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GEOLOGICAL SURVEY OF CANADA RADIOCARBON DATES XVIII

J.A. LOWDON
W. BLAKE JR.

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

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CONTENTS

The present date list, GSC XVIII, is the seventh to be published directly in the Geological Survey's Paper series. 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..

Tables

GEOLOGICAL SURVEY OF CANADA RADIOCARBON DATES XVIII

Abstract

This list includes 90 radiocarbon age determinations on 88 geological samples made by the Radiocarbon Dating Laboratory. They are on samples from various areas as follows: Newfoundland (4); Prince Edward Island (1); New Brunswick (2); Quebec (9); Ontario (9); Manitoba (3); Alberta (1); British Columbia (23); Yukon Territory (1); Northwest Territories, Mainland (14); Northwest Territories, Arctic Archipelago (22); Greenland (1). Details of background and standard for the 2 L and 5 L counters during the period from September 1, 1977 to September 6, 1978 are summarized in Tables 1 and 2; Table 3 gives the number of counts used to determine the average background and standard counting rates; and Table 4 lists the number of different background and standard gas preparations used for counting.

Résumé

Ce rapport présente les résultats de 90 datations effectuées sur 88 échantillons géologiques par le Laboratoire de datation au radiocarbone. Ces échantillons proviennent des régions suivantes: Ile de Terre-Neuve (4); Ile-du-Prince-Edouard (1); Nouveau-Brunswick (2); Québec (9); Ontario (9); Manitoba (3); Alberta (1); Colombie-Britannique (23); Yukon (1); Territoires du Nord-Ouest, continent (14); Territoires du Nord-Ouest, archipel Arctique (22); Groenland (1). Les valeurs de mouvement propre et de l'étalonnage des compteurs 2 L et 5 L, pour la période allant du 1 septembre 1977 au 6 septembre 1978, sont présentées dans les tableaux 1 et 2; le tableau 3 donne le nombre de coups utilisés pour déterminer la moyenne des taux d'impulsions du mouvement propre et de l'étalonnage; et, le tableau 4 donne le nombre de préparations de gaz pour le mouvement propre et pour l'étalonnage utilisées pour le comptage.

INTRODUCTION [1]

During the period covered by this introduction (September 1977 through August 1978) both the 2 L counter (Dyck and Fyles, 1962) and the 5 L counter (Dyck et al., 1965) were operated for the entire 12 months. The 2 L counter was operated at 2 atm and the 5 L at 1 atm except for June and July, when it was operated at 4 atm.

Average background and standard counting rates for the periods used for computerized age calculations are shown in Tables 1 and 2, respectively. On a period basis, counting rates were within statistical limits.

As can be seen from Table 1, the 2 L counter background rose steadily between September 1977 and May 1978. This problem has been encountered in the past and probably is due to particulate impurities entering the counter from the sample storage cylinder. The counter was removed and washed out with an acetone-distilled water mixture. Unfortunately, during this cleaning process the central counter wire broke. The old 2 L counter, which had been removed in April 1975, was cleaned with acetone-distilled water and has been in use since June.

Table 3 lists the number of daily counts used to determine the average background and standard counting rates that were utilized for age calculations during the

Table 1

Background (c/m)* for Periods Used for Age Calculations
September 1, 1977 to September 6, 1978

PERIOD	2 L COUNTER (2 atm)	5 L COUNTER (1 atm)
September 1977	1.169 ± 0.018	2.183 ± 0.025
October	1.172 ± 0.019	2.220 ± 0.038
November	1.240 ± 0.019	2.219 ± 0.040
December	1.297 ± 0.019	2.230 ± 0.025
January 1978	1.291 ± 0.024	2.274 ± 0.034
February	1.329 ± 0.020	2.249 ± 0.043
March	1.365 ± 0.021	2.273 ± 0.044
April	1.378 ± 0.020	2.228 ± 0.031
May	1.492 ± 0.033	2.263 ± 0.032
June	1.230 ± 0.016	3.053 ± 0.025**
July	1.254 ± 0.019	
August	1.260 ± 0.020	2.370 ± 0.025

*c/m = counts per minute

** 5 L counter operating at 4 atm. The value 3.053 ± 0.025 is the average background for period June 1 to August 9

Table 2

Standard, N_o*, (c/m) for Periods Used for Age Calculations
September 1, 1977 to September 6, 1978

PERIOD	2 L COUNTER (2 atm)	5 L COUNTER (1 atm)
September 1977	19.632 ± 0.102	28.136 ± 0.190
October	19.388 ± 0.099	28.197 ± 0.124
November	19.625 ± 0.104	28.412 ± 0.130
December	19.563 ± 0.099	28.176 ± 0.115
January 1978	19.447 ± 0.100	28.211 ± 0.123
February	19.474 ± 0.099	28.309 ± 0.132
March	19.519 ± 0.102	27.924 ± 0.158
April	19.376 ± 0.102	28.237 ± 0.125
May	19.596 ± 0.261	28.166 ± 0.191
June	17.991 ± 0.138	104.414 ± 0.164**
July	17.883 ± 0.094	
August	18.013 ± 0.161	27.783 ± 0.114

*N_o = 0.95 x net counting rate of the NBS oxalic acid standard

** 5 L counter operating at 4 atm. The value 104.414 ± 0.164 is the average standard for period June 1 to August 9

[1] Prepared by J.A. Lowdon who operates the laboratory. The date list has been compiled by W. Blake, Jr. from descriptions of samples and interpretations of age determinations by the collectors and submitters.

Table 3

Number of Counts Used to Determine Average Background and Standard Counting Rates for Periods Listed

PERIOD	2 L BACKGROUND	5 L BACKGROUND	2 L STANDARD	5 L STANDARD
September 1977	4	4	3	3
October	4	4	3	3
November	4	4	3	3
December	4	4	3	3
January 1978	4	4	3	3
February	4	4	3	3
March	4	4	3	3
April	4	4	3	3
May	4	4	3	3
June	5	14*	4	5*
July	4		3	
August	4	4	3	3

*Number of counts used for period June 1 to August 9 (5 L counter operating at 4 atm)

Table 4

Number of Different Background and Standard Gas Preparations Used for Counting for Periods Listed

PERIOD	2 L BACKGROUND	5 L BACKGROUND	2 L STANDARD	5 L STANDARD
September 1977	3	1	2	2
October	2	2	2	2
November	2	2	2	2
December	2	2	2	2
January 1978	2	3	2	2
February	3	3	2	2
March	2	2	2	2
April	2	3	2	2
May	2	2	2	2
June	2	2*	2	1*
July	2		2	
August	2	2	2	2

*Number of different preparations used for period June 1 to August 9 (5 L counter operating at 4 atm)

periods listed. Table 4 lists the number of different background and standard gas preparations used for counting during the same periods. Age calculations are carried out by a CDC Cyber 70 Series/Model 74 computer. Calculations are 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 (B.P.) 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 et al., 1977). Finite dates are based on the 2σ criterion (95.5% probability) and "infinite" dates on the 4σ criterion (99.9% probability).

Sample gas preparation and purification are carried out as previously described (Lowdon et al., 1977). Carbon dioxide gas proportional counting techniques have been discussed by Dyck (1967).

Where $^{13}C/^{12}C$ ratios are available, a correction for isotopic fractionation has been applied to the date, and the $\delta^{13}C$ value has been reported. Related to the PDB standard, the "normal" values used for correction are $\delta^{13}C = 25.0‰$ for wood, other terrestrial organic materials, and bones (terrestrial and marine), and 0.0‰ for marine shells. All determinations were made on aliquots of the same sample gas used for age determination. All $^{13}C/^{12}C$ ratios were determined at the University of Waterloo, Department of Earth Sciences, Waterloo, Ontario, under the supervision of Prof. P. Fritz (Contracts OSU5-0167, OSU76-00126, OSU77-00021, and OST78-0037) except for the following samples: GSC-1316, -1401, -1793, -1817, -1836, -1870, -1882, and -1891 were determined by the GSC Geochronology Section (Head, R.K. Wanless); GSC-1156 and -1268 were determined at Isotopes, Inc., Westwood, New Jersey.

Acknowledgments

Thanks are extended to I.M. Robertson and J.E. Tremblay for the preparation, purification, and counting of samples in the laboratory, to K. Santowski for the GSC $\delta^{13}C$ determinations, and to R. Drimmie, Department of Earth Sciences, University of Waterloo, for his expeditious handling of samples sent to him (under contract) for $\delta^{13}C$ determination. We are also grateful to R.J. Mott and L. Farley-Gill for wood and pollen identifications, to M. Kuc and J.V. Matthews, Jr. for determination of plant macrofossils, to S. Lichti-Federovich for identification of diatoms, and to F.J.E. Wagner, Atlantic Geoscience Centre, and Mrs. M.F.I. Smith, National Museum of Natural Sciences, Ottawa, for identification of molluscs. R.J. Richardson has assisted in the processing and examination of samples prior to their submission to the laboratory, and A.C. Roberts has made the X-ray diffraction determinations on all shell samples.

GEOLOGICAL SAMPLES

Eastern Canada

Newfoundland

GSC-2601. Sugar Loaf Pond — 9270 ± 150; $\delta^{13}C$ = -25.3‰

Diatomaceous gyttja (sample SL1: 571-576) from near the base of a core in lake sediment 871 to 876 cm below lake level and 571 to 576 cm below the sediment/water interface in Sugar Loaf Pond, 6.5 km east-northeast of St. John's, Newfoundland (47°37'N, 52°40'W), at an altitude of ca. 100 m. Collected 1977 by J.B. Macpherson[1], Memorial University of Newfoundland, St. John's.

Comment (J.B. Macpherson): the lake occupies a rock basin; the Livingstone corer penetrated a further 35 cm in mineral sediment, the lower part of which was laminated; the rock floor was not reached. The date is a minimum for deglaciation and is older than the date from Whitbourne (8420 ± 300 years, I (GSC)-4; Isotopes I, 1961, p. 50; Terasmae, 1963) 69 km to the west-southwest and previously the oldest from the Avalon Peninsula. The pollen assemblage indicates that the vegetation was sedge-tundra. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2487. Trout River — 11 900 ± 160; $\delta^{13}C$ = -1.0‰

Complete valves of **Hiatella arctica** (sample 72-3; 10.8 g) from silty sand delta foreset beds exposed at 27 m in a cliff along an unnamed creek, known locally as "The Feeder", in the village of Trout River, Newfoundland (49°28.3'N, 58°07.3'W). Collected 1972 by I.A. Brookes, York University, Toronto.

Comment (I.A. Brookes): The sediments were deposited in a delta related to a sea level at approximately 35 m above present sea level and marginal to a glacier tongue in the valley now occupied by Trout River Ponds. Brookes (1974) originally related the 35 m delta terrace at Trout River to a major stillstand of local postglacial sea level during its fall from a 70 m late Wisconsinan marine limit, which is weakly recorded by an erosional notch in till-mantled bedrock around Trout River Cove. This stillstand was assigned the same age as a delta at 35 to 40 m at Lomond, 26 km to the east, from which shells of **Macoma calcarea** in bottomset beds were dated at 10 500 ± 300 years (GSC-1575; GSC XIII, 1973, p. 7). Grant (1976, 1977) places the late Wisconsinan ice limit in this locality at a position that permits the 35 m delta to be genetically related to it. Therefore, this date most likely refers to a local late Wisconsinan maximum ice margin. Marine features higher than 35 m are pre-late Wisconsinan in age. Because of the small sample size, only the outer 10% was removed by HCl leach. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2295. Stephenville — 12 600 ± 140; $\delta^{13}C$ = +2.2‰

Fragmented values of marine pelecypod shells (sample 72-6(b); 16.0 g; **Mya truncata**; identified by W. Blake, Jr.) from a sand member within kame gravels of Robinson's Head moraine, exposed at approximately 10 m a.s.l. in a 20 m-high eroding sea cliff, 1 km west of the western boundary of the town of Stephenville, Newfoundland (48°32.6'N, 58°36.7'W). Collected 1965 by I.A. Brookes, York University, Toronto.

Comment (I.A. Brookes): This sample dates the formation of the Robinson's Head moraine during a stillstand of the ice margin in a sea whose level was then at approximately 30 m in this locality (Brookes, 1977).

