 190

The silty clay gyttja lake sediment sample MS-95-01 (470–473 cm; 62.9 g wet weight), enclosed in organic lake sediment, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment omitted. The treated sample (20.4 g) yielded 1.8 L of CO_2 gas. The age estimate is based on one count for 3665 minutes in the 2 L counter with a mixing ratio of 2.21. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.467 ± 0.091, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

Comment (R.J. Mott): Sediment stratigraphy of the core indicates that organic deposition began prior to 11 200 years BP, when the climate had warmed following deglaciation. The bulk date on organic lake sediment at 470 to 473 cm depth in the core is 11 200 ± 190 years BP. An AMS date of 10 780 ± 70 years BP on *Picea* (spruce) needles at 468 to 470 cm depth suggests that the bulk date is probably valid or is only slightly anomalous due to contamination by old carbon. Both dates are below a change to more mineral sedimentation between 468 and 446 cm depth in the core. Organic content of the sediment increases again above 446 cm depth. An age of 9360 ± 190 years BP on bulk organic lake sediment at 395 to 398 cm depth shows that organic sedimentation was dominant in the early Holocene. The sediment stratigraphy and chronology indicate that a cool interval related to the Younger Dryas cooling event was preceded by a warm interval when spruce trees were present in the area. Climate warmed again after about 10 000 years BP, as evidenced by the return to organic sedimentation in the lake and the age of 9360 ± 190 years BP. This climatic oscillation is seen in lake-sediment profiles and buried organic-sediment sites throughout Nova Scotia (Mott et al., 1986; Stea and Mott, 2005).

GSC-5882. Big Tancook Island

normalized age:	610 ± 70
$\delta^{13}C$:	-25.3‰
uncorrected age:	620 ± 70

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-98) was underlain by till. Sample 94-GS-01 was collected by D.R. Grant on July 9, 1994 from the south end of the barrier beach at the head of Southeast Cove, Big Tancook Island, Atlantic coast, Nova Scotia (44°26.90′N, 64°10.31′W), at a depth of 2.0 m. The sample was submitted by D.R. Grant to gain information on sea-level change, specifically recent submergence.

The sample (8.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.5 g) yielded 5.44 L of CO_2 gas. The age estimate is based on two counts for 2070 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.990 ± 0.097, 1.206 ± 0.026, and 18.348 ± 0.107 cpm, respectively.

Comment (D.R. Grant): The sample was collected from a tree stump rooted in till that is exposed on the foreshore in the intertidal zone, which here has a range of slightly more than 2 m. The tree stumps ranged in diameter from 5 to 30 cm and project up to 30 cm from the roots. The trunks were sound and largely intact, except for some wear by winter pack ice. The wood was discoloured to dark grey, possibly by percolation of humic acids from peat (*see* below). The sample comes from the inner part of a 5 cm diameter root of a 10 cm diameter stump.

A gently sloping till blanket and its forest cover became progressively submerged in recent millennia. The local setting, a broad shallow cove, led to construction of a barrier beach, which ponded a lagoon that prompted accumulation of peat, the level of which corresponds to high-tide level. Rising sea level drove the barrier landward and caused the pond and its thin peat deposits to transgress the surrounding forest. The early submerged forest eventually reappeared on the seaward side of the barrier. Most of the thin cover of peat has been eroded by wave action.

Very few dates are available on the Atlantic coast of Nova Scotia to document the recent rise of sea level. This date should give a useful measure of the local rate of submergence for Mahone Bay, an area particularly susceptible to the

destructive effects of transgression because its shores are composed mainly of till and because it is the prime recreational real estate in the province of Nova Scotia.

Amherst Marsh Series

This series of samples was dated by the GSC laboratory to gain information on the possible incorporation of 'old carbon' into modern materials in and around the marine environment, and the extent to which 'old carbon' may be incorporated into nearshore surface sediments.

GSC-5833. Amherst Marsh (I)

$\delta^{13}C$:	-28.1‰
percentage modern carbon (pMC):	112.78 ± 1.32

The alder leaves (*Alnus*, identified by J. Shaw) were a living collection. Sample 94-305 A was collected by J. Shaw on June 14, 1994 from Amherst Marsh, 1 km northwest of the settlement of Amherst Point, Nova Scotia (45°47.65′N, 64°16.70′W), at an elevation of 8 m.

The sample (64.06 g wet weight) was not chemically treated but underwent distilled water rinses similar to the standard GSC processing method for maple leaves. The treated sample (8.48 g) yielded 8.53 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.837 ± 0.130, 2.149 ± 0.033, and 28.371 ± 0.131 cpm, respectively.

GSC-5833. Second count

$\delta^{13}C$:	-28.1‰
pMC:	113.18 ± 1.48

The age estimate is based on one count for 1090 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.801 ± 0.178, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

GSC-5833. 'Bomb' preparation

$\delta^{13}C$:	-28.0‰
pMC:	113.45 ± 1.53

The treated alder leaves were processed using the 'bomb' technique (Switsur, 1974) and (7.70 g) yielded 7.14 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.883 ± 0.205, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

GSC-5834. Amherst Marsh (II)

$\delta^{13}C$:	-24.6‰
pMC:	113.01 ± 1.30

The salt-marsh sedge (*Carex paleacea* (Wahl), identified by A. Dugal) was a living collection. Sample 94-305 B was collected by J. Shaw on June 13, 1994 from Amherst Marsh, 1 km northwest of the settlement of Amherst Point, Nova Scotia (45°47.6′N, 64°16.75′W), at an elevation of 7.8 to 8.0 m.

The sample (137.1 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.45 g) yielded 7.13 L of CO_2 gas. The age estimate is based on one count for 2460 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.975 ± 0.120, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

GSC-5915. Amherst Marsh (III)

$\delta^{13}C$:	-13.7‰
pMC:	112.84 ± 0.98

The salt-marsh grass (*Spartina alterniflora*, identified by J. Shaw) was a living collection from the low salt marsh. Sample 94-305-101 was collected by J. Shaw on November 4, 1994 from Amherst Marsh, on the bank of the Maccan River, 1 km northwest of the settlement of Amherst Point, Nova Scotia (45°46.60′N, 64°17.05′W), at an elevation of 6.6 m.

The sample (185.3 g wet weight) was treated with hot acid (noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (12.82 g) yielded 11.05 L of CO_2 gas. The age estimate is based on two counts for 2120 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 32.613 ± 0.173, 2.218 ± 0.035, and 28.217 ± 0.131 cpm, respectively.

GSC-amherst. Amherst Marsh (IV)

$\delta^{13}C$:	-21.5‰
unofficial age:	1.24 ka
pMC:	85.59 ± 1.15

The marine (?)organic mud was a surface collection from the high salt marsh. Sample 94-305-100 was collected by J. Shaw on November 4, 1994 from Amherst Marsh, 1 km northwest of the settlement of Amherst Point, Nova Scotia (45°46.60′N, 64°17.05′W), at an elevation of 7.5 m.

The sample (823.1 g wet weight) was treated with hot acid (it was moderately calcareous) and distilled water rinses. The base treatment was omitted. The treated sample (156.8 g) yielded 2.05 L of CO_2 gas. The age estimate is based on two

counts for 2050 minutes in the 2 L counter with a mixing ratio of 2.11. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.767 ± 0.147, 1.233 ± 0.025, and 18.272 ± 0.104 cpm, respectively.

Comment (R. McNeely): With the advent of AMS dating, there has been a concern expressed about dating marine plant fragments to obtain a reliable estimate of the age a deposit. This limited series of samples was dated by the GSC laboratory to gain information on the possible incorporation of 'old carbon' into modern materials in and around the marine environment, and the extent to which 'old carbon' may be incorporated into nearshore surface sediments. In addition, the exercise provided $\delta^{13}C$ values for plant material that is not normally dated by the GSC laboratory. I wish to acknowledge the support and effort expended in the field by J. Shaw (GSC-Atlantic) in providing the samples for this exercise.

Unfortunately, a number of caveats must applied to this data set, especially the surface sediment sample that was very low in organic carbon (0.7%), which the GSC laboratory would not normally process (i.e. the sample had less than 2% organic carbon, and therefore the laboratory is only prepared to provide an unofficial age estimate and no laboratory number). Even though 825 g of sediment were processed, the final gas volume had to be mixed with 'dead' gas for counting purposes (cf. Lowdon, 1985). In addition, there is enhanced variability related to 'mixed' samples dated at GSC (cf. Tables 1 and 2).

The alder leaves were treated only once in the manner that the GSC laboratory treats maple leaves in its regular monitoring of atmospheric ^{14}C in the Ottawa River valley. The treated material was then processed by two different techniques, first by the standard combustion technique used in the GSC laboratory (cf. Lowdon, 1985) and then by the 'bomb' technique outlined by Switsur (1974). The original sample was counted on two different occasions in the 5 L counter, with very comparable results (112.8 and 113.2 pMC); the gas produced by the 'bomb' technique was also counted in the 5 L counter, with results (113.4 pMC) indistinguishable from the standard technique. The analysis of maple leaves collected during the growing season of the same year in the Gatineau Park (Ottawa River valley) ranged from 113.5 to 115.4 pMC; thus, the Nova Scotia alder, marsh sedge, and grass were indistinguishable from the maple leaves collected in the same month, but the marine mud was considerably depleted in ^{14}C (apparent age, i.e. 'older'). These preliminary results (Table 3) suggest that marsh sedges and grass are useful for dating purposes, whereas marine mud has a marine reservoir or carbonate error associated with it, thus confirming the results of other failed dating attempts on bulk marine sediments (McNeely and McCuaig, 1991; cf. GSC-3272).

'Pat Kempton Lake' Series

A series of lake sediment and organic samples was collected by R.J. Mott and H. Jetté on July 16, 1989 from 'Pat Kempton Lake' (officially known as 'Red Lake'), 2.5 km southeast of Maitland Bridge and 1.3 km east of the main gate to Kejimkujik National Park, Nova Scotia (44°26.08′N, 65°10.15′W), at an elevation of 120 m.

'Pat Kempton Lake' is a small lake on granite upland with a maximum water depth of 2 m. Coring penetrated to a depth of 550 cm beneath the mud-water interface. Soft, dark brown gyttja grades to stiff, greenish grey to black, silty gyttja to 310 cm, where the sediment is mottled grey and black silty gyttja. Below is about 20 cm of grey silty gyttja that grades into laminated black and grey organic silt to black silty clay at 450 cm. These sediments overlie yellow and black banded silty clay with abundant sulphide minerals. Extending below this to the bottom of the core is grey clay with yellowish grey banding that becomes gritty with depth.

These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen assemblage and provide a minimum age for deglaciation.

GSC-6155. 'Pat Kempton Lake' (I)

normalized age:	4790 ± 80
$\delta^{13}C$:	-31.31‰
uncorrected age:	4890 ± 80

The black gyttja lake sediment sample 89-MS-07 (100–104 cm; 53.6 g wet weight), enclosed in yellow/black gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (10.5 g) yielded 3.1 L of CO_2 gas. The age estimate is based on one count for 3755 minutes in the 2 L counter with a mixing ratio of 1.35. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.861 ± 0.072, 1.162 ± 0.025, and 18.124 ± 0.109 cpm, respectively.

Beta-66128. 'Pat Kempton Lake' (II)

normalized age:	8250 ± 150

The gyttja lake sediment sample 89-MS-07 (208–212 cm) was enclosed in gyttja. This sample was submitted by H. Jetté.

Table 3. Preliminary results for leaves, sedges, grasses and marine mud related to the incorporation of 'old carbon' into modern materials.

Material	pMC	±	Lab no.
Maple leaves (Gatineau Park, QC)	113.9	1.4	GSC-9406
Alder leaves	112.8	1.3	GSC-5833
	113.2	1.5	GSC-5833 2
	113.5	1.5	GSC-5833 B
Salt-marsh sedge	113.0	1.3	GSC-5834
Salt-marsh grass	112.8	1.0	GSC-5915
Marine mud	85.6	1.2	GSC-amherst

GSC-6166. 'Pat Kempton Lake' (III)

normalized age:	9660 ± 180
$\delta^{13}C$:	-31.46‰
uncorrected age:	9760 ± 180

The black gyttja lake sediment sample 89-MS-07 (290–294 cm; 63.8 g wet weight), enclosed in yellow/black gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (10.6 g) yielded 1.5 L of CO_2 gas. The age estimate is based on one count for 3750 minutes in the 2 L counter with a mixing ratio of 2.82. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.379 ± 0.107, 1.162 ± 0.025, and 18.124 ± 0.109 cpm, respectively.

TO-3972. 'Pat Kempton Lake' (IV)

normalized age:	11 610 ± 90

The wood, twigs, and leaf fragments of sample 89-MS-07 (445–450 cm) were enclosed in yellow/black silty clay gyttja. This sample was submitted by R.J. Mott as a crosscheck on GSC-5031 (below) and to gain information on deglaciation. The age was normalized assuming a $\delta^{13}C$ = -25‰.

GSC-5031. 'Pat Kempton Lake' (V)

normalized age:	11 900 ± 270
$\delta^{13}C$:	-21.2‰
uncorrected age:	11 800 ± 270

The basal black gyttja lake sediment sample 89-MS-07 (450–454 cm; 174.3 g wet weight), enclosed in yellow/black gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (38.8 g) yielded 1.33 L of CO_2 gas. The age estimate is based on one count for 3440 minutes in the 2 L counter with a mixing ratio of 3.34. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.070 ± 0.131, 0.990 ± 0.030, and 17.773 ± 0.104 cpm, respectively.

Comment (R.J. Mott): The basal date (GSC-5031) of 11.9 ka BP is only about 300 years older than the AMS date (TO-3972) of 11.6 ka BP obtained on twig and leaf fragments from the increment immediately above that used for the bulk date. Therefore, the basal organic sediment reliably predates 11 ka BP and the Younger Dryas cold interval that is recorded at many sites throughout the Maritimes (Mott et al., 1986; Stea and Mott, 1989). Further dating and pollen analysis will be required to document the climatic oscillation that, because of the dark colour of the basal sediments, is not as readily discernible as at most sites.

Bower Lake Series

A series of lake sediment samples was collected by R.J. Mott on July 17, 1989 from Bower Lake, just west of East Kemptville and about 15.5 km northeast of Carleton, Nova Scotia (44°05.24′N, 65°46.56′W), at an elevation of about 73 m. Bower Lake is a small lake on granite terrane covered by glacial deposits. The lake has an irregular bottom with a maximum depth of 4 m.

The corer penetrated to a depth of 680 cm below the mud-water interface. Basal, soft grey clay was encountered at 660 cm, above which a transition zone of dark grey clay with organic streaks grades into olive, slightly silty gyttja. The latter changes to dark brown silty gyttja to 632 cm. From 632 to 612 cm, the sediment becomes a dark grey-brown, more silty gyttja with pebbles and blebs of lighter sediment. Above this is dark grey-brown gyttja that becomes dark brown algal gyttja to the surface.

These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen assemblage and provide a minimum age for deglaciation.

GSC-6168. Bower Lake (I)

normalized age:	3350 ± 90
$\delta^{13}C$:	-30.26‰
uncorrected age:	3430 ± 90

The brown silty gyttja lake sediment sample 89-MS-09 (150–154 cm; 57.5 g wet weight), enclosed in silty gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.7 g) yielded 2.0 L of CO_2 gas. The age estimate is based on one count for 3550 minutes in the 2 L counter with a mixing ratio of 2.09. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.821 ± 0.106, 1.162 ± 0.025, and 18.124 ± 0.109 cpm, respectively.

Beta-66129. Bower Lake (II)

normalized age:	5930 ± 110

The brown silty gyttja lake sediment sample 89-MS-09 (369–371 cm) was enclosed in silty gyttja. This sample was submitted by H. Jetté. The age was normalized assuming a $\delta^{13}C$ = -25‰.

GSC-6170. Bower Lake (III)

normalized age:	8060 ± 110
$\delta^{13}C$:	-30.98‰
uncorrected age:	8160 ± 110

The brown silty gyttja lake sediment sample 89-MS-09 (488–490 cm; 91.8 g wet weight), enclosed in silty gyttja, was treated with hot acid (it was noncalcareous) and distilled

water rinses. The base treatment was omitted. The treated sample (17.6 g) yielded 3.4 L of CO_2 gas. The age estimate is based on one count for 3600 minutes in the 2 L counter with a mixing ratio of 1.21. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.567 ± 0.063, 1.196 ± 0.029, and 18.124 ± 0.143 cpm, respectively.

GSC-5022. Bower Lake (IV)

normalized age:	9820 ± 160
$\delta^{13}C$:	-25.8‰
uncorrected age:	9830 ± 160

The brown silty gyttja lake sediment sample 89-MS-09 (609–611 cm; 85.71 g wet weight), enclosed in silty gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (19.10 g) yielded 1.83 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 2 L counter with a mixing ratio of 2.24. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.229 ± 0.094, 0.990 ± 0.030, and 17.773 ± 0.104 cpm, respectively.

GSC-5023. Bower Lake (V)

normalized age:	10 700 ± 170
$\delta^{13}C$:	-26.1‰
uncorrected age:	10 700 ± 170

The brown silty gyttja lake sediment sample 89-MS-09 (632.5–634.5 cm; 104.47 g wet weight), enclosed in silty gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (19.80 g) yielded 2.40 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.72. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.677 ± 0.090, 0.990 ± 0.030, and 17.773 ± 0.104 cpm, respectively.

GSC-5024. Bower Lake (VI)

normalized age:	12 400 ± 220
$\delta^{13}C$:	-23.3‰
uncorrected age:	12 400 ± 220

The basal silty gyttja lake sediment sample 89-MS-09 (653–656 cm; 116.90 g wet weight), enclosed in grey clay and silty gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (52.10 g) yielded 2.17 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.91. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 3.789 ± 0.094, 0.990 ± 0.030, and 17.773 ± 0.104 cpm, respectively.

Comment (R.J. Mott): All ages appear to be reliable, although there is the possibility that the basal date on organic-poor sediment in the recently deglaciated terrane may be somewhat anomalous. If valid, the date provides a minimum age for deglaciation. The dates of 10.7 ka BP (GSC-5023) and 9.8 ka BP (GSC-5022) bracket an interval of greater mineral content that relates, in many parts of the Maritimes, to a cold interval correlated with the Younger Dryas (Mott et al., 1986; Stea and Mott, 1989). Sample Beta-66129 relates to the pollen profile around 6 ka BP.

New Brunswick

Figure 5. Radiocarbon-dated sites in New Brunswick.

Poucette Lake Series

Poucette Lake is about 20 km northwest of Port Elgin, New Brunswick (46°09.50′N, 64°17.33′W), at an elevation of about 28 m. A 565 cm long core was obtained by R.J. Mott on August 15, 1978 with a modified Livingstone piston corer from beneath 2.5 m of water. The lake is situated in an area of morainal sediments above the limit of marine submergence (Rampton et al., 1984). The core showed dark brown algal gyttja that grades into reddish clayey gyttja to a depth of 455 cm, overlying 10 cm of black clayey gyttja and brownish red clay with minor organic content to a depth of 517 cm. This overlies stiff brownish red clay and soft pinkish red clay at the base of the core. These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen profile and the initiation of organic accumulation, and to provide a minimum age for deglaciation.

GSC-5629. Poucette Lake (I)

normalized age:	5540 ± 120
$\delta^{13}C$:	-27.5‰
uncorrected age:	5580 ± 120

The brown gyttja lake sediment sample MS-78-10 (227–233 cm; 32.0 g wet weight), was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (3.3 g) yielded 1.31 L of CO_2 gas. The age estimate is based on one count for 3725 minutes in the 2 L counter with a mixing ratio of 3.38. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.154 ± 0.128, 1.191 ± 0.020, and 18.338 ± 0.103 cpm, respectively.

GSC-3462. Poucette Lake (II)

uncorrected age:	9560 ± 120

The reddish brown clayey lake sediment sample MS-78-10 (390–395 cm; 90.6 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (30.4 g) yielded 3.01 L of CO_2 gas. The age estimate is based on one 3-day count in the 2 L counter with a mixing ratio of 1.54. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.550 ± 0.064, 1.286 ± 0.024, and 18.243 ± 0.115 cpm, respectively.

GSC-2814. Poucette Lake (III)

normalized age:	10 500 ± 170
$\delta^{13}C$:	-27.3‰
uncorrected age:	10 600 ± 170

The mottled black to brown gyttja lake sediment sample MS-78-10 (463–468 cm; 100.3 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (43.2 g) yielded 2.29 L of CO_2 gas. The age estimate is based on two 1-day counts in the 2 L counter with a mixing ratio of 1.89. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.750 ± 0.093, 1.253 ± 0.026, and 17.723 ± 0.095 cpm, respectively.

Comment (R.J. Mott): Samples GSC-2814 and -3462 were reported previously in McNeely (1989). Date GSC-3462 dates the beginning of the pine (*Pinus*) pollen rise following the decline in spruce (*Picea*) and maximum in *Betula* (birch) pollen in the early Holocene. Date GSC-2814 provides a date on the beginning of organic accumulation at the site that is a minimum date for deglaciation of the area. Pollen analysis shows that the late-glacial climatic oscillation found at many sites throughout southern New Brunswick and Nova Scotia (Mott et al., 1986) is not represented at this site. Organic accumulation began during the latter part of the climatic reversal when herb and shrub tundra prevailed. The spruce maximum is seen shortly after 10.5 ka BP at the beginning of early Holocene warming.

Beausejour Beach Series

A series of samples was collected by D. Keenlyside and C. MacKinnon on July 22, 2001 from the Fort Beausejour dyke, 'Beausejour Beach', Cumberland Basin, Bay of Fundy, New Brunswick (45°51′N, 64°18′W), at an elevation of 0.3 m. These samples were submitted by D. Keenlyside to gain information on the Beausejour Bayonet archeological site (Maritime Archaic) and sea-level change.

Beta-139755. 'Beausejour Beach' (I)

normalized age:	3710 ± 50
$\delta^{13}C$:	-13.7‰
uncorrected age:	3530 ± 50

The walrus baculum sample CMC-1537 (*Odobenus rosmarus*, identified by R.E. Morlan), was enclosed in an organic sandy matrix on the low-tide beach. The material was sampled at extreme low tide (+0.3 m a.s.l.).

GSC-6627. 'Beausejour Beach' (II)

normalized age:	4120 ± 70
$\delta^{13}C$:	-25.33‰
uncorrected age:	4120 ± 70

The wood sample (BlDb-10: C14; 10.4 g dry weight of *Pinus strobus*, identified by R.J. Mott in unpublished GSC Wood Report 2001-35), a surface collection on the low-tide beach, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.8 g) yielded 8.7 L of CO_2 gas. The age estimate is based on one count for 3780 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.827 ± 0.079, 2.056 ± 0.034, and 28.122 ± 0.209 cpm, respectively.

Comment (D. Keenlyside): An in situ tree stump was exposed at low tide, at the base of a steeply sloping beach where the beach begins to level off. This was about 75 m below the dyke. The tree stump was closely associated with cultural finds. A walrus baculum removed from an organic sandy matrix several metres away, but at same stratigraphic level, was also dated (Beta-139755 AMS). A surface collection of 46 stone plummets in the immediate area of the stump, also at same stratigraphic level, typologically date to 3500 to 4500 years BP (Maritime Archaic). This tree stump is part of a drowned forest that was closely associated with a human occupation. Thus, its ecological context and paleoenvironmental interpretations (vegetation, climate, and sea-level implications) are significant for the Maritimes and the northeastern seaboard.

Shaddick Lake Series

A series of gyttja lake sediment samples was collected by R.J. Mott on August 13, 1978 from Shaddick Lake, a small kettle lake in an area of morainal topography about 28 km west-northwest of Newcastle, New Brunswick (47°05′N, 65°51.3′W), at an elevation of 44 m. These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen spectra and provide a minimum age for deglaciation.

GSC-5621. Shaddick Lake (I)

normalized age:	6460 ± 130
$\delta^{13}C$:	-28.4‰
uncorrected age:	6520 ± 130

The gyttja lake sediment sample MS-78-7 (118–122 cm; 40.0 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.0 g) yielded 1.83 L of CO_2 gas. The age estimate is based on two counts for 2185 minutes in the 2 L counter with a mixing ratio of 2.37. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.148 ± 0.119, 1.191 ± 0.020, and 18.338 ± 0.103 cpm, respectively.

Comments (R.J. Mott): Level 118 to 122 cm in the core was dated to help determine the location of the 6.0 ka BP level in the sequence and thus the age of the associated pollen spectra.

GSC-2767. Shaddick Lake (II)

normalized age:	10 100 ± 170
$\delta^{13}C$:	-29.0‰
uncorrected age:	10 100 ± 170

The basal silty sandy gyttja lake sediment sample MS-78-07 (253–257 cm; 123 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (54.2 g) yielded 3.07 L of CO_2 gas. The age estimate is based on two 1-day counts in the 2 L counter with a mixing ratio of 1.45. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.006 ± 0.093, 1.251 ± 0.044, and 17.701 ± 0.122 cpm, respectively.

Comment (R.J. Mott): This basal sediment date was reported previously in McNeely (1989). The sample dates the beginning of organic deposition at the site and is a minimum age for melting of the ice block that formed the kettle in glacial outwash. The area may have been washed subsequently by marine or lacustrine waters (Rampton et al., 1984). Pollen analysis shows that deposition of organic sediments began at the close of the period of late-glacial climatic reversion, just prior to 10.0 ka BP (Mott et al., 1986).

Island Lake Series

A series of lake sediment samples was collected by R.J. Mott on August 18, 1978 from Island Lake, a small kettle lake in an area of hummocky stagnant-ice topography about 40 km southeast of Campbellton, New Brunswick (47°49′50″N, 66°11′20″W), at an elevation of 290 m. More than 750 cm of sediment were penetrated in a core from beneath 8.8 m of water using a modified Livingstone piston corer. The corer penetrated 642 cm of dark brown gyttja and black laminated gyttja overlying 16 cm of black organic silty clay. Below this was about 70 cm of brownish grey to dark grey clay with pebbles at the base, overlying grey laminated clay. These samples were submitted by R.J. Mott and H. Jetté to gain information on the pollen profile spectra and provide a minimum age for deglaciation.

GSC-5620. Island Lake (I)

normalized age:	5940 ± 110
$\delta^{13}C$:	-29.9‰
uncorrected age:	6020 ± 110

The black gyttja lake sediment sample MS-78-12 (337–343 cm; 41.3 g wet weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (4.0 g) yielded 2.45 L of CO_2 gas. The age estimate is based on two counts for 2080 minutes in the 2 L counter with a mixing ratio of 1.78. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.666 ± 0.102, 1.191 ± 0.020, and 18.338 ± 0.103 cpm, respectively.

Comment (R.J. Mott): This sample (GSC-5620) dates the maximum in *Pinus strobus* at about 6 ka BP at this site.

GSC-3492. Island Lake (II)

normalized age:	8650 ± 100
$\delta^{13}C$:	-27.5‰
uncorrected age:	8690 ± 100

The black, finely laminated (algal) gyttja lake sediment sample MS-78-12 (495–505 cm; 149.9 g wet weight), enclosed in lake sediment, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (12.5 g) yielded 5.95 L of CO_2 gas. The age estimate is based on two 1-day counts in the 5 L counter with a mixing ratio of 1.00. The count rate for the sample (net) and monthly backgrounds and standards (net) were 9.402 ± 0.099, 2.237 ± 0.033, and 27.731 ± 0.133 cpm, respectively.

Comment (R.J. Mott): Date GSC-3492 (8.7 ka BP) dates the end of the *Alnus crispa* (green alder)–dominated pollen zone and the beginning of the increase in *Pinus strobus* (white pine) pollen.

Beta-70672 (CAMS-11531). Island Lake (III)

normalized age:	9920 ± 60
$\delta^{13}C$:	-28.5‰
uncorrected age:	9980 ± 60

The organic plant material sample MS-78-12 (650 cm) was enclosed in lake sediment. This sample was submitted by H. Jetté as a crosscheck comparison on GSC-2748.

Comment (R.J. Mott): A bulk sample from 633 to 638 cm in the core from Island Lake was previously dated at 12 300 ± 210 years BP (GSC-2748) and was reported (McNeely, 1989) as probably too old, judging by the pollen assemblage at that level and the presence of carbonate minerals in the basal sediments. The date on terrestrial plant material from 650 cm in the same core (Beta-70672) was 9.9 ka BP, thus verifying the anomalous age of GSC-2748. Therefore, the warm interval and the succeeding Younger Dryas cold interval, recorded at many sites throughout the Maritimes (Mott et al., 1986), are not seen at this site.

GSC-2748. Island Lake (IV)

normalized age:	12 300 ± 210
$\delta^{13}C$:	-33.4‰
uncorrected age:	12 400 ± 210

The basal, black, finely laminated, silty gyttja lake sediment sample MS-78-12 (633–638 cm) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (12.4 g) yielded 2.14 L of CO_2 gas. The age estimate is based on two 1-day counts in the 2 L counter with a mixing ratio of 2.06. The count rate for the sample (net) and monthly backgrounds and standards (net) were 3.833 ± 0.092, 1.260 ± 0.023, and 18.044 ± 0.149 cpm, respectively.

Comment (R.J. Mott): Date GSC-3942 dates the beginning of the increase in pine (*Pinus*) pollen following the decline in spruce (*Picea*) and the increase of birch (*Betula*) pollen. Date GSC-2748 dates the beginning of organic accumulation and is a minimum for deglaciation of the area. Despite being comparable to shell dates along the coast of Chaleur Bay (Rampton et al., 1984), the age is considerably older than expected based on the pollen spectra of the basal sediments. The late-glacial climatic amelioration and subsequent climatic cooling prior to 10.0 ka BP, found at numerous sites throughout southern New Brunswick and Nova Scotia (Mott et al., 1986), is not readily apparent in this core, suggesting that the actual date for the basal sediments is probably between 10 and 11 ka BP, and that the oscillation, if present, lies below. Contamination of the basal sediments by old carbonates is suspected.

Roulston Lake Series

Roulston Lake is located 1.3 km south of Plaster Rock, New Brunswick (46°53.5′N, 67°24′W), at an elevation of about 155 m. A 446 cm long core was obtained by R.J. Mott on August 20, 1978 with a modified Livingstone piston corer beneath about 4 m of water. The lake is situated in an area of till and glaciofluvial deposits overlying Mississippian sedimentary rocks, including gypsum, and the lake may be a karst depression (Rampton et al., 1984). The core showed 399 cm of brown algal gyttja and banded gyttja overlying 11 cm of brownish grey silty gyttja, 5 cm of pinkish brown silty clay, and banded, silty organic clay to the base of the core. The corer could barely penetrate the underlying reddish brown till that was recovered in another core in a shallower part of the lake. These samples were submitted by R.J. Mott to gain information on the pollen spectra and the rate of organic sedimentation, and to provide a minimum age for deglaciation.

GSC-5639. Roulston Lake (I)

normalized age:	5480 ± 150
$\delta^{13}C$:	-31.1‰
uncorrected age:	5580 ± 150

The dark brown algal gyttja lake sediment sample MS-78-15 (233–240 cm; 29.4 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (1.9 g) yielded 1.08 L of CO_2 gas. The age estimate is based on one count for 5145 minutes in the 2 L counter with a mixing ratio of 4.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.031 ± 0.145, 1.266 ± 0.025, and 18.088 ± 0.145 cpm, respectively.

GSC-3455. Roulston Lake (II)

normalized age:	8150 ± 130
$\delta^{13}C$:	-32.8‰
uncorrected age:	8280 ± 130

The gyttja (algal) lake sediment sample MS-78-15 (348–358 cm; 83.1 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (6.0 g) yielded 2.16 L of CO_2 gas. The age estimate is based on one 3-day count in the 2 L counter with a mixing ratio of 2.15. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.533 ± 0.091, 1.262 ± 0.028, and 18.305 ± 0.120 cpm, respectively.

GSC-2872. Roulston Lake (III)

normalized age:	9930 ± 160
$\delta^{13}C$:	-24.8‰
uncorrected age:	9920 ± 160

The gyttja lake sediment sample MS-78-15 (406–409.5 cm; 75.1 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (24.3 g) yielded 1.65 L of CO_2 gas. The age estimate is based on one 3-day count in the 2 L counter with a mixing ratio of 2.64. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.119 ± 0.091, 1.246 ± 0.021, and 17.609 ± 0.098 cpm, respectively.

GSC-2804. Roulston Lake (IV)

normalized age:	11 100 ± 90
$\delta^{13}C$:	-23.2‰
uncorrected age:	11 100 ± 90

The basal clayey gyttja lake sediment sample MS-78-15 (440–446 cm; 124.6 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (59.0 g) yielded 6.29 L of CO_2 gas. The age estimate is based on one 3-day count in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.991 ± 0.052, 2.308 ± 0.022, and 27.886 ± 0.118 cpm, respectively.

Comment (R.J. Mott): Three dates from this site were reported previously in McNeely (1989): GSC-3455 dated the top of the spruce (*Picea*) pollen zone; GSC-2872 dated the end of the cool period and the beginning of Holocene warming; and GSC-2804 dated the close of the warm period following deglaciation prior to the climatic reversion. This reversion is seen in the pollen spectra as a change from shrub tundra spectra to those indicative of herbaceous tundra. The climatic oscillation is recorded throughout southern New Brunswick and Nova Scotia (Mott et al., 1986), and this site represents the most northerly New Brunswick locality where it is readily seen in the pollen spectra and the core lithology. Date GSC-5639 was dated to provide ages for the hemlock maximum in the upper Saint John River valley and the pollen assemblage surrounding the 6.0 ka BP level in the sequence.

Quebec

GSC-5978. Portage-du-Cap

normalized age:	31 400 ± 710
corrected age:	31 000 ± 710
$\delta^{13}C$:	-2.98‰
uncorrected age:	31 000 ± 710

The marine shells (*Crassostrea virginica*, identified by M. Parent) were enclosed in silty sand. Sample PIA-880704-2DD was collected by M. Parent and J.M. Dubois on September 19, 1989 about 300 m northwest of a three-way intersection at Portage-du-Cap, Îles-de-la-Madeleine, Quebec (47°14′32″N, 61°53′57″W), at an elevation of 11 m. The sample was submitted by M. Parent to gain information on sea-level change, specifically submergence.

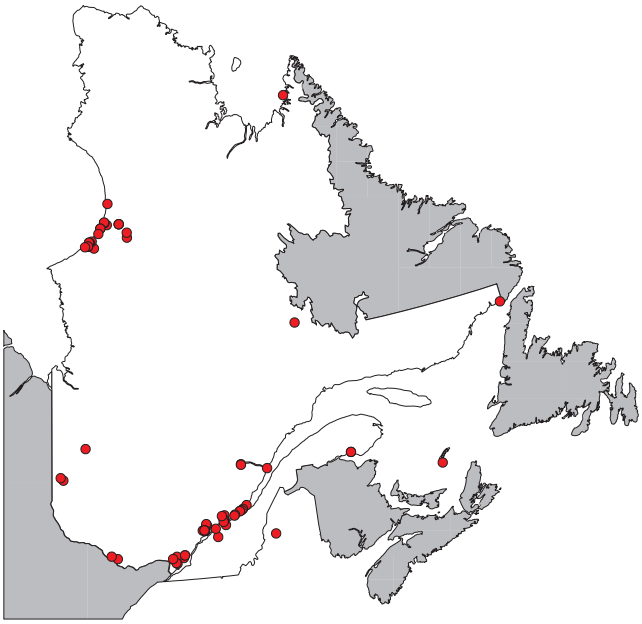

Figure 6. Radiocarbon-dated sites in Quebec.

The sample (24.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.4 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.383 ± 0.033, 1.195 ± 0.026, and 18.272 ± 0.110 cpm, respectively.

Comment (M. Parent): A fresh back-hoe excavation was made about midslope at the site because the shell-bearing unit was known to lie at a depth of 4 to 5 m, and because of the risk of disturbance to the foundations of the house located upslope. Shells previously collected at this site from a debris pile of an abandoned water well, and therefore not in situ, were dated at 39 000 ± 1200 years BP (UQ-1648). An age of the pre–Late Wisconsinan marine transgression, possibly a late Sangamonian high sea-level stand, was expected.

Fire Lake Series

A series of lake sediment, plant material, and wood samples was collected by R. Klassen and R.J. Mott on July 26, 1988 from Fire Lake, Quebec, about 70 km south-southwest of Labrador City–Wabush, Labrador (52°21′N, 67°22′W), at an elevation of 600 m. These samples were submitted by J.V. Matthews, Jr. and R.J. Mott to gain information on deglaciation, and climate and vegetation change.

Beta-61765 (CAMS-6203). Fire Lake (I)

normalized age: 3220 ± 70

The plant material (sample 110–120 cm above base; *Myrica* leaves, identified by J.V. Matthews, Jr.) was enclosed in coarse woody peat, more mossy above. It was from the peat unit above pond deposits. The age was normalized assuming $\delta^{13}C = -25‰$.

Beta-61764 (CAMS-6202). Fire Lake (II)

normalized age: 3430 ± 60

The wood (twig sample 70–80 cm above base; *Larix*, identified by J.V. Matthews, Jr.) was enclosed in coarse detrital peat (less fibrous than above). It was collected from the peat unit above pond deposits. The age was normalized assuming $\delta^{13}C = -25‰$.

Beta-61763 (CAMS-6201). Fire Lake (III)

normalized age: 4390 ± 60

The wood (twig sample 50–60 cm above base) was enclosed in algal gyttja. The age was normalized assuming $\delta^{13}C = -25‰$.

TO-5706. Fire Lake (IV)

normalized age: 6540 ± 100

The wood (twig sample 10–20 cm above the base; mainly *Salix*, identified by A. Telka in Lab Report ES-95-0239) was enclosed in light grey/brown gyttja with algal gyttja above. This sample was submitted by R.J. Mott as a crosscheck date on GSC-4764. The age was normalized assuming $\delta^{13}C = -25‰$. The original GSC date was on a bulk sample from the pond deposit. See ESL Lab. Bk 1-34, 35 (ES-95-0238/0239D) for diagram and details.

GSC-4764. Fire Lake (V)

normalized age:	7660 ± 100
$\delta^{13}C$:	-27.9‰
uncorrected age:	7710 ± 100

The basal silty gyttja lake sediment sample PL-88-89 (260 cm depth or 20 cm above the base; 136.3 g dry weight), with clay below and gyttja above, was treated with cold base, hot acid, and distilled water rinses (it was noncalcareous). The treated sample (54.5 g) yielded 6.00 L of CO_2 gas. The age estimate is based on two counts for 2030 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.920 ± 0.065, 1.092 ± 0.018, and 18.072 ± 0.097 cpm, respectively.

Comments (R.J. Mott): A 280 cm thick section along a stream in southwestern Labrador exposed a complete Holocene sequence of organic lake sediments overlying grey clay and sand, and overlain by peat deposits. Bulk sediment from 20 cm above the basal sand at the contact between the light grey/brown, slightly organic clayey sediment and the overlying silty gyttja produced a conventional date of 7660 ± 100 years BP. An AMS date on *Salix* (willow) twigs (TO-5706) from about 2 cm below the bulk date was 6540 ± 100 years BP. This suggests that the bulk sediment date is probably somewhat anomalous and the minimum age for the inception of organic deposition following deglaciation of the area was 6540 years BP. Woody twigs (Beta-61763), obtained from the interval 50 to 60 cm above the base in algal gyttja, produced an AMS date of 4390 ± 60 years BP. A *Larix* (tamarack) short shoot (Beta-61764) from fibrous detrital peat at 70 to 80 cm above the base, immediately above the contact with the underlying algal gyttja, gave an AMS age of 3430 ± 60 years BP. *Myrica* leaves (Beta-61765) from 110 to 120 cm above the base in coarse woody peat provided an AMS age of 3220 ± 70 years BP. These latter dates provide a chronology for the pollen profile that shows a shift from early assemblages dominated by *Alnus* (alder) and *Betula* (birch) to spectra dominated by *Picea* (spruce) pollen. A beaver-built structure (dam or lodge) of branches was exposed adjacent to the dated sediments. Correlation of the sediment stratigraphy in the two sections shows that the structure was formed sometime in the 200-year interval between about 3400 and 3200 years BP.

GSC-6271. La Baie

normalized age:	9300 ± 110
corrected age:	8900 ± 110
$\delta^{13}C$:	-2.74‰
uncorrected age:	8940 ± 110

The marine shells (*Mya arenaria*, identified by M. Parent) were enclosed in intertidal clayey diamicton. Sample PIA-La Baie 1 was collected by M. Parent and C. Bégin in 1998 from an old exposure along a generally forested slope, within the city of La Baie, Quebec (48°19′21″N, 70°52′43″W), at an elevation of 78 m. The sample was submitted by M. Parent to gain information on sea-level change related to the Laflamme Sea regression.

The sample (23.3 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (20.6 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 3710 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.949 ± 0.050, 1.227 ± 0.024, and 18.101 ± 0.150 cpm, respectively.

Comment (M. Parent): Shells were collected in a fairly old exposure along a generally forested slope. The enclosing clayey intertidal-diamicton underlies a regressive terrace at about 80 m a.s.l. Brown encrustations on the surface of some shells had to be removed prior to the leaching of the material for dating. The date provides an age for the Laflamme Sea regression to a level of about 80 m a.s.l.

GSC-6261. Ha! Ha! River

$\delta^{13}C$:	-22.64‰
age:	>39 000

The wood fragment (*Picea*, identified by C. Keith) was enclosed in a diamicton (debris flow) and laminated marine mud of the Laflamme Sea. Sample Ha Ha-9-97 was collected by M. Parent and C. Bégin on September 11, 1997 from a natural exposure about 2 m above river level on the right bank of Ha! Ha! River, about 1.5 km upstream from the river mouth at Grande-Baie, Quebec (48°18′12″N, 70°52′57″W), at an elevation of 55 m. The sample was submitted by M. Parent.

The sample (12.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.5 g) yielded 7.3 L of CO_2 gas. The age estimate is based on one count for 3765 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.030 ± 0.048, 2.212 ± 0.041, and 28.444 ± 0.139 cpm, respectively.

Comment (M. Parent): The flood of July 1996 created a fresh exposure on the right bank of the river about 2 m above the water level. The freshly exposed diamicton contained abundant wood fragments slightly above river level, within a sequence of laminated mud deposited in the Laflamme Sea. It was hoped that the date would provide an age for the enclosing diamicton (debris flow) and marine sediment (i.e. the wood was reworked from trees growing in the watershed at the time of the Laflamme Sea). This date indicates that the wood has been recycled from much older material that had been incorporated into the regional till.

GSC-6280. Chateau-Richer

normalized age:	10 300 ± 110
corrected age:	9890 ± 110
$\delta^{13}C$:	+0.80‰
uncorrected age:	9880 ± 110

The marine shells (*Hiatella arctica*, identified by A. Bolduc) were enclosed in reworked till. Sample 98-BZA-0026 was collected by A. Bolduc and S. Paradis on October 02, 1998 from 1.5 km west-northwest of Chateau-Richer, Quebec (46°58′12″N, 71°01′48″W), at an elevation of 65 m. The sample was submitted by A. Bolduc to gain information on sea-level change in either the Goldthwait Sea or the Champlain Sea.

The sample (30.4 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (20.4 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.271 ± 0.049, 1.236 ± 0.027, and 18.030 ± 0.148 cpm, respectively.

Comment (A. Bolduc): This is one of the youngest ages obtained on faunas of the Goldthwait Sea or even the Champlain Sea, and is the north-shore equivalent of a fauna dated at 9860 ± 80 years BP (TO-4162; Dionne and Occhietti, 1996) on the south shore at Berthier-sur-Mer. By this time, most of the basin is assumed to have been under brackish if not freshwater conditions, except perhaps some sunken saline pools in the Mauricie area (e.g. GSC-6276, -6356). Such a young age was not expected on the Côte-de-Beaupré. This indicates that the transition zone between marine waters of the end of the Goldthwait Sea and fresh estuarine waters west of Québec city (GSC-1796, 9730 ± 190 years BP at 42 m a.s.l. LaSalle et al. (1977)) was relatively narrow, as less than 40 km separate the two sites. This date also supports a late stabilization of relative sea level, as suggested by Occhietti et al. (2001).

GSC-6285. L'Ange-Gardien

normalized age:	11 100 ± 100
corrected age:	10 700 ± 100
$\delta^{13}C$:	+0.27‰
uncorrected age:	10 700 ± 100

The marine shells (*Macoma balthica*, identified by A. Bolduc) were enclosed in massive to faintly stratified sand. Sample 98-BZA-0025 (1–1.5 m depth) was collected by A. Bolduc and S. Paradis on September 30, 1998 from 2.25 km north of L'Ange-Gardien, Quebec (46°56′11″N, 71°05′37″W), at an elevation of 115 m. The sample was submitted by A. Bolduc to gain information on sea-level change, specifically emergence, and the thanatocenose.

The sample (39.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (30.7 g) yielded 6.6 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.508 ± 0.061, 2.230 ± 0.035, and 28.420 ± 0.140 cpm, respectively.

Comment (A. Bolduc): This site, which is located in the 'transition zone' between the Champlain and Goldthwait seas, is composed of mostly *Macoma balthica*, normally associated with littoral to sublittoral environments. The shells are not in situ, but are not likely to have been transported a great distance. This age fits well with other published dates (e.g. GSC-6280, -6283, and -6292), together with some of the

published dates on marine shells (GSC-1232, 11 100 ± 160 years BP at 106 m a.s.l., LaSalle (1974); GSC-1235, 11 600 ± 160 years BP at 176 m a.s.l., LaSalle et al. (1977); GSC-1295, 11 200 ± 160 years BP at 67 m a.s.l., LaSalle (1974)), freshwater shells (GSC-1796, 9730 ± 190 years BP at 42 m a.s.l., LaSalle et al. (1977)) and charcoal of an archeological site on the south shore of the St. Lawrence River (Beta-40342, 7990 ± 80 years BP, 23 m, Laliberté, 1992) to form a consistent marine-regression curve for the Québec city region.

GSC-6292. Place-Notre-Dame

normalized age:	11 100 ± 120
corrected age:	10 700 ± 120
$\delta^{13}C$:	+0.18‰
uncorrected age:	10 700 ± 120

The marine shells (*Macoma calcarea*, identified by M. Parent and A. Bolduc) were enclosed in sand at the contact between underlying till and overlying littoral sand (1 m). Sample 98-BZA-0027 was collected by A. Bolduc, S. Paradis, M. Parent, and Y. Michaud on October 16, 1998 from 2 km northwest of Place-Notre-Dame, on boulevard de l'Aéroport, 'Ancienne-Lorette', Sainte-Foy, Quebec (46°49′34″N, 71°24′29″W), at an elevation of 85 m. The sample was submitted by A. Bolduc to gain information on sea-level change related to emergence in the Champlain Sea, and the thanatocenose.

The sample (18.9 g dry weight) was treated with an acid leach to remove the outer 15%. The treated sample (15.0 g) yielded 3.2 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.28. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.770 ± 0.057, 1.275 ± 0.026, and 18.118 ± 0.111 cpm, respectively.

Comment (A. Bolduc): The fauna found at this site include *Mya arenaria*, the presence of which suggests a nearshore environment. The species submitted, *Macoma calcarea*, however, can live much deeper. This site is too old to correspond to the *Mya arenaria* phase of Occhietti et al. (2001); alternatively, the shells dated are not contemporaneous with *M. arenaria* but are an older assemblage reworked into this site from a higher location. The new dates published (e.g. GSC-6280, -6283, and -6285), together with some of the published dates on marine shells (GSC-1232, 11 100 ± 160 years BP at 106 m a.s.l., LaSalle (1974); GSC-1235, 11 600 ± 160 years BP at 176 m a.s.l., LaSalle et al. (1977); GSC-1295, 11 200 ± 160 years BP at 67 m a.s.l., LaSalle (1974); GSC-1533, 12 400 ± 110 years BP at 110 m a.s.l., LaSalle et al. (1977)), GSC-1796 freshwater shells; 9730 ± 90 years BP at 42 m a.s.l., LaSalle et al. (1977)) and charcoal of an archeological site on the south shore of the St. Lawrence River (Beta-40342, 7990 ± 80 years BP at 23 m a.s.l., Laliberté (1992)) consistently suggest emergence of the 85 m site by 10.8 ka BP.

GSC-6283. Les Grands-Déserts

normalized age:	11 300 ± 110
corrected age:	10 900 ± 110
$\delta^{13}C$:	+0.64‰
uncorrected age:	10 900 ± 110

The marine shells (*Balanus hameri*, identified by A. Bolduc) were enclosed in clayey diamicton. Sample 98-BZA-0028 was collected by A. Bolduc and S. Paradis on September 11, 1998 from 2 km west of Les Grands-Déserts, Highway 358, 'Ancienne-Lorette', Sainte-Foy, Quebec (46°47′54″N, 71°26′29″W), at an elevation of 75 m. The sample was submitted by A. Bolduc to gain information on sea-level change and the thanocenose.

The sample (39.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.27 g) yielded 6.65 L of CO_2 gas. The age estimate is based on one count for 2650 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.296 ± 0.069, 2.210 ± 0.034, and 28.265 ± 0.191 cpm, respectively.

Comment (A. Bolduc): The age obtained at this site corresponds to the end of the *Balanus hameri* phase of Occhietti et al. (2001), which is either the result of a glacial readvance (LaSalle and Shilts, 1993) and equivalent to the Saint-Nicolas till, or sedimentation from a floating ice margin (Cummings, 1999) or, more likely at this time, from calved icebergs. *Balanus hameri* can live in deep waters, and clearly this site is not a regression site. It fits well, however, with the diamictic sedimentation in the Champlain Sea basin associated with the Saint-Narcisse episode.

GSC-6362. Sainte-Anne River

normalized age:	10 900 ± 140
corrected age:	10 500 ± 140
$\delta^{13}C$:	-0.11‰
uncorrected age:	10 500 ± 140

The marine shells (*Portlandia arctica* mainly with *Mya*, identified by M. Parent) were enclosed in laminated clay. Sample 98-FG-019 was collected by F. Girard and M. Parent on September 21, 1998 from the left bank of the Sainte-Anne River, 6.5 km downstream from the bridge in Saint-Raymond, Portneuf County, Quebec (46°50′18″N, 71°52′43″W), at an elevation of 128 m. The sample was submitted by M. Parent to gain information on deglaciation and sea-level change.

The sample (42.3 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (29.8 g) yielded 3.7 L of CO_2 gas. The age estimate is based on one count for 3890 minutes in the 2 L counter with a mixing ratio of 1.09. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.858 ± 0.065, 1.313 ± 0.045, and 17.866 ± 0.153 cpm, respectively.

Comment (M. Parent): *Portlandia arctica* shells were collected from a fresh exposure in the natural left bank of the Sainte-Anne River. The shells provide an indirect date on the nearby Saint-Narcisse moraine, since the site is just 3 km down-glacier from the moraine.

GSC-6213. Portneuf

normalized age:	10 300 ± 80
corrected age:	9930 ± 80
$\delta^{13}C$:	+0.23‰
uncorrected age:	9920 ± 80

The marine shells (*Hiatella arctica*, identified by A. Bolduc) were enclosed in sand. Sample 97-BZA-0001 was collected by A. Bolduc, M. Parent, and F. Girard on July 7, 1997 from 1.5 km north of the town of Portneuf, Quebec (46°42′N, 71°53′24″W), at an elevation of about 20 m. The sample was submitted by A. Bolduc to gain information on lake-level change, a maximum age for glacial Lampsilis Lake, and sea-level change.

The sample (37.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (28.9 g) yielded 6.2 L of CO_2 gas. The age estimate is based on one count for 8120 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.240 ± 0.050, 2.260 ± 0.035, and 28.346 ± 0.136 cpm, respectively.

Comment (A. Bolduc): The marine shells collected in the sandy deltaic sequence at Portneuf, Quebec were obviously reworked. Paleocurrent indicators clearly indicate flow to the west, opposite to flow in the St. Lawrence River. The altitude of the delta sequence, about 20 m a.s.l., the paleoflows and the broken shells all suggest that the environment of sedimentation was likely a tidewater delta built by incoming ebb tides along the fluvial segment of the proto–St. Lawrence River into glacial Lampsilis Lake. This date provides a maximum age for the beginning of glacial Lampsilis Lake. Sometime after 9.9 ka BP, the central St. Lawrence Lowland basin ceased to be directly connected with the Atlantic waters as glacio-isostatic rebound was nearing completion. This date is consistent with the seemingly too-young faunas at Saint-Étienne-des-Grès (GSC-6356, 9730 ± 300 years BP; GSC-6276, 9890 ± 90 years BP; GSC-6376, 10 100 ± 100 years BP; this volume) and with ages obtained on freshwater faunas, *Elliptio complanatus* in the Québec city region (GSC-1796, 9730 ± 190 years BP at 42 m a.s.l., LaSalle et al. (1977)) and *Lampsilis siliquoidea* in the Montréal area (GSC-2414, 9750 ± 150 years BP at 47 m a.s.l., Richard (1978)).

Portneuf Series

A series of marine-shell samples was collected by M. Parent and Y. Michaud on August 26, 1997 near the bridge, about 4 km northwest of the main intersection in the town of Portneuf, Quebec (46°42′26″N, 71°55′48″W), at an elevation of 85 m. These samples were submitted by M. Parent to gain information on sea-level change, specifically the 85 m relative sea level.

GSC-6270. Portneuf (I)

normalized age:	10 500 ± 100
corrected age:	10 100 ± 100
$\delta^{13}C$:	-2.17‰
uncorrected age:	10 100 ± 100

The marine-shell sample 97-MNB-51-B (25.0 g dry weight; *Macoma balthica*, identified by M. Parent), enclosed in sand with minor gravel, was treated with an acid leach to remove the outer 20%. The treated sample (20.1 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.136 ± 0.048, 1.218 ± 0.025, and 18.054 ± 0.108 cpm, respectively.

Comment (M. Parent): A site about 50 m from 97-MNB-51-A (GSC-6272) was freshly excavated in material from below stream level near the bridge, exposing sand with minor gravel. The shell sample collected dates the marine regression at about 85 m a.s.l.

GSC-6272. Portneuf (II)

normalized age:	11 700 ± 110
corrected age:	11 300 ± 110
$\delta^{13}C$:	+0.72‰
uncorrected age:	11 200 ± 110

The marine-shell sample 97-MNB-51-A (38.4 g dry weight; *Balanus hameri*, identified by M. Parent) was treated with an acid leach to remove the outer 20%. The treated sample (30.2 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3710 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.027 ± 0.060, 2.270 ± 0.033, and 28.501 ± 0.190 cpm, respectively.

Comment (M. Parent): A shell collection was made in a fresh exposure along the right bank of a brook in sand and till. The shells date the deep-water phase of the Champlain Sea in the region, and provide a minimum age for the marine incursion into the region.

GSC-6051. Deschambault

normalized age:	11 700 ± 100
corrected age:	11 300 ± 100
$\delta^{13}C$:	+0.28‰
uncorrected age:	11 300 ± 100

The marine shells (*Balanus*, identified by A. Bolduc) were enclosed in glaciomarine diamicton. Sample 95-BZA-8059 was collected by A. Bolduc and A. Shaw on July 20, 1995 from 1 km southwest of Deschambault, along Highway 138, on the north shore of the St. Lawrence River, Quebec (46°38′42″N, 71°56′38″W), at an elevation of 10 m. The sample was submitted by A. Bolduc to gain information on sea-level change in the Champlain Sea.

The sample (40.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.7 g) yielded 6.7 L of CO_2 gas. The age estimate is based on one count for 3850 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.979 ± 0.055, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

Comment (A. Bolduc): The age determination, obtained on in situ shells of *Balanus hameri* in a glaciomarine diamicton, is virtually identical to those reported in LaSalle and Shilts (1993) for the Pointe Saint-Nicolas site (GSC-1476, 11 200 ± 170), Chevalier site (GSC-1232, 11 100 ± 160), and Issoudun site (GSC-4998, 11 400 ± 90) for what they interpreted as fossiliferous till (Saint-Nicolas till), suggesting readvance of the Laurentide ice sheet into the Champlain Sea. A new date obtained at Pointe Saint-Nicolas by Cummings (1999) for a clayey unit stratigraphically lower than the presumed Saint-Nicolas till (Beta-125967, 10 950 ± 60) was used by Occhietti et al (2001) to extend a deep-water sedimentation phase with colonization by *Balanus hameri* from 11.4 to 10.9 ka BP. The presence of an undisturbed 11.3 ka BP fauna on the north shore suggests that there may have been a phase of floating ice margin before the Saint-Narcisse episode (Cummings, 1999), rather than a readvance of the ice into the Champlain Sea (LaSalle and Shilts, 1993). Alternatively, if the ice margin surged into the Champlain Sea basin to form the Saint-Nicolas till, it may not have been grounded everywhere, leaving areas that don't appear to have been ridden by ice. Nevertheless, this date extends the area over which early *Balanus* colonization is recognized.

GSC-6039. Sainte-Christine

normalized age:	10 700 ± 100
corrected age:	10 300 ± 100
$\delta^{13}C$:	+0.46‰
uncorrected age:	10 300 ± 100

The marine shells (*Hiatella arctica*, identified by A. Bolduc) were enclosed in marine clay with gravelly layers. Sample 95-BZA-8069 was collected by A. Bolduc and M-E. Lesieur on July 26, 1995 from 2 km north-northwest of Sainte-Christine, north of the Sainte-Anne River and the Saint-Narcisse moraine, Quebec (46°49′22″N, 71°59′49″W), at an elevation of 140 m. The sample was submitted by A. Bolduc to gain information on sea-level change in the Champlain Sea.

The sample (39.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.0 g) yielded 6.6 L of CO_2 gas. The age estimate is based on one count for 3740 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.928 ± 0.063, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Comment (A. Bolduc): This site is located north of the Saint-Narcisse moraine, tucked in close to the Laurentian Mountains. This age determination is compatible with others obtained in the Mauricie area on reworked sand of the Saint-Narcisse moraine (GSC-1700, 10 200 ± 160 years BP at 128 m a.s.l., Occhietti (1980); GSC-1444, 10 100 ± 150 years BP at 137 m a.s.l., Lowdon and Blake (1975)), as well as on faunas collected north of the moraine (GSC-2101, 10 300 ± 100 years BP at 129 m a.s.l., Occhietti (1980); GSC-6215, 10 500 ± 100 years BP at 150 m a.s.l.; GSC-6217, 10 300 ± 90 years BP at 130 m a.s.l.). It confirms that the Saint-Narcisse episode was well over by that time and that glacio-isostatic rebound was similar along the Laurentian piedmont, at least east of the Saint-Maurice River. A short sequence of regression rhythmites above the fossiliferous layer suggests the shoreline was within a few metres vertically of the site at the time the shells were deposited.

