



GEOLOGICAL
SURVEY
OF
CANADA

DEPARTMENT OF ENERGY,
MINES AND RESOURCES

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RADIOCARBON DATES XII

J. A. Lowdon
R. Wilmeth
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FOREWORD

The present date list, GSC XII, is the first to be published directly in the Geological Survey's Paper series. Previous lists 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 GSC VII to XI (1968 to 1971) were reprinted with the same pagination.

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ABSTRACT

Forty-five radiocarbon age determinations on archeological samples made by the Radiocarbon Dating Laboratory are reported. They are on samples from various areas as follows: Newfoundland, including Labrador (12); New Brunswick (7); Quebec (2); Ontario (8); Manitoba (2); Alberta (5); British Columbia (7); Northwest Territories - Mainland (1); Northwest Territories - Arctic Archipelago (1). Many of the dates reported have been corrected for isotopic fractionation. Details of background and standard for all three counters during the period from October 1970 to September 1971 are summarized in tables. Another table provides a comparison of results on charcoal samples utilizing different pretreatments. For the Swan River site, Manitoba, dates on organic sediment and bone are compared and show excellent agreement.

RÉSUMÉ

L'auteur rend compte de quarante-cinq datations au radiocarbone effectuées sur des échantillons archéologiques par le laboratoire de datation au radiocarbone. Ces échantillons proviennent de différentes régions: Terre-Neuve, y compris le Labrador (12); Nouveau-Brunswick (7); Québec (2); Ontario (8); Manitoba (2); Alberta (5); Colombie-Britannique (7); Territoires du Nord-Ouest continentaux (1); Territoires du Nord-Ouest - archipel arctique (1). Plusieurs des dates enregistrées ont été corrigées pour tenir compte du fractionnement isotopique. Les détails concernant les données particulières et la norme pour les trois compteurs pendant la période d'octobre 1970 à septembre 1971 sont résumés dans les tableaux. Un autre tableau porte sur la comparaison de résultats d'analyse d'échantillons de charbon de bois qui ont subi différents traitements préalables. En ce qui concerne le site de Swan River, au Manitoba, l'auteur compare les datations de sédiments organiques et d'os; ces datations concordent parfaitement.

INTRODUCTION*

During 1970-1971, the 1-L (Lowdon *et al.*, 1971) and 2-L (Dyck and Fyles, 1962) counters were operated for a period of six months each. The 5-L counter (Dyck *et al.*, 1965) was operated throughout the year. The 1-L counter was operated at 1 atm, the 2-L at 2 atm, and the 5-L at 1 atm.

Throughout the year considerable difficulty was experienced with the 2-L counter. On three occasions the counter broke down and had to be reconstructed. The cause of the problem is unsolved. Finally, a new 2-L counter was constructed and put into operation in August, 1971. The design of this counter is the same as the original one (Dyck and Fyles, 1962). Both the background and standard counting rates varied considerably between the two 2-L counters although, on a monthly basis, counting rates were within statistical limits.

Age calculations are carried out monthly by a C.D.C. 3100 computer and are based on a C^{14} half-life of 5568 ± 30 yrs. 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. Age errors include: counting errors of sample, background, and standard; error in the half-life of C^{14} ; and an error term to account for the average variation of $\pm 1.5\%$ in the C^{14} concentration of the atmosphere during the past 1100 yrs. The error assigned to an age is always a minimum of ± 100 yrs. Unless otherwise stated in the sample descriptions, all ages are based on two 1-day counts. Finite dates are based on the 2σ criterion (95.5% probability) and "infinite" dates on the 4σ criterion (99.9% probability).

Average background and standard counting rates over the past 12 months are listed in Tables 1 and 2, respectively.

For all three counters, the monthly backgrounds are the average of four individual daily counts. During the six months the 1-L counter was operated, seven different background preparations were used, and one count had to be omitted for statistical reasons. During the six months that the 2-L counter was in operation, 14 different background preparations were used but, because of counter malfunction, five results had to be omitted. Results of samples counted at these times were not used, and the samples were recounted later. With respect to the 5-L counter, in the 12-month period 12 different preparations were counted, and one result had to be omitted for statistical reasons.

*Prepared by the first author, who operates the laboratory. The date list has been compiled by the second and third authors from descriptions of samples and interpretations of dates by the collectors.

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TABLE 1

Monthly background (c/m) for period
October 1, 1970 to September 30, 1971

Month	2-L Counter (2 atm)	5-L Counter (1 atm)	1-L Counter (1 atm)
October, 1970	1,312 ± .048	2,258 ± .026	
November		2,298 ± .026	1,300 ± .021
December		2,322 ± .026	1,327 ± .021
January, 1971	1,583 ± .047	2,285 ± .055	
February		2,253 ± .043	1,302 ± .024
March		2,333 ± .029	1,328 ± .023
April		2,198 ± .027	1,262 ± .019
May	1,181 ± .024	2,239 ± .027	
June	1,109 ± .022	2,165 ± .028	
July		2,091 ± .036	1,271 ± .020
August	1,207 ± .018	2,083 ± .033	
September	1,242 ± .069	2,109 ± .028	

TABLE 2

Monthly standard, N_o^* , (c/m) for period
October 1, 1970 to September 30, 1971

Month	2-L Counter (2 atm)	5-L Counter (1 atm)	1-L Counter (1 atm)
October, 1970	19,521 ± .105	28,823 ± .118	
November		28,708 ± .127	4,484 ± .047
December		28,841 ± .102	4,422 ± .047
January, 1971	17,576 ± .107	28,723 ± .132	
February		28,902 ± .247	4,428 ± .063
March		28,701 ± .120	4,373 ± .055
April		28,753 ± .123	4,411 ± .055
May	15,736 ± .087	28,641 ± .132	
June	15,677 ± .128	28,783 ± .117	
July		28,869 ± .116	4,435 ± .052
August	16,224 ± .087	28,643 ± .121	
September	16,389 ± .110	28,466 ± .166	

* $N_o = 0.95 \times$ net counting rate of the NBS oxalic acid standard.

TABLE 3

Comparison of results on charcoal samples using different pretreatment methods

Sample no.	Laboratory dating no.*	Original sample weight (g)	Pretreatment	Final sample weight (g)	Counter(L)	Counting Time	Uncorrected C ¹⁴ Age (yrs)	δC ¹³ (‰)**	Corrected C ¹⁴ Age (yrs)
NMC-281	GSC-1439	15	Visible rootlets removed by hand, cold NaOH 5 min., distilled H ₂ O rinses.	8	5	one 3-day	2220 ± 130	-25.6	2220 ± 130
NMC-281	GSC-1439-2	11.4	Nitration and acetone leaching (as per Haynes, 1966).	2.7	1	one 4-day	2250 ± 170	-25.5	2240 ± 170
NMC-280	GaK-1877	-	No base, boiling 2N HCl 5-10 min., distilled H ₂ O rinses.	-	-	-	2480 ± 100	-	-
NMC-431	GSC-1544	8	Visible rootlets removed by hand, hot NaOH 15 min., distilled H ₂ O rinses.	6.5	5	two 1-day	860 ± 130	-22.6	900 ± 130
NMC-431	GSC-1544-2	11	Same as GSC-1439-2.	7.8	5	two 1-day	870 ± 130	-21.9	920 ± 130

* Detailed descriptions of both GSC samples appear in this date list. Determination GSC-1439 was carried out as an inter-laboratory check on GaK-1877, a determination by Gakushuin University, Tokyo, Japan (Kigoshi et al., 1973). Both NMC samples are from the same site and stratum; different numbers were assigned only because the sample was put into two bags.

** δC¹³ values determined by Geochronology Section, Regional and Economic Geology Division, Geological Survey of Canada.

For all three counters the monthly standards are the average of three individual daily counts. For the 1-L counter, four individual oxalic acid preparations were used and no result had to be omitted. For both the 2-L and 5-L counters, five individual preparations were used and no result had to be omitted.