Comment (W. Blake, Jr.): Determination (GSC-2063, 13 300 ± 810 years; GSC XV, 1975, p. 5) was based on a single valve (4.0 g; no HCl leach) of **Mya truncata** from the same sample. GSC-2295 was mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2496. Port au Port Peninsula — 12 500 ± 160; $\delta^{13}C$ = -0.2‰

Fragments of marine pelecypods (sample 72-2(a); 18.0 g; **Mytilus edulis**; identified by R.J. Richardson and W. Blake, Jr.) from clean, coarse sand at 2 to 3 m a.s.l. in a low, wave-eroded bluff at Marches Point, on the south shore of Port au Port Peninsula, Newfoundland (48°30'N, 59°08'W). Collected 1966 by I.A. Brookes, York University, Toronto.

Comment (I.A. Brookes): The shell-bearing sand overlies till deposited by the late Wisconsinan ice which filled St. George's Bay prior to deglaciation. The sand underlies a low marine terrace which extends inland to the foot of a bedrock slope at 12 to 14 m a.s.l. This niche possibly marks the position of local sea level at ca. 12 500 years B.P.; but sea level may have been higher and was not registered by a visible landform against the steepening bedrock slope inland of the terrace. At Stephenville, 31 km to the east, shells dated 12 600 ± 140 years B.P. (GSC-2295; this list; Brookes, 1977) relate to a sea level at approximately 30 m. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

Prince Edward Island

GSC-2740. North Cape — 7650 ± 80; $\delta^{13}C$ = -24.2‰

Basal sandy gyttja (sample PC-60-68; 195 g wet) from 122 to 124 cm below the top of a peat section exposed along the northwest coast, 12 km northeast of Tignish, Prince Edward Island (47°03'N, 64°01'W), at an elevation of 6.38 m. The sample overlies sand and underlies well decomposed peat grading upward to undecomposed woody **Sphagnum** peat. Collected 1968 by V.K. Prest, submitted 1978 by T.W. Anderson.

Comment (T.W. Anderson): This coastal bog relates to climatic and/or groundwater level changes which brought about the initiation of peat accumulation approximately 7700 years ago. Pollen analysis shows that the sample is older than the basal gyttja in a core collected inland on the bog, but the sample is younger than several other bog bottom dates throughout Prince Edward Island (Lowdon and Blake, 1968). Date based on two 1-day counts in the 5 L counter.

Comment (V.K. Prest): The similarity in peat thickness between the coastal section and the cored site inland suggests that much of the bog has been removed by wave action.

[1] All persons referred to as collectors or submitters of samples or cited as sources of data are with the Geological Survey of Canada unless otherwise specified.

New Brunswick

Caribou Lake Bog series

Peat samples collected by piston corer from Caribou Lake Bog, Fundy National Park, New Brunswick (45°37'10"N, 65°03'35"W), at an elevation of 380 m. Collected 1976 by B.A. Sreenivasa and M.P. Burzynski, University of New Brunswick, Fredericton; submitted by R.W. Wein of the same university.

GSC-2544. Caribou Lake Bog (I) 830 ± 70

Peat (sample FA1; 5.3 g) from a depth of 87.5 to 97.5 cm below the peat surface.

GSC-2524. Caribou Lake Bog (II) 6080 ± 80

Peat (sample FA2; 10.0 g) from a depth of 175 to 185 below the peat surface.

Comment (R.W. Wein): The samples were dated to determine rates of peat accumulation and the frequency of forest fires in the area. GSC-2544 mixed with dead gas for counting. Both dates based on two 1-day counts in the 2 L counter.

Quebec

GSC-2313. Portage-du-Cap, Magdalen Islands >38 000

A single twig (sample PC-57/75A; 3.9 g; **Abies balsamea;** identified by R.J. Mott) from a gravel pit at Portage-du-Cap, Amherst Island; Magdalen Islands, Quebec (47°14.75'N, 61°54.35'W), at an altitude of ca. 9 to 10.5 m. Balsam fir, spruce, and poplar are contained in organic debris associated with stratified clayey silt and sand that disconformably overlies northward-dipping foreset gravel beds and is overlain by 1 to 2 m of a red, sandy diamicton. Collected 1975 by J. Terasmae, Brock University, St. Catharines, and V.K. Prest from a cleaned vertical face.

Comment (V.K. Prest): The sample was dated to corroborate an age determination obtained at Brock University on peaty material, collected from the same site a year earlier, but given no pretreatment (BGS-259, >35 000 years). In the interim, a study of pollen, plant and insect remains, and of diatoms has shown that the deposit is of an interglacial rather than an interstadial age (Prest et al., 1976). Detailed study of the fauna and flora is continuing, but conditions warmer than at present are indicated. The shoreline debris (including the dominant insect, **Cercyon litoralis**, which is characteristic of marine shoreline sites) and enclosing sand and silt beds are believed to relate to a former sea level about 17 m above the present. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2511. Anse-au-Griffon 12 500 ± 140
$\delta^{13}C = +1.9‰$

Aragonitic shells (sample PC3/76; 17.0 g; **Mya truncata;** identified by R.J. Richardson) from an abandoned borrow pit on the west side of the highway at Anse-au-Griffon, eastern Gaspé, Quebec (48°55.6'N, 64°19.3'W), at an elevation of ca. 9 m. This site is 9.6 km to the southeast of GSC-2376 (this list). Collected 1976 by V.K. Prest.

Comment (V.K. Prest): The shells are from a knoll of marine clay exposed during removal of a 3 to 4 m-thick gravel mantle of uncertain origin. The shells are slightly chalky due to weathering, but many are still paired. They are considered adequate as a check on GSC-2376 to date the postglacial marine phase. Farther southeast at Cap-des-Rosiers-Est the marine limit was established at 23 to 25 m.

Comment (W. Blake, Jr.): Only a single pair of **Mya truncata,** 5.2 cm long and 3.8 cm high, was used for dating. The shells were chalky and lacked periostracum but did not exhibit pitting or incrustations. This age determination, plus GSC-2376 (this list), is in agreement with a date of 12 600 ± 160 years (GSC-1186; GSC XI, 1971, p. 268) on shells at ca. 45 from Ruisseau-à-Rebours on the north coast of Gaspé. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2376. Rivière au Renard 12 700 ± 170
$\delta^{13}C = +1.4‰$

Aragonitic shells (sample PC2/76; 20.2 g; **Mya truncata;** identified by W. Blake, Jr.) from a borrow pit exposure of dirty cobbly substratified drift along Rivière au Renard, eastern Gaspé, Quebec (48°59.25'N, 64°25.1'W), at an elevation of ca. 8 m. The sand and gravel drift unit is considered to be an ice-contact deposit surrounding and overlying an erosional remnant of shell-bearing clayey silt; there are also some patches of cobbly diamicton within the variably bedded "gravel". **Mya truncata** is common, but other genera are also present. Collected 1976 by V.K. Prest.

Comment (V.K. Prest): The clayey gravels overlying an eroded ridge or knoll of marine beds appear to indicate sudden melting of nearby Gaspesian ice, or an actual readvance of ice eastward down Rivière au Renard valley to this locality. The elevation of the terrace surface here is about 10 m, but 1.6 km to the east, at the junction of the valley road with Highway 6, there are only clean, ice-contact gravels at an elevation of 23 to 27 m. Striae on a bedrock knoll near here indicate that ice flowed towards N75°E.

Comment (W. Blake, Jr.): The sample utilized for dating comprised 10 left and 10 right valves (in part fragmented) of **Mya truncata;** the shells were thin, with some bits of periostracum still attached. The largest valve was 4.1 cm long. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1821. Small lake near Sept-Îles, 205-210 cm 5460 ± 100

Basal organic lake sediment (sample MS-72-19; 100 g wet) from a small kettle lake in a morainic ridge adjacent to a much larger kettle lake about 11.3 km northeast of Sept-Îles, Quebec (50°17.8'N, 66°17.5'W), at an elevation of 130 m and with a maximum water depth of 2 m. The core was collected with a Livingstone piston corer. A total of 210 cm of coarse and fine detritus gyttja and silty gyttja overlies pebbly silt and sand, and the dated increment was from 205 to 210 cm below the sediment/water interface. Collected 1972 by R.J. Mott.

Comment (R.J. Mott): GSC-1821 is much younger than expected as a minimum date for deglaciation, and it simply dates the beginning of organic accumulation at the site. NaOH leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Dates based on one 3-day count in the 2 L counter.

GSC-2456. Sept-Îles 7840 ± 110

A single right valve of the marine pelecypod **Panomya arctica** (sample DU-72-49; 10.9 g; identified by F.J.E. Wagner) from a foundation excavation in a housing development 500 m south of the Old Fort at Sept-Îles, Quebec (50°14'N, 66°24'W), at an elevation of 9 m. Collected 1972 by L.A. Dredge.

Comment (L.A. Dredge): The dated shells (plus **Arctica islandica, Ensis directus, Mya pseudoarenaria,** and **Mya truncata;** identified by F.J.E. Wagner) were taken from sand beds in a well developed raised foreshore spit formation and were thought to have been emplaced at the time of a sea level stand at 9 m. The date is too old, since in situ molluscs from beach deposits at 72 m a.s.l. at Rivière des Rapides (about 10 km northwest of this site) have been dated at 7580 ± 70 years (GSC-1809; GSC XV, 1975, p. 10; Dredge, 1976). The pelecypods must have been living in deep water when relative sea level was far higher than 9 m, and they were thrown up onto the 9 m beach at a much later time. Because of the small sample size, only the outer 5% of shell was removed by HCl leach. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

Sept-Îles series

Organic lake sediment (sample MS-72-20) from a small lake ("LD" lake) in an outwash delta at the southern end of fiord-like Walker Lake in Sept-Îles–Port Cartier Provincial Park, Quebec (50°08'N, 67°07'W) at an elevation of 121 m and with a maximum water depth of 4.5 m. A total of 345 cm of gyttja, silty gyttja, and organic silt overlie laminated clay with sand partings. The samples were taken with a Livingstone corer. Collected 1972 by R.J. Mott.

GSC-2032. "LD" lake, 168-172 cm — 3390 ± 110; $\delta^{13}C = -29.7‰$

Algal gyttja (62 g wet) from 168 to 172 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1811. "LD" lake, 335-345 cm — 6960 ± 300

Basal algal gyttja (203 g wet) from 335 to 345 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on one 2-day count in the 2 L counter.

Comment (R.J. Mott): The beginning of organic accumulation and a minimum age for the development of the boreal forest is provided by GSC-1811. GSC-2032 marks the beginning of a probable climatic deterioration in the area (Mott, 1976).

GSC-2381. Saint-Ulric — 10 400 ± 140; $\delta^{13}C = -1.0‰$

Shells (sample PC1/76; 11.9 g; **Mytilus edulis;** identified by W. Blake, Jr.) from a borrow pit on the east side of the first main north/south road west of Saint-Ulric, Quebec and about 2.5 km south of town (48°46'N, 67°41.2'W), at an elevation of ca. 70 to 72 m. Collected 1976 by V.K. Prest.

Comment (V.K. Prest): Limited shells (mainly fragmented) were winnowed from the sides of the older part of the pit within 2 to 4 m of the surface of an eastward-sloping terrace with maximum elevation of 76 m and considered to be close to the limit of postglacial marine submergence. The low marine limit (as compared to farther southwest up St. Lawrence Valley), combined with the young date, suggests an eastward decrease in the influence and hence thickness of Laurentide ice and the possible presence of "late" Appalachian ice in this region. More age determinations on shells are needed from deposits close to the marine limit northeastward along Gaspesia to verify or disprove these assumptions. Because of the small sample size, only the outer 10% was removed by HCl leach. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-2621. Rivière du Lièvre — 10 700 ± 100; $\delta^{13}C = +1.1‰$

Aragonitic marine pelecypod shells (sample JSV-72-5; 24.1 g; **Hiatella arctica;** identified by J-S. Vincent) exposed in a gravel pit on the east side of the road along the western bank of Rivière du Lièvre, 5 km north-northwest of the bridge that crosses the same river at Buckingham, Quebec (45°37'16"N, 75°27'00"W), at an altitude of ca. 146 m. The dated shells, together with **Macoma balthica,** were collected at the base of a 1 m-thick sequence of silt and clay with some thin interbedded layers of sand and fine gravel; this unit was underlain by a thick sequence of stratified sand and gravel and was overlain by about 4 m of stratified sand and gravel. Collected 1972 by J-S. Vincent.