GSC-6304. Champlain River

normalized age:	2180 ± 60
$\delta^{13}C$:	-25.64‰
uncorrected age:	2190 ± 60

The wood (*Prunus*, identified by C. Keith) was enclosed in silt. Sample 98-BZA-0005 was collected by A. Bolduc and F. Girard on July 20, 1998 from the east bank of the Champlain River, 2.5 km northeast of Champlain, Quebec (46°27′40″N, 72°19′30″W), at an elevation of 5 m. The sample was submitted by A. Bolduc to gain information on sea-level change, specifically the Laurentian or Mitis levels.

The sample (7.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.6 g) yielded 5.4 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.801 ± 0.068, 1.275 ± 0.026, and 18.118 ± 0.111 cpm, respectively.

Comment (A. Bolduc): This site represents a flood-bank deposit. The dynamics of the Champlain River may have played a role in the burial of the organic matter, but the age obtained on the logs indicates that these events took place during a high marine stand associated with the Mitis transgression. These data suggest that the low terrace around Lake Saint-Pierre may have been built during that time (Bolduc, 1999a). A duplicate age, obtained by J-C. Dionne (2002, UL-2239, 2020 ± 70 years BP) from the same site, confirms the timing of the burial of the organic bed during the Mitis transgression.

GSC-6215. Grand-Mère

normalized age:	10 900 ± 100
corrected age:	10 500 ± 100
$\delta^{13}C$:	+0.79‰
uncorrected age:	10 500 ± 100

The marine shells, often paired valves (*Hiatella arctica*, identified by A. Bolduc), were enclosed in clay. Sample 97-BZA-0008 was collected by A. Bolduc and F. Girard on July 21, 1997 from 2.5 km northwest of Grand-Mère, Mauricie, Quebec (46°37′45″N, 72°43′W), at an elevation of 150 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (33.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (25.2 g) yielded 5.4 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.957 ± 0.043, 1.217 ± 0.027, and 18.231 ± 0.108 cpm, respectively.

Comment (A. Bolduc): The sequence clearly indicates a delta environment. The fauna is rich and somewhat diversified, suggesting full marine conditions. The state of preservation of even the most fragile shells suggests that the assemblage, if not in situ, is at least representative of the timing of sedimentation of the delta. The age, obtained from a *Hiatella arctica* population, indicates that the Champlain Sea was receding rapidly after emplacement of the Saint-Narcisse moraine. The highest shorelines recorded in the area, at 198 m a.s.l., are on the flanks of the Laurentian hills at Saint-Tite and Lac-à-la-Pêche. There are no known faunal assemblages associated with these shorelines. The maximum shorelines can only have been built after the Saint-Narcisse episode, after 11 to 10.8 ka BP. Therefore, there could only have been a few hundred years between retreat of the glacier north of this site to allow shoreline formation after the Saint-Narcisse episode and recession of the sea to 150 m a.s.l.

GSC-6376. Yamachiche River

normalized age:	10 500 ± 100
corrected age:	10 100 ± 100
$\delta^{13}C$:	+0.95‰
uncorrected age:	10 100 ± 100

The marine shells (*Macoma balthica*, *Hiatella arctica*, and *Mya truncata*, identified by A. Bolduc) were enclosed in clay with sandy layers. Sample 98-BZA-0002 was collected by A. Bolduc and F. Girard on July 17, 1998 from 4 km west-northwest of Saint-Etienne-des-Grès, north of the bridge on the east bank of the Yamachiche River, Quebec (46°26′49″N, 72°49′35″W), at an elevation of 95 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (41.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.9 g) yielded 7.0 L of CO_2 gas. The age estimate is based on one count for 2420 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.057 ± 0.075, 2.320 ± 0.036, and 28.282 ± 0.137 cpm, respectively.

Comment (A. Bolduc): This site is located just south of the Saint-Narcisse moraine, and a few kilometres north of samples GSC-6356 and -6276. It was submitted to shed some light on those ages that appeared too young. This age is a little older than GSC-6276, but its error overlaps with that for GSC-6356. It is still fairly young for what is expected in this setting but, contrary to those ages obtained farther down river, the clay sequence above the sampling site is only a few metres thick. There is no need to suggest rapid sedimentation in 'deep' water. The age fits reasonably well in the expected marine regression in the Mauricie area.

GSC-6217. Charette

normalized age:	10 700 ± 90
corrected age:	10 300 ± 90
$\delta^{13}C$:	+0.83‰
uncorrected age:	10 300 ± 90

The marine shells, often paired valves (*Hiatella arctica*, identified by A. Bolduc), were enclosed in clay. Sample 97-BZA-0037 B was collected by A. Bolduc and F. Lenormand

on September 24, 1997 from 1.75 km east-northeast of Charette, Quebec (46°26′45″N, 72°54′W), at an elevation of 130 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (34.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (25.8 g) yielded 5.5 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.893 ± 0.056, 2.260 ± 0.035, and 28.346 ± 0.136 cpm, respectively.

Comment (A. Bolduc): The shells were collected on the northern flank of the Saint-Narcisse moraine in a storm deposit, indicating that the shoreline was close by but possibly lower than the elevation of the sample site. The age determination on these shells is consistent with those obtained on similar sites of reworked sand along the Saint-Narcisse moraine (GSC-1700, 10 200 ± 160 years BP at 128 m a.s.l., Occhietti (1980); GSC-1444, 10 100 ± 150 years BP at 137 m a.s.l., Lowdon and Blake (1975)). Together with GSC-6215, this date suggests that isostatic rebound during that time period was in the order of 10 cm/a.

GSC-6423. Sainte-Thérèse

normalized age:	11 000 ± 90
corrected age:	10 600 ± 90
$\delta^{13}C$:	-3.47‰
uncorrected age:	10 700 ± 90

The marine shells (*Macoma balthica*, identified by A. Bolduc) were enclosed in sand. Sample 99-BZA-0002 was collected by A. Bolduc and M. Ross on September 31, 1999 from 2 km northeast of the intersection of Highway 117 and the road to 'la cote Saint-Louis Est', Sainte-Thérèse, Quebec (45°40′07″N, 73°49′29″W), at an elevation of 68 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (44.3 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (29.5 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3860 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.480 ± 0.057, 2.126 ± 0.027, and 28.325 ± 0.130 cpm, respectively.

Comment (A. Bolduc): The age obtained at this site is somewhat older than expected. The geomorphological context suggested the surface to be a late littoral environment that would have supported the last marine faunas in the area and thus yield an age circa 10 ka BP. The sample was not collected from a section, but rather from excavated material in a residential development. The small error on the date indicates the population is not a mixture of various fossiliferous sediments. The site is also the highest in the area, excluding the possibility that the shells were washed in during erosion of a previously built shoreline. The most likely explanation is that, although *Macoma balthica* is usually associated with near-shore facies, it can be found from mid-tide to deep waters (Wagner, 1970). Presumably, *Macoma balthica* colonized this site regardless of water depth because it was a suitable substrate and the only one available. From GSC-6421 and Lévesque's (1982) emergence curve, Champlain Sea level should have been at least 130 m, putting the site at a water depth of more than 60 m.

GSC-6413. 'Montée de l'Eglise'

normalized age:	10 800 ± 90
corrected age:	10 400 ± 90
$\delta^{13}C$:	+1.44‰
uncorrected age:	10 300 ± 90

The marine shells (*Hiatella arctica*, identified by A. Bolduc) were enclosed in clay. Sample 99-BZA-0027A was collected by A. Bolduc and M. Ross on July 12, 1999 on the 'Montée de l'Eglise', 2 km west of Saint-Canut, Quebec (45°43′17″N, 74°06′51″W), at an elevation of 108 m. The sample was submitted by A. Bolduc to gain information on sea-level change in the Champlain Sea.

The sample (39.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (30.3 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3980 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.827 ± 0.057, 2.126 ± 0.027, and 28.325 ± 0.130 cpm, respectively.

Comment (A. Bolduc): This age is consistent with other age determinations in the area for this altitude, such as QU-74 (Hillaire-Marcel, 1974). It fits well with the emergence curve proposed by Lévesque (1982). It strengthens the rejection of QU-53 (Gangloff, 1974) as too young (9100 ± 300 years BP at 120 m a.s.l.).

GSC-6421. 'St-Hypdite'

normalized age:	11 000 ± 110
corrected age:	10 600 ± 110
$\delta^{13}C$:	+1.13‰
uncorrected age:	10 500 ± 110

The marine shells (*Hiatella arctica*, identified by A. Bolduc) were enclosed in gravelly sand. Sample 99-BZA-0069 was collected by A. Bolduc, M. Ross, and S. Paradis on September 30, 1999 along the 'St-Hypdite' road, 5.5 km north-northwest of Oka, Quebec (45°30′36″N, 74°06′53″W), at an elevation of 129 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (34.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (27.7 g) yielded 5.9 L of CO_2 gas. The age estimate is based on one count for 3985 minutes in the 2 L counter with a mixing ratio of 1.00.

The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.803 ± 0.043, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

Comment (A. Bolduc): The gravel pit in which the shells were found displays crossbedding that indicates paleocurrents toward the east-southeast. The high-energy environment suggested by the coarseness of the deposit must be the result of funnelling of currents through the Oka Hills and strong wave washing. The age obtained fits well with the proposed emergence curve (Lévesque, 1982) for the Montréal area.

GSC-6426. Saint-Placide

normalized age:	8600 ± 190
$\delta^{13}C$:	-27.30‰
uncorrected age:	8640 ± 190

The organic debris (flotsam) was enclosed in sand. Sample 99-BZA-0019 was collected by A. Bolduc and M. Ross on June 26, 1999 from 1.5 km northeast of Route 344 on the road to Saint-Etienne then 1 km southeast of the road, 2.5 km east of Saint-Placide, Quebec (45°32′04″N, 74°09′34″W), at an elevation of 55 m. The sample was submitted by A. Bolduc to gain information on sea-level change.

The sample (11.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.7 g) yielded 1.5 L of CO_2 gas. The age estimate is based on one count for 2000 minutes in the 2 L counter with a mixing ratio of 3.10. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.149 ± 0.134, 1.128 ± 0.017, and 18.019 ± 0.103 cpm, respectively.

Comment (A. Bolduc): The organic debris, twigs and leaves, measures millimetres in size. Fragments are blunt and the pieces, identified by Larouche (2000), come from a variety of environments, indicating transport. As suggested in Bolduc and Ross (2000), this site was a shallow embayment on the Rigaud terrace (60–67 m; Brown-Macpherson, 1967) that was being constructed by the proto–Ottawa River. The environment was likely alluvial bars in an anastomosing river entering a lacustrine estuary. The bars had a well established vegetation cover. The numerous charcoal fragments indicate that a forest fire might have caused increased erosion of the river banks. This age corresponds with the beginning of a period of increased fire activity recognized by Carcaillet and Richard (2000). This age also corresponds well with the estimate of Brown-Macpherson at 8.5 ka BP (1967) for the building of the Rigaud terrace, but is younger by a 1000 years than the 9.6 ka BP suggested by Lévesque (1982), an estimate he said could be younger by a few hundred years. Considering the terrace was not built instantaneously, the age range 9.5 to 8.6 ka BP may represent a period of stability of the water level at the time of transition from full marine to freshwater conditions associated with glacial-tilt recovery. The age reported for *Lampsilis siliquoidea* (GSC-2414, 9750 ± 150 years BP at 47 m, Richard (1978)) suggests freshwater conditions shortly after 10 ka BP. Residual glacio-isostatic tilting at that time projects the water-plane from 47 to 50 m at Saint-Stanislas-de-Kostka to about 60 to 70 m at Saint-Placide. It supports the idea that the Rigaud terrace is lacustrine rather than marine in origin.

GSC-6424. Lachute

normalized age:	1900 ± 60
$\delta^{13}C$:	-27.81‰
uncorrected age:	1940 ± 60

The charcoal was enclosed in sand. Sample 99-BZA-0020A was collected by A. Bolduc and M. Ross on June 29, 1999 along Route 158, 3 km east of Lachute, Quebec (45°39′49″N, 74°17′22″W), at an elevation of 69 m. The sample was submitted by A. Bolduc to gain information on geomorphic processes.

The sample (19.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.0 g) yielded 8.9 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.144 ± 0.066, 1.128 ± 0.017, and 18.019 ± 0.103 cpm, respectively.

Comment (A. Bolduc): The paleosol from which the dated charcoal fragments were collected separates two major environments. Below the paleosol, the sediments are marine to fluvial in origin and, above it, they are eolian. As reported in Bolduc and Ross (2000), the date clearly indicates that some of the dunes of the St. Lawrence lowlands were built after colonization by vegetation of the emerged surfaces. The age obtained fits well with the identified period of increased forest-fire activity related to dry summers (Carcaillet and Richard, 2000). Known human activity in the Oka area (Chapdelaine, 1990) raises the possibility that the forest fire might have been human induced rather than related to climatic factors.

Beauport Series

A series of wood samples was collected by A. Bolduc and M. Liard on August 5, 1999 from 2 km east of the intersection of Raymond Boulevard and Saint-Pierre Avenue, Beauport, Quebec (46°54′49″N, 71°10′41″W), at an elevation of 150 m. These samples were submitted by A. Bolduc to gain information on fluvial geomorphic processes.

GSC-6472. Beauport (I)

normalized age:	3280 ± 70
$\delta^{13}C$:	-27.16‰
uncorrected age:	3310 ± 70

The wood sample 99-BZA-0102B (13.8 g dry weight; *Quercus*, identified by C. Keith), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 7.8 L of CO_2 gas. The age estimate is based on one count for 5145 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.890 ± 0.063, 1.125 ± 0.038, and 17.960 ± 0.111 cpm, respectively.

GSC-6444. Beauport (II)

normalized age:	4920 ± 80
$\delta^{13}C$:	-27.38‰
uncorrected age:	4960 ± 80

The wood sample 99-BZA-0120G (11.3 g dry weight; *Quercus*, identified by C. Keith), enclosed in organic sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.4 g) yielded 6.6 L of CO_2 gas. The age estimate is based on one count for 5285 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.746 ± 0.050, 1.152 ± 0.020, and 18.077 ± 0.147 cpm, respectively.

Comment (A. Bolduc): These two dates are consistent with one another. They are somewhat younger than expected, since it was thought that the meander was carved and then abandoned in the early development of the Montmorency River. Even if the wood species, *Quercus*, is a temperate tree, it has been recognized in pollen spectra as early as the period 10 to 8 ka BP (Richard, 1994). At this site, however, the abandoned meander of the Montmorency River was likely still active 5000 years ago, but may have been used by the river for quite some time prior to that. The dates obtained on the beginning of the organomineral horizon (4920 ± 80 years BP) and the start of the completely organic sequence (3280 ± 70 years BP) bracket a time of periodic inundations of the abandoned meander. Due to the presence of large sand pits in this area (Bolduc et al., 2000), the morphology of the 5000 year old river channel is unknown. It can be suggested, however, that the definite occupation of the modern channel started about 3000 years ago.

Saint-Etienne-des-Grès Series

A series of organic matter and wood charcoal samples was collected by A. Bolduc and M. Parent on October 17, 1997 and by A. Bolduc and F. Henormant on September 30, 1997 from Chemin des Dalles, 3 km southwest of Saint-Etienne-des-Grès, Quebec (46°25′45″N, 72°48′W), at an elevation of 110 m. These samples were submitted by A. Bolduc to gain information on the initiation (reactivation) of eolian activity, and forest development and wildfires.

GSC-6219. Saint-Etienne-des-Grès (I)

normalized age:	180 ± 60
$\delta^{13}C$:	-25.98‰
uncorrected age:	190 ± 60

The wood charcoal sample 97-BZA-0041 F (4.9 g dry weight), enclosed in eolian sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.8 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 6600 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.798 ± 0.060, 1.217 ± 0.027, and 18.231 ± 0.108 cpm, respectively.

GSC-6227. Saint-Etienne-des-Grès (II)

normalized age:	190 ± 70
$\delta^{13}C$:	-26.56‰
uncorrected age:	210 ± 70

The organic matter and wood charcoal sample 97-BZA-0041 A (12.3 g dry weight), enclosed in sandy soil, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.6 g) yielded 2.3 L of CO_2 gas. The age estimate is based on one count for 3780 minutes in the 2 L counter with a mixing ratio of 1.81. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.645 ± 0.108, 1.214 ± 0.025, and 18.117 ± 0.109 cpm, respectively.

GSC-6223. Saint-Etienne-des-Grès (III)

normalized age:	8250 ± 200
$\delta^{13}C$:	-29.13‰
uncorrected age:	8320 ± 200

The wood charcoal sample 97-BZA-0041 E (3.1 g dry weight), enclosed in eolian sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.1 g) yielded 1.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 3.98. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.474 ± 0.152, 1.217 ± 0.027, and 18.231 ± 0.108 cpm, respectively.

Comment (A. Bolduc): The lower charcoal fragments are disseminated within an eolian sequence. They indicate that the vegetation cover was well established following Champlain Sea regression, contrary to the common interpretation that dune formation immediately followed marine regression. The age obtained is consistent with the seemingly too-young ages on marine faunas less than 10 km north of this site (GSC-6356, 9730 ± 300 years BP; GSC-6276, 9890 ± 90 years BP; GSC-6376, 10 100 ± 100 years BP). Even using the very conservative figure of 1 cm/a residual isostatic rebound during the period 8 to 10 ka BP, there is enough time

for marine regression to the deltaic surface (110 m) and establishment of the vegetation by 8.25 ka BP, after which the wildfire occurred. This also fits well with the increased fire activity noted by Carcaillet and Richard (2000) for the period 8.5 to 7.5 ka BP. The age of the upper soil and charcoals corresponds to a period of man-induced fire activity associated with the Forges du Saint-Maurice. At that time, a great quantity of charcoal was produced in situ as fuel for the forge operation. The site was close to a major road, Chemin des Dalles, that allowed transport of the charcoal to the forges. The area surrounding the site was restricted to the charcoal-producing activity, there being no farms or other human activity at the time (Samson, 1998).

Yamachiche River Series

A series of marine shell samples was collected by A. Bolduc and F. Girard on July 17, 1998 from north of Côte des Quatorze, 2 km west of Saint-Etienne-des-Grès, on the east bank of the Yamachiche River, Quebec (46°26′30″N, 72°48′20″W), at an elevation of 85 m. These samples were submitted by A. Bolduc to gain information on sea-level change, specifically the Saint-Narcisse episode, and to provide a crosscheck on GSC-6276.

GSC-6356. Yamachiche River (I)

normalized age:	10 100 ± 300
corrected age:	9730 ± 300
$\delta^{13}C$:	+1.29‰
uncorrected age:	9710 ± 300

The marine shell sample 98-BZA-0003 A (6.5 g dry weight; *Hiatella arctica*, identified by A. Bolduc), enclosed in sandy gravel, was treated with an acid leach to remove the outer 10%. The treated sample (5.9 g) yielded 1.2 L of CO_2 gas. The age estimate is based on one count for 2420 minutes in the 2 L counter with a mixing ratio of 3.34. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.336 ± 0.190, 1.313 ± 0.045, and 17.866 ± 0.153 cpm, respectively.

GSC-6276. Yamachiche River (II)

normalized age:	10 300 ± 90
corrected age:	9890 ± 90
$\delta^{13}C$:	+0.82‰
uncorrected age:	9880 ± 90

The marine shell sample 98-BZA-0003 (44.9 g dry weight; *Balanus hameri*, identified by A. Bolduc), enclosed in sandy gravel, was treated with an acid leach to remove the outer 30%. The treated sample (31.0 g) yielded 6.5 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.262 ± 0.056, 2.210 ± 0.034, and 28.265 ± 0.191 cpm, respectively.

Comment (A. Bolduc): When these shells were collected, in a 30 cm thick gravelly layer 25 m up a 40 m clayey sequence, they were expected to represent a faunal assemblage that lived in coarse debris shed from the Saint -Narcisse moraine. The ages obtained on two different species are clearly too young to reflect that event. Freshwater faunas, *Elliptio complanatus* in the Québec city region (GSC-1796, 9730 ± 190 years BP at 42 m a.s.l., LaSalle et al. (1977)), and *Lampsilis siliquoidea* in the Montréal area (GSC-2414, 9750 ± 150 years BP at 47 m a.s.l., Richard (1978)), suggest freshening of the basin shortly after sedimentation of the Côte des Quatorze site. Perhaps, as suggested in Occhietti (1980), the delay in glacial rebound in the Mauricie area explains why there were marine assemblages trapped in sunken marine pools underneath a freshwater wedge. The site, according to Occhietti's emergence curve (1980) should have emerged by about 9.9 ka BP. There are other young marine ages (less than 10 ka BP) in the Portneuf and Château-Richer areas (GSC-6213 and -6280). The gravelly layer may be due to a submarine slump. The 15 m of massive clay above the gravelly layer must have been rapidly deposited following a landslide or submarine slump, of which there is considerable evidence in the area. The top of the sequence, at 100 m, is a thin cover of regression sand (Bolduc, 1999b) washed off the Saint-Narcisse moraine.

Sainte-Anne-des-Plaines Series

A series of organic debris (flotsam) samples was collected by A. Bolduc and M. Ross on June 12, 1999 from 5 km southeast of Sainte-Anne-des-Plaines, Chemin du Bras Nord, Quebec (45°44′46″N, 73°45′47″W), at an elevation of 62 m. These samples were submitted by A. Bolduc to gain information on sea-level and lake-level changes, and the environment of sedimentation.

GSC-6415. Sainte-Anne-des-Plaines (I)

normalized age:	9220 ± 110
$\delta^{13}C$:	-26.82‰
uncorrected age:	9250 ± 110

The organic debris (flotsam) sample 99-BZA-0006 (11.0 g wet weight), enclosed in sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.5 g) yielded 5.1 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.649 ± 0.056, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

GSC-6431. Sainte-Anne-des-Plaines (II)

normalized age:	9600 ± 90
$\delta^{13}C$:	-27.64‰
uncorrected age:	9640 ± 90

The organic debris (flotsam) sample 99-BZA-0006E (36.0 g wet weight), enclosed in sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (13.1 g) yielded 7.2 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.581 ± 0.063, 2.080 ± 0.033, and 28.482 ± 0.131 cpm, respectively.

Comment (A. Bolduc): This site is part of a large sandy plain, the Terrebonne terrace. It is the same surface as the one where GSC-6423 was obtained. This clearly indicates that the sediment making up the plain is polygenetic, as suggested on the map by Bolduc and Ross (2001). This site more likely reflects the environment of sedimentation and is thought to be similar to GSC-6426. As proposed by Bolduc and Ross (2000), these ages represent the earliest estuarine phase, transitional between the Champlain Sea and glacial Lampsilis Lake. At that time, the Ottawa River flowed east in the valley now occupied by the Rivière du Nord. Both rivers emptied into the estuary located east of Saint-Jérôme in a series of anastomosing channels. The bars had a well established vegetation cover. The numerous charcoal fragments indicate that a forest fire might have led to increased erosion of the river banks. The vegetation remains, identified by Larouche (2000), show a mix of environments indicative of some transport. The ages of the organic debris agree with the estimate of 9.6 ka BP by Lévesque (1982) for the building of the Rigaud terrace, but are older than the 8.5 ka BP age of Brown-Macpherson (1967). This site is 7 m higher than GSC-6426, and an older age for the construction of this segment of the Rigaud terrace is compatible with previous estimates, as well as the age on *Lampsilis siliquoidea* (GSC-2414, 9750 ± 150 years BP at 47 m, Richard (1978)).

GSC-5851. Saint-Joachim

normalized age:	10 500 ± 120
corrected age:	10 100 ± 120
$\delta^{13}C$:	-0.39‰
uncorrected age:	10 100 ± 120

The marine shells, articulated valves of *Hiatella arctica* (identified by S. Occhietti), were enclosed in sand and silty sand. Sample E.15.7.93C was collected by J. Lanoie on July 15, 1993 from the road to the village of Saint-Joachim (originally Cap-Tourmente), Quebec (47°04′16″N, 70°51′09″W), at an elevation of 80 m. The sample was submitted by S. Occhietti to gain information on sea-level change, specifically the beginning of marine sedimentation.

The sample (27.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (21.5 g) yielded 4.86 L of CO_2 gas. The age estimate is based on one count for 2130 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.229 ± 0.059, 1.228 ± 0.021, and 18.462 ± 0.140 cpm, respectively.

Comment (S. Occhietti): The stratified fossiliferous beds overlie a thick sandy unit deposited as a submarine fan downstream and laterally from the large delta accumulated in the lower reaches of the Sainte-Anne River. They are overlain by marine-estuarine silt beds and regressive sandy beds. The sample dates the end of the sedimentation of the Sainte-Anne delta in the Goldthwait Sea (Lanoie, 1995; Bhiry et al., 2001), on the north shore of the present middle estuary of St. Lawrence River, 60 km downstream of Québec city.

GSC-5987. Sainte-Croix

normalized age:	10 600 ± 100
corrected age:	10 200 ± 100
$\delta^{13}C$:	-1.04‰
uncorrected age:	10 200 ± 100

The marine shells, articulated valves of *Mya arenaria* (identified by S. Occhietti), were enclosed in stratified silt, underlain by an erosional disconformity and overlain by sand. Sample CHAM-94 H4 was collected by S. Occhietti on October 11, 1994, at the intersection of Highways 226 and 271, 3 km southeast of Sainte-Croix, Quebec (46°36′06″N, 72°42′46″W), at an elevation of about 68 m. The sample was submitted by S. Occhietti to gain information on sea-level change and a paleoshoreline at about 68 m, indicating marine regression.

The sample (26.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.9 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 5000 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.169 ± 0.042, 1.250 ± 0.022, and 18.382 ± 0.101 cpm, respectively.

Comment (S. Occhietti): An erosional disconformity in Champlain Sea deposits is observed in several locations in the St. Lawrence River valley, at about the same elevation. It represents an erosional phase of the marine sediments due to relative sea-level lowering generated by glacio-isostatic rebound (forced regression). The overlying shelly bed contains shallow-water species and *Mya arenaria*, a species that requires warmer growing conditions than other common species (*Hiatella arctica*, *Macoma balthica*). The shelly bed is related to an episode of stable relative sea level or a slight transgression, as a result of a slower glacio-isostatic rebound and a rising sea level, at the beginning of the Holocene. A local marine reservoir effect on the order of 350 years, added to the standard oceanic correction of 400 years,

can be applied to this normalized ^{14}C age (*see* Occhietti et al., 2001). The shelly bed would have an estimated ^{14}C age of 9850 ± 100 years BP, definitively in the early Holocene.

GSC-5957. Issoudun

normalized age:	11 300 ± 130
corrected age:	10 900 ± 130
$\delta^{13}C$:	-1.05‰
uncorrected age:	10 900 ± 130

The marine shells, articulated plates of *Balanus hameri* (identified by S. Occhietti), were enclosed in coarse sand. Sample CHAM-94 H1 was collected by S. Occhietti on October 11, 1994 from 4.7 km west of Issoudun, 6.15 km south of the southern shore of the St. Lawrence River and 5.5 km northwest of Laurier-Station, Quebec (46°34′26″N, 72°41′10″W), at an elevation of about 90 m. The sample was submitted by S. Occhietti to gain information on deglaciation and sea-level change, specifically marine submergence.

The sample (27.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.0 g) yielded 4.61 L of CO_2 gas. The age estimate is based on one count for 2320 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.688 ± 0.057, 1.232 ± 0.025, and 18.199 ± 0.150 cpm, respectively.

Comment (S. Occhietti): The fossiliferous sand bed, 20 cm thick, overlies unfossiliferous outwash deposits and is overlain by a clayey diamicton with *Balanus hameri* fragments (GSC-4998, normalized age 11 800 ± 90 years BP, LaSalle and Shilts (1993), McNeely and Jorgensen (1993)). Stratified silt and sand beds, with shallow-water marine shells (GSC-4997, normalized age 10 700 ± 90 years BP, LaSalle and Shilts (1993)), have accumulated in local depressions. The undisturbed articulated plates of *Balanus hameri* are related to the local early-marine colonization, immediately after the deposition of a diamicton, attributed by LaSalle and Shilts (1993) to the Saint-Nicolas readvance. An age close to the age of the shelly diamicton was expected. The shell fragments in the diamicton are reworked from marine beds older than the local fossiliferous sand bed. This confirms a late-glacial readvance or ice flow in the area that may or may not be contemporaneous with the Saint-Nicolas readvance (Occhietti et al., 2001; Cummings and Occhietti, 2001).

GSC-5927. Rivière du Chêne

normalized age:	11 700 ± 100
corrected age:	11 300 ± 100
$\delta^{13}C$:	+0.57‰
uncorrected age:	11 300 ± 100

The marine shells, articulated plates of *Balanus hameri* (identified by S. Occhietti), were lying on a pavement at the top of deglaciation sand, overlain by marine clay-silt-sand. Sample CHAM-94 B21 was collected by S. Occhietti on September 11, 1994 from a natural section on the left bank of Rivière du Chêne, 3.2 km south-southwest of Saint-Édouard-de-Lotbinière and the southern bank of the St. Lawrence River, Quebec (46°32′36″N, 71°51′33″W), at an elevation of about 60 m. The sample was submitted by S. Occhietti to gain information on sea-level change and regional submergence, and to verify amino-acid calibration.

The sample (43.8 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (30.8 g) yielded 6.98 L of CO_2 gas. The age estimate is based on one count for 3880 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.931 ± 0.059, 2.228 ± 0.033, and 28.171 ± 0.176 cpm, respectively.

Comment (S. Occhietti): The shells of the pavement are related to the local early-marine colonization in the central part of this area of the St. Lawrence River valley (Occhietti et al., 2001). They provide a minimum age for the ice retreat between the Appalachians piedmont to the southeast (normalized marine shell age of ca. 12.4 ka BP, based on a corrected age, not including the local reservoir effect, of ca. 12.0 ka BP) and the Saint-Narcisse moraine to the northwest (corrected age, not including the local reservoir effect, of ca. 10.8 ka BP). As for all the ages from marine shells in the Champlain Sea, a local reservoir effect of at least 350 years should be deducted (Occhietti et al., 2001). The age of this early-marine phase is probably closer to 10.95 ka BP.

GSC-5854. Saint-Sylvère

normalized age:	11 900 ± 110
corrected age:	11 500 ± 110
$\delta^{13}C$:	+0.54‰
uncorrected age:	11 500 ± 110

The marine shells of *Hiatella arctica* (identified by S. Occhietti) were enclosed in silty sand. Sample 1994.S was collected by S. Occhietti in August 1994 from 4 km south-southwest of Saint-Sylvère, on the right side of the Bécancour River, 27.5 km southeast of Trois-Rivières, Quebec (46°12′26″N, 72°15′W), at an elevation of about 79 m. The sample was submitted by S. Occhietti to gain information on sea-level change related to a marine regressive phase.

The sample (38.0 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (25.6 g) yielded 5.34 L of CO_2 gas. The age estimate is based on one count for 5030 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.424 ± 0.042, 1.243 ± 0.025, and 18.474 ± 0.105 cpm, respectively.

Comment (S. Occhietti): The shells in the lower marine beds are related to the local early-marine invasion in the middle of the central St. Lawrence River valley (Hétu et al., 1995). They provide a minimum age for the local ice retreat between the Appalachians piedmont to the southeast (normalized marine shell age of ca. 12.4 ka BP; based on a corrected age, not including the local reservoir effect, of ca. 12.0 ka BP) and the Saint-Narcisse moraine to the northwest (corrected age, not including the local reservoir effect, of ca. 10.8 ka BP). As for all the ages from marine shells in the Champlain Sea, a local reservoir effect of at least 350 years should be deducted (Occhietti et al., 2001). The age of this early-marine phase is probably closer to 11.1 ka BP.

Pointe aux Alouettes Series

A series of marine shell samples was collected by S. Occhietti on September 27, 1994 from west-northwest of Pointe aux Alouettes, southeast of the church of Baie-Sainte-Catherine, 2.5 km south of the mouth of the Saguenay River, Quebec. These samples were submitted by S. Occhietti to gain information on sea-level change.

GSC-5945. Pointe aux Alouettes (I)

normalized age:	9170 ± 110
corrected age:	8770 ± 110
$\delta^{13}C$:	-0.39‰
uncorrected age:	8770 ± 110

The marine shells, articulated valves of *Mytilus edulis* (identified by S. Occhietti), were collected by S. Occhietti 600 m southeast of the church of Baie Sainte-Catherine, Quebec (46°06′09″N, 69°43′07″W), at an elevation of 3.2 m. Sample SAG-94.II (36.2 g dry weight) was enclosed in sand and pebbles, overlying an erosional disconformity in massive silt. The shells were treated with an acid leach to remove the outer 20%. The treated sample (26.1 g) yielded 5.48 L of CO_2 gas. The age estimate is based on two counts for 2060 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.156 ± 0.065, 1.212 ± 0.025, and 18.348 ± 0.104 cpm, respectively.

GSC-5944. Pointe aux Alouettes (II)

normalized age:	9200 ± 100
corrected age:	8800 ± 100
$\delta^{13}C$:	+0.87‰
uncorrected age:	8780 ± 100

The marine shells of *Balanus hameri* (identified by S. Occhietti) were collected 620 m southeast of the church of Baie Sainte-Catherine (48°06′08″N, 69°43′06″W), at an elevation of 6.30 m. Sample SAG-94.III.2 (59.61 g dry weight) was enclosed in sandy cobbles on an erosional disconformity at the base of sand and muddy sand unit. The shells were treated with an acid leach to remove the outer 30%. The treated sample (37.8 g) yielded 7.89 L of CO_2 gas. The age estimate is based on one count for 3520 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.147 ± 0.052, 1.212 ± 0.025, and 18.348 ± 0.104 cpm, respectively.

Comment (S. Occhietti): Two coarse beds with in situ shells overlie an erosional disconformity that overlies disturbed marine clay (*see* Dionne and Occhietti, 1996, Fig. 23). Different and much younger ages were expected than those that were obtained because the shells were presumed to be related to marine terraces at 6.3 and 3.2 m a.s.l. The two dates are very close and may be related to the same event. They indicate an unexpected sequence of early-marine clay sedimentation, followed by large local mudflows from the paleocoastline toward or into the Goldthwait Sea that were subsequently colonized by shallow-water marine organisms dated at ca. 8.8 ka BP (corrected age from marine shells). The terrace surface, between 10 and 20 m a.s.l. now, is dissected into several sections.

Kuujjuarapik Series

A series of lake sediment samples was collected by M. Parent and S.J. Paradis on August 24, 1992 from a small unnamed lake about 150 km northeast of Kuujjuarapik, Quebec (55°39′18″N, 75°30′19″W), at an elevation of 255 m. These samples were submitted by M. Parent to gain information on deglaciation and Holocene organic sedimentation.

GSC-5972. Kuujjuarapik (I)

normalized age:	4090 ± 80
$\delta^{13}C$:	-26.96‰
uncorrected age:	4120 ± 80

The basal gyttja lake sediment sample 92-PIA-PBA-5 (65–73 cm; 6.6 g dry weight), enclosed in gyttja above lacustrine clay, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.6 g) yielded 2.2 L of CO_2 gas. The age estimate is based on one count for 4760 minutes in the 2 L counter with a mixing ratio of 1.73. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.944 ± 0.082, 1.195 ± 0.026, and 18.272 ± 0.110 cpm, respectively.

Comment (M. Parent): A lake sediment core was collected using a piston corer in 1.1 m of water. Subsamples were taken at various core depths for dating. The increment between 65 and 73 cm was taken immediately above the lacustrine clay. This date provides an age for early organic sedimentation in this small postglacial lake.

GSC-5961. Kuujjuarapik (II)

normalized age:	3310 ± 120
$\delta^{13}C$:	-23.2‰
uncorrected age:	3280 ± 120

The gyttja lake sediment sample 92-PIA-PBA-5 (11–19 cm; 5.8 g dry weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (4.7 g) yielded 1.52 L of CO_2 gas. The age estimate is based on one count for 5000 minutes in the 2 L counter with a mixing ratio of 2.62. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.197 ± 0.126, 1.225 ± 0.034, and 18.343 ± 0.180 cpm, respectively.

Comment (M. Parent): A lake sediment core was collected using a piston corer in 1.1 m of water. Subsamples were taken at various core depths for dating. The interval between 11 and 19 cm predates the increase in metal concentrations near the top of the core.

'Camp Mollet' Series

A series of lake sediment samples was collected by M. Parent and S.J. Paradis on August 24, 1992 from 89 km west-northwest of 'Camp Mollet', Quebec (55°55.6′N, 75°54.5′W), at an elevation of 250 m. These samples were submitted by M. Parent to gain information on organic sedimentation.

GSC-5711. 'Camp Mollet' (I)

normalized age:	3320 ± 160
$\delta^{13}C$:	-25.8‰
uncorrected age:	3340 ± 160

The basal gyttja lake sediment sample 92-PIA-PBA-3 (95–99 cm; 5.1 g dry weight), above clay, was treated with hot acid (it was slightly calcareous) and distilled water rinses. The base treatment was omitted. The treated sample (4.0 g) yielded 1.01 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 2 L counter with a mixing ratio of 4.30. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.141 ± 0.226, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

Comment (M. Parent): A piston core was taken in a water depth of 10 m. The 95 to 99 cm interval, at the base of the gyttja unit overlying the clay, was sampled. The sample therefore dates the onset of organic sedimentation in this small lake. This core had substantial geochemical analytical work done on it.

GSC-5748. 'Camp Mollet' (II)

normalized age:	3600 ± 110
$\delta^{13}C$:	-26.2‰
uncorrected age:	3620 ± 110

The gyttja lake sediment sample 92-PIA-PBA-3 (6–15 cm; 10.9 g dry weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (6.5 g) yielded 1.53 L of CO_2 gas. The age estimate is based on two counts for 3450 minutes in the 2 L counter with a mixing ratio of 2.80. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.792 ± 0.138, 1.214 ± 0.025, and 18.515 ± 0.105 cpm, respectively.

Comment (M. Parent): A piston core taken from a depth of 10 m in a lake was subsampled for dating. The 8 to 12 cm interval, which records a peak content of many 'heavy' metals, was dated. The date provides an estimate of the sedimentation rate in this lake and the age of the geochemical peak.

GSC-5909. 'Camp Mollet' (III)

normalized age:	3600 ± 90
$\delta^{13}C$:	-26.3‰
uncorrected age:	3620 ± 90

The gyttja lake sediment sample 92-PIA-PBA-3 (45–55 cm; 13.1 g dry weight), enclosed in gyttja, was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (10.5 g) yielded 2.93 L of CO_2 gas. The age estimate is based on two counts for 2060 minutes in the 2 L counter with a mixing ratio of 1.48. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.642 ± 0.105, 1.233 ± 0.025, and 18.272 ± 0.104 cpm, respectively.

Comment (M. Parent): A lake sediment core was collected using a piston corer beneath 10 m of water. The base of the core (95–99 cm) was dated at 3.3 ka BP (GSC-5711), but the top 6 to 15 cm of the core was dated at 3.6 ka BP (GSC-5748). The second sample may have been erroneously labelled, so the middle part of core (45–55 cm) was dated. The dates on this core are confusing and not particularly useful.

GSC-5755. Umiujaq

normalized age:	7110 ± 80
corrected age:	6710 ± 80
$\delta^{13}C$:	+0.31‰
uncorrected age:	6700 ± 80

The marine shells (*Mytilus edulis*, identified by M. Parent) were enclosed in sandy gravel beach material. Sample 93-PIA-501 was collected by M. Parent on July 29, 1993

about 3 km east-southeast of Umiujaq, Quebec (56°33.5′N, 76°28.7′W), at an elevation of 205 m. The sample was submitted by M. Parent to gain information on sea-level change, specifically postglacial emergence and a regressive beach at 205 m.

The sample (38.6 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (26.0 g) yielded 5.98 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.036 ± 0.055, 1.214 ± 0.025, and 18.515 ± 0.105 cpm, respectively.

Comment (M. Parent): A sample was collected from beach material in a small fresh exposure along a trail heading toward Lake Guillaume-Delisle, about 40 m below the marine limit. The date provides an age for the regressive beach at 205 m a.s.l. and expands knowledge of the history of postglacial emergence.

GSC-5719. Petite rivière de la Baleine

normalized age:	7290 ± 70
corrected age:	6890 ± 70
$\delta^{13}C$:	+2.37‰
uncorrected age:	6850 ± 70

The marine shells (*Hiatella arctica*, identified by M. Parent) were enclosed in silty clay. Sample 92-PIA-301-D was collected by M. Parent and S. Paradis on July 31, 1992 from small tributary on the left bank of Petite rivière de la Baleine, about 17.3 km upstream from the river mouth on Hudson Bay, about 104 km northeast of Kuujjuarapik, Quebec (55°55.0′N, 76°33.9′W), at an elevation of 189 m. The sample was submitted by M. Parent to gain information on sea-level change, and to provide a maximum age for the end of the glaciomarine phase.

The sample (53.0 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (36.5 g) yielded 7.88 L of CO_2 gas. The age estimate is based on one count for 3505 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.025 ± 0.071, 2.174 ± 0.032, and 28.216 ± 0.130 cpm, respectively.

Comment (M. Parent): A sample was collected from a 30 cm thick interval in moist silty clay of a fresh exposure in gullied sediments. The sample was 21 m above the base of a 32 m high section. The enclosing silty clay sediment is overlain by coarse glaciomarine sediments. The date provides a maximum age for the end of the glaciomarine phase in the Petite rivière de la Baleine valley, and provides an indirect age for the marine limit at about 250 m a.s.l. in the region.

Qilalugarsiuviup Rapids Series

A series of samples was collected by M. Parent and S.J. Paradis on August 6, 1992 from the left bank of Petite rivière de la Baleine, just downstream from the first set of rapids, Qilalugarsiuviup Rapids, about 102 km northeast of Kuujjuarapik, Quebec (55°58.9′N, 76°42.3′W). These samples were submitted by M. Parent to gain information on sea-level change, specifically a maximum age for emergence and the rhythmic sedimentation during Tyrrell Sea regression, and to provide information on probable landslide activity during postglacial emergence.

GSC-5736. Qilalugarsiuviup Rapids (I)

normalized age:	3950 ± 100
$\delta^{13}C$:	-26.6‰
uncorrected age:	3970 ± 100

The wood fragment sample 92-PIA-330-I (25.3 g dry weight; *Salix*, identified by H. Jetté in unpublished GSC Wood Report 94-16), enclosed in sand at an elevation of 38 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.8 g) yielded 7.49 L of CO_2 gas. The age estimate is based on two counts for 2165 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.134 ± 0.080, 1.218 ± 0.025, and 18.260 ± 0.170 cpm, respectively.

Comment (M. Parent): Wood and other organic matter were collected from a single bed in a fresh exposure on the river bank. The enclosing sand was moist, with no plant growth in the section. The collection site was from a single bed in deltaic sand, which was 4 m below the top of a large section about 38 m above the river level. The date provides a maximum age for emergence, at the elevation of the sample, and the age of the deltaic unit.

GSC-5801. Qilalugarsiuviup Rapids (II)

normalized age:	4120 ± 60
$\delta^{13}C$:	-26.0‰
uncorrected age:	4130 ± 60

The wood sample 92-PIA-330-G (15.0 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 94-39), enclosed in silty sand at an elevation of 27 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.2 g) yielded 7.54 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.945 ± 0.078, 2.152 ± 0.033, and 28.340 ± 0.131 cpm, respectively.

Comment (M. Parent): Wood was collected from a single turbidite bed, 27 m above the base of a freshly exposed section on the river bank. The enclosing sand was moist and devoid of plant growth. The wood from the turbidite bed was in a thick sequence of marine sand-silt-clay rhythmites. This bed is the youngest of a series of four fossiliferous beds in the marine rhythmites. The date provides a probable proxy age for landslide activity in the region.

GSC-5779. Qilalugarsiuviup Rapids (III)

normalized age:	4780 ± 70
$\delta^{13}C$:	-25.2‰
uncorrected age:	4790 ± 70

The wood sample 92-PIA-330-C (9.1 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 94-40), enclosed in silty sand at an elevation of 7 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.8 g) yielded 7.23 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.715 ± 0.100, 2.175 ± 0.033, and 28.520 ± 0.132 cpm, respectively.

Comment (M. Parent): In a fresh exposure on the river bank, wood and other organic matter were collected from a single wet, silty sand bed. The sample was taken from a bed of a large section at 8 m above river level in sand-silt-clay marine rhythmites, 3 m above the contact with underlying laminated silty marine clay. The date provides an early record of probable landslide activity during postglacial emergence (uplift) of the area.

GSC-5783. Qilalugarsiuviup Rapids (IV)

normalized age:	5560 ± 60
corrected age:	5160 ± 60
$\delta^{13}C$:	-0.75‰
uncorrected age:	5170 ± 60

The marine shell sample 92-PIA-330-B (45.8 g dry weight; *Clinocardium ciliatum*, identified by M. Parent), a surface collection on silty sand at an elevation of 5 m, was treated with an acid leach to remove the outer 30%. The treated sample (30.0 g) yielded 6.53 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.989 ± 0.076, 2.175 ± 0.033, and 28.520 ± 0.132 cpm, respectively.

Comment (M. Parent): Shells were collected at the surface of a section extending from river level to a height of 8 m because fossil shells are virtually absent in sediments above the 8 m level and only a few could be found in situ. There was no chance of mixed populations being sampled. All shells presumably come from a turbidite bed lying at the base of a thick sequence (29 m) of sand-silt-clay rhythmites that overlies a laminated silty clay. The date provides an age for the onset of rhythmic sedimentation in the Petite rivière de la Baleine valley during Tyrrell Sea regression.

GSC-5803. Qilalugarsiuviup Rapids (V)

normalized age:	4310 ± 110
$\delta^{13}C$:	-27.3‰
uncorrected age:	4350 ± 110

The plant debris sample 92-PIA-330-E (12.1 g dry weight), enclosed in sandy turbidite at an elevation of 18 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.5 g) yielded 1.97 L of CO_2 gas. The age estimate is based on two counts for 2180 minutes in the 2 L counter with a mixing ratio of 2.21. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.635 ± 0.128, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

Comment (M. Parent): Moist plant debris (92-PIA-330-E), devoid of modern plant material, was collected from a single bed in a fresh exposure on the river bank, about 18 m above river level and at a depth of 24 m below the surface of a large section of marine sediments that contain several organic-rich turbidite beds. The date provides an age for the paleoecological record, as well as a probable proxy record of landslide activity in the region.

Second River Series

A series of wood samples was collected by M. Parent and S.J. Paradis on August 5, 1993 along the Second River, about 4.5 km upstream of the river mouth in southeastern Hudson Bay, 80 km northeast of Kuujjuarapik, Quebec (55°49.0′N, 76°55.1′W), at an elevation of 13 m. These samples were submitted by M. Parent to gain information on sea-level change and emergence, and to provide a comparison of shell and wood.

GSC-5809. Second River (I)

normalized age:	2960 ± 50
$\delta^{13}C$:	-27.5‰
uncorrected age:	3000 ± 50

The wood (branch or trunk) sample 93-PIA-503-C-W (8.2 g wet weight; *Betula*, identified by H. Jetté in unpublished GSC Wood Report 94-79), enclosed near the top of a marine silty clay below 7 m of beach and nearshore sediments, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.9 g) yielded 7.19 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 5 L counter with a

mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 19.511 ± 0.081, 2.152 ± 0.033, and 28.340 ± 0.131 cpm, respectively.

Comment (M. Parent): In a fresh exposure on the right bank of the river, wood was collected near the top of a marine clay unit, in a nonoxidized moist silt devoid of modern plant growth, below 7.0 m of beach and nearshore sediments. The marine clay unit also contains marine shells (mainly *Mytilus edulis*) at the same level as the wood. This site provides an excellent opportunity for paired shell-wood dating. This wood (GSC-5809)–shell (GSC-5807) pair suggests a marine reservoir correction of about 460 years, which is somewhat less than the estimates from pre-bomb modern shells collected in southern Hudson Bay (540 years) and considerably less than the value of 820 years for southern James Bay (Dyke et al., 2003). The date also provides a maximum age for emergence at about 20 m a.s.l. in the region.

GSC-5807. Second River (II)

normalized age:	3420 ± 80
corrected age:	3020 ± 80
$\delta^{13}C$:	+0.96‰
uncorrected age:	3000 ± 80

A mixed collection of marine shells, sample 93-PIA-503-C-S (22.1 g dry weight), enclosed in marine silty clay, was treated with an acid leach to remove the outer 20%. The treated sample (17.1 g) yielded 3.92 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 2 L counter with a mixing ratio of 1.12. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.568 ± 0.089, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

Comment (M. Parent): In a fresh exposure on the right bank of the river, a shell collection was made near the top of a marine clay unit in a nonoxidized moist silt, below 7.0 m of beach and nearshore sediments. The marine clay unit also contains reworked plant debris (e.g. wood, twigs, etc.) at the same level as the shells. This site provides an excellent opportunity for paired shell-wood dating (cf. GSC-5809), and the date provides a maximum age for emergence at about 20 m a.s.l. in the region.

GSC-5775. 'Piguard River'

normalized age:	7350 ± 80
corrected age:	6950 ± 80
$\delta^{13}C$:	+1.76‰
uncorrected age:	6920 ± 80

The marine shells (*Hiatella arctica*, identified by M. Parent) were enclosed in silty sand. Sample 93-PIA-539-D was collected by M. Parent and S.J. Paradis on August 16, 1993 from a small stream just south of 'Piguard River', about 5.5 km upstream of its mouth in Manitounuk Sound, about 65 km northeast of Kuujjuarapik, Quebec (55°39.3′N, 77°02.1′W), at an elevation of 174 m. The sample was submitted by M. Parent to gain information on sea-level change and (?)glacial sedimentation associated with the Tyrrell Sea.

The sample (24.4 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (20.6 g) yielded 4.60 L of CO_2 gas. The age estimate is based on one count for 4860 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.866 ± 0.050, 1.218 ± 0.025, and 18.627 ± 0.106 cpm, respectively.

Comment (M. Parent): A sample was collected from a well defined bed at a depth of about 11 m in the section on the left bank of a stream. The site was near the top of a unit of high-energy glaciomarine sediments, more than 4 m thick, that is overlain by 3 m of deep-water marine clay. The date provides an age for (?)ice-proximal sedimentation during the Tyrrell Sea episode.

GSC-5701. Domanchin River

normalized age:	7090 ± 70
corrected age:	6690 ± 70
$\delta^{13}C$:	+2.83‰
uncorrected age:	6650 ± 70

The marine shells (*Hiatella arctica*, identified by M. Parent) were enclosed in a massive silt-clay turbidite. Sample 92-PIA-365-D was collected by M. Parent and S.J. Paradis on August 14, 1992 about 1.2 km upstream from the mouth of the Domanchin River, 41 km northeast of Kuujjuarapik, Quebec (55°13.1′N, 77°18.1′W), at an elevation of 6 m. The sample was submitted by M. Parent to gain information on the onset of the Tyrrell Sea.

The sample (35.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (28.8 g) yielded 6.53 L of CO_2 gas. The age estimate is based on one count for 2570 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.284 ± 0.081, 2.258 ± 0.029, and 28.094 ± 0.130 cpm, respectively.

Comment (M. Parent): A sample was collected from only freshly exposed shells on the left bank of the river at a depth of 3.5 m below the surface in a massive, fossiliferous silt-clay turbidite that directly overlies a laminated (?varved) unit of nonfossiliferous silt and clay. This mixed shell assemblage in a glaciomarine turbidite records the onset of the Tyrrell Sea in the region.

Manitounuk Sound Area Series

A series of marine shells samples was collected by M. Parent and S.J. Paradis on August 23, 1993 from the Manitounuk Sound area, about 28 km northeast of

Kuujjuarapik, Quebec. These samples were submitted by M. Parent to gain information on sea-level change, glaciation, and a fossiliferous diamicton.

GSC-5776. Manitounuk Sound area (I)

normalized age:	6450 ± 80
corrected age:	6050 ± 80
$\delta^{13}C$:	+0.38‰
uncorrected age:	6040 ± 80

The marine shell sample 93-PIA-546 (24.2 g dry weight; *Hiatella arctica*, identified by M. Parent), enclosed in clayey diamicton on the left bank of the Minguarutiit River, 5 km upstream from its mouth (55°25.8′N, 77°24.5′W), at an elevation of 82 m, was treated with an acid leach to remove the outer 15%. The treated sample (19.0 g) yielded 4.22 L of CO_2 gas. The age estimate is based on one count for 3765 minutes in the 2 L counter with a mixing ratio of 1.02. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.781 ± 0.058, 1.218 ± 0.025, and 18.627 ± 0.106 cpm, respectively.

Comment (M. Parent): A sample was collected from a distinct diamictic clay bed in a freshly exposed unit at a depth of 7.5 m in a 15 m thick section. The age of the enclosing fossiliferous diamicton is similar to that observed in other nearby sections at about the same elevation (90 m a.s.l.).

GSC-5752. Manitounuk Sound area (II)

normalized age:	7360 ± 70
corrected age:	6960 ± 70
$\delta^{13}C$:	+2.44‰
uncorrected age:	6920 ± 70

The marine shell sample 93-PIA-542-A (42.4 g dry weight; *Hiatella arctica*, identified by M. Parent), enclosed in clay diamicton about 3.5 km upstream of a small unnamed stream entering Manitounuk Sound (55°23.3′N, 77°30.2′W), at an elevation of 85 m, was treated with an acid leach to remove the outer 20%. The treated sample (33.7 g) yielded 7.62 L of CO_2 gas. The age estimate is based on one count for 3600 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.005 ± 0.071, 2.107 ± 0.032, and 28.412 ± 0.128 cpm, respectively.

Comment (M. Parent): In a fresh exposure on the left bank of a stream, a fossiliferous bed lies at the top of a marine clay unit and is directly overlain by regressive beach sand. A sample was collected 4.5 m from the top of the section (3.5 m above the base). The date provides an age for the enclosing fossiliferous diamicton. The date is similar to that observed in other sections nearby at about the same elevation (90 m a.s.l.).

Manitounuk Sound Series

A series of wood samples was collected by M. Parent on June 27, 1998 from Manitounuk Sound on the east coast of Hudson Bay, about 19 km northeast of Kuujjuarapik Airport, Quebec (55°23′55″N, 77°33′18″W). These samples were submitted by M. Parent to gain information on sea-level change related to the Tyrrell Sea.

GSC-6365. Manitounuk Sound (I)

normalized age:	2020 ± 50
$\delta^{13}C$:	-25.86‰
uncorrected age:	2040 ± 50

The wood sample 98-PIA-GB-2 (15.1 g wet weight; probably *Picea,* according to M. Parent), enclosed in sand at an elevation of 5 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 7.0 L of CO_2 gas. The age estimate is based on one count for 3260 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.947 ± 0.093, 2.320 ± 0.036, and 28.282 ± 0.137 cpm, respectively.

Comment (M. Parent): A wood sample from a fresh exposure in a natural beach section, at the head of a landslide that occurred in 1997, was taken from the upper 1 m of a 3 m thick littoral sediment unit that overlies 3 m of marine clay. The sample dates the regression of the Tyrrell Sea in the area.

GSC-6364. Manitounuk Sound (II)

normalized age:	2400 ± 80
$\delta^{13}C$:	-23.78‰
uncorrected age:	2380 ± 80

The wood sample 98-PIA-GB-1 (5.8 g dry weight), enclosed in sand at an elevation of 6 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.1 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.337 ± 0.067, 1.234 ± 0.026, and 17.940 ± 0.149 cpm, respectively.

Comment (M. Parent): A wood sample from a fresh exposure in a natural beach section, at the head of a landslide that occurred in 1997, was taken from the lower 1 m of a 3 m thick littoral sediment unit that overlies 3 m of marine clay. The sample dates the regression of the Tyrrell Sea in the area.

Kuujjuarapik-Whapmagoostui Series

A series of organic and shell samples was collected by M. Parent in August 1994 about 10 km east of Kuujjuarapik and Whapmagoostui, Quebec (55°16.46′N, 77°36.84′W). These samples were submitted by M. Parent.

GSC-5883. Kuujjuarapik-Whapmagoostui (I)

normalized age:	3580 ± 60
$\delta^{13}C$:	-28.4‰
uncorrected age:	3640 ± 60

The plant debris sample 94-PIA-608-C, enclosed in fine sand, was collected by M. Parent on August 14, 1994 from the left bank of Grande rivière de la Baleine, just south of the deep-water dock in Kuujjuarapik and Whapmagoostui, Quebec (55°15.89′N, 77°46.37′W), at an elevation of 0.5 m. The sample was submitted by M. Parent to gain information on sea-level change and the prodeltaic rhythmites.

The sample (100.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (44.6 g) yielded 18.32 L of CO_2 gas. The age estimate is based on two counts for 2060 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.100 ± 0.105, 2.233 ± 0.034, and 28.468 ± 0.135 cpm, respectively.

Comment (M. Parent): In freshly exposed moist sand devoid of modern plant growth, a sample of plant debris was collected near base of the section. The base of prodeltaic rhythmites was at a depth of 14.5 m below the surface, just above the contact with marine silty clay. This date provides an age for the onset of the prodeltaic rhythmites at this site.

GSC-5875. Kuujjuarapik-Whapmagoostui (II)

normalized age:	4110 ± 60
$\delta^{13}C$:	-27.7‰
uncorrected age:	4160 ± 60

The plant debris sample 94-PIA-609-F, enclosed in fine sand, was collected by M. Parent on August 15, 1994 from the left bank of a small tributary of the Grande rivière de la Baleine, about 10 km east of Kuujjuarapik and Whapmagoostui, Quebec (55°16.46′N, 77°36.84′W), at an elevation of 40 m. The sample was submitted by M. Parent to gain information on sea-level change in the Tyrrell Sea.

The sample (40.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (14.4 g) yielded 6.75 L of CO_2 gas. The age estimate is based on two counts for 2150 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.871 ± 0.100, 2.277 ± 0.033, and 28.303 ± 0.131 cpm, respectively.

Comment (M. Parent): Plant debris, devoid of modern material, was collected from 1 m behind the partly obscured face of a section in a Tyrrell Sea regressive delta at about 48 m elevation. The 8 cm thick organic bed was 7.5 m below the top of the section at the contact between prodeltaic sand and overlying deltaic sand. The date provides an age for this large regressive Tyrrell Sea delta.