No changes have been made in the routine CO₂ pretreatment, preparation, and purification techniques described in previous GSC date lists (Lowdon et al., 1969; Lowdon and Blake, 1970).

In this date list, where C¹³/C¹² ratios are available, a correction for isotopic fractionation has been applied to the date, and the δC¹³ value is reported. Related to the PDB standard, the "normal" values used for correction are δC¹³ = -25.0‰ for wood, other terrestrial organic material and bones (terrestrial and marine), and 0.0‰ for marine shells. The C¹³/C¹² ratios reported were determined by either Teledyne Isotopes, Westwood, New Jersey, or the GSC Geochronology Section (Head, R.K. Wanless) on aliquots of the same sample gas used for age determination.

Table 3 compares ages obtained by different methods of sample pretreatment on charcoal (see Lowdon et al., 1970).

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Thanks are extended to I.M. Robertson and Mrs. S. Chartrand for assistance in preparation and measurement of samples in the laboratory, to K. Santowski for the GSC δC¹³ determinations, and to Mrs. G. Mahony for assistance in compilation. The new 2-L counter was fabricated in the GSC Instrumental Development Shop by G.A. Meilleur.

ARCHEOLOGICAL SAMPLES

Eastern Canada

Newfoundland

GSC-1411. DjAq-5 site 100±130
A.D. 1850

Wood charcoal and wood (NMC-386) from site DjAq-5, Back Harbour, Twillingate, Newfoundland (49° 39'20"N., 54° 46'40"W.). From shallow hearth ca. 8 to 13 cm below surface, Excavation Unit Trench 8, in association with fire-cracked cooking stones and broken stone artifacts. Matrix was orange ash, burnt soil and unburnt soil. Cultural assemblage is distinguished by well-developed stone grinding technology and a red ochre burial pattern. Site is small camp and workshop related to Maritime Archaic. Site location was originally on small point protruding into a pond, which is now a marsh. Several other small camps and a cemetery of same culture are within 0.8 km of site. Cemetery (Curtis site, DjAq-1) previously dated by four charcoal samples, three of which ranged in age from 1770 to 1250 B.C. (GaK-1254, 3200 ± 90 yrs.; Wilmeth, 1969; Gakushuin VII, p. 323-324; GSC-758, 3560±140 yrs. and GSC-834, 3720±130 yrs.; both in GSC VIII, p. 24) and one

anomalously old date (6920 ± 160 yrs., GaK-1266; Wilmeth, 1969; Gakushuin VII, p. 323-324). It was hoped that dating of NMG-386 would help confirm relationship in time between cemetery and camp sites, which are related spatially and stylistically. If age difference is considerable, new studies regarding time depth of this culture and its duration will have to be initiated. Est. age 1700 to 1200 B.C. Coll. 1969 by D. MacLeod, then at Natl. Mus. of Man, Ottawa; now at Ontario Dept. Lands and Forests, Toronto; subm. by R. Wilmeth.*

Comments (R. W.): shallow depth of hearth suggests historic re-use of this Archaic site; (W.B., Jr.): sample (8.3 g) was clean; only a few tiny rootlets remained.

GSC-1367. East Pompey Island 1 site
2520 \pm 160
570 B.C.
 $\delta C^{13} = -23.0\%$

Charcoal from areas 1 and 2 (on either side of small pond) East Pompey Island 1 site (GcBi-12, Hamilton Inlet, Labrador ($54^{\circ} 27'N.$, $57^{\circ} 24'W.$)). Sample not from a specific archeological feature but from cultural layers generally 15 to 41 cm beneath tundra surface, at alt. 7.1 to 8.5 m. A peaty zone 5 to 20 cm thick overlies cultural deposit. Sample should date Dorset assemblage from site which is similar in all respects to collection Ticoralak 5, dated at 450 B.C. (2400 ± 160 yrs. B.P.; GSC-1314; this list). Est. age 300 B.C. Coll. and subm. by W.W. Fitzhugh, then at Harvard Univ., Cambridge, Mass., now at Smithsonian Inst., Washington, D.C.

Comments (W. W. F.): date is within general framework of other Dorset site dates in area and re-emphasizes early period of Dorset occupation in Groswater Bay. Site alt. is above that of nearby Rattlers Bight 1 Maritime Archaic site (6.7 m) and indicates site's remoteness from active beach line during its occupation (Fitzhugh, 1972); (W.B., Jr.): rootlets picked out by submitter; sample received by lab. was clean charcoal pieces up to 2 cm long. NaOH-leach omitted from pretreatment due to small size (3.2 g). Sample mixed with dead gas for counting.

Rattlers Bight series

Charcoal from Rattlers Bight 1 (GcBi-7) site on N.E. shore of Groswater Bay, Hamilton Inlet, Labrador ($54^{\circ} 27'N.$, $57^{\circ} 26'W.$). Site on tombolo beach at alt. 6.7 m.

GSC-1260. Rattlers Bight 1 site, Sq. ON-35W
3850 \pm 140
1900 B.C.
 $\delta C^{13} = -24.1\%$

Charcoal from Sq. ON-35W, in hearth 8 to 18 cm beneath surface of site in undisturbed deposit containing Maritime Archaic artifacts, burned

* All persons referred to as collectors or submitters of samples or cited as sources of data are, unless otherwise specified, with the National Museum of Man, one of the National Museums of Canada.

food bones, and red ochre. Should date an early occupation of tombolo beach after its emergence. Est. age A.D. 300. Coll. 1969 by S.L. Cox for W.W. Fitzhugh; subm. by Fitzhugh.

Comment (W.W.F.): first age determination on Maritime Archaic GcBi-7 site at Rattlers Bight. Est. age was based on predicted rate of uplift in outer Groswater Bay from data available for Lake Melville 80 to 160 km to the west. Archeological considerations suggested site should be much earlier, in second millenium B.C. Date is compatible with archeological evidence and forces re-evaluation of uplift rate in outer Groswater Bay. Isostatic adjustment was less than in western part of Hamilton Inlet and was completed earlier (Fitzhugh, 1972). NaOH-leach omitted from pretreatment of clean (rootlets removed by submitter) but small sample (3.8 g). Sample mixed with dead gas for counting.

GSC-1379. Rattlers Bight 1 site, Sq. ON-5E
4020±150
2070 B.C.
 $\delta C^{13} = -22.8\%$

Charcoal from scattered hearth deposit, 5 to 15 cm beneath tundra surface at north end of site (Sq. ON-5E, N. datum), associated with burned sand containing archeological remains of Maritime Archaic culture, burned food bones, and red ochre stains. Est. age 1800 B.C. or slightly earlier based on GSC-1260 and fact that northern end of site might have been occupied slightly earlier than central portion from which GSC-1260 was taken. Coll. and subm. by W.W. Fitzhugh.

Comment (W.W.F.): date is consistent with GSC-1260 and cultural analysis. It suggests that Maritime Archaic peoples moved to site soon after its emergence from sea. Site defines Rattlers Bight Phase of Maritime Archaic Culture in Hamilton Inlet (Fitzhugh, 1972). Two other dates on same phase (at Rattlers Bight 1 site) are SI-929 (4525±155 yrs.; charcoal sample 2 from hearth 2, Sq. 62N-36E, depth 28 cm under large slab cooking rock) and SI-932 (3890±145 yrs.; a charcoal sample from hearth in Sq. 60N-14E, beneath peat and rotting slab of hearth rock 12-18 cm below surface). Due to small size (3.9 g) of GSC-1379, NaOH-leach omitted from pretreatment of clean charcoal (rootlets removed by submitter). Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-1196. Point Revenge site
760±130
A.D. 1190
 $\delta C^{13} = -22.4\%$

Charcoal (NMC-314) from Point Revenge site (GbBm-1), on barren point with tundra vegetation, north side of Big Island, Labrador (54° 18'N., 58° 02'30"W.). From hearth containing chipped stone debris and some burnt bone, S.W. corner Sq. 48S-12E. Sample within cultural zone, overlain by 2.5 to 5 cm of sterile peat, and overlying sterile sand, in Area B, alt. 2.7 m. Associated points have convex bases, corner-notching, and general triangular shape, found in Area B only. Cultural phase not previously known from interior. Assemblage consists almost entirely of Ramah Quartzite. Bird (1945) described "Stone Culture Lodge" with similar points, and sporadic finds reported from Labrador coast. Est. age A.D. 1200±200. Coll. 1968 by W.W. Fitzhugh; subm. by R. Wilmeth.