Comment (J-S. Vincent): The sediments underlying the silt of Champlain Sea marine origin are ice-contact whereas the sediments overlying the silts are deposits reworked by wave action of the Champlain Sea at the end of its regressive phase. The close association of the marine silt and the reworked material indicates that the sample probably dates a water plane of the Champlain Sea situated a few metres (up to 20m ?) higher than the altitude of the collection site. Mapping in the area (Vincent, 1976) shows that the sediments underlying the marine deposits are part of a linear sequence of ice-contact deposits - i.e., they define an ice front position - extending from north of Thurso to north of Cantley near Gatineau River. Shells from beach deposits overlying the same ice-contact deposits north of Cantley, at an altitude of about 196 m, gave a radiocarbon age of 12 200 ± 160 years (GSC-1646; GSC XIII, 1973, p. 16-17; Romanelli, 1975). It follows that the Champlain Sea must have inundated Rivière du Lièvre, in the vicinity of Buckingham, for a minimum period of 1500 years. Because of the small sample size, only the outer 10% was removed by HCl leach. Date based on one 3-day count in the 2 L counter.

Ontario

GSC-2477. Moose Creek Bog — 7590 ± 90

Peat (sample CHA-1; 8.4 g) from the base of Moose Creek Bog, 30 m south of the Canadian National railway line and 5.7 km east of Casselman, Ontario (45°17'00"N, 75°02'45"W), at an altitude of ca. 65 m. The sample was obtained with a 5 cm diameter Shelby tube sampler from a depth of 3.4 m. Sample was split for palynological examination. Collected 1976 by P.B. Fransham, now at the University of Waterloo, Waterloo.

Comment (P.B. Fransham): The bog developed in the bottom of an abandoned channel of proto-Ottawa River. The date therefore can be considered as a minimum date for the abandonment of the channel and is consistent with other bog bottom dates from the ancient Ottawa River channel bottoms: e.g., 6750 ± 150 years, (GSC-548; GSC VI, 1967, p. 160), 7650 ± 210 years (GSC-681; GSC VII, 1968, p. 213) and 8010 ± 180 years (GSC-621; GSC XI, 1971, p. 270-271).

Comment (L.D. Farley-Gill): The pollen concentration is low, and the grains are corroded and poorly preserved. The assemblage is dominated by pine (**Pinus**). The absence of hemlock (**Tsuga**), beech (**Fagus**), and maple (**Acer**) places an approximate age of 7500 years on the sample.

Comment (W. Blake, Jr.): The basal 3 cm of peat, above clay, was used for dating. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Maplehurst Lake series

Maplehurst Lake (sample TB-68-38) is a small lake (5.8 ha) in a closed depression about 13 km northeast of Woodstock, Ontario (43°15.5'N, 80°39.5'W) with a maximum water depth of 4 m. Some 765 cm of fine detritus algal gyttja overlies clay and sand. Samples were taken with a Livingstone piston corer during coring of the lake for pollen analysis. Collected 1968 by R.J. Mott.

GSC-2024. Maplehurst Lake, 25-40 cm — 580 ± 130; $\delta^{13}C = -26.1‰$

Algal gyttja (220 g wet) from 25 to 40 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Date based on one 2-day count in the 2 L counter.

GSC-1891. Maplehurst Lake, 452-458 cm — 5330 ± 220; $\delta^{13}C = -25.2‰$

Algal gyttja (42 g wet) from 452 to 458 cm below the sediment/water interface. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1882. Maplehurst Lake, 597-603 cm — 7690 ± 170; $\delta^{13}C = -22.0‰$

Algal gyttja (52 g wet) from 597 to 603 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1870. Maplehurst Lake, 717-723 cm — 9650 ± 110; $\delta^{13}C = -22.2‰$

Algal gyttja (57 g wet) from 717 to 723 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

GSC-1156. Maplehurst Lake, 760-765 cm — 12 500 ± 180; $\delta^{13}C = -21.0‰$

Algal gyttja (81.5 g wet) from 760 to 765 cm below the sediment/water interface. NaOH leach omitted from sample pretreatment. Date based on two 1-day counts in the 2 L counter.

Comment (R.J. Mott): GSC-1156 dates the beginning of organic accumulation and the changeover from pollen spectra containing abundant herb pollen to spectra dominated by spruce pollen. GSC-1870 dates an assemblage containing abundant pine pollen of the jack pine/red pine type. The pine/hemlock pollen zone boundary is dated by GSC-1882 and GSC-1891 provides an age for a pollen zone dominated by beech, elm, oak, and various other hardwood genera. The ragweed (**Ambrosia**) rise, indicating the beginning of historically datable agricultural activity, was dated by GSC-2024; this implies an error of 480 years between the historical and isotope dates. This error can be applied to the other radiocarbon dates as a minimum error caused by the hard water effect. Palynological details are as described in Mott and Farley-Gill (1978).

GSC-2353-2. Port Talbot — 45 200 ± 630

A log (sample $27^{a}/75$ (7986); 45.5 g; **Picea** sp.; identified by R.J. Mott) found in wet silt (Tyrconnell Formation) in a fresh exposure along a lake cliff at the type locality of the Port Talbot Interstadial, 24 km southwest of St. Thomas, Ontario (42°37'10"N, 81°23'W), at an elevation of 176.5 m. This well preserved sample of wood was collected 2 m above the level of Lake Erie, 1.5 m above the level of radiocarbon dated gyttja and 30 cm below the contact between the Tyrconnell Formation and the overlying Catfish Creek Till. Collected 1975 by A. Dreimanis, University of Western Ontario, London. Two determinations were made:

GSC-2353. — >39 000

Date based on one 3-day count in the 5 L counter; sample weight, 11.6 g.

GSC-2353-2. — 45 200 ± 630

Pretreatment of new material included leaches for one hour in hot NaOH and hot HCl. Date based on one 5-day count in the 5 L counter at 4 atm; sample weight, 45.5 g.

Comment (A. Dreimanis): The new finite date agrees well with all previous finite dates on what are presumed to be noncontaminated wood and peat samples from the Tyrconnell Formation (Port Talbot Interstadial) type area between Port Talbot and Plum Point, Ontario. These dates (10) range from 42 700 ± 1200 years (GrN-4799; twigs) to 47 600 ± 400 years (GrN-2601; gyttja; both dates in Groningen X, 1972, p. 9; cf. also Dreimanis et al., 1966 and Dreimanis, 1973).

Comment (W. Blake, Jr.): The submitter noted no plant growth on the sample, which was exposed by a storm within two weeks of the date of collection (November 11, 1975). The clean samples used for dating were cut from the outside of the log; the outermost wood had been removed previously by the submitter.

GSC-2245. St. Joseph Island — 6500 ± 70

Wood (sample PC-13/75; 11.0 g; **Betula** sp.; identified by R.J. Mott) in a gravel pit at the south end of an esker on the west side of St. Joseph Island, 0.8 km east of Richardson Point, Ontario (46°11'50" N, 84°03'30" W), at an altitude of 167 m. Collected 1972 by J.H. McAndrews, Royal Ontario Museum, Toronto; submitted by V.K. Prest.

Comment (J.H. McAndrews): the wood is from the middle of a 0.3 m-thick wood and detritus layer (interpreted as being a lagoonal deposit) within a sand and gravel deposit. It represents an early phase of the Nipissing transgression and is in harmony with a date of 5860 ± 140 years (GSC-1749) on wood from the upper part of the same layer collected by Saarnisto (Lowdon et al., 1977). The pollen assemblage is dominated by **Pinus strobus**. Fossil seeds include **Betula papyrifera** and aquatic plants. Date based on one 3-day count in the 5 L counter.

Western Canada

Manitoba

GSC-2556. Caribou River — Modern

A single alder twig (sample 9/7/8 - DU-77-235; 0.9 g; **Alnus** sp.; identified by R.J. Mott) from 5.5 m below the surface in a section of sandy deltaic deposits on the south bank of an unnamed river between Caribou River and Seal River, northern Manitoba (59°18'N, 95°23'W), at an elevation of 90 m (based on the 1:250 000 topographic map). Collected 1977 by L.A. Dredge and M.F. Nixon.

Comment (L.A. Dredge): Marine shells from the same sample have been dated at 6570 ± 100 years (GSC-2579; unpublished); that date provides an approximate age for the 90 m sea level. Sample mixed with dead gas for counting. Date based on one 1-day count in the 2 L counter.

GSC-2481. Fox and Stupart Rivers >37 000

Wood (sample 56-76-3; 6.0 g; **Picea** sp., identified by L.D. Farley-Gill) from an 11 m-high section at the junction of Fox and Stupart rivers, Manitoba (55°52'N, 96°20'W), at an elevation of approximately 100 m. Collected 1976 by J. Clue, University of Manitoba, Winnipeg.

Comment (L.A. Dredge): The wood was taken from the lower of two tills which are separated by a gravel bed. The sampled unit also is underlain by gravel. The date suggests that the lower till at this site is probably mid-Wisconsinan or older.

Comment (W. Blake, Jr.): The sample dated was a single piece of twisted root, 5x4x2 cm in size, with some bark still attached. The wood was brittle and iron stained, but not lignitized. Date based on one 3-day count in the 2 L counter. counter.

GSC-2567. Spruce Lake 4850 ± 60

A single piece of wood (sample 19/7/1 - DU-77-317A; 11.6 g; **Picea** sp.; identified by R.J. Mott) from approximately 1.4 m below the surface in a section along the northwest arm of Spruce Lake, northern Manitoba (59°05'N, 96°45'W), at an elevation of 210 m. The wood was derived from a sandy organic bed which is underlain by silts bearing freshwater microfossils (unpublished GSC Diatom Report 77-40 by S. Lichti-Federovich) and overlain by a compact sandy diamicton. Collected 1977 by L.A. Dredge and M.F. Nixon.

Comment (L.A. Dredge): Regional and local stratigraphic relationships suggested that late-glacial ice advanced into a glacial lake, depositing till and burying the marginal organic deposits. The sample was run to determine a maximum age for this final ice advance. The date obtained appears to be far too young for this interpretation to be correct in the light of other dates from northern Manitoba, but a similar young age of 5220 ± 340 years (Y-231; Yale II, 1955, p. 959) on peat overlain by more than 1 m of till(?) has been obtained from Rankin Inlet (cf. Lee, 1959). Date based on one 3-day count in the 5 L counter.

Alberta

GSC-2409. Midnapore 49 400 ± 1000

Wood (sample SF-76-1; 41.9 g; **Picea** sp.; identified by R.J. Mott) from an artificial lake dug for a new subdivision in southeast Calgary, Alberta. The site is 800 m east of Highway 2 and 800 m south of former Midnapore Station in W1/2 sec. 34, tp. 22, rge. 1, W 5th mer. (50°54'40"N, 114°03'40"W). The sample came from 5 m below the surface near the boundary between the underlying unoxidized till and the overlying oxidized till, at an altitude of about 1025 m. Collected by M. Rapsey of R.M. Hardy & Associates Ltd., Calgary, and submitted by E. Harrington of the same firm through A. MacS. Stalker, the stratigraphy of the site was examined by M. Wilson of the Department of Archaeology, University of Calgary, Calgary.

Comment (A. MacS. Stalker): The wood was contained in till that apparently was deposited by the last Laurentide Ice Sheet to cross the area, and so the date appears to set a maximum time for the advance of that glacier. Until this date is corroborated by similar results on other samples, however, it would be best to regard it merely as "greater than 49 000 years". All the outside wood was scraped off this dry and solid sample. The date is based on one 5-day count in the 5 L counter at 4 atm.

British Columbia

Kelowna Series

Wood samples from a peat bog on Highway 97, 3.2 km north of Rutland, British Columbia (49°56'N, 119°23'W), at an elevation of ca. 405 m. Collected 1972 with a Livingstone corer by N.F. Alley, then under contract to the Geological Survey, now Soil Conservation Service, Kew, Victoria, Australia.

GSC-1868. Kelowna peat bog, wood (I) 3640 ± 70

Wood (sample RB1, 5.0 g; angiosperm wood, possibly **Betula**, but an accurate determination could not be made by R.J. Mott due to poor sample preservation) from 93 cm below the surface of the bog. St. Helens Y tephra (dated at ca. 3200 years) was present a few centimetres above the sample.

Comment (N.F. Alley): This date on wood fixes the age of a level in the pollen profile which corresponds to the first of three Neoglacial pine maxima. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1867. Kelowna peat bog, wood (II) 8410 ± 100

Wood (sample RB2; 4.55 g; **Salix** sp.; identified by R.J. Mott) from 260 cm below the surface of the bog. Two tephras occur above the sample: the older (at 125 to 130 cm depth) is Mazama (ca. 6600 years old) and the younger (at 86 to 90 cm depth) is St. Helens Y (ca. 3200 years old).

