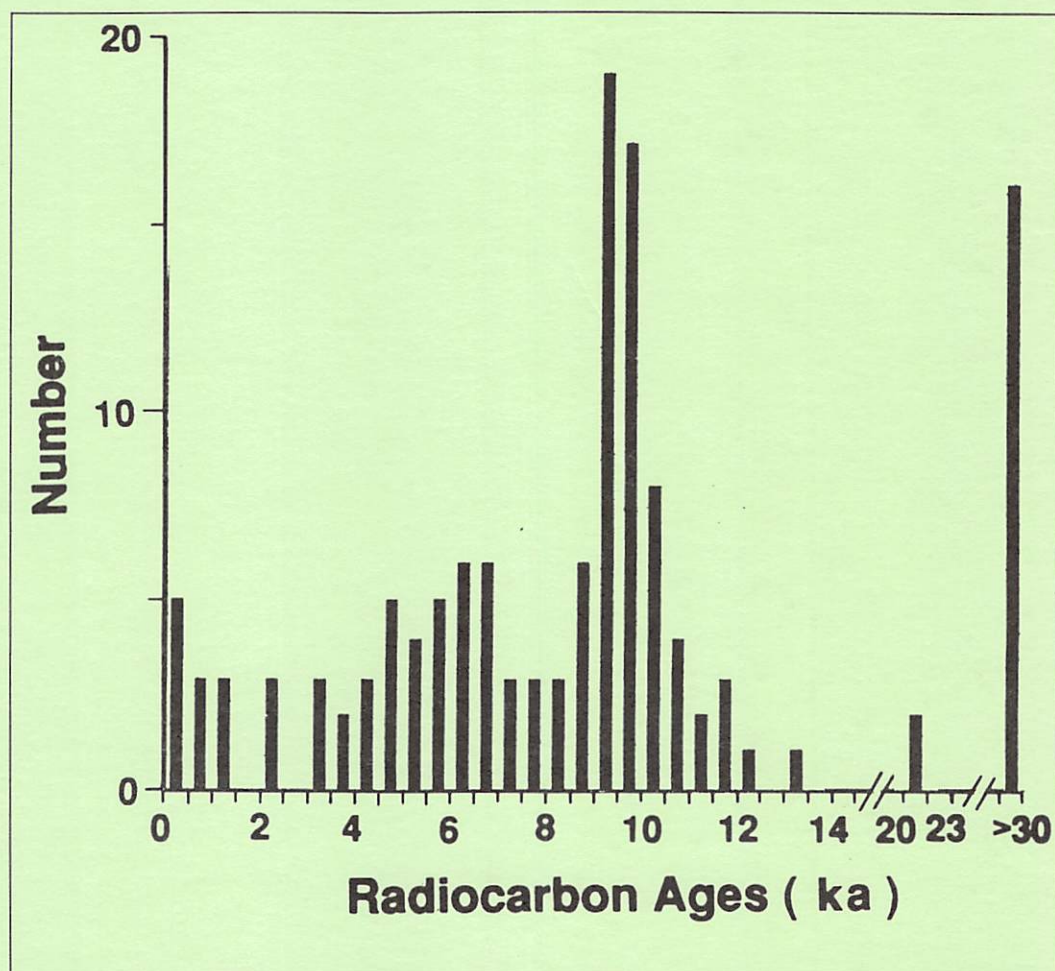


SVALBARD RADIOCARBON DATE LIST 1

Compiled by Steven L. Forman

Contributors

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SVALBARD RADIOCARBON DATE LIST I

Compiled by Steven L. Forman

**Institute of
Arctic and Alpine Research
University of Colorado
Boulder, Colorado 80309**

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ABSTRACT

Svalbard Radiocarbon Date List I is the first compilation of radiocarbon dates from the Svalbard Archipelago. Reported are 135 radiocarbon dates on whalebone, driftwood, peat, shell, and foraminifera collected mostly from raised marine and glacial deposits. A number of the whalebones have both collagen and appatite radiocarbon ages. A majority of the dated material is either < 13 ka or > 30 ka. These dates provide a firm chronologic basis to understand the timing of relative sea level and glacial events during the Weichselian on Svalbard.

ACKNOWLEDGMENTS

A number of radiocarbon laboratories have provided services beyond the routine in dating organic material from Svalbard. In particular, we acknowledge the careful analysis of whalebone samples by Geochron Laboratories. DiCarb Laboratories (Dr. Irene Stehli) provided extended counting times on number of shell samples. Lastly, we acknowledge the assistance of Dr. A.J.T.Jull in obtaining AMS radiocarbon dates from the NSF facility at the University of Arizona.

This radiocarbon data list has evolved over two years and could not have been complete without the patient word processing efforts of Ms. Diane Ashley and the eagle editorial eye of Ms. Kathleen Salzberg. Figures were ably drafted by Ms. Diane Lorenz.

A number of grants to the University of Colorado has supported research on Svalbard and the associated geochronology. This support is principally from National Science Foundation grants ATM-8190913, DPP-830325, DPP-8322016 and Research contract N0014-99-K0017 from the Office of Naval Research.

PREFACE

Over a decade has elapsed since the first INSTAAR researchers initiated studies on late Quaternary climate change on Svalbard. This Occasional Paper is the first radiocarbon date list for the Svalbard Archipelago and represents the core data in understanding the pace of sea level and glacier variations during the last ca. 30 ka. This publication follows in the tradition of radiocarbon data lists from the eastern Canadian Arctic, which for the past 20 years have been an invaluable source of information. These dates from Svalbard are a measure of the past research productivity but also provide a firm chronologic base to direct future research. We hope that these data will be useful to Quaternary researchers on both sides of the Atlantic Ocean.

Mark F. Meier
Director, INSTAAR
July 1990

INTRODUCTION

Geochronology is a critical parameter in understanding the course of environmental and climatic events on the Svalbard Archipelago during the Quaternary. Without a secure geochronology it is not possible to understand the causative relationships between changes in insolation and regional oceanography, and glacierization and deglaciation of the Archipelago. Radiocarbon dates presented here provide an extensive data base to assess the timing of relative sea level change, of glacier retreat and advance and the immigration of marine fauna.

This is the first radiocarbon date list for the Svalbard Archipelago, presenting 134 dates on whalebone, wood, peat, and shell. The majority of the dates are less than 13 ka, though there are a significant number of dates greater than 30 ka (Fig. 1). Most of these dates have been generated by researchers associated with INSTAAR, but, at their discretion, we have included dates from other organizations that have worked on Svalbard.

The dates are presented referencing location, principally the numerous and distinctive coastal forelands on the Svalbard Archipelago (Fig. 2). A majority of the dates are from northwestern Spitsbergen, which has been the principal focus of field research during the past decade. However, contributions from J.D. Peacock has expanded coverage, providing new data from islands in the eastern part of the Archipelago.

A number of procedures were uniformly applied for dating organic material from Svalbard. Prior to radiocarbon dating the outer 50% of shell material was dissolved in HCl. All dated materials are corrected for fractionation of carbon isotopes by normalizing to a $\delta^{13}\text{C}$ of -25‰ (Stuvier and Polach, 1977). A $\delta^{13}\text{C}$ of 0‰ was assumed (Ollson, 1980) for shell samples with no ^{13}C determination. To correct for the reservoir effect, 425 yr are subtracted from the ^{13}C corrected date of shells (Ollson, 1980) and 300 yr from whalebone dates. The 300-yr correction is an estimate of the reservoir effect expected in wide-ranging, northeast Atlantic whales. It is derived from estimates of the reservoir age of ocean water made by dating pre-bomb, modern whalebones from southern Sweden (Ollson, 1980).

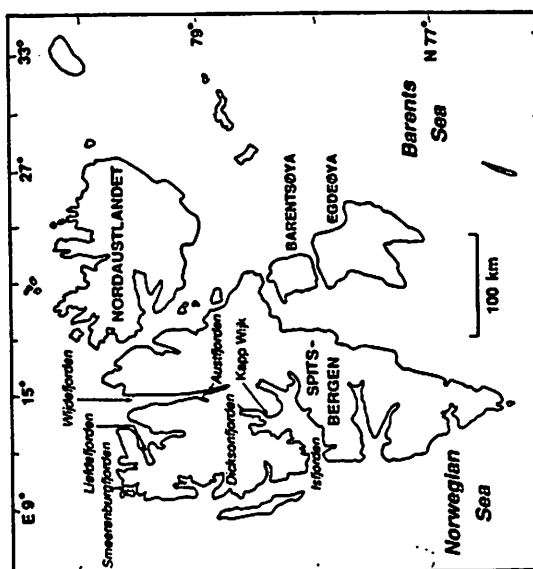