Comment (W. W. F.): site is coastal Indian probably belonging to same cultural phase as Henry Blake 1 site at North West River, where a "bone-apatite" date on burned food bones (300 g) was A.D. 1055 (895±105 yrs. B. P.; GX-1578; Fitzhugh, 1972). Importance of culture lies in its presence in both interior and on coast at time of possible Viking contact. Thule Culture was conspicuously absent on central Labrador coast at this time. Harp (1963) has similar points from Blanc-Sablon 4, Quebec coast just S. W. of Labrador, dated at A.D. 690 (1260±46 yrs., P-686, Harp and Hughes, 1968; same date given as A.D. 727, 1223±45 yrs., in Pennsylvania IX, p. 361); similar points also are found in Middle Woodland context farther south. Pretreatment of 9 g sample included cold NaOH-leach. Date based on one 3-day count.

Ticoralak Island series

GSC-1179. Ticoralak 2 site 2690±140
740 B.C.
 $\delta C^{13} = -23.1\%$

Charcoal (NMC-315) from Ticoralak 2 site (GbBn-2), east side of elevated beach sequence on west side of Ticoralak Island, Hamilton Inlet, Labrador (54° 16'40"N., 58° 13'30"W.), at alt. ca. 9.5 m. Composite sample from several squares in area ca. 1.8 m in diam. Cultural deposit only 2.5 to 5 cm thick, with charcoal distributed from within 2.5 cm of surface to sterile gravel below. Sample associated with scattered hearth remains. Small, brief Dorset occupation. Sequence of Dorset camps in area apparently related to relic beach levels. Sample should date an intermediate stage of Dorset Culture in Labrador. Est. age A.D. 1 ±200. Coll. 1968 by W. W. Fitzhugh, G. Conrad and P. Wells; subm. by R. Wilmeth.

Comment (W. W. F.): date is earlier than expected, but it is consistent with other radiocarbon dated Dorset sites in area, and it is highest of three dated sites on raised beaches at Ticoralak. Small tool sample makes cultural comparison difficult; site is most significant for anchoring early end of local Dorset sequence and in demonstrating its early presence in Labrador. It appears to represent an early expansion of Dorset to central and southern Labrador coast from its ancestral, pre-Dorset culture in northern Labrador. Some rootlets removed by hand in lab. Due to small sample size (10 g) NaOH-leach omitted from sample pretreatment.

GSC-1217. Ticoralak 3 site 2380±140
430 B.C.
 $\delta C^{13} = -22.3\%$

Charcoal (NMC-317) from Ticoralak 3 site (GbBn-4), east side of elevated beach sequence on west side of Ticoralak Island (54° 16'40"N., 58° 13'30"W.), at alt. 8.5 to 8.8 m. Composite sample from Sqs. 162E-24N and 162E-30N. Cultural deposit containing charcoal was thin and within ca. 2 to 5 cm of surface. Some charcoal was found under rocks or in small depressions, always overlying sterile gravel. No definite hearth could be located although rock concentrations suggest charcoal came from such a feature now disturbed beyond recognition. A new point type suggesting new

cultural influences was found. Within 6 m is an Indian site. Sample should postdate Ticoralak 2E and Ticoralak 2, which are slightly earlier. Est. age A.D. 400 ± 200. Coll. 1968 by G. Conrad and P. Wells for W. W. Fitzhugh; subm. by R. Wilmeth.

Comment (W. W. F.): Ticoralak 3 also represents a small Dorset site. Tool assemblage is small, but certain common Dorset types, such as the triangular "tip-fluted" point, are absent. Site documents a regional variant of Dorset in early to middle period of Dorset occupation in central Labrador. Site alt. is intermediate in range of Dorset sites on Ticoralak beach series. Date is earlier than expected, but it is consistent with other local Dorset sites and with geological evidence. Rootlets removed by hand. Pretreatment of sample (11 g) included cold NaOH-leach. Sample mixed with dead gas for counting.

GSC-1314. Ticoralak 5 site

2400 ± 160
450 B.C.

Charcoal sample from hearth in Ticoralak 5 (GbBn-7) site on Ticoralak Island (54° 16'N., 59° 12.5'W), at alt. 7.3 m. Found in a shallow cultural zone 2.5 to 7.5 cm below tundra surface; Sq. 6, 2ON-OW from Tic-5 datum. During occupation of site shoreline was probably between 6 to 6.7 m above present sea level, as judged by local topography and site position. Should date middle to late period of Dorset Culture in Hamilton Inlet. Est. age A.D. O. Coll. by G. Weil for W. W. Fitzhugh; subm. by Fitzhugh.

Comment (W. W. F.): Ticoralak 5 is at lowest alt. of any Dorset site yet found in Hamilton Inlet region, and its age was earlier than anticipated. However, in light of other dates received for local Groswater Bay Dorset sites, this determination is not anomalous. Cultural assemblage found with charcoal sample includes most features of other sites of this local Dorset variant. Of all sites dated at Ticoralak this one allows most accurate estimate of shoreline position at time of occupation (Fitzhugh, 1972). Rootlets removed by submitter. NaOH-leach omitted from pretreatment of small but clean sample (2.2 g). Sample mixed with dead gas for counting.

GSC-1210. Eskimo Island 1 site

2160 ± 130
210 B.C.
 $\delta C^{13} = +0.6\text{‰}$

Marine pelecypod shell fragments (Mytilus edulis) (NMC-309) from Eskimo Island 1 site (GaBp-1), S. W. end of The Narrows, Lake Melville, Labrador (54° 03'N., 58° 30'W.), at alt. 7.3 ± 0.3 m. From below basal peat deposit containing historic Eskimo midden debris. Shell deposit covers large area near highest point on Eskimo Island. Material is fragmented and occurs on bedrock in bed ca. 12.5 cm thick. Sample, with other geological and archeological samples, may permit construction of postglacial emergence chronology to aid interpretation of archeological sites. Highest point on island, at alt. 9.1 m, is 46 m west of sample site. Island probably not suitable for habitation until fairly recently, thus explaining absence of other, earlier occupations. In other respects, island is ideal winter sealing site. Est. age 400 B.C. ± 400. Coll. 1968 by W. W. Fitzhugh; subm. by R. Wilmeth.

Comment (W.W.F.): this geological sample aids in interpretation of local archeological sequence. Eskimo Island is ca. 32 km S.W. of Ticoralak Island, where small Dorset occupations at alt. 9.5 and 8.8 m date, respectively, 740 B.C. (2690±140; GSC-1179) and 430 B.C. (2380±140; GSC-1217; both in this list). Therefore, geological date corresponds well with archeology. Date based on one 3-day count.