Comment (N.F. Alley): This wood is from near the base of a bog overlying silts deposited in glacial Lake Penticton of Nasmith (1962). The date provides a minimum age for the draining of the lake and is consistent with Fulton (1969). The date also defines an early Holocene flora consisting dominantly of **Pinus, Picea, Abies, Tsuga heterophylla, Larix, Pseudotsuga, Alnus,** and **Salix** (Alley, 1976). Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-2543. Chilliwack Modern

Wood (sample FAB180W; 11.1 g; **Alnus** sp., identified by L.D. Farley-Gill) from the Bailey disposal pit, Chilliwack, British Columbia (49°06'35"N, 121°55'20"W) at an elevation of 80 m. The sample is from a calcrete layer at the base of 10 m of outwash related to the Sumas advance. Collected 1977 by J.E. Armstrong.

Comment (J.E. Armstrong): The modern date is unexplainable. The sand and gravel unit below the calcrete contains a mammoth tusk dated at 22 700 ± 320 years (GSC-2232; Harington, 1977), and marine shell fragments at an elevation of 46 m are >34 000 years old (GSC-2230; GSC XVII, 1977, p. 14).

Comment (W. Blake, Jr.): Counting was carried out for only a few hours once it became apparent that this sample was not in the age range of 22 000 ± 500 years which was expected by the collector.

GSC-2523. Cultus Lake 11 300 ± 100

Wood (sample FAB163W; 10.0 g; **Tsuga heterophylla**, identified by L.D. Farley-Gill) from a gravel pit at the south end of Cultus Lake, British Columbia (49°01'59"N, 122°01'30"W), at an elevation of 124 m. The sample is from Sumas till overlying 50 m of outwash related to the Sumas advance. Collected 1975 by J.E. Armstrong.

Comment (J.E. Armstrong): This date corresponds with seven previous dates obtained on wood from Sumas Drift (cf. Fulton, 1971; GSC XIII, 1973, p. 26). It is from a locality 10 km east of the most easterly previously dated material (L-331A, 11 450 ± 150 years; Armstrong et al., 1965). The presence of western hemlock would indicate a climate similar to that of the present prior to the advance of Sumas ice. Date based on one 5-day count in the 5 L counter.

GSC-2468. Aldergrove >32 000

Detrital wood chips (sample FAB153W; 2.5 g; **Picea** sp. and possibly **Pseudotsuga menziesii,** identified by L.D. Farley-Gill) from a water well drillhole 6 km north-northwest of Aldergrove, British Columbia (49°06'43"N, 122°29'49"W), at an elevation of 44 m. The sample (which consisted of several pieces of dry wood, one with bark, and a cone) is from near the base of a sandy gravel lithologic unit, approximately 34 m thick. This unit is overlain by 29 m of Fort Langley glaciomarine, stony, clayey silt. It is also underlain by what appears to be another glaciomarine, stony, clayey silt. Collected 1975 by E.C. Halstead (Environment Canada, Vancouver) from a new drillhole; submitted by J.E. Armstrong.

Comment (J.E. Armstrong): Shells from the overlying Fort Langley glaciomarine, stony, clayey silt at an exposure 1 km to the south-southeast yielded a date of 11 680 ± 180 years (GSC-186; GSC IV, 1965, p. 35). Halstead and Armstrong thought that this gravel unit, which is widespread and contains much detrital organic material, was a Fort Langley glaciofluvial unit lying between two Fort Langley glaciomarine units. If the date is accepted as having come from trees growing at the time that the gravel was deposited, however, the gravel is then obviously much older, at least in the lower part of the Cowichan Head sediments (cf. GSC-2137, 40 200 ± 430 years; GSC-2167, 40 500 ± 1700 years; and QL-195, 58 800 $^{+2900}_{-2100}$ years; Armstrong and Clague, 1977). It is also probably fluvial and not glaciofluvial. The other interpretation would be to conclude that all the detrital material was derived from an older unit. The widespread nature of both the gravel unit and the organic detritus would appear to make this explanation less plausible, especially as this is one of numerous such dates. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Coquitlam Valley series (II)

GSC-2371. Coquitlam Valley (IV) 18 000 ± 150

Large log (sample FAB170W; 11.3 g; **Abies** sp.; identified by R.J. Mott) from the surface of a fresh exposure in a natural slide gully 7 km north of Port Coquitlam, British Columbia (49°20'15"N, 122°46'41"W), at an elevation of 356 m. The sample is from rhythmically bedded (varved) glaciolacustrine silt and fine sand containing scattered dropstones. The glaciolacustrine deposits are overlain by Vashon till. Collected 1976 by S.R. Hicock, now at the University of Western Ontario, London.

Comment (J.E. Armstrong): The dated log is from near the top of a 50 m-high section of glaciolacustrine sediments. A specimen of wood collected 42 m below this sample gave a date of 17 800 ± 150 years (GSC-2297; GSC XVII, 1977, p. 15). These two dates suggest rapid deposition for this 50 m-thick sequence of glaciolacustrine sediments. They probably mark the lower age limit of the Vashon Stade for the area. The glaciolacustrine sediments probably were deposited in a glacial lake occupying part of Coquitlam Valley when dammed by Vashon ice 18 000 years ago. Date based on one 3-day count in the 5 L counter.

GSC-2335. Coquitlam Valley (V) 21 700 ± 240

Wood (sample FAB169W; 11.7 g; **Abies** sp.; identified by L.D. Farley-Gill) from the Ceewee gravel pit, Pipeline Road, 6.5 km north of Port Coquitlam, British Columbia (49°19'49"N, 122°46'38"W), at an elevation of 205 m. The sample is from a thin layer of wood-bearing silty sand near the top of a thick section (70 m) of crossbedded, white Quadra sand. The sand is overlain by both Coquitlam and Vashon Drift. Collected 1976 by S.R. Hicock from a clean, freshly exposed face.

GSC-2416. Coquitlam Valley (VI) 21 700 ± 130

Wood (sample FAB171W; 48.0 g; **Abies** sp.; identified by L.D. Farley-Gill) from Ceewee gravel pit, Pipeline Road, 6.5 km north of Port Coquitlam, British Columbia (49°19'49"N, 122°46'38"W), at an elevation of 130 m. Sample is from a gravelly sand believed to be near the base of the Quadra section exposed here. The Quadra is underlain by fine sand and silt that yielded wood >49 000 years old (GSC-2094-2; GSC XVII, 1977, p. 15). Collected 1976 by S.R. Hicock from a clean, freshly exposed face.

Comment (J.E. Armstrong): The wood from GSC-2203, at an elevation of 190 m a.s.l., was dated at 21 600 ± 200 years (Armstrong and Hicock, 1976; GSC XVII, 1977, p. 15). Consequently we have three dates in a 70+m-thick section of Quadra Sand (95% sand) in which the maximum age difference is about 500 years and probably considerably less. This indicates very rapid proglacial deposition prior to the advance of Coquitlam ice. The sediment came from the north. GSC-2335 based on two 1-day counts in the 5 L counter; GSC-2416 based on one 4-day count in the 5 L counter at 4 atm.

GSC-2536. Coquitlam Valley (VII) 21 500 ± 240

Wood (sample FAB179W; 11.3 g; **Thuja plicata,** western red cedar; identified by L.D. Farley-Gill) in a freshly exposed face of the S and S gravel pit, 5 km north of Port Coquitlam, British Columbia (49°18'45"N, 122°46'45"W), at an elevation of 125 m. The wood was found in the oldest of three till units which, along with outwash and glaciomarine stony clayey silt, comprise the Coquitlam Drift at this site. Coquitlam Drift overlies sand and gravel which may be Quadra or older. Collected 1977 by J.E. Armstrong.

Comment (J.E. Armstrong): This date provides a lower limiting date for the advance of Coquitlam ice. Quadra sediments upvalley yielded three dates in the range 21 600 to 21 700 years (GSC-2203; GSC XVII, 1977, p. 15; plus GSC-2335 and GSC-2416, this series). The presence of western red cedar suggests a climate during the advance of the Coquitlam glacier that is not appreciably colder than the present climate. Date based on one 3-day count in the 5 L counter.

Port Moody series

GSC-2322. Port Moody, wood 18 300 ± 170

Wood (sample F4APW; 11.6 g; **Abies** sp.; identified by L.D. Farley-Gill) from the Port Moody sanitary disposal pit on Barnet Road, 3.2 km west of Port Moody, British Columbia (49°17'20"N, 122°52'40"W), at an elevation of 61 m. The specimen is from a layer of wood at the base of a rhythmically bedded silt unit about 5 m thick. The wood-bearing silt rests on Coquitlam Drift and is overlain by crossbedded Quadra sand. At the top of the section is Vashon till. Collected 1974 by J.E. Armstrong from a fresh, moist exposure.

Comment (J.E. Armstrong): These sediments are considered to be post-Coquitlam Quadra Sand and appear to range in age from about 19 500 to 18 000 years. This is one of the youngest dates obtained from Quadra-type materials north of the 49th parallel. Armstrong and Clague (1977) thought the Quadra Sand was proglacial in origin, and this still seems the best explanation when the whole of the Quadra succession is considered. The presence of Pacific yew 18 700 ± 700 years ago, however, suggests a climate similar to that at present. Apparently the coastal climate did not show an appreciable temperature change until the Strait of Georgia was filled with ice, which peaked about 15 500 to 16 000 years B.P. Date based on one 3-day count in the 5 L counter.

GSC-2533. Port Moody, peat 31 000 ± 520

Compressed peat (sample F3AP; 636 g) from an exposure in back of Port Moody Secondary School, Port Moody, British Columbia (49°16'20"N, 122°50'20"W), at an elevation of 58 m. The peat occurs beneath silt, clay, and sand which underlie Coquitlam Drift consisting of ice-contact gravel and till. This in turn is overlain by Quadra-type sand and gravel which may be as much as 75 m thick. Collected 1974 by J.E. Armstrong from a fresh exposure.

Comment (J.E. Armstrong): The date would place this peat and associated sediments in the Cowichan Head Formation. The older part of the Quadra Sand (pre-Coquitlam) is missing. L.D. Farley-Gill described the pollen as follows (unpublished GSC Palynological Report 77-3): "The accompanying assemblage is dominated by spruce (**Picea**) and grass (Gramineae) which together total 64.3%. The remainder of the arboreal component consists of minor amounts of birch (**Betula**), alder (**Alnus**), pine (**Pinus**), willow (**Salix**), fir (**Abies**), maple (**Acer**), and mountain hemlock (**Tsuga mertensiana**). Herbaceous pollen of Ericaceae, Tubuliflorae, **Artemisia**, Rosaceae, **Sanguisorba**, Umbelliferae, and Polypodiaceae, as well as sedge (Cyperaceae) and **Sphagnum**, complete the assemblage." NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 5 L counter.

GSC-2433. Semiahmoo Bay >31 000

Wood (sample FAB172W; 2.0 g) from a seacliff exposure bordering Semiahmoo Bay, 1.8 km west of White Rock, British Columbia (49°01'35"N, 122°52'40"W), at an elevation of 15 m. The sample is from a thinly bedded silt between an overlying stony glaciomarine clayey silt containing whole **Nuculana** shells and an underlying till. Lithologic units above the glaciomarine unit are, from bottom to top, rhythmically bedded silt, Quadra sand and minor gravel, Vashon till, Capilano stony glaciomarine silt, and Capilano beach gravel. Collected 1976 by S.R. Hicock from near the surface of a fresh exposure.

Comment (J.E. Armstrong): This is the stratotype section for Semiahmoo Drift. The lowest till, the overlying silt (from which the wood was obtained), and the stony glaciomarine unit are all considered part of the Semiahmoo Drift, which elsewhere has been dated at 58 800 $^{+2900}_{-2100}$ years (QL-195; this value should probably be regarded as a minimum) and >62 000 years (QL-194; Armstrong and Hicock, 1976). Consequently the >31 000 year date would seem to corroborate the general age of the Semiahmoo. The specimen was too small for a better date. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Capilano series

GSC-2604. East Delta 12 700 ± 150

Aragonitic pelecypod valves (sample F23AS; 14.2 g; a single intact pair of **Clinocardium nuttalli**; identified by R.J. Richardson) from an offshore bar deposit exposed near the surface in a gravel pit in east Delta, British Columbia (49°07'38"N, 122°54'04"W), at an elevation of 70 m. The shells derived from a stony clayey silt overlying Vashon till. The silt is overlain by Capilano beach gravel. Collected 1974 by J.E. Armstrong.