GSC-5872. Kuujjuarapik-Whapmagoostui (III)

normalized age:	7860 ± 80
corrected age:	7460 ± 80
$\delta^{13}C$:	-1.97‰
uncorrected age:	7490 ± 80

The marine shells (*Macoma calcarea*, identified by M. Parent) were enclosed in massive silty clay. Sample 94-PIA-606-H was collected by M. Parent on August 12, 1994 at the foot of Qurlutuq Rapids, about 10 km east of Kuujjuarapik and Whapmagoostui, on the right bank of the Grande rivière de la Baleine, about 12 km upstream from its mouth on Hudson Bay, Quebec (55°17.26′N, 77°36.98′W), at an elevation of 5 m. The sample was submitted by M. Parent to gain information on sea-level change, Tyrrell Sea sedimentation, and deglaciation related to the Sakami moraine.

The sample (43.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (33.4 g) yielded 7.64 L of CO_2 gas. The age estimate is based on one count for 2140 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.134 ± 0.086, 2.277 ± 0.033, and 28.303 ± 0.131 cpm, respectively.

Comment (M. Parent): An in situ shell collection was made in moist silty clay from a freshly exposed section. There were no encrustations observed in the fossiliferous bed. The shells were collected at the base of a fossiliferous bed overlying rhythmites that may have been deposited in glacial Lake Ojibway. This bed was previously dated at 7.6 ka BP (I-9005), according to Hillaire-Marcel (1976). Early Tyrrell Sea sedimentation occurred at a site located a few kilometres up glacier of the Sakami moraine.

GSC-5616. Coigny River

age:	>41 000
$\delta^{13}C$:	-25.6‰

The wood chips (*Larix*, identified by H. Jetté in unpublished GSC Wood Report 93-33) were enclosed in fine sand. Sample CD 93-15 was collected by D.R. Holmes and S.A. Averill on March 4, 1993 about 3 km northwest of Provincial Road 61 bridge over the Coigny River, Matagami, Quebec (49°07′06″N, 77°58′47″W), at an elevation of 310 m. The sample was submitted by J.J. Veillette.

The sample (4.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.7 g) yielded 3.66 L of CO_2 gas. The age estimate is based on one count for 3880 minutes in the 2 L counter with a mixing ratio of 1.19. The count rates for the sample (net) and for monthly backgrounds and standards (net) were -0.047 ± 0.036, 1.246 ± 0.025, and 18.110 ± 0.145 cpm, respectively.

Comment (J.J. Veillette): Wood chips were recovered from drill cuttings at a depth of 25 m below the surface, which puts the elevation of the sample at 276 m (310 m being the elevation of the collar of the borehole). Reverse circulation was the drilling technique used by Overburden Drilling Management Ltd. for Cambior Mines Ltd.

The borehole log description shows that the wood chips were found at the base of a sequence of Lake Ojibway varves, in the proximal portion, about 3 m above till. The driller's log indicates that a 'tree' was cut through by the drill bit at a depth of 25 m.

Before the sample was submitted for dating, it was presumed that wood chips at the base of the Barlow-Ojibway varve sequence would suggest that the wood was probably recycled from older sediments. Judging from other dates obtained in the Abitibi area in a similar stratigraphic context, it was thought that the age of the sample would probably exceed the limits of the radiocarbon dating method. This nonfinite age obtained confirms this suspicion.

Horne Smelter Series

Hand-cut and core samples were collected from sphagnum hummocks in a small wooded peatland southwest of the Horne smelter, Rouyn-Noranda, Quebec to interpret the geochemical profile and the effects of smelter emissions.

GSC-6524. Horne smelter (I)

normalized age:	640 ± 50
$\delta^{13}C$:	-26.45‰
uncorrected age:	660 ± 50

The peat (*Sphagnum russowii*, *Polytricum stricum* and *Chamaedaphne calyculata*) sample 97-KFA-3540-H1 (67–71 cm) was collected by I.M. Kettles on September 16, 2000 about 70 m from a gravel road in a small wooded peatland with some sphagnum hummock, 11.6 km southwest of the Horne smelter, Rouyn-Noranda, Quebec (48.17023°N, 79.019750°W), at an elevation of 289 m. The sample was submitted by I.M. Kettles to gain information on the rate of peat accumulation.

The sample (116.2 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.1 g) yielded 8.2 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 26.187 ± 0.092, 2.109 ± 0.033, and 28.424 ± 0.138 cpm, respectively.

Comment (I.M. Kettles): Hand-cut and core samples were collected in a profile through a sphagnum hummock. A Couteau corer (about 10 cm diameter) was used to obtain a continuous core to the clay at 249 cm depth in the peatland near the hummock and a sample was collected at 67 to 71 cm depth. Material from the upper part of the hummock was unsuccessfully dated using ^{210}Pb and ^{137}Cs, and the pollen profile was examined. Chronological contraints were needed to interpret the geochemical profile and the effects of smelter emissions, so the sample was radiocarbon dated.

GSC-6536. Horne Smelter (II)

normalized age:	3320 ± 80
$\delta^{13}C$:	-28.02‰
uncorrected age:	3370 ± 80

The basal peat (*Sphagnum fusum* and *S. russowii*) sample 97-KFA-3533-H (91–96 cm) was collected by I.M. Kettles on September 17, 2000 from peatland with hummocks near a power installation at the end of the road northeast of Evain, 9.8 km west of the Horne smelter, Rouyn-Noranda, Quebec (48.247533°N, 79.14150°W), at an elevation of 289 m. The sample was submitted by I.M. Kettles to gain information on the rate of peat accumulation.

The sample (32.6 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.4 g) yielded 3.1 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.33. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.995 ± 0.090, 1.133 ± 0.044, and 18.241 ± 0.112 cpm, respectively.

Comment (I.M. Kettles): Clay was intercepted at a depth of 342 cm in a hummocky marsh located 50 m from the sampling site. The water table was 73 cm below the top of the hummock. The sample was collected from a core taken with a Macaulay corer between 51 and 101 cm from the surface in the base of a sphagnum hummock. The material in the overlying hummock was previously dated and analyzed for selected elements. Material from the upper part of the hummock was unsuccessfully dated using ^{210}Pb and ^{137}Cs, and the pollen profile was examined. Chronological contraints were needed to evaluate the effects of smelter emissions on peat, so the sample was radiocarbon dated.

All indications, specifically ^{137}Cs, organic matter accumulation, and the *Ambrosia* profile, suggest that both GSC-6524 and -6536 are much too old. The peat was collected in an area with carbonate-rich glacial sediments. In the core sequence, the peat changed toward the surface from forming under fen conditions (the peat was minerotrophic) to forming in a nutrient-poor bog. Research has shown that

hummocks growing on more nutrient-rich peatlands act as miniature ombrotrophic bogs (Bellamy and Riely, 1967), but the 71 cm depth was below the sphagnum hummock peat and into the decomposed sedge peat. For additional information on the project and sites, refer to Kettles and Dion (2000).

GSC-4326. Île du Grand Calumet

normalized age:	11 200 ± 100
corrected age:	10 800 ± 100
$\delta^{13}C$:	-0.60‰
uncorrected age:	10 800 ± 100

The marine shells (*Macoma balthica*, identified by S.H. Richard) were enclosed in a thin layer of shell-rich marine sand and silt in the top 0.5 m of a 5 m face. Sample 85 KAR 1949 was collected by I.M. Kettles in September 1986 from a large gravel pit on Île du Grand Calumet, about 6.5 km west-northwest of Campbell's Bay, Quebec (45°45′20″N, 76°40′45″W), at an elevation of about 153 m. The sample was submitted by I.M. Kettles to gain information on sea-level change in the Champlain Sea.

The sample (40.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.3 g) yielded 6.61 L of CO_2 gas. The age estimate is based on two counts for 4090 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (I.M. Kettles): The samples were collected 0.5 m from the top of a laminated silt and fine sand unit. The top 0.5 m of the face where shells were collected is underlain by 1.5 m of very chunky, massive silt and clay. The section becomes slumped 2 m from the top. About 5 m laterally to the north from the layer of shells, the wedge of marine sediment pinches out and bedded coarse sand to cobbles is exposed beneath the wedge. The date will help determine the glacial history of the Fort-Coulonge area. Shells collected at similar elevations in other pits in this area have been dated. An accelerator mass spectrometry date of 10 700 years BP was obtained at one site. A date of 11 400 ± 190 years BP (GSC-3670, Blake, 1983) was obtained near Shawville.

GSC-4473. Île aux Allumettes

normalized age:	11 400 ± 150
corrected age:	11 000 ± 150
$\delta^{13}C$:	-2.52‰
uncorrected age:	11 000 ± 150

The marine shells (*Macoma balthica*, identified by S.H. Richard) are enclosed in a coarse gravel layer that is overlain and infilled with silt, part of an interbedded gravel and sand unit. Sample 85-KAR-1938 was collected by I.M. Kettles on May 14, 1987 from a partly fresh exposure in a gravel pit, 11 km south of Waltham Station, on eastern Île aux Allumettes, Quebec (45°50′15″N, 76°56′30″W), at an elevation of 135 m. The sample was submitted by I.M. Kettles to gain information on sea-level change in the Champlain Sea.

The sample (12.98 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (13.0 g) yielded 2.44 L of CO_2 gas. The age estimate is based on one count for 2450 minutes in the 2 L counter with a mixing ratio of 1.67.

Comment (I.M. Kettles): The date will help determine the glacial history of the Fort-Coulonge area. It will also serve as a check on other dates in the area.

Ontario

Figure 7. Radiocarbon-dated sites in Ontario.

'Detour Lake Bog' Series

A series of peat and basal wood samples was collected by I.M. Kettles on August 22, 1993 near Hopper Lake, southeast of Kesagami Lake, between Cochrane and the Detour Lake mine, Ontario (49°59.58′N, 79°53.97′W), at an elevation of 289 to 304 m. These samples were submitted by I.M. Kettles to gain information on peat development.

GSC-5764. 'Detour Lake Bog' (I)

normalized age:	180 ± 50
$\delta^{13}C$:	-29.4‰
uncorrected age:	250 ± 50

The peat sample 93-KDL-0002 (160.8 g wet weight), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample

(8.3 g) yielded 7.86 L of CO_2 gas. The age estimate is based on two counts for 3505 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.565 ± 0.105, 2.137 ± 0.035, and 28.437 ± 0.131 cpm, respectively.

Beta-79045. 'Detour Lake Bog' (II)

normalized age:	3230 ± 80

The wood sample 93-KDL-0002B (30–40 cm), was enclosed in peat overlying till. The age was normalized to $\delta^{13}C$ = -25‰.

GSC-5694. 'Detour Lake Bog' (III)

normalized age:	6880 ± 110
$\delta^{13}C$:	-26.4‰
uncorrected age:	6900 ± 110

The peat sample 93-KDL-0002B (92–100 cm; 32.1 g wet weight), enclosed in peat resting on till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.3 g) yielded 3.00 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 2 L counter with a mixing ratio of 1.45. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.789 ± 0.092, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

Beta-70113. 'Detour Lake Bog' (IV)

normalized age:	7280 ± 70

The basal wood sample 93-KDL-0002B (118 cm) was enclosed in peat overlying till. The age was normalized to $\delta^{13}C$ = -25‰.

Comment (I.M. Kettles): The bog at 49°59.58′N, 79°53.97′W developed in a region dominated by drumlins where peatlands are a minor component of the boreal forest landscape. The bog is underlain by calcareous silty till derived primarily from Paleozoic carbonate bedrock in the Hudson Bay and James Bay regions (Dredge and Cowan, 1989) and metasedimentary rocks of the Canadian Shield (Thurston et al., 1991, Pt. 1, Fig. 1).

In 1993, cores were collected from the peat bog along with the underlying glacial till. Two 130 cm long cores were taken close to each other from a flat part ('hollow') of the 'Detour Lake bog' using a stainless-steel Macaulay corer (4.5 cm diameter). A third core, 35 cm long, was hand cut from an approximately 25 cm high mound of sphagnum peat ('hummock'), located less than 1 m from the 'hollow' coring site. All cores were wrapped in plastic film, placed in plastic containers, and refrigerated. In the laboratory, the 'hummock' core was subsampled at 0.5 cm depth intervals, and the cores from the 'hollow' site were sectioned at 10 cm intervals using a stainless steel electric knife.

Peat from one 'hollow' site core was dated at selected intervals and analyzed for macrofossils and pollen to determine its long-term history (Kettles et al., 2000). Peat from the 'hummock' site core was dated using both radiocarbon and ^{210}Pb methods (Kettles et al., 2000; Turner and Kettles, 2000), and the 'hollow' site core was radiocarbon dated. Lead-isotope determinations (^{204}Pb, ^{206}Pb, ^{207}Pb, ^{208}Pb) were made on selected peat samples from the 'hummock' and 'hollow' site cores and several till samples (Kettles and Bell, 1996; Bell and Kettles, 2003).

In the 'hollow' site core, wood at the base of the peat (118 cm) was dated at 7280 ± 70 years BP (Beta-70113 (AMS)); the peat between 92 and 100 cm at 6880 ± 110 years BP (GSC-5694); and the peat between 30 and 40 cm at 3230 ± 80 years BP (Beta-79045 (radiometric)).

The 'hummock' site peat, collected between depths of 33 and 35 cm, was dated at 180 ± 50 years BP (GSC-5764), while ^{210}Pb determinations on twenty-five subsamples between the surface and 22.5 cm suggest that the peat above 22.5 cm formed in the 100 years period prior to 1993.

Kinosheo Lakes Series

A series of peat and wood samples from the shore of Kinosheo Lakes, west of Moosonee between the Moose and Albany rivers, Ontario (51°33.01′N, 81°48.83′W), was collected by I.M. Kettles on August 20, 1993. These samples were submitted by I.M. Kettles to gain information on the age correlation required for ^{210}Pb dating and geochemistry.

GSC-5672. Kinosheo Lakes (I)

normalized age:	1720 ± 70
$\delta^{13}C$:	-27.5‰
uncorrected age:	1760 ± 70

The peat sample 93-KKL-006C (67 cm depth; 78.3 g wet weight), enclosed in peat overlying grey sandy clay till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.9 g) yielded 7.35 L of CO_2 gas. The age estimate is based on two counts for 2165 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 22.780 ± 0.113, 2.238 ± 0.033, and 28.354 ± 0.189 cpm, respectively.

TO-4318. Kinosheo Lakes (II)

normalized age:	4000 ± 80

The wood sample 93-KKL-006C (251 cm), was enclosed in peat. The age was normalized assuming $\delta^{13}C$ = -25‰.

Comment (I.M. Kettles): Refer to Kettles et al. (2000) for details and Turner and Kettles (2000) for specifics on the ^{210}Pb dating of the cores.

Strain Lake Series

A series of lake sediment samples was collected by T.W. Anderson on October 13, 1988 from Strain Lake, about 0.5 km west of the junction of Highways 69 and 69B, on the northwest edge of Parry Sound, Ontario (45°21′33″N, 80°02′48″W), at an elevation of 206 m. These samples were submitted by T.W. Anderson to gain information on the pollen sequence related to climate change.

GSC-5297. Strain Lake (I)

normalized age:	9720 ± 120
δ^{13}C:	-27.9‰
uncorrected age:	9760 ± 120

The basal gyttja lake sediment sample AP-88-8A (556.5–560 cm; 162.1 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (43.1 g) yielded 4.19 L of CO_2 gas. The age estimate is based on one count for 3840 minutes in the 2 L counter with a mixing ratio of 1.08. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.500 ± 0.057, 1.261 ± 0.033, and 18.546 ± 0.156 cpm, respectively.

Comment (T.W. Anderson): The sample was taken across the gyttja–clay gyttja contact. The date falls at increases in *Picea* and *Pinus* pollen percentages. As at Plate Lake (GSC-5600), the sample dates an early Holocene recurrence of *Picea* and the onset of cooling. See GSC-5594 for additional comments.

GSC-5594. Strain Lake (II)

normalized age:	9430 ± 150
δ^{13}C:	-25.9‰
uncorrected age:	9450 ± 150

The gyttja lake sediment sample AP-88-8 (548.3–550 cm; 106.4 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (11.0 g) yielded 2.6 L of CO_2 gas. The age estimate is based on two counts for 2190 minutes in the 2 L counter with a mixing ratio of 1.69. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.599 ± 0.087, 1.227 ± 0.024, and 18.146 ± 0.137 cpm, respectively.

Comment (T.W. Anderson): This sample dates the upper limit of the spruce pollen recurrence in the eastern Georgian Bay area. Date GSC-5297 dates the lower limit of the spruce recurrence in the same lake. Samples GSC-5297 and -5594 bracket a regional climate reversal in the eastern extremity of the upper Great Lakes region, indicated by the *Picea* pollen recurrence and corresponding *Pinus* minimum (Anderson and Lewis, 1992, 2002).

The sample was taken about 10 cm higher in the gyttja than GSC-5297. As at Plate Lake (GSC-5596), the sample dates the end of the *Picea* recurrence (correlated with cooling) and the onset of *Pinus* dominance (correlated with regional warming).

Like Plate Lake, the dated *Picea* recurrence correlates with the 9.7 ka BP pre–Boreal Oscillation of Yu and Eicher (1998) and Yu (2000).

Plate Lake Series

A series of lake sediment samples was collected by T.W. Anderson on October 14, 1988 from Plate Lake, 9.5 km east of Parry Sound, Ontario (45°20′50″N, 79°55′10″W), at an elevation of 251 m. These samples were submitted by T.W. Anderson to gain information on pollen spectra influx.

GSC-5596. Plate Lake (I)

normalized age:	9450 ± 160
δ^{13}C:	-25.8‰
uncorrected age:	9470 ± 160

The gyttja lake sediment sample AP-88-9 (579–581 cm; 50.6 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.8 g) yielded 2.0 L of CO_2 gas. The age estimate is based on two counts for 2500 minutes in the 2 L counter with a mixing ratio of 2.16. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.583 ± 0.100, 1.227 ± 0.024, and 18.146 ± 0.137 cpm, respectively.

Comment (T.W. Anderson): Date GSC-5596 falls at the upper limit of the spruce pollen recurrence in the eastern Georgian Bay area. Date GSC-5600 falls at the lower limit of the spruce recurrence in the same lake. Samples GSC-5600 and -5596 bracket a regional climate reversal in the eastern extremity of the upper Great Lakes, indicated by the *Picea* pollen recurrence and corresponding *Pinus* minimum (Anderson and Lewis, 2002).

The sample was taken about 12 cm higher in the gyttja profile than GSC-5600. The sample dates the end of an early Holocene recurrence of *Picea* and the beginning of the early to middle Holocene *Pinus* dominance. The *Picea-Pinus* switchover marks the end of a brief cool interval and onset of regional warming.

The dated *Picea* recurrence and early Holocene cool interval correlate exactly with the 9.7 ka BP North Atlantic pre–Boreal Oscillation (PB) cooling, as documented in Yu and Eicher (1998) and Yu (2000).

GSC-5600. Plate Lake (II)

normalized age:	9720 ± 140
$\delta^{13}C$:	-26.5‰
uncorrected age:	9740 ± 140

The gyttja lake sediment sample AP-88-9 A (591–593.3 cm; 66.7 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (13.1 g) yielded 2.7 L of CO_2 gas. The age estimate is based on one count for 2570 minutes in the 2 L counter with a mixing ratio of 1.64. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.395 ± 0.079, 1.227 ± 0.024, and 18.146 ± 0.137 cpm, respectively.

Comment (T.W. Anderson): The sample, which occurs near the base of the gyttja unit above clay, dates an early Holocene recurrence of *Picea* and the onset of a brief cool interval.

WESTERN CANADA

Saskatchewan

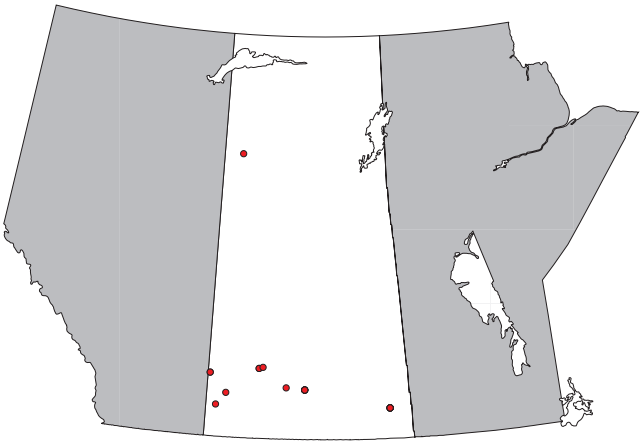

Figure 8. Radiocarbon-dated sites in Saskatchewan.

GSC-5381. McBeath Lake

normalized age:	9800 ± 100
$\delta^{13}C$:	-20.6‰
uncorrected age:	9730 ± 100

The basal light brown gyttja lake sediment lies above greenish brown sandy silt. Sample AP-88-3 (579–583 cm) was collected by T.W. Anderson on October 16, 1988 from McBeath Lake, about 40 km northeast of La Loche, Saskatchewan (56°42′40″N, 109°05′00″W), at an elevation of 472 m. The sample was submitted by T.W. Anderson to gain information on deglaciation.

The sample (208.3 g wet weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (123.5 g) yielded 6.30 L of CO_2 gas. The age estimate is based on one count for 3975 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.402 ± 0.050, 1.238 ± 0.028, and 18.133 ± 0.104 cpm, respectively.

Comment (T.W. Anderson): The sediment sample was taken from the base of a gyttja unit above basal sandy silt. The basal silt is likely glacial outwash derived from the retreating Laurentide ice sheet, and the date provides a minimum age for deglaciation in this area. This lake is situated south and above the Frobisher Lakes–Clearwater River spillway topographic lowland, through which glacial Lake Agassiz is thought to have drained by about 11 ka BP (Anderson and Lewis, 1992) or between 9.9 and 9.1 ka BP (Fisher and Souch, 1998).

Andrews Site Series

A series of organic samples was collected by C.H. Yansa in 1995 from the Andrews site, 7 km west of The Missouri Coteau escarpment, 22 km southwest of Moose Jaw, Saskatchewan (50°20′N, 105°52′W), at an elevation of 770 m.

TO-5018. Andrews site (I)

normalized age:	5770 ± 80

The charcoal and plant fragments (sample 164 at 310 cm depth; unidentifiable, according to C.H. Yansa) were in sandy clay. The sample was taken 85 cm above TO-4780; calibrated age is 4645 years BC. This sample was submitted by C.H. Yansa and J. Basinger to gain information on climate and macrofossil preservation. The age was normalized to $\delta^{13}C$= -25‰.

Comment (C.H. Yansa): Charcoal flakes and plant fragments were sampled from a level that contains poorly preserved plant macrofossils in sandy clay, at a depth of 310 cm below the present-day surface. The overlying 310 cm of sediment lacks plant macrofossils. This date marks the end of the semipermanent slough phase in southern Saskatchewan and plant macrofossil preservation at the Andrews site.

TO-4780. Andrews site (II)

normalized age:	7670 ± 80

The charcoal and plant fragments (sample 179 at 395 cm depth; unidentifiable, according to C.H. Yansa) were in sandy clay. The sample was taken 15 cm above TO-5019; calibrated age is 6460 years BC. This sample was submitted by C.H. Yansa and J. Basinger to gain information on the end of Hypsithermal interval. The age was normalized to $\delta^{13}C$= -25‰.

Comment (C.H. Yansa): Charcoal flakes and plant fragments from charcoal-rich sandy clay, at a depth of 395 cm below the present-day surface, unconformably overlie laminated silty clay with plant macrofossils of parkland and permanent wetland taxa. The two dates, TO-5019 and -4780, bracket the Hypsithermal interval in southern Saskatchewan between 8790 ± 140 and 7670 ± 80. This date marks the end of the Hypsithermal interval in southern Saskatchewan and the onset of conditions wetter than at present with the development of a semipermanent slough phase between 7670 ± 80 and 5770 ± 80 years BP (TO-4780 and -5018).

TO-5019. Andrews site (III)

normalized age: 8790 ± 140

The plant seeds and fruits (sample 56 at 410 cm depth; *Chenopodium salinum* and *Scirpus americanus*, identified by C.H. Yansa) were in laminated silty clay. This sample was taken 15 cm below TO-4780 and 45 cm above AECV-4048C; calibrated age is 7755 years BC. This sample was submitted by C.H. Yansa and J. Basinger to gain information on the end of the parkland–permanent pond phase. The age was normalized to $\delta^{13}C$= -25‰.

Comment (C.H. Yansa): Saline goosefoot seeds and three-square bulrush achenes, in excellent condition, were taken from the top of a laminated silty clay unit, at a depth of 410 cm. The sample was overlain by 10 cm of nonlaminated silty clay and 10 cm of charcoal-rich sandy clay. This sample dates the end of the parkland–permanent pond phase and onset of the Hypsithermal interval in southern Saskatchewan.

AECV-2048C. Andrews site (IV)

normalized age: 10 200 ± 140
$\delta^{13}C$: -23.9‰

The tree trunk (sample 51b ASA-D95-2 at 455 cm depth; *Picea* (spruce), identified by C.H. Yansa) was in laminated silty clay (gyttja). This white spruce sample was taken 35 cm above GSC-5822 and 45 cm above AECV-2047C. It was submitted by C.H. Yansa and J. Basinger to gain information on the end of the late-glacial *Picea glauca* woodland.

Comment (C.H. Yansa): The *Picea* wood, from a large trunk, was found 455 cm below the present-day surface. This sample documents the first appearance of *Populus tremuloides* (aspen poplar) and *P. balsamifera* (balsam poplar). *Betula* cf. *B. occidentalis* (river birch) macrofossils were found at the same level as this topmost layer of *Picea* trunks. This sample dates the end of the white spruce woodland and the onset of the parkland–permanent wetland phase in southern Saskatchewan.

AECV-2047C. Andrews site (V)

normalized age: 10 230 ± 140
$\delta^{13}C$: -23.9‰

The root (sample 30c ASA-D95-1 at 500 cm depth; *Picea* (spruce), identified by C.H. Yansa) was in silty clay. This white spruce sample was taken 5 cm below GSC-5822 and 45 cm below AECV-2048C. It was submitted by C.H. Yansa and J. Basinger to gain information on late-glacial *Picea glauca* woodland.

Comment (C.H. Yansa): Fossils were exposed when a kettle depression in a hummocky moraine of The Missouri Coteau was excavated for a cattle watering hole. The *Picea* root was situated at 500 cm below the present-day surface and found in situ, penetrating a 10 cm thick litter layer composed primarily of *Picea glauca* needles, cones, and seeds.

GSC-5822. Andrews site (VI)

normalized age: 10 200 ± 90
$\delta^{13}C$: -25.2‰
uncorrected age: 10 300 ± 90

The wood (sample 34b at 4.9 m depth; *Picea glauca*, identified by C.H. Yansa in unpublished GSC Wood Report 94-81) was in silty clay. The *Picea glauca* wood was situated east of an adjacent larger log that was 2.1 m horizontally westward along the trench at 0 to 10 cm below the surface of the dugout. This sample was submitted by C.H. Yansa and D.S. Lemmen to gain information on climate change.

General comment (C.H. Yansa): Plant macrofossil studies and associated ^{14}C dating of a kettle deposit in hummocky moraine terrain of southern Saskatchewan revealed that an open white-spruce woodland was established in the area by 10.2 ka BP (AECV-2047C, AECV-2048C, GSC-5822). Subsequently, a deep pond developed in a parkland setting that lasted until 8.8 ka BP (TO-5019). This phase was followed by a period of low water levels, frequent prairie fires, and slopewash from unstable slopes from 8.8 ka BP (TO-5019) to 7.7 ka BP (TO-4780), which is interpreted as the Hypsithermal interval. Water levels then began to rise and a semipermanent slough was established until 5.8 ka BP (TO-5018), when the wetland became ephemeral as it is today. See GSC-5958 for additional comments.

GSC-5958. Newfield site

normalized age: 9860 ± 120
$\delta^{13}C$: -25.1‰
uncorrected age: 9860 ± 120

The wood (*Picea*; identified by H. Jetté in unpublished GSC Wood Report 95-17) was in silty clay. The sample (CY-94-01N 001) was collected by C.H. Yansa on May 10, 1994 from the Newfield site, 9.5 km northeast of the eastern city limits of Swift

Current and 0.6 km south of the Trans-Canada Highway, Saskatchewan (50°23.0′N, 106°39.2′W), at an elevation of 810 m. This sample was submitted by C.H. Yansa and D.S. Lemmen to gain information on climate change.

Comment (C. Yansa): These five samples (GSC-5622, -5651, -5822, -5921, -5958) from similar settings all document the presence of *Picea glauca* woodlands on The Missouri Coteau for a relatively short period between about 10.3 and 9.8 ka BP. Abundant water resulting from the melting of buried glacier ice is believed critical to the establishment of coniferous trees at these sites. Detailed macrofossil analyses are available for one of the sites (Andrews site) in Yansa and Basinger (1999).

Kyle Series

A series of wood samples was collected by J. Basinger and C.H. Yansa on August 20, 1988 from about 14 km southeast of Clearwater Lake, in the vicinity of Kyle, about 175 km west-northwest of Moose Jaw, Saskatchewan (50°53′N, 107°50′W), at an elevation of 720 m.

GSC-5651. Kyle (I)

normalized age:	10 200 ± 90
$\delta^{13}C$:	-27.6‰
uncorrected age:	10 300 ± 90

The wood sample US-600-5602 (unidentifiable, according to H. Jetté in unpublished GSC Wood Report 94-04), was enclosed in wood and organics. The sample was exposed in a dugout about 4 m below the ground surface. This sample was submitted by D.S. Lemmen and C.H. Yansa to gain information on climate change.

See GSC-5958 for comments.

GSC-5622. Kyle (II)

normalized age:	10 300 ± 90
$\delta^{13}C$:	-24.1‰
uncorrected age:	10 300 ± 90

The wood sample US-600-5601 (about 4 m depth; *Picea glauca*, identified by J. Basinger in unpublished GSC Wood Report 93-31) was in a 1 m thick organic-rich unit. The sample was exposed in a dugout about 4 m below the ground surface. This sample was submitted by D.S. Lemmen and C.H. Yansa to gain information on climate change.

See GSC-5958 for comments.

GSC-5921. Beechy site

normalized age:	10 300 ± 90
$\delta^{13}C$:	-25.8‰
uncorrected age:	10 300 ± 90

The wood (*Picea*; identified by C.H. Yansa) was in silty clay. Sample CY-94-02B-001 was collected by C.H. Yansa on November 5, 1993 from the Beechy site, 6 km north of Highway 342, 30 km west-northwest of Beechy and 27 km northeast of Kyle, about 175 km west-northwest of Moose Jaw, Saskatchewan (50°55.0′N, 107°40.0′W), at an elevation of 808 m. This sample was submitted by C.H. Yansa and D.S. Lemmen to gain information on climate change.

See GSC-5958 for comments.

Kenosee Lake Series I

A series of organic samples was collected by R.E. Vance on May 14, 1992 from Kenosee Lake, about 250 km southeast of Regina, on the Moose Mountain Upland of southeastern Saskatchewan (49°49′01″N, 102°17′07″W), at an elevation of 740 m. Refer to Vance et al. (1997) for complete details; also published in Morlan et al. (2001).

CAMS-6866. Kenosee Lake (I)

normalized age:	3910 ± 80

The seed (organic) sample KN1 (60–70 cm; *Betula* (5) and *Carex*-type (1), identified by R.E. Vance) was in lake sediment. The sample was screened, and selected plant macrofossils were picked from the residue with forceps. This sample was submitted by R.E. Vance to gain information on climate change and water-level rise. The age was normalized to $\delta^{13}C$= -25‰.

Comment (R.E. Vance): The sample's age is out-of-sequence with CAMS-6862 and -3911, likely due to a redeposited *Carex* seed enclosed with a *Betula* seed to bring this sample to minimum weight required for dating. The *Carex* seed did bear some evidence of reworking (rounded edges, piece missing, discoloured).

GSC-5821. Kenosee Lake (II)

normalized age:	2030 ± 80
$\delta^{13}C$:	-26.4‰
uncorrected age:	2050 ± 80

The lake sediment sample KN1 (80–75 cm) was in clay and silt, and consisted of *Betula* pollen and plant macrofossils. This sample was submitted by R.E. Vance to gain information on climate change and water-level rise.

Comment (R.E. Vance): This date is out-of-sequence with CAMS-6862 and -3991.

Laboratory comment: The fact that the sample was very calcareous when treated suggests that the age is anomalously old.

CAMS-6862. Kenosee Lake (III)

normalized age: 2760 ± 60

The seed (organic) sample KN1 (160–165 cm; *Scirpus*-type (1) and *Chenopodium*-type (5), identified by R.E. Vance) was in lake sediment. The lake sediment sample was screened, and selected plant macrofossils were picked from the screened residue with forceps. This sample was submitted by R.E. Vance to gain information on climate change. The age was normalized to $\delta^{13}C$= -25‰.

CAMS-3991. Kenosee Lake (IV)

normalized age: 4090 ± 110

The seed (organic) sample KN1 (195–198 cm; *Chenopodium*-type (20), identified by R.E. Vance) was in lake sediment. The lake sediment sample was screened, and selected plant macrofossils were picked from the screened residue with forceps. This sample was submitted by R.E. Vance to gain information on climate change. The age was normalized to $\delta^{13}C$= -25‰.

Kenosee Lake Series II

A second series of samples from Kenosee Lake was collected by R.E. Vance and submitted for dating.

CAMS-12907. Kenosee Lake (V)

normalized age: 2510 ± 60

The seed sample KN3 (340–345 cm; 40 Chenopodiaceae seeds, identified by R.E. Vance) was enclosed in massive clay and silt. This sample was submitted by R.E. Vance to gain information on lake-level change, specifically termination of a low lake stand. The age was normalized assuming a $\delta^{13}C$ = -25‰.

CAMS-17433. Kenosee Lake (VI)

normalized age: 2460 ± 60

The seed sample KN2 (210–215 cm; 60 Chenopodiaceae seeds, identified by R.E. Vance) was enclosed in massive clay and silt. This sample was submitted by R.E. Vance to gain information on lake-level change, specifically termination of a low lake stand. The age was normalized assuming a $\delta^{13}C$ = -25‰

CAMS-19175. Kenosee Lake (VII)

normalized age: 2170 ± 60

The seed sample KN4 (175–190 cm; 40 Chenopodiaceae seeds, identified by R.E. Vance) was enclosed in massive clay and silt. This sample was submitted by R.E. Vance to gain information on lake-level change, specifically termination of a low lake stand. The age was normalized assuming a $\delta^{13}C$ = -25‰.

This additional series of organic samples was published in Vance et al. (1997) with complete details.

GSC-5930. Bigstick Sand Hills

age: modern
$\delta^{13}C$: -25.8‰

The organic detritus (probably dominantly *Psoralea agrophylla*, identified by S.A. Wolfe) in a paleosol is overlain and underlain by eolian sand and exposed along the edges of a blowout. Sample 94-SAW-84 (2–5 m below dune surface) was collected by D. Lemmen and S.A. Wolfe on September 29, 1994 from the Bigstick Sand Hills central dune, about halfway between Bigstick and Crane lakes, triangulated to be 34 km northeast of Maple Creek, 37 km southeast of Fox Valley, and 51 km west-northwest of Gull Lake, Saskatchewan (50°11′15″N, 109°11′37″W), at an elevation of 730 m. This sample was submitted by D.S. Lemmen and S.A. Wolfe to gain information on eolian (eolian) activity and formation of a modern blowout.

See GSC-5943 for comments.

Laboratory comment: The count on the sample suggests that the material formed between 1950 and 1960, certainly pre-1960 (cf. McNeely, 1994).

GSC-5943. Burstall Sand Hills

age: modern
$\delta^{13}C$: -18.9‰
uncorrected age: 10 ± 100

The organic detritus (probably dominantly *Psoralea agrophylla*, identified by S.A. Wolfe) was in a paleosol overlain and underlain by eolian sand and exposed along the edges of a blowout. Sample 94-SAW-85 (4 m below the dune surface) was collected by D.S. Lemmen and S.A. Wolfe on September 30, 1994 from Burstall Sand Hills, 4.9 km north of Highway 321 from the town of Burstall, near the Alberta border, Saskatchewan (50°42′8″N, 109°54′50″W), at an elevation of 740 m. This sample was submitted by D.S. Lemmen and S.A. Wolfe to gain information on eolian activity and the formation of a modern blowout.

Comment (D.S. Lemmen and S.A. Wolfe): Date GSC-5930 and -5943 confirm that the formation of the blowouts is a very recent event following a period of regionally extensive sand-dune activity, which optical dating places within the last 200 years. The radiocarbon dates generally

support the optical-dating chronology, although GSC-5930 suggests that zeroing of blowout sand may not always be complete.

S-3553. Burstall Sand Hills

uncorrected age:	2620 ± 140

The bone (*Bison bison*; identified by B. Kooyman) was enclosed in eolian and shallow lacustrine sand, exposed on the south face of a blowout. Sample SW6-01 (about 11 m below the surface of the dune) was collected by S.A. Wolfe on October 10, 1993 from the Burstall Sand Hills, 4.9 km north of Highway 321 from town of Burstall, near the Alberta border, Saskatchewan (50°42′8″N, 109°54′50″W). This sample was submitted by S.A. Wolfe to gain information on eolian activity.

Comment (S.A. Wolfe): The sample dates an interval of low eolian activity and provides a maximum age estimate on the last interval of extensive eolian activity (optically dated at 310 years). The date is consistent with optical-dating chronology from the same site and therefore provides an important corroboration of these dates (cf. Morlan et al., 2001).

GSC-6068. Gap Creek

normalized age:	7230 ± 100
$\delta^{13}C$:	-26.7‰
uncorrected age:	7250 ± 100

The wood (unidentifiable, according to R.J. Mott in unpublished GSC Wood Report 96-29) was in sand. Sample WVRC-9409 was collected by W.J. Vreeken in 1994 from along the western (left) cutbank of Gap Creek, 10 km southwest of the town of Maple Creek, Saskatchewan (49°51′15″N, 109°35′20″W), at an elevation of 789 m. This sample was submitted by W.J. Vreeken to gain information on stream incision and the rate of sedimentation.

Alberta

GSC-6137. Viking

normalized age:	10 400 ± 120
corrected age:	not corrected
$\delta^{13}C$:	-10.73‰
uncorrected age:	10 200 ± 120

The freshwater gastropod shells were enclosed in silt. Sample 95-H-8 was collected by D.B. Sjogren on September 29, 1995 from 6.3 km south of Highway 619, 32.5 km east of Viking, Alberta (53°02′50″N, 111°16′20″W), at an elevation of 690 m. The sample was submitted by R.R. Young to gain paleoenvironmental information.

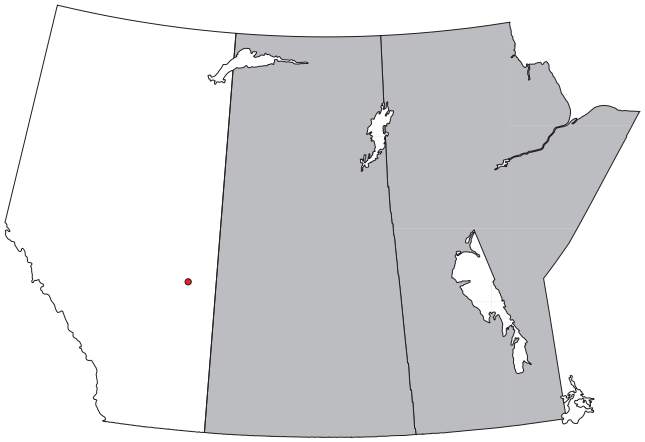

Figure 9. Radiocarbon-dated sites in Alberta.

The sample (21.9 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (19.4 g) yielded 4.2 L of CO_2 gas. The age estimate is based on one count for 3715 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.076 ± 0.049, 1.243 ± 0.026, and 18.089 ± 0.147 cpm, respectively.

Comment (R.R. Young): The sample was found in situ, approximately 2 m below the crest of a glacial hummock that is 5 m in height. The sample was collected from pre-existing, sorted, silty sediment that has been thrust (glaciotectonically) into place; the bedding has been sheared along several planes. The sample was collected from sediment that is positioned between diamicton units that are probably till.

The age of the shells is significant because it provides an age of the sediment within the hummock and thus constrains the timing of glaciation. The species present are good paleoclimatic indicators and are consistent with a preglacial climate as interpreted by Burns and Young (1994).

British Columbia

GSC-6064. North Star Glacier

normalized age:	9620 ± 100
$\delta^{13}C$:	-23.60‰
uncorrected age:	9600 ± 100

The wood (*Abies*, identified by R.J. Mott in unpublished GSC Wood Report 96-10) was a surface collection on till. Sample NS 94-1 was collected by A. Solte in August 1994 from the North Star Glacier, southwest of Invermere, Purcell Mountains, British Columbia (50°37.5′N, 116°32′W), at an elevation of 2440 m. The sample was submitted by G. Holdsworth to gain information on Neoglacial fluctuations.

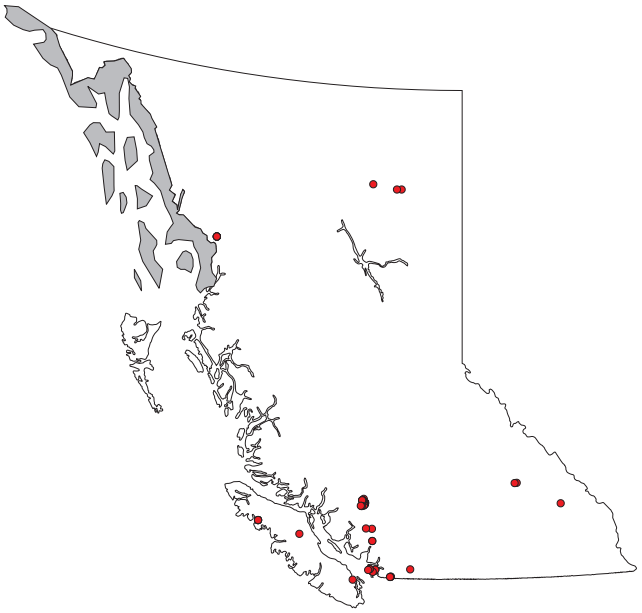

Figure 10. Radiocarbon-dated sites in British Columbia.

The sample (11.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.5 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 2300 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.550 ± 0.077, 2.293 ± 0.035, and 28.244 ± 0.136 cpm, respectively.

Comment (G. Holdsworth): This sample presumably, but not necessarily, represents an advance of glacial ice at about 9600 ^{14}C years BP. This provisionally puts the event post–Younger Dryas termination. There is a 'cooling' event in $\delta^{18}O$ data at about 11 300 calendar years BP. The sample could be correlative with this event.

Inverness Glacier Series

A series of wood samples was collected by G. Holdsworth on August 3 and September 12, 1995 from the Inverness Glacier, on the Trans-Canada Highway, 17 km northeast of Revelstoke, British Columbia. These samples were submitted by G. Holdsworth to gain information on Neoglacial fluctuations.

GSC-6042. Inverness Glacier (I)

age:	Modern
$\delta^{13}C$:	-26.70‰

The wood sample WO 95-1 (9.6 g dry weight; *Picea*, identified by R.J. Mott in unpublished GSC Wood Report 96-11), from an elevation of 1980 m at 51°07.4′N, 118°03.5′W and enclosed in loose till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.5 g) yielded 6.1 L of CO_2 gas. The age estimate is based on one count for 3745 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.960 ± 0.102, 2.293 ± 0.035, and 28.244 ± 0.136 cpm, respectively.

Comment (G. Holdsworth): This sample could be related to a late 'Little Ice Age' pulse to this advanced position, but it does not preclude transport by a large avalanche.

GSC-6021. Inverness Glacier (II)

normalized age:	3670 ± 70
$\delta^{13}C$:	-22.54‰
uncorrected age:	3630 ± 70

The wood sample INV 95-3 (6.8 g dry weight; *Picea*, identified by R.J. Mott in unpublished GSC Wood Report 96-06), from an elevation of 2000 m at 51°07.1′N, 118°08′W and enclosed in sand till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.8 g) yielded 5.1 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.640 ± 0.064, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (G. Holdsworth): This date adds to the growing network of dates for the Neoglacial in the Rocky Mountains (including the Interior Mountains). It is significantly earlier than the (median) date for the eastern glaciers (e.g. Peyto G1). More dating is necessary.

GSC-5168. Cheam Indian Reserve

normalized age:	4770 ± 110
$\delta^{13}C$:	-23.70‰
uncorrected age:	4750 ± 110

The wood was enclosed in rock-avalanche debris. Sample EN-89-1401 was collected by S.G. Evans on October 14, 1989 from a gravel pit on Cheam Indian Reserve 1, 4.5 km south of Agassiz, British Columbia (49°12.0′N, 121°46′W), at an elevation of 40 m. The sample was submitted by S.G. Evans to gain information on the rock avalanche.

The sample (5.68 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.7 g) yielded 5.04 L of CO_2 gas. The age estimate is based on two counts for 2170 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.114 ± 0.076, 1.065 ± 0.026, and 18.277 ± 0.188 cpm, respectively.

Comment (S.G. Evans): This sample will refine the dating of the 'Mt. Cheam' rock avalanche.

GSC-5871. Bradner Road (I)

normalized age:	11 900 ± 100
$\delta^{13}C$:	-26.2‰
uncorrected age:	11 900 ± 100

The wood, the outer rings of an in situ stump (probably *Pinus contorta*, according to J.J. Clague) was enclosed in peat and overlain by glaciomarine mud. Sample CIA-94-56-1 was collected by J.J. Clague on October 16, 1994, 1 km northeast of the intersection of Bradner and Huntingdon roads, 6 km southeast of Aldergrove, British Columbia (49°01.4′N, 122°24.8′W), at an elevation of 88 m. The sample was submitted by J.J. Clague to gain information on sea-level change related to late glacial advance, the Sumas Stade.

The sample (10.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 9.12 L of CO_2 gas. The age estimate is based on one count for 6240 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.422 ± 0.050, 2.277 ± 0.033, and 28.303 ± 0.131 cpm, respectively.

Comment (J.J. Clague): Date GSC-5871 provides a maximum limiting age for the death of a tree that became buried in mud deposited either in the sea or in an ice-marginal lake. The tree death and burial coincide with a late-glacial readvance of a lobe of the Cordilleran ice sheet in the eastern Fraser Lowland, one of the Sumas advances. Other radiocarbon ages from this site are reported in Clague et al. (1997a).

GSC-5770. Bradner Road (II)

normalized age:	11 600 ± 100
$\delta^{13}C$:	-30.2‰
uncorrected age:	11 600 ± 100

The wood, a branch of *Pinus contorta* (identified by H. Jetté in unpublished GSC Wood Report 94-45) was enclosed in diamicton. Sample C1A-93-10-1 was collected by J.J. Clague on June 13, 1993 from a gravel pit off Bradner Road, 5 km southeast of Aldergrove, British Columbia (49°01.2′N, 122°25.5′W), at an elevation of 77 m. The sample was submitted by J.J. Clague to gain information on the time of a late-glacial advance during the Sumas Stade.

The sample (14.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.5 g) yielded 8.94 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.676 ± 0.059, 2.137 ± 0.035, and 28.437 ± 0.131 cpm, respectively.

Comment (J.J. Clague): The dated wood came from a clayey diamicton, interpreted to be either glaciomarine or glaciolacustrine in origin (Clague et al., 1997a). The diamicton abruptly overlies a terrestrial peat, from which the dated wood may have been reworked. The clayey diamicton is overlain by outwash and till. The sequence thus records a readvance of a lobe of the Cordilleran ice sheet in the eastern Fraser Lowland at the end of the last glaciation. Date GSC-5770 and other radiocarbon ages reported by Clague et al. (1997a) and Kovanen and Easterbrook (2002) from this site show that this readvance occurred after 11 600 ^{14}C years BP.

Lefeuvre Road Series

A series of wood samples was collected by J.J. Clague on June 22, 1994 from 300 m north of Huntingdon Road, 600 m east of Lefeuvre Road, 5 km southeast of Aldergrove, British Columbia (49°01.0′N, 122°26.4′W), at an elevation of 76 m. These samples were submitted by J.J. Clague to gain information on sea-level change and a late glacial readvance, the Sumas advance.

GSC-5860. Lefeuvre Road (I)

normalized age:	11 800 ± 100
$\delta^{13}C$:	-27.5‰
uncorrected age:	11 800 ± 100

The wood (log, outermost 10 rings) sample CIA-94-9-2 (10.0 g dry weight; unidentifiable, according to H. Jetté in unpublished GSC Wood Report 95-34), enclosed in glaciomarine gravelly mud, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 8.94 L of CO_2 gas. The age estimate is based on one count for 3450 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.524 ± 0.061, 2.233 ± 0.034, and 28.337 ± 0.129 cpm, respectively.

GSC-5862. Lefeuvre Road (II)

normalized age:	11 800 ± 100
$\delta^{13}C$:	-25.9‰
uncorrected age:	11 900 ± 100

The wood (branch) sample CIA-94-9-1 (29.5 g dry weight; *Pinus*, identified by H. Jetté in unpublished GSC Wood Report 94-94), enclosed in glaciomarine gravelly mud, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.7 g) yielded 8.70 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.469 ± 0.059, 2.277 ± 0.033, and 28.303 ± 0.131 cpm, respectively.

Comment (J.J. Clague): The dated wood samples were collected from a clayey diamicton unit, interpreted to be either glaciomarine or glaciolacustrine in origin (Clague et al., 1997a). The diamicton abruptly overlies a terrestrial peat and is overlain by outwash and till. The sequence records one of the readvances of the Sumas Stade at the end of the last glaciation. Samples GSC-5860, -5862, and other radiocarbon ages reported by Clague et al. (1997a) and Kovanen and Easterbrook (2002) from the Aldergrove area show that this readvance occurred after 11 600 ^{14}C years BP.

GSC-6432. Trutch Creek

normalized age:	2750 ± 60
δ^{13}C:	-24.73‰
uncorrected age:	2750 ± 60

The wood (*Picea*, identified by C. Keith) was enclosed in clay, silt, and sand, overlain by colluvium and underlain by coarse gravel. Sample 99-BJB-0049 was collected by J. Bednarski on July 2, 1999 along Trutch Creek, at the junction with a tributary stream from the north, 21.75 km east of Trutch (abandoned) townsite, British Columbia (57.7212°N, 122.5804°W), at an elevation of 640 m. The sample was submitted by J. Bednarski to gain information on deglaciation and a landslide.

The sample (11.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.9 g) yielded 7.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.757 ± 0.065, 1.171 ± 0.025, and 17.959 ± 0.103 cpm, respectively.

Comment (J. Bednarski): The sample provides a date for a large landslide along Trutch Creek (*see* GSC-6440, below).

GSC-6440. Trutch Creek

normalized age:	4750 ± 60
δ^{13}C:	-23.14‰
uncorrected age:	4720 ± 60

The wood (*Picea*, identified by C. Keith) was enclosed in stratified sand abruptly overlying fluvial gravel. Sample 99-BJB-0047 was collected by J. Bednarski on July 2, 1999 along Trutch Creek, 10 km east of Trutch (abandoned) townsite, British Columbia (57.7175°N, 122.7764°W), at an elevation of 724 m. The sample was submitted by J. Bednarski to gain information on a landslide.

The sample (10.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.2 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 3970 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.823 ± 0.075, 2.080 ± 0.033, and 28.482 ± 0.131 cpm, respectively.

Comment (J. Bednarski): The sample provides a date for a large landslide along Trutch Creek. See GSC-6432 (above) for additional information.

Annacis Island Series

A series of wood samples was collected by J.J. Clague and E. Naesgaard on September 15, 1994 and February 01, 1995 from Annacis Island, 5 km south-southwest of New Westminster, British Columbia (49°09.9′N, 122°57.1′W), at an elevation of about 3 m. These samples were submitted by J.J. Clague to gain information on sand blow produced by liquefaction during a large prehistoric earthquake.

GSC-5865. Annacis Island (I)

normalized age:	1780 ± 70
δ^{13}C:	-24.3‰
uncorrected age:	1770 ± 70

The wood (root or branch) sample CIA-94-52-1 (6.1 g dry weight; *Pinus*, identified by H. Jetté in unpublished GSC Wood Report 94-100), enclosed in sand (above) and soil (below), was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.6 g) yielded 5.69 L of CO_2 gas. The age estimate is based on two counts for 2140 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.809 ± 0.090, 1.217 ± 0.026, and 18.461 ± 0.106 cpm, respectively.

GSC-5857. Annacis Island (II)

normalized age:	1790 ± 60
δ^{13}C:	-21.5‰
uncorrected age:	1740 ± 60

The wood (outer 9 rings of log) sample CIA-94-52-2 (9.90 g dry weight; *Thuja plicata*, identified by H. Jetté in unpublished GSC Wood Report 94-90), enclosed in sand overlying paleosol, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.1 g) yielded 8.10 L of CO_2 gas. The age estimate is based on two counts for 1900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 22.828 ± 0.120, 2.233 ± 0.034, and 28.337 ± 0.129 cpm, respectively.

GSC-5983. Annacis Island (III)

normalized age:	2000 ± 60
$\delta^{13}C$:	-24.2‰
uncorrected age:	1990 ± 60

The wood (branch) sample C1A-94-52-8 (11.1 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 95-32), enclosed in sand and silt, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.1 g) yielded 5.8 L of CO_2 gas. The age estimate is based on one count for 6655 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.328 ± 0.053, 1.240 ± 0.021, and 18.353 ± 0.110 cpm, respectively.

Comment (J.J. Clague): The three Annacis Island ages closely delimit the age of a large earthquake in the Vancouver area (Clague et al., 1992, 1997b). Two of the dated samples were logs lying on a paleosol. The logs were buried by sand that erupted onto the land surface during the earthquake. The third sample (GSC-5983) is a branch within the sand. The ages show that the earthquake occurred around 1700 to 1800 ^{14}C years BP.

GSC-5804. Ladner

normalized age:	1890 ± 70
$\delta^{13}C$:	-25.5‰
uncorrected age:	1900 ± 70

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-51) was enclosed in sand. Sample 'FD 93-4 47–67' 186–200 cm' was collected by J.L. Luternauer and J.J. Clague on October 12, 1993 from the intersection of 60th Avenue and 68th Street, near Ladner, British Columbia (49°06.7′N, 123°02.0′W), at a depth of 15 m. The sample was submitted by J.J. Clague to gain information on a Holocene stratigraphic correlation.

The sample (10.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.1 g) yielded 4.89 L of CO_2 gas. The age estimate is based on two counts for 2055 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.421 ± 0.091, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

Comment (J.J. Clague): The dated wood was recovered from distributary channel sediments forming the upper part of the Holocene sedimentary sequence of the Fraser River delta. Date GSC-5804 indicates that an active distributary channel was present near Ladner about 1900 ^{14}C years BP. Since then, the active channel migrated away from this site and the old channel became infilled with sediment.

Gilbert Road Series

A series of wood samples was collected by J.L. Luternauer and J.J. Clague on August 17 and 18, 1993 from Richmond General Hospital, near the intersection of Westminster Highway and Gilbert Road, Richmond, British Columbia (49°10.2′N, 123°08.7′W). These samples were submitted by J.J. Clague to gain information on the evolution of the Fraser River delta.

GSC-5790. Gilbert Road (I)

normalized age:	3760 ± 90
$\delta^{13}C$:	-23.9‰
uncorrected age:	3740 ± 90

The wood sample 'FD 93-2 17.5–27.5' 229–230 cm' (5.1 g dry weight; *Thuja plicata*, identified by H. Jetté in unpublished GSC Wood Report 94-77) enclosed in sand at a depth of 6 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.8 g) yielded 3.13 L of CO_2 gas. The age estimate is based on one count for 2170 minutes in the 2 L counter with a mixing ratio of 1.39. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.462 ± 0.098, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

GSC-5792. Gilbert Road (II)

normalized age:	5120 ± 100
$\delta^{13}C$:	-24.5‰
uncorrected age:	5110 ± 100

The wood fragment sample 'FD 93-2 47–67' 223–226 cm' (4.2 g dry weight; *Picea* or *Larix*, identified by H. Jetté in unpublished GSC Wood Report 94-78), enclosed in sand at a depth of 15 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.4 g) yielded 2.92 L of CO_2 gas. The age estimate is based on one count for 2150 minutes in the 2 L counter with a mixing ratio of 1.48. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.673 ± 0.096, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

GSC-5802. Gilbert Road (III)

normalized age:	8220 ± 110
$\delta^{13}C$:	-29.4‰
uncorrected age:	8290 ± 110

The wood sample 'FD 93-2 127–147' 371 cm' (3.6 g dry weight; deciduous but unidentifiable, according to H. Jetté in unpublished GSC Wood Report 94-80), enclosed in mud at a depth of 41 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.6 g) yielded 2.63 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 2 L counter with a

mixing ratio of 1.67. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.510 ± 0.073, 1.204 ± 0.025, and 18.269 ± 0.117 cpm, respectively.

Comment (J.J. Clague): The three dated samples were collected from a drillcore on the western part of the Fraser River delta. The ages provide information on the timing of delta progradation at this site. Middle or lower delta-slope sediments were accumulating in this area 8200 ^{14}C years BP (GSC-5802), so the mouth of the Fraser River at that time was farther east. Active distributary channels were present at the site about 5100 ^{14}C years BP (GSC-5792). About 3700 ^{14}C years BP (GSC-5790), delta topset beds were accumulating in this area, so the active delta slope was somewhere to the west.

GSC-5785. Francis Road

normalized age:	3200 ± 90
δ^{13}C:	-25.9‰
uncorrected age:	3220 ± 90

The wood (unidentifiable, according to H. Jetté in unpublished GSC Wood Report 94-73) was enclosed in silty sand. Sample 'FD 93-3 27–37' 72–75 cm' was collected by J.L. Luternauer and J.J. Clague on September 9, 1993 from a dyke at the west end of Francis Road, Richmond, British Columbia (49°09.0′N, 123°11.7′W), at a depth of 6 m. The sample was submitted by J.J. Clague to gain information on the development of the delta.

The sample (5.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.1 g) yielded 2.74 L of CO_2 gas. The age estimate is based on one count for 2090 minutes in the 2 L counter with a mixing ratio of 1.57. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.476 ± 0.111, 1.218 ± 0.025, and 18.627 ± 0.106 cpm, respectively.