GSC-1280. Red Ochre site
3090±180
1140 B.C.
 $\delta C^{13} = -23.7\%$

Charcoal from hearth in Red Ochre site (FjCa-38) on Little Lake side of North West River, Labrador (53° 33'N., 60° 10'W.), at alt. ca. 24 m. Sample (charcoal flecks and pieces) from 15 to 20 cm beneath forest floor among fire-burned sand and rocks mixed with cultural debris and red ochre stains. Burned roots from forest fires also occurred in deposit but generally could be picked out during sampling; nevertheless there is some possibility of contamination. Available data on uplift at North West River suggests this site could not have been occupied earlier than 1500-1800 B.C. (cf. GSC-1135, 5330±170 yrs.; Mytilus edulis fragments at ca. 33m; Fitzhugh, 1972; GSC XI, p. 263).

Comment (W.W.F.): date was slightly younger than expected. Based on cultural sequence at North West River, this site should follow Maritime Archaic occupation and precede Charles Complex which is dated at Hound Pond site (GcBi-16), Groswater Bay, at 1245 B.C. (3195±120 yrs.; SI-927) and 1145 B.C. (3095±105 yrs.; SI-928; both dates on charcoal in hearth, alt. 12.2 m; Fitzhugh, 1972). Red Ochre site dates Brinex Complex in North West River. A date of ca. 1300 B.C. would have been more amenable. Site contained distinctive side-notched, convex-based bifaces, small triangular bifaces, and grinding implements. Rootlets picked out by submitter. Small sample size (3 g) precluded NaOH-leach. Sample mixed with dead gas for counting.

Thalia Point series

Samples from Thalia Point 2 site (HfCi-2) on Tikkeratsuk, north of Nain, Labrador (57° 00'N., 61° 21'W.).

GSC-1264. Thalia Point 2 site, area 19
3700±140
1750 B.C.
 $\delta C^{13} = -22.3\%$

Charcoal, at depth 7.6 to 22.9 cm, from test pit in area 19, alt. 11.3 m. Sample was hearth charcoal in situ with flakes of chert, pre-Dorset artifacts, and charcoal-stained sand. Surface vegetation included tundra mosses and grasses. Blowouts had disturbed part of site, but not area 19. Sample should date late pre-Dorset to early Dorset period of occupation when shoreline was ca. 11 to 9 m above present sea level, as cove became unsuitable for habitation at lower sea level. Est. age 800 B.C. Coll. 1969 and subm. by W.W. Fitzhugh.

Comment (W. W. F.): in 1969 pre-Dorset culture was first discovered in Labrador, both at Saglek by J. A. Tuck, Memorial Univ., St. John's, and at Thalia Point. So far (end of 1971) no sites of this culture have been found south of Nain. Sample age was earlier than expected, but is considered a valid indicator of early arrival of Arctic Small Tool tradition culture in northern Labrador. Sample was associated with unpolished burins and large, stemmed bifaces. Surface collections taken from near sample area included small Ramah chert side-notched points and small triangular bifaces of same material. These appear to be a second component of early Dorset culture above pre-Dorset level from which sample was taken; however there was no stratigraphic indication other than depth on which distinction could be based. NaOH-leach omitted due to small size of clean sample (3.3 g). Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-1381, Thalia Point 2 site, area 25
2540 ± 160
590 B.C.
 $\delta C^{13} = -22.9\%$

Charcoal from test pit in area 25 in seemingly undisturbed deposit, alt. 10.4 m. Cultural deposit extended 5 to 25 cm below tundra surface in direct association with Dorset culture artifacts, stains of burned and decaying bone, and fire-cracked rock. Should date early period of Dorset culture in northern Labrador, probably ca. 800 B.C., and represents terminal occupation of cove. Associated artifacts include double side-notched polished nephrite knife, microblades, eared end scrapers, polished burin-like tools, and a corner-notched biface knife. Coll. 1969 by S. L. Cox for W. W. Fitzhugh; subm. by Fitzhugh.

Comment (W. W. F.): area 25 test excavation appears to be a single component Dorset station without contamination from upslope pre-Dorset materials. Date is in agreement with other dates obtained from early Dorset in Saglek, northern Labrador by J. A. Tuck. Artifact sample, though small, is similar to collections from Dorset sites of same age in Hamilton Inlet, Labrador (this list). Small sample size (4.1 g) precluded NaOH-leach. Sample mixed with dead gas for counting.

New Brunswick

McAleenan site series

Charcoal and shell from McAleenan site (BhDr-1), on property of Mrs. H. McAleenan, north end of Digdeguash Harbour, New Brunswick (45° 10' 30" N., 66° 57' W.), at alt. <1 m. Site is small, shallow midden of apparently single component. Associated materials include slender corner-notched and corner-removed points; small end scrapers; cord-wrapped stick-decorated ceramics; excellent faunal preservation. Coll. 1969 by J. Keenlyside for D. Sanger, then Natl. Mus. of Man, Ottawa; now Univ. of Maine, Orono, Maine; subm. by R. Wilmeth.

GSC-1313. McAleenan site, charcoal 680±160
A.D. 1270

Charcoal (NMC-366; 2.2 g) from shallow single component site in unit N 11-12, W 11-12. No rock hearth association, surrounding area full of burned fish bones. Sample from area 15 x 10 cm at N 12, W 11.50 m, at 25 cm depth below surface. Dated to assist chronological placement of similar materials elsewhere in New Brunswick. Est. age 800 to 1000 yrs.

GSC-1292. McAleenan site, shell 500±130
A.D. 1450
 $\delta C^{13} = +2.9\%$

Shell collection (NMC-367) is random selection of pelecypods from midden, but only one large right valve (8.5 cm long, 5 cm high; 25.9 g), prob. Mya arenaria, subm. for dating.

General Comment (D.S.): dates are satisfactory in that they tend to suggest that marine shells can be used with confidence in Passamaquoddy Bay area. Dates are a little later than anticipated, although currently there are no other dates on similar material on which to base an earlier placement. NaOH-leach omitted from pretreatment of GSC-1313; sample mixed with dead gas for counting.

Minister's Island series

Sample from Minister's Island site (BgDs-10), south shore Minister's Island, New Brunswick (45° 06'N., 67° 03'W.). Shell midden spanning long time range, from Late Archaic to late prehistoric occupations, ca. A.D. 1000. Previous date on charcoal of 420 B.C. (2370±80 yrs., Y-1293; Yale IX, p. 602) was obtained from R. Pearson, Coll. 1970 by J. Burns (shells), W. Russell, J. Benmouyal and J. Lavoie (other samples) for D. Sanger; subm. by R. Wilmeth.

GSC-1452. Minister's Island, 410±130
A.D. 1540
top of shell column C

Soft shell clam, Mya arenaria (NMC-402; 48.4 g), from directly beneath plough zone at N 15, W 41, 15 to 20 cm below surface, alt., ca. 1.5 m above high tide level. Sample dates top of shell column and: 1) gives terminal date on site at that point; 2) should confirm pre-Norse (?) occurrence of Littorina littorea species in North America (cf. Clarke and Erskine, 1961; Spjeldnaes and Henningsmoen, 1963; Clarke, 1963). Est. age 800 to 1000 yrs.

GSC-1445. Minister's Island, 650±130
A.D. 1300
mid-point of shell column C

Soft shell clam (NMC-403; 48.7 g) from N. 15, W. 41; 35 to 40 cm below surface. Sample dates mid-point of shell midden and several Littorina littorea at same level. Est. age 1200 to 1500 yrs.

GSC-1580. Minister's Island, Feature 5 580±210
A.D. 1370

Charred wood product (?) (NMC-479; 5.4 g) from hearth in Feature 5 at N 21-22, W 26-27, 35 cm below surface, alt. ca. 1.8 m above high tide level. Should date Feature 5 and related Features 8, 10 and 11. Associated dentate-stamped sherds are thought to represent mid-point of site occupation.

GSC-1581. Minister's Island, Burial 1 900±180
A.D. 1050

Charcoal (NMC-486; 5 g) from above Burial 1, at N 18.3-18.4, W 46.25, 62 cm below surface. Date should be minimum for burial; only shell midden burial in area.