GSC-2612. Port Moody, shell 12 600 ± 120

A single large gastropod, shell material aragonitic (sample F1As; 36.0 g; **Fusitron oregonensis**; identified by M.F.L. Smith, National Museum of Natural Sciences, Ottawa), on the hill lying south and east of Port Moody, British Columbia (49°16'17"N, 122°48'40"W), at an elevation of 91.5 m. The shell sample, part of a rich fauna, was collected from stony clayey silt of the Capilano sediments. The clayey silt rests on Vashon till and is overlain by Capilano beach gravel. Collected 1974 by J.E. Armstrong.

Comment (J.E. Armstrong): Dates GSC-2604 and GSC-2612 help to establish the deglaciation pattern in relation to relative sea level changes in the Fraser Lowland. Since the Vashon ice retreated, the area apparently has undergone two major submergences and subsequent emergences in relation to the sea (cf. Mathews, et al., 1970). Both samples are found in material that formed part of the first emergence and that is Capilano in age. Because of the small size of the samples, only the outer 10% of shell was removed by HCl leach. GSC-2604 mixed with dead gas for counting; date based on one 3-day count in the 2 L counter. GSC-2612 based on one 3-day count in the 5 L counter.

East Delta series

GSC-2123. East Delta, wood >50 000

Wood (sample F25AW(1); 41.0 g; **Abies** sp., identified by R.J. Mott) from a gravel pit in East Delta, British Columbia (49°09'20"N, 122°55'35"W), at an elevation of 58 m. The sample is from a wood-bearing laminated silt layer (2 to 7 cm thick) overlying ice-contact sand, gravel, and diamictons. The silt layer is overlain by 3 to 6 m of sand and gravel which in turn is overlain by Vashon till (late Wisconsin). Collected 1974 by J.E. Armstrong from the surface of a fresh face.

Comment (J.E. Armstrong): A wood specimen from near the top of the silt at this site was collected in 1961 by J.E. Armstrong and dated at that time as >39 000 years (GSC-62; GSC II, 1963, p. 23). Another wood specimen collected from this silt by J.E. Armstrong in 1975 was dated by M. Stuiver, Institute of Quaternary Research, University of Washington. He writes as follows: "QL-195: 58 800 $^{+2900}_{-2100}$ years. The ^{14}C activity of such a sample is only about 0.07 per cent of modern carbon. It would be wise to consider this as a **minimum** age. Agrees with GSC-2123 date of >50 000 years." The silt contains hundreds of pieces of wood, some up to 0.5 m in diameter and 3 m long. The dates obtained on wood samples from this silt layer lying between two drift sequences accentuate a major problem encountered in interpreting the Quaternary stratigraphy in the Fraser Lowland. Normally the near-surface drift has been called Vashon Drift (late Wisconsin), and the sediments directly below have been considered as Quadra Sand or Cowichan Head Formation (18 000 to 40 000+ years). The problem now presented is

whether to consider this silt as an extension of the Cowichan Head Formation or to consider it to be part of an older sequence (cf. Armstrong and Clague, 1977). I have opted for the first and have made a tentative correlation with the Cowichan Head Formation; the underlying glacial complex has been correlated with Semiahmoo Drift (middle or early Wisconsin). Numerous other localities in the Fraser Lowland have yielded material between the top two drift sequences that have infinite dates. Date based on three 1-day counts and one 3-day count in the 5 L counter at 4 atm.

GSC-2627. East Delta, peat >39 000

Hard compact detrital peat (sample FAB181W; 29.3 g) from an exposure in an abandoned gravel pit 12.1 km south of New Westminster, British Columbia (49°06.7'N, 122°54.0'W), at an elevation of 25 m. The sample is from till-like material in a bed of interbedded diamictons and thinly laminated silts. This unit is overlain by Quadra-type fine to medium sand and is underlain by fine to medium sand believed to be Highbury. Collected 1977 by S.R. Hicock, now at the University of Western Ontario, London.

Comment (J.E. Armstrong): The age of this sample suggests that the till-like diamictons and thinly laminated silts are part of Semiahmoo Drift. Vashon Drift is exposed at the top of the section. A piece of wood in the sand exposed below the probable Semiahmoo Drift was collected from this gravel pit (Kiewet) in 1961 and was dated at >37 000 years (GSC-60; GSC II, 1963, p. 47). Although both dates may be anomalous and indicate that older material has been picked up, the stratigraphy suggests that the correlations made above are probably correct.

Comment (W. Blake, Jr.): **Chenopodium** seeds and poorly preserved insect fragments (identified by J.V. Matthews, Jr.) were found in this highly compressed peat. Date based on one 5-day count in the 5 L counter.

GSC-2603. Tsawwassen >39 000

Clastic peat (sample F142AW; 40.8 g) from a gravel pit near the United States–Canada border at Tsawwassen, British Columbia (49°00'39"N, 123°04'12"W), at an elevation of 45 m. The sample is from a sandy gravel exposed below Vashon Drift and Capilano Sediments. Collected 1974 by J.E. Armstrong; the specimen was dug up by bulldozer at least six months prior to the collection date, consequently material had dried out.

Comment (J.E. Armstrong): The material from which the clastic peat was collected has been mapped as Quadra Sand (18 000 to 26 000 years old; cf. Armstrong and Clague, 1977). If this correlation is accepted, the date is anomalous and the material was derived from much older beds. The other possibility is that the sand and gravel are part of the Cowichan Head Formation from which several similar dates have been obtained. Date based on one 3-day count in the 5 L counter.

GSC-2571. Lillooet River Canyon 2500 ± 50
$\delta^{13}C = -24.5‰$

A single piece of burnt wood (sample MM755-C14; 12.1 g; **Pseudotsuga menziesii**; identified by R.J. Mott) from the centre of a 80 cm diameter tree stump which is one of at least six found in living position and enclosed by Bridge River tephra. The sample location is on the east bank of Lillooet River, 3.9 km northwest of the confluence of Lillooet River and Pebble Creek, British Columbia (59°39'40"N, 123°26'47"W), at an altitude of 522 m and 18 m above mean river level. The trees extended at least another 8 m into the base of an overlying vitrophyric rhyodacite breccia and flow. Collected 1977 by P.B. Read, Geotex Consultants Limited, Vancouver; submitted by J.G. Souther.

Comment (P.B. Read): The sample was collected near the centre of a tree, which was about 150 years old assuming a present-day rate of growth, when it was engulfed by Bridge River tephra and overlying breccia and flows. The vent lies about 3 km to the northwest. The radiocarbon age is a maximum for the volcanic activity which probably occurred 2500 ± 50 years ago, minus the age of the tree (150 years), thus 2350 ± 50 years B.P. The radiocarbon age is consistent with maximum ages of 2440 ± 140 years (GSC-529; Nasmith et al., 1967; GSC VII, 1968, p. 227) and 2670 ± 140 years (GSC-531; Westgate and Dreimanis, 1967; GSC VII, 1968, p. 223) determined on peat and charcoal, respectively, underlying Bridge River tephra in other localities (cf. also Westgate, 1977). Date based on two 1-day counts in the 5 L counter.

GSC-2587. Pebble Creek 2480 ± 60
$\delta^{13}C = -23.5‰$

Charcoal (sample C-1; 11.9 g; **Pseudotsuga menziesii**; identified by L.D. Farley-Gill) from a piece 20 cm wide by approximately 60 cm long. The sample locality is a bulldozer cut about 250 m northwest of the first creek northwest of Pebble Creek, British Columbia (50°40'N, 123°30'W; 840 m at 338° from the confluence of Pebble Creek and Lillooet River). The cut exposes a diagonal section down an alluvial terrace of stratified, reworked Bridge River tephra which contains the sampled piece of charcoal. The terrace is 25 to 30 m high (elevation 480 m) above Lillooet River, and the sample site at 474 m is 6 m below the top of the terrace. Collected 1977 by T.L. Sadlier-Brown, Nevin Sadlier-Brown, Goodbrand Ltd., Vancouver; submitted by J.G. Souther.

Comment (P.B. Read, Geotex Consultants Limited, Vancouver): The sample was collected from near the top of an alluvial terrace 0.7 km southeast of, and downstream from, the unmodified distribution of Bridge River tephra. The base of this terrace of Bridge River tephra is close to the present Lillooet River at 444 m elevation. The terrace formed by local rapid aggradation of Lillooet River downstream after the explosive eruption of tephra. The charcoal formed during the fire caused by the Bridge River eruption (see GSC-2571, 2500 ± 50 years; this list) and floated downstream with pumiceous tephra to the sample site. The radiocarbon age is consistent with other maximum ages for the Bridge River event (cf. Nasmith et al., 1967; Westgate and Dreimanis, 1967; Westgate, 1977) determined on organic materials underlying Bridge River tephra at other localities in British Columbia and Alberta. It corroborates a radiocarbon age of 2500 ± 50 years B.P. (GSC-2571; this list) from a tree engulfed in living position by Bridge River tephra. It also gives a maximum age for the formation of the alluvial terrace which probably occurred immediately after the tephra eruption. Date based on two 1-day counts in the 5 L counter.

GSC-2109. Reception Point >43 000

Wood (sample 102-2; 7.1 g; **Abies** sp; identified by L.D. Farley-Gill) from a coastal bluff 10 km due west of Sechelt, British Columbia at Reception Point (49°28'27"N, 123°53'08"W), at an elevation of 2 m. The sample was collected from a gravel lens in diamicton. The diamicton is overlain by a silt-clay unit containing marine mollusc shells and by well sorted, crossbedded sand. The latter is overlain by thin drift at the top of the exposure. Collected 1974 by J.J. Clague.

Comment (J.J. Clague): The date indicates that the glaciation preceding the last in this area occurred before 43 000 years ago and that the overlying stratified sediments probably were deposited during the Olympia nonglacial interval. Wood from crossbedded sand on North Thormanby

Island (49°30'N, 124°00'W), about 9 km from Reception Point, has been dated at 27 960 ± 420 years (GSC-232; GSC IV, 1965, p. 37; Clague 1977). This sand is thought to be stratigraphically equivalent to the sand unit at Reception Point. Date based on one 3-day count in the 5 L counter.

GSC-2609. Skutz Falls 20 800 ± 240

Wood (sample FAB182W; 11.8 g; **Abies** sp.; identified by R.J. Mott) collected from a meander cut about 40 m high, 600 m downstream from Skutz Falls on the southwest side of Cowichan River, 17 km west of Duncan, British Columbia (48°46.6'N, 123°56.9'W), at an elevation of approximately 105 m. The sample was collected from a wood- and plant-bearing silt-sand layer, 1 to 2 m thick, which is overlain by 15 m of ice contact/alluvial deposits including gravel, sand, and flow tills. The organic layer overlies about 8 m of poorly sorted sandy pebble to boulder gravel, including some flow tills. Collected 1977 by S.R. Hicock, now at the University of Western Ontario, London; submitted by J.E. Armstrong.

Comment (S.R. Hicock): This date confirms GSC-195 (21 070 ± 290 years; GSC-IV, 1965, p. 36) which was based on twigs and plant remains from the same layer at Skutz. The wood-bearing organic silt layer may represent a marsh deposit on the surface of proglacial outwash of a Cowichan Valley ice tongue (Halstead, 1968) during the early part (for this latitude) of the Fraser Glaciation (late Wisconsinan). These outwash deposits in part may correlate chronostratigraphically with the Quadra Sand in the Strait of Georgia and would plot in the Quadra field of Clague's (1977, p. 18) diagram. It appears that at about this time the mouth of Cowichan Valley was blocked, perhaps by Strait of Georgia ice, as thick deposits of clayey silt to silt are found interbedded with sand and gravel at Marie Canyon, 5 km downstream from the Skutz site (cf. GSC-317, 21 730 ± 230 years; GSC V, 1966, p. 111). The organic silt layer at Skutz is at about the same elevation as GSC-317, and it may have been formed near the lake margin at that time. It may also just represent a shift in stream course and outwash deposition towards the northeast side of the valley at Skutz (since it lies between gravel) which would imply that the lake did not extend that far up the valley. The ice dam seems to have failed more than once, as indicated by the gravel interbeds at Marie Canyon, but it persisted until at least 19 000 years ago, according to GSC-210 (wood in silt, 19 150 ± 210 years; GSC IV, 1965, p. 36), 5 m above GSC-317 at Marie Canyon.

Comment (W. Blake, Jr.): The sample for GSC-2609 was cut from part of an imbedded log, 60 cm long and 5 cm in diameter. Date based on one3-day count in the 5 L counter.