Comment (J.J. Clague): Date GSC-5785 indicates that Fraser delta topset beds were accumulating in this area 3200 ^{14}C years BP and that the active delta slope was situated somewhere to the west by this time. An inference that can be drawn from this conclusion is that the Fraser delta had achieved something close to its present extent prior to 3000 years ago.

Cheekye River Series

GSC-5100. Cheekye River (I)

normalized age:	1550 ± 80
δ^{13}C:	-26.1‰
uncorrected age:	1570 ± 80

The conifer wood charcoal (unidentifiable, according to R.J. Mott in unpublished GSC Wood Report 90-49) was enclosed in a debris-avalanche diamicton. Sample EN-89-17JN-9C was collected by S.G. Evans on June 17, 1989 beneath the power lines, 5 km north of Brackendale on the Cheekye River, British Columbia (49°47.8′N, 123°06.0′W), at an elevation of 310 m. The sample was submitted by S.G. Evans to gain information on landslides.

The sample (12.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.9 g) yielded 9.63 L of CO_2 gas. The age estimate is based on two counts for 1800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 23.303 ± 0.125, 2.172 ± 0.034, and 28.328 ± 0.234 cpm, respectively.

Comment (S.G. Evans): The material was extracted from a fresh dry exposure in a cutbank on the north side of the Cheekye River. The sample dates unit 1 of the Mount Garibaldi megaslide.

GSC-5101. Cheekye River (II)

normalized age:	2190 ± 140
δ^{13}C:	-25.7‰
uncorrected age:	2200 ± 140

The wood charcoal (unidentifiable, according to R.J. Mott in unpublished GSC Wood Report 90-50) was enclosed in debris-avalanche diamicton. Sample EN-89-17JN-9B was collected by S.G. Evans on June 17, 1989 beneath power lines 5 km northeast of Brackendale, Cheekye River, British Columbia (49°47.8′N, 123°06.0′W), at an elevation of 310 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically landslides.

The sample (2.3 g dry weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (1.55 g) yielded 1.30 L of CO_2 gas. The age estimate is based on two counts for 1705 minutes in the 2 L counter with a mixing ratio of 3.46. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.074 ± 0.221, 1.150 ± 0.032, and 18.513 ± 0.124 cpm, respectively.

Comment (S.G. Evans): A freshly exposed cutbank on the north side of the river was sampled for charcoal in a dry diamicton matrix. This material provides chronological control for unit 2 of the Mount Garibaldi megaslide.

Shovelnose Creek Series

GSC-5271. Shovelnose Creek (I)

normalized age:	5550 ± 70
δ^{13}C:	-25.6‰
uncorrected age:	5560 ± 70

The wood (*Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 91-52) was enclosed in landslide diamicton. Sample EN-89-2J-3B was collected by S.G. Evans on July 2, 1989 from a road cutbank south of Shovelnose Creek, on the west slope of Mount Cayley volcano, British Columbia (50°04.00′N, 123°08.00′W), at an elevation of 260 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically landslides.

The sample (10.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.0 g) yielded 7.44 L of CO_2 gas. The age estimate is based on two counts for 2180 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.155 ± 0.094, 2.196 ± 0.038, and 28.279 ± 0.131 cpm, respectively.

Comment (S.G. Evans): This date confirms the upper age limit on the Mount Garibaldi megaslide deposit south of Turbid Creek.

GSC-4874. Shovelnose Creek (II)

normalized age:	2660 ± 60
$\delta^{13}C$:	-22.4‰
uncorrected age:	2620 ± 60

The wood charcoal (possibly *Thuja plicata*, identified by R.J. Mott in unpublished GSC Wood Report 89-38) was enclosed in fluvial sand. Sample EN-86-SQ-13 was collected by S.G. Evans on July 25, 1986 from a roadcut 50 m south of Shovelnose Creek, Squamish River, British Columbia (50°04′00″N, 123°20′25″W), at an elevation of about 140 m. The sample was submitted by S.G. Evans to gain information on fluvial processes, specifically related to landslides.

The sample (5.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.7 g) yielded 4.62 L of CO_2 gas. The age estimate is based on one count for 5225 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.951 ± 0.055, 1.070 ± 0.019, and 17.936 ± 0.117 cpm, respectively.

Comment (S.G. Evans): The sample was taken from sand deposited behind the most recent landslide (debris avalanche of Mount Cayley volcano) blockage of the Squamish River, thus providing chronological control on this event.

Nogood Creek Series

GSC-4264. 'Nogood Creek' (I)

normalized age:	800 ± 70
$\delta^{13}C$:	-25.6‰
uncorrected age:	800 ± 70

The wood (*Alnus*, identified by R.J. Mott in unpublished GSC Wood Report 86-13) was enclosed in cobble boulder gravel. Sample EN-MEAG-NOG4 was collected by P. Jordan on September 6, 1985 from Meager Creek, just above its junction with 'Nogood Creek', 55 km northwest of Pemberton, British Columbia (50°33′39″N, 123°31′56″W), at an elevation of 762 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (11.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.2 g) yielded 9.3 L of CO_2 gas. The age estimate is based on two counts for 2260 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): A single piece of dry wood (measuring 5.2 cm by 3.5 cm in cross-section (max.) and 23.5 cm long) was taken from a section on the left bank of Meager Creek. There was a little bark adhering to what was otherwise a fairly smooth exterior, and the ends were jagged. All 18 to 20 rings of this branch were used for dating. The wood provides a maximum age for the overlying mudflow unit.

GSC-4223. 'Nogood Creek' (II)

normalized age:	900 ± 60
$\delta^{13}C$:	-22.1‰
uncorrected age:	850 ± 60

The wood (*Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 86-10) was enclosed in mudflow diamicton. Sample EN-MEAG-NOG5 was collected by P. Jordan on September 6, 1985 from Meager Creek, just above its junction with 'Nogood Creek', 55 km northwest of Pemberton, British Columbia (50°33.65′N, 123°31.93′W), at an elevation of 762 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (11.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.6 g) yielded 9.9 L of CO_2 gas. The age estimate is based on one count for 1100 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): The sample was taken from a fresh section on the left bank of Meager Creek. Three pieces of wood, all from the same log, were submitted. Only the largest piece (max. width and thickness of 6.5 and 2.5 cm, respectively, and 21.5 cm long) was used. The wood appeared to be from the outermost part of the log, and the outer 14 to 16 annual rings were used for dating. The sample dates a mudflow unit on Meager Creek.

GSC-4239. 'Nogood Creek' (III)

normalized age:	990 ± 70
$\delta^{13}C$:	-23.5‰
uncorrected age:	960 ± 70

The wood (*Thuja plicata*, identified by H. Jetté in unpublished GSC Wood Report 86-15) was enclosed in mudflow diamicton. Sample EN-MEAG-NOG2 was collected by P. Jordan on September 4, 1985 from 'Nogood Creek', 55 km northwest of Pemberton, British Columbia (50°34′00″N, 123°30′47″W), at an elevation of 853 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (12.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.1 g) yielded 8.9 L of CO_2 gas. The age estimate is based on two counts for 2280 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): Three pieces of wood from a single log (probably not the outermost; measuring 16.0 cm by 0.5 cm by 3.0 cm) were taken from the river bank along 'Nogood Creek'. There was no bark on the branches with jagged ends. All adhering sediment was scraped off and about 30 rings were used for dating. The wood dates mudflow unit A in 'Nogood Creek'.

GSC-4302. 'Devastation Creek'

normalized age:	2170 ± 60
$\delta^{13}C$:	-22.3‰
uncorrected age:	2120 ± 60

The wood (*Thuja plicata*, identified by H. Jetté in unpublished GSC Wood Report 86-14) was enclosed in mudflow diamicton. Sample EN-MEAG-DEV3 was collected by P. Jordan on September 4, 1985 from 'Devastation Creek', 55 km northwest of Pemberton, British Columbia (50°34′00″N, 123°33′44″W), at an elevation of 853 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (12.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.9 g) yielded 23.9 L of CO_2 gas. The age estimate is based on two counts for 2500 minutes in the 2 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): A clean, single flat piece of wood (measuring 14.0 cm by 11.8 cm by 2.4 cm) was taken from a log in a fresh dry exposure near 'Devastation Creek'. The wood was very fresh looking, without bark or branches. At least 25 to 30 rings were used for dating, and not the entire radius of the log. The wood exhibited three tones of colour (i.e light beige exterior with medium brown to yellow interior). This sample dates an older landslide deposit in 'Devastation Creek'.

Meager Creek Series

GSC-5464. Meager Creek (I)

normalized age:	150 ± 60
$\delta^{13}C$:	-25.9‰
uncorrected age:	170 ± 60

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-75) was enclosed in a debris flow. Sample EN-91-AU19-3 was collected by S.G. Evans on August 19, 1991 from the confluence of Capricorn Creek and Meager Creek, British Columbia (50°36.24′N, 123°25.60′W), at an elevation of 457 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a debris flow damming of Meager Creek.

The sample (22.30 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.4 g) yielded 8.2 L of CO_2 gas. The age estimate is based on two counts for 2245 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.801 ± 0.165, 2.122 ± 0.040, and 28.386 ± 0.132 cpm, respectively.

Comment (S.G. Evans): This sample dates a major debris flow in Capricorn Creek that dammed Meager Creek.

GSC-4211. Meager Creek (II)

normalized age:	3940 ± 70
$\delta^{13}C$:	-24.0‰
uncorrected age:	3930 ± 70

The wood (*Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 86-9) was enclosed in mudflow diamicton. Sample EN-MEAG-M5 was collected by S.G. Evans on August 25, 1985 from the north side of Meager Creek, 55 km northwest of Pemberton, British Columbia (50°34′47″N, 123°27′15″W), at an elevation of 548 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (11.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.2 g) yielded 10.1 L of CO_2 gas. The age estimate is based on two counts for 2320 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): The sample was taken from a fresh exposure in a cutbank of Meager Creek. The end piece (measuring 4.0 cm by 13.0 cm by 19.0 cm) was sawn off the rough end of a log without bark. The end that was sticking out of the mudflow was jagged with very little adhering sediment. The log's exterior was fractured in a right-angled pattern. A maximum of the outer 20 rings was used for dating, after the exterior was scraped lightly and any dirt along cracks was removed. The sample dates mudflow unit 6, and will help provide chronological control on a complex section.

GSC-4207. Meager Creek (III)

normalized age:	4080 ± 70
$\delta^{13}C$:	-24.9‰
uncorrected age:	4080 ± 70

The wood (*Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 86-7) was enclosed in mudflow diamicton. Sample EN-MEAG-M4 was collected by S.G. Evans on August 25, 1985 from the north side of Meager Creek, 55 km northwest of Pemberton, British Columbia (50°34′47″N, 123°27′15″W), at an elevation of 548 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (11.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.0 g) yielded 9.5 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 5 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): The sample was taken from a fresh exposure in a cutbank of Meager Creek. The sample submitted comprises several large pieces, all from the same log. The exterior surface, rough but without bark, was scraped clean of adhering sediment. The sample for dating was taken from a single piece (measuring 33.0 cm by 4.5 cm by 2.5 cm). The wood was cracked in a rectangular pattern. A maximum of 25 outer rings was used for the sample sent to the laboratory. This sample dates mudflow unit 5, and will help provide chronological control on a complex section.

GSC-5454. Meager Creek (IV)

normalized age:	5250 ± 70
$\delta^{13}C$:	-24.6‰
uncorrected age:	5250 ± 70

The (?)burnt wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-68) was enclosed in landslide debris. Sample EN-91-AU19-2A was collected by S.G. Evans on August 19, 1991 from the west side of Meager Creek, 800 m downstream from its confluence with Capricorn Creek, British Columbia (50°36.61′N, 123°25.23′W), at an elevation of 442 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a debris avalanche.

The sample (5.20 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.6 g) yielded 4.6 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.606 ± 0.058, 1.198 ± 0.024, and 18.457 ± 0.104 cpm, respectively.

Comment (S.G. Evans): This sample dates a major debris avalanche into Meager Creek.

GSC-5456. Meager Creek (V)

normalized age:	5310 ± 60
$\delta^{13}C$:	-25.8‰
uncorrected age:	5330 ± 60

The (?)burnt wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-70) was enclosed in landslide debris. Sample EN-91-AU19-2B was collected by S.G. Evans on August 19, 1991 from the west side of Meager Creek, 800 m downstream from its confluence with Capricorn Creek, British Columbia (50°36.61′N, 123°25.23′W), at an elevation of 442 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a debris avalanche.

The sample (7.40 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.7 g) yielded 6.7 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.625 ± 0.077, 2.122 ± 0.040, and 28.386 ± 0.132 cpm, respectively.

Comment (S.G. Evans): This sample dates a major debris avalanche in Meager Creek valley.

Lillooet River (A) Series

A series of wood samples was collected by J.J. Clague and O. Lian on July 13, 1993 from the Lillooet River, 6 km northwest of the mouth of Meager Creek, 60 km northwest of Pemberton, British Columbia (50°39.7′N, 123°26.8′W), at an elevation of 497 m. These samples were submitted by J.J. Clague to gain information on a volcanic eruption.

GSC-5690. Lillooet River (I)

normalized age:	2400 ± 60
$\delta^{13}C$:	-24.2‰
uncorrected age:	2390 ± 60

The charred wood sample CIA-93-6-4 (17.3 g dry weight), enclosed in part of a tree enclosed in a pyroclastic deposit, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.0 g) yielded 10.65 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.870 ± 0.111, 2.258 ± 0.029, and 28.094 ± 0.130 cpm, respectively.

GSC-5675. Lillooet River (II)

normalized age:	2500 ± 60
$\delta^{13}C$:	-24.6‰
uncorrected age:	2490 ± 60

The charred wood sample CIA-93-6-3 (26.2 g dry weight; unidentifiable, according to H. Jetté in unpublished GSC Wood Report 94-14), enclosed in part of a tree enclosed in airfall pyroclastic deposits, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.3 g) yielded 11.91 L of CO_2 gas. The age estimate is based on two counts for 1930 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.749 ± 0.122, 2.235 ± 0.033, and 28.299 ± 0.131 cpm, respectively.

GSC-5777. Lillooet River (III)

normalized age:	4000 ± 60
$\delta^{13}C$:	-26.0‰
uncorrected age:	4020 ± 60

The wood (part of large branch) sample C1A-93-95-2 (13.5 g dry weight; conifer but unidentifiable, according to H. Jetté in unpublished GSC Wood Report 94-35), enclosed in peat at an elevation of about 487 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 8.69 L of CO_2 gas. The age estimate is based on two counts for 2080 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.301 ± 0.102, 2.175 ± 0.033, and 28.520 ± 0.132 cpm, respectively.

Comment (J.J. Clague): Samples GSC-5690 and -5675 provide ages on the outer rings of charred tree trunks in growth position. The tree trunks were buried in tephra and pyroclastic flow deposits produced by the last eruption of the Mount Meager volcano. These ages and others reported in Clague et al. (1995) show that the eruption occurred about 2400 ^{14}C years (2350 calendar years) BP. Date GSC-5777 is a date on a branch recovered from peat underlying the Mount Meager eruptive deposits. It indicates that the volcano did not erupt between 4000 and 2400 ^{14}C years BP, and that there were no landslides into the Lillooet River valley from the east flank of the volcano during this period.

Lillooet River (B) Series

A series of wood samples was collected by J.J. Clague and G. Woodsworth on May 25, 1993 from the Lillooet River, 7 km northwest of the mouth of Meager Creek, 60 km northwest of Pemberton, British Columbia (50°39.9′N, 123°27.4′W), at an elevation of about 527 m. These samples were submitted by J.J. Clague to gain information on a volcanic eruption.

GSC-5633. Lillooet River (IV)

normalized age:	2360 ± 60
$\delta^{13}C$:	-23.8‰
uncorrected age:	2340 ± 60

The wood sample CIA-93-5 (rings 45–60 from outermost; 14.0 g dry weight; *Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 93-30), enclosed in soil, bedrock (below), and pumice (above), was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.5 g) yielded 10.85 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.019 ± 0.111, 2.165 ± 0.052, and 28.136 ± 0.136 cpm, respectively.

GSC-5631. Lillooet River (V)

normalized age:	2410 ± 50
$\delta^{13}C$:	-23.7‰
uncorrected age:	2390 ± 50

The wood sample CIA-93-4 (outermost 3 rings; 28.0 g dry weight; *Pseudotsuga*, identified by H. Jetté in unpublished GSC Wood Report 93-29), enclosed in soil, bedrock (below), and pumice (above), was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.0 g) yielded 10.53 L of CO_2 gas. The age estimate is based on one count for 3935 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.905 ± 0.092, 2.165 ± 0.052, and 28.136 ± 0.136 cpm, respectively.

Comment (J.J. Clague): The two dated samples are rings from the outside and middle of a single stump in growth position. The stump is buried in lapilli tephra deposited during the last eruption of Mount Meager volcano. 'Wiggle matching' of the two ages indicates that the tree died about 2400 ^{14}C years (2350 calendar years) BP. Tree death is attributed to the eruption. Additional radiocarbon ages on this event are reported in Clague et al. (1995).

Lillooet River Series

GSC-5190. Lillooet River (I)

normalized age:	2300 ± 90
$\delta^{13}C$:	-24.4‰
uncorrected age:	2290 ± 90

The wood was enclosed in pyroclastic (?landslide) debris. Sample EN-89-22JN-7F was collected by S.G. Evans on June 22, 1989 from the northeast bank of the Lillooet River, 6.5 km upstream of Meager Creek, British Columbia (50°40′N, 123°27′W), at an elevation of 487 m. The sample

was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide and volcanic activity.

The sample (7.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.3 g) yielded 7.56 L of CO_2 gas. The age estimate is based on two counts for 1800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.705 ± 0.095, 1.087 ± 0.025, and 18.225 ± 0.161 cpm, respectively.

Comment (S.G. Evans): A piece of good dry wood, exposed in a fresh river cutbank, was sampled. This date refines the age of the Plinth Peak eruption, and possibly dates landslide debris in the Lillooet River valley.

GSC-5203. Lillooet River (II)

normalized age:	2410 ± 100
$\delta^{13}C$:	-26.5‰
uncorrected age:	2430 ± 100

The wood charcoal (*Abies*, identified by R.J. Mott in unpublished GSC Wood Report 91-42) was enclosed in pyroclastic debris. Sample EN-89-22JN-7E was collected by S.G. Evans on June 22, 1989 from the northeast bank of the Lillooet River, 6.5 km upstream of Meager Creek, British Columbia (50°40′N, 123°27′W), at an elevation of 487 m. The sample was submitted by S.G. Evans to gain information on a landslide and volcanic activity (the Bridge River tephra).

The sample (11.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.7 g) yielded 6.23 L of CO_2 gas. The age estimate is based on one count for 2200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.501 ± 0.086, 1.065 ± 0.026, and 18.277 ± 0.188 cpm, respectively.

Comment (S.G. Evans): This date will refine the age on the Plinth Peak eruption.

GSC-5403. Lillooet River (III)

normalized age:	2460 ± 60
$\delta^{13}C$:	-22.8‰
uncorrected age:	2420 ± 60

The burnt wood (charcoal; *Thuja plicata*, identified by R.J. Mott in unpublished GSC Wood Report 92-46) was enclosed in a debris and pyroclastic flow. Sample EN-91-AU16-2A was collected by S.G. Evans on August 16, 1991 from the north bank of the Lillooet River, 500 m upstream of its confluence with Pebble Creek, in the Mount Meager complex of the Garibaldi volcanic belt, British Columbia (50°38.24′N, 123°25.09′W), at an elevation of 487 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes and a debris flow (pyroclastic sediments).

The sample (21.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.8 g) yielded 11.65 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.910 ± 0.119, 2.197 ± 0.037, and 28.267 ± 0.155 cpm, respectively.

Comment (S.G. Evans): This sample dates a major debris-pyroclastic flow in the Lillooet River valley.

GSC-5433. Lillooet River (IV)

normalized age:	2490 ± 80
$\delta^{13}C$:	-23.8‰
uncorrected age:	2470 ± 80

The wood (unidentifiable, according to H. Jetté in unpublished GSC Wood Report 92-56) was enclosed in rock avalanche debris. Sample EN-91-AU16-2C was collected by S.G. Evans on August 16, 1991 from the north bank of the Lillooet River, 500 m upstream of its confluence with Pebble Creek, British Columbia (50°38.24′N, 123°25.09′W), at an elevation of 487 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a rock avalanche.

The sample (8.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.9 g) yielded 5.17 L of CO_2 gas. The age estimate is based on two counts for 2200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.472 ± 0.085, 1.209 ± 0.024, and 18.316 ± 0.145 cpm, respectively.

Comment (S.G. Evans): This sample dates a major rock avalanche in the Lillooet River valley.

Salal Creek Series

GSC-5401. Salal Creek (I)

normalized age:	280 ± 70
$\delta^{13}C$:	-23.6‰
uncorrected age:	250 ± 70

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-28) was enclosed in lacustrine sand. Sample EN-91-AU20-6 was collected by S.G. Evans on August 20, 1991 from the south bank of the Lillooet River, 4 km upstream of its confluence with Salal Creek, British Columbia (50°41.45′N, 123°31.68′W), at an elevation of

685 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (18.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.4 g) yielded 8.15 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.101 ± 0.128, 2.185 ± 0.041, and 27.969 ± 0.203 cpm, respectively.

Comment (S.G. Evans): This sample dates a damming event on the Lillooet River and provides a minimum age for the landslide diamicton in which the tree was rooted.

GSC-5452. Salal Creek (II)

normalized age:	360 ± 60
$\delta^{13}C$:	-24.0‰
uncorrected age:	340 ± 60

The wood (*Salix*, identified by H. Jetté in unpublished GSC Wood Report 92.66) was enclosed in peaty sand. Sample EN-91-AU23-1D was collected by S.G. Evans on August 23, 1991 from a fresh stream incision into bog deposits, just north of a logging road 1.55 km northwest of the mouth of Salal Creek, on the north side of the Lillooet River, British Columbia (50°41.25′N, 123°29.89′W), at an elevation of 700 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (5.20 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.2 g) yielded 4.2 L of CO_2 gas. The age estimate is based on two counts for 2195 minutes in the 2 L counter with a mixing ratio of 1.06. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.688 ± 0.099, 1.198 ± 0.024, and 18.457 ± 0.104 cpm, respectively.

Comment (S.G. Evans): This sample dates a bog formed by the landslide damming of the Lillooet River.

GSC-5451. Salal Creek (III)

normalized age:	830 ± 80
$\delta^{13}C$:	-24.4‰
uncorrected age:	830 ± 80

The wood (*Salix*, identified by H. Jetté in unpublished GSC Wood Report 92-65) was enclosed in peaty sand. Sample EN-91-AU23-1C was collected by S.G. Evans on August 23, 1991 from a fresh stream incision into bog units, just north of a logging road 1.55 km northwest of the mouth of Salal Creek, on the north side of the Lillooet River, British Columbia (50°41.25′N, 123°29.89′W), at an elevation of 700 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (3.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.8 g) yielded 2.77 L of CO_2 gas. The age estimate is based on two counts for 2175 minutes in the 2 L counter with a mixing ratio of 1.58. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.453 ± 0.142, 1.207 ± 0.022, and 18.234 ± 0.101 cpm, respectively.

Comment (S.G. Evans): This sample dates the landslide damming of the Lillooet River.

GSC-5441. Salal Creek (IV)

normalized age:	890 ± 60
$\delta^{13}C$:	-24.0‰
uncorrected age:	870 ± 60

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-59) was enclosed in peaty sand. Sample EN-91-AU23-1A was collected by S.G. Evans on August 23, 1991 from a fresh stream incision into bog deposits, just north of a logging road 1.55 km northwest of mouth of Salal Creek, on the north side of the Lillooet River, British Columbia (50°41.25′N, 123°29.89′W), at an elevation of 700 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (18.00 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.2 g) yielded 7.9 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 25.124 ± 0.110, 2.111 ± 0.026, and 28.013 ± 0.180 cpm, respectively.

Comment (S.G. Evans): This sample dates a bog formed by the landslide damming of the Lillooet River.

GSC-4290. Salal Creek (V)

normalized age:	890 ± 80
$\delta^{13}C$:	-25.7‰
uncorrected age:	900 ± 80

The wood (?*Abies*, identified by H. Jetté in unpublished GSC Wood Report 86-17) was enclosed in mudflow diamicton. Sample EN-MEAG-SAL2 was collected by P. Jordan on September 5, 1985 from the Lillooet River above Salal Creek, 55 km northwest of Pemberton, British Columbia (50°41′12″N, 123°30′00″W), at an elevation of

670 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (7.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.8 g) yielded 5.80 L of CO_2 gas. The age estimate is based on two counts for 2270 minutes in the 2 L counter with a mixing ratio of 1.00.

Comment (S.G. Evans): The sample, comprising three large flat pieces of wood from the same log (measuring 9.0 cm by 6.0 cm by 1.3 cm, 9.0 cm by 4.9 cm by 2.0 cm, and 9.5 cm by 4.5 cm by 1.5 cm), was taken from a section above the old hydro road above the Lillooet River floodplain. An inner layer of bark, dark brown in colour, was intact on two pieces. The exterior was rough, with ends jagged upon breaking from the log. Approximately the outer 10 rings, after the outermost wood was scraped off, were used for dating. This wood dates a massive mudflow unit in the Lillooet River valley.

GSC-5448. Salal Creek (VI)

normalized age:	1000 ± 50
$\delta^{13}C$:	-24.8‰
uncorrected age:	1000 ± 50

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-63) was enclosed in peaty sand. Sample EN-91-AU23-1B was collected by S.G. Evans on August 23, 1991 from a fresh stream incision into bog deposits, just north of a logging road 1.55 km northwest of the mouth of Salal Creek, on the north side of the Lillooet River, British Columbia (50°41.25′N, 123°29.89′W), at an elevation of 700 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (8.90 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.8 g) yielded 8.0 L of CO_2 gas. The age estimate is based on two counts for 2230 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 25.059 ± 0.118, 2.122 ± 0.040, and 28.386 ± 0.132 cpm, respectively.

Comment (S.G. Evans): This sample dates a bog formed by a landslide dam on the Lillooet River.

GSC-5370. Salal Creek (VII)

normalized age:	1100 ± 50
$\delta^{13}C$:	-23.7‰
uncorrected age:	1070 ± 50

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-17) was enclosed in lacustrine sand. Sample EN-91-AU25-9 was collected by S.G. Evans on August 25, 1991 from the south bank of the Lillooet River, 3.25 km upstream of its confluence with Salal Creek, British Columbia (50°41.31′N, 123°31.23′W), at an elevation of 686 m. The sample was submitted by S.G. Evans to gain information on lacustrine and geomorphic processes, specifically a landslide damming the Lillooet River.

The sample (17.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 8.31 L of CO_2 gas. The age estimate is based on two counts for 2100 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 24.607 ± 0.118, 2.215 ± 0.033, and 28.129 ± 0.131 cpm, respectively.

Comment (S.G. Evans): This sample dates a landslide damming event on the Lillooet River.

GSC-5366. Salal Creek (VIII)

normalized age:	2450 ± 60
$\delta^{13}C$:	-24.7‰
uncorrected age:	2440 ± 60

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report No. 92-12) was enclosed in tephra. Sample EN-91-AU25-7A was collected by S.G. Evans on August 25, 1991 from the south side of the Lillooet River, 1.6 km upstream from its confluence with Salal Creek, British Columbia (50°40.99′N, 123°30.17′W), at an elevation of 670 m. The sample was submitted by S.G. Evans to gain information on volcanic activity, specifically the Bridge River tephra.

The sample (10.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.0 g) yielded 8.13 L of CO_2 gas. The age estimate is based on two counts for 2710 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.810 ± 0.100, 2.305 ± 0.035, and 28.206 ± 0.135 cpm, respectively.

Comment (S.G. Evans): This sample dates a tephra on the north slope of Plinth Peak.

GSC-5979. Salal Creek (IX)

normalized age:	7270 ± 80
$\delta^{13}C$:	-25.11‰
uncorrected age:	7270 ± 80

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 95-31) was enclosed in lacustrine silt. Sample EN91-26A-3 was collected by S.G. Evans on August 26, 1991 from the southeast side of Salal Creek, 65 km northwest of Pemberton, British Columbia (50°43.4′N, 123°28.5′W), at an elevation of 1158 m. The

sample was submitted by S.G. Evans to gain information on various geomorphic processes (e.g. fluvial, landslide, and lake-level change).

The sample (5.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.9 g) yielded 4.6 L of CO_2 gas. The age estimate is based on one count for 8100 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.424 ± 0.039, 1.240 ± 0.021, and 18.353 ± 0.110 cpm, respectively.

Comment (S.G. Evans): This date records the damming of Salal Creek by the flank-collapse of Plinth Peak volcano.

Lillooet River Valley Series

GSC-5460. Lillooet River valley (I)

normalized age:	210 ± 80
$\delta^{13}C$:	-24.8‰
uncorrected age:	210 ± 80

The wood (unidentifiable, according to H. Jetté in unpublished GSC Wood Report 92-74) was enclosed in terrace gravel. Sample EN-91-AU24-4B was collected by S.G. Evans on August 24, 1991 from the east side of the Lillooet River valley, 50 m downstream of a washed-out logging-road bridge, British Columbia (50°41.05′N, 123°30.35′W), at an elevation of 685 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a fluvial terrace from landslide damming of the Lillooet River.

The sample (4.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.6 g) yielded 2.40 L of CO_2 gas. The age estimate is based on two counts for 2215 minutes in the 2 L counter with a mixing ratio of 1.84. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.762 ± 0.135, 1.207 ± 0.022, and 18.234 ± 0.101 cpm, respectively.

Comment (S.G. Evans): This sample dates a recent river terrace in the Lillooet River valley upstream of a landslide dam.

GSC-5450. Lillooet River valley (II)

normalized age:	2480 ± 80
$\delta^{13}C$:	-23.6‰
uncorrected age:	2460 ± 80

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 92-71) was enclosed in tephra. Sample EN-91-AU24-4A was collected by S.G. Evans on August 24, 1991 from the east bank of Lillooet River, 50 m downstream of a washed-out logging-road bridge, British Columbia (50°41.05′N, 123°30.35′W), at an elevation of 685 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically volcanic tephra.

The sample (3.10 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.9 g) yielded 2.8 L of CO_2 gas. The age estimate is based on two counts for 2105 minutes in the 2 L counter with a mixing ratio of 1.59. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.589 ± 0.115, 1.198 ± 0.024, and 18.457 ± 0.104 cpm, respectively.

Comment (S.G. Evans): This sample dates an airfall tephra on the north side of the Lillooet River valley.

GSC-5278. Job Creek

normalized age:	1860 ± 50
$\delta^{13}C$:	-25.1‰
uncorrected age:	1860 ± 50

The wood (*Abies*, identified by H. Jetté in unpublished GSC Wood Report 91-49) was enclosed in landslide diamicton. Sample EN-89-1702 was collected by S.G. Evans in 1989 from the Lillooet River, upstream from Job Creek, British Columbia (50°41.45′N, 123°31.68′W), at an elevation of 685 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically a landslide.

The sample (13.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.0 g) yielded 8.31 L of CO_2 gas. The age estimate is based on one count for 3520 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 22.422 ± 0.092, 2.196 ± 0.038, and 28.279 ± 0.131 cpm, respectively.

Comment (S.G. Evans): This sample dates a major landslide diamicton in the Lillooet River valley.

GSC-5377. Upper Campbell Lake

normalized age:	70 ± 60
$\delta^{13}C$:	-26.7‰
uncorrected age:	100 ± 60

The wood (*Pseudotsuga menziesii*, identified by H. Jetté in unpublished GSC Wood Report 92-18) was enclosed in landslide debris. Sample EN-91-JL15-1B was collected by S.G. Evans on July 15, 1991 from a gravel pit at the south end of Upper Campbell Lake, 350 m north of the Highway 28 crossing, Vancouver Island, British Columbia (49°50.69′N, 125°37.54′W), at an elevation of 228 m. The sample was submitted by S.G. Evans to gain information on geomorphic processes, specifically the Buttle Lake rock avalanche.

The sample (6.4 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.6 g) yielded 4.51 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.908 ± 0.094, 1.238 ± 0.028, and 18.133 ± 0.104 cpm, respectively.

Comment (S.G. Evans): This date is anomalously young for the Buttle Lake rock avalanche.

Fair Harbour Series

A series of wood samples was collected by J.J. Clague on June 15, 1995 from Fair Harbour, British Columbia (50°03.4′N, 127°05.9′W). These samples were submitted by J.J. Clague to gain information on a tsunami deposit and the inception of the marsh.

GSC-6018. Fair Harbour (I)

normalized age:	270 ± 80
$\delta^{13}C$:	-28.25‰
uncorrected age:	320 ± 80

The wood (branch) sample CIA-95-9-1 (10.3 g dry weight; *Tsuga*, identified by R.J. Mott in unpublished GSC Wood Report 96-28), enclosed in peat at an elevation of 2 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.3 g) yielded 7.1 L of CO_2 gas. The age estimate is based on one count for 3720 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.437 ± 0.077, 1.349 ± 0.029, and 18.151 ± 0.150 cpm, respectively.

GSC-6030. Fair Harbour (II)

normalized age:	300 ± 80
$\delta^{13}C$:	-24.47‰
uncorrected age:	300 ± 80

GSC-6030 2.

normalized age:	290 ± 90
$\delta^{13}C$:	-26.16‰
uncorrected age:	310 ± 90

The wood (branch) sample CIA-95-9-2 (2.5 g dry weight; *Juniperus*, identified by R.J. Mott in unpublished GSC Wood Report 96-07), enclosed in woody sand at an elevation of 1 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.4 g) yielded 2.0 L of CO_2 gas. The age estimate for GSC-6030 is based on one count for 2340 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.493 ± 0.094, 1.349 ± 0.029, 18.151 ± 0.150 cpm, respectively. The age estimate for GSC-6030 2 is based on one count for 2300 minutes in the 2 L counter with a mixing ratio of 1.96. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.484 ± 0.139, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

GSC-6006. Fair Harbour (III)

normalized age:	510 ± 80
$\delta^{13}C$:	-24.18‰
uncorrected age:	500 ± 80

GSC-6006 2.

normalized age:	420 ± 80
$\delta^{13}C$:	-24.18‰
uncorrected age:	410 ± 80

The wood (branch) sample CIA-95-9-3 (4.8 g dry weight; *Picea* cf. *sitchensis*, identified by R.J. Mott in unpublished GSC Wood Report 96-25), enclosed in peat at an elevation of 2 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.0 g) yielded 4.5 L of CO_2 gas. The age estimate for GSC-6006 is based on one count for 2345 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.060 ± 0.093, 1.349 ± 0.029, 18.151 ± 0.150 cpm, respectively. The age estimate for GSC-6006 2 is based on one count for 2310 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.251 ± 0.094, 1.349 ± 0.029, and 18.151 ± 0.150 cpm, respectively.

Comment (J.J. Clague): Samples GSC-6018 and -6030 delimit the age of a tsunami sand bed at Fair Harbour. The bed was deposited about 300 ^{14}C years BP during the tsunami generated by the last great earthquake at the Cascadia subduction zone. Additional radiocarbon ages from other tidal marshes on central and northern Vancouver Island are reported in Benson et al. (1997).

GSC-6450. Crehan Creek

normalized age:	9340 ± 80
$\delta^{13}C$:	-23.69‰
uncorrected age:	9320 ± 80

The wood (*Picea*, identified by C. Keith) was enclosed in silty diamicton. Sample 99-BJB-0100 was collected by J. Bednarski on July 26, 1999 from beneath a mountain slope on the south side of Crehan Creek, 12.5 km due west of the summit of Sleeping Chief Mountain, British Columbia

(57.8078°N, 123.7981°W), at an elevation of 1006 m. The sample was submitted by J. Bednarski to gain information on a landslide.

The sample (10.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.0 g) yielded 7.2 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.929 ± 0.052, 2.103 ± 0.024, and 28.472 ± 0.132 cpm, respectively.

Comment (J. Bednarski): The sample provides a maximum age for a large landslide along Crehan Creek and a minimum age for deglaciation of the Rocky Mountain Foothills in the region. The date also provides a minimum age for postglacial migration of trees into the area.

Berendon Glacier Series

A series of wood samples was collected by J.J. Clague and O. Lian on July 30 and 31, 1993 from 2 km east of the toe of Berendon Glacier, 33 km north of Stewart, British Columbia (56°14.4′N, 130°03.0′W), at an elevation of about 788 m. These samples were submitted by J.J. Clague to gain information on late Holocene fluctuations of the Berendon and Frank Mackie glaciers and the history of Tide Lake.

GSC-5746. Berendon Glacier (I)

normalized age:	1720 ± 80
$\delta^{13}C$:	-24.5‰
uncorrected age:	1720 ± 80

The wood sample C1A-93-110-1 (74–85 cm; 7.2 g dry weight; *Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-23), a root enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.8 g) yielded 5.91 L of CO_2 gas. The age estimate is based on two counts for 2170 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.736 ± 0.113, 1.172 ± 0.024, and 18.250 ± 0.102 cpm, respectively.

GSC-5760. Berendon Glacier (II)

normalized age:	1500 ± 50
$\delta^{13}C$:	-24.6‰
uncorrected age:	1490 ± 50

The wood sample CIA-93-109 (51–53 cm; 14.9 g dry weight; *Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-43), a root enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.9 g) yielded 7.36 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 23.624 ± 0.088, 2.137 ± 0.035, and 28.437 ± 0.131 cpm, respectively.

GSC-5726. Berendon Glacier (III)

normalized age:	470 ± 90
$\delta^{13}C$:	-26.6‰
uncorrected age:	500 ± 90

The wood sample CIA-93-103 (18 cm; 5.1 g dry weight; *Salix*, identified by H. Jetté in unpublished GSC Wood Report 94-20), a branch or root enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.6 g) yielded 4.60 L of CO_2 gas. The age estimate is based on two counts for 2175 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.159 ± 0.095, 1.218 ± 0.025, and 18.260 ± 0.170 cpm, respectively.

GSC-5730. Berendon Glacier (IV)

normalized age:	900 ± 50
$\delta^{13}C$:	-23.2‰
uncorrected age:	870 ± 50

The wood sample CIA-93-113-2 (10.4 g dry weight; *Abies*, identified by H. Jetté in unpublished GSC Wood Report 94-18), a branch and twig enclosed in muddy sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.6 g) yielded 9.48 L of CO_2 gas. The age estimate is based on two counts for 2175 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 25.310 ± 0.117, 2.174 ± 0.032, and 28.216 ± 0.130 cpm, respectively.

GSC-5707. Berendon Glacier (V)

normalized age:	1270 ± 70
$\delta^{13}C$:	-26.0‰
uncorrected age:	1290 ± 70

The wood sample CIA-92-38-9 (6.9 g dry weight; *Salix*, identified by H. Jetté in unpublished GSC Wood Report 94-66), a root enclosed in muddy peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.5 g) yielded 6.55 L of CO_2 gas. The age estimate is based on two counts for 2065 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.666 ± 0.095, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

GSC-5753. Berendon Glacier (VI)

normalized age:	6690 ± 90
$\delta^{13}C$:	-28.2‰
uncorrected age:	6740 ± 90

The wood sample C1A-93-112 (60–65 cm; 7.8 g dry weight; unidentifiable, extremely compressed wood, according to H. Jetté, pers. comm., 1994), a branch or root enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.0 g) yielded 6.80 L of CO_2 gas. The age estimate is based on two counts for 2125 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.889 ± 0.070, 1.172 ± 0.024, and 18.250 ± 0.102 cpm, respectively.

Comment (J.J. Clague): Samples of the Berendon Glacier Series were collected from shovel pits at Berendon fen, east of the toe of Berendon Glacier. The sediment sequence in the fen spans much of the Holocene and consists mainly of peat. Thin layers of silt, sand, and gravel within the organic sequence record periods of meltwater flow into the fen, resulting from advances of Berendon Glacier. In addition, glacier-dammed Tide Lake backed up into the lower part of the fen when Frank Mackie Glacier reached its maximum Neoglacial extent. The radiocarbon ages reported here constrain the timing of these events. They identify two periods of Neoglacial glacier advance, one during the Tiedemann phase about 3000 to 2000 years BP and another during the Little Ice Age, which began about AD 1200 (for additional details and other radiocarbon ages, *see* Clague and Mathewes, 1996).

NORTHERN CANADA

Arctic Mainland

Northwest Territories, District of Mackenzie

Horn Plateau Series

A series of peat samples was collected by I.M. Kettles and S.D. Robinson on June 25, 1993 from the Horn Plateau, 50 km west of Fort Simpson, District of Mackenzie, Northwest Territories (61°56′57″N, 120°02′25″W), at an elevation of 685 m. These samples were submitted by I.M. Kettles to gain information on the rate of peat accumulation.

GSC-6381. Horn Plateau (I)

normalized age:	4870 ± 90
$\delta^{13}C$:	-27.3‰
uncorrected age:	4910 ± 90

The peat sample 'Horn Plateau bog' (87–95 cm; 9.2 g dry weight), enclosed in peat over till at 283 cm depth, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.8 g) yielded 5.9 L of CO_2 gas. The age estimate is based on one count for 2760 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.694 ± 0.065, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

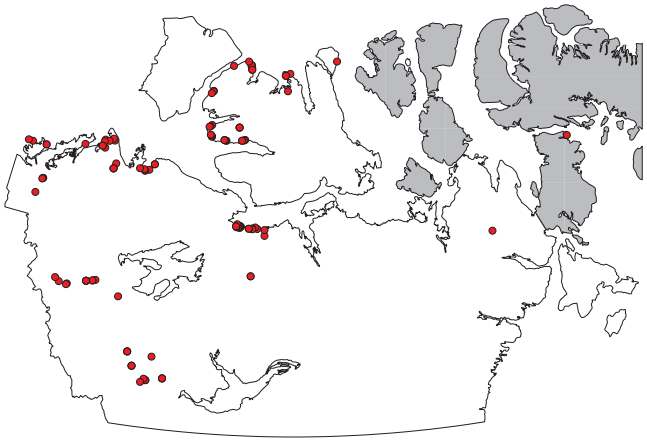

Figure 11. Radiocarbon-dated sites on the Arctic mainland and in the Arctic Archipelago, Northwest Territories.

GSC-6383. Horn Plateau (II)

normalized age:	5790 ± 90
$\delta^{13}C$:	-26.6‰
uncorrected age:	5820 ± 90

The peat sample 'Horn Plateau bog' (151–157 cm; 9.1 g dry weight), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.4 g) yielded 4.7 L of CO_2 gas. The age estimate is based on one count for 2430 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.655 ± 0.066, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

GSC-5727. Horn Plateau (III)

normalized age:	7800 ± 80
$\delta^{13}C$:	-25.6‰
uncorrected age:	7810 ± 80

The basal peat sample 'Horn Plateau bog' (279–283 cm; 60.3 g wet weight), enclosed in peat overlying clay till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.9 g) yielded 8.56 L of CO_2 gas. The age estimate is based on two counts for 2165 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.673 ± 0.084, 2.174 ± 0.032, and 28.216 ± 0.130 cpm, respectively.

GSC-5750. Bulmer Lake

normalized age:	9190 ± 110
$\delta^{13}C$:	-26.3‰
uncorrected age:	9210 ± 110

The basal peat was enclosed in peat above till. Sample 'Bulmer Lake' (455–463 cm) was collected by I.M. Kettles on June 23, 1993 from 120 km northeast of Fort Simpson, District of Mackenzie, Northwest Territories (62°43′N, 121°06′W), at an elevation of 244 m. The sample was submitted by I.M. Kettles to gain information on peat accumulation.

The sample (47.0 g wet weight) was treated with hot base, hot acid (slightly calcareous), and distilled water rinses. The treated sample (9.0 g) yielded 5.98 L of CO_2 gas. The age estimate is based on two counts for 2175 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.800 ± 0.062, 1.172 ± 0.024, and 18.250 ± 0.102 cpm, respectively.

Fort Simpson Series

A series of peat samples was collected by S.D. Robinson from 5 km southwest of Fort Simpson (61°48.39′N, 121°20.876′W), at an elevation of 240 m, District of Mackenzie, Northwest Territories. These samples were submitted by I.M. Kettles to gain information on macrofossils and paludification.

GSC-6069. Fort Simpson (I)

normalized age:	1380 ± 80
$\delta^{13}C$:	-29.9‰
uncorrected age:	1460 ± 80

The basal peat was collected by S.D. Robinson on August 11, 1995. Sample 'Town Site Mollusk Fen' (102.9–105.1 cm; 37.0 g wet weight), underlain by sand and overlain by peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.6 g) yielded 5.0 L of CO_2 gas. The age estimate is based on one count for 2325 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.139 ± 0.087, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

GSC-6078. Fort Simpson (II)

normalized age:	1410 ± 50
$\delta^{13}C$:	-29.0‰
uncorrected age:	1480 ± 50

The basal peat was collected by S.D. Robinson on July 25, 1995. Sample 'Town Site Bog' (74.5–79.5 cm; 82.8 g wet weight), underlain by sand and overlain by peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.7 g) yielded 7.7 L of CO_2 gas. The age estimate is based on one count for 3320 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 23.630 ± 0.100, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

GSC-6108. Martin River

normalized age:	7180 ± 80
$\delta^{13}C$:	-29.2‰
uncorrected age:	7250 ± 80

The basal peat was underlain by lacustrine clay and overlain by peat. Sample 'Martin River Bog' (252–258 cm) was collected by S.D. Robinson in August, 1995 about 1.5 hours on foot from the road to Wrigley along an abandoned seismic line, 4 km south of the Martin River and 15 km west of Fort Simpson, District of Mackenzie, Northwest Territories (61°51.367′N, 121°30.576′W), at an elevation of 180 m. The sample was submitted by I.M. Kettles to gain information on peat accumulation.

The sample (209.4 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (14.4 g) yielded 11.5 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.578 ± 0.083, 2.183 ± 0.033, and 28.546 ± 0.138 cpm, respectively.

GSC-5744. Antoine Lake

normalized age:	8680 ± 100
$\delta^{13}C$:	-29.4‰
uncorrected age:	8750 ± 100

The basal fen peat was enclosed in peat above till. Sample 'Antoine Lake' (450–463 cm) was collected by I.M. Kettles on June 20, 1993 from 20 km southeast of Fort Simpson, District of Mackenzie, Northwest Territories (61°43′N, 121°45′W), at an elevation of 190 m. The sample was submitted by I.M. Kettles to gain information on peat accumulation.

The sample (45.1 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.0 g) yielded 4.46 L of CO_2 gas. The age estimate is based on two counts for 2190 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.144 ± 0.063, 1.172 ± 0.024, and 18.250 ± 0.102 cpm, respectively.

Wrigley Ferry Series

A series of peat samples was collected by S.D. Robinson on August 1, 1995 along the Mackenzie Highway, 17 km north of the ferry at Wrigley, District of Mackenzie, Northwest Territories (62°16.706′N, 122°36.33′W), at an elevation of 180 m. These samples were submitted by I.M. Kettles to gain information on macrofossils and peat accumulation, and to provide chronology for geochemical analyses.

GSC-6245. Wrigley Ferry (I)

age:	modern
$\delta^{13}C$:	-28.15‰

The peat sample 'Wrigley Ferry Bog' (11.5–15 cm; 89.3 g wet weight), enclosed in the active layer, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (15.9 g) yielded 11.9 L of CO_2 gas. The age estimate is based on one count for 3755 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 29.165 ± 0.097, 2.141 ± 0.033, and 28.542 ± 0.138 cpm, respectively.

GSC-6391. Wrigley Ferry (II)

normalized age:	2510 ± 110
$\delta^{13}C$:	-26.8‰
uncorrected age:	2540 ± 110

The peat sample 'Wrigley Ferry Bog' (92–93.5 cm; 5.58 g dry weight), at the transition from fen peat to bog peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.4 g) yielded 2.8 L of CO_2 gas. The age estimate is based on one count for 2330 minutes in the 2 L counter with a mixing ratio of 1.47. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.098 ± 0.110, 1.180 ± 0.036, and 17.957 ± 0.184 cpm, respectively.

GSC-6109. Wrigley Ferry (III)

normalized age:	5300 ± 60
$\delta^{13}C$:	-28.1‰
uncorrected age:	5350 ± 60

The basal peat sample 'Wrigley Ferry Bog' (203–216 cm; 164.2 g wet weight), underlain by silty clay and overlain by peat with an ash layer at 51.5 to 53.5 cm, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (16.2 g) yielded 8.8 L of CO_2 gas. The age estimate is based on one count for 3390 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.671 ± 0.078, 2.183 ± 0.033, and 28.546 ± 0.138 cpm, respectively.

Willow Lake River Series

A series of peat samples was collected by S.D. Robinson in August 1995 from a small peatland 9 km north of the Willow Lake River bridge on the Mackenzie River, District of Mackenzie, Northwest Territories (62°47.173′N, 123°07.277′W), at an elevation of 240 m. These samples were submitted by I.M. Kettles to gain information on peat development and provide chronology for geochemical analyses.

GSC-6229. Willow Lake River (I)

normalized age:	390 ± 60
$\delta^{13}C$:	-26.6‰
uncorrected age:	420 ± 60

The peat sample 'Willow Lake River Bog' (12–15 cm; 97.7 g wet weight), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.8 g) yielded 7.6 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.206 ± 0.074, 1.214 ± 0.025, and 18.117 ± 0.109 cpm, respectively.

GSC-6234. Willow Lake River (II)

normalized age:	8610 ± 100
$\delta^{13}C$:	-28.7‰
uncorrected age:	8670 ± 100

The peat sample 'Willow Lake River Bog' (130–136 cm; 142.8 g wet weight), near the transition between transitional and fen environments, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.0 g) yielded 6.8 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.156 ± 0.051, 1.214 ± 0.025, and 18.117 ± 0.109 cpm, respectively.

GSC-6111. Willow Lake River (III)

normalized age:	9380 ± 90
$\delta^{13}C$:	-28.7‰
uncorrected age:	9440 ± 90

The basal peat sample 'Willow Lake River Bog' (154–161 cm; 107.0 g wet weight), overlain by peat and underlain by cobbly material, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (13.0 g) yielded 10.1 L of CO_2 gas. The age estimate is based on one count for 3375 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.814 ± 0.066, 2.183 ± 0.033, and 28.546 ± 0.138 cpm, respectively.

Grafe River Series

A series of peat samples was collected by S.D. Robinson on July 25, 1994 from 40 km southwest of Norman Wells, District of Mackenzie, Northwest Territories (65°06.275′N, 127°31.768′W), at an elevation of 800 to 1000 m. These samples were submitted by I.M. Kettles to gain information on the rate of peat accumulation.

GSC-6247. Grafe River (I)

normalized age:	6640 ± 70
$\delta^{13}C$:	-26.4‰
uncorrected age:	6660 ± 70

The peat sample 'Grafe River Bog' (39–41 cm; 182.0 g wet weight), at the base of the active layer, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.9 g) yielded 10.5 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.457 ± 0.070, 2.141 ± 0.033, and 28.542 ± 0.138 cpm, respectively.

GSC-6387. Grafe River (II)

normalized age:	6860 ± 90
$\delta^{13}C$:	-25.3‰
uncorrected age:	6860 ± 90

The peat sample 'Grafe River Bog' (108–114 cm; 15.0 g dry weight), enclosed in peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.6 g) yielded 8.09 L of CO_2 gas. The age estimate is based on one count for 3580 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.804 ± 0.089, 2.081 ± 0.044, and 27.732 ± 0.183 cpm, respectively.

GSC-6389. Grafe River (III)

normalized age:	8790 ± 100
$\delta^{13}C$:	-26.8‰
uncorrected age:	8820 ± 100

The peat sample 'Grafe River Bog' (177–185 cm; 14.5 g dry weight), enclosed in peat overlying till at 260 cm depth, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.2 g) yielded 5.8 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.960 ± 0.047, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

GSC-6249. Grafe River (IV)

normalized age:	10 300 ± 110
$\delta^{13}C$:	-27.13‰
uncorrected age:	10 300 ± 110

The basal peat (including a mixture of herbs and bryophytes) sample 'Grafe River Bog' (255–260 cm; 122.3 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (24.6 g) yielded 5.1 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.032 ± 0.053, 1.196 ± 0.035, and 18.199 ± 0.112 cpm, respectively.

For information on all the peat bog samples in the Mackenzie River valley noted above, refer to Kettles et al. (2003).

GSC-5457. Big Smith Creek

normalized age:	4980 ± 80
$\delta^{13}C$:	-26.8‰
uncorrected age:	5010 ± 80

The wood (*Populus*, identified by H. Jetté in unpublished GSC Wood Report 92-72) was enclosed in sand and pea gravel. Sample DOA 91-57 (2) was collected by A. Duk-Rodkin on August 19, 1991 on Big Smith Creek, a tributary to the Mackenzie River, 120 km southeast of Norman Wells, District of Mackenzie, Northwest Territories (64°45′N, 124°35′W), at an elevation of 256 m. The sample was submitted by A. Duk-Rodkin to gain information on the mudflow deposits.

The sample (17.80 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.4 g) yielded 6.36 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.840 ± 0.059, 1.214 ± 0.025, and 18.357 ± 0.145 cpm, respectively.

Comment (A. Duk-Rodkin): Big Smith Creek is an eastern tributary of the Mackenzie River that drains into the river just south of the Great Bear River. A series of mudflows occurred in streams associated with the Mackenzie River as a result of warmer climatic conditions and the postglacial downcutting of these streams. This date provides an age for one of these mudflows.

Three Day Lake Series

A series of peat samples was collected by I.M. Kettles on July 23, 1994 from 20 km south of Norman Wells, District of Mackenzie, Northwest Territories (65°09.580′N, 126°59.920′W), at an elevation of about 400 m. These samples were submitted by I.M. Kettles to gain information on macrofossils and provide chronology for geochemical analyses.

GSC-6239. Three Day Lake (I)

normalized age:	400 ± 50
$\delta^{13}C$:	-26.2‰
uncorrected age:	420 ± 50

The sphagnum peat sample 'Three Day Lake' (35–38 cm; 148.0 g wet weight), at the base of the active layer, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.4 g) yielded 6.5 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.089 ± 0.094, 2.141 ± 0.033, and 28.542 ± 0.138 cpm, respectively.

GSC-6221. Three Day Lake (II)

normalized age:	4570 ± 60
$\delta^{13}C$:	-27.7‰
uncorrected age:	4610 ± 60

The basal peat sample 'Three Day Lake' (260–264 cm; 24.1 g wet weight), a herb and bryophyte mixture, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (13.4 g) yielded 4.6 L of CO_2 gas. The age estimate is based on one count for 8120 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.270 ± 0.046, 1.217 ± 0.027, and 18.231 ± 0.108 cpm, respectively.

GSC-5468. Norman Wells

normalized age:	6540 ± 80
$\delta^{13}C$:	-24.8‰
uncorrected age:	6530 ± 80

The wood (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 92-78) was enclosed in peat. Sample DOA 91-14 was collected by A. Duk-Rodkin on July 20, 1991 from 7 km southeast of Norman Wells, District of Mackenzie, Northwest Territories (65°12′N, 126°45′W), at an elevation of 100 m. The sample was submitted by A. Duk-Rodkin to gain information on peat development.

The sample (5.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.1 g) yielded 3.89 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 2 L counter with a mixing ratio of 1.13. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.126 ± 0.059, 1.200 ± 0.024, and 18.324 ± 0.104 cpm, respectively.

Comment (A. Duk-Rodkin): A peat sample was obtained 1.4 m from the top of an exposure on the left bank of the Mackenzie River. The sample was taken halfway upsection from a fluvial terrace. The date provides a good estimate for peat formation, though it could be older.

GSC-6224. Dempster Highway

normalized age:	6430 ± 100
$\delta^{13}C$:	-28.7‰
uncorrected age:	6490 ± 100

The peat (herb species) sample 'Kilometre 184 Bog' (60–70 cm) was collected by I.M. Kettles 60 km south of Inuvik beside the Dempster Highway, District of Mackenzie, Northwest Territories (67°47.759′N, 133°45.88′W), at an elevation of about 100 m. The sample was submitted by I.M. Kettles to gain information on peat development and provide control for geochemical analyses.

The sample (9.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.7 g) yielded 2.5 L of CO_2 gas. The age estimate is based on one count for 3710 minutes in the 2 L counter with a mixing ratio of 1.62. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.081 ± 0.078, 1.214 ± 0.025, and 18.117 ± 0.109 cpm, respectively.

Inuvik Series

A series of peat samples was collected by I.M. Kettles and S.D. Robinson from about 10 km east of Inuvik, District of Mackenzie, Northwest Territories. These samples were submitted by I.M. Kettles to gain information on the rate of peat accumulation.

GSC-6385. Inuvik (I)

normalized age:	6140 ± 90
$\delta^{13}C$:	-26.8‰
uncorrected age:	6160 ± 90

The peat from Inuvik East (68°20′34″N, 133°23′42″W) was collected by I.M. Kettles and S.D. Robinson on August 1, 1994. Sample 'Inuvik east' (170–181 cm; 11.3 g dry weight), at the transition from fen to bog peat, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.0 g) yielded 6.8 L of CO_2 gas. The age estimate is based on one count for 3730 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.289 ± 0.054, 1.213 ± 0.018, and 17.857 ± 0.141 cpm, respectively.

GSC-6211. Inuvik (II)

normalized age:	6630 ± 90
$\delta^{13}C$:	-27.9‰
uncorrected age:	6680 ± 90

The basal peat from the Inuvik East Bog (68°20′35″N, 133°23′42″W) was collected by I.M. Kettles on July 31, 1994. Sample 'Inuvik East Bog' (220–226 cm; 10.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.5 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.827 ± 0.050, 1.215 ± 0.027, and 17.975 ± 0.149 cpm, respectively.

GSC-6214. Inuvik area

normalized age:	3550 ± 70
$\delta^{13}C$:	-28.5‰
uncorrected age:	3610 ± 70

The peat (herbs and bryophytes) sample 94-KFA-0906 (190–196 cm) was collected by I.M. Kettles on August 1, 1994 from the Inuvik area, District of Mackenzie, Northwest Territories (68°19.01′N, 133°27.696′W). The sample was submitted by I.M. Kettles to gain information on peat development and provide control for geochemical analyses.

The sample (7.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.3 g) yielded 2.7 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 2 L counter with a mixing ratio of 1.53. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.634 ± 0.075, 1.217 ± 0.027, and 18.231 ± 0.108 cpm, respectively.