GSC-1674. Minister's Island, Feature 15 1060±140
A.D. 890

Charcoal (NMC-487; 5.25 g) from housepit 1 (Feature 15), at N 19.25, W 31.5-32.0, 50 to 60 cm depth below surface, alt. ca. 1.8 m. Rocker dentate sherds associated with house. Est. age more than 1200 yrs.

General Comments (D.S.): suggested ages were based on estimate of A.D. 1000 as terminal date. Results of GSC-1452 and GSC-1445, however, clearly indicate site was occupied up to late prehistoric period. GSC-1580 seems too recent for associated artifact assemblage. Possibly hearth was contaminated by recent charcoal. GSC-1581, representing minimum date for mass burial, is extremely useful as burial is suspected to be Late Archaic. Date GSC-1674, also very useful, tends to confirm suspicion that GSC-1580 (A.D. 1370±210) from the same site is too young. It now appears that dentate-stamped pottery persisted in the Passamaquoddy Bay area until A.D. 900, at which time cord-wrapped-stick became the dominant decorative technique; (W.B., Jr.): dates for GSC-1445 and GSC-1452 each based on one 1-day count. GSC-1580, -1581, and -1674, clean samples free of rootlets, were mixed with dead gas for counting.

Quebec

GSC-1393. McInnes site 1090±260
A.D. 860
 $\delta C^{13} = -19.3\%$

Charcoal (NMC-234) scattered throughout pit fill (Feature No. 4) in Sq. 11, level 2b, of McInnes site (CkEe-5), Grand Touladi Lake, Quebec (47° 43'21"N., 68° 46'28"W.). Site extends 70 m along beach on west shore of lake. Excavated area is in forest, ca. 15 m inland from low 1.2 m terrace which parallels beach. Stratigraphically, six layers are recognizable, of which the fourth (Zone 2c) represents occupation during later Middle Woodland times. It is associated with projectile point, apparently of Jack's Reef corner-notched type, and some thumbnail scrapers. Est. age between A.D. 700 and 900. Coll. 1966 by H.-P. Lacasse for C.A. Martijn, then at Univ. of Wisconsin, Madison, Wisconsin; now at Service d'Archéologie, Québec; subm. by R. Wilmeth.

Comment (C.A.M.): date A.D. 860 seems acceptable; GaK-1495 (A.D. 1240; 710 ± 230 yrs. B.P.) is from same level (2b). Chronologically it follows expectations in being younger than GaK-1277 (A.D. 550; 1400 ± 90 yrs. B.P.) from level below (2c). In addition, it now seems evident that GaK-1276 (4550 B.C.; 6500 ± 180 yrs. B.P.), which came from same pit as GSC-1393, must indeed have been contaminated (see comment in Gakushuin VII, p. 323). NaOH-leach omitted from pretreatment of small sample (1.5 g). Sample mixed with dead gas for counting. Date based on one 4-day count.

GSC-1256. Davidson site 1570 ± 150
A.D. 380
 $\delta C^{13} = -24.8 \text{‰}$

Charcoal (NMC-233) from Davidson site (GkEe-2), Lake Temiscouata, Quebec ($47^{\circ} 40' 15'' N.$, $68^{\circ} 47' 50'' W.$). From Area A, Sq. 17, level 2, at ca. 15 cm depth, from under small cluster of rocks in east sector of square. At one time these may have formed part of hearth (Feature 1) in that square, but large tree root has caused some disturbance and two rock concentrations no longer form single unit. Stratified site with Archaic to Middle Woodland occupations. Est. age Middle Woodland, perhaps somewhere between A.D. 500 and 900. Coll. 1966 by C.A. Martijn and R. Wilson; subm. by R. Wilmeth.

Comments (C.A.M.): date is acceptable. It bears out comments that GaK-1268 from same level in same square with a date of A.D. 1730 (220 ± 70 yrs., B.P.), was probably contaminated by roots, but GSC-1256 is in stratigraphic agreement with GaK-1270, 20 B.C. (1970 ± 100 yrs., B.P.), from level 3 at 25 cm depth (Wilmeth, 1969; Gakushuin VII, p. 322); (W.B., Jr.): pretreatment of small sample (2.1 g), after rootlets removed by hand, included cold NaOH-leach. Sample mixed with dead gas for counting.

Ontario

GSC-1394. Boomcamp 1 site 470 ± 140
A.D. 1480
 $\delta C^{13} = -23.2 \text{‰}$

Human bones (NMC-391) from Boomcamp 1 site, McNab Tp., Renfrew Co., Ontario ($45^{\circ} 26.3' N.$, $76^{\circ} 19.7' W.$). Burial revealed by road construction, but still almost completely in situ until disturbed for artifacts by untrained discoverer. Red Ochre burial with two shell gorgets, two slate bayonet blades ca. 25 cm long, copper knife, and 21 shell disk beads. Except for most artifacts and skull, bones still in pit, although disturbed when examined. Should represent Archaic cultural group, possibly Glacial Kame, which occupied Ottawa Valley during interval between Brewerton Complex (Laurentian Archaic) and Woodland groups. Est. age 3500 yrs. Coll. 1970 by C. G. Kennedy, Ottawa; subm. by R. Wilmeth.

Comments (C.C.K.): no explanation can be offered for this impossible date. Association was good, and bones were stained with red ochre (Kennedy, 1972); (W.B. Jr.): 2 tibias and 1 femur (702 g) subm. to lab after careful cleaning with wire brush to remove sand and fragile, thin bone portions. After pretreatment with HCl plus 1 hr. 0.1 N NaOH, 5.5 g burned. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-1197. Lite site 500±130
A.D. 1450
 $\delta C^{13} = -22.9\%$

Charcoal (NMC-230; 20 g) from Lite site (BbGi-1), Sidney Tp., Hastings Co., Ontario (44° 13'N., 77° 28'W.). Composite sample from Area A, at 61 cm depth in 76 cm-deep midden. Palisaded Iroquoian hilltop village, Southern Division Huron, covers area ca. 183 x 91 m on top and steep N.W. shoulder of large hill rising 38 to 46 m above surrounding terrain. Ceramic sample fits well with Southern Division Huron sequence at Black Creek time level, ca. A.D. 1500 (Wright, 1966b), but contains quantity of cord-wrapped-stick-decorated rim sherds, which otherwise resemble motifs on Huron Incised, Lawson Incised, and Lawson Opposed. At present, such sherds known only from this site. Date should help determine whether introduction of cord-wrapped-stick-impressed pottery represents a local anomaly or a yet-to-be-understood relationship with Iroquois Oak Hill Horizon (Lenig, 1965). Date will also assist in seriation of Huron sites on Trent River axis for comparison with Southern Division on better-known Humber River axis. Est. age A.D. 1450. Coll. 1967 by J.F. Pendergast, Ottawa; subm. by R. Wilmeth.

Comments (J.F.P.): date is acceptable; (W.B., Jr.): sample composed of large pieces of charcoal, quite clean; few modern rootlets removed by hand in lab. Pretreatment included cold NaOH-leach. Date based on one 3-day count.

Radiant Lake 3 site series

Charcoal samples from Radiant Lake 3 site (CaGn-1), a multi-component hilltop site at outlet of North River into Radiant Lake, Algonquin Park, Ontario (46° 00'07"N., 78° 17'58"W.), alt. ca. 305 m, 12 to 14 m above summer level of Radiant Lake.

GSC-1351. Radiant Lake 3, Sqs. I27-I28 1240±130
A.D. 710
 $\delta C^{13} = -22.7\%$

Wood charcoal (NMC-287; 20.5 g) from border of Sqs. I27 and I28, at 10 to 20 cm depth among cord-malleated sherds occurring at 12.7 cm. Associated rims bear exterior punctations with interior nodes, cord-malleated exterior and cord-impressed lip. Rims may represent early Cree occupation in S.E. Ontario. Sample dates use of cord-malleated, exterior-punctated and interior-bossed pottery. Est. age not known precisely; probably Late Woodland. Coll. 1967 by B.M. Mitchell, Deep River, Ontario; subm. by R. Wilmeth.