Toboggan Lake series

Wood samples collected from a drainage ditch (west of Highway 16) in an alluvial fan in Bulkley Valley, 10 km north-northwest of Smithers, British Columbia (54°51.9'N, 127°14.0'W). Collected 1977 by J.J. Clague

GSC-2552. Toboggan Lake (I) 150 ± 50

Wood (sample CIA-735-3; 11.5 g; **Alnus** sp., identified by L.D. Farley-Gill), at an altitude of ca.481 m. The sample is from the base of a sand unit, approximately 0.6 m thick, forming the uppermost layer of the alluvial fan and conformably overlying the silty clay from which sample GSC-2535 was taken.

GSC-2535. Toboggan Lake (II) 660 ± 50

Wood (sample CIA-735-1; 11.5 g; **Salix** sp., identified by L.D. Farley-Gill), at an altitude of ca. 480 m. The sample is from 1 m below the surface in silty clay which underlies a surface sand unit, 0.6 m thick. Sample GSC-2552, from the base of the sand unit (this date list), was above the water table, whereas GSC-2535 was below the water table.

Comment (J.J. Clague): Although postglacial alluvial fans are common in Bulkley Valley, there is no direct geomorphic evidence as to whether or not these fans are presently active. Therefore, samples GSC-2535 and -2552 were dated in order to determine the age of the uppermost sediments of a representative Bulkley Valley fan and to provide data on the rate of aggradation of the fan. Date GSC-2552 indicates that the uppermost 0.6 m of alluvium at this site was deposited during the past 150 ± 50 radiocarbon years and suggests that fan aggradation is continuing. Clay, at depths from 0.6 to 1.0 m, was deposited in 400 to 600 years (assuming no hiatus at the sand-clay contact). These dates are among the first geologic ^{14}C dates from Bulkley Valley. Each determination based on two 1-day counts in the 5 L counter.

Northern Canada, Mainland and Offshore Islands

Yukon Territory

GSC-2680. Caldwell Lake 5820 ± 90

Peat (sample E 77-150; 10.7 g dry), containing achenes of **Carex** sp. and seeds of **Menyanthes trifoliata** (identified by J.V. Matthews, Jr.); from a dry, unvegetated exposure on the east flank of a small pingo. The pingo is located in an area of alpine tundra on the east side of Blackstone River about 2.2 km northeast of Caldwell Lake, Yukon Territory (64°47.28'N, 138°32.46'W), at an elevation of approximately 1000 m. The peat is underlain by fluvial gravel and sand. The pingo is about 10 m high, dome shaped, with a shallow indentation at the top. It is situated in a shallow, wet, circular depression on the valley floor (Vernon and Hughes, 1966, Pl. II); a broad arcuate ridge 2 to 4 m high within the same depression also is judged to be a pingo. The form and setting of the dome-shaped pingo are typical for closed-system pingos of the Mackenzie Delta type. Collected 1977 by R.O. van Everdingen, Inland Waters Directorate, Department of Fisheries and Environment, Calgary.

Comment (J.V. Matthews, Jr.): The number of **Menyanthes** seeds removed from this small peat sample shows that **Menyanthes** was abundant. Since it is an emergent aquatic plant, this indicates that the peat is aquatic in origin and must have formed before the development of the pingo.

Comment (R.O. van Everdingen): Comparison of this date with GSC-296, 13 870 ± 870 years (GSC V, 1966, p. 115-116) for retreat of ice from Blackstone River valley indicates that pingo growth postdated ice retreat by at least 8000 years. NaOH leach omitted from sample pretreatment. Date based on two 1-day counts in the 2 L counter.

Northwest Territories

GSC-1401. Devil Lake 150 ± 130
$\delta^{13}C = -23.8‰$

Wood (sample 72ROV-A; 15.0 g; **Betula** sp.; identified by R.J. Mott) from the surface of a strandline at the southern end of Devil Lake, northern end of the Caribou Hills, Northwest Territories (68°55'N, 134°34'W), approximately 3.3 m above summer lake level (= similar elevation above sea level). Collected 1969 by V.N. Rampton.

Comment (V.N. Rampton): The date indicates that the wood was deposited during a storm tide or during spring flooding. Elevation indicates maximum height that floodwaters will achieve in this area.

Comment (W. Blake, Jr.): A single piece of wood, 23 cm long and with a maximum diameter of 2.5 cm, was used for dating. Date based on one 1-day count in the 5 L counter.

GSC-1495. Holmes Creek 9340 ± 260

Peat (sample 21ROW3A; 15.0 g; mainly sedge fragments, identified by M. Kuc) from the southeast bank of East Channel of Mackenzie River, 3.5 km northwest of the mouth of Holmes Creek, Northwest Territories (69°08'N, 134°18'W), at an elevation of 3 m. The peat was from near the base of 0.8 m of gravel containing peaty layers, which overlies more than 1 m of oxidized gravel and underlies 8 m of peat. Collected 1970 by V.N. Rampton.

Comment (V.N. Rampton): The date is a minimum for a narrow bench on the southeast side of East Channel. This date is probably too young to indicate a possible age for the bench, which is thought to be a terrace that predates the downcutting of East Channel to its present level. The date may relate to thermokarst phenomena or climatic change that initiated peat development (Rampton, 1973a). NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 1 L counter.

GSC-1316. East Channel 1840 ± 130
$\delta^{13}C = -24.7‰$

Peat (sample 60ROV3A; 240 g damp) from the east bank of Mackenzie River, 3.5 km north of Inuvik, Northwest Territories (68°23'N, 133°45'W) at 6 m above summer river level. The peaty layer underlies about 1 m of silty clay and overlies more than 2 m of gravel. Collected 1969 by V.N. Rampton.

Comment (V.N. Rampton): The date indicates a maximum age for the deposition of alluvium over terrace gravels by a small creek flowing off the uplands to the east. NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 5 L counter.

GSC-1303. Kugaluk Estuary 10 900 ± 160

Peat (sample 166ROV2A; 375 g damp) from the west edge of Kugaluk River estuary, 8 km south of the southern end of Thumb Island, Northwest Territories (69°20'N, 130°55'W), 4 m below the surface of the exposure. The sample is from the base of 0.4 m of peat and organic silt that underlies more than 2.5 m of gravel and sand and overlies more than 2.2 m of sand. Collected 1969 by V.N. Rampton.

Comment (V.N. Rampton): A series of low terraces flanks Kugaluk River estuary, grading to sea level north of Campbell Island. This date seems to confirm the age of 10 800 ± 300 years (I-483) previously obtained on the same terrace on Thumb Island (Mackay, 1963). At the present site the peat and organic silt appear to have formed in a channel bottom that later was filled with gravel and sand. Whether this channel was eroded and filled by streams flowing northward along the terrace or by a stream flowing east or west along the incised canyon joining Kugaluk River estuary to Eskimo Lakes is not clear. NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 5 L counter.

Liverpool Bay series

Exposures along Liverpool Bay show grey glaciofluvial sands and gravels overlying brown fine grained deltaic sands with large-scale foreset beds (Mackay, 1963; Fyles et al., 1972). In places on the south edge of Liverpool Bay the glaciofluvial deposits fill channels eroded in the deltaic sands.

GSC-1281. Liverpool Bay (I) >36 000

Wood (sample 130ROV4B; 100 g damp; **Picea** sp., identified by R.J. Mott) from an exposure on the south side of Liverpool Bay, 2 km east of Turnabout Point, Northwest Territories, (69°42'N, 130°18'W), approximately 8 m above sea level. The sample is from near the base of 8 m of grey sand and gravel overlying more than 5 m of brown sand. Collected 1969 by V.N. Rampton.

GSC-1637-2. Liverpool Bay (II) >29 000

Wood (sample 186ROXA: 0.8 and 3.8 g burnt, respectively, for GSC-1637 and GSC-1637-2) from an exposure on the north side of Liverpool Bay about 21 km north of Turnabout Point, Northwest Territories (69°52'N, 130°08'W), at 12 m above sea level. The sample is from the base of a 1 m-thick laminated and crossbedded sand layer with wood and plant fragments and shale chips that forms the upper part of a 4.2 m-thick grey sand unit overlying brown sand. Collected 1971 by V.N. Rampton. Two determinations were made:

GSC-1637.	A single small piece of wood (1.05 g)	>22 000
GSC-1637-2.	Between 80 and 100 tiny pieces of wood, all rounded on the ends (5.2 g)	>29 000

GSC-1650. Liverpool Bay (III) >42 000

Wood (sample 188ROX2A; 6.2 g; **Picea** sp., identified by L.D. Farley-Gill) from an exposure on the north side of Liverpool Bay about 18 km north of Turnabout Point, Northwest Territories (69°51'N, 130°14'W) at 13.5 m above sea level. The sample is from near the midpoint of 7.6 m of grey sand overlying more than 9 m of fine brown sand. Collected 1971 by V.N. Rampton.

Comment (V.N. Rampton): The grey sand and gravel unit from which the samples were obtained is thought to have been deposited during, and immediately following, the last glaciation of the Liverpool Bay area. The dates support the hypothesis that the area is well beyond the limit of late Wisconsin ice and that the outwash probably was deposited during an early Wisconsin glaciation (Mackay et al., 1972; Fyles et al., 1972). The dates should be treated with caution, however, as the sampled wood showed signs of stream transport and may be reworked from older deposits. The identification of samples 130ROV4B and 188ROX2A as **Picea** sp. suggests that this wood may have originated in older interglacial deposits. Conversely, the plant and wood fragments in sample 186ROXA appear too fragile to have suffered redeposition and extensive stream transport. GSC-1637 and -1637-2 both mixed with dead gas for counting. GSC-1281 based on one 3-day count in the 5 L counter; GSC-1637 based on one 1-day and one 3-day count in the 2 L counter; GSC-1637-2 based on one 1-day and one 2-day count in the 2 L counter; GSC-1650 based on one 3-day count in the 2 L counter.

GSC-1268. Johnson Bay 3280 ± 130
$\delta^{13}C = -25.2‰$

Organic detritus (sample FG-65-81a; 290 g) from an exposure on the south side of Johnson Bay near its confluence with Liverpool Bay, Northwest Territories (70°01'N, 129°29'W), at an elevation of 3 m. The sample is from an organic layer near the base of 1.5 m of windblown sand, which overlies more than 3 m of crossbedded glaciofluvial sand with pebbles. Collected 1965 by J.G. Fyles; submitted 1969 by V.N. Rampton.

Comment (V.N. Rampton): The date relates to the formation of local sand dunes at this locality. NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 5 L counter.

Mason River series

The samples in this series derive from an exposure in the low glaciofluvial(?) terrace 2.5 km west of the mouth of the westernmost distributary of Mason River, Northwest Territories (69°55'N, 128°26'W). At the site, a 2.6 m-high terrace shows 0.6 m of silty sand (with a peaty layer at midpoint) overlying 2 m of crossbedded sandy gravel. Collected 1973 by V.N. Rampton.

GSC-2019. Mason River (I) 200 ± 70

Plant fragments and small twigs with bark (sample 11ROZ-A; 9.4 g; although the two largest twigs were too small and deteriorated to section, R.J. Mott suggested that both were probably **Salix** sp.) from near the midpoint of the gravel, at an elevation of 1 m. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-2029. Mason River (II) 8650 ± 80

Peat and woody fragments (sample 11ROZ-B; 50.0 g) from the midpoint of the silty sand, at an elevation of 2.1 m. Date based on one 3-day count in the 5 L counter.

Comment (V.N. Rampton): GSC-2019 obviously does not relate to the formation of the glaciofluvial terrace. The presence of lemming-like droppings (identified by M. Kuc) in the sample indicates that the plant fragments and twigs may be from an animal burrow, although no evidence to support this was noted at the site. The silty sand overlying the gravel is believed to be loess; GSC-2029 dates an interval of soil development and an interruption in the deposition of loess.

GSC-1989. Cape Monte Casino 9020 ± 80

Wood (sample 20ROZ-A; 11.5 g; **Populus** sp., identified by R.J. Mott) from a coastal exposure at Cape Monte Casino on the east side of Liverpool Bay, Northwest Territories (70°05'N, 128°24'W), at an elevation of 18 m. The sample was from near the base of 1 m of peat containing large chunks of wood. The peat overlies, in succession, 3 m of icy silt, 2.6 m of gravel, and 10 m of clay. The lowermost 2.6 m above the sea is a covered interval. Collected 1973 by V.N. Rampton.