GSC-5459. Mountain River (I)

normalized age:	9290 ± 120
$\delta^{13}C$:	-25.7‰
uncorrected age:	9300 ± 120

The organic detritus was enclosed in outwash overlain by diamicton. Sample DOA 91-26 (2b) was collected by A. Duk-Rodkin on August 8, 1991 from 120 km southwest of Norman Wells, on the right side of the Mountain River near the confluence with the Ram River, District of Mackenzie, Northwest Territories (64°50′N, 129°10′W), at an elevation of 750 m. The sample was submitted by A. Duk-Rodkin to gain information on redeposited early Holocene till.

The sample (4.30 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.6 g) yielded 2.6 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.70. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.797 ± 0.072, 1.198 ± 0.024, and 18.457 ± 0.104 cpm, respectively.

GSC-5462. Mountain River (II)

normalized age:	9310 ± 110
$\delta^{13}C$:	-24.3‰
uncorrected age:	9300 ± 110

The organic detritus sample DOA 91-26 (2d) was collected by A. Duk-Rodkin on August 8, 1991 from 120 km southwest of Norman Wells, on the right side of the Mountain River near its confluence with the Ram River, District of Mackenzie, Northwest Territories (64°52′N, 129°07′W). The sample was submitted by A. Duk-Rodkin to gain information on redeposited early Holocene till.

The sample (5.40 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.6 g) yielded 3.3 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 2 L counter with a mixing ratio of 1.33. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.800 ± 0.060, 1.198 ± 0.024, and 18.457 ± 0.104 cpm, respectively.

Comment (A. Duk-Rodkin): Diamictons related to mudflow deposits are identified by stratified peat between two diamicton beds, whereas pre–Late Pleistocene till can be identified by the relatively high weathering of the enclosed clasts. These two dates corroborate the timing of one such event.

GSC-5467. Ram River

normalized age:	2190 ± 50
$\delta^{13}C$:	-23.5‰
uncorrected age:	2160 ± 50

The wood sample DOA 91-24 (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 92-77) was collected by A. Duk-Rodkin on August 06, 1991 from 130 km west of Norman Wells, on the right side of the Ram River, District of Mackenzie, Northwest Territories (64°53′N, 129°50′W), at an elevation of 1000 m. The sample was submitted by A. Duk-Rodkin to gain information on deglaciation.

The sample (9.40 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.5 g) yielded 8.8 L of CO_2 gas. The age estimate is based on one count for 3900 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.679 ± 0.088, 2.122 ± 0.040, and 28.386 ± 0.132 cpm, respectively.

Comment (A. Duk-Rodkin): The stratigraphy at the site records catastrophic glacial floods, probably related to Neoglacial activity, as indicated by this date. These deposits include substratified organic debris and occur 16 m above river level.

GSC-5465. Gayna River

normalized age:	2020 ± 60
$\delta^{13}C$:	-25.3‰
uncorrected age:	2030 ± 60

The peat sample DOA 91-20 (b) was collected by A. Duk-Rodkin on August 5, 1991 from 170 km west of Norman Wells, on left bank of Gayna River, District of Mackenzie, Northwest Territories (65°00′N, 130°13′W), at an elevation of 1000 m. The sample was submitted by A. Duk-Rodkin to gain information on deglaciation.

The sample (39.8 g dry weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (17.9 g) yielded 7.49 L of CO_2 gas. The age estimate is based on one count for 3725 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.777 ± 0.101, 2.201 ± 0.062, and 28.038 ± 0.135 cpm, respectively.

Comment (A. Duk-Rodkin): The stratigraphy at the site records a glacial-outwash sequence with hyperconcentrated flood flows. This date provides an age of probably Neoglacial activity.

TO-217. Darnley Bay

corrected age:	11 280 ± 100
$\delta^{13}C$:	0 e‰

The marine shell (*Hiatella arctica*, identified by J-S. Vincent) was a surface collection on a mud boil in marine sediments. Sample VH-85-023 was collected by J-S. Vincent on July 16, 1985 from the south shore of Darnley Bay between the Hornaday River and Brock River deltas, 20 km east of Paulatuk, District of Mackenzie, Northwest Territories (69°22.1′N, 123°34.6′W), at an elevation of about 6 m. The sample was submitted by J-S. Vincent to gain information on deglaciation.

The sample was treated with an acid leach to remove the outer 20%.

Comment (J-S. Vincent): This date provides a minimum age for deglaciation of the area at the head of Darnley Bay, as well as for a low marine inundation of the area (Vincent, 1989, p. 113).

Brock Lagoon Series

Marine shell fragments of *Hiatella arctica* (identified by D.E. Kerr) were enclosed in silty clay. Sample 88K-20 was collected by D.E. Kerr on June 6, 1988 from a section by a stream 6.5 km (4 miles) north of Brock Lagoon, District of Mackenzie, Northwest Territories (69°35′N, 123°08′W), at an elevation of 5 m.

AECV-643Cc. Brock Lagoon (I)

uncorrected age:	11 790 ± 180

This sample was submitted by D.E. Kerr to gain information on sea-level change.

GSC-4757. Brock Lagoon (II)

normalized age:	11 600 ± 100
corrected age:	11 200 ± 100
$\delta^{13}C$:	+0.97‰
uncorrected age:	11 200 ± 100

The stratigraphy of the section was, from the top down: 0.75 m of sandy silty clay; 0.75 m of silty clay, with fossil horizon (approx. 25 cm thick); 0.75 m of silty clay; 3 m of diamicton; over a basal 1 m that was covered.

This sample was submitted by J-S. Vincent to gain information on sea-level change and as a crosscheck on AECV-643Cc.

The sample (33.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.8 g) yielded 22.2 L of CO_2 gas. The age estimate is based on one count for 3925 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.483 ± 0.042, 1.092 ± 0.018, and 18.072 ± 0.097 cpm, respectively.

Comment (J-S. Vincent): This sample was submitted as a verification for the date from AECV643Cc, which is the oldest age determination on postglacial shells in the District of Mackenzie and needed to be confirmed because of its importance.

GSC-4399. 'Paulatuk River'

normalized age:	9380 ± 150
$\delta^{13}C$:	-25.9‰
uncorrected age:	9390 ± 150

The wood (*Salix*, identified by R.J. Mott in unpublished GSC Wood Report 86-43) was enclosed in lacustrine fine to medium sand on the surface of a moraine. Sample VH-85-009 was collected by J-S. Vincent and D.A. St-Onge on July 5, 1985 from 4 km southeast of 'Paulatuk River' and 4 km west of the west side of Rat Lake, District of Mackenzie, Northwest Territories (69°18.8′N, 123°57.8′W), at an elevation of about 75 m. The sample was submitted by J-S. Vincent to provide a minimum age for deglaciation.

The sample (3.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (1.68 g) yielded 1.50 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 2.68. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.632 ± 0.091, 1.239 ± 0.019, and 18.136 ± 0.097 cpm, respectively.

Comment (J-S. Vincent): A fresh exposure in the headwall of a large nivation hollow, which had developed in ice-contact sand and gravel, yielded fragments from one piece of wood. The material at site VH-85-028 was collected dry but had small rootlets on its surface that were removed prior to dating. The wood was from a small tundra pond that developed on the surface of a moraine. The pond was then buried by sand and the entire sequence exposed through the progression of the headwall of a large nivation hollow. The date provides a minimum age for deglaciation. Other dates in the area are TO-217 (11.3 ka BP) and GSC-4143 (9.4 ka BP).

GSC-4143. Paulatuk harbour

uncorrected age: 9400 ± 120

The allochthonous wood (*Salix*, identified by R.J. Mott in unpublished GSC Wood Report 85-78) was enclosed in fine- to medium-grained oxidized deltaic sand with some fine gravel. Sample VH-85-011 was collected by J-S. Vincent on July 8, 1985 from a bluff 1.2 km southeast of Paulatuk, on the west side of Paulatuk harbour, District of Mackenzie, Northwest Territories (69°20.6′N, 124°02.6′W), at an elevation of about 1 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (12.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.60 g) yielded 6.46 L of CO_2 gas. The age estimate is based on one count for 1090 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.757 ± 0.104, 2.290 ± 0.024, and 28.213 ± 0.142 cpm, respectively.

This sample was composed of many pieces, the largest measuring 7.3 cm long and the greatest cross-section dimension being 1.3 cm. Many pieces appear to be from the interior of a larger log or logs, and were soft light pieces that broke apart easily with jagged ends and exteriors. It was difficult to remove the adhering sediment without crumbling the wood; it broke apart in layers. Some bark-like material was scraped off. Pieces with whitish spots or crusts were not included in the sample.

Comment (J-S. Vincent): The material was collected below the active layer of permafrost, so no roots from surface vegetation penetrated the deposit in this fresh section in a coastal bluff. The area around Paulatuk seems to be a large terrace of generally fine-grained outwash sediments deposited in a deltaic environment (cf. extensive morainal system found to the south). Sections along the coastline show that the deltaic or littoral deposits are covered by tundra pond deposits, eolian silt and sand, and small channel-fill deposits, many of which are organic rich. Sample VH-85-029 was collected from such a channel-fill deposit that indicated a northwest flow and was overlain by 2 m of stratified sand, pond, and eolian sediments. The altitude and nature of the deltaic deposits imply that sea level was higher when the sediments were deposited than at present.

GSC-4410. Paulatuk church

uncorrected age: 5100 ± 100

The peat was enclosed between fine sand above and sand-gravel below. Sample VH-85-001A (depth of 50–70 cm) was collected by J-S. Vincent and D.A. St-Onge on July 3, 1987 from a low coastal bluff on Paulatuk harbour, 1.1 km north of Paulatuk church, Paulatuk, District of Mackenzie, Northwest Territories (69°21.6′N, 124°03.5′W), at an elevation of about 2 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (7.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.50 g) yielded 2.14 L of CO_2 gas. The age estimate is based on two counts for 2290 minutes in the 2 L counter with a mixing ratio of 1.88. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.609 ± 0.105, 1.239 ± 0.019, and 18.136 ± 0.097 cpm, respectively.

Comment (J-S. Vincent): A sample was collected from a depth of 50 to 70 cm below the surface in a fresh natural exposure, site VH-85-015. Some rootlets in the sand above penetrated into the peat bed and were removed prior to processing the material. The sand and gravel on which the peat developed are likely deltaic and were deposited when sea level was higher than at present. It was hoped that the age determination would provide a minimum age for the higher sea level, but other related dates from the area, TO-217 (11.3 ka BP) and GSC-4143 (9.4 ka BP), suggest otherwise.

GSC-4480. Argo Bay

normalized age: 9600 ± 100
$\delta^{13}C$: -27.40‰
uncorrected age: 9630 ± 100

The peat and twigs of *Salix* (identified by R.J. Mott in unpublished GSC Wood Report 87-23) were enclosed in medium sand. Sample SV-85-7 was collected by D.A. St-Onge on July 11, 1985 from a coastal bluff on the west side of Argo Bay, southwestern part of Darnley Bay, Distinct of Mackenzie, Northwest Territories (69°22.3′N, 124°30′W), at an elevation of 2 to 3 m. The sample was submitted by J-S. Vincent to gain information on sea-level change and peat development.

The sample (4.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.63 g) yielded 3.47 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.19. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.492 ± 0.049, 1.148 ± 0.018, and 18.222 ± 0.097 cpm, respectively.

Comment (J-S. Vincent): On the east flank of a very large end moraine, a fresh exposure in a wave-cut bluff, about 23 m above sea level, had an 8 m thick sequence of channel sand with peaty sand and peat beds dispersed throughout. An organic sample was taken from the lowermost peat bed. The sand was likely laid down by streams that cut through the moraine and flared toward the ocean. The peat was thought to date from when sea level in the area was some 2 to 3 m higher than at present. The purpose of the sample was to provide a maximum age for the higher sea level southwest of Darnley Bay (cf. GSC-4143, 9.4 ka BP).

GSC-4435 HP. lower Horton River

age:	>48 000

The wood (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 87-18) was enclosed in organic-rich mud. Sample W.H.M. No. 7 was collected by W.H. Mathews on June 23, 1982 from the lower Horton River, 200 km east of Tuktoyaktuk, District of Mackenzie, Northwest Territories (69°23.5′N, 126°52.3′W), at an elevation of 262 m. The sample was submitted by J-S. Vincent as a crosscheck on a U-Th date.

The sample (31.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (27.31 g) yielded 24.15 L of CO_2 gas. The age estimate is based on one count for 6400 minutes in the 5 L counter with a mixing ratio of 1.17. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.069 ± 0.045, 2.810 ± 0.021, and 107.347 ± 0.197 cpm, respectively.

Comment (J-S. Vincent): Material from a freshly exposed slump scar in permafrost was collected to provide an interlaboratory comparison with the U-Th technique. A U-Th date yielded an age of 61 500 +4000/-3300. The sample had an aspartic acid D/L ratio 0.12.

Horton River Area Series

A series of peat and wood samples was collected by J-S. Vincent on July 12, 1988 from a gully section on the east side of a western tributary of the Horton River, 32 km northwest of the mouth of the West River, District of Mackenzie, Northwest Territories (69°12.4′N, 127°01.8′W), at an elevation of about 240 m. These samples were submitted by J-S. Vincent to gain information on eolian processes (the minimum age of the loess), glacial advance, and the development of peat.

GSC-4748. Horton River (I)

normalized age:	7790 ± 70
$\delta^{13}C$:	-27.4‰
uncorrected age:	7820 ± 70

The peat sample VH-88-64 (1.2 m below the surface; 115.6 g dry weight), enclosed in and overlain by (?)eolian silt, was treated with hot base, hot acid (slightly calcareous), and distilled water rinses. The treated sample (14.4 g) yielded 8.47 L of CO_2 gas. The age estimate is based on one count for 4995 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.654 ± 0.057, 2.152 ± 0.026, and 28.221 ± 0.153 cpm, respectively.

Comment (J-S. Vincent): The material from site VH-88-16 was collected 1.2 m below the surface from a section in a gully on the east side of a stream. The material was radiocarbon dated to determine whether the peat was of a Late Wisconsinan–Holocene age or older, thus providing a minimum age for the loess cover.

GSC-5093. Horton River (II)

age:	>39 000
$\delta^{13}C$:	-25.6‰

The wood sample VH-88-63 (about 5 m below surface; 14.4 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 88-38), enclosed in 'stratified' sandy silt till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.8 g) yielded 6.62 L of CO_2 gas. The age estimate is based on one count for 3680 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.035 ± 0.042, 2.172 ± 0.034, and 28.328 ± 0.234 cpm, respectively.

Comment (J-S. Vincent): This large piece of wood (site VH-88-016) was at the base of the section but likely came from the 'stratified' sandy silt till, which is the only unit in the area containing spruce logs. The 'stratified' sandy silt till was deposited in a lake at the margin of the last ice sheet to advance into the area; thus, the wood provides a 'maximum' age for this ice advance. A U-Th age determination on the same piece of wood (UQT-1090) gave a corrected age of about 26 ka BP, but three other pieces of wood from the same unit (UQT-1091, -1092, -1094) gave U-Th ages of >200 ka BP.

GSC-5094. Horton River (III)

age:	>39 000
$\delta^{13}C$:	-26.0‰

The wood sample VH-88-69 (about 5–6 m below the surface; 11.5 g dry weight; *Picea*, identified by H. Jetté in unpublished GSC Wood Report 88-38), enclosed in 'stratified'

sandy silt till, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.5 g) yielded 6.31 L of CO_2 gas. The age estimate is based on one count for 3945 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.020 ± 0.029, 1.092 ± 0.024, and 18.125 ± 0.241 cpm, respectively.

Comment (J-S. Vincent): The section sampled, site VH-90-016, was in a gully on the east side of a stream. A piece of wood was collected from a 'stratified' sandy silt till unit near site VH-88-63, at about 5 to 6 m below the surface. Three other pieces of wood from the same unit (UQT-1091, -1092, -1094) gave U-Th ages of >200 ka BP, yet a U-Th age determination on the same piece of wood (UQT-1093) gave a corrected age of about 13 ka BP.

See GSC-5093 for additional comments.

GSC-4653. Harrowby Bay

normalized age:	4550 ± 80
$\delta^{13}C$:	-27.9‰
uncorrected age:	4600 ± 80

The twigs of *Salix* (identified by H. Jetté in unpublished GSC Wood Report 88-22) were enclosed in sandy peat. Sample J87-59 was collected by V.N. Rampton on June 27, 1986 from a wave-eroded scarp on the west bank of a long narrow drowned valley leading to Harrowby Bay, 25 km northwest of Malloch Hill, District of Mackenzie, Northwest Territories (70°09′N, 127°25′W), at an elevation of 2.5 m. The sample was submitted by J-S. Vincent to gain information on the geomorphic processes related to the glaciofluvial terraces.

The sample (15.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.2 g) yielded 7.12 L of CO_2 gas. The age estimate is based on two counts for 2300 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.207 ± 0.072, 1.053 ± 0.017, and 18.090 ± 0.096 cpm, respectively.

Comment (J-S. Vincent): This sample dates the low terraces along the old Horton River that appear to grade below sea level, and allows a minimum age to be assigned to the higher (?)glaciofluvial terraces. Most woody and twiggy zones in peat, in this area, date between 9 and 11 ka BP (Rampton, 1988).

GSC-4647. Harrowby Bay

normalized age:	2220 ± 50
$\delta^{13}C$:	-27.9‰
uncorrected age:	2270 ± 50

The peat (?sedgy) was enclosed in overlying pebbly sand. Sample J87-56A was collected by V.N. Rampton on June 27, 1987 along the south shore at the east end of Harrowby Bay, District of Mackenzie, Northwest Territories (70°12.5′N, 127°33′W), at an elevation of 0 m. The sample was submitted by J-S. Vincent to gain information on the geomorphic processes related to the glaciofluvial terraces.

The sample (184.5 g wet weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (14.4 g) yielded 8.10 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 21.263 ± 0.078, 2.113 ± 0.024, and 28.204 ± 0.118 cpm, respectively.

Comment (J-S. Vincent): The material was collected, in a frozen state, from a wave-eroded terrace. The peat appeared to go just below sea level and appeared to be underlain by pebbly sand, but sand may occupy a notch cut during storms of previous years. The sample dates the abandonment of a low terrace at the mouth of the old Horton River. This terrace grades to below present sea level and dates a low sea level. The date also provides a minimum age for other terraces along the Horton River that relate to changing sea levels and glacial limits (cf. Rampton, 1988).

GSC-3722. Maitland Point

age:	>39 000
$\delta^{13}C$:	-29.4‰

The wood sample VH-83-190 (*Salix*, identified by R.J. Mott in unpublished GSC Wood Report 83-43) was collected by J-S. Vincent, J.V. Matthews, Jr., and V.N. Rampton on August 8, 1983 from 12 km east-southeast of Maitland Point on the north side of the small inlet south of Harrowby Bay, Bathurst Peninsula, District of Mackenzie, Northwest Territories (70°06.5′N, 127°56.0′W), at an elevation of about 3.5 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (11.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.1 g) yielded 7.69 L of CO_2 gas. The age estimate is based on one count for 5640 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.330 ± 0.044, 2.258 ± 0.039, and 27.720 ± 0.120 cpm, respectively.

Comment (J-S. Vincent): This driftwood postdates the Mason River Stade (?Sangamonian; Vincent, 1989, p. 113).

GSC-4761. 'Manou River'

normalized age:	5880 ± 80
$\delta^{13}C$:	-28.4‰
uncorrected age:	5930 ± 80

The wood (*Betula*, identified by H. Jetté in unpublished GSC Wood Report 88-31) was enclosed in organic silt and peat layers. Sample VH-88-37 (4 m below the surface) was collected by J-S. Vincent on July 8,1988 from a 10 m high section on the left bank in a meander bend of the Manou River, about 11 km south-southeast of the river mouth, District of Mackenzie, Northwest Territories (69°51′N, 128°13.5′W), at an elevation of 15 m. The sample was submitted by J-S. Vincent to gain information on fluvial geomorphic processes.

The sample (6.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.1 g) yielded 5.36 L of CO_2 gas. The age estimate is based on two counts for 2460 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.562 ± 0.065, 1.114 ± 0.019, and 17.921 ± 0.095 cpm, respectively.

Comment (J-S. Vincent): The wood, in a fluvial sequence, was collected from a 10 m high section in a meander bend (concave bank), 4 m below the surface. The sample, including *Salix* and *Betula* twigs, was detrital but had undergone little reworking (bark and minute branches were still attached to the twigs). The collection site was an overbank deposit, likely with some freshwater shells. The wood dates widespread higher terrace deposits in an area that was not glaciated during the last Wisconsinan glaciation. The deposits therefore may have been laid down during a time period older than the Late Wisconsinan–Holocene.

GSC-3763. Liverpool Bay

age: 9400 ± 80

The basal peat and twigs were enclosed in peat overlying fine-grained sand. Sample VH-83-164 (about 1 m below the surface) was collected by J-S. Vincent and V.N. Rampton on August 5, 1983 from a fresh exposure in a gully 6.5 km southwest of Maitland Point on the east side of Liverpool Bay, District of Mackenzie, Northwest Territories (70°07.3′N, 128°20.4′W), at an elevation of about 15 m. The sample was submitted by J-S. Vincent to gain information on the development of peat.

The sample (46.0 g dry weight) was treated with hot base, hot acid (slightly calcareous), and distilled water rinses. The treated sample (20.0 g) yielded 11.69 L of CO_2 gas. The age estimate is based on one count for 4080 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.683 ± 0.060, 2.265 ± 0.031, and 27.980 ± 0.122 cpm, respectively.

Comment (J-S. Vincent): The sample was from the lowermost of a series of peat layers associated with thinly laminated fine sand with a few freshwater shells (pond sediments). These sediments have been intruded by ice wedges and overlie massive fine sand. The fine fraction (-80 mesh) was used for dating. The peat was dated to ascertain whether the organic deposits exposed at the surface in this region are >10 ka BP and therefore similar to those on the Yukon coastal plain and in the Mackenzie Delta region.

GSC-4075. Liverpool Bay

age: >36 000
$\delta^{13}C$: -24.5‰

The driftwood (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 85-32) was enclosed in medium sand overlying bedded silt and sand and underlying organic-rich sand. Sample VH-83-212B was collected by J-S. Vincent and V.N. Rampton on August 10, 1983 from a coastal bluff on Liverpool Bay, 13 km north-northwest of the mouth of the Mason River and 12 km southwest of Maitland Point, District of Mackenzie, Northwest Territories (70°03.7′N, 128°23.7′W), at an elevation of about 7 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (11.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.3 g) yielded 8.01 L of CO_2 gas. The age estimate is based on one count for 5560 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.094 ± 0.051, 2.233 ± 0.047, and 27.970 ± 0.197 cpm, respectively.

Comment (J-S. Vincent): The wood was collected from a fresh exposure in a coastal bluff. The material submitted was a single solid log, about 30 cm long by 9 cm in diameter. The wood was collected from a continuous 2 m thick driftwood layer overlying what appeared to be 6 m of bedded silt and sand with a large amount of organic detritus, and underlying 1 m of organic-rich sand and 7 m of beach gravel and sand. The site lies on the distal side of the presumably Early Wisconsinan Toker Point Stade limit (cf. Rampton, 1988). The driftwood and associated littoral sediments were deposited when sea level was higher than today, likely in an interglacial sea rather than a glacio-isostatic sea. A Sangamonian (or older?) age was therefore inferred. An age of >38 ka BP (GSC-3759) was obtained for driftwood collected 7 km southwest of the mouth of the Mason River and likely deposited during the same event. A U-Th age of 25 300 ± 800 years BP (UQT-233) was obtained on sample VH-83-212, creating doubt regarding the inferred antiquity of the littoral deposits. This ^{14}C age determination helped resolve the problem.

GSC-4385. Mason River

normalized age: 6580 ± 70
$\delta^{13}C$: -27.8‰
uncorrected age: 6620 ± 70

The wood (*Salix*, identified by H. Jetté in unpublished GSC Wood Report 86-40) was enclosed in sandy mossy peat. Sample 24RCM3 (2.4 m depth) was collected by V.N. Rampton on July 8, 1986 from 8 km southwest of the mouth of the Mason River, District of Mackenzie, Northwest Territories (69°54′N, 128°29′W), at an elevation of 1 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (10.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.21 g) yielded 7.03 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.344 ± 0.070, 2.438 ± 0.036, and 28.142 ± 0.121 cpm, respectively.

Comment (J-S. Vincent): A freshly dug pit by the side of a small creek provided material for dating. This woody material was thought to relate to the last postglacial high sea level in Liverpool Bay (cf. Rampton, 1988), since other samples in the area were dated at 10.8 ka BP (I-438) near the Kugaluk River and 10.9 ka BP (GSC-1303) in the estuary to the west of this site.

GSC-3759. Wood Bay

age:	>38 000
$\delta^{13}C$:	-24.3‰

The driftwood (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 84-1) was enclosed in sand. Sample VH-83-220A was collected by J-S. Vincent and V.N. Rampton on August 11, 1983 from a coastal bluff 7 km southwest of the mouth of the Mason River, on the east side of Wood Bay, District of Mackenzie, Northwest Territories (69°54.0′N, 128°30.8′W), at an elevation of about 2.0 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically the Mason River Stade (?Sangamonian).

The sample (12.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.1 g) yielded 8.45 L of CO_2 gas. The age estimate is based on one 3-day count in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.090 ± 0.039, 2.265 ± 0.031, and 27.980 ± 0.122 cpm, respectively.

Comment (J-S. Vincent): This driftwood postdates the Mason River Stade (?Sangamonian; Vincent, 1989, p. 113).

GSC-4713. Liverpool Bay

normalized age:	8360 ± 90
$\delta^{13}C$:	-26.7‰
uncorrected age:	8390 ± 90

The peaty silt (mainly *Expetrum rigrium Linné*, identified by J.V. Matthews, Jr.) sample VH-85-035 was collected by J-S. Vincent on July 26, 1985 from a coastal section on the north side of Liverpool Bay, Tuktoyaktuk Peninsula, District of Mackenzie, Northwest Territories (69°50′N, 130°13′W), at an elevation of 18 to 20 m. The sample was submitted by J-S. Vincent to gain information on the paleoenvironment and peat development.

The sample (260.6 g dry weight) was treated with cold base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (46.5 g) yielded 8.59 L of CO_2 gas. The age estimate is based on one count for 2330 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.985 ± 0.078, 2.074 ± 0.030, and 28.375 ± 0.130 cpm, respectively.

Comment (J-S. Vincent): The sample was collected from a fresh exposure in a coastal section, in a decayed organic soil in which no modern contaminants were seen (J.V. Matthews, Jr., pers. comm., 1988). The date should have provided a minimum age for the Kittigazuit Formation and overlying fluvial deposits, but GSC-4711 gave an age of >42 ka BP on peat (site DHA-88-55) from the same stratigraphic situation. Other related dates in the area are GSC-1637-2 (>29 ka BP on allochthonous wood, probably from a fluvial unit) and GSC-1650 (>42 ka BP on wood). Also refer to Fossil Arthropod Report 88-15 (J.V. Matthews, Jr.) for additional paleoenvironmental information.

Beta-77432. Kidluit Bay

normalized age:	31 290 ± 350

The organic material, cones of *Picea* (identified by J.V. Matthews, Jr.) was enclosed in brownish eolian sand of the Kidluit Formation. Sample VH-86-024 was collected by J-S. Vincent and S.R. Dallimore on July 25, 1986 from a natural coastal bluff section on the southwest shore of Kidluit Bay, northern Richards Island, District of Mackenzie, Northwest Territories (69°29.8′N, 133°54.3′W), at an elevation of 6 m. This sample was submitted by J.V. Matthews, Jr. to gain information on geomorphic processes, specifically the fluvial Kidluit Formation and the eolian Kittigazuit Formation.

See GSC-5858 HP for comments.

GSC-5858 HP. Kidluit Bay

age:	>50 000
$\delta^{13}C$:	-23.95‰

The wood, a detrital log (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 86-73), was enclosed in brownish eolian sand of the Kittigazuit Formation. Sample VH-86-020 was collected by J-S. Vincent and S.R. Dallimore on July 25, 1986 from a natural coastal bluff section on the

southwest shore of Kidluit Bay, northern Richards Island, District of Mackenzie, Northwest Territories (69°29.8′N, 133°54.3′W), at an elevation of 6 m. The sample was submitted by J-S. Vincent to gain information on geomorphic fluvial processes, a minimum age for the fluvial Kidluit Formation, and a maximum age for the eolian Kittigazuit Formation.

The sample (55.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (33.1 g) yielded 28.39 L of CO_2 gas. The age estimate is based on one count for 9280 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.030 ± 0.041, 2.787 ± 0.037, and 101.230 ± 0.333 cpm, respectively.

Comment (J-S. Vincent): A detrital log, lying horizontally on a sharp erosion surface separating 4 to 5 m of greyish fluvial sand of the Kidluit Formation from about 25 m of brownish eolian sand of the Kittigazuit Formation, was collected (VH-86-020). The date provides a minimum age for the Kidluit Formation and a maximum age for the Kittigazuit Formation. In view of recent finite ages of organic materials in the Kittigazuit Formation, it was essential to ascertain if the Kidluit could also be of Middle Wisconsinan age.

RIDDL-801. Kendall Island

uncorrected age: 48 200 ± 1100

The marine shell (*Astarte*, identified by J. Brigham-Grette) was enclosed in marine sediments. Sample VH-85-052 (UA-2219 B) was collected by J-S. Vincent in 1985 south of Kendall Island, District of Mackenzie, Northwest Territories (69°29′25″N, 135°17′00″W). The sample was submitted by J-S. Vincent to gain information on sea-level change.

Comment (J-S. Vincent): This date provides a minimum age for marine transgression after the Toker Point Stade (? Early Wisconsinan), but the age should be considered nonfinite (Vincent, 1989, p. 113).

TO-796. Garry Island

corrected age: 43 550 ± 470

The marine shell fragments from one valve of *Astarte* (identified by J. Brigham-Grette) were collected about 2 m below the surface in nearshore sand and gravel overlying till. Sample VH-86-015 was collected by J-S. Vincent on July 24, 1986 from a coastal bluff on Garry Island, District of Mackenzie, Northwest Territories (69°30.1′N, 135°42.2′W), at an elevation of less than 5 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically a transgression minimum.

Comment (J-S. Vincent): This date provides a minimum age for marine transgression after the Toker Point Stade (? Early Wisconsinan), but the age should be considered nonfinite (Vincent, 1989, p. 113). Total amino-acid ratio was determined by J. Brigham-Grette to be 0.17 and 0.17; a second valve had a ratio of 0.26 and 0.29

Nunavut, Keewatin region

GSC-6584. Hayes River area

normalized age:	3470 ± 60
$\delta^{13}C$:	-28.17‰
uncorrected age:	3520 ± 60

The organic detritus (fibrous peat) was enclosed in sand. Sample 01-DJU-0705-20 was collected by E. Little, D. Utting, and B. Ward on July 5, 2001 from 30 km northwest of Walker Lake on a tributary of the Hayes River, Keewatin region, Nunavut (66°56′N, 91°20′W), at an elevation of 380 m. The sample was submitted by B. Ward.

The sample (12.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.8 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 5125 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.687 ± 0.057, 1.154 ± 0.027, and 18.115 ± 0.106 cpm, respectively.

Comment (D. Utting): This sample is from the lowermost exposure of a section along a tributary of the Hayes River. This section is composed of thinning-upsection layers of peat, interbedded with fine-grained sand, most likely overbank deposits. Twelve samples were taken from the peat layers, three of which were submitted for plant and insect macrofossil analyses.

Nunavut, Kitikmeot region

GSC-6031. Tree River valley (I)

normalized age:	10 200 ± 100
corrected age:	9790 ± 100
$\delta^{13}C$:	-2.73‰
uncorrected age:	9830 ± 100

The marine shells (*Mya arenaria*, identified by L.A. Dredge) were part of a surface collection on clayey silt with dropstones. Sample 95-DU-4117 (S2+S1) was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 from the Tree River valley, 35 km south of the coast of Coronation Gulf, Kitikmeot region, Nunavut (67.4274°N, 112.167°W), at an elevation of 130 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (25.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.3 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.380 ± 0.049, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (L.A. Dredge): This site is 22 km inland from the site for GSC-6016 and at the southern limit of marine deposits in the area. The marine limit is at 200 m in this area. The date is an estimate of the time of deglaciation. Refer to Dredge et al. (1998) for additional information.

GSC-6016. Tree River valley (II)

normalized age:	10 000 ± 100
corrected age:	9630 ± 100
$\delta^{13}C$:	+0.36‰
uncorrected age:	9620 ± 100

The marine shells (*Mya truncata*, identified by L.A. Dredge) were enclosed in fine-grained grey sand. Sample 95-DU-4027 (A) was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 from the Tree River valley, 10 km south of the coast of Coronation Gulf, Kitikmeot region, Nunavut (67.633°N, 112.18°W), at an elevation of 150 m. The sample was submitted by L.A. Dredge to gain information on sea-level change and deglaciation.

The sample (37.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (30.8 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 5200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.573 ± 0.041, 1.348 ± 0.018, and 18.461 ± 0.145 cpm, respectively.

Comment (L.A. Dredge): Shells were collected from bedded silt near the contact with littoral sand in a glaciomarine delta. The marine limit is at 200 m in this area. The date is a minimum estimate for the time of deglaciation. Refer to Dredge et al. (1998) for additional information.

Cowles Lake Series

A series of peat samples was collected by L.A. Dredge and B. Ward on July 26, 1994 from 250 m east of the northern shore of Cowles Lake, Kitikmeot region, Nunavut (65°58′N, 113°17′W), at an elevation of 450 m. These samples were submitted by L.A. Dredge to gain information on the paleoecology and vegetation change to sphagnum peat, and to provide a minimum age for deglaciation and organic accumulation.

GSC-5844. Cowles Lake (I)

normalized age:	1340 ± 60
$\delta^{13}C$:	-26.3‰
uncorrected age:	1360 ± 60

The peat sample 94-DU-2717 B (337.1 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (16.2 g) yielded 12.43 L of CO_2 gas. The age estimate is based on one count for 2660 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 23.832 ± 0.102, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

Comment (L.A. Dredge): A 70 cm peat core was collected from a kettle in a large esker complex. The dated peat marks a change from basal sedge peat to sphagnum. The basal date is reported as GSC-5843.

GSC-5843. Cowles Lake (II)

normalized age:	3050 ± 60
$\delta^{13}C$:	-26.4‰
uncorrected age:	3070 ± 60

The peat sample 94-DU-2717 A (359.9 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (17.4 g) yielded 13.20 L of CO_2 gas. The age estimate is based on one count for 3260 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 19.259 ± 0.085, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

Comment (L.A. Dredge): The peat with cobbles was collected from the base of a 70 cm core from a kettle hole in a large esker complex. Material was dated to test whether the terrain in this area could be relict, as is the case for some glacial terrains in Scandinavia. The date obtained indicates that the peat is a recent accumulation. The date gives an estimate of the onset time of peat accumulation in the depression. Refer to Dredge et al. (1996) for additional information.

GSC-6065. Kugaryuak River (I)

normalized age:	210 ± 90
$\delta^{13}C$:	-27.42‰
uncorrected age:	250 ± 90

The wood, possibly driftwood (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 96-13), was a surface collection on a cobble beach. Sample 95 DU-4134 was collected by L.A. Dredge, B. Ward, and D. Kerr on July 10, 1995 from 19 km east of the Kugaryuak River and 1 km south of coast of the Coronation Gulf, Kitikmeot region, Nunavut (67.663°N, 112.852°W), at an elevation of 110 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (7.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.4 g) yielded 5.3 L of CO_2 gas. The age estimate is based on one count for 1020 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.605 ± 0.138, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

Comment (L.A. Dredge): The wood was collected from the surface of a flight of raised beaches. Either this wood was carried inland or it is not driftwood.

GSC-6005. Kugaryuak River (II)

$\delta^{13}C$:	+0.27‰
age:	modern

The marine shells (*Mytilus edulis*, identified by L.A. Dredge) were part of a surface collection on a sand beach. Sample 95-DU-4071 was collected by L.A. Dredge, B. Ward, and D. Kerr on July 13, 1995 from 10 km east of the Kugaryuak River, on an island in the Coronation Gulf near the mainland, Kitikmeot region, Nunavut (67.7154°N, 113.047°W), at an elevation of 0 m. The sample was submitted by L.A. Dredge to gain information on sea-level change and post-bomb reservoir age.

The sample (41.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.7 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 920 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 31.711 ± 0.195, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Refer to Dredge et al. (1998) for additional information.

GSC-6022. Kugaryuak River (III)

normalized age:	7480 ± 90
$\delta^{13}C$:	-27.44‰
uncorrected age:	7520 ± 90

The organic detritus was enclosed in sand. Sample 95 DU-4075 D was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 along the east bank of the Kugaryuak River, 6 km south of the river mouth, Kitikmeot region, Nunavut (67.6777°N, 113.301°W), at an elevation of 30 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (13.1 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8.9 g) yielded 3.7 L of CO_2 gas. The age estimate is based on one count for 3750 minutes in the 2 L counter with a mixing ratio of 1.09. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.177 ± 0.057, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (L.A. Dredge): The detritus from nearshore sand dates sea level at about 35 m. Dates GSC-6017 and -6016 are from higher deltas along the same river. Refer to Dredge et al. (1998) for additional information.

GSC-6017. Kugaryuak River (IV)

normalized age:	9980 ± 90
corrected age:	9580 ± 90
$\delta^{13}C$:	-0.01‰
uncorrected age:	9580 ± 90

The marine shells (*Mya truncata*, identified by L.A. Dredge) were part of a surface collection on silty fine sand. Sample 95-DU-4076 was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 from 6.5 km south of the mouth of the Kugaryuak River, Kitikmeot region, Nunavut (67.6467°N, 113.308°W), at an elevation of 140 m. The sample was submitted by L.A. Dredge to gain information on sea-level change and the 140 m relative sea level.

The sample (41.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (33.2 g) yielded 6.8 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.653 ± 0.064, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Comment (L.A. Dredge): The shells relate to a delta surface at 140 m, about 30 m below the marine limit, so they provide a minimum age for deglaciation. Date GSC-6022 is from a lower level along the same river. Refer to Dredge et al. (1998) for additional information.

Kugaryuak River Series

A series of marine shell samples was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 from 4 km north of the Kugaryuak River, halfway between the river and the Coronation Gulf, Kitikmeot region, Nunavut (67.6596°N, 113.635°W), at an elevation of 150 m. These samples were submitted by L.A. Dredge to gain information on sea-level change, specifically the 150 m relative sea level, and deglaciation, as well as a species intercomparison.

GSC-6081. Kugaryuak River (V)

normalized age:	10 600 ± 100
corrected age:	10 200 ± 100
$\delta^{13}C$:	+0.60‰
uncorrected age:	10 100 ± 100

The marine shell sample 95 DU-4048 (part B; 38.9 g dry weight; *Hiatella arctica*, identified by L.A. Dredge), enclosed in silt of a delta foreset bed, was treated with an acid leach to remove the outer 20%. The treated sample (30.4 g) yielded 6.0 L of CO_2 gas. The age estimate is based on one count for 3230 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.037 ± 0.073, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

Comment (L.A. Dredge): These shells provide an approximate age of sea level at 150 m and the time of deglaciation. The marine limit is at 170 m. A date on *Macoma balthica* from the same collection (GSC-5998) gives an age that is 400 years older than this *Hiatella* sample. Refer to Dredge et al. (1998) for additional information.

GSC-5998. Kugaryuak River (VI)

normalized age:	10 900 ± 120
corrected age:	10 500 ± 120
$\delta^{13}C$:	-2.28‰
uncorrected age:	10 500 ± 120

The marine shell sample 95-DU-4048 (part A; 26.3 g dry weight; *Macoma baltica*, identified by L.A. Dredge), enclosed in grey silty sand, was treated with an acid leach to remove the outer 20%. The treated sample (20.8 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3905 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.037 ± 0.047, 1.224 ± 0.025, and 18.597 ± 0.152 cpm, respectively.

Comment (L.A. Dredge): These shells, collected from foreset silt near the contact with littoral sand in a raised delta, provide a minimum age for deglaciation and recession of the ice lobe occupying Coronation Gulf. The marine limit is at 170 m.

A date on *Hiatella arctica* from the same collection (GSC-6081) is 400 years younger. Also note that there is a deglaciation date of 8.5 ka BP (TO-4241) on wood in glaciofluvial gravel near Aylmer Lake, 400 km to the south. Refer to Dredge et al. (1998) for additional information.

GSC-6071. Asiak River (I)

normalized age:	7940 ± 80
corrected age:	7540 ± 80
$\delta^{13}C$:	+0.02‰
uncorrected age:	7540 ± 80

The marine shells, whole valves of *Clinocardium* (identified by D. Kerr) were enclosed in silt. Sample 95 DU-4565 A was collected by L.A. Dredge, B. Ward, and D. Kerr on August 1, 1995 from 10 km east of the Asiak River, 3.5 km inland from the coast of Coronation Gulf, Kitikmeot region, Nunavut (67.7152°N, 114.368°W), at an elevation of 20 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (45.0 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (30.4 g) yielded 6.5 L of CO_2 gas. The age estimate is based on two counts for 3392 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net), and for monthly backgrounds and standards (net) were 11.048 ± 0.077, 2.293 ± 0.035, and 28.244 ± 0.136 cpm, respectively.

Comment (L.A. Dredge): The shell sample is from the surface of silt boils and related to deepwater deposits. The date is a minimum for deglaciation in the area. Refer to Kerr et al. (1997) for additional information.

GSC-6093. Asiak River (II)

normalized age:	4030 ± 60
$\delta^{13}C$:	-27.52‰
uncorrected age:	4070 ± 60

The peat, wood, and detrital organic matter that make up sample 95 DU-4566 were collected by L.A. Dredge, B. Ward, and D. Kerr on August 15, 1995 from the west bank of the Asiak River, 2.5 km upstream from its mouth, Kitikmeot region, Nunavut (67.7468°N, 114.466°W), at an elevation of 10 m. The sample was submitted by L.A. Dredge to gain information on sea-level change and climate change.

The sample (249.8 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (25.2 g) yielded 7.4 L of CO_2 gas. The age estimate is based on one count for 2480 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.107 ± 0.100, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

Comment (L.A. Dredge): This sample was taken from nearshore debris near the top of delta foreset beds and gives an estimated age of sea level at 10 m.

GSC-5999. Asiak River (III)

normalized age:	10 500 ± 100
corrected age:	10 100 ± 100
$\delta^{13}C$:	-0.49‰
uncorrected age:	10 100 ± 100

The marine shells (*Hiatella arctica*, identified by B. Ward) were part of a surface collection directly below the sand and silt contact of a delta. Sample 95-DU-4563 was collected by L.A. Dredge, B. Ward, and D. Kerr on July 15, 1995 from 2.5 km west of the bend in the Asiak River, 12 km south of the coast, Kitikmeot region, Nunavut (67.6728°N, 114.481°W), at an elevation of 140 m. The sample was submitted by L.A. Dredge to gain information on sea-level change and deglaciation.

The sample (26.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.9 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 6690 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.236 ± 0.036, 1.348 ± 0.018, and 18.461 ± 0.145 cpm, respectively.

Comment (L.A. Dredge): The shells were collected from a large delta and yield a minimum age for deglaciation in the area, and an estimate of the time when sea level stood at 140 m. Refer to Kerr et al. (1997) for additional information.

Asiak River Series

A series of driftwood, detrital organic matter, and marine shell samples, was collected by L.A. Dredge, B. Ward, and D. Kerr on August 10, 1995 from the east bank of the Asiak River, 6.4 km upstream from its mouth, Kitikmeot region, Nunavut (67.7252°N, 114.515°W), at an elevation of 30 m. These samples were submitted by L.A. Dredge to gain information on sea-level change, deglaciation, and climatic change.

GSC-6083. Asiak River (IV)

normalized age:	4920 ± 70
$\delta^{13}C$:	-27.26‰
uncorrected age:	4950 ± 70

The driftwood and detrital organic matter sample 95-DU-4603 (part D1; 9.9 g dry weight; *Salix*, identified by R.J. Mott in unpublished GSC Wood Report 96-19), enclosed in sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.4 g) yielded 6.1 L of CO_2 gas. The age estimate is based on one count for 2465 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.334 ± 0.096, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

Comment (L.A. Dredge): This nearshore detrital material provides an age on the 30 m sea level. The related date (GSC-6059) is on marine shells lower in the section. Refer to Kerr et al. (1997) for additional information.

GSC-6059. Asiak River (V)

normalized age:	6560 ± 90
corrected age:	6160 ± 90
$\delta^{13}C$:	-0.61‰
uncorrected age:	6170 ± 90

The marine shell (whole valves and fragments) sample 95 DU-4603 (26.2 g dry weight; *Macoma calcarea*, *M. balthica* and *Mytilus edulis*, identified by L.A. Dredge), enclosed in silt, was treated with an acid leach to remove the outer 20%. The treated sample (20.6 g) yielded 4.1 L of CO_2 gas. The age estimate is based on one count for 3745 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.425 ± 0.057, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

Comment (L.A. Dredge): The shells were recovered from about 15 m below the surface of the section in bedded silt and clay. Date GSC-6083 is from nearshore detritus higher in the same section. The shells give a maximum age for the 30 m sea level. Refer to Kerr et al. (1997) for additional information.

GSC-6033. Asiak River (VI)

normalized age:	9870 ± 100
corrected age:	9470 ± 100
$\delta^{13}C$:	-1.79‰
uncorrected age:	9500 ± 100

The marine shells (*Macoma calcarea*, identified by L.A. Dredge) were part of a surface collection on silt. Sample 95 DU-4606 was collected by L.A. Dredge, B. Ward, and D. Kerr on August 1, 1995 from a small creek flowing into and about 10 km from the mouth of the Asiak River, Kitikmeot region, Nunavut (67.6891°N, 114.603°W), at an elevation of 100 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (28.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.7 g) yielded 4.8 L of CO_2 gas. The age estimate is based on one count for 3515 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.610 ± 0.051, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (L.A. Dredge): The shells were in marine silt directly below the contact with beach sand. They give an estimate of the time when sea level stood at 100 m. Date GSC-5999 is from a high delta along the same river. Refer to Kerr et al. (1997) for additional information.

GSC-6020. Asiak River (VII)

normalized age:	9760 ± 100
corrected age:	9360 ± 100
$\delta^{13}C$:	-0.82‰
uncorrected age:	9370 ± 100

The marine shells (*Mya arenaria* and *Macoma calcarea*, identified by L.A. Dredge) were enclosed in silt. Sample 95 DU-4555 was collected by L.A. Dredge, B. Ward, and D. Kerr on July 10, 1995 near an esker along an unnamed lake, 7 km west of the Asiak River, 15 km south of the Coronation Gulf coast, Kitikmeot region, Nunavut (67.6900°N, 114.7600°W), at an elevation of 90 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (24.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.4 g) yielded 4.1 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.697 ± 0.050, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (L.A. Dredge): The shells are from deltaic deposits on the north side of a glaciofluvial ridge; thus, the date pertains to sea level at 90 m. Refer to Kerr et al. (1997) for additional information.

Napaaktoktok River Series

A series of basal peat and marine shell samples was collected by L.A. Dredge, B. Ward, and D. Kerr on August 2 and 10, 1995 from the east bank of the Napaaktoktok River, 13 km upstream from its mouth, Kitikmeot region, Nunavut (67.7215°N, 114.828°W), at an elevation of 55 m. These samples were submitted by L.A. Dredge to gain information on sea-level change, specifically the 55 m relative sea level and peat initiation.

GSC-6057. Napaaktoktok River (I)

normalized age:	6950 ± 90
corrected age:	6550 ± 90
$\delta^{13}C$:	-2.00‰
uncorrected age:	6580 ± 90

The marine shells (*Macoma calcarea*, identified by L.A. Dredge) were part of a surface collection on silty clay, near a sand interface. Sample 95 DU-4600 was collected by L.A. Dredge, B. Ward, and D. Kerr on August 1, 1995 from a small creek emptying into Napaaktoktok River, 2 km from the coast of Coronation Gulf, Kitikmeot region, Nunavut (67.7988°N, 114.728°W), at an elevation of 35 m. The sample was submitted by L.A. Dredge to gain information on sea-level change.

The sample (28.4 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (20.3 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3935 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.003 ± 0.054, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

Comment (L.A. Dredge): Shells were collected from a 20 m section through beach ridges overlying marine clay. The shells were collected from the base of the sand unit and relate to sea level at 35 m. Refer to Kerr et al. (1997) for additional information.

GSC-6091. Napaaktoktok River (II)

normalized age:	4230 ± 70
$\delta^{13}C$:	-28.32‰
uncorrected age:	4280 ± 70

The basal peat sample 95 DU-4596 P1 (279.6 g wet weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (29.2 g) yielded 8.4 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.668 ± 0.109, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

Comment (L.A. Dredge): The sample was collected from the base of 4 m of fibrous peat that overlies marine silt. The date gives an indication of the onset of vegetation and a minimum age for sea level at 55 m.

GSC-6026. Napaaktoktok River (III)

normalized age:	8250 ± 80
corrected age:	7850 ± 80
$\delta^{13}C$:	-0.70‰
uncorrected age:	7860 ± 80

The marine shell sample 95 DU-4596-S (33.9 g dry weight; *Clinocardium*, identified by D. Kerr), enclosed in silty clay, was treated with an acid leach to remove the outer 10%. The treated sample (30.6 g) yielded 6.5 L of CO_2 gas. The age estimate is based on one count for 3760 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.712 ± 0.069, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Comment (L.A. Dredge): These shells provide an age estimate of sea level at 55 m. Refer to Kerr et al., (1997) for additional information.

Arctic Archipelago

Northwest Territories *(cf. Fig. 11, p. 81)*

Victoria Island

GSC-3519. Wynniatt Bay

normalized age:	11 300 ± 100
corrected age:	10 900 ± 100
$\delta^{13}C$:	+1.20‰
uncorrected age:	10 800 ± 100

The marine shells (*Hiatella arctica*, identified by D.A. Hodgson) were enclosed in stony sand and silty till of proglacial sediments. The sample HCA-82-22/7-18 was collected by D.A. Hodgson on July 22, 1982 from the southeast

corner of Wynniatt Bay, northern Victoria Island, District of Franklin, Northwest Territories (72°22′N, 110°05′W), at an elevation of about 90 m. The sample was submitted by D.A. Hodgson to gain information on deglaciation and sea-level change.

Comment (D.A. Hodgson): The shells were recovered from the interface between till and up to 15 m of glaciomarine sand and silt. The till, up to 1 m thick, overlies glacially smoothed rock bearing north-northwest-trending striations from trans–Shaler Mountains–Victoria Island ice flow. An adjacent delta at 130 m records the outlet of meltwater believed to have originated at an ice front on the southeastern flank of the Shaler Mountains (Hodgson, 1994). Date GSC-3519 thus provides a maximum age for the latter ice margin.

GSC-5222. Natkusiak Peninsula

normalized age:	7580 ± 70
corrected age:	7180 ± 70
$\delta^{13}C$:	+ 3.1‰
uncorrected age:	7120 ± 70

The marine shells (*Hiatella arctica*, identified by D.A. Hodgson) were enclosed in a silt lens in a granule to boulder bed. Sample HCA 82-6-7-6 was collected by J. Bednarski and D.A. Hodgson on July 6, 1982 from a riverbank cut northeast of Natkusiak Peninsula, Victoria Island, Kitikmeot region, Nunavut (72°56′N, 109°50′W), at an elevation of 10 m. The sample was submitted by D.A. Hodgson to gain information on sea-level change.

The sample (42.3 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.4 g) yielded 7.21 L of CO_2 gas. The age estimate is based on one count for 3770 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.671 ± 0.066, 2.055 ± 0.028, and 28.334 ± 0.123 cpm, respectively.

Comment (D.A. Hodgson): These shells, together with *Mya truncata* valves, were preserved in a delta topset bed that can be projected to present ground surface of at least 16 m elevation, which is the minimum related sea level. This date was previously reported in McNeely (2002).

Natkusiak Peninsula Series

A series of marine shells, mostly whole valves, was collected by J. Bednarski in 1982 and by D.A. Hodgson on July 14, 2004 from southwestern Natkusiak Peninsula, Victoria Island, District of Franklin, Northwest Territories (72°52.2′N, 110°19.82′W), at an elevation of 105 to 110 m. These samples were submitted by J. Bednarski to gain information on sea-level change and by D.A. Hodgson to gain information on deglaciation and sea-level change.

GSC-3511. Natkusiak Peninsula (I)

normalized age:	12 200 ± 100
corrected age:	11 800 ± 100
$\delta^{13}C$:	+0.20‰
uncorrected age:	11 800 ± 100

The marine shell sample HCA-82-5-7-4, consisting of whole valves and fragments of *Hiatella arctica* (identified by J. Bednarski), was enclosed in sand.

Comment (J. Bednarski): The shells were collected from marine or basal deltaic sediments from a marine event that followed strong northwest glacial flow over the Natkusiak Peninsula. Sea level at the time the molluscs lived was at an elevation of at least 120 m; marine or deltaic deposits occur nearby up to 135 m in elevation. The deposits predate deposition of the Winter Harbour till on the shores of Natkusiak Peninsula (Hodgson and Vincent, 1984).

GSC-6840. Natkusiak Peninsula (II)

normalized age:	12 500 ± 120
corrected age:	12 100 ± 120
$\delta^{13}C$:	0.21‰
uncorrected age:	12 100 ± 120

The marine shells sample HCA-04-14-7-1 (39.5 g dry weight), a surface collection of mostly whole valves of *Hiatella arctica* (identified by D.A. Hodgson) on calcareous clast-supported silty till, was treated with an acid leach to remove the outer 20%. The treated sample (31.8 g) yielded 6.9 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.337 ± 0.069, 2.078 ± 0.036, and 28.664 ± 0.134 cpm, respectively.

Comment (D.A. Hodgson): This is an additional collection from exactly the same site as GSC-3511, which yielded a corrected age of 11 800 ± 100 years BP (Hodgson and Vincent, 1984; Blake, 1984). No explanation is apparent for the slightly older age. The sample, found on calcareous silty till over scoured rock, remains the oldest minimal age for northwest-flowing regional-continental ice on northern Victoria Island, except for the *Portlandia arctica* valves of GSC-1707 (12 600 ± 140 years BP), collected by J.G. Fyles from calcareous marine silt at Peel Point (Lowdon and Blake, 1976).

GSC-403. Loch Point (I)

uncorrected age:	11 000 ± 160

The marine shells (*Hiatella arctica*, identified by J.G. Fyles) were enclosed in pebbly sand. Sample FG-59-88a was collected by J.G. Fyles on July 24, 1959 near Loch Point,

Victoria Island, District of Franklin, Northwest Territories (73°02′N, 114°02′W). The sample was submitted by J.G. Fyles to gain information on sea-level change and deglaciation.

See GSC-4224 for comments.

GSC-3409. Loch Point (II)

normalized age:	11 700 ± 260
corrected age:	11 300 ± 260
$\delta^{13}C$:	+ 0.6‰
uncorrected age:	11 300 ± 260

The marine shells, whole valves and fragments of *Hiatella arctica* (identified by J-S. Vincent and W. Blake, Jr.), were enclosed in a thin clay bed in fine to medium marine sand. Sample VH-81-061 was collected by J-S. Vincent and F.M. Nixon on July 7, 1981 from the south side of a stream 14.5 km south-southwest of Loch Point on Richard Collinson Inlet, Victoria Island, District of Franklin, Northwest Territories (73°01.9′N, 114°02.5′W), at an elevation of 43 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (8.5 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (8.1 g) yielded 1.79 L of CO_2 gas. The age estimate is based on two counts for 2110 minutes in the 2 L counter with a mixing ratio of 2.45. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.481 ± 0.139, 1.214 ± 0.034, and 18.299 ± 0.101 cpm, respectively.

See GSC-4224 for comments.

GSC-4271. Loch Point (III)

normalized age:	10 800 ± 140
corrected age:	10 400 ± 140
$\delta^{13}C$:	+ 0.5‰
uncorrected age:	10 400 ± 140

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on fine sand and gravel veneer overlying stratified fine sand. Sample VH-81-063 was collected by J-S. Vincent on July 7, 1981 from 8 km south-southwest of Loch Point on Richards Collinson Inlet, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°05.8′N, 114°03′W), at an elevation of 42 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (47.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (38.0 g) yielded 8.95 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.753 ± 0.110, 3.613 ± 0.097, and 28.183 ± 0.210 cpm, respectively.

See GSC-4224 for comments.

GSC-3366. Loch Point (IV)

normalized age:	11 800 ± 100
corrected age:	11 400 ± 100
$\delta^{13}C$:	+ 0.4‰
uncorrected age:	11 400 ± 100

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on fine-grained marine sediments. Sample VH-81-053 was collected by J-S. Vincent and F.M. Nixon on July 9, 1981 from 5.5 km northwest of Loch Point on Richard Collinson Inlet, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°10.8′N, 114°05.8′W), at an elevation of 55.0 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (46.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (37.4 g) yielded 7.94 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.579 ± 0.056, 2.375 ± 0.032, and 27.797 ± 0.124 cpm, respectively.

See GSC-4224 for comments.

GSC-4257. Loch Point (V)

normalized age:	11 600 ± 160
corrected age:	11 200 ± 160
$\delta^{13}C$:	+ 3.1‰
uncorrected age:	11 200 ± 160

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on fine-grained gravel and sand veneer overlying stratified fine-grained sand and silt. Sample VH-81-065 was collected by J-S. Vincent on July 16, 1981 from 6.5 km west of Loch Point on Richard Collinson Inlet, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°09′N, 114°08′W), at an elevation of 46 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (24.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.8 g) yielded 4.72 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.487 ± 0.076, 1.805 ± 0.066, and 18.056 ± 0.159 cpm, respectively.

See GSC-4224 for comments.

GSC-4224. Loch Point (VI)

normalized age:	11 800 ± 110
corrected age:	11 400 ± 110
$\delta^{13}C$:	-0.3‰
uncorrected age:	11 400 ± 110

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on sand and fine gravel overlying stratified fine sand. Sample VH-81-058 was collected by J-S. Vincent on July 10, 1981 from 7.5 km west-northwest of Loch Point on Richard Collinson Inlet, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°11.2′N, 114°09′W), at an elevation of 54 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (49.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (39.8 g) yielded 9.62 L of CO_2 gas. The age estimate is based on two counts for 2530 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.793 ± 0.075, 3.343 ± 0.039, and 28.190 ± 0.128 cpm, respectively.