Comment (B.M.M.): date slightly earlier than expected but not unreasonable. Somewhat similar material from Neck site (HfLq-1) Southern Indian Lake, Manitoba, is dated between A.D. 760 (1190±70 yrs.; GaK-1260; Gakushuin VII, p. 319) and A.D. 1245 (705±320 yrs.; I-2082; Isotopes VI, p. 286; Wilmeth, 1969).

GSC-1529. Radiant Lake 3, Sq. H21

330±130
A.D. 1620

Charcoal (NMC-270; 6.9 g) from Sq. H21, at 18 to 23 cm depth in firepit 53 cm deep. Sample from zone yielding fabric-impressed pottery, probably representing early Cree. Will date use, in eastern and southern Ontario, of exterior fabric-malleated pottery with external circular punctates producing interior nodes. Est. age 1000 yrs. Coll. 1966 by B.M. Mitchell; subm. by R. Wilmeth.

Comment (B.M.M.): date is later than expected. Assuming that charcoal was not inadvertently coll. from Iroquoian deposit instead of from fabric-malleated zone, two explanations are possible: 1) If relatively stable (700 yrs.) ceramic material culture encountered at Pic River site (Wright, 1966a) is applicable to Radiant Lake area, then date of A.D. 1620, as well as previous date of A.D. 710 (GSC-1351), is acceptable. Both dates would apply to cord-and/or fabric-malleated pottery users, but would probably represent extreme time range. 2) If ceramic styles were not stable during last 1000 yrs. in Radiant Lake area, A.D. 1620 date must be regarded as resulting from a non-representative sample. Date based on one 1-day count.

GSC-1662. Radiant Lake 3, Sq. K20

1870±130
A.D. 80

Charcoal (NMC-289; 8.0 g) from Sq. K20, depth 15 to 25 cm among fabric- or cord-malleated sherds 7.5 to 15 cm below surface, in small hearth feature. Should provide date on fabric- or cord-malleated rims and body sherds bearing external punctates and internal nodes, perhaps attributable to the Cree. Est. age post-2000 yrs. Coll. 1967 by B.M. Mitchell; subm. by R. Wilmeth.

Comment (B.M.M): date was expected to confirm GSC-1351 (NMC-287, A.D. 710; this list). The result is 370 to 890 yrs. earlier and reaches back to similar known dates for classic Middle Woodland (NMC-75 and -76, respectively, A.D. 130 and 80 B.C.; Wilmeth, 1969). Although Algonkian groups on north shore of Lake Superior appear to span time from A.D. 962 to 1700 (Wright, 1966a), similar groups at Southern Indian Lake reach back to A.D. 760 (GaK-1260 Gakushuin VII, p. 319). In the light of our observation of very tight association between corded, exterior-punctated, interior-noded rims and charcoal samples, date GSC-1662 suggest that the makers of this ware may have had greater time depth than previously expected. Sample pretreatment included 5 min. cold NaOH-leach.

GSC-1627. Campion Rapids site

280±170
A.D. 1670

Charcoal from Campion Rapids site (CbGr-1), north side of Mattawa River above Campion Rapids and below junction with Amable du Fond River, 13 km west of Mattawa, Ontario (46° 19'N., 78° 53'W.), at alt. ca. 152 m. Site is 5.4 m above July (1971) river level, 6 m from shore and on well-drained sandy soil with grass cover. Sample is at 15 cm depth in association with Late Woodland corded pottery. Est. age 500 to 1000 yrs. Coll. and subm. 1971 by R. Gordon, Peterborough, Ontario, for D. MacLeod, Ontario Dept. Lands and Forests, Toronto.

Comments (R.G.): date is reasonable, as contact materials occurred in other parts of site; (W.B., Jr.): for a sample 280 radiocarbon yrs. old, the age in calendar years may be as much as 430 yrs. (A.D. 1520; Stuiver and Suess, 1966); and, since the error term cannot be ignored, the true age may be between ca. 140 and 600 yr. Sample contained many rootlets in all charcoal pieces; all visible ones removed by hand in lab. NaOH-leach omitted because of small sample size (4.0 g). Sample mixed with dead gas for counting.

GSC-1247. Poplar Point Lodge site 460±150
A.D. 1490
 $\delta C^{13} = -25.3\%$

Charcoal (NMC-236) from Poplar Point Lodge site (DjJa-5), mouth of Sandy Creek, S.E. Lake Nipigon (alt. ca. 260 m), Ontario (49° 38'N., 88° 05'W.). From only place in which cultural material was noted, an area of red discoloration in river bank, forming a pit with max. depth of 30.5 cm. Sample from 28 cm depth in pottery cache. Cultural affiliation: Middle Woodland. Est. age A.D. 400. Coll. 1967 by K.C.A. Dawson, Lakehead Univ., Thunder Bay, Ontario; subm. by R. Wilmeth.

Comments (K.C.A.D.): date is too recent for cultural affiliations suggested by recoveries from site. Sample, which was taken from exposed eroding river bank, must be intrusive; (W.B., Jr.): rootlets removed by hand in lab. NaOH-leach omitted from pretreatment of small sample (3.5 g). Sample mixed with dead gas for counting.

GSC-1245. Pikitigushi River site 4380±160
2430 B.C.
 $\delta C^{13} = -23.7\%$

Charcoal (NMC-238) from Pikitigushi River site (EbJd-1) near mouth of and in second clearing on N.W. bank of Pikitigushi River, North Bay, Lake Nipigon (alt. ca. 260 m), Ontario (50° 15'N., 88° 34'W.). From test trench in layer of cultural refuse lying immediately below 5 cm layer of burned pioneer fill-in humus layer. Cultural level extends to 28 cm depth. Cultural affiliation: Blackduck Focus, Late Woodland. Est. age A.D. 1400. Coll. 1967 by K.C.A. Dawson; subm. by R. Wilmeth.

Comments (K.C.A.D.): date is much too early for cultural affiliation suggested by recoveries from site. Charcoal must have been deposited by flooding or ice rafting; both processes are active at mouth of river; (W.B., Jr.): rootlets removed by hand in lab. NaOH-leach omitted from pretreatment of small sample (4.1 g). Sample mixed with dead gas for counting.

Western Canada

Manitoba

GSC-1546. Snyder 11 site 340 ± 130
A. D. 1610

Charcoal and charred wood (NMC-463) from Snyder 11 site, S. W. 1/4, sec. 33, tp. 2, rge. 27, W1, on Gainsborough Creek, Manitoba (49° 10'N., 101° 02'32"W.) at alt. 450 m. From lowest hearth resting on floor of bell-shaped pit in excavation unit 15, square VII. Charcoal from lowest of series of hearths in pit, which is located in same field as Mounds A, B, C, and D (Capes, 1963), but relationship to mounds not yet demonstrated. Pieces of ceramic vessel associated with hearth represent square-lipped vessel that may have Middle Missouri affiliations. Sample should date earliest use of pit, and may prove useful in establishing contemporaneity with mounds. Est. age A. D. 1200 to 1600. Coll. 1970 by E. L. Syms, then Univ. of Alberta, Edmonton; now Univ. of Manitoba, Winnipeg.

Comments (E. L. S.): date is satisfactory; (W. B., Jr.): few visible rootlets removed by hand in lab. Pretreatment of 11 g sample included 5 min. cold NaOH-leach. Date based on one 1-day count.