Comment (V.N. Rampton): This sample is the northernmost recorded occurrence of **Populus** in the western Canadian Arctic in post-Wisconsin time and is further confirmation of a warm interval allowing northward expansion of the treeline around 9000 years B.P. (Ritchie and Hare, 1971). Date based on two 1-day counts in the 5 L counter.

GSC-2030. Baillie Island 9580 ± 170

Twigs (sample 44ROZ-2A; 4.4 g; probably **Salix** sp.; identified by R.J. Mott) from the north coast of Baillie Island, 4 km east of Observation Point, Northwest Territories (70°37'N, 128°10'W), at an elevation of 7 m. The sample, composed of twigs less than 6 cm long and less than 0.5 cm in diameter, was from the base of 3 m of interbedded lacustrine clay and peat that overlie 7 m of marine clay. Collected 1973 by V.N. Rampton.

Comment (V.N. Rampton): The date gives the age of active thermokarst expansion of a lake basin, a process which reached a maximum between 10 000 and 9000 years B.P. (Rampton 1973a, 1973b). Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

GSC-1974. Cy Peck Inlet 33 800 ± 880

Wood and bark (sample 48ROZ3A; 5.6 g; 20 fragments probably **Salix** sp., one fragment probably **Picea** sp., identified by R.J. Mott) from the base of an exposure on the south side of Cy Peck Inlet, 6.5 km east of its confluence with the Beaufort Sea, Northwest Territories (70°20'N, 127°57'W), at an elevation of 1 m. Above sea level, 4 m of crossbedded sand is exposed in the eroded terrace. Collected 1973 by V.N. Rampton.

Comment (V.N. Rampton): The terrace appears to correlate with one of the high terraces that flank Horton River and Old Channel of Horton River to the south (Rampton and Dugal, 1974). These terraces formed contemporaneously and subsequent to the most extensive glaciation in the Liverpool Bay/Franklin Bay region. Thus the date not only gives an age to the specific terrace, from which the dated sample was obtained, but it provides a minimum age for regional glaciation. Because most twigs were fragile, had bark on them, and were associated with finer plant fragments, it is believed that this sample is not redeposited older material. The possible presence of **Picea** sp. in this area 33 800 ± 880 years ago would appear to be an anomaly and implies some possible reworked material in the samples if the identified twig was truly **Picea** sp. Sample mixed with dead gas for counting. Date based on one 4-day count in the 2 L counter.

Northern Canada, Arctic Archipelago

Hudson Strait

GSC-2698. Hudson Strait 8730 ± 250
$\delta^{13}C = +1.1‰$

Aragonitic marine pelecypod shells (Core Hu 77-021-154 FBA; 4.1 g; **Nuculana pernula**; identified by F.J.E. Wagner) from a water depth of 933 m in the inner basin of eastern Hudson Strait, Northwest Territories (60°53.7'N, 65°26.6'W). The sediment enclosing the shells (extracted from 102 to 110 cm depth interval) was a marine mud probably deposited by turbidity currents. The shells were well preserved with several sets of paired valves. A current-winnowed, ice-rafted sand unit caps the sequence above a depositional break at a depth of 15 cm in the core. Collected in 1977 by R.H. Fillon from **CSS Hudson**.

Comment (R.H. Fillon): The dated shells and associated stratigraphic and high resolution seismic evidence (cf. Fillon, 1978) indicate that eastern Hudson Strait was deglaciated prior to 8730 years B.P. Bottom currents initiated after opening of the Strait and the advent of a modern-type hydrographic regime may have eroded a portion of the turbidite sequence prior to formation of the upper sand unit. Amino acid ratios suggest that the base of the core (at 800 cm) is not significantly older than the 102 to 110 cm interval (G.H. Miller, INSTAAR, pers. comm. 1978).

Comment (W. Blake, Jr.): This piston core sample also contained **Yoldiella lenticula** (identified by F.J.E. Wagner), but only **Nuculana pernula** was used for dating. The date is of the same order of magnitude as one of 9380 ± 790 years (GSC-2026) from Pritzler Harbour, on the nearby coast of southern Baffin Island (GSC XVII, 1977, p. 18), but is considerably older than the only date available from Akpatok Island. (GSC-1530, 6900 ± 480 years; GSC XVII, 1977, p. 18; Løken, 1978). Because of the small sample size, the HCL leach was omitted. The sample was mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Bylot Island

Aktineq glacier series

Peat samples from a gully on the southeast side of the snout of Aktineq glacier, Bylot Island, Northwest Territories (72°52'45"N, 78°52'W), at an altitude of ca. 150 m. The site is ca. 40 km north of Pond Inlet, Baffin Island. The gully exposes several layers of in situ peat on till(?), fluvial and eolian sand, and gravel. Collected 1977 by R.N.W. DiLabio.

GSC-2597. Aktineq glacier, 10-20 cm 450 ± 70
$\delta^{13}C = -27.0‰$

In situ peat (sample DDA-77-BI-196; 30.4 g) from a sequence of eolian sand.

GSC-2541. Aktineq glacier, 230-235 cm 7860 ± 100
$\delta^{13}C = -27.2‰$

In situ peat (sample DDA-77-BI-192; 33.0 g) overlying weathered till or poorly sorted gravelly sand, overlain by fluvial and eolian sand.

GSC-2577. Aktineq glacier, 370-375 m 7540 ± 230
$\delta^{13}C = -27.9‰$

Allochthonous lens of peat (sample DDA-77-BI-187; 3.3 g) in poorly sorted gravelly sand.

Comment (R.N.W. DiLabio): The site underlies the outer edge of the fresh lateral moraines of Aktineq glacier. GSC-2597 is a maximum age for the moraines. GSC-2541 and -2577 indicate that the snout of Aktineq glacier is as far out onto the lowlands of Bylot Island as it has been in the past 7000+ years (DiLabio and Shilts, 1978). An incorrect value for GSC-2577 (7450 ± 230 years) is given in DiLabio and Shilts (1978). Because of small sample size the NaOH leach was omitted from the pretreatment of this sample. All three samples mixed with dead gas for counting. Dates for GSC-2597 and -2541 each based on two 1-day counts in the 2 L counter; GSC-2577 based on one 3-day count in the 2 L counter.

GSC-2529. Glacier B-7 120 ± 120

Peat (sample SCA-77BI-1; 11.4 g) in growth position on a block of outwash sand that was in transport in Glacier B-7 on Bylot Island, District of Franklin (73°01'50"N, 79°14'W) at an altitude of ca. 460 m. Collected 1977 by W.W. Shilts.

Comment (W.W. Shilts): A block of outwash sand must have been lifted from the glacier bed within a kilometre of the site where it was found, because such vegetated outwash does not occur much farther than that up-ice. Many debris bands in the glaciers contain blocks of highly deformed to virtually undeformed outwash, especially near their snouts (DiLabio and Shilts, 1978). Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

Baillie Hamilton Island

GSC-2382. Baillie Hamilton Island 5000 ± 60
$\delta^{13}C = 27.1‰$

Organic detritus (sample BDA-75-P19; 166 g dry) containing abundant sedge pollen, with a few grass, willow, and birch grains (unpublished GSC Palynological Report 76-12 by R.J. Mott) from the southeast corner of Baillie Hamilton Island, Northwest Territories (75°47'55"N, 94°47'00"W), at an elevation of approximately 45 m (derived from the National Topographic System 1:250 000 map sheet). Collected 1975 by D.M. Barnett, L.A. Dredge, and S.A. Edlund.

Comment (L.A. Dredge): The material comes from a soil pit in which the organic bed was overlain by 40 cm of beach gravel containing fragments of **Mya truncata.** The date should provide a maximum and approximate age for the overlying marine strata. A 45 m elevation for the 5000 year old shoreline is much higher than expected on the basis of other dates from the central Arctic Islands, but the date and elevation are in keeping with a westerly extrapolation of Blake's 5000-year strandline diagram for the southeastern Queen Elizabeth Islands (Blake, 1975, Fig. 6). The possibility of the elevation determination being in error, however, cannot be excluded. NaOH leach omitted from sample pretreatment. Date based on one 3-day count in the 5 L counter.

Bathurst Island

GSC-2454. Dundee Bight 710 ± 50

A single piece of wood (sample BDA-75-W1 'B'; 7.1 g; **Salix** sp.; identified by R.J. Mott) from the sandy surface of a river terrace on the south side of "Dundee River", Bathurst Island, Northwest Territories (75°57'55"N, 96°16'50"W). The site is about 2 km east of Dundee Bight at an elevation of 45 m. Collected 1975 by D.M. Barnett and S.A. Edlund.

Comment (L.A. Dredge): The terrace surface has been deflated by wind activity, and clumps of dead **Salix** are exposed over a considerable area. The date obtained for the kill-out of the vegetation coincides with a period of eolian activity between 700 and 1000 years ago in southeastern Baffin Island (Dyke, 1977) and may be related to eolian deposition in the Hayes River area of Keewatin which has a maximum date of 980 ± 70 years (GSC-2522; GSC XVII, 1977, p. 18; peat sample collected by R.D. Thomas). Date based on one 3-day count in the 2 L counter.

Cameron Island

GSC-2378. Cameron Island 10 200 ± 140
$\delta^{13}C = +1.3‰$

Marine pelecypods (sample BDA-75-S25; 19.3 g; whole valves of **Hiatella arctica**; identified by R.J. Richardson) from south-central Cameron Island, Northwest Territories (76°25'55"N, 103°42'20"W), at an elevation of 104 m. The sample was collected from the ground surface, which consists of calcareous sand. Collected 1975 by D.M. Barnett, L.A. Dredge, and S.A. Edlund.

Comment (L.A. Dredge): The sample provides a minimum date for the postglacial marine limit on the island and indicates that sea level was at least 104 m above present level 10 200 years ago. This is the first age determination on marine shells from Cameron Island. Wood from a dry river bed about 15 km to the southeast has been dated at 4990 ± 70 years (GSC-2513; unpublished). The age of the shells is identical to the oldest date on shells from nearby Sabine Peninsula, northern Melville Island (GSC-1752, 10 200 ± 150 years; Barnett, 1973; GSC XIII, 1973, p. 45). Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

Ellesmere Island

Swinnerton Peninsula driftwood series

GSC-1791. Swinnerton Peninsula wood (I) 630 ± 50

Driftwood 40 cm long (sample HCA-72-26/7-6b; 12.3 g; **Picea** sp., identified by L.D. Farley-Gill) partially emplaced in a frost crack on a flight of rubbly beach berms on the south shore of Swinnerton Peninsula, Makinson Inlet, Ellesmere Island, Northwest Territories (77°18'N, 81°28'W), at an elevation of 20 m. Collected 1972 by D.A. Hodgson.

Comment (D.A. Hodgson): This sample presumably has been moved by man or some other agency, as buried driftwood from the same flight of raised beaches, at ca. 33 m, is 6100 ± 90 years old (GSC-1817; this list and Blake, 1975), and driftwood 18 km to the west at approximately 4 m a.s.l. is 2060 ± 50 years old (GSC-1836; this list). Date based on two 1-day counts in the 5 L counter.

GSC-1817. Swinnerton Peninsula wood (II) — 6100 ± 90, $\delta^{13}C = -21.9‰$

Driftwood (sample McCann-72-300; 13.05 g; **Picea** sp.; identified by L.D. Farley-Gill) half-buried in dry beach gravel at the foot of a talus slope, south side of Swinnerton Peninsula, Makinson Inlet, Ellesmere Island (77°17'N, 81°23'W), at an elevation of 32.7 m. Collected 1972 by R.B. Taylor, then at McMaster University, Hamilton; submitted by S.B. McCann of the same institution.

Comment (W. Blake, Jr.): This sample, together with GSC-1836 (2060 ± 50 years; this list) collected 18 km to the west, suggested that the 5000 year-old shoreline, with which pumice is commonly associated, should be at approximately the same level in inner Makinson Inlet as at Cape Storm on the south coast of Ellesmere Island (Blake, 1975). New collections made in 1977, including pumice, verified this hypothesis (Blake, 1978). Date based on two 1-day counts in the 5 L counter.

GSC-1836. Swinnerton Peninsula wood (III) — 2060 ± 50, $\delta^{13}C = -24.4‰$

A small driftwood log 1.2 m long (sample HCA-72-26/7-8B; 13.2 g; **Picea** sp.; identified by L.D. Farley-Gill) buried below 50 cm of beach rubble at the head of the western arm of Makinson Inlet, Ellesmere Island, Northwest Territories (77°19'N, 83°52'W), at an elevation of approximately 4 m. The log was exposed in a recent streamcut showing nearshore or beach fine sand covered by less than 50 cm of rubbly (storm?) beach deposits. Collected 1972 by D.A. Hodgson.

Comment (D.A. Hodgson): The sample was deposited immediately prior to the development of a 4.5 m (storm?) beach surface. It also aids in defining the altitude of the shoreline 5000 years ago (Blake, 1975). Date based on two 1-day counts in the 5 L counter.

Makinson Inlet series

GSC-1972. Makinson Inlet, north — 7330 ± 80, $\delta^{13}C = +1.6‰$

Aragonitic fragments and whole shells of marine pelecypods (sample McCann-73-302; 27.0 g; **Hiatella arctica**; identified by W. Blake, Jr.) from clayey silt exposed in a fresh river cut approximately 16 km north of the head of Makinson Inlet, Ellesmere Island, Northwest Territories (77°50'N, 81°50'W), at an elevation of ca. 36 m, according to a series of altimeter readings. The site is 5 km north of the ice-dammed lake which occupies the valley leading to the north arm of Makinson Inlet. Collected 1973 by S.B. McCann, McMaster University, Hamilton.

Comment (W. Blake, Jr.): This age determination shows that the sea had penetrated inland (more than 100 km from the outer east coast of Ellesmere Island) by about the same time that the inner part of Vendom Fiord had become ice free due to the sea opening up on the west side of Ellesmere Island (Hodgson, 1973; Blake, 1978; cf. GSC-1858, 7010 ± 80 years and GSC-1957, 6980 ± 90 years, this list). The sample also contained **Mya truncata, Portlandia arctica,** and fragments of marine algae. Date based on two 1-day counts in the 2 L counter.

GSC-2519. Swinnerton Peninsula — 8930 ± 100, $\delta^{13}C = +1.4‰$

Aragonitic shells (sample BS-77-256; 46.0 g; **Hiatella arctica;** identified by W. Blake, Jr.) from clayey silt at the base of a section of marine sediments exposed along a south-facing river draining into Piliravijuk Bay, the western arm of Makinson Inlet, Ellesmere Island, Northwest Territories (77°19.2'N, 82°01'W), at an elevation of approximately 40 m, as determined by several altimeter traverses. Collected 1977 by W. Blake, Jr. and R.J. Richardson.

Comment (W. Blake, Jr.): This determination indicates that the sea had reached the head of Piliravijuk Bay by approximately 9000 to 8900 years ago, well before the head of the north arm became free of glacier ice (cf. GSC-1972, 7330 ± 80 years, this list). This clayey silt unit also contained **Portlandia arctica,** and the paleomagnetic characteristics of the sediments have been described by Richardson (1978). Date based on two 1-day counts in the 5 L counter.

GSC-2645. Bentham Fiord — 8870 ± 180, $\delta^{13}C = +1.2‰$

Aragonitic pelecypod shells (sample BS-77-391; 9.7 g; **Mya truncata;** identified by W. Blake, Jr.) from the ground surface and in sandy debris among boulders on the slope north of the northernmost glacier entering the west side of Bentham Fiord, Ellesmere Island, Northwest Territories (77°10.4'N, 80°11'W), at an elevation of ca. 60 m, according to altimeter determinations. Collected 1977 by W. Blake, Jr. and R.J. Richardson.

Comment (W. Blake, Jr.): This date is in the range expected. Since it was known already that the sea had penetrated to the western arm (Piliravijuk Bay) of Makinson Inlet by 9000 to 8900 years ago (Blake, 1978), it is reasonable that an incursion of the sea into Bentham Fiord, on the south side of Makinson Inlet, also had taken place. Because of the small sample size, only the outer 10% was removed by HCl leach. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Vendom Fiord shell series

GSC-1858. Vendom Fiord shells (I) — 7010 ± 80, $\delta^{13}C = +1.7‰$

Marine pelecypod shells (sample HCA-72-28/7-1a; 28.0 g; **Hiatella arctica,** identified by D.A. Hodgson) exposed on the surface of a freshly undercut riverbank at an elevation of ca. 52 m, cliff top 54 m, 6 km east of the head of Vendom Fiord, Ellesmere Island, Northwest Territories (78°04'30"N, 82°06'W). The shells were well preserved, almost intact, some periostracum was present; they appear to have derived from rhythmically bedded sandy foreset beds below gravel topset beds. Collected 1972 by D.A. Hodgson.

GSC-1957. Vendom Fiord shells (II) — 6980 ± 90, $\delta^{13}C = +1.9‰$

Marine pelecypod whole shells and fragments (sample HCA-72-30/7-1B; 45.0 g; **Hiatella arctica,** identified by W. Blake, Jr.) from the surface of silt and fine sand marine sediments, 8 km northeast of the head of Vendom Fiord, Ellesmere Island, Northwest Territories (78°07'N, 82°10'W), at an elevation of 48 to 53 m. The surface of the marine sediments rises to a coarse topset or channel deposit at 63 m, which probably postdates the marine phase. Collected 1972 by D.A. Hodgson.

Comment (D.A. Hodgson): These age determinations provide a minimum date for the retreat of the late Quaternary ice lobe which occupied the valley north of Vendom Fiord (Hodgson, 1973). GSC-1858 mixed with dead gas for counting; date based on one 3-day count in the 5 L counter; GSC-1957 based on two 1-day counts in the 5 L counter.

Vendom Fiord wood series

GSC-1789. Vendom Fiord wood (I) >36 000

Driftwood 20 cm long (sample HCA-72-27/7-5c; 11.85 g; **Larix** sp.; identified by L.D. Farley-Gill) on the surface of a flight of rubble and shingle beach berms at the head of Vendom Fiord, Ellesmere Island, Northwest Territories (78°05'N, 82°24'W), at an elevation of 5 m. Collected 1972 by D.A. Hodgson.

GSC-1832. Vendom Fiord wood (II) >30 000

A twig 18 cm long (sample HCA-72-29/7-2; 2.4 g; **Salix** sp., identified by L.D. Farley-Gill) exposed in a freshly undercut riverbank at an elevation of 62.5 m, cliff top 65 m, 4 km east of the head of Vendom Fiord, Ellesmere Island, Northwest Territories (78°02'N, 82°13'W). The sample, which retained some bark, is part of a placer deposit of organic material within sandy gravel deltaic topset beds. Collected 1972 by D.A. Hodgson.

GSC-1942. Vendom Fiord wood (III) >23 000

A twig 8.5 cm long (sample HCA-72-28/7-1c; 2.2 g; **Salix** sp., identified by L.D. Farley-Gill) exposed in a freshly undercut riverbank at an elevation of 52 m, cliff top 54 m, 6 km east of the head of Vendom Fiord, Ellesmere Island, Northwest Territories (78°04'30"N, 82°06'W). The sample was found in rhythmically bedded sandy foreset beds below gravel topset beds. Collected 1972 by D.A. Hodgson.

Comment (D.A. Hodgson): The twigs were found in association with placer lignite and coal, and all three samples, though not mineralized, resembled material found in accumulations of wood in possible Beaufort Formation age sediments of central Ellesmere Island. The age determinations indicate that caution must be observed in sampling mixed peat deposits in this region (Hodgson, 1973). This material has been reworked, as the driftwood of GSC-1789 is well below the Holocene marine limit (ca. 70 m), and shells found in the same unit as GSC-1942 are Holocene in age (GSC-1858; 7010 ± 80 years; Hodgson, 1973; this list). GSC-1832 and -1942 mixed with dead gas for counting. Date GSC-1789 based on two 1-day counts in the 5 L counter; GSC-1832 based on one 3-day count in the 2 L counter, and GSC-1942 based on three 1-day counts in the 2 L counter.

Nansen Sound

GSC-1793. Nansen Sound Modern
$\delta^{13}C = -22.4‰$

Wood (sample H.S. 1; 10.2 g; **Picea** sp.; identified by L.D. Farley-Gill) found on the surface of multi-year sea ice at Station 42, near the north end of Nansen Sound, Northwest Territories (81°22'N, 92°30'W). The sample was cut from the end of a dry log 1.3 m long (with root structure) and 0.35 m in circumference. Collected 1971 by H. Serson, then Defence Research Establishment (DRE), Ottawa, now Defence Research Establishment Pacific, Victoria, British Columbia; submitted by G. Hattersley-Smith, then DRE Ottawa, now at Cranbrook, Kent, England.

Comment (J.A. Lowdon): A date of 0 ± 50 years can be calculated for this sample. The $\delta^{13}C$ correction amounts to an additional +40 years, but no correction has been applied as the sample showed "post-bomb" activity.

Comment (W. Blake, Jr.): Rather rarely are driftwood logs reported on pack ice, and this is the first such sample from the Canadian Arctic Archipelago that has been "dated" by ^{14}C. This sample obviously has been living within the last two decades (cf. Blake, 1975). Date based on two 1-day counts in the 5 L counter.

Ellef Ringnes Island

GSC-2383. Jackson Bay 7690 ± 120
$\delta^{13}C = +3.0‰$

Aragonitic marine pelecypod shells (sample HCA-76-3/8-7; 12.4 g; **Mya truncata**, identified by D.A. Hodgson) exposed in a riverbank at an elevation of 25 m, cliff top 33 m, 11 km north of Jackson Bay, Ellef Ringnes Island, Northwest Territories (78°12.25'N, 100°46.75'W). The sample was taken from the base of a 5 m-thick silty clay marine unit, overlain by silty and sandy nearshore or deltaic sediments and underlain by a thin gravelly sand unit and by bedrock. Collected 1976 by D.A. Hodgson.

Comment (D.A. Hodgson): Dating was carried out on four valves with most of the periostracum still intact. The Holocene marine limit is estimated to be ca. 60 m in the vicinity. This sample indicates that three samples from 50 km to the southeast (L-643A, 8500 ± 200 years, surface shells at 33 m (St-Onge, 1965); GSC-999, 8320 ± 140 years, driftwood at 25 ± 5 m (Blake, 1970); and GSC-1846, 8370 ± 200 years, surface shells at 32 m (Blake, 1970)) were collected from below their contemporaneous sea levels (Hodgson, 1977). Because of the small sample size, only the outer 10% was removed by HCl leach. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

King Christian Island

GSC-2386. Bardin Point 8940 ± 140
$\delta^{13}C = +2.9‰$

A single large valve of the marine pelecypod **Mya truncata** (sample HCA-76-19/7-8A; 11.2 g; identified by D.A. Hodgson) from the ground surface 10 km north-northeast of Bardin Point, King Christian Island, Northwest Territories (77°45.25'N, 101°37.25'W), at an elevation of 43 m. The sample was taken from one of a number of clusters of **Mya truncata** valves in silty clay marine sediment which extends to an elevation of 48 m at this location. The sample also contained **Hiatella arctica**. Collected 1976 by D.A. Hodgson.

Comment (D.A. Hodgson): Dating was carried out on a single, large, thin valve (7.5 cm long, 5 cm high), which still had some periostracum attached; the shell material was aragonite. This age determination indicates a Holocene marine limit of at least 48 m a.s.l. (Hodgson, 1977). Furthermore, three samples from north of Cape Nathorst, Ellef Ringnes Island, 50 km to the east-northeast (see GSC-2383, this list) appear to have been collected from well below contemporaneous sea levels. Because of the small sample size, only the outer 10% was removed by HCl leach. Sample mixed with dead gas for counting. Date based on one 3-day count in the 2 L counter.

Greenland

GSC-2279. Adam Gletscher 4190 ± 140

Fragments of marine pelecypods (sample GGU-215308; 5.5 g; unidentified shell fragments plus **Mya truncata, Mya** sp., **Hiatella arctica;** identified by W. Blake, Jr.), from till on the distal side of the outermost (Neoglacial) moraine, east side of Adam Gletscher at the head of J.P. Koch Fjord, Pearyland, Greenland (82°21.2'N, 40°51°'W), at an estimated elevation of 2 to 3 m. The highest parts of the moraine are ca. 10 m a.s.l. Collected 1975 by A. Weidick, Geological Survey of Greenland, Copenhagen, Denmark.

Comment (W. Blake, Jr.): Adam Gletscher has re-advanced to its present position sometime after 4000 years B.P. Weidick (1976, p. 32) states "The Holocene recession of the Inland Ice and the local ice caps in Greenland generally seems to have continued until the glaciers were smaller than at present. The readvances after 6000 B.P. brought the margins to their present limit..." Because of the small sample size the HCl leach was omitted. Sample mixed with dead gas for counting. Date based on two 1-day counts in the 2 L counter.

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INDEX