Comment (D.A. Hodgson): The shell samples were collected from massive deposits (many hundreds of square kilometres in area, up to 30 m thick) of stratified glaciomarine fine sand and silt, derived from carbonate rocks, that abut Richard Collinson Inlet, where they were deposited from one or more glaciers retreating south of the inlet. The sediment overlies till and is unfossiliferous except for minor occurrences in the topmost strata. In the outermost inlet, the coastal fringe was overridden by the Viscount Melville Sound ice shelf (Hodgson and Vincent, 1984), which deposited a veneer of clayey silt till that overlaps the site of GSC-4271. The bulk of the sediment thus appears to immediately predate 11.4 ka BP (GSC-4224) and be no younger than 10.4 ka BP (GSC-4271).

GSC-3642. Prince Albert Sound (I)

normalized age:	10 400 ± 120
corrected age:	10 000 ± 120
$\delta^{13}C$:	+ 0.5‰
uncorrected age:	10 000 ± 120

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on marine-reworked till. Sample VH-82-007 was collected by J-S. Vincent on June 20, 1982 from 126 km east of Holman and 4 km north of Prince Albert Sound on Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°42.8′N, 114°23.8′W), at an elevation of 82 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically the marine limit at about 98 m.

The sample (16.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (13.2 g) yielded 2.98 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.66. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.172 ± 0.061, 1.128 ± 0.019, and 18.016 ± 0.095 cpm, respectively.

The shells making up this collection were of very poor quality. All encrusted valves and fragments were excluded from the material submitted for dating. All valves dated showed pitting or holes at muscle scars, and only a very few still exhibited internal lustre. The shell material used for dating was fragmental. Some fragments were translucent, others showed peeling and separation of the external layers. Some of the valves and fragments had encrustations and lichen on their surfaces. The largest valves were >2.5 cm long and >1.5 cm high, and all pieces were less than 1 mm thick (W. Blake, Jr., pers. comm., 1983).

Comment (J-S. Vincent): The till surface at site VH-82-019, where the shells were collected, was obviously reworked by the sea but lies below the marine limit (about 97–98 m in this area). Since these were the highest shells found in this area, they provide a good age estimate for the marine limit.

GSC-4285. Prince Albert Sound (II)

normalized age:	10 200 ± 140
corrected age:	9760 ± 140
$\delta^{13}C$:	-1.5‰
uncorrected age:	9780 ± 140

The marine shells (*Mytilus*, identified by J-S. Vincent) were a surface collection on a sand and gravel delta. Sample VH-82-003 was collected by J-S. Vincent on June 18, 1982 on the west side of a riverbank 6 km north of Prince Albert Sound, 121 km east of Holman, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°41.4′N, 114°31.4′W), at an elevation of 69 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically the marine limit, and deglaciation.

The sample (15.5 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (14.0 g) yielded 3.23 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.37. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.356 ± 0.082, 2.018 ± 0.047, and 18.107 ± 0.107 cpm, respectively.

Comment (J-S. Vincent): The date at site VH-82-004 (276) provides an approximate age for the 69 m delta and shoreline. With other age determinations around Diamond Jenness Peninsula, it provides information on the pattern of rebound and deglaciation. This is the highest *Mytilus* found in the area and provides a minimum age for its arrival in the western Arctic.

Kuujjua River Series

A series of peat samples was collected by C.R. Harington on August 12, 1992 from the Kuujjua River, south of Minto Inlet, Victoria Island, District of Franklin, Northwest Territories (71°07′N, 115°03′W), at an elevation of 70 m. These samples were submitted by D.A. Hodgson to gain information on peat development.

GSC-5680. Kuujjua River (I)

normalized age:	1240 ± 50
$\delta^{13}C$:	-27.7‰
uncorrected age:	1280 ± 50

The vascular plant fragment sample CR-92-38 (17.7 g dry weight; unidentifiable, according to A. Telka), enclosed in silty sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.3 g) yielded 6.23 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 24.243 ± 0.116, 2.137 ± 0.035, and 28.437 ± 0.131 cpm, respectively.

Comment (C.R. Harington): This sample (CR-92-38) consisted of patches of organic fibre with a mossy look within silty sand about 1 to 1.5 m above the highest preserved bones of a partial skeleton of an individual adult wood bison (*Bison bison athabascae*), the northernmost recorded specimen and the earliest known wood bison (AMS radiocarbon dated to 8080 ± 60 years BP (TO-3709); Stephenson et al., 2001, Table 1; Harington, 2003). It is a great deal younger than the partial skeleton with which it was thought to be associated, and casts no light on the wood bison's paleoenvironment.

See GSC-5652 for additional comments.

GSC-5652. Kuujjua River (II)

normalized age:	6260 ± 80
$\delta^{13}C$:	-26.3‰
uncorrected age:	6280 ± 80

The peat sample CR-92-35 (26.4 g dry weight), enclosed in silty sand, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (10.8 g) yielded 5.91 L of CO_2 gas. The age estimate is based on one count for 3890 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.338 ± 0.054, 1.284 ± 0.021, and 18.219 ± 0.103 cpm, respectively.

Comment (C.R. Harington): This peat sample (CR-92-35) is from a 30 cm thick layer overlying 1.5+ m of yellow to brown laminated sand, and is located about 1 km east of the above-mentioned partial skeleton of a wood bison (*Bison bison athabascae*), 1 m below the top of a terrace of the Kuujjua River. The peat is nearly 1800 years younger than the bones and therefore sheds no light on the wood bison's surroundings.

TO-3709. Kuujjua River (III)

normalized age:	8080 ± 60

The terrestrial bone sample CR-92-37 (*Bison bison athabascae*, identified by C.R. Harington), was enclosed in silty sand. This sample was submitted by C.R. Harington to gain information on paleobiology. The age was normalized assuming $\delta^{13}C$ = -25%.

Comment (C.R. Harington): This sample is from the bones of a partial skeleton of an individual adult wood bison (*Bison bison athabascae*) and is the northernmost recorded specimen and the earliest known wood bison (Stephenson et al., 2001, Table 1; Harington, 2003). The associated dates on peat (GSC-5652 and -5680) are a great deal younger than the partial skeleton with which they were thought to be associated, and therefore cast no light on the wood bison's paleoenvironment.

See GSC-5652 and -5680 for additional comments.

GSC-4248. Peel Point

normalized age:	11 800 ± 110
corrected age:	11 400 ± 110
$\delta^{13}C$:	+ 0.3‰
uncorrected age:	11 400 ± 110

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on a fine gravel veneer overlying stratified fine sand and silt. Sample VH-81-056 was collected by J-S. Vincent on July 10, 1981 from 10 km south-southeast of Peel Point at the north tip of Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°17.5′N, 114°26′W), at an elevation of 20 to 30 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (24.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.2 g) yielded 4.30 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.377 ± 0.047, 1.593 ± 0.027, and 18.151 ± 0.100 cpm, respectively.

Comment (D.A. Hodgson): The shells were collected from the northwesternmost body of glaciomarine sediment described for the Loch Point Series. The sample site was variously described by the collector (J-S. Vincent) as 20 to 30 m or 53 m a.s.l. The date is at the oldest end of the range of dates for shells (all *Hiatella arctica*) collected from the glaciomarine sediments by J-S. Vincent. This site is about 2 km

southwest of the 67 to 70 m site of shells collected in 1959 by J.G. Fyles, which were dated at 12 400 ± 320 years BP (I(GSC)-18; Walton et al., 1961) and were re-dated at 12 600 ± 140 years BP (GSC-1707; Lowdon and Blake, 1976). The latter sample was also in or on the Richard Collinson Inlet glaciomarine sediments; however, the species dated was *Portlandia arctica*, which is a detrital-feeder infauna species that extracts old carbon from the bottom sediments, especially calcareous sediments, unlike *Hiatella arctica*, which is a filter-feeder in the water column (Dyke et al., 2003).

GSC-3622. Holman (I)

normalized age:	10 200 ± 90
corrected age:	9840 ± 90
$\delta^{13}C$:	-2.0‰
uncorrected age:	9870 ± 90

The marine shells, paired in situ valves of *Mytilus edulis* (identified by W. Blake, Jr.). were enclosed in beach sand and gravel. Sample VH-82-005A was collected by J-S. Vincent on June 19, 1982 from a hill 6 km north of Prince Albert Sound, 0.5 km east of Holman, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°40.8′N, 114°43′W), at an elevation of 66 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically the 66 m relative sea level, deglaciation, and the *Mytilus* invasion into the western Arctic.

The sample (38.0 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (34.2 g) yielded 7.83 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.117 ± 0.059, 2.322 ± 0.032, and 27.727 ± 0.122 cpm, respectively.

GSC-3622 2.

uncorrected age:	8150 ± 100

Sample VH-82-005A (2) was submitted by J-S. Vincent as a crosscheck.

The sample (34.0 g dry weight), which had no treatment, yielded 7.35 L of CO_2 gas. The age estimate is based on two counts for 2420 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.147 ± 0.099, 2.265 ± 0.031, and 27.980 ± 0.122 cpm, respectively.

Comment (J-S. Vincent): The shells at site VH-82-014 were collected in a pit dug in a raised beach on the northeast side, and almost at the top, of a small hill that dominates the surrounding area. The imbrication of the raised beach gravel was perfectly preserved. The shells were paired valves, in situ and in life position but very fragile. The sample provides an age for the 66 m shoreline and, with other age determinations around Diamond Jenness Peninsula, provides information on the pattern of rebound and deglaciation in the area. The date also indicates when *Mytilus* invaded this part of the western Arctic.

GSC-3422. Holman (II)

normalized age:	9410 ± 120
corrected age:	9010 ± 120
$\delta^{13}C$:	-0.5‰
uncorrected age:	9020 ± 120

The marine shells, paired valves of *Mya truncata* (identified by W. Blake, Jr.), were enclosed in fine deltaic sand. Sample VH-81-016 (1 m below the surface) was collected by J-S. Vincent and F.M. Nixon on June 23, 1981 from 55 km east-southeast of Holman, Diamond Jenness Peninsula, 0.4 km north of Prince Albert Sound, Victoria Island, District of Franklin, Northwest Territories (70°38.6′N, 116°17′W), at an elevation of 30 m. The sample was submitted by J-S. Vincent to gain information on sea-level change, specifically the 31 m relative sea level.

The sample (13.7 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (12.3 g) yielded 2.47 L of CO_2 gas. The age estimate is based on two counts for 5220 minutes in the 2 L counter with a mixing ratio of 1.96. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.951 ± 0.071, 1.171 ± 0.023, and 18.282 ± 0.102 cpm, respectively.

All the shells were thin, fragile, and less than 1 mm thick, except near the hinge. One entire left valve (measuring 3.1 cm by 1.9 cm, this is the smallest valve), plus eight left valve fragments (all have truncated ends) and two right valve fragments (largest measures >5 cm long by >3 cm high), were used for dating. There was no periostracum and only occasional internal lustre. There was some iron-stain but no encrustations on the shells (according to W. Blake, Jr.).

Comment (J-S. Vincent): The paired shells were collected in situ, in growth position, 1 m below the surface in a 31 m high delta built into a glacio-isostatic sea that followed the retreat of the westward-flowing ice lobe in Prince Albert Sound. This is an excellent sample for developing an emergence curve for the area.

GSC-3621. Holman (III)

normalized age:	10 100 ± 130
corrected age:	9660 ± 130
$\delta^{13}C$:	+ 0.3‰
uncorrected age:	9650 ± 130

The marine pelecypod shells were a surface collection on fine gravel, sand, and silt, overlying silty marine clay. Sample VH-81-010 was collected by J-S. Vincent and F.M. Nixon on June 20, 1981 from between two small lakes

52 km east-southeast of Holman, Diamond Jenness Peninsula, 1.4 km north of Prince Albert Sound, Victoria Island, District of Franklin, Northwest Territories (70°39′N, 116°22.3′W), at an elevation of 61 m. The sample was submitted by J-S. Vincent to gain information on sea-level change and provide a minimum age for deglaciation.

The sample (15.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (12.0 g) yielded 2.75 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.85. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.406 ± 0.078, 1.172 ± 0.028, and 17.972 ± 0.098 cpm, respectively.

Comment (J-S. Vincent): The shells were collected on the surface of a flat area situated between two small lakes. At the collection site, a thin veneer of fine gravel, sand, and silt was observed overlying thicker silty marine clay. A pit dug in the clay revealed the presence of shell material. These shells are the highest found in the area, with a marine limit at about 90 m. The enclosing marine sediments overlie a 'pink' till laid down by a lobe of ice that flowed westward in Prince Albert Sound. The date provides a minimum age for deglaciation and for subsequent marine invasion of the north coast of Prince Albert Sound and, with other dates, provides an indication of the rate of ice retreat in the sound.

GSC-3529. Armstrong Point

normalized age:	11 400 ± 90
corrected age:	11 000 ± 90
$\delta^{13}C$:	+ 0.6‰
uncorrected age:	11 000 ± 90

The marine shells, paired whole valves of *Hiatella arctica* (identified by J-S. Vincent), were enclosed in clayey marine silt. Sample VH-82-047 was collected by J-S. Vincent on July 9, 1982 from a coastal bluff 46 km northeast of Armstrong Point, Prince of Wales Strait, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (73°07.3′N, 116°04.2′W), at an elevation of 2 to 4 m. The sample was submitted by J-S. Vincent to gain information on sea-level change and deglaciation.

The sample (46.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (37.5 g) yielded 8.65 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.099 ± 0.056, 2.186 ± 0.031, and 27.837 ± 0.124 cpm, respectively.

Comment (D.A. Hodgson): Numerous paired valves were preserved beneath 5 m of nonfossiliferous silt. They provide a minimum age for withdrawal of ice from this part of Prince of Wales Strait (between Victoria and Banks islands, 100 km north-northeast of GSC-3376). Vincent (1989) believed the last marine inundation to be that of the Late Wisconsinan Schuyter Point Sea; however, he believed the last glacial ice cover to have been part of the Early Wisconsinan Prince of Wales Lobe, which was succeeded by the East Coast Sea of similar age.

GSC-3613. Graveyard Bay (I)

age:	>37 000
$\delta^{13}C$:	-28.2‰

The organic material, leaves of *Salix* (identified by J-S. Vincent), was enclosed in silt and sandy silt. Sample VH-82-123 was collected by J-S. Vincent on July 24, 1982 from the bank of a stream, 4 km from the stream's mouth, 14 km west-northwest of Graveyard Bay, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°40′N, 116°29.2′W), at an elevation of 60 to 90 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (20.8 g dry weight) was treated with hot acid and distilled water rinses. The base treatment was omitted. The treated sample (12.0 g) yielded 9.59 L of CO_2 gas. The age estimate is based on one count for 7080 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.045 ± 0.056, 2.249 ± 0.053, and 27.811 ± 0.126 cpm, respectively.

Comment (J-S. Vincent): This sample dates interstadial deposits between Early and Late Wisconsinan tills (Vincent, 1989, p. 113).

GSC-3592. Graveyard Bay (II)

age:	>38 000
$\delta^{13}C$:	-27.8‰

The wood was enclosed in fine sand and silty sand. Sample VH-82-125 was collected by J-S. Vincent on July 24, 1982 3.5 km from the mouth of a stream and 14 km west-northwest of Graveyard Bay, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°39.8′N, 116°30′W), at an elevation of 60 to 90 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (11.8 g dry weight) was treated with hot base, hot acid, and distilled water rinses. The treated sample (10.0 g) yielded 8.15 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.040 ± 0.052, 2.286 ± 0.046, and 27.759 ± 0.125 cpm, respectively.

Comment (J-S. Vincent): This sample dates interstadial deposits between Early and Late Wisconsinan tills (Vincent, 1989, p. 113).

GSC-3935. Holman Airport Road (I)

normalized age:	9300 ± 90
corrected age:	8900 ± 90
$\delta^{13}C$:	+ 0.53‰
uncorrected age:	8890 ± 90

The marine shells, some in growth position (*Mya truncata*, identified by J-S. Vincent), were enclosed in fine deltaic sand. Sample VH-82-115 was collected by J-S. Vincent and J.G. Fyles on July 23, 1982 from a gravel pit on the west side of a stream just north of the bridge on the Holman Airport Road, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°44.8′N, 117°47.9′W), at an elevation of 9.0 m. The sample was submitted by J-S. Vincent to gain information on sea-level change and do a crosscheck comparison of species.

The sample (24.0 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (21.6 g) yielded 4.92 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.945 ± 0.047, 1.159 ± 0.023, and 17.985 ± 0.098 cpm, respectively.

The sample sent to the laboratory included 24 valves, the largest being 4.9 cm by 3.2 cm and the smallest being 2.7 cm by 1.7 cm. There was little periostracum and no pitting or encrustations on the shells. The internal lustre was good on these well preserved, whole, paired shells (according to W. Blake, Jr.).

GSC-3955. Holman Airport Road (II)

normalized age:	9140 ± 120
corrected age:	8740 ± 120
$\delta^{13}C$:	+ 0.4‰
uncorrected age:	8730 ± 120

The marine shells of *Clinocardium ciliatum* (identified by W. Blake, Jr.) were a different species (sample VH-82-115) from the same collection as GSC-3935.

The sample (28.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.4 g) yielded 4.81 L of CO_2 gas. The age estimate is based on two counts for 2390 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.092 ± 0.058, 1.138 ± 0.018, and 18.066 ± 0.185 cpm, respectively.

The dated material comprised two paired valves and half of the largest pair, which measured 4.2 cm wide by 4.3 cm high. Most valves had whitish interiors with faint lustre; exteriors tended to have light brownish staining. Some shells were brownish throughout and some had a bluish tinge near their hinge; most were fragile, since all were less than 2 mm thick and most less than 1 mm (according to W. Blake, Jr.).

Comment (J-S. Vincent): The delta at site UH-82-205, with its surface at 13 m a.s.l., exhibited a deltaic sequence at least 5 to 6 m thick comprising up to five sand units, all of which were very fossiliferous. This date provides a limiting age for the formation of the delta and, with other age determinations, provides information on the pattern of rebound.

GSC-3843. Amundsen Gulf (I)

normalized age:	11 300 ± 100
corrected age:	10 900 ± 100
$\delta^{13}C$:	-0.2‰
uncorrected age:	10 900 ± 100

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were enclosed in stratified clayey silt. Sample VH-82-111 (2 m below the surface) was collected by J-S. Vincent on July 22, 1982 from a fresh natural face on the west side of a stream 3 km north Amundsen Gulf, 7 km northwest of Holman, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°47.4′N, 117°52′W), at an elevation of 47 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (44.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (35.4 g) yielded 7.76 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.136 ± 0.065, 2.283 ± 0.044, and 27.781 ± 0.127 cpm, respectively.

The sample sent to the laboratory consisted of ten pairs of *Hiatella arctica*, four of them intact pairs with the largest being 5.0 cm by 2.9 cm and most being robust shells. The thinnest shells were less than 1 mm thick, but most were thicker. All shells had a somewhat rough exterior, some with iron-staining and a few traces of encrustations, but the exteriors were spalling off in some cases. All had good interior lustres (according to W. Blake, Jr.).

Comment (J-S. Vincent): The sediments were deposited in a delta, the surface of which was at about 49 m. This date therefore provides a limiting age for formation of the delta and the 50 m shoreline. In conjunction with other age determinations, this date provides information on patterns of rebound and deglaciation.

GSC-3558. Amundsen Gulf (II)

normalized age:	11 400 ± 100
corrected age:	11 000 ± 100
$\delta^{13}C$:	-0.1‰
uncorrected age:	11 000 ± 100

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on marine silt. Sample VH-82-112 was collected by J-S. Vincent on July 22, 1982 from 10 km

northwest of Holman on Amundsen Gulf, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (70°48.4′N, 117°55.8′W), at an elevation of 76.0 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (47.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (38.2 g) yielded 8.68 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.032 ± 0.054, 2.333 ± 0.026, and 27.686 ± 0.153 cpm, respectively.

Comment (J-S. Vincent): This sample provides an approximate age of the marine limit in the area (Vincent, 1989, p. 113).

GSC-4300. Cape Wollaston (I)

normalized age:	11 000 ± 110
corrected age:	10 600 ± 110
$\delta^{13}C$:	-0.3‰
uncorrected age:	10 600 ± 110

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on marine-reworked till. Sample VH-82-033 was collected by J-S. Vincent on June 30, 1982 on the southeast side of a small hill projecting above the marine limit, 16 km northeast of Cape Wollaston on Minto Inlet, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (71°08.1′N, 117°53′W), at an elevation of 65 m. The sample was submitted by J-S. Vincent to gain information on the marine limit and glaciation in Minto Inlet.

The sample (33.4 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (30.1 g) yielded 6.82 L of CO_2 gas. The age estimate is based on three counts for 4140 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.844 ± 0.050, 1.170 ± 0.017, and 18.159 ± 0.079 cpm, respectively.

Comment (J-S. Vincent): The till surface where the shells were collected was obviously reworked by marine waters but lies just below the marine limit (about 72 m in this area). The date provides a good estimate of the marine limit. With other determinations, an emergence curve for the Cape Wollaston area is now available. The date also provides a minimum age for an ice lobe that flowed down Minto Inlet.

GSC-3533. Cape Wollaston (II)

normalized age:	11 400 ± 100
corrected age:	11 000 ± 100
$\delta^{13}C$:	-0.5‰
uncorrected age:	11 000 ± 100

The marine shells (*Hiatella arctica*, identified by J-S. Vincent) were a surface collection on fine-grained deltaic sand overlying thick, bedded, fine sand and silt. Sample VH-82-017 was collected by J-S. Vincent on June 27, 1982 from 3 km south-southeast of Cape Wollaston on Minto Inlet, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (71°05.4′N, 118°01.5′W), at an elevation of 61 m. The sample was submitted by J-S. Vincent to gain information on the marine limit at 70 m.

The sample (48.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (38.7 g) yielded 8.70 L of CO_2 gas. The age estimate is based on one count for 2580 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.071 ± 0.068, 2.186 ± 0.031, and 27.837 ± 0.124 cpm, respectively.

The sample submitted consisted of many large, massive shells of generally poor quality. Many were encrusted, and some had pitting and lichen growth. The material dated consisted of four left and four right valves without periostracum, only slight lustre (and that mainly on thinner shells or fragments), plus 16 fragments, all identifiable as *Hiatella arctica*. The largest valve measured 5.5 cm by 3.0 cm, and the smallest was 3.9 cm by 2.1 cm. The shells were also stained and some had a tendency to translucence (according to W. Blake, Jr.).

Comment (J-S. Vincent): The shells were collected from the surface of a marine delta on the east side of a stream, mixed in a veneer (2–3 cm thick) of sand and small gravel resting on thick, bedded, fine sand and silt of a delta situated close to the marine limit, which is estimated at about 70 m in the area. The date should provide a good estimate of the age of the marine limit and, with other determinations, be useful in developing an emergence curve for the Cape Wollaston area.

GSC-3840. Cape Wollaston (II)

normalized age:	11 800 ± 100
corrected age:	11 400 ± 100
$\delta^{13}C$:	-2.2‰
uncorrected age:	11 400 ± 100

The marine shells (*Macoma balthica*, identified by J.E. Dale) were a surface collection on a fine sand and gravel veneer overlying offshore marine silt. Sample VH-82-026 was collected by J-S. Vincent on June 28, 1982 on the south side of a stream 6 km south-southwest of Cape Wollaston on Minto Inlet, Diamond Jenness Peninsula, Victoria Island, District of Franklin, Northwest Territories (71°04′N, 118°08′W), at an elevation of 32 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (36.0 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (32.4 g) yielded 7.30 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 5 L counter with a mixing ratio

of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.725 ± 0.062, 2.311 ± 0.041, and 27.783 ± 0.125 cpm, respectively.

Comment (J-S. Vincent): A large collection with numerous paired valves, none exceeding 2 cm in length and all thin-walled shells, had undergone minimal transport because the *Macoma* shells were grouped in small pockets here and there in the deposit. The enclosing (?prelittoral) sand and gravel veneer rested on offshore marine silt about 38 m below the marine limit, which is at about 70 m in this area. When used with other age determinations, an emergence curve for the Cape Wollaston area can be developed.

GSC-3376. Deans Dundas Bay (I)

normalized age:	11 700 ± 210
corrected age:	11 300 ± 210
$\delta^{13}C$:	+ 0.2‰
uncorrected age:	11 300 ± 210

The marine shells were enclosed in silty marine clay. Sample VH-81-042 was collected by J-S. Vincent and F.M. Nixon on July 4, 1981 from a gully on the northeast corner of a large lake near the southeast corner of Deans Dundas Bay, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (72°15.6′N, 118°01.7′W). The sample was submitted by J-S. Vincent to gain information on sea-level change and deglaciation.

The sample (13.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (10.7 g) yielded 2.20 L of CO_2 gas. The age estimate is based on two counts for 2300 minutes in the 2 L counter with a mixing ratio of 2.31. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.470 ± 0.109, 1.270 ± 0.029, and 18.230 ± 0.105 cpm, respectively.

Comment (D.A. Hodgson): The marine shells (*Hiatella arctica*, identified by A. Aitken, including several siphons; the collection also contained *Portlandia arctica,* but they were not submitted for dating) were 1 m above lake level at the base of an 18 m high exposure of marine sediment. They provide a minimum age for the withdrawal of ice from this part of Prince of Wales Strait (between Victoria and Banks islands). Vincent (1989) believed the last marine inundation to be that of the Late Wisconsinan Schuyter Point Sea; however, he believed the last glacial ice cover to have been part of the Early Wisconsinan Prince of Wales Lobe, which was succeeded by the East Coast Sea of similar age.

GSC-4288. Deans Dundas Bay (II)

normalized age:	11 400 ± 130
corrected age:	11 000 ± 130
$\delta^{13}C$:	+ 1.5‰
uncorrected age:	11 000 ± 130

The marine shells (*Hiatella arctica*, identified by A. Aitken) were a surface collection on marine sediments. Sample VH-81-041 was collected by J-S. Vincent on July 4, 1981 from a hill 0.5 km east of Deans Dundas Bay and west of a lake near the southeast corner of the bay, Victoria Island, District of Franklin, Northwest Territories (72°14.6′N, 118°04′W), at an elevation of 32 m. The sample was submitted by J-S. Vincent to gain information on sea-level change.

The sample (25.3 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (22.8 g) yielded 5.01 L of CO_2 gas. The age estimate is based on one count for 4200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.623 ± 0.061, 2.018 ± 0.047, and 18.107 ± 0.107 cpm, respectively.

Comment (D.A. Hodgson): Locally abundant shells on marine silt were believed by Vincent to be in situ. They provide a minimum age for the 32 m level of the Late Wisconsinan Schuyter Point Sea (Vincent, 1989) at Deans Dundas Bay.

GSC-3321. Gordon Point

uncorrected age:	7740 ± 100

The wood (*Salix*, identified by R.J. Mott in unpublished GSC Wood Report 81-33) was enclosed in glaciofluvial sand and peat. Sample VH-81-032 C (8 m depth) was collected by J-S. Vincent and F.M. Nixon on June 29, 1981 from 10 km east of Gordon Point and 6.5 km south of Deans Dundas Bay, Prince Albert Peninsula, Victoria Island, District of Franklin, Northwest Territories (72°10.8′N, 118°14′W), at an elevation of 91 m. The sample was submitted by J-S. Vincent to gain information on deglaciation.

The sample (249.7 g wet weight) was treated with hot base, hot acid, and distilled water rinses. The treated sample (8.9 g) yielded 8.33 L of CO_2 gas. The age estimate is based on two counts for 2720 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.059 ± 0.059, 1.252 ± 0.019, and 18.508 ± 0.161 cpm, respectively.

Comment (D.A. Hodgson): The Holocene *Salix* twigs, together with peat, were exposed in channel deposits below 8 m of what was believed by Vincent at the time of collection to be undisturbed stratified sediment peripheral to the Early Wisconsinan Prince of Wales Lobe (Vincent, 1989).

Nunavut, Baffin region

Axel Heiberg Island

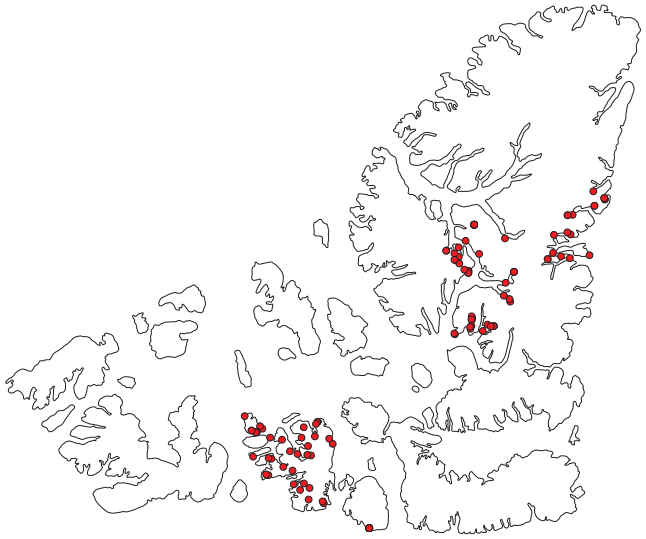

Figure 12. Radiocarbon-dated sites in the Queen Elizabeth Islands, Nunavut.

May Point Series I

A series of marine shell samples was collected by T. Bell and A.E. Aitken on July 4, 1994 from 18.75 km southwest of May Point and 50 km south of Depot Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°09.5′N, 85°37.5′W), at an elevation of 6 m. These samples were submitted by T. Bell to gain information on sea-level change and late Holocene sedimentation rates.

GSC-6036. May Point (I)

normalized age:	4090 ± 60
corrected age:	3690 ± 60
$\delta^{13}C$:	-0.58‰
uncorrected age:	3700 ± 60

The marine shell sample ES-04D-S-9404 (38.4 g dry weight; *Serripes groenlandicus* and *Astarte borealis*, identified by A. Aitken), enclosed in thinly bedded sand and silt, was treated with an acid leach to remove the outer 20%. The treated sample (30.2 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3715 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.983 ± 0.082, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

GSC-6027. May Point (II)

normalized age:	4110 ± 60
corrected age:	3710 ± 60
$\delta^{13}C$:	-0.89‰
uncorrected age:	3720 ± 60

The marine shell sample ES-04A-S-9404 (41.9 g dry weight; *Serripes groenlandicus* and *Astarte borealis*, identified by A. Aitken), enclosed in thinly bedded sand and silt, was treated with an acid leach to remove the outer 20%. The treated sample (33.5 g) yielded 6.9 L of CO_2 gas. The age estimate is based on one count for 3750 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.932 ± 0.082, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Comments (T. Bell and A.E. Aitken): These shell samples were collected from a marine offlap sequence, 2 to 6 m a.s.l., exposed in a stream bank along the coast southwest of May Point, Axel Heiberg Island. Five lithostratigraphic units are recognized in this sequence: 1) fine-grained fossiliferous diamicton; 2) massive marine mud; 3) pervasively bioturbated, laminated silty sand; 4) thinly bedded medium and fine sand; and 5) gravel lag with shell hash. Radiocarbon dating of mollusc shells in the May Point Series indicates that units 2 to 4 were deposited following deglaciation between ≥7.8 and 3.7 ka BP. The marine mollusc fauna recovered from unit 2 consists only of *Hiatella arctica*, *Mya truncata*, and *Mya pseudoarenaria*. The extralimital North Atlantic mollusc *Mya pseudoarenaria* is recorded for the first time in the eastern Canadian Arctic north of Baffin Island. Units 3 and 4 contain a more diverse, shallow water (5–50 m depth) mollusc fauna dominated by *Astarte borealis*, *Hiatella arctica*, *Mya truncata*, *Serripes groenlandicus*, *Clinocardium ciliatum*, and gastropods. The lithostratigraphy is interpreted to record the transition from a low-energy, shallow (?lagoonal) nearshore environment to a high-energy beach-face environment accompanying marine regression (Aitken and Bell, 2000).

May Point Series II

A series of marine shells and organic samples was collected by T. Bell and A.E. Aitken on July 4 and 5, 1994 from 16 km southwest of May Point and 46.25 km south of Depot Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°11.5′N, 85°36′W). These samples were submitted by T. Bell to gain information on sea-level change and the peat accumulation rate.

GSC-6055. May Point (I)

normalized age:	8200 ± 80
corrected age:	7800 ± 80
$\delta^{13}C$:	+1.64‰
uncorrected age:	7770 ± 80

The marine shell sample ES-03-S-9404 (44.8 g dry weight; *Mya truncata*, identified by A. Aitken), a surface collection at an elevation of 80 m on silty sand beneath a veneer of beach gravel, was treated with an acid leach to remove the outer 30%. The treated sample (31.1 g) yielded 6.6 L of CO_2 gas. The age estimate is based on one count for 3310 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.798 ± 0.067, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

Comments (T. Bell and A.E. Aitken): Date GSC-6055 represents a minimum date for when relative sea level was at 80 m elevation on eastern Axel Heiberg Island. The shells collected from a silty veneer on the raised beach surface were likely deposited during a higher sea level and were reworked into the 80 m beach during early Holocene marine emergence. This interpretation is consistent with the relative-sea-level curve reconstructed for adjacent Fosheim Peninsula on Ellesmere Island (Bell, 1996).

GSC-6099. May Point (II)

normalized age:	5650 ± 100
$\delta^{13}C$:	-30.16‰
uncorrected age:	5740 ± 100

The basal organic detritus sample ES-06A-0-9405 (peat; 90.0 g dry weight), including twigs of *Salix* (identified by R.J. Mott in unpublished GSC Wood Report 96-32), enclosed in peat at an elevation of 48.6 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (19.2 g) yielded 3.9 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.02. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.821 ± 0.070, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

GSC-6100. May Point (III)

normalized age:	4840 ± 70
$\delta^{13}C$:	-30.28‰
uncorrected age:	4920 ± 70

The organic detritus sample ES-06B-0-9405 (top; 78.5 g dry weight), enclosed in peat at an elevation of 54.7 m, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (28.8 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 2380 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 15.466 ± 0.092, 2.183 ± 0.033, and 28.546 ± 0.138 cpm, respectively.

Comment (T. Bell and S. Vardy): These two radiocarbon dates indicate that 6 m of peat and mineral sediment accumulated within about 800 ^{14}C years on the shore of Eureka Sound during the middle Holocene. The peat deposit developed against a bluff consisting of a coarsening-upward sequence of marine sediments, specifically thinly bedded sand and silt capped by massive gravelly sand associated with Holocene beach ridges (Bell et al., 1998). These marine sediments were incised by a stream in the early to middle Holocene, possibly in response to falling sea level. The channel was rapidly filled by peat accumulation in the middle Holocene, based on ages of 5650 ± 100 years BP (GSC-6099) and 4820 ± 80 years BP (GSC-6100) from the base and top of the exposure, respectively. A smaller stream has since incised through the peat, leaving an exposure from which samples were collected for paleobotanical analysis (Vardy et al., 2000). Although mosses grow in abundance along the current stream channel, there is no evidence of significant recent peat accumulation in the area.

The peat section is composed of moss and herbaceous peat interbedded with sand and silt units containing small amounts of organic material. Well preserved *Drepanocladus* spp. are the most abundant bryophytes, although several other species were also identified. These mosses are common in all organic layers, but herbaceous material, including abundant *Carex* remains, also makes up a significant proportion of the total peat matrix in the upper half of the section. The abundance and state of preservation of the *Drepanocladus* spp. and other mosses suggest the existence of a highly productive peatland ecosystem, with moderately high water levels for much of the growing season during the times these peat beds were formed. The mosses in most layers show little sign of decomposition, suggesting that they were quickly incorporated into the permafrost without extended exposure to aerobic conditions. Remains of other wetland plants, including *Carex* spp. and *Hippuris vulgaris*, also support the interpretation of these peat layers as forming in a moderately wet environment. The organic sediment is interbedded with layers of sand and silt. These sediments were probably deposited by a combination of eolian, niveolian and alluvial processes. Since this peat deposit formed in a river channel, some of the interbedded mineral material may represent periods of high stream flow and surface runoff from rapid spring and early summer snowmelt, with associated erosion and subsequent deposition of flood deposits. Eolian activity, however, probably also played a role. The ground surface near the site is commonly covered with a patchy veneer of fine-grained clastic sediments and leaf debris in early summer. These materials are eroded by wind action from the adjacent land surface, deposited on the surface of the winter snow cover, and subsequently deposited as the snow cover melts in early summer. The presence of silt and the remains of upland plants throughout all levels of the deposit suggests that this process was

important during the middle Holocene as well. *Dryas integrifolia* (mountain aven) leaves are abundant in all the organic layers and are the most common macrofossil in most mineral layers, where few paleobotanical remains were found. It is unlikely that this species was growing in the wet moss substrate of the peatland, and the leaves were likely blown in from the adjacent upland areas. Significant eolian deposits have been found interbedded with peat in other high Arctic peat deposits representing nonriverine peatlands (e.g. Garneau, 1992).

The two radiocarbon ages available from the base and top of the deposit were used to estimates the overall accumulation rates. In total, 6 m of peat and mineral sediment accumulated in about 800 years, giving an average accumulation rate of 7.5 mm/a. About 335 cm of the total sediment thickness was predominately organic, for an average rate of organic accumulation of 4.2 mm/a between the dated levels of the deposit. This is considerably higher than accumulation rates reported from previous studies in the high Arctic (e.g. Blake, 1964, 1974; LaFarge et al., 1991; Garneau, 1992; Gajewski et al., 1995). Higher-than-average accumulation rates have been reported for the middle Holocene from some other high Arctic peat deposits. However, there is not yet enough evidence available to indicate that this is part of a regional phenomenon associated with warmer or wetter middle Holocene climates, as there are examples of low accumulation rates during the same period. LaFarge et al. (1991) reported varied patterns of peat accumulation at four sites on northern Ellesmere Island, with low middle Holocene accumulation rates at some sites coinciding with high accumulation rates at neighbouring sites. Peat accumulation rates are sometimes influenced more by local hydrology and microclimate conditions than by macroclimate, as is well known from studies of boreal and subarctic peatlands.

GSC-5974. Depot Point

normalized age:	5440 ± 80
$\delta^{13}C$:	-27.8‰
uncorrected age:	5490 ± 80

The organic matter, including *Salix* (identified by H. Jetté in unpublished GSC Wood Report 95-30) was enclosed in coarse-grained deltaic sand. Sample ES-16-0-9419 was collected by T. Bell and A. Aitken on July 19, 1994 from 37.5 km northwest of May Point and 20 km southwest of Depot Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°27.2′N, 86°20.3′W), at an elevation of 31 m. The sample was submitted by T. Bell to gain information on sea-level change.

The sample (4.6 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (4.0 g) yielded 3.5 L of CO_2 gas. The age estimate is based on one count for 4000 minutes in the 2 L counter with a mixing ratio of 1.16. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.224 ± 0.063, 1.195 ± 0.026, and 18.272 ± 0.110 cpm, respectively.

Comment (T. Bell): Date GSC-5974 dates a delta remnant at 43 m a.s.l. in the lower reaches of a formerly submerged tributary basin of central Eureka Sound. The sample was collected at the contact between interbedded clayey silt and fine sand (27–31 m) and an overlying coarsening-upward sequence of thinly bedded gravel and sand (31–43 m) with abundant organic matter and coal fragments in low-angle foresets. The age of this former sea-level position accords well with the relative-sea-level curve reconstructed by Bell (1996) for nearby Fosheim Peninsula.

GSC-5666. Buchanan Lake (I)

normalized age:	33 800 ± 790
corrected age:	33 400 ± 790
$\delta^{13}C$:	+0.41‰
uncorrected age:	33 400 ± 790

The marine shells (*Hiatella arctica*, identified by T. Bell) were a surface collection comprising whole valves deflating from a sandy surface. Sample MF-94-S-9323 was collected by T. Bell and A. Aitken on July 23, 1993 from 31.25 km west-northwest of May Point and 29.25 km east-southeast of the southernmost point of Buchanan Lake, eastern Axel Heiberg Island, Baffin region, Nunavut (79°20.3′N, 86°21.0′W), at an elevation of 116 m. The sample was submitted by T. Bell to gain information on sea-level change, specifically the marine limit.

The sample (33.9 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (30.3 g) yielded 6.80 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.443 ± 0.042, 2.238 ± 0.033, and 28.354 ± 0.189 cpm, respectively.

Comment (T. Bell): This shell sample was collected from a deflating sandy surface 10 m below and several hundred metres downvalley from a marine-limit delta at 126 m a.s.l. Although the shells were initially thought to relate to the delta deposit, which is interpreted to represent the Holocene marine limit, the radiocarbon date suggests reworking of the local fossiliferous till that mantles the valleysides.

GSC-5928. Buchanan Lake (II)

normalized age:	12 400 ± 150
$\delta^{13}C$:	-26.0‰
uncorrected age:	12 400 ± 150

The organic matter was enclosed in sand. Sample ES-14-0-9419 was collected by A. Aitken and T. Bell on July 19, 1994 from 32.5 km northwest of May Point and

28.75 km south-southwest of Depot Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°24′N, 86°39′W), at an elevation of 82 m. The sample was submitted by T. Bell to gain information on sea-level change, specifically the maximum age of transgression.

The sample (22.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.5 g) yielded 3.44 L of CO_2 gas. The age estimate is based on two counts for 2130 minutes in the 2 L counter with a mixing ratio of 1.17. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 3.901 ± 0.060, 1.292 ± 0.021, and 18.357 ± 0.102 cpm, respectively.

Comment (T. Bell): This site records a fining-upward sequence from planar and ripple crosslaminated fine sand (80–87 m a.s.l.) to laminated mud interbedded with massive sand (87–115 m a.s.l.). Date GSC-5928 is from disseminated organic matter in the lower unit. The section is interpreted to represent a transgressive sequence from prodeltaic to proximal glaciomarine deposits, possibly indicating the deepening of the submerged basin as relative sea level rose to the marine limit (Bell et al., 1998). The date of 12 400 years BP is difficult to interpret. On the one hand, organic matter from a similar depositional setting in an adjacent valley (GSC-5974) provided a radiocarbon date consistent with the local relative-sea-level history On the other hand, a silty organic bed overlying gravelly outwash to the south produced a likely nonfinite date of 49.8 ka BP (Beta-117277). Local unconsolidated Tertiary sediments are a potential source of 'older' organic matter, which may be mixed with Holocene organic matter in the deltaic deposits. Date GSC-5928 is one of very few finite dates from this region that is older than 9 to 10 ka BP.

Beta-117277. Buchanan Lake (III)

normalized age:	49 820 ± 1800
$\delta^{13}C$:	-26.8‰
uncorrected age:	49 790 ± 1800

The wood fragments were enclosed in silty organic matter. Sample ES-02-0-9402 was collected by A. Aitken and T. Bell on July 2, 1994 from 22.5 km west-northwest of May Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°13.4′N, 85°57.6′W), at an elevation of 150 m. The sample was submitted by T. Bell and treated with Beta's standard acid-alkali-acid treatment.

Comment (T. Bell): Glaciofluvial sediments form extensive outwash fans and terraces in the upper reaches of valleys on eastern Axel Heiberg Island, but they are rarely exposed in section. Here, at a site exposed through fluvial erosion, coarse clast-supported gravel is overlain by a silty organic bed that was dated at 49.8 ka BP. The overlying diamicton is interpreted to be colluvial till from the slopes above. The section is interpreted to represent aggradation of gravel during deglaciation and high sea level (base level), followed by fluvial incision as relative sea level fell in the early Holocene (Bell et al., 1998). The age of the organic material is difficult to interpret. Although the radiocarbon age is measurably above the background (56 170 ± 350 years BP) for this accelerator mass spectrometry (AMS) analysis, it is likely nonfinite, with a possible wood source in the unconsolidated Tertiary sediments of the region. Elsewhere, shells recovered from the surface of glaciofluvial sediments, dated at 33.4 ka BP (GSC-5666), are likely reworked from a local till veneer.

GSC-5948. Mokka Fiord

normalized age:	8920 ± 110
$\delta^{13}C$:	-28.1‰
uncorrected age:	8970 ± 110

The organic matter is enclosed in discrete lenses of ice-rich, massive sandy clay within the sediments. Sample ES-20-0-9422 was collected by A.E. Aitken on July 22, 1994 from 1.5 km north of Mokka Fiord, Axel Heiberg Island, Baffin region, Nunavut (79°35.0′N, 87°27.5′W), at an elevation of 86 m. The sample was submitted by T. Bell to gain information on sea-level change, provide a maximum age for the marine limit at 95 m, and provide a minimum age for peat accumulation.

The sample (61.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (18.2 g) yielded 4.66 L of CO_2 gas. The age estimate is based on two counts for 2060 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.110 ± 0.067, 1.253 ± 0.031, and 18.665 ± 0.106 cpm, respectively.

Comment (T. Bell and A.E. Aitken): The organic matter was recovered from massive silty clay at the base of a coarsening-upward sequence of laminated and trough-crossbedded fluvial sand and gravel that forms a distinct terrace. In the vicinity of this site, in situ marine molluscs (ES-18-S-9421, not dated) were recovered from massive silt that is overlain by a similar coarsening-upward sequence of fluvial sand and gravel. The coarse-grained sediments record the progradation of fluvial sediments southward across the landscape toward Mokka Fiord as relative sea level fell in the early Holocene.

Baffin Island

Soper River Series

A series of organic plant detritus samples was collected by D.A. Hodgson on July 28, 1997 from a middle reach of the unnamed river, east of the Soper River, that drains into the head of Shaftesbury Inlet, west-central Meta Incognita Peninsula, southern Baffin Island, Baffin region, Nunavut (63°05.25.N, 69°10.83.W), at an elevation of 250 m. These samples were submitted by D.A. Hodgson to gain information on Holocene vegetation history.

GSC-6226. Soper River (I)

normalized age:	3650 ± 60
$\delta^{13}C$:	-25.48‰
uncorrected age:	3660 ± 60

The organic plant detritus sample HCA 97-28-7-1C (71.1 g dry weight), enclosed in eolian sand and slope wash, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (36.8 g) yielded 7.4 L of CO_2 gas. The age estimate is based on one count for 4835 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.925 ± 0.076, 2.195 ± 0.041, and 28.266 ± 0.154 cpm, respectively.

GSC-6208. Soper River (II)

normalized age:	4440 ± 70
$\delta^{13}C$:	-25.19‰
uncorrected age:	4440 ± 70

The organic plant detritus sample HCA 97-28-7-1B (102.5 g dry weight), enclosed in eolian sand and slope wash, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (15.6 g) yielded 7.1 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 16.331 ± 0.085, 2.216 ± 0.048, and 28.397 ± 0.191 cpm, respectively.

GSC-6204. Soper River (III)

normalized age:	5420 ± 90
$\delta^{13}C$:	-24.49‰
uncorrected age:	5420 ± 90

The organic plant detritus sample HCA 97-28-7-1A (89.9 g dry weight), enclosed in eolian sand and slope wash, was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.2 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.158 ± 0.059, 1.215 ± 0.027, and 17.975 ± 0.149 cpm, respectively.

Comment (D.A. Hodgson): Radiocarbon dates from the base, middle and top of a 2 m thick exposure of plant material and sand found in the Shaftesbury Inlet river valley record accumulation from 5.42 ka BP through 4.44 ka BP until at least 3.65 ka BP (Hodgson, 2005). Similar material continued to accumulate above the uppermost sample; however, it is disturbed by slumping and modern root penetration. At least 1 m of organic-free planar to ripple-bedded sand underlies the basal sample. The interbedded peat and sand, contained in a minor gully, probably has a niveolian origin. The age range of the oldest date (GSC-6204) from this section overlaps the age of a basal date from organic-rich partings in fluvial sand at 'Grinnell Bay', which yielded a date of 5490 ± 180 years BP (QC-683B; Andrews and Short, 1983; Jacobs et al., 1985b). Whereas the latter date is from a cryoturbated paleosol marking a transition from a period of soil formation to niveolian conditions, the lowest Shaftesbury Inlet river sample appears to be part of an undisturbed succession.

Bathurst Island

GSC-6235. Cockscomb Peak

normalized age:	29 100 ± 660
corrected age:	28 700 ± 660
$\delta^{13}C$:	+1.66‰
uncorrected age:	28 600 ± 660

The marine shells, fragments and whole valves (*Hiatella arctica*, identified by J. Bednarski), were a surface collection on gravel. Sample 97-BJB-0015 was collected by J. Bednarski on July 27, 1997 from near the summit of Cockscomb Peak, Bathurst Island, Baffin region, Nunavut (76.22242°N, 97.59980°W), at an elevation of 110 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (21.4 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (20.2 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.515 ± 0.041, 1.196 ± 0.035, and 18.199 ± 0.112 cpm, respectively.

Comment (J. Bednarski): Given the pre–Late Glacial Maximum (LGM) age, these shells were likely redeposited by glaciers during the last glaciation. The shell date provides a maximum age for the last glaciation.

GSC-6241. Reindeer Bay

normalized age:	6270 ± 90
corrected age:	5870 ± 90
$\delta^{13}C$:	+2.54‰
uncorrected age:	5830 ± 90

The marine shells, whole valves of *Mya truncata* and *Astarte* (identified by J. Bednarski), were enclosed in bedded sand that dips to the east, capped by 20 cm of pebbly gravel. Sample 97-BJB-0022 was collected by J. Bednarski on July 29, 1997 from the south side of a river cutting through sandy delta deposits, 3 km inland from Reindeer Bay, Bathurst Island, Baffin region, Nunavut (76.31261°N, 97.89018°W), at an elevation of 34 m. The sample was submitted by J. Bednarski to gain information on sea-level change.

The sample (15.3 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (13.0 g) yielded 2.7 L of CO_2 gas. The age estimate is based on one count for 5400 minutes in the 2 L counter with a mixing ratio of 1.50. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.811 ± 0.075, 1.196 ± 0.035, and 18.199 ± 0.112 cpm, respectively.

Comment (J. Bednarski): The sample dates a relative sea level ranging from >34 to 42 m.

GSC-6353. Freemans Cove (I)

normalized age:	9150 ± 110
corrected age:	8750 ± 110
$\delta^{13}C$:	+2.32‰
uncorrected age:	8710 ± 110

The marine pelecypod shells (*Mya truncata* and *Hiatella arctica*, identified by J. Bednarski) were a surface collection on silty gravel. Sample 95-BJB-0184 was collected by J. Bednarski on August 5, 1995 from a shallow valley paralleling the west shore of northern Freemans Cove, southeastern Bathurst Island, Baffin region, Nunavut (75°07.721′N, 98°06.152′W), at an elevation of 98 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change by providing a minimum age on the marine limit at 107 m.

The sample (23.2 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (21.0 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.065 ± 0.051, 1.234 ± 0.026, and 17.940 ± 0.149 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age on the 107 m a.s.l. marine limit and deglaciation of Freemans Cove. The age is slightly older than shells collected a few kilometres farther up the cove (GSC-191 and -6351). This may reflect the progressive northward recession of glaciers from the cove.

GSC-6351. Freemans Cove (II)

normalized age:	8920 ± 100
corrected age:	8520 ± 100
$\delta^{13}C$:	+2.12‰
uncorrected age:	8490 ± 100

The marine pelecypod shells (*Mya truncata* and *Hiatella arctica*, identified by J. Bednarski) were a surface collection on coarse gravel. Sample 95-BJB-0183 was collected by J. Bednarski on August 5, 1995 from 2 km inland on the south side of a river flowing into the western shore of northern Freemans Cove, southeastern Bathurst Island, Baffin region, Nunavut (75°09.696′N, 98°10.862′W), at an elevation of 96 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change by providing a minimum age for the marine limit at 107 m.

The sample (24.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.8 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.237 ± 0.051, 1.234 ± 0.026, and 17.940 ± 0.149 cpm, respectively.

Comment (J. Bednarski): This sample is slightly younger than GSC-6353, a site about 4 km down the cove, and must record a sea level slightly lower than the 107 m marine limit. The younger age may also be an indication of progressive northward deglaciation of Freemans Cove. Date GSC-6351 has a similar age to GSC-191, on shells collected from the head of Freemans Cove at an elevation of 98 m.

Cracroft Sound Series

A series of marine shell samples was collected by J. Bednarski on August 2, 1995 from Cracroft Sound, northeastern Bathurst Island, Baffin region, Nunavut (76.604°N, 98.858°W), at an elevation of 105 m. These samples were submitted by J. Bednarski to gain information on sea-level change, specifically a minimum age for the 108 m relative sea level.

TO-5667. Cracroft Sound (I)

normalized age:	9980 ± 70

The marine shell sample (*Hiatella arctica*, identified by J. Bednarski) was a surface collection. The age was normalized $\delta^{13}C$ = -25‰.

GSC-6048. Cracroft Sound (II)

normalized age:	9190 ± 120
corrected age:	8790 ± 120
$\delta^{13}C$:	+0.55‰
uncorrected age:	8780 ± 120

The marine shells (*Hiatella arctica*, identified by J. Bednarski) were a surface collection on gravel. Sample 95-BJB-0173 was collected by J. Bednarski on August 2, 1995 from the south shore of Cracroft Sound.

The sample (28.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.7 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 1910 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.198 ± 0.067, 1.148 ± 0.025, and 18.488 ± 0.152 cpm, respectively.

Comment (J. Bednarski): The date provides a minimum age on the highest strandline in the area, which lies at 108 m a.s.l.

Young Inlet Series

A series of marine shell fragment samples was collected by J. Bednarski on July 23, 1997 from Young Inlet, 4.5 km south of Cape Sophia, Bathurst Island, Baffin region, Nunavut (76°20.6′N, 98°59.5′W), at an elevation of 110 to 112 m. These samples were submitted by J. Bednarski to gain information on deglaciation and sea-level change.

TO-5664. Young Inlet (I)

normalized age:	10 190 ± 160

The marine shell fragments of *Portlandia* (identified by J. Bednarski) were a surface collection. The age was normalized to $\delta^{13}C$ = -25‰.

GSC-6232. Young Inlet (II)

normalized age:	9400 ± 80
corrected age:	9000 ± 80
$\delta^{13}C$:	+2.15‰
uncorrected age:	8960 ± 80

The marine shell fragments (*Mya truncata*, identified by J. Bednarski) were a surface collection on platy-shale gravel. Sample 97-BJB-0002 was collected near the crest of the ridge on the east side of Young Inlet. The sample (31.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (27.9 g) yielded 6.0 L of CO_2 gas. The age estimate is based on one count for 5400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.351 ± 0.057, 2.141 ± 0.033, and 28.542 ± 0.138 cpm, respectively.

Comment (J. Bednarski): These dates provide a minimum age for the 110 m relative sea level and date of deglaciation.

GSC-6238. Bracebridge Inlet

age:	>32 000
$\delta^{13}C$:	+2.65‰

The marine shells, a mixture of whole valves and large fragments, were a surface collection on gravelly till with a fine sand matrix. Sample 95-BJB-0187 was collected by J. Bednarski on August 6, 1995 near the summit of the ridge that separates the head of the inlet and a large lake to the south, 2.5 km south of Bracebridge Inlet, Bathurst Island, Baffin region, Nunavut (75.395147°N, 99.169375°W), at an elevation of 133 m. The sample was submitted by J. Bednarski to gain information on a glacial advance.

The sample (22.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (19.9 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.148 ± 0.040, 1.196 ± 0.035, and 18.199 ± 0.112 cpm, respectively.

Comment (J. Bednarski): The shells were transported to the location by glacier ice sometime before 32 000 years BP.

GSC-6145. Allison Inlet

normalized age:	9430 ± 80
corrected age:	9030 ± 80
$\delta^{13}C$:	+0.36‰
uncorrected age:	9020 ± 80

The marine pelecypod shells (*Hiatella arctica*, identified by J. Bednarski) were enclosed in sand. Sample 96-BJB-0008 was collected by J. Bednarski on July 3, 1996 from Allison Inlet, Bathurst Island, Baffin region, Nunavut (75.1820°N, 99.1946°W), at an elevation of 76 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (40.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.2 g) yielded 6.9 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.235 ± 0.064, 2.163 ± 0.032, and 28.387 ± 0.135 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age of deglaciation and the 107 m a.s.l. marine limit in Allison Inlet. The age overlaps with GSC-353, on shells collected from about 104 m a.s.l.

GSC-6038. Dundee Bight

normalized age:	9130 ± 110
corrected age:	8730 ± 110
$\delta^{13}C$:	+0.80‰
uncorrected age:	8710 ± 110

The marine shells (*Hiatella arctica* and *Mya truncata*, identified by J. Bednarski) were a surface collection on silt underlying gravel. Sample 95-BJB-0135 was collected by J. Bednarski on July 25, 1995 from Dundee Bight, Bathurst Island, Baffin region, Nunavut (75.992°N, 99.200°W), at an elevation of 97 to 104 m. The sample was submitted by J. Bednarski to gain information on deglaciation.

The sample (35.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (31.2 g) yielded 3.2 L of CO_2 gas. The age estimate is based on one count for 3730 minutes in the 2 L counter with a mixing ratio

of 1.27. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.249 ± 0.060, 1.148 ± 0.025, and 18.488 ± 0.152 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age of deglaciation and a relative sea level of at least 107 m a.s.l. at the head of Dundee Bight. The upslope gravel terrace marking the marine limit has a lip elevation of 107 m, but rises to 116 m along the valley side.

GSC-6159. Stuart River valley

normalized age:	6700 ± 70
corrected age:	6300 ± 70
$\delta^{13}C$:	+1.04‰
uncorrected age:	6280 ± 70

The marine pelecypod shells (*Mya truncata*, identified by J. Bednarski) were enclosed in laminated sand. Sample 96-BJB-0043 was collected by J. Bednarski on July 29, 1996 from a rivercut on the north side of the mouth of the Stuart River valley, central Bathurst Island, Baffin region, Nunavut (76.16118°N, 99.46923°W), at an elevation of 24 m. The sample was submitted by J. Bednarski to gain information on glacial retreat.

The sample (36.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (28.9 g) yielded 6.2 L of CO_2 gas. The age estimate is based on one count for 3785 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.860 ± 0.072, 2.172 ± 0.034, and 28.110 ± 0.147 cpm, respectively.

Comment (J. Bednarski): The sample comes from a low delta and provides an age estimate of the overlying terrace, indicating a relative sea level of 36 m. This date is part of a series with CAMS-34099 and -34960.