GSC-1308. Swan River site, peat 2330 ± 130
380 B. C.
 $\delta C^{13} = -24.9\%$

Organic sediment (decomposed aquatic muck; id. by M. Kuc, Geol. Survey of Canada) from Swan River site, FbMi-5, Manitoba (52° 12'N., 101° 25'W). From base of bog comprising woody peat ("Shallow Peat" of Ehrlich et al., 1962), depth ca. 75 cm, Sq. 20N-6W, east wall. Natural vegetation consists of spruce and tamarack. Underlying parent material composed of Lake Agassiz (Upper Campbell beach) sands and clays, upper portion bearing evidence of gleying. Site is early prehistoric campsite with side-notched projectile points resembling those found in Iowa in the Logan Creek Complex. Coll. 1969 by E. M. Gryba for L. Pettipas, Univ. of Manitoba, Winnipeg; subm. by Pettipas.

Comments (L. P.): earlier date (GSC-1219; 2320 ± 130; GSC X, p. 475-476) was run on bone from archeological component of same site; (W. B., Jr.): although dates on material from Lake Agassiz beach were far younger than expected (cf. Elson, 1967) agreement between collagen fraction of butchered bone and organic sediment at same depth is striking. Recovery of collagen by procedure using SrCO₃, giving a result of 2270 ± 130 yrs. (GSC-1219-2), is reported in GSC XI, p. 258-259. NaOH-leach omitted from pretreatment of GSC-1308; weight burned after HCl treatment, 30 g.

Alberta

GSC-1296. Ross Creek, site D1On-200 1180 ± 140
A.D. 770
 $\delta C^{13} = -23.3\%$

Charcoal from site D1On-200, exposed on east bank of Ross Creek, ca. 3.2 km S.W. of Irvine, Alberta, in LSD 2 of sec. 26, tp. 11, rge. 3, W. 4th mer. (49° 55'45"N., 110° 18'20"W.), alt. ca. 770 m. From hearth (bank face to 20 cm in), in alluvium of Ross Creek ca. 3.7 m below surface and 4.9 m above creek level, which contained artifacts indicating Avonlea age. Bison bones are common in enclosing alluvium. Coll. 1969 by L.O. Lindoe, Medicine Hat, Alberta, for A.M. Stalker, Geol. Survey of Canada, Ottawa; subm. by Stalker.

Comment (A.M.S.): date accords well with estimated age of Avonlea Culture. Pretreatment of 27 g sample included cold NaOH-leach. Date based on one 3-day count.

GSC-1140. Calling Lake, site GhPh-106 410 ± 130
A.D. 1540
 $\delta C^{13} = -23.5\%$

Charcoal (NMC-252) from site GhPh-106, S.E. shore of Calling Lake (alt. 204 m), Alberta (55° 11'N., 113° 14'W.). From Sq. E13, in brown clayey silt with gravel. Stratified campsite on old beach ridge. Cultural affiliations undetermined. Sample dates stratum directly underlying oldest occupation of site. Est. age 7000 B.C. Coll. 1967 by R. MacPhee; subm. for R. Gruhn, Univ. of Calgary, Calgary, by R. Wilmeth.

Comments (R.G.): date obviously unacceptable. Only one of series of four dates from Calling Lake area is at all reasonable; i.e., GSC-1034 (NMC-251; site GhPh-107): 1190 ± 130 yrs.; Est. age A.D. 0 to 1500; GSC X, p. 476-477. Possibility that something is inherently wrong with boreal forest samples, as others have suggested, must be considered; (W.B., Jr.): pretreatment of 7.7 g sample included cold NaOH-leach. Date based on one 5-day count.

D1Po-20 series

Charcoal from archeological living floors found in Ah horizon of buried soil profiles, developed in eolian and colluvial sediments overlying landslide debris 30 m above Oldman River, Alberta, on south side of 'the Gap' where river flows through Front Range of Rocky Mountains; S.W. 1/2, sec. 33, tp. 10, rge. 2, W. 5th mer. (49° 51.5'N., 114° 22.5'W.). Coll. 1968 by O.A. Christensen for B. Reeves, Univ. of Calgary, Calgary; subm. by N.W. Rutter, Geol. Survey of Canada, Calgary.

GSC-1255. D1Po-20 Sample 1 6060±140
4110 B. C.
 $\delta C^{13} = -23.6\%$

Ah horizon of buried soil above volcanic ash layer, 1.8 m below present surface. Pretreatment of small sample (5.6 g), after rootlets picked out in lab, included cold NaOH-leach.

GSC-1298. D1Po-20 Sample 2 6720±170
4770 B. C.

Ah horizon of buried soil underlying volcanic ash, at 2.1 m depth. Few tiny rootlets and other material lighter-coloured than charcoal removed by hand in lab. Because of small sample size (2.0 g), NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-1158. D1Po-20 Sample 3 8000±150
6050 B. C.
 $\delta C^{13} = -24.6\%$

Ah horizon of buried soil, 2.7 m depth. Few rootlets removed by hand (total weight, 0.01 g). Pretreatment of sample (7.0 g) included cold NaOH-leach.

General Comment (B.R.): sample from volcanic ash layer between Ah horizons dated by GSC-1255 and GSC-1298 identified as Mazama by J. Westgate, Univ. of Alberta, Edmonton. Dates provide minimum and maximum dates, respectively, for deposition of Mazama ash in this area. Maximum date is in accord with those obtained on Mazama ash elsewhere in Alberta and the Pacific Northwest. GSC-1158 dates earliest living floor and buried soil at site. Sample of charred bison bone from same floor dated at 9520±240 (GX-956). GSC-1158 considered a better determination. Side-notched atlatl points found associated with floors dated by GSC-1255 and -1298 and lanceolate point with floor dated by GSC-1158.

British Columbia

GSC-1544. Second Beach site 900±130
A. D. 1050
 $\delta C^{13} = -22.6\%$

Charcoal (NMC-431) from Second Beach site (EbRc-1), Nicola Lake, British Columbia (50° 13'N., 120° 29'W.). From S 7-8, E 0-2, ca. 60 cm below surface. Probably associated with house pit fill, although stratigraphy irregular. House pit site is Kamloops Phase, possibly very early in phase. Est. Age: A. D. 1200 to 1300. Coll. July 1970 by D. Wyatt, then at State Univ. College at Potsdam, Potsdam, New York; now at Univ. of Victoria, Victoria; subm. by R. Wilmeth. Two determinations were made (cf. Table 3, this list):

GSC-1544. Standard pretreatment; two 1-day counts
in 5-L counter at 1 atm. 900±130

GSC-1544-2. Pretreatment using Haynes' (1966) method;
two 1-day counts in 5-L counter at 1 atm. 920±130
 $\delta C^{13} = -21.9\%$

Comments (D.W.): date is acceptable; (W.B., Jr.): Sample was composed of large clean chunks of charcoal, mostly >1 cm diam. and up to 4 cm long. Only a few tiny rootlets noticed; these were removed by hand in lab.

GSC-1371. Potlatch site 310±170
A.D. 1640
 $\delta C^{13} = -23.0\%$

Charcoal (NMC-351) from Potlatch site (FcSi-2), south shore of Little Anahim Lake, central interior British Columbia (52° 29'30"N., 125° 20'30"W.), alt. ca. 1067 m. From 2.47 m N., 0.55 m E., 19 cm below surface in gravelly matrix, S.E. quadrant of T λ 'okut House. Site includes at least two components, one early historic Chilcotin (cf. GSC-1154, 120±130 yrs.; GSC X, p. 478-479), another probably much earlier and associated with micro-blades. T λ 'okut House is a shallow circular pit house presumably related to earlier component. However, house is overlain by historic material and hearths occur in upper part of fill. Est. age possibly between A.D. 500 and contact period. Coll. 1969 by P.F. Donahue for R. Wilmeth; subm. by Wilmeth.