GSC-6085. Half Moon Bay

normalized age:	9670 ± 110
corrected age:	9270 ± 110
$\delta^{13}C$:	+0.35‰
uncorrected age:	9260 ± 110

The marine shells, paired valves of *Hiatella arctica* (identified by J. Bednarski), were a surface collection on beach gravel. Sample 95-BJB-0114 was collected by J. Bednarski on July 22, 1995 from Half Moon Bay, Dundee Bight, Bathurst Island, Baffin region, Nunavut (76.000°N, 99.484°W), at an elevation of 107 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (24.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.4 g) yielded 4.2 L of CO_2 gas. The age estimate is based on one count for 2545 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.677 ± 0.058, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (J. Bednarski): The sample provides an age of local deglaciation and of the 107 m relative sea level.

GSC-6154. Bracebridge Inlet

normalized age:	9390 ± 90
corrected age:	8990 ± 90
$\delta^{13}C$:	+1.74‰
uncorrected age:	8960 ± 90

The marine pelecypod shells, whole valves and fragments of *Mya truncata* (identified by J. Bednarski), were a surface collection on stony silt. Sample 96-BJB-0021 was collected by J. Bednarski on July 13, 1996 about 8 km upstream from the coast, on a silt outlier situated on the north shore of a river draining into Bracebridge Inlet, Bathurst Island, Baffin region, Nunavut (75.47274°N, 99.60101°W), at an elevation of 83 m. The sample was submitted by J. Bednarski to gain information on sea-level change and glacial retreat.

The sample (38.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (30.1 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 3600 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.212 ± 0.066, 2.172 ± 0.034, and 28.110 ± 0.147 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for deglaciation of the valley and an age for the ≥104 m relative sea level.

GSC-6162. Hooker Bay

normalized age:	9190 ± 100
corrected age:	8790 ± 100
$\delta^{13}C$:	+0.84‰
uncorrected age:	8780 ± 100

The marine pelecypod shells, whole valves and fragments of *Hiatella arctica* and *Mya truncata* (identified by J. Bednarski), were a surface collection on sand. Sample 96-BJB-0023 was collected by J. Bednarski on July 14, 1996 downstream of a kettle lake on a terrace along a stream bed, about 16 km due west of Hooker Bay, Bathurst Island, Baffin region, Nunavut (75.349°N, 99.85°W), at an elevation of 88 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (20.6 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (18.6 g) yielded 4.0 L of CO_2 gas. The age estimate is based on one count for 3710 minutes in the 2 L counter with a mixing ratio

of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.075 ± 0.051, 1.162 ± 0.025, and 18.124 ± 0.109 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for nearby ice-contact terraces and therefore deglaciation, as well as the highest upslope beach, which marks the marine limit at 105 m a.s.l.

GSC-6252. Emma Point

normalized age:	9290 ± 80
corrected age:	8890 ± 80
$\delta^{13}C$:	+2.21‰
uncorrected age:	8860 ± 80

The marine shells (*Mya truncata*, identified by J. Bednarski) were enclosed in well sorted stratified sand. Sample 95-BJB-0170 was collected by J. Bednarski on August 2, 1995 from 20 km due east of Emma Point in the Grogan Morgan Range, Bathurst Island, Baffin region, Nunavut (76°29.76′N, 99°53.33′W), at an elevation of 93 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (32.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (28.8 g) yielded 6.2 L of CO_2 gas. The age estimate is based on one count for 3780 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.446 ± 0.069, 2.212 ± 0.041, and 28.444 ± 0.139 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for deglaciation of a valley that crosses from Purcell Bay to Young Inlet. It also gives a minimum age for the 93 m relative sea level.

GSC-6049. Purcell Bay

normalized age:	9800 ± 110
corrected age:	9400 ± 110
$\delta^{13}C$:	+1.30‰
uncorrected age:	9370 ± 110

The marine shells, whole valves and fragments of *Hiatella arctica* (identified by J. Bednarski), were a surface collection on silty gravel. Sample 95-BJB-0155 was collected by J. Bednarski on July 29, 1995 from the tip of a prominent point in Purcell Bay, Bathurst Island, Baffin region, Nunavut (76.304°N, 100.006°W), at an elevation of 105 to 122 m. The sample was submitted by J. Bednarski to gain information on sea-level change.

The sample (29.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.4 g) yielded 5.0 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.756 ± 0.049, 1.148 ± 0.025, and 18.488 ± 0.152 cpm, respectively.

Comment (J. Bednarski): The sample provides an age estimate of the 122 m relative sea level.

GSC-6040. Dundee Bight

normalized age:	9580 ± 120
corrected age:	9180 ± 120
$\delta^{13}C$:	+1.56‰
uncorrected age:	9160 ± 120

The marine shells (*Hiatella arctica*, identified by J. Bednarski) were a surface collection on a well formed gravel beach. Sample 95-BJB-0192 was collected by J. Bednarski on August 07, 1995 opposite Half Moon Bay, on the west side of Dundee Bight, Bathurst Island, Baffin region, Nunavut (76.004°N, 100.228°W), at an elevation of 116 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (27.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.0 g) yielded 4.6 L of CO_2 gas. The age estimate is based on one count for 2140 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.914 ± 0.062, 1.148 ± 0.025, and 18.488 ± 0.152 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the 116 m relative sea level. See also GSC-386 (Dyck et al., 1966) and GSC-6085 (above) for additional information.

GSC-6152. Bracebridge Inlet

normalized age:	9780 ± 100
corrected age:	9380 ± 100
$\delta^{13}C$:	+1.12‰
uncorrected age:	9360 ± 100

The marine pelecypod shells, whole valves of *Hiatella arctica* (identified by J. Bednarski), were a surface collection on silt. Sample 96-BJB-0010 was collected by J. Bednarski on July 7, 1996 from a prominent ridge that separates Bracebridge Inlet from Hooker Bay, along the north shore of the southernmost elongated embayment of Bracebridge Inlet, Bathurst Island, Baffin region, Nunavut (75.4436°N, 100.3385°W), at an elevation of 108 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (32.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (26.0 g) yielded 5.6 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio

of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.651 ± 0.049, 1.162 ± 0.025, and 18.124 ± 0.109 cpm, respectively.

Comment (J. Bednarski): This sample provides a minimum age for the 108 m relative sea level and for the deglaciation of east-central Bathurst Island.

GSC-6338. Bracebridge River

normalized age:	6630 ± 80
corrected age:	6230 ± 80
$\delta^{13}C$:	+1.62‰
uncorrected age:	6200 ± 80

The marine shells (*Hiatella arctica*, identified by J. Bednarski) were enclosed in silty sand overlain by stratified sand with thin layers of plant material. Sample 95-BJB-0178 was collected by J. Bednarski on August 3, 1995 from a section along an eastern tributary flowing into the Bracebridge River, Bathurst Island, Baffin region, Nunavut (75.6952°N, 100.4991°W), at an elevation of 24 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (31.7 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (28.4 g) yielded 6.1 L of CO_2 gas. The age estimate is based on one count for 3535 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.303 ± 0.058, 1.249 ± 0.026, and 17.977 ± 0.104 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the >26 m relative sea level.

GSC-6089. Grant Point

normalized age:	9460 ± 110
corrected age:	9060 ± 110
$\delta^{13}C$:	+1.35‰
uncorrected age:	9040 ± 110

The marine shells, paired valves of *Hiatella arctica* (identified by J. Bednarski), were enclosed in marine silty sand. Sample 95-BJB-0053 was collected by J. Bednarski on July 9, 1995 from Grant Point, Dundee Bight, Bathurst Island, Baffin region, Nunavut (76.043°N, 100.813°W), at an elevation of 88 m. The sample was submitted by J. Bednarski to gain information on sea-level change.

The sample (28.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.4 g) yielded 4.8 L of CO_2 gas. The age estimate is based on one count for 2320 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.838 ± 0.061, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the local marine limit of 115 m a.s.l. and an estimate for deglaciation.

GSC-6339. Erskine Inlet

normalized age:	8290 ± 100
corrected age:	7890 ± 100
$\delta^{13}C$:	+3.07‰
uncorrected age:	7840 ± 100

The marine shells, mostly *Mya truncata*, *Hiatella arctica*, and *Astarte* (identified by J. Bednarski), were a surface collection on sand. Sample 95-BJB-0141 was collected by J. Bednarski on July 26, 1995 from the south end of Erskine Inlet, Bathurst Island, Baffin region, Nunavut (75°44.924′N, 101°12.71′W), at an elevation of 48 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (27.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (21.7 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 2555 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.772 ± 0.062, 1.249 ± 0.026, and 17.977 ± 0.104 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum estimate for the 48 m relative sea level, although the dated shells may have been washed down the slope.

GSC-6058. Dampier Bay

normalized age:	9170 ± 80
corrected age:	8770 ± 80
$\delta^{13}C$:	+1.12‰
uncorrected age:	8750 ± 80

The marine shells, paired valves of *Mya truncata* (identified by J. Bednarski), were enclosed in sand overlying till. Sample 95-BJB-0072 was collected by J. Bednarski on December 12, 1995 from the north side of the valley connecting Dampier Bay with Erskine Inlet, Bathurst Island, Baffin region, Nunavut (76.24°N, 101.477°W), at an elevation of 65 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (45.8 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (31.8 g) yielded 6.7 L of CO_2 gas. The age estimate is based on one count for 3935 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.501 ± 0.065, 2.293 ± 0.035, and 28.244 ± 0.136 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the 65 m relative sea level, but it likely dates a much higher sea level. The marine limit in the area is about 116 m a.s.l. The sample also provides a minimum age for deglaciation.

GSC-6349. Pell Inlet

normalized age:	7130 ± 110
corrected age:	6730 ± 110
$\delta^{13}C$:	+3.31‰
uncorrected age:	6680 ± 110

The marine pelecypod shells (*Mya truncata*, identified by J. Bednarski) were enclosed in sandy diamicton. Sample 95-BJB-0164 was collected by J. Bednarski on July 26, 1995 from a delta on the south side of Pell Inlet, on the west side of the river 9 km west of Erskine Inlet, western Bathurst Island, Baffin region, Nunavut (75°52.640′N, 102°08.667′W), at an elevation of 8 m. The sample was submitted by J. Bednarski to gain information on sea-level change.

The sample (29.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.5 g) yielded 4.8 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.781 ± 0.076, 1.313 ± 0.045, and 17.860 ± 0.153 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for a relative sea level of at least 27 m.

GSC-6332. Schomberg Point

normalized age:	8570 ± 90
corrected age:	8170 ± 90
$\delta^{13}C$:	+2.55‰
uncorrected age:	8130 ± 90

The marine shells (*Mya truncata*, identified by J. Bednarski) were a surface collection on silt mantled by a thin gravel lag. Sample 95-BJB-0143 was collected by J. Bednarski on July 26, 1995 from 15 km due east of Schomberg Point, Bathurst Island, Baffin region, Nunavut (75°34.316′N, 102°14.92′W), at an elevation of 62 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (23.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (19.5 g) yielded 4.2 L of CO_2 gas. The age estimate is based on one count for 3620 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.532 ± 0.053, 1.249 ± 0.026, and 17.977 ± 0.104 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the 62 m relative sea level.

GSC-6341. Alexander Island

age:	>33 000
$\delta^{13}C$:	+2.56‰

The marine shells, paired valves of *Mya truncata* (identified by J. Bednarski), were enclosed in horizontally bedded sandy silt above stratified sand and pebbly layers. Sample 95-BJB-0146 was collected by J. Bednarski on July 26, 1995 from a coastal gully on the southeast shore of Alexander Island, north shore of Pell Inlet, 'Bathurst Island group', Baffin region, Nunavut (75°53.122′N, 102°21.719′W), at an elevation of 3 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (10.9 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (10.0 g) yielded 2.1 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.91. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.046 ± 0.060, 1.249 ± 0.026, and 17.977 ± 0.104 cpm, respectively.

Comment (J. Bednarski): The pre–last glacial age of the paired shell suggests that the basal sediments exposed along coastal gullies of southeastern Alexander Island predate the last glaciation. Moreover, the presence of several foraminifera species, including *Cassidrelina tesetis* Tappan (D.H. McNeil, pers. comm., 1999) warrants further investigation.

GSC-6066. Vanier Island

normalized age:	10 300 ± 120
corrected age:	9940 ± 120
$\delta^{13}C$:	+0.59‰
uncorrected age:	9930 ± 120

The marine shells, some paired valves of *Hiatella arctica* (identified by J. Bednarski), were enclosed in sand. Sample 95-BJB-0150 was collected by J. Bednarski on July 27, 1995 from northeastern Vanier Island, 'Bathurst Island group', Baffin region, Nunavut (76.258°N, 102.393°W), at an elevation of 97 to 101 m. The sample was submitted by J. Bednarski to gain information on sea-level change.

The sample (30.0 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (19.3 g) yielded 4.1 L of CO_2 gas. The age estimate is based on one count for 3730 minutes in the 2 L counter with a mixing ratio of 1.13. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 5.276 ± 0.053, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the 101 m relative sea level and a minimum age for deglaciation.

GSC-6340. Schomberg Point

normalized age:	8580 ± 80
corrected age:	8180 ± 80
$\delta^{13}C$:	+1.88‰
uncorrected age:	8150 ± 80

The marine shells (*Mya truncata*, identified by J. Bednarski) were enclosed in a sandy silt unit underlying about 6 m of stratified sand. Sample 95-BJB-0144 was collected by J. Bednarski on July 26, 1995 from a bluff overlooking the east side of a river 10 km east-northeast of Schomberg Point, Bathurst Island, Baffin region, Nunavut (75°34.84′N, 102°25.23′W), at an elevation of 42 m. The sample was submitted by J. Bednarski to gain information on deglaciation and sea-level change.

The sample (33.3 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (30.4 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.209 ± 0.067, 2.264 ± 0.034, and 28.162 ± 0.131 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for a relative sea level of at least 50 m.

GSC-6336. Marc Island

normalized age:	9080 ± 100
corrected age:	8680 ± 100
$\delta^{13}C$:	+2.35‰
uncorrected age:	8640 ± 100

The marine shells, mostly *Mya truncata* (identified by J. Bednarski), were enclosed in sand. Sample 95-BJB-0167 was collected by J. Bednarski on August 01, 1995 from Marc Island, 'Bathurst Island group', Baffin region, Nunavut (75°52.756′N, 103°31.260′W), at an elevation of 46 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (25.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.2 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.147 ± 0.053, 1.267 ± 0.024, and 18.031 ± 0.134 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the deglaciation of Marc Island.

Cameron Island

Arnott Strait Series

A series of marine shell, wood and whale bone samples was collected by D.A. Hodgson on August 3 and 5, 1992 from the north shore of Arnott Strait, Cameron Island, Baffin region, Nunavut. These samples were submitted by D.A. Hodgson to gain information on sea-level change.

S-3502. Arnott Strait (I)

normalized age:	1300 ± 130
$\delta^{13}C$:	-15.1‰
uncorrected age:	1140 ± 130

The whale rib bone, sample HCA-92-3-8-2 (500 g submitted), was on the surface of sand with a cover of 80% moss and 20% vascular plants, 150 m north of an inlet 11 km east of Bent Horn Creek (76°20.4′N, 103°27′W), at an elevation of 4.0 m.

S-3503. Arnott Strait (II)

normalized age:	3820 ± 150
$\delta^{13}C$:	-15.8‰
uncorrected age:	3670 ± 150

The whale ear bone, sample HCA-92-5-8-1 (500 g submitted), was found on the surface and partially buried in an unvegetated gravel and sand raised beach ridge, 200 m inland, 1.5 km south-southwest of Clerk Point (76°24.3′N, 103°03.8′W), at an elevation of 17.5 m.

GSC-5504. Arnott Strait (III)

normalized age:	3700 ± 70
corrected age:	3300 ± 70
$\delta^{13}C$:	2.79‰
uncorrected age:	3260 ± 70

The marine shells, sample HCA-92-3-8-3c (*Mya truncata*, identified by D.A. Hodgson), were enclosed in clay silt sand (76°19.5′N, 103°32′W), at an elevation of 6.5 m. The sample (14.60 g dry weight), was treated with an acid leach to remove the outer 10%. The treated sample (13.1 g) yielded 2.9 L of CO_2 gas. The age estimate is based on one count for 3910 minutes in the 2 L counter with a mixing ratio of 1.51. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.096 ± 0.082, 1.214 ± 0.024, and 18.146 ± 0.102 cpm, respectively.

GSC-5517. Arnott Strait (IV)

normalized age:	4180 ± 80
$\delta^{13}C$:	-28.4‰
uncorrected age:	4240 ± 80

The twigs and roots, sample HCA-92-3-8-3b (*Salix*, identified by H. Jetté in unpublished GSC Wood Report 93-09), were enclosed in dark, reduced silt and sand (76°19.5′N, 103°32′W), at an elevation of 5.5 m. The sample (2.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (3.9 g) yielded 3.4 L of CO_2 gas. The age estimate is based on one count for 3855 minutes in the 2 L counter with a mixing ratio of 1.30. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.693 ± 0.079, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

Comment (D.A. Hodgson): Both whale bone samples are probably from bowhead whales. At the site of S-3502, the sampled rib (2.1 m arc), a jaw bone, and three vertebrae (25 cm diameter) were spread over a distance of 15 m, and a head was found 300 m to the east at the same elevation. Across an inlet, 500 m to the south, a 3 m long jaw bone was found at an elevation of 5.5 m. At the site of S-3503, a skull (1.7 m by 1.3 m), a jawbone, and an unidentified bone were partially buried within 5 m of one another.

The sampled bones were more porous than the preferred dense ear bone and were therefore cut into slices less than 10 mm thick and air blasted in an attempt to remove any younger vegetation.

The whale bone samples appear unaccountably too high or too young. They accord with sea levels from southern and central Bathurst Island. The plant material and shells lie on a far lower curve than the bone, and accord with driftwood that was dated at 4990 ± 70 years BP (GSC-2513; Blake, 1987) collected by Panarctic Oils Ltd. staff 1 km from S-3503 (Clerk Point), at 11 m a.s.l.

The material for GSC-5504 and -5517 was collected from the same cutbank of an unnamed creek, in raised deltaic sediments that project to a 12.5 m elevation terrace, which is assumed to be the approximate sea level at the time of deposition of the material. Date GSC-5517 was taken from mats of compressed plant material in a 10 cm silty sand stratum that included rare molluscs (*Macoma*, some paired). Numerous mollusc valves, mainly *Serripes groenlandicus* up to 6 cm in length and *Macoma*, were exposed on the weathered surface of a clayey silt-sand stratum 1 m above GSC-5517. Embedded shells were rarely observed in the stratum, but a paired valve of *Mya truncata*, complete with siphon, was sampled for GSC-5504.

GSC-6156. Mount Wilmot

normalized age:	10 900 ± 100
corrected age:	10 500 ± 100
$\delta^{13}C$:	+0.14‰
uncorrected age:	10 500 ± 100

The marine pelecypod shells, whole valves of *Hiatella arctica* (identified by J. Bednarski), were a surface collection on fine sand. Sample 96-BJB-0025 was collected by J. Bednarski on July 17, 1996 about 4 km west of Mount Wilmot, Cameron Island, Baffin region, Nunavut (76.445°N, 103.262°W), at an elevation of 114 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (37.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (29.5 g) yielded 6.3 L of CO_2 gas. The age estimate is based on one count for 3715 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.627 ± 0.062, 2.172 ± 0.034, and 28.110 ± 0.147 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the 114 m relative sea level and an age of deglaciation for northwestern Cameron Island. This is the oldest postglacial age in the 'Bathurst Island group'. See GSC-6149 (below) for additional information.

GSC-6149. Cameron Island

normalized age:	10 800 ± 100
corrected age:	10 400 ± 100
$\delta^{13}C$:	+1.58‰
uncorrected age:	10 400 ± 100

The marine pelecypod shells (*Hiatella arctica*, identified J. Bednarski) were a surface collection on sandy gravel. Sample 96-BJB-0033 was collected by J. Bednarski on July 21, 1996 from northeastern Cameron Island, Queen Elizabeth Islands, Baffin region, Nunavut (76.592°N, 104.539°W), at an elevation of 84 m. The sample was submitted by J. Bednarski to gain information on sea-level change and deglaciation.

The sample (29.6 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.3 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 4.957 ± 0.044, 1.180 ± 0.017, and 18.078 ± 0.106 cpm, respectively.

Comment (J. Bednarski): The sample provides a minimum age for the deglaciation of northeastern Cameron Island and a relative sea level of >98 m (marine limit). Also see GSC-6156 (above) for additional information.

Bent Horn Creek Series

The marine shells, sample HCA-92-6-8-1, were collected by D.A. Hodgson on August 6, 1992 in and on a very stony sandy silt diamicton exposed as a low river terrace on lower Bent Horn Creek, 3 km north-northwest of the creek mouth, Cameron Island, Baffin region, Nunavut (76°20.9′N, 103°52.3′W), at an elevation of 10.0 m. These samples were submitted by D.A. Hodgson to gain information on time of deglaciation.

GSC-5491. Bent Horn Creek (I)

normalized age:	21 600 ± 250
corrected age:	21 200 ± 250
$\delta^{13}C$:	+1.76‰
uncorrected age:	21 200 ± 250

Several of the marine shells (48.1 g dry weight; *Mya truncata*, identified by D.A. Hodgson) were treated with an acid leach to remove the outer 20%. The treated sample (38.5 g) yielded 8.56 L of CO_2 gas. The age estimate is based on one count for 3535 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 2.022 ± 0.054, 2.193 ± 0.042, and 28.163 ± 0.147 cpm, respectively.

GSC-5658. Bent Horn Creek (II)

normalized age:	39 400 ± 1480
corrected age:	39 000 ± 1480
$\delta^{13}C$:	1.84‰
uncorrected age:	39 000 ± 1480

One large valve of *Mya truncata* (6.5 cm long; 21.1 g dry weight; identified by D.A. Hodgson) was treated with an acid leach to remove the outer 5%. The treated sample (20.4 g) yielded 4.69 L of CO_2 gas. The age estimate is based on one count for 6400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.142 ± 0.026, 1.284 ± 0.021, and 18.219 ± 0.103 cpm, respectively.

Comment (D.A. Hodgson): GSC-5491 and -5658 were obtained from the same collection of abundant shells (*Mya*, *Hiatella arctica*, and *Macoma*) occurring on and in a terrace underlain by diamicton that contains local and foreign clasts (including granite boulders). The diamicton is assumed to be a till that incorporated molluscs of Late to Middle Wisconsinan age. It is possible that GSC-5491 is a mixture of shells that includes some of postglacial age.

Ellesmere Island

Starfish Bay Series

A series of marine shell samples was collected from the Starfish Bay area, western Ellesmere Island, Baffin region, Nunavut to gain information on deglaciation and sea-level change.

GSC-5907. Starfish Bay (I)

normalized age:	5200 ± 120
corrected age:	4800 ± 120
$\delta^{13}C$:	+1.59‰
uncorrected age:	4780 ± 120

The marine shell fragments (*Mya truncata* and unidentified fragments, according to C. O'Cofaigh) were enclosed in glaciomarine silt overlying till and striated bedrock. Sample SB-7-7-94 was collected by C. O'Cofaigh on July 7, 1994 from 0.75 km west-northwest of the head of Starfish Bay on the north side of the bay (78°10′35″N, 84°02′00″W), at an elevation of 6 m. The sample was submitted by C. O'Cofaigh to gain information on prominent ice-contact deltas at 80 and 86 m.

The sample (7.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (6.2 g) yielded 1.45 L of CO_2 gas. The age estimate is based on one count for 3870 minutes in the 2 L counter with a mixing ratio of 3.08. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.080 ± 0.130, 1.233 ± 0.025, and 18.272 ± 0.104 cpm, respectively.

The next two samples were collected from 2 km west of the head of the fiord on the southern side of Starfish Bay (78°10′20″N, 84°03′15″W). They were collected on July 01, 1994 and submitted by C. O'Cofaigh.

GSC-5936. Starfish Bay (II)

normalized age:	5030 ± 80
corrected age:	4630 ± 80
$\delta^{13}C$:	+1.50‰
uncorrected age:	4610 ± 80

The marine shell sample SB-1-7-94 (a), whole valves and fragments of *Mya truncata* and unidentified fragments (according to C. O'Cofaigh), was enclosed in basal laminated glaciomarine silt with occasional dropstones, at an elevation of 2.9 m.

The sample (14.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (11.6 g) yielded 2.42 L of CO_2 gas. The age estimate is based on one count for 3850 minutes in the 2 L counter with a mixing ratio of 1.68. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.343 ± 0.082, 1.292 ± 0.021, and 18.357 ± 0.102 cpm, respectively.

GSC-5941. Starfish Bay (III)

normalized age:	5350 ± 70
corrected age:	4950 ± 70
$\delta^{13}C$:	+1.32‰
uncorrected age:	4930 ± 70

The marine shell sample SB-1-7-94 (b), whole valves of *Mya truncata* and *Hiatella arctica* (identified by C. O'Cofaigh), was enclosed in glaciomarine silt with occasional dropstones up to large cobble size, at an elevation of 8.6 m.

The sample (20.3 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (19.3 g) yielded 4.07 L of CO_2 gas. The age estimate is based on one count for 3910 minutes in the 2 L counter with a mixing ratio

of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.101 ± 0.062, 1.253 ± 0.031, and 18.665 ± 0.106 cpm, respectively.

Comment (C. O'Cofaigh): A previous age of 8710 ± 120 years BP (GSC-2719; Hodgson, 1985; Blake, 1986) was obtained on a sample of *Portlandia arctica* collected by D.A. Hodgson from 3 km west of the head of Starfish Bay. This lay distal to prominent marine limit deltas at 86 and 80 m a.s.l. at the fiord head and provided a minimum date for deglaciation of the head of the bay. The purpose of the above three dates (GSC-5907, -5941, -5936) was to constrain more closely the age of these deltas, so samples were collected from raised marine silt immediately distal to the delta at 90 m. The silt could be traced stratigraphically up-fiord and beneath the 86 m delta terrace. The samples were therefore originally regarded as providing a reasonable estimate on the age of the delta. However, the young ages of all three samples, relative to GSC-2719, and the fact that GSC-6037, collected at 78 m a.s.l. midway along the fiord, was dated at 7740 ± 90 years BP, suggest that these three dates are probably related to a lower relative sea level, subsequent to that marked by the 86 and 80 m marine-limit deltas.

GSC-5967. Starfish Bay (IV)

normalized age:	5530 ± 90
corrected age:	5130 ± 90
$\delta^{13}C$:	+0.37‰
uncorrected age:	5120 ± 90

The marine shells, whole valves and fragments of *Mya truncata* and *Macoma calcarea* (identified by C. O'Cofaigh), were enclosed in glaciomarine silt. Sample SB-3-7-94 was collected by C. O'Cofaigh on July 3, 1994 from an ice-contact delta at the mouth of a deeply incised north-northeast-trending tributary valley 7 km west of fiord head on the southern side of Starfish Bay (78°10′45″N, 84°18′20″W), at an elevation of 7 m. The sample was submitted by C. O'Cofaigh to gain information on deglaciation in the middle part of the fiord.

The sample (15.1 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (13.5 g) yielded 2.8 L of CO_2 gas. The age estimate is based on one count for 2375 minutes in the 2 L counter with a mixing ratio of 1.44. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.655 ± 0.091, 1.195 ± 0.026, and 18.272 ± 0.110 cpm, respectively.

Comment (C. O'Cofaigh): This date is regarded as a minimum age for the 98 m relative sea level due to the age of 7740 ± 90 years BP (GSC-6037) on marine silt at 78 m a.s.l.

GSC-6037. Starfish Bay (V)

normalized age:	8140 ± 90
corrected age:	7740 ± 90
$\delta^{13}C$:	+1.38‰
uncorrected age:	7720 ± 90

The marine shells, whole valves and fragments of *Mya truncata* and *Hiatella arctica* (identified by C. O'Cofaigh) were enclosed in a thick blanket of glaciomarine silt overlying till and ice-moulded bedrock. Sample CSB-27-7-95 was collected by C. O'Cofaigh on July 27, 1995 about 15 km west of the fiord head on the north side of Starfish Bay (78°13′N, 84°34′W), at an elevation of 78 m. The sample was submitted by C. O'Cofaigh to gain information on deglaciation in central Starfish Bay.

The sample (29.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.1 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 3770 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.997 ± 0.053, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (C. O'Cofaigh): The shells were collected from raised glaciomarine silt on the north side of an ice-moulded bedrock knoll that records the former flow of trunk ice toward the fiord mouth during the last glaciation. Marine limit in this locality is marked by a prominent washing limit around the bedrock knoll at 101 m a.s.l. The thick blanket of glaciomarine silt from which the sample was collected suggests that the bedrock knoll acted as a pinning point during retreat of trunk ice upfiord. The age of 7740 ± 90 years BP (GSC-6037) provides a minimum date for the formation of the 101 m washing limit and deglaciation of the central part of Starfish Bay (O'Cofaigh, 1998).

GSC-6034. Trold Fiord

normalized age:	8610 ± 90
corrected age:	8210 ± 90
$\delta^{13}C$:	+0.44‰
uncorrected age:	8200 ± 90

The marine shells (*Mya truncata*, identified by C. O'Cofaigh) were enclosed in deltaic sand prograding to gravel above. Sample OTF-8-8-95 was collected by C. O'Cofaigh and C. Horvath on August 8, 1995 from the east side of outer Trold Fiord, western Ellesmere Island, Baffin region, Nunavut (78°07′N, 85°02′W), at an elevation of 75 m. The sample was submitted by C. O'Cofaigh to gain information on sea-level change related to the 95 m relative sea level, and on deglaciation.

The sample (42.6 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (30.4 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 2600 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.265 ± 0.078, 2.269 ± 0.035, and 28.506 ± 0.173 cpm, respectively.

Comment (C. O'Cofaigh): Delta gravel prograded over sand containing shells. The sand is thus prodelta sand related to the 95 m marine-limit delta surface above the site. Paired

valves of *Mya truncata* and *Hiatella arctica*, ubiquitous throughout the prodelta sand, were collected from 2 to 3 m below the surface.

The sample dates the 95 m marine-limit delta of a tributary delta to the outer Trold Fiord and is thus a good control point for an emergence curve. It also provides a minimum age for the deglaciation of Starfish Bay ice from outer Trold Fiord.

Blind Fiord Series

A series of marine shell samples was collected from the head of and on the east side of Blind Fiord, western Ellesmere Island, Baffin region, Nunavut to gain information on sea-level change and deglaciation.

GSC-6054. Blind Fiord (I)

normalized age:	8620 ± 100
corrected age:	8220 ± 100
$\delta^{13}C$:	+0.63‰
uncorrected age:	8210 ± 100

The marine shells, whole valves and fragments of *Hiatella arctica* and *Mya truncata* (identified by C. O'Cofaigh), were enclosed in sandy gravel. Sample BF-19-6-95 was collected by C. O'Cofaigh and C. Horvath on June 19, 1995 at an elevation of 107 m (78°22′N, 85°48′W). The sample was submitted by C. O'Cofaigh.

The sample (22.9 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (20.9 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 3600 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.653 ± 0.053, 1.148 ± 0.025, and 18.488 ± 0.152 cpm, respectively.

GSC-5896. Blind Fiord (II)

normalized age:	8490 ± 110
corrected age:	8090 ± 110
$\delta^{13}C$:	+1.63‰
uncorrected age:	8070 ± 110

The marine shell fragments (some unidentifiable species and *Hiatella arctica* and *Mya truncata*, identified by C. O'Cofaigh) were enclosed in glaciomarine silt with occasional clasts (coarse ice-contact delta). Sample BF-25-7-94 was collected by C. O'Cofaigh on July 25, 1994 from a delta at the mouth of a deeply incised tributary valley from the uplands on the east side of Blind Fiord, on the north side of a river about 3 km northeast of the shore at the fiord head (78°23′55″N, 85°48′80″W), at an elevation of 91 m. The sample was submitted by C. O'Cofaigh to gain information on the marine limit at the 120 m relative sea level.

The sample (14.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (11.3 g) yielded 2.64 L of CO_2 gas. The age estimate is based on one count for 3850 minutes in the 2 L counter with a mixing ratio of 1.66. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.721 ± 0.074, 1.206 ± 0.026, and 18.348 ± 0.107 cpm, respectively.

GSC-5990. Blind Fiord (III)

normalized age:	8420 ± 90
corrected age:	8020 ± 90
$\delta^{13}C$:	+1.44‰
uncorrected age:	7990 ± 90

The marine shells, whole valves and fragments of unidentified species and *Mya truncata* and *Hiatella arctica* (identified by C. O'Cofaigh), were a surface collection on discontinuous glaciomarine silt. Sample BF-28-7-94 (b) was collected by C. O'Cofaigh on July 28, 1994 about 3.5 km south-southwest of the shore at the fiord head, on the south side at the mouth of a steeply descending, deeply incised valley in the delta on the east side of Blind Fiord (78°20′10″N, 85°50′58″W), at an elevation of 76 m. The sample was submitted by C. O'Cofaigh.

The sample (25.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.2 g) yielded 4.2 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.796 ± 0.051, 1.250 ± 0.022, and 18.382 ± 0.101 cpm, respectively.

GSC-5924. Blind Fiord (IV)

normalized age:	8390 ± 140
corrected age:	7990 ± 140
$\delta^{13}C$:	+1.52‰
uncorrected age:	7970 ± 140

The marine shells (*Mya truncata* and unidentifiable fragments, according to C. O'Cofaigh) were a surface collection on glaciomarine silt (thin veneer on gravel bench). Sample BF-28-7-94 (a) was collected by C. O'Cofaigh on July 28, 1994 on the north side of the mouth of a prominent, deeply incised meltwater channel on the east side of Blind Fiord, about 3 km south-southwest of the shore at the fiord head (78°20′45″N, 85°52′30″W), at an elevation of 86 m. The sample was submitted by C. O'Cofaigh to gain information on the marine limit at 124 m.

The sample (19.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (15.7 g) yielded 3.58 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.22. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.777 ± 0.102, 1.233 ± 0.025, and 18.272 ± 0.104 cpm, respectively.

Comment (C. O'Cofaigh): These four dates (GSC-5896, -5924, -5990, and -6054) were collected from the inner part of Blind Fiord and all provide minimum estimates on the age of the local marine limit.

TO-5612. Blind Fiord (V)

normalized age:	8510 ± 80

The marine shell, a broken valve of *Mya truncata* (identified by C. O'Cofaigh) was from a surface collection on a raised beach. The sample was collected by C. O'Cofaigh on July 07, 1995 from the central part of Blind Fiord, western Ellesmere Island, Nunavut (78°11′N, 86°04′W), at an elevation of 127 m. This sample was submitted by C. O'Cofaigh to gain information on the timing of the deglaciation of central Blind Fiord and on the marine limit at 133 m a.s.l.

The age was normalized to a $\delta^{13}C$ = -25‰.

See GSC-6047 (below) for comments.

GSC-6047. Blind Fiord (VI)

normalized age:	8950 ± 80
corrected age:	8550 ± 80
$\delta^{13}C$:	+1.56‰
uncorrected age:	8520 ± 80

The marine shells, whole valves and fragments of *Mya truncata* and *Hiatella arctica* (identified C. O'Cofaigh), were enclosed in raised beach gravel. Sample CFB-15-7-95 was collected by C. O'Cofaigh and C. Horvath on July 15, 1995 about 15 km south of the fiord head on the east side of Blind Fiord (78°14′N, 85°57′W), at an elevation of 119 m. The sample was submitted by C. O'Cofaigh to gain information on the marine limit at 133 m relative sea level for central Blind Fiord.

The sample (40.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.1 g) yielded 6.7 L of CO_2 gas. The age estimate is based on one count for 3745 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.836 ± 0.062, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

Comment (C. O'Cofaigh): This sample provides a minimum age for a marine limit of 133 m a.s.l. in central Blind Fiord. This is supported by a second date (TO-5612) obtained on a *Mya truncata* fragment from the surface of a raised beach at 127 m a.s.l. Refer to O'Cofaigh (1999) for additional details.

GSC-6102. Blind Fiord (VII)

normalized age:	6040 ± 110
corrected age:	5640 ± 110
$\delta^{13}C$:	+0.74‰
uncorrected age:	5630 ± 110

The marine shells, paired whole valves of *Hiatella arctica* and *Astarte borealis* (identified by C. O'Cofaigh), were enclosed in glaciomarine silt. Sample CBF-20-7-95C was collected by C. O'Cofaigh and C. Horvath on July 20, 1995 on the east side of the fiord at the mouth of a west-northwest-trending tributary valley, about 17 km south of the fiord head, Blind Fiord (78°13′N, 86°04′W), at an elevation of 31 m. The sample was submitted by C. O'Cofaigh.

The sample (15.3 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (14.3 g) yielded 3.0 L of CO_2 gas. The age estimate is based on one count for 2255 minutes in the 2 L counter with a mixing ratio of 1.34. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.942 ± 0.086, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (C. O'Cofaigh): This sample was obtained from marine silt at 31 m a.s.l. underlying a delta graded to a former relative sea level of 39 m a.s.l. The date is regarded as a good control point for the relative sea level at 39 m a.s.l. (O'Cofaigh, 1999).

Bear Corner Series

A series of marine shell samples was collected from the Bear Corner area on the east side of southern Eureka Sound, western Ellesmere Island, Baffin region, Nunavut to gain information on sea-level change.

GSC-6028. Bear Corner (I)

normalized age:	9150 ± 100
corrected age:	8750 ± 100
$\delta^{13}C$:	+0.18‰
uncorrected age:	8750 ± 100

The marine shells, whole valves and fragments of *Mya truncata* and *Hiatella arctica* (identified by C. O'Cofaigh), were a surface collection on raised beach gravel. Sample BC-10-7-95 was collected by C. O'Cofaigh and C. Horvath on July 10, 1995 from Bear Corner (78°07′N, 87°27′W), at an elevation of 132 m, and submitted by C. O'Cofaigh.

The sample (22.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (18.0 g) yielded 3.8 L of CO_2 gas. The age estimate is based on one count for 3740 minutes in the 2 L counter with a mixing ratio of 1.05. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.158 ± 0.053, 1.200 ± 0.026, and 18.293 ± 0.108 cpm, respectively.

Comment (C. O'Cofaigh): This sample was collected from the surface of a raised beach ridge at Bear Corner, at the southern entrance to Eureka Sound. Extensive raised beaches of gravel extend to 142 m a.s.l. along the coastline in this area, but raised marine deltas and glacial landforms are rare. The date of 8750 ± 100 years BP (GSC-6028) provides a minimum estimate of the

age of the 142 m a.s.l. marine limit and for the deglaciation of the southern end of Eureka Sound. However, older accelerator mass-spectrometry (AMS) dates of up to 9 ka BP were obtained from samples of *Portlandia arctica* from Trappers Cove farther north in the sound (O'Cofaigh et al., 2000).

GSC-6067. Bear Corner (II)

normalized age:	6440 ± 60
corrected age:	6040 ± 60
$\delta^{13}C$:	+1.79‰
uncorrected age:	6020 ± 60

The marine shells, paired whole valves of *Mya truncata* (identified by C. O'Cofaigh), were enclosed in fine deltaic sand underlain by massive silty mud and overlain by beach gravel. Sample BC-11-7-95 (b) was collected by C. O'Cofaigh and C. Horvath on July 11, 1995 from 2 km north of Bear Corner (78°08′N, 87°29′W), at an elevation of 23 m, and submitted by C. O'Cofaigh.

The sample (40.3 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.8 g) yielded 6.7 L of CO_2 gas. The age estimate is based on one count for 3560 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.436 ± 0.071, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

Comment (C. O'Cofaigh): This sample was obtained from crosslaminated deltaic sand overlying massive raised marine silt. Both sand and silt were rich in in situ marine bivalves. The relatively young age of 6040 ± 60 years BP indicates that the sand was deposited during the later stages of regional deglaciation, probably by meltwater flowing from ice on the coastal lowlands south of Hare Point. Related relative sea level was greater than 23 m a.s.l.

Eureka Sound Series

GSC-5695. Eureka Sound (I)

normalized age:	5800 ± 70
corrected age:	5400 ± 70
$\delta^{13}C$:	+3.30‰
uncorrected age:	5350 ± 70

The marine shells (*Astarte*, identified by T. Bell) were a surface collection of paired whole valves eroding from deflating silt. Sample MF-85-S-9321 was collected by T. Bell and A. Aitken on July 21, 1993 from 13 km east of the southernmost point of Mokka Fiord and 22.5 km southwest of Depot Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°31.2′N, 86°41.7′W), at an elevation of 27.5 m. The sample was submitted by T. Bell to gain information on sea-level change.

The sample (39.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.7 g) yielded 7.30 L of CO_2 gas. The age estimate is based on one count for 2335 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.436 ± 0.090, 2.258 ± 0.029, and 28.094 ± 0.130 cpm, respectively.

GSC-5738. Eureka Sound (II)

normalized age:	6410 ± 70
corrected age:	6010 ± 70
$\delta^{13}C$:	+3.54‰
uncorrected age:	5960 ± 70

The marine shells (*Astarte*, identified by T. Bell) were enclosed in marine silt. Sample FP-67-S-9317 was collected by T. Bell on July 17, 1993 from 25 km northeast of May Point, Axel Heiberg Island, and 50 km southeast of Blue Man Cape, Fosheim Peninsula, west-central Ellesmere Island, Baffin region, Nunavut (79°27.5′N, 84°24′W), at an elevation of 33 m. The sample was submitted by T. Bell to gain information on sea-level change and deglaciation.

The sample (34.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (28.3 g) yielded 6.53 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.537 ± 0.095, 2.107 ± 0.032, and 28.412 ± 0.128 cpm, respectively.

GSC-5713. Eureka Sound (III)

normalized age:	6890 ± 90
corrected age:	6490 ± 90
$\delta^{13}C$:	+2.15‰
uncorrected age:	6450 ± 90

The marine shells (*Astarte*, identified by T. Bell) were from a surface collection of paired whole valves eroding from deflating marine silt. Sample FP-03-S-9327 was collected by T. Bell and W. Pollard on June 27, 1993 from 16.75 km east of Blue Man Cape and 31.75 km south-southeast of Eureka, Fosheim Peninsula, west-central Ellesmere Island, Baffin region, Nunavut (79°42.8′N, 85°30.1′W), at an elevation of 44 to 51 m. The sample was submitted by T. Bell to gain information on deglaciation and a maximum age for the growth of massive ground ice.

The sample (28.4 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.4 g) yielded 5.06 L of CO_2 gas. The age estimate is based on one count for 2290 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.238 ± 0.070, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

GSC-5938. Eureka Sound (IV)

normalized age:	7710 ± 80
corrected age:	7310 ± 80
$\delta^{13}C$:	+2.01‰
uncorrected age:	7280 ± 80

The marine shells, in situ whole valves of *Mya truncata* (identified by A. Aitken) were in marine silt overlying weathered bedrock. Sample ES-19-S-9422 was collected by A. Aitken, A. Burt, and C. Omelon on July 22, 1994 from 35 km west-southwest of Depot Point and 28.75 km southwest of Blue Man Cape, eastern Axel Heiberg Island, Baffin region, Nunavut (79°35.1′N, 87°25.7′W), at an elevation of 41 m. The sample was submitted by T. Bell to gain information on sea-level change.

The sample (41.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.5 g) yielded 6.67 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.415 ± 0.052, 1.292 ± 0.021, and 18.357 ± 0.102 cpm, respectively.

GSC-5725. Eureka Sound (V)

normalized age:	8160 ± 80
corrected age:	7760 ± 80
$\delta^{13}C$:	+3.66‰
uncorrected age:	7700 ± 80

The marine shells (*Mya truncata*, identified by T. Bell) were a surface collection comprising paired valves eroded from deflating marine silt. Sample MF-79-S-9319 was collected by T. Bell on July 19, 1993 from 10 km west of Depot Point and 41.25 km south of Eureka, Ellesmere Island, on eastern Axel Heiberg Island, Baffin region, Nunavut (79°37′N, 86°14′W), at an elevation of 67.5 m. The sample was submitted by T. Bell to gain information on sea-level change and deglaciation.

The sample (37.4 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (33.3 g) yielded 7.51 L of CO_2 gas. The age estimate is based on one count for 3680 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.819 ± 0.068, 2.174 ± 0.032, and 28.216 ± 0.130 cpm, respectively.

GSC-5669. Eureka Sound (VI)

normalized age:	8290 ± 80
corrected age:	7890 ± 80
$\delta^{13}C$:	+2.21‰
uncorrected age:	7860 ± 80

The marine shells (*Mya truncata*, identified by T. Bell) were a surface collection of paired and whole valves eroded from deflating silt. Sample MF-91-S-9322 was collected by T. Bell and A. Aitken on July 22, 1993 from 20 km east of southernmost point of Buchanan Lake and 41.25 km northwest of May Point, eastern Axel Heiberg Island, Baffin region, Nunavut (79°24.8′N, 86°46.1′W), at an elevation of 88 m. The sample was submitted by T. Bell to gain information on sea-level change, specifically the marine limit at 126 m.

The sample (34.9 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (31.2 g) yielded 7.05 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.660 ± 0.067, 2.238 ± 0.033, and 28.354 ± 0.189 cpm, respectively.

Comment (T. Bell): These six shell samples were collected from the deflating surface of massive to laminated marine mud draping lower valleys draining into Eureka Sound, between Blue Man Cape and May Point. In one case (GSC-5669), the marine mud thickens to form a valleyside bench. The mud accumulated between 6 and 8 ka BP in a shallowing sea due to postglacial emergence of Eureka Sound. Water depths are estimated to have been between 30 and 80 m, based on the postglacial relative-sea-level curve from adjacent Fosheim Peninsula, Ellesmere Island (Bell, 1996). The enclosing mud is interpreted to represent turbidity flow and suspension deposits accumulated in a prodeltaic environment. The macrofossil faunas recorded at the sample sites are similar to the mid-Holocene *Astarte borealis–Mya truncata* assemblage of Aitken and Bell (1998), which is associated with laminated mud deposited in shallow water under moderate sedimentation rates (50 cm/ka). Mid-Holocene sedimentation in nearshore marine environments of central Eureka Sound most probably reflects paraglacial conditions, where nival and glacial meltwaters were able to erode and transport older glacial and deglacial (emerged) marine sediments. Date GSC-5713 also provides a maximum date on the formation of massive ground ice that underlies the laminated mud at this site (Pollard and Bell, 1998).

GSC-5959. South Bay

normalized age:	6780 ± 70
corrected age:	6380 ± 70
$\delta^{13}C$:	+1.65‰
uncorrected age:	6350 ± 70

The marine mollusc shells, in situ whole valves of *Mya truncata* and *Hiatella arctica* (identified by A.E. Aitken), were recovered from a sandy mud associated with a marine delta. Sample CF-01-S-2993 was collected by A.E. Aitken on July 29, 1994 from 1.5 km west of South Bay, Cañon Fiord, Ellesmere Island, Baffin region, Nunavut (79°39.02′N, 81°44.43′W), at an elevation of 30 m. The sample was submitted by A.E. Aitken to gain information on sea-level change, specifically the 30 m relative sea level, and the fiord macrofauna.

The sample (30.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.8 g) yielded 5.06 L of CO_2 gas. The age estimate is based on one count for 5325 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.322 ± 0.049, 1.212 ± 0.025, and 18.348 ± 0.104 cpm, respectively.

Comment (A.E. Aitken): The Holocene emergence of inner Cañon Fiord is constrained by only two other dates (GSC-3023 and -4741), at 86 and 65 m a.s.l. This date furthers understanding of sea-level history of this area. The sample has considerable paleoecological interest, in that it contains 14 mollusc species, the most diverse sample recorded in the Canadian high Arctic. It thereby enhances understanding of the evolution of the modern fiord macrofauna.

Species list (identified by A.E. Aitken):

Mya truncata, *Hiatella arctica*, *Astarte borealis*, *Portlandia arctica*, *Thyasira gouldi*, *Axinopsida orbiculata*, *Nucula* sp., *Nuculana* sp., *Siphonodentalium* sp., *Delectopecten* sp., *Cylichna* sp., *Serripes groenlandicum*, *Oenopota* spp.

'Sverdrup Pass River' Series

GSC-5897. 'Sverdrup Pass River' (I)

normalized age:	5600 ± 70
corrected age:	5200 ± 70
$\delta^{13}C$:	+0.79‰
uncorrected age:	5190 ± 70

The marine shells, mostly *Astarte borealis* and some *Hiatella arctica* (identified by A. Podor), were enclosed in marine silt and sand containing abundant dropstones. Sample 'H.I.B., June 24/1:45' was collected by A. Podor on June 24, 1994, 2.5 km inland to the east of the head of Irene Bay and 0.5 km north of the sandur (braided plain) of the 'Sverdrup Pass River', 0.2 km east of the third easternmost tributary north of the sandur, Ellesmere Island, Baffin region, Nunavut (79°03′14″N, 81°28′34″W), at an elevation of 55 m. The sample was submitted by A. Podor to gain information on sea-level change and provide a minimum age for the deglaciation of the fiord head.

The sample (25.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.2 g) yielded 4.70 L of CO_2 gas. The age estimate is based on one count for 3860 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.617 ± 0.059, 1.206 ± 0.026, and 18.348 ± 0.107 cpm, respectively.

Comment (A. Podor): Similar to sample 'H.I.B. July 28/12:12' (GSC-5966, below), these shells were taken from a raised marine delta that had been reworked by waves during emergence. The shells were collected in situ in foreset beds at an elevation of 54 m along a marine delta. The upper units (>75 m) were typically devoid of shells, and the silt and sand contained abundant dropstones. The sample was collected in situ from a depth of 0.25 m, and thus provides an age on the marine limit at 82 m. This sample provides an age for the establishment of the local marine limit and a minimum date for the deglaciation of the fiord head. This will provide an important control date for the regional isobases.

GSC-5966. 'Sverdrup Pass River' (II)

normalized age:	6360 ± 100
$\delta^{13}C$:	-23.7‰
uncorrected age:	6340 ± 100

The driftwood (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 95-15) was enclosed in marine sand and silt that contained numerous dropstones. Sample 'H.I.B., June 25/6:31' was collected by A. Podor on June 25, 1994, 2.5 km inland to the east of the head of Irene Bay and 0.5 km north of the braided plain of 'Sverdrup Pass River', 0.25 km east of the third easternmost tributary north of the plain, Ellesmere Island, Baffin region, Nunavut (79°03′18″N, 81°28′38″W), at an elevation of 55 m. The sample was submitted by A. Podor to gain information on sea-level change and deglaciation.

The sample (6.9 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.2 g) yielded 5.49 L of CO_2 gas. The age estimate is based on one count for 5110 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.333 ± 0.055, 1.225 ± 0.034, and 18.343 ± 0.180 cpm, respectively.

Comment (A. Podor): The wood was collected at an elevation of 55 m along a marine delta that marks an 82 m marine limit. The sample lay partially buried in marine sand and silt that contains numerous dropstones. Shells were enclosed in foreset and bottomset beds of the delta, but the upper portions were typically devoid of shells. The wood was dry when collected, and the weathered rind was trimmed away prior to submission to the GSC laboratory. If the sample had been reworked wood, then the cambium layer would have been much darker and partially mineralized, and the sample would not likely to be so long (2.5 m) and thin (14.5 cm).

Similar to sample 'H.I.B. July 28/12:12' (GSC-5897, above), this material was taken from raised beach deposits that mantle a marine delta related to an 82 m marine limit. The wood sample lay within a beach ridge representing the storm-beach elevation at the time of deposition. The sample, because of its age and elevation, provides important information on the relative-sea-level history of the site soon after deglaciation. The Holocene age of this sample has important ramifications related to the climate soon after deglaciation, especially the extent of sea ice within Bay Fiord.

GSC-5955. 'Sverdrup Pass River' (III)

normalized age:	1790 ± 160
$\delta^{13}C$:	-24.7‰
uncorrected age:	1790 ± 160

The driftwood (*Picea*, identified by H. Jetté in unpublished GSC Wood Report 95-16) was enclosed in glaciomarine silt and sand containing abundant dropstones. Sample 'H.I.B., July 28/12:12' was collected by A. Podor on July 28, 1994 from the wall of a small gully on the southwestern margin of a delta, 0.5 km east of the head of Irene Bay, 0.25 km north of the unnamed embayment at the mouth of the 'Sverdrup Pass River', west-central Ellesmere Island, Baffin region, Nunavut (79°03′11″N, 81°28′52″W), at an elevation of 9 m. The sample was submitted by A. Podor to gain information on sea-level change, specifically the 9 m relative sea level.

The sample (6.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5.4 g) yielded 4.77 L of CO_2 gas. The age estimate is based on two counts for 4305 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 14.684 ± 0.265, 1.225 ± 0.034, and 18.343 ± 0.180 cpm, respectively.

Comment (A. Podor): The wood lay partially buried in glaciomarine silt and sand containing abundant dropstones. The sample was exposed along the wall of a small gully within the sand and was dry when collected. The weathered rind was trimmed away prior to its submission to the GSC laboratory.

As the area rebounded, the deltaic sediments were reworked into raised beaches. The wood sample lay within a beach ridge and thus represents the storm-beach elevation at the time of deposition. The fact that the sample was not reworked provides information on the relative-sea-level history of the site long after deglaciation.

GSC-5960. Strathcona Fiord

normalized age:	6510 ± 80
corrected age:	6110 ± 80
$\delta^{13}C$:	+0.97‰
uncorrected age:	6100 ± 80

The marine shells of *Astarte borealis* (identified by A. Podor) were a surface collection on marine sand rich in ice-rafted debris. Sample 'W.S.F., July 8/2:29' was collected by A. Podor on July 8, 1994 on the eastern flank of a prominent raised marine delta, 0.75 km inland to the west of the fiord, about two-thirds of the way along Strathcona Fiord from its head, Ellesmere Island, Baffin region, Nunavut (78°40′30″N, 82°45′30″W), at an elevation of 21.1 m. The sample was submitted by A. Podor to gain information on sea-level change and deglaciation in the central fiord.

The sample (36.1 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (29.1 g) yielded 5.93 L of CO_2 gas. The age estimate is based on one count for 3860 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.590 ± 0.056, 1.212 ± 0.025, and 18.348 ± 0.104 cpm, respectively.

Comment (A. Podor): Shells occurred in glaciomarine sediments below the 90 m local marine limit. The sample site was on a well gullied, raised marine delta 0.75 km inland from the fiord. The sediment contained abundant dropstones and rose laterally toward the delta, which prograded over more distal silt that was unfossiliferous. The shell species dated is consistent with a deglacial environment. A surface collection was made on material that had washed out of the gullied sand. The date provides some chronological control on deglaciation and marine emergence in central Strathcona Fiord.

Strathcona Fiord Series

GSC-5905. Strathcona Fiord (I)

normalized age:	6070 ± 70
corrected age:	5670 ± 70
$\delta^{13}C$:	+1.21‰
uncorrected age:	5650 ± 70

The marine shells (*Astarte borealis* and *Hiatella arctica*, identified by A. Podor) were a surface collection on glaciomarine silt and sand. Sample 'H.S.F., July 21/12:29' was collected by A. Podor on July 21, 1994 from the southeastern (proximal) slope of the lateral moraine at the head of Strathcona Fiord, 0.4 km northwest of a lake inland of the fiord head and about 0.2 km west of the outlet river, Ellesmere Island, Baffin region, Nunavut (78°33′10″N, 82°17′30″W), at an elevation of 11.3 m. The sample was submitted by A. Podor to gain information on sea-level change and deglaciation, and to provide a minimum age for the lateral moraine.

The sample (43.3 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (34.5 g) yielded 7.99 L of CO_2 gas. The age estimate is based on two counts for 2050 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.964 ± 0.095, 2.218 ± 0.035, and 28.217 ± 0.131 cpm, respectively.

Comment (A. Podor): Both the distal (northeast) and proximal (southeast) slopes of the lateral moraine contained abundant shells within raised beach sediment and marine silt and sand. The glaciomarine silt and sand were dissected by gullies and mollusc shells were exposed, in growth position, within this sediment. The shells were collected from the surface and from the base of a small gully that cut the marine-sediment mantle. This sample lay in marine mud-silt that overlapped a prominent lateral moraine. Thus, these sediments postdate the formation of the moraine and are assumed to date the site just prior to its emergence.

The sample provides a minimum age on the lateral moraine near the head of Strathcona Fiord, and also provides control on the sea-level history of the area and the rate of isostatic recovery. The local marine limit in Strathcona Fiord is 75 m.

GSC-5937. Strathcona Fiord (II)

normalized age:	5620 ± 80
corrected age:	5220 ± 80
$\delta^{13}C$:	+0.90‰
uncorrected age:	5200 ± 80

The marine shells (*Mya truncata*, identified by A. Podor) were enclosed in foreset and topset marine sand and silt immediately above a coarse till. Sample 'H.S.F., July 16/12:33' was collected by A. Podor on July 16, 1994 inland of a lateral moraine on the first northeast tributary north of Strathcona Fiord, 0.2 km northeast of the fiord and 50 m west of the river that drains the uplands, Ellesmere Island, Baffin region, Nunavut (78°36′N, 82°18′30″W), at an elevation of 12.6 m. The sample was submitted by A. Podor to gain information on sea-level change and deglaciation of a tributary valley glacier.

The sample (14.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (12.2 g) yielded 2.40 L of CO_2 gas. The age estimate is based on one count for 3870 minutes in the 2 L counter with a mixing ratio of 1.68. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.607 ± 0.079, 1.292 ± 0.021, and 18.357 ± 0.102 cpm, respectively.

Comment (A. Podor): A lateral moraine had been overtopped by marine waters and, during this inundation, a wide sand deposit collected between the southeastern portion of the moraine and the local marine limit. Shells were abundant both on the surface of the sand and in situ immediately below the surface. A shell sample was collected from foreset and topset marine sand immediately above a coarse till unit of the moraine. The marine sand is assumed correlative with the local marine limit, estimated to be 74 m at this site. The shells were collected 0.5 m above the base of the sand unit, in a 3 m trench cut by the river that drains the upland.

This date provides an age for the deglaciation of the tributary valley extending from the upland, and also provides control on ice dynamics and the sea-level history of the site.

GSC-5991. Marie Island

normalized age:	5700 ± 70
corrected age:	5300 ± 70
$\delta^{13}C$:	+1.03‰
uncorrected age:	5280 ± 70

The marine shells, whole valves of (?)*Mya arenaria* (identified by R. McNeely), were enclosed in foreset and bottomset marine sand and silt above glacially abraded bedrock. Sample 'N.I.B., July 6/10:17' was collected by A. Podor on July 6, 1994 from 7.5 km west of the major river and sandur (outwash-plain system) along the northwest shore of Irene Bay, on the north shore of Bay Fiord, 3.5 km east of Marie Island and 50 m inland from the fiord, Ellesmere Island, Baffin region, Nunavut (78°53′30″N, 82°23′45″W), at an elevation of 13.3 m. The sample was submitted by A. Podor to gain information on sea-level marine change and the extent of glacial ice during the Holocene.

The sample (25.7 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.3 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3710 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.523 ± 0.058, 1.250 ± 0.022, and 18.382 ± 0.101 cpm, respectively.

Comment (A. Podor): The site was 50 m inland from the fiord, in a 2.5 m high eroding bluff of foreset and bottomset sediment relating to a local marine limit of 96 m. The sample site was in foreset and bottomset marine sediments within a raised delta sequence. The local marine limit was 96 m; however, the apex of this raised delta was heavily modified by slope processes and difficult to distinguish. Glacially abraded bedrock lay below the deltaic sediments. The shells were collected in situ from strata 1 m below the surface in an exposed river cut. Although no samples suggestive of a pre-Holocene marine limit are known from this portion of Bay Fiord, the shells were thought to have been from a pre-Holocene marine sequence, since they showed iron-staining and postdepositional encrustation with calcium carbonate.

This date provides some chronological control on the sea-level history and ice extent related to the last (Holocene) glaciation, as it dates the high strandline evident along Bay Fiord.

GSC-5722. Scoresby Bay (I)

normalized age:	31 300 ± 950
corrected age:	30 900 ± 950
$\delta^{13}C$:	+2.88‰
uncorrected age:	30 900 ± 950

The marine shells (*Hiatella arctica*, identified by J.H. England) were a surface collection on silty gravel. Sample SB-11-S-93 was collected by J.H. England on July 1, 1993 from the head of Scoresby Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°52′30″N, 71°29′W), at an elevation of 77 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (16.1 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (15.2 g) yielded 3.46 L of CO_2 gas. The age estimate is based on one count for 2750 minutes in the 2 L counter with a mixing ratio of 1.25. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.395 ± 0.046, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

TO-4202. Scoresby Bay (II)

corrected age: 24 250 ± 190

The marine shell (*Astarte borealis*, identified by J.H. England) was a surface collection on fossiliferous till. Sample SB-11-S-93 was collected by J.H. England on July 1, 1993 from inside a small moraine at the head of Scoresby Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°52′30″N, 71°29′W), at an elevation of 85 m. This sample was submitted by J.H. England to gain information on the Late Wisconsinan glacial advance.

Comment (R. Smith): Based on the age and location of this sample (distal to a small moraine and below the Holocene marine limit), it is assumed to have been redeposited during the Last Glacial Maximum (LGM). This sample, in combination with a date of 24 250 ± 190 years BP (TO-4202) on an *Astarte borealis* shell collected from fossiliferous till inside the small moraine (85 m a.s.l.), provides a minimum age estimate for the Late Wisconsinan ice advance (for additional information, *see* England, 1996).

GSC-5668. Scoresby Bay (III)

normalized age:	7720 ± 80
corrected age:	7320 ± 80
$\delta^{13}C$:	+1.79‰
uncorrected age:	7290 ± 80

The marine shells (*Mya truncata* and *Hiatella arctica*, identified by J.H. England) were enclosed in marine silt. Sample SB-12-S-93 was collected by J.H. England on July 2, 1993 from the head of Scoresby Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°54′N, 71°30′W), at an elevation of 65 to 70 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (22.6 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (20.4 g) yielded 4.60 L of CO_2 gas. The age estimate is based on one count for 3910 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.436 ± 0.055, 1.281 ± 0.029, and 18.437 ± 0.106 cpm, respectively.

TO-4200. Scoresby Bay (IV)

corrected age: 7370 ± 70

The growth-position marine shell (*Astarte borealis*, identified by J.H. England) was enclosed in deglacial deltaic sediments. Sample SB-12-S-93 was collected by J.H. England on July 2, 1993 from the head of Scoresby Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°54′N, 71°30′W), at an elevation of 83 m. This sample was submitted by J.H. England to gain information on sea-level change.

Comment (R. Smith): Sample was collected from dissected marine silt underlying a delta at 84 m a.s.l., and therefore constrains this relative sea level. This date closely corresponds to another deglacial delta upvalley at a similar elevation (83 m a.s.l.), from which a date of 7370 ± 70 years BP (TO-4200) was obtained on an *Astarte borealis* shell collected in growth position, as well as other deglacial dates (ca. 7.5 ka BP) on the east side of Darling Peninsula (England, 1996; Gualtieri and England, 1998).

GSC-5670. John Richardson Bay

normalized age:	7050 ± 190
corrected age:	6650 ± 190
$\delta^{13}C$:	+2.23‰
uncorrected age:	6610 ± 190

The marine shells (*Hiatella arctica*, identified by J.H. England) were enclosed in marine sand. Sample JRB-2-S-93 was collected by J.H. England on July 4, 1993 from the head of the south arm of John Richardson Bay, eastern Ellesmere Island, Baffin region, Nunavut (80°04′N, 72°19′W), at an elevation of 40 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (4.3 g dry weight) was not treated. The treated sample (4.3 g) yielded 0.92 L of CO_2 gas. The age estimate is based on one count for 3920 minutes in the 2 L counter with a mixing ratio of 4.61. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.094 ± 0.185, 1.281 ± 0.029, and 18.437 ± 0.106 cpm, respectively.

Comment (J.H. England): A sample was collected from bedded bottomset sand immediately distal to the modern tidewater glacier at the fiord head. The bottomset sand is considered to relate to the adjacent marine-limit delta (67 m a.s.l.), and this date therefore constrains this relative sea level and records the rapid deglaciation of the southern arm of John Richardson Bay (England, 1996).

GSC-5654. Dobbin Bay (I)

normalized age:	7170 ± 110
corrected age:	6770 ± 110
$\delta^{13}C$:	+2.62‰
uncorrected age:	6730 ± 110

The marine shells (*Mya truncata* and *Hiatella arctica*, identified by J.H. England) were enclosed in marine silt and sand. Sample DB-2-S-93 was collected by J.H. England on July 5, 1993 from the north side of the valley where the main valley turns from east-west to north-south, 4 km inland from the head of the unnamed bay along the outer north shore of Dobbin Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°49′30″N, 72°38′W), at an elevation of about 45 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (9.5 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (9.0 g) yielded 2.01 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 2.19. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.881 ± 0.091, 1.284 ± 0.021, and 18.219 ± 0.103 cpm, respectively.

TO-4187. Dobbin Bay (II)

corrected age:	6740 ± 80

These marine-shell fragments were enclosed in bottomset marine silt. Sample DB-2-S-93 was collected by J.H. England on July 5, 1993 near the head of Dobbin Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°49′30″N, 72°38′W), at an elevation of 50 m; the co-ordinates are approximate, but the site is 15 km west of the site of GSC-5654. The sample was submitted by J.H. England to gain information on the sea-level change.

Comment (R. Smith): A sample was collected from massive silt along the edge of an ice-contact delta (83 m a.s.l.) situated 10 km downvalley of an outlet glacier from the Agassiz Ice Cap. This sample provides a minimum age estimate on the 83 m sea level. Fifteen kilometres to the west, toward the head of Dobbin Bay, shell fragments collected from bottomset silt at 50 m a.s.l. (relating to an 81 m a.s.l. delta) provide a corroborating age of 6740 ± 80 years BP (TO-4187). Refer to England (1996) for additional information.

GSC-6074. Cape Albert

normalized age:	7130 ± 90
corrected age:	6730 ± 90
$\delta^{13}C$:	+1.89‰
uncorrected age:	6700 ± 90

The marine shells (*Hiatella arctica*, identified by J.H. England) were enclosed in sand and gravel outwash. Sample CA-94-S-95 was collected by J.H. England and D.J.A. Evans on July 26, 1995 from an exposed section on the south side of a river in a small canyon about 2 km southwest of Cape Albert, outer southeast coast of Bache Peninsula, Ellesmere Island, Baffin region, Nunavut (79°02′N, 74°25′W), at an elevation of about 40 m. The sample was submitted by J.H. England to gain information on sea-level change and deglaciation.

The sample (22.6 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (21.3 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 2310 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.806 ± 0.068, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (R. Smith): The outwash in which this sample was found could be traced upslope to an estimated relative sea level of ≥56 m a.s.l. The date is in accordance with other samples collected west of this site, nearer the fiord heads, that constrain a similar relative sea level. The presence and age of these outwash deposits provide further evidence of the retreat of a plateau ice cap(s) on outer Bache Peninsula, well after larger trunk glaciers had retreated westward up the regional fiords (England et al., 2000).

GSC-5663. Eugenie Glacier (I)

normalized age:	31 800 ± 900
corrected age:	31 400 ± 900
$\delta^{13}C$:	+2.59‰
uncorrected age:	31 400 ± 900

The marine shells (*Mya truncata*, identified by J.H. England) were enclosed in stony marine silt. Sample DB-13-S-93 was collected by J.H. England on July 12, 1993 on the south shore, near the head of Dobbin Bay, about 4 km west-southwest of the terminus of the Eugenie Glacier (occupying the fiord head), eastern Ellesmere Island, Baffin region, Nunavut (79°47′N, 74°54′W), at an elevation of about 46 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (18.0 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (16.7 g) yielded 3.82 L of CO_2 gas. The age estimate is based on one count for 3690 minutes in the 2 L counter with a mixing ratio of 1.15. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 0.370 ± 0.041, 1.281 ± 0.029, and 18.437 ± 0.106 cpm, respectively.

Comment (R. Smith): This sample was collected from silt that contained abundant whole valves of *Mya truncata*, dropstones, and occasional debris-flow deposits. The silt was overlain by foreset gravel of an ice-contact delta marking the marine limit at 72 m a.s.l. The age of this sample indicates that the silt is not related to this delta (it was bottomsets) but rather to open marine deposition prior to the Late Wisconsinan advance (for additional information, *see* England, 1996).

GSC-5712. Eugenie Glacier (II)

normalized age:	5560 ± 100
corrected age:	5160 ± 100
$\delta^{13}C$:	+1.63‰
uncorrected age:	5130 ± 100

The marine shells of *Hiatella arctica* (identified by J.H. England) were enclosed in marine silt. Sample DB-17-S-93 was collected by J.H. England on July 11, 1993 from a valley about 8 km inland from the terminus of the Eugenie Glacier, head of Dobbin Bay, eastern Ellesmere

Island, Baffin region, Nunavut (79°48′N, 75°23′W), at an elevation of 21 m. The sample was submitted by J.H. England to gain information on sea-level change.

The sample (13.8 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (13.1 g) yielded 2.98 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 2 L counter with a mixing ratio of 1.46. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.707 ± 0.097, 1.199 ± 0.028, and 18.393 ± 0.105 cpm, respectively.

TO-4189. Eugenie Glacier (III)

corrected age:	3460 ± 70

The marine shell was enclosed in ice-thrust marine silt. This sample was collected by J.H. England from the terminus of the Eugenie Glacier, at the head of Dobbin Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°48′N, 75°23′W). This sample was submitted by J.H. England to gain information on glacial retreat.

Comment (R. Smith): This sample was collected in silt that blanketed an interior lowland, at a site that was within 100 m of the margin of the modern tidewater Eugenie Glacier. A lateral moraine bordering the Eugenie Glacier is trimmed by shorelines to about 28 m a.s.l., and the uppermost shoreline rises to the west, where it trims the moraine of a small piedmont glacier at 31 m a.s.l. Nearby, a small fan delta has also prograded into the 31 m sea level, and it was distal to this fan delta that the present sample was collected. This sample thus constrains a relative sea level to between ≥21 and ≤31 m a.s.l. and the emplacement of the lateral moraine. Shells collected from ice-thrust silt in contact with the Eugenie Glacier date 3460 ± 70 years BP (TO-4189), thus providing a maximum age for its current position (for additional information, *see* England, 1996).

GSC-6090. Copes Bay (I)

normalized age:	6640 ± 90
corrected age:	6240 ± 90
$\delta^{13}C$:	+2.56‰
uncorrected age:	6200 ± 90

The marine shells (*Hiatella arctica* and *Mya truncata*, identified by J.H. England) were enclosed in massive sand overlying a debris flow about 10 m above the basal diamicton. Sample CB-4-S-95 was collected by J.H. England and R. Smith on June 26, 1995 from the mouth of the first prominent tributary valley reaching the main valley from the east, just inland from the easternmost bay, 3 km inland from two unnamed bays along the outer north shore of Copes Bay, Baffin region, Nunavut (79°28′N, 75°35′W), at an elevation of 25 m. The sample was submitted by J.H. England to gain information on sea-level change and deglaciation.

The sample (22.7 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (20.3 g) yielded 4.4 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.312 ± 0.068, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (R. Smith): The date provides a minimum estimate for retreat of glaciers inland of this site, and is related to a Holocene marine limit at ≤88 m a.s.l. This sample was submitted in hopes of constraining the age of the underlying diamict and initial retreat of the glaciers. However, corroborating samples, including a whole *Portlandia arctica* bivalve, collected from bottomset beds at 40 m a.s.l. in this same general location that dated 7380 ± 70 years BP (TO-5609), and GSC-6101 (*Hiatella arctica* and *Mya truncata* pelecypod shells; 6760 ± 110 years BP), collected about 2 km upvalley from the collection site of GSC-6090, indicate earlier ice-free conditions (cf. England et al., 2000).

GSC-6101. Copes Bay (II)

normalized age:	7160 ± 110
corrected age:	6760 ± 110
$\delta^{13}C$:	+1.10‰
uncorrected age:	6750 ± 110

The marine shells (paired whole valves; *Hiatella arctica* and *Mya truncata*, identified by J. England) were enclosed in silt. Sample CB-20-S-95 was collected by J.H. England and R. Smith on July 2, 1995 north of the confluence of two glacierized drainages with present ice margins within 7 km of it, 8 km inland (north) from two unnamed bays along the outer north shore of Copes Bay, eastern Ellesmere Island, Baffin region, Nunavut (79°31′N, 75°50′W), at an elevation of 49 m. The sample was submitted by J.H. England to gain information on sea-level change and deglaciation.

The sample (18.0 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (16.9 g) yielded 3.6 L of CO_2 gas. The age estimate is based on one count for 1800 minutes in the 2 L counter with a mixing ratio of 1.12. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.777 ± 0.080, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (R. Smith): The date provides a minimum estimate for retreat of glaciers inland of this site and is related to a Holocene marine limit of between 60 and 89 m a.s.l. This sample supersedes GSC-6090 (6240 ± 90 years BP) as controlling the earliest retreat of ice in this side valley (England et al., 2000).

GSC-6094. Knud Peninsula

normalized age:	7220 ± 90
corrected age:	6820 ± 90
$\delta^{13}C$:	+1.31‰
uncorrected age:	6800 ± 90

The marine shells (*Hiatella arctica* and *Mya truncata*, identified by J.H. England) were a surface collection on deltaic sand and gravel. Sample KP-71-S-95 was collected by J.H. England and R. Smith on July 23, 1995 from the outer south shore of Knud Peninsula, eastern Ellesmere Island, Baffin region, Nunavut (79°04′30″N, 76°13′W), at an elevation of about 30 m. The sample was submitted by J. England to gain information on sea-level change and deglaciation.

The sample (30.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.6 g) yielded 5.0 L of CO_2 gas. The age estimate is based on one count for 2390 minutes in the 2 L counter with a mixing ratio of 1.05. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.712 ± 0.069, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (R. Smith): A sample was collected from the prominent Knud delta, deposited along the margin of trunk ice at the mouth of Hayes Fiord. The 80 m delta closely corresponds with the marine limit measured around the tip of the Knud Peninsula, constrained by shell dates of 7.3 ka BP (GSC-3700; Blake, 1988). The age of this bulk sample is considered a minimum age estimate, as indicated by two AMS dates on individual valves from this same sample that were younger: 6660 ± 100 years BP on *Hiatella arctica* (Beta-119913) and 5780 ± 70 years BP on *H. arctica* (TO-5589). The sample constrains a relative sea level to between 30 and 80 m a.s.l. (England et al., 2000).

GSC-6095. Flagler Bay

normalized age:	5860 ± 80
$\delta^{13}C$:	-26.17‰
uncorrected age:	5880 ± 80

The organic materials were enclosed in silt and sand. Sample FB-79-O-95 was collected by J.H. England and R. Smith on July 20, 1995 from a large crosscutting valley trending southeast across Knud Peninsula to the outer north shore of Hayes Fiord, within 1 km of outer south shore of Flagler Bay, Ellesmere Island, Baffin region, Nunavut (79°08′30″N, 76°58′W), at an elevation of 185 m. The sample was submitted by J.H. England to gain information on deglaciation.

The sample (30.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (24.0 g) yielded 7.6 L of CO_2 gas. The age estimate is based on one count for 2400 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.666 ± 0.094, 2.213 ± 0.046, and 28.403 ± 0.142 cpm, respectively.

Comment (R. Smith): This sample is interpreted to have been deposited in an ice-dammed lake. Consequently, the age constrains the retreat of local plateau ice on central Knud Peninsula well after regional trunk ice had retreated westward up Flagler Bay (England et al., 2000).

GSC-6079. Parrish Glacier

normalized age:	6700 ± 190
corrected age:	6300 ± 190
$\delta^{13}C$:	+1.18‰
uncorrected age:	6280 ± 190

The marine shells (*Hiatella arctica*, identified by J. England) were enclosed in glaciomarine silt and sand. Sample CP-46-S-95 was collected by J. England and R. Smith on July 12, 1995 about 1 km distal to the margin of the Parrish Glacier, on the innermost west shore of Copes Bay, Ellesmere Island, Baffin region, Nunavut (79°32′N, 77°07′W), at an elevation of 39 m. The sample was submitted by J. England to gain information on sea-level change and deglaciation.

The sample (9.8 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (8.4 g) yielded 1.7 L of CO_2 gas. The age estimate is based on one count for 920 minutes in the 2 L counter with a mixing ratio of 2.40. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.233 ± 0.181, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (R. Smith): A sample was collected from bottomset silt and constrains a relative sea level to between 39 and 67 m a.s.l. The proximity of this sample to the Parrish Glacier, in addition to shells collected by W. Blake, Jr. inside the modern Parrish Glacier terminus that dated 6.5 ka BP (GSC-4876; McNeely and Jorgensen, 1993), illustrate a readvance of at least 2 km since about 6.5 ka BP. This contrasts with a high plateau (about 700 m a.s.l.) west of Flagler Bay that remains ice free inside the 5.5 ka BP isochrone. Other prominent Middle to Late Holocene glacier readvances are recognized southeast of this site around the Prince of Wales Icefield (England et al., 2000).

GSC-6097. Harmsworth Bay

normalized age:	6780 ± 100
corrected age:	6380 ± 100
$\delta^{13}C$:	+1.31‰
uncorrected age:	6360 ± 100

The marine shells (*Mya truncata*, identified by J. England) were enclosed in massive glaciomarine silt about 2 m above the modern sandur (outwash plain). Sample HB-57-S-95 was collected by J. England and R. Smith on July 15, 1995 about

0.5 km inland from the fiord head and on the east side of the modern sandur at the head of Harmsworth Bay, innermost Bache Peninsula, eastern Ellesmere Island, Baffin region, Nunavut (79°14′N, 77°36′W), at an elevation of 13 m. The sample was submitted by J. England to gain information on sea-level change and deglaciation.

The sample (28.9 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.8 g) yielded 4.8 L of CO_2 gas. The age estimate is based on one count for 2380 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.165 ± 0.067, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (R. Smith): This sample constrains a relative sea level to ≤62 m a.s.l., as well as the rate of ice retreat from the mouth of Harmsworth Bay, where an ice-contact delta at 75 m a.s.l. is constrained by a date of 6700 ± 70 years BP on *Mya truncata* in foresets (TO-5595; England et al., 2000).

GSC-6088. Sverdrup Pass (I)

normalized age:	6340 ± 90
corrected age:	5940 ± 90
$\delta^{13}C$:	+1.89‰
uncorrected age:	5910 ± 90

The marine shells (*Hiatella arctica*, *Mya truncata*, and *M. calcarea*, identified by J.H. England) were enclosed in a massive sand bed within silt and clay. Sample FB-60-S-95 was collected by J. England and R. Smith on July 15, 1995 from the south side of the main valley at the very head of Flagler Bay, east end of Sverdrup Pass, Ellesmere Island, Baffin region, Nunavut (79°09′N, 78°13′W), at an elevation of 16 m. The sample was submitted by J. England to gain information on sea-level change and deglaciation.

The sample (21.0 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (16.6 g) yielded 3.6 L of CO_2 gas. The age estimate is based on one count for 2285 minutes in the 2 L counter with a mixing ratio of 1.14. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 8.619 ± 0.076, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Beta-91863. Sverdrup Pass (II)

uncorrected age:	5920 ± 60

A shell fragment from the same collection (FB-60-S-95) was re-dated as a crosscheck on the age of GSC-6088.

Comment (R. Smith): This date constrains a relative sea level to ≤51 m a.s.l. and the retreat of ice from the head of Flagler Bay at the eastern end of Sverdrup Pass. By comparison, the retreat of Innuitian ice from the head of Irene Bay at the western end of Sverdrup Pass, occurred about 8.8 ka BP (Hodgson, 1985), almost 3000 years earlier! A second sample from the same collection was submitted to Beta Analytic Inc. as a crosscheck — it yielded an age of 5920 ± 60 years BP.

Hot Weather Creek Area Series

A series of peat samples was collected in the Hot Weather Creek area, Fosheim Peninsula, Ellesmere Island, Baffin region, Nunavut by M. Garneau and others during 1991 and 1992. The samples were submitted by M. Garneau to gain information on peat accumulation through the dynamics of polygons.

GSC-5547. 'Ridge Lake' (I)

normalized age:	3930 ± 80
$\delta^{13}C$:	-29.2‰
uncorrected age:	4000 ± 80

The peat sample (*Calliergon*, *Scorpidium*, and *Drepanocladus*, identified by M. Garneau) was enclosed in a 2.85 cm thick peat deposit. Sample 91.10.A3.45 was collected by M. Garneau on July 8, 1991 from 2 km south of base camp, a few hundred metres east of Ridge Lake (79°58′N, 84°28′W), at an elevation of 60 m.

The sample (28.2 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (11.5 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 2215 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 11.018 ± 0.082, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

GSC-5549. 'Ridge Lake' (II)

normalized age:	7820 ± 100
corrected age:	7420 ± 100
$\delta^{13}C$:	0.87‰
uncorrected age:	7410 ± 100

The marine shells (*Mya truncata*, identified by R. McNeely) was enclosed in a beach deposit. Sample 92.25.7.9.2 was collected by M. Garneau and K. Gajewski on July 25, 1992 from 2 km south of the base camp, around Ridge Lake, (79°58′N, 84°28′W), at an elevation of 100 m.

The sample (26.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (21.4 g) yielded 4.9 L of CO_2 gas. The age estimate is based on one count for 2550 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 7.204 ± 0.067, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

GSC-5554. 'Ridge Lake' (III)

normalized age:	4310 ± 80
$\delta^{13}C$:	-29.4‰
uncorrected age:	4380 ± 80

The peat sample (*Scorpidium*, *Calliergon*, and *Drepanocladus*, identified by M. Garneau) was enclosed in a 2.85 cm thick peat deposit. Sample 91.10.B7.100 (100–104 cm) was collected by M. Garneau on July 8, 1991 from 2 km south of base camp, some 50 m from Ridge Lake (79°58′N, 84°28′W), at an elevation of 60 m.

The sample (24.0 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (9.5 g) yielded 4.5 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 10.503 ± 0.084, 1.216 ± 0.035, and 18.123 ± 0.108 cpm, respectively.

GSC-5570. 'Ridge Lake' (IV)

normalized age:	4900 ± 70
$\delta^{13}C$:	-32.0‰
uncorrected age:	5010 ± 70

The bryophyte and Cyperaceae peat (*Scorpidium*, *Calliergon*, and *Drepanocladus*, identified by M. Garneau) was enclosed in a 2.85 cm thick peat deposit. Sample 91-10-BIO (150 cm) was collected by M. Garneau on July 8, 1991 from 2 km south of base camp, a few hundred metres from Ridge Lake, (79°58′N, 84°28′W), at an elevation of 60 m.

The sample (12.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (8 g) yielded 5.0 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 9.838 ± 0.058, 1.179 ± 0.020, and 18.355 ± 0.109 cpm, respectively.

GSC-5577. Mouth of Hot Weather Creek (I)

normalized age:	2700 ± 70
$\delta^{13}C$:	-26.2‰
uncorrected age:	2720 ± 70

The sedge peat (Cyperaceae, identified by M. Garneau) was enclosed in a 140 cm thick peat horizon. Sample 92.14F.100 (100–104 cm) was collected by M. Garneau on July 23, 1992 from 1 km north of base camp, about 500 m from the mouth of Hot Weather Creek (79°58′N, 84°28′W), at an elevation of 45 m.

The sample (7.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (5 g) yielded 3.8 L of CO_2 gas. The age estimate is based on one count for 3970 minutes in the 2 L counter with a mixing ratio of 1.20. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.082 ± 0.070, 1.179 ± 0.020, and 18.355 ± 0.109 cpm, respectively.

GSC-5586. Mouth of Hot Weather Creek (II)

normalized age:	3140 ± 110
$\delta^{13}C$:	-25.8‰
uncorrected age:	3150 ± 110

The herbaceous and twiggy organic debris was enclosed in a 140 cm thick organic horizon of wood and herbaceous remains. Sample 92.14H.120 (115–125 cm) was collected by M. Garneau on July 23, 1992 from 1 km north of base camp, about 500 m from the mouth of Hot Weather Creek (79°58′N, 84°28′W), at an elevation of 45 m.

The sample (3.8 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (2.5 g) yielded 1.9 L of CO_2 gas. The age estimate is based on two counts for 2145 minutes in the 2 L counter with a mixing ratio of 2.40. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 12.253 ± 0.143, 1.227 ± 0.024, and 18.146 ± 0.137 cpm, respectively.

GSC-5575. Hot Weather Creek (I)

normalized age:	2510 ± 70
$\delta^{13}C$:	-31.1‰
uncorrected age:	2610 ± 70

The organic material (*Calliergon giganteum*, identified by M. Garneau) was enclosed in a 140 cm thick peat horizon. Sample 92.14B.60 (58–61 cm) was collected by M. Garneau on July 23, 1992 from Hot Weather Creek (79°58′N, 84°28′W), at an elevation of 45 m.

The sample (19.3 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7 g) yielded 5.5 L of CO_2 gas. The age estimate is based on two counts for 2055 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 13.268 ± 0.086, 1.179 ± 0.020, and 18.355 ± 0.109 cpm, respectively.

GSC-5589. Hot Weather Creek (II)

normalized age:	2580 ± 60
$\delta^{13}C$:	-26.8‰
uncorrected age:	2610 ± 60

The sedge peat (Cyperaceae, Gramineae, and *Dryas integrifolia*, identified by M. Garneau) was enclosed in a 50 cm thick organic layer eroded from a polygon. Sample 92.29.7.15.3 was collected by M. Garneau on July 29, 1992 from Hot Weather Creek (79°58′N, 84°28′W), at an elevation of 110 m.

The sample (33.3 g dry weight) was treated with hot base, hot acid (slightly calcareous), and distilled water rinses. The treated sample (10.1 g) yielded 7.5 L of CO_2 gas. The age estimate is based on two counts for 2160 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 20.306 ± 0.107, 2.197 ± 0.031, and 28.117 ± 0.130 cpm, respectively.

Refer to Garneau (2000) for descriptions and interpretation of these dates.

Nunavut, Kitikmoet region

Stefansson Island

S-3505. Stefansson Island

$\delta^{13}C$:	-15.9‰
uncorrected age:	6520 ± 160

The whale vertebra, sample HCA-86-5-8-6 (260 g submitted), was collected by D.A. Hodgson on August 06, 1986 on the surface and partially buried in an unvegetated gravel and silt raised beach ridge, 1 km inland on southeastern Stefansson Island, Nunavut (73°17.5′N, 104°39.0′W), at an elevation of 20 m. The sample was submitted by D.A. Hodgson to gain information on sea-level change.

Comment (D.A. Hodgson): Four ribs, six vertebrae, and several unidentified bones from an assumed bowhead whale were found on a raised beach backshore. The age and elevation of S-3505 accord with other sea-level-related dates from Stefansson Island (McNeely, 2005).

INTERNATIONAL

Morocco

GSC-5852. El Kiffen, Morocco

normalized age:	3760 ± 60
corrected age:	3360 ± 60
$\delta^{13}C$:	+2.03‰
uncorrected age:	3330 ± 60

The gastropod shells of *Monodonta lineata* (identified by S. Occhietti), sample UQ-1873, were collected by J-P. Raynal and J-P. Texier from El Kiffen, near Casablanca, Morocco and submitted by S. Occhietti as a crosscheck on Université du Québec à Montréal (UQ) dates.

The sample (49.2 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (32.9 g) yielded 7.59 L of CO_2 gas. The age estimate is based on one count for 3860 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.650 ± 0.077, 2.215 ± 0.024, and 28.239 ± 0.180 cpm, respectively.

Comment (S. Occhietti): The sample dates a Holocene site on the Atlantic coast of Morocco. Refer to Occhietti et al. (2002) for additional comments.

Comment (GSC laboratory): The GSC percentage modern carbon (pMC) was 62.5%, somewhat lower than UQ values of 65 to 68% (cf. UQ-1873).

Russia

GSC-5099. Moreyu River (I)

normalized age:	8810 ± 110
$\delta^{13}C$:	-28.2‰
uncorrected age:	8860 ± 110

The wood (*Populus*, identified by R.J. Mott in unpublished GSC Wood Report 90-51) was enclosed in peat. Sample VH-90-115 was collected by J-S. Vincent on August 9, 1990 from a section on the left bank of the Moreyu River, eastern Arctic coastal plain of the European portion of Russia (67°49′N, 59°55′W). The sample was submitted by J-S. Vincent to gain information on the age of the peat deposit.

The sample (8.7 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (6.6 g) yielded 7.33 L of CO_2 gas. The age estimate is based on two counts for 2400 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.141 ± 0.064, 1.150 ± 0.032, and 18.513 ± 0.124 cpm, respectively.

Comment (J-S. Vincent): The wood was collected in a vertical peat sequence, about 5 m below the surface, at the head of a nivation hollow, which is a major gully on the left bank of the Moreyu River (site VH-90-106C). The surface peat was overlying high-terrace alluvial sand and, in places, eolian deposits. The wood was dated to obtain an age for the surface peat sequence, which will be studied for macro- and microfaunal and -floral remains. This date was the most reliable information available at the time.

GSC-5097. Moreyu River (II)

normalized age:	8040 ± 100
$\delta^{13}C$:	-25.2‰
uncorrected age:	8040 ± 100

The wood (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 90-47) was enclosed in sand. Sample VH-90-108B was collected by J-S. Vincent on August 7, 1990 from a section on the right bank of the Moreyu River, eastern Arctic coastal plain of the European portion of Russia (67°51′N, 60°10′W). The sample was submitted by J-S. Vincent to gain information on the age of the sequence.

The sample (10.5 g dry weight) was treated with hot base, hot acid (it was noncalcareous), and distilled water rinses. The treated sample (7.4 g) yielded 7.74 L of CO_2 gas. The age estimate is based on one count for 3565 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.804 ± 0.057, 1.150 ± 0.032, and 18.513 ± 0.124 cpm, respectively.

Comment (J-S. Vincent): The wood was collected about 3 m below the surface in a fresh exposure on the right bank of the Moreyu River (site VH-90-104), in an alluvial sequence with organic-rich beds that was overlying a severely deformed till. The deformation indicated that the complete sequence must have been ice thrusted. The organic materials, including the wood, likely predate the last glaciation (i.e. presence of vivianite on wood, etc.). The sample was dated to confirm whether there was any antiquity to the sequence. This date provided the most accurate information available at the time.

GSC-5098. Moreyu River (III)

normalized age:	8270 ± 110
$\delta^{13}C$:	-25.9‰
uncorrected age:	8290 ± 110

The wood (*Picea*, identified by R.J. Mott in unpublished GSC Wood Report 90-52) was enclosed in sand. Sample VH-90-103 was collected by J-S. Vincent on August 4, 1990 from a section on the left bank of the Moreyu River, eastern Arctic coastal plain of the European portion of Russia (67°51′N, 60°20′W). The sample was submitted by J-S. Vincent to gain information on the age of the alluvial sequence.

The sample (9.0 g dry weight) was treated with hot base, hot acid (slightly calcareous), and distilled water rinses. The treated sample (7.7 g) yielded 8.71 L of CO_2 gas. The age estimate is based on two counts for 2060 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 6.804 ± 0.057, 1.150 ± 0.032, and 18.513 ± 0.124 cpm, respectively.

Comment (J-S. Vincent): Wood was collected, 6 m below the surface, in a fresh exposure at the head of a nivation hollow on the left bank of the Moreyu River (site VH-90-100), in an alluvial sequence on a high terrace of the river. The sand was deposited on a floodplain that was subsequently incised by the Moreyu River. These deposits overlie more than 16 m of till. Soviet scientists believed that the till was of Early Pleistocene age, the Vaines of Middle Pleistocene age, and the alluvial sequence was of 'Early' Late Pleistocene age. Vincent attributed the whole sequence to 'Late' Late Pleistocene age. The GSC date on the wood provided a maximum age for the alluvial sequence and a minimum age for the underlying glacial deposits, which are probably of Lake Valdai (Late Wisconsinan) age. This date was the most reliable available at the time.

MARINE SHELL DATES

Marine Reservoir Project

A suite of 12 shell samples was analyzed in the GSC laboratory as part of the GSC Marine Reservoir Project, undertaken to define the marine reservoir correction for the oceans around Canada.

In the late 1950s and early 1960s, nuclear bomb testing spiked the atmosphere and the oceans with large amounts of artificial ^{14}C. Hence, the reservoir ages can currently be determined only on shells collected live prior to bomb testing (ca. 1955). Therefore, only material in museum collections can be used to resolve this problem. Museum mollusc material was ideal for the requirements of this project, because it was collected by research scientists and, as part of a museum collection, was thoroughly documented in terms of species, location, and date of collection. The only potential drawback to using the collection material was that it is destroyed by the dating process. This concern was lessened by the use of the accelerator mass spectrometry (AMS) dating technique. The project was fortunate to acquire a large number of shell samples that were collected live prior to bomb testing.

For the large samples analyzed in the GSC laboratory, the Canadian Museum of Nature's (CMN) collection was extensive enough to provide shell specimens without compromising the collections. A suite of pre-bomb marine pelecypod shells was provided to the Geological Survey of Canada by the Canadian Museum of Nature from their 'wet' and 'dry' collections. The support and assistance of J-M. Gagnon, Curator of Invertebrate Collections at the CMN, in fulfilling the requirement for 'live pre-1955 pelecypod samples' is greatly appreciated.

There is now a database of about 315 radiocarbon ages on marine mollusc shells that were collected live during the period between 1860 and 1959. About 80% of these dates are new and most (80%) have been obtained using the AMS technique. Preliminary results of this project were presented in June 2003 at the Canadian Quaternary Association (CANQUA) meeting in Halifax. A complete assessment and data analysis related to the marine reservoir ages in Canadian waters is anticipated in the near future; a preliminary data assessment is available in McNeely et al. (2006).

Nova Scotia Marine Reservoir Series

This shell material will be used to define the 'marine reservoir age' of the waters around Nova Scotia. Additional details and a comprehensive interpretation of these and other reservoir ages will appear in future publications.

GSC-6273. Halifax Harbour

normalized age:	490 ± 60
corrected age:	90 ± 60
$\delta^{13}C$:	+0.44‰
uncorrected age:	80 ± 60

The valve of *Mercenaria mercenaria* was from a live collection. Sample CMNML Halifax Harbour was collected on July 29, 1931 from Halifax Harbour, Nova Scotia (approx. 44°39′N, 63°36′W), at an unknown depth.

The sample (35.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (32.7 g) yielded 6.9 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 28.220 ± 0.096, 2.270 ± 0.033, and 28.501 ± 0.190 cpm, respectively.

Comment (GSC laboratory): A very large sample from the wet collection of CMN had muscle and hinge ligament present. The soft tissue was removed from the paired valves with some periostracum. One whole, thick-walled valve was used for dating. Note that the co-ordinates are approximate.

GSC-6110. 'Hour Bank' (I)

normalized age:	430 ± 80
corrected age:	30 ± 80
$\delta^{13}C$:	+1.78‰
uncorrected age:	0 ± 80

The marine shells, a paired valve of *Chlamys islandicus* Muller (identified by M.F.I. Smith), were from a live collection. Sample CMNML 047984 was collected on June 26, 1950 from 'Hour Bank', Nova Scotia, at a depth of 73 m. Exact co-ordinates were not provided, so co-ordinates of 44°N, 63°W were assigned for plotting purposes.

The sample (23.6 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (21.4 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 2600 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.009 ± 0.089, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): The material, from the wet collection of CMN, consisted of paired whole valves of medium thickness with a pink exterior and a white interior.

GSC-6112. 'Hour Bank' (II)

normalized age:	480 ± 80
corrected age:	80 ± 80
$\delta^{13}C$:	+1.93‰
uncorrected age:	50 ± 80

The marine shells, two paired valves of *Modiolus modiolus* (Linné), were a live collection. Sample CMNML 047985 was collected on June 26, 1950 from 'Hour Bank', Nova Scotia, at a depth of 73 m. Exact co-ordinates were not provided, so co-ordinates of 44°N, 63°W were assigned for plotting purposes.

The sample (26.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (20.5 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 2200 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.904 ± 0.096, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): The material, from the wet collection of CMN, consisted of two paired, medium-thick, white, whole valves with some periostracum on their exterior surfaces. Note that the exact site co-ordinates are unknown.

New Brunswick Marine Reservoir Series

This shell material will be helpful in defining the 'marine reservoir age' of the waters around New Brunswick. Additional details and a comprehensive interpretation of these and other reservoir ages will appear in future publications.

GSC-6134. Birch Cove

normalized age:	480 ± 70
corrected age:	80 ± 70
$\delta^{13}C$:	+0.35‰
uncorrected age:	70 ± 70

The marine shell, a whole valve of *Mercenaria mercenaria* (identified by A.H. Clarke), was dredged as a (?)live collection of paired valves. Sample CMN 23376 was collected by J.C. Medcof on July 15, 1924 from Birch Cove in Passamaquoddy Bay, about 11 km from St. Andrews, New Brunswick (approx. 45°09′N, 67°02′W), at an unknown depth. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age.

The sample (29.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (23.2 g) yielded 4.8 L of CO_2 gas. The age estimate is based on one count for 3825 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.931 ± 0.075, 1.243 ± 0.026, and 18.089 ± 0.147 cpm, respectively.

Comment (GSC laboratory): The material was in an excellent state of preservation. A single whole valve was selected and scrubbed prior to acid leaching. Note that the co-ordinates are approximate.

GSC-6118. Leggett Shoal

normalized age:	510 ± 60
corrected age:	110 ± 60
$\delta^{13}C$:	-1.53‰
uncorrected age:	130 ± 60

The marine shells (*Mytilus edulis* Linné, identified by M.F.I. Smith) were a live collection. Sample CMN 56872 was collected by on August 24, 1950 from Leggett Shoal, Loggieville, New Brunswick (approx. 47°04′N, 65°23′W), at an unknown water depth. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age.

The sample (21.9 g dry weight) was treated with an acid leach to remove the outer 10%. The treated sample (19.6 g) yielded 4.2 L of CO_2 gas. The age estimate is based on one count for 2450 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.947 ± 0.092, 1.225 ± 0.024, and 18.240 ± 0.103 cpm, respectively.

Comment (GSC laboratory): The sample, from the wet collection of CMN, consisted of medium-thick walled whole valves, with a purple exterior and white interior. There was some *Balanus* adhering to shells. Note that the co-ordinates are approximate.

GSC-6114. Middle Island

normalized age:	490 ± 80
corrected age:	90 ± 80
$\delta^{13}C$:	-2.28‰
uncorrected age:	130 ± 80

The marine shells, six valves of *Crassostrea virginica* Gmelin (identified by M.F.I. Smith), were a live collection. Sample CMN 55477 was collected by E.L. Bousfield on August 10, 1950 from (?)station M74, east of Middle Island, north shore of the Miramichi River, New Brunswick (approx. 47°05′N, 65°22′W), at an unknown water depth. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age.

The sample (28.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (21.1 g) yielded 4.3 L of CO_2 gas. The age estimate is based on one count for 3800 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.731 ± 0.075, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): The material, from the wet collection of CMN, consisted of six medium-thick, white whole valves plus fragments. Some material had iron-staining. There was a small amount of frothing during leaching. Note that the co-ordinates are approximate.

GSC-6116. Sheldrake Island

normalized age:	550 ± 60
corrected age:	150 ± 60
$\delta^{13}C$:	-1.67‰
uncorrected age:	180 ± 60

The marine shells, four whole valves of *Crassostrea virginica* Gmelin (identified by M.F.I. Smith), were a live collection. Sample CMN 56866 was collected on August 25, 1950 from Sheldrake Island, New Brunswick (approx. 47°06′N, 65°19′W), at a water depth of 9 to 13 m. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age.

The sample (31.3 g dry weight) was treated with an acid leach to remove the outer 30%. The treated sample (21.5 g) yielded 4.5 L of CO_2 gas. The age estimate is based on one count for 3700 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.843 ± 0.076, 1.225 ± 0.024, and 18.240 ± 0.103 cpm, respectively.

Comment (GSC laboratory): The sample of four whole, thick-walled white valves was from the wet collection of CMN. There was some *Balanus* adhering to shells. Note that the co-ordinates are approximate.

Quebec Marine Reservoir Series

The shell material will be used to define the 'marine reservoir age' of the waters around the province of Quebec. Additional details and a comprehensive interpretation of these and other reservoir ages will appear in future publications.

GSC-6044. Baie des Chaleurs

normalized age:	570 ± 50
corrected age:	170 ± 50
$\delta^{13}C$:	-0.39‰
uncorrected age:	170 ± 50

The marine shell, a single valve of *Crassostrea virginica* (Gmelin), identified by J.W. Dawson, was a (?)live collection. Sample RM-16359 was collected by J.W. Dawson in 1860 from Baie des Chaleurs, Gaspésie, Quebec (48°10′N, 65°50′W). The sample was submitted by A.S. Dyke to gain information on its true age.

The sample (39.8 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (31.2 g) yielded 6.4 L of CO_2 gas. The age estimate is based on one count for 2350 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 27.808 ± 0.116, 2.277 ± 0.024, and 28.415 ± 0.135 cpm, respectively.

GSC-6044 2L.

normalized age:	570 ± 80
corrected age:	170 ± 80
$\delta^{13}C$:	-0.39‰
uncorrected age:	170 ± 80

The age estimate is based on one count for 2345 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.777 ± 0.093, 1.191 ± 0.025, and 18.165 ± 0.152 cpm, respectively. This is a recount of the original gas preparation but in the 2 L counter.

Comment (GSC laboratory): The material was in excellent condition, with many valves available. The sample selected showed evidence of 'soot', possibly due to charring. The surface discolouration was physically scraped off prior to acid leaching of the sample.

The material was assumed to be a 'modern', pre-bomb, live collection of American oysters at their northern limit in Baie des Chaleurs. However, Ardley (1912) stated that "Sir William Dawson in his list of Pleistocene fossils published in his volume entitled 'The Canadian Ice Age' records that he collected a loose specimen of *Ostrea virginiana* at Saco. This he states was apparently derived from Leda clay. He also states that he received from Mr. Paisley specimens of the same species which had been found at the Baie des Chaleurs, and which were also said to have come from the Pleistocene beds in that district at a depth of 16 feet below the surface."

The date resolved the question of provenance of this material. It is not from Champlain Sea deposits but is essentially modern (pre-bomb) and thus useful for estimating the marine reservoir correction for this region.

GSC-6106. Bradore-Bay

normalized age:	450 ± 80
corrected age:	50 ± 80
$\delta^{13}C$:	+0.64‰
uncorrected age:	40 ± 80

The marine shells, four valves of *Mytilus edulis* (Linné), were a live collection. Sample CMNML 044677 was collected on September 10, 1923 from Bradore-Bay, Quebec (approx. 51°28′N, 57°15′W). The sample was submitted by R. McNeely and A.S. Dyke to gain information on the local marine-reservoir age.

The sample (27.5 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (21.5 g) yielded 4.6 L of CO_2 gas. The age estimate is based on one count for 1940 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.915 ± 0.102, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): Material was collected by the Belle Isle Strait Expedition and stored in the wet collection of CMN. The sample comprised dry, medium-thick, clean whole valves that were purple in colour on the exterior with a white interior. Note that the co-ordinates are approximate.

GSC-6107. Keglo Bay

normalized age:	480 ± 80
corrected age:	80 ± 80
$\delta^{13}C$:	+1.48‰
uncorrected age:	60 ± 80

The marine shells (*Clinocardium ciliatum*, identified by I. Lubinsky) were a live collection. Sample CMNML 042253 was collected on August 10, 1947 at station 33, Keglo Bay, east side of Ungava Bay, Baffin region, Nunavut (59°13′N, 65°45′W). The sample was submitted by R. McNeely and A.S. Dyke to gain information on the local marine-reservoir age.

The sample (18.4 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (17.4 g) yielded 3.5 L of CO_2 gas. The age estimate is based on one count for 2435 minutes in the 2 L counter with a mixing ratio of 1.16. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.884 ± 0.100, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): This material was collected by the Fisheries Research Board (FRB) 'Calanus' Expedition, and stored in the wet collection of CMN. The sample consisted of dry, thin-walled shell fragments that were pink to light brown on the exterior with a white interior. The shell material was very brittle.

Nunavut Marine Reservoir Series

This shell material will be used to define the 'marine reservoir age' of the waters in Foxe Basin. Additional details and a comprehensive interpretation of these and other reservoir ages will appear in future publications.

GSC-6098. Hooper Inlet

normalized age:	740 ± 80
corrected age:	340 ± 80
$\delta^{13}C$:	+0.96‰
uncorrected age:	330 ± 80

The marine shells (*Astarte borealis forma placenta*, identified by I. Lubinsky) were a live collection. Sample CMNML 041832 was collected on June 13, 1956 at station 719 in Hooper Inlet, Melville Peninsula, Foxe Basin, Baffin region, Nunavut (69°20.5′N, 81°43.5′W), at a depth of 51 m. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age in the Foxe Basin area.

The sample (18.1 g dry weight) was treated with an acid leach to remove the outer 5%. The treated sample (16.8 g) yielded 3.5 L of CO_2 gas. The age estimate is based on one count for 2600 minutes in the 2 L counter with a mixing ratio of 1.14. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.294 ± 0.095, 1.185 ± 0.025, and 18.014 ± 0.154 cpm, respectively.

Comment (GSC laboratory): Material was collected during the FRB 'Calanus' Expedition and stored in the wet collection of CMN. The selected material was medium-thick, white, whole valves with the exterior covered by periostricum.

British Columbia Marine Reservoir Series

The shell material will be used to define the 'marine reservoir age' of the waters around British Columbia. Additional details and a comprehensive interpretation of these and other reservoir ages will appear in future publications.

GSC-6086. Chemainus Bay

normalized age:	800 ± 70
corrected age:	400 ± 70
$\delta^{13}C$:	-0.60‰
uncorrected age:	420 ± 70

The marine shells (*Crassostrea gigas* (Thunberg)) were a nearshore live collection. Sample CMNML was collected by E.L. Bousfield on July 29, 1955 at the river mouth in Chemainus Bay, east coast of Vancouver Island, British Columbia (48°55′N, 123°42′W), at an elevation of about 0 m. The sample was submitted by R. McNeely and A.S. Dyke to gain information on the marine-reservoir age along the British Columbia coast.

The sample (28.2 g dry weight) was treated with an acid leach to remove the outer 20%. The treated sample (22.4 g) yielded 4.7 L of CO_2 gas. The age estimate is based on one count for 1871 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.078 ± 0.102, 1.204 ± 0.026, and 17.983 ± 0.109 cpm, respectively.

Comment (GSC Lab.): The material, from the wet collection of CMN, consisted of a solid paired valve of *Crassostrea* with a white rugose surface with barnacles. The surface was scrubbed and the barnacles removed and kept; also, an embedded *Mytilus* fragment was removed; the ligament residue from the *Crassostrea* was removed, dried and stored.

Marine Mollusc Species Comparison

During the 1980s, scientists submitting shell samples for dating in the GSC laboratory were encouraged to date only monospecific collections in order to obtain more reliable age estimates and a more interpretable environment of deposition. In most cases, this was implemented with little or no difficulty and a more useful database came into existence, although there was always a concern about the marine reservoir age for the various regions around Canada, as well as the ephemeral Champlain and Goldtwait seas. The use of monospecific collections raised the question of comparability among species and whether the use of a species or limited number of commonly occurring species would bias the age estimates provided. Time and cost considerations did not promote the dating of a variety of species from individual deposits, so the question remained unanswered.

In 1988, there was an opportunity to obtain a collection of various species from a site in Arctic Canada, albeit compromised with 'bomb' ^{14}C. Thus, in 1988–1989, the GSC laboratory was able to date a suite of marine molluscs, the enclosed tissue, a marine alga, and related terrestrial material as a reference.

Resolute Bay Series, Cornwallis Island, Nunavut

A live collection of marine molluscs was dredged by H.E. Welch in August, 1988 from a stony, bouldery silt at a depth of 15 to 18 m in Resolute Bay, Cornwallis Island, Baffin region, Nunavut (74°41′N, 94°50′W). These samples were submitted by R. McNeely to ascertain the existence of interspecies variability, and to provide a comparison between marine shell and tissue apparent ages in relation to the marine and terrestrial reservoirs.

GSC-4853. Resolute Bay (I)

normalized age:	900 ± 50
corrected age:	500 ± 50
$\delta^{13}C$:	+1.40‰
uncorrected age:	480 ± 50
pMC:	89.14 ± 0.71

The marine-shell sample 88-MIB-RB-3 (45.5 g dry weight; *Astarte borealis*, identified by J. Dale) was treated with an acid leach to remove the outer 20%. The treated sample (38.2 g) yielded 7.35 L of CO_2 gas. The age estimate is based on two counts for 2015 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 26.936 ± 0.123, 2.186 ± 0.024, and 28.589 ± 0.128 cpm, respectively.

GSC-4993. Resolute Bay (II)

normalized age:	90 ± 100
$\delta^{13}C$:	-20.39‰
age:	modern
pMC:	98.74 ± 3.16

The pelecypod tissue of sample 88-MIB-RB-3 (3.9 g dry weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (2.0 g) yielded 1.99 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 2.25. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.952 ± 0.168, 1.013 ± 0.022, and 17.992 ± 0.133 cpm, respectively.

GSC-4851. Resolute Bay (III)

normalized age:	500 ± 90
$\delta^{13}C$:	+1.12‰
uncorrected age:	80 ± 90
pMC:	93.73 ± 1.00

The marine-shell sample 88-MIB-RB-1 (16.4 g dry weight; *Serripes groenlandicus*, identified by J. Dale) was treated with an acid leach to remove the outer 10%. The treated sample (14.5 g) yielded 3.07 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 2 L counter with a mixing ratio of 1.45. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 17.660 ± 0.119, 1.077 ± 0.015, and 17.836 ± 0.153 cpm, respectively.

GSC-4988. Resolute Bay (IV)

$\delta^{13}C$:	-19.37‰
age:	modern
pMC:	101.58 ± 3.11

The pelecypod tissue of sample 88-MIB-RB-1 (12.5 g dry weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.9 g) yielded 5.11 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.506 ± 0.101, 1.013 ± 0.022, and 17.992 ± 0.133 cpm, respectively.

GSC-4854. Resolute Bay (V)

normalized age:	470 ± 50
$\delta^{13}C$:	+0.87‰
age:	modern
pMC:	94.02 ± 0.73

The marine-shell sample 88-MIB-RB-4 (46.5 g dry weight; *Hiatella arctica*, identified by J. Dale) was treated with an acid leach to remove the outer 20%. The treated sample (40.8 g) yielded 7.39 L of CO_2 gas. The age estimate is based on two counts for 2130 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 28.379 ± 0.122, 2.186 ± 0.024, and 28.589 ± 0.128 cpm, respectively.

GSC-4994. Resolute Bay (VI)

$\delta^{13}C$:	-21.16‰
age:	modern
pMC:	100.28 ± 3.28

The pelecypod tissue of sample 88-MIB-RB-4 (5.8 g dry weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (3.7 g) yielded 3.50 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.27. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.211 ± 0.117, 1.013 ± 0.027, and 18.000 ± 0.102 cpm, respectively.

GSC-4855. Resolute Bay (VII)

normalized age:	400 ± 50
$\delta^{13}C$:	+0.03‰
age:	modern
pMC:	95.43 ± 0.73

The marine-shell sample 88-MIB-RB-5 (47.1 g dry weight; *Macoma calcarea*, identified by J. Dale) was treated with an acid leach to remove the outer 20%. The treated sample (38.6 g) yielded 7.67 L of CO_2 gas. The age estimate is based on two counts for 2035 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 28.754 ± 0.126, 2.186 ± 0.024, and 28.589 ± 0.128 cpm, respectively.

GSC-5845. Resolute Bay (VIII)

normalized age:	280 ± 120
$\delta^{13}C$:	-16.2‰
uncorrected age:	140 ± 120
pMC:	96.49 ± 2.54

The pelecypod tissue of sample 88-MIB-RB-5 (1.7 g dry weight) was not treated (because of the very small sample size). The sample (1.5 g) yielded 1.16 L of CO_2 gas. The age estimate is based on one count for 2050 minutes in the 2 L counter with a mixing ratio of 3.82. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.155 ± 0.221, 1.228 ± 0.021, and 18.462 ± 0.140 cpm, respectively.

GSC-4852. Resolute Bay (IX)

normalized age:	210 ± 50
$\delta^{13}C$:	+1.02‰
age:	modern
pMC:	97.43 ± 0.76

The marine-shell sample 88-MIB-RB-2 (47.2 g dry weight; *Mya truncata*, identified by J. Dale), was treated with an acid leach to remove the outer 20%. The treated sample (40.4 g) yielded 7.10 L of CO_2 gas. The age estimate is based on two counts for 2065 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 29.417 ± 0.137, 2.186 ± 0.024, and 28.589 ± 0.128 cpm, respectively.

GSC-4992. Resolute Bay (X)

$\delta^{13}C$:	-20.02‰
age:	modern
pMC:	99.61 ± 3.10

The pelecypod tissue of sample 88-MIB-RB-2 (14.1 g dry weight) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.0 g) yielded 5.70 L of CO_2 gas. The age estimate is based on one count for 2688 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 18.131 ± 0.089, 1.013 ± 0.027, and 18.000 ± 0.102 cpm, respectively.

GSC-4987. Resolute Bay (XI)

$\delta^{13}C$:	-20.40‰
age:	modern
pMC:	104.82 ± 3.35

The marine alga sample 88-MIB-RB-6 (12.1 g dry weight; *Laminaria*, identified by H.E. Welch and J.E. Dale) was treated with hot acid (it was noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (5.4 g) yielded 4.53 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 2 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 19.056 ± 0.103, 1.013 ± 0.022, and 17.992 ± 0.133 cpm, respectively.

GSC-4989. Resolute (XII)

$\delta^{13}C$:	-27.1‰
age:	modern
pMC:	119.87 ± 4.88

The growing tips of *Salix arctica* (collected by A.L. Washburn and identified by S.A. Edlund), sample 88-MIB-RB-7 (9.6 g dry weight), were treated with hot acid (they were noncalcareous) and distilled water rinses. The base treatment was omitted. The treated sample (7.8 g) yielded 7.90 L of CO_2 gas. The age estimate is based on two counts for 2000 minutes in the 5 L counter with a mixing ratio of 1.00. The count rates for the sample (net) and for monthly backgrounds and standards (net) were 33.613 ± 0.137, 2.079 ± 0.032, and 28.127 ± 0.134 cpm, respectively.

Comment (R. McNeely): The terrestrial material exhibited a ^{14}C content equivalent to that of maple leaves in the Gatineau Park (atmospheric reservoir), whereas the marine alga exhibited a depletion in ^{14}C as a result of the apparent (marine reservoir) age of the seawater in Resolute Bay. As expected, all the shell material was depleted in ^{14}C as a result of the local marine reservoir age and was more depleted than the tissue samples, although the difference between shell and tissue pairs was not consistent and varied considerably (Table 4).

Table 4. Comparison of marine mollusc species (shell and tissue).

Taxon / habitat feeding	Shell pMC	Tissue pMC	Lab no.
Astarte borealis / infaunal suspension	89.14 ± 0.71	98.74 ± 3.16	GSC-4853 GSC-4993
Serripes groenlandicus / infaunal suspension	93.73 ± 1.00	101.58 ± 3.11	GSC-4851 GSC-4988
Hiatella arctica / epifaunal suspension	94.02 ± 0.73	100.28 ± 3.28	GSC-4854 GSC-4994
Macoma calcarea / infaunal facultative	95.43 ± 0.73	96.49 ± 2.54	GSC-4855 GSC-5845
Mya truncata / infaunal suspension	97.43 ± 0.76	99.61 ± 3.10	GSC-4852 GSC-4992
Laminaria (alga)		104.82 ± 3.35	GSC-4987
Salix arctica (tips)		119.87 ± 4.88	GSC-4989
Acer saccharum (Gatineau Park maple leaves)		118.61 ± 5.24 119.75 ± 5.25	GSC-8808 GSC-8809

Abbreviation: pMC, percentage modern carbon

Based on the habitat and feeding of the various molluscs dated, it was anticipated that the sequence of species, from least affected to most affected by the marine-reservoir age and substrate, would have been *Hiatella arctica*, (*Mya truncata*, *Serripes groenlandicus*, *Astarte borealis*), and *Macoma calcarea*. This turned out not to be the case.

Unfortunately, with such a small sample, it is prudent not to draw broad conclusions other than to say that there appear to be variations in the ^{14}C content of various molluscs collected at the same site at the same time. This interspecies 'effect' is more fully defined and assessed in a recent analysis of data related to marine-reservoir ages in Canadian waters (McNeely et al., 2006).

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Abbreviations:
*, sample counted in both counters or replicate count;
HP, 'high pressure' (5 L counter at 4 atmospheres)