Comments (R.W.): date appears to represent early historic or late prehistoric Chilcotin occupation post-dating abandonment of original house. Another sample, from a pit bottom at 31 cm depth below surface in same structure, gave a date of A.D. 80 (1870±75; S-501; Saskatchewan VI, p. 204-205) and probably is referable to original occupation; (W.B., Jr.) sample was shot through by abundant rootlets, and no piece of charcoal was found without rootlets. All visible rootlets were removed and all pieces were split open, but sample was probably contaminated nevertheless. NaOH-leach omitted due to small sample size (3.0 g). Sample mixed with dead gas for counting.

GSC-1439. Dodge Island site 2220±130
270 B.C.
 $\delta C^{13} = -25.6\%$

Charcoal (NMC-281) from Dodge Island site (GbTo-18), Prince Rupert Harbour, British Columbia (54° 17'30"N., 130° 22'40"W.), at alt. between 3 and 7.6 m above max. high tide. From unit J20, at S2.2, W10, 61 cm below datum and 5 cm into top of black layer. Site, on small island, is a midden up to 3 m thick and is underlain by thick humus. Represents settlement of hunting population pre-dating shell midden. Coll. 1967 by K.R. Fladmark and A. McMillan for G.F. MacDonald; subm. by R. Wilmeth. A portion of same sample, catalogued as NMC-280, gave date of 2480±100 yrs. (GaK-1877; Gakushuin VIII, p. 53-54). Present sample run as inter-laboratory check (cf. Table 3, this list). Two determinations were made:

GSC-1439. Standard pretreatment except cold NaOH-leach used; one 3-day count in 5-L counter at 1 atm. 2220±130

GSC-1439-2. Pretreatment using Haynes' (1966) method; one 4-day count in 1-L counter at 1 atm. 2240±170
 $\delta C^{13} = -22.5\%$

Comments (G.F.M.) as suggested shift in date is minor it can be accepted without changing interpretation of cultural development in area; (W.B. Jr.): sample was large (cf. Table 3) and was composed of pure charcoal (not charred wood) pieces up to 3 cm long and, in part, shiny; two rootlets noticed and removed in lab.

GSC-1290. Skoglund's Landing site 1940±140
A.D. 10
 $\delta C^{13} = -24.2\%$

Sample of yellow cedar wood (Chamaecyparis nootkatensis; id. by R.J. Mott, Geol. Survey of Canada) from organic mucklayer overlying cultural horizon at Skoglund's Landing site (F1Ua-1) ca. 8 km south of Masset, Graham Island, Queen Charlotte Islands, British Columbia (53° 57'37"N., 132° 07'30"W.); alt. of site ranges between 7 and 14 m above mean high tide. Muck layer containing abundant wood is overlain by 3.7 to 4.3 m of convoluted sand, silty sand and fine gravel strata. Coll. 1969 and subm. by H. W. Nasmith, Thurber Consultants, Ltd., Victoria.

Comments (H.W.N.): date is maximum for deformation of overlying strata, which appear to have reached their present position by creep, landsliding or slumping. Date on good charcoal sample from site is 1145±80 (GX-1628; Fladmark, 1970); (W.B., Jr.): only largest piece of dark grey wood (64 g) in sample subm. for dating (10.5 g burnt). All outside material and some whitish mold removed first, as sample was damp on receipt.

GSC-1554. Bluejacket site 4290±130
2340 B.C.

Large fragments of wood charcoal (NMC-435) in sand and shell matrix from Bluejacket site (F1Ua-4), 2.4 km south of Masset on east shore of Masset Sound, Graham Island, Queen Charlotte Islands, British Columbia (54° 00'N., 132° 07'45"W), at alt. 13.7 m above max. high tide. From Test Pit 1, N. 0.25 m, E. 1.70 m, level 9, 1.60 m below surface, in matrix of loose clam shell and light beach sand. Site is extensive shell midden with deposits between 0.3 and 2.4 m deep; sample from 40 cm above base. Cultural assemblage consists of quantities of retouched basalt flakes, large crude pebble choppers, boulder spall scrapers, various pecked and ground stone artifacts, abrasive stones, some ground slate and worked bone. With exception of first class of artifact material, most objects seem to correlate with middle to late periods of Prince Rupert Harbour sequence (MacDonald, 1969). Sample should date one of earlier levels of prehistoric portion of Queen Charlotte Islands cultural sequence. Est. age 2000 to 4500 yrs. Coll. 1970 by K.R. Fladmark, Univ. of Calgary, Calgary.

Comment (K.R.F.): date is near early end of est. age range, and is close to age of upper level of Skoglund's Landing site (F1Ua-1). Latter site produced some artifacts similar to Bluejacket assemblage but in considerably greater numbers. Date suggests that both sites, 3.2 km apart, represent single cultural tradition. Most of numerous visible rootlets removed by hand in lab. Haynes' (1966) method used in pretreatment of large sample (15.0 g).

Northern Canada

Mainland

GSC-1559. Frank Channel site 360±180
A.D. 1590

Charcoal (NMC-165) from Frank Channel site (KeP1-1) at north end of North Arm, Great Slave Lake and 8.8 km south of Rae, Dist. of Mackenzie, N.W.T. (60° 47'30"N., 115° 57'W.). From bottom of pit-like depression with small hearth at 29.2 to 34.3 cm depth, S.E. corner of Unit B. Site is a type component for late phase of Taltheilei Shale Tradition (Noble, 1971). Est. age A.D. 1000 to 1600. Coll. 1966 by W.C. Noble, then at Univ. of Calgary, Calgary; now at McMaster Univ., Hamilton; subm. by R. Wilmeth.

Comments (W.C.N.): date is slightly later than expected. Rootlets and small sample size (1.0 g) might account for this. Frank Channel site has previously been dated at A.D. 1280 (670±70 yrs., GaK-1865; Gakushuin VIII, p. 51) and comparable materials from Haig site, S.E. Artillery Lake, N.W.T., date A.D. 1410 (540±95 yrs., I-4550; Noble, 1971). Frank Channel phase is now considered to date A.D. 1300 to 1500; (W.B., Jr.): plastic sample container cracked on receipt by lab; few plastic shards plus few unidentified fibres and tiny rootlets removed prior to treatment. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

Arctic Archipelago

GSC-1382. KdDq-11-8 site, Cape Tanfield 4690±380
2740 B.C.
 $\delta C^{13} = -20.1\%$

Charred (seal?) fat and sand cinder from pre-Dorset KdDq-11-8 (Closure) site, tip of Cape Tanfield, Baffin Island, N.W.T. (62° 39'N., 69° 39'W.), alt. 14 m above present lichen line. Sample from 10 cm depth, in test pit, Sq. 55L15. S.W. 1/4, from encrusted rock of cultural deposit in gravel matrix within both active zone of permafrost and sod rootlet zone. Cultural deposit consists of artifacts and rocks possibly oriented as a tent ring. Pumice occurred together with encrusted rocks. Est. age 4300 to 4600 yrs. B.P. Coll. 1967 by A.A. Dekin, Jr., then at Michigan State Univ., East Lansing, Michigan; now at State Univ. College at Potsdam, Potsdam, New York; subm. by W. Blake Jr., Geol. Survey of Canada, Ottawa.

Comment (A.A.D., Jr.): date, as expected, indicates site may be earliest pre-Dorset in Eastern Arctic. Other analyses, however, indicate that this component of Closure site may not be earliest at Cape Tanfield. Date is in good agreement with two previously dated components of Closure site: KdDq-11-0 at 4067±73 yrs. B.P. (P-707; Pennsylvania IX, p. 362), and KdDq-11-6 at 4460±100 yrs. B.P. (GaK-1281; Gakushuin VII, p. 314). Date is also in accordance with age of pumice of close to 5000 years as determined by dates on driftwood (Blake, 1970, 1972; GSC X, p. 483-484; GSC XI, p. 311-315). NaOH-leach omitted due to small sample size (1.9 g). Sample mixed with dead gas for counting.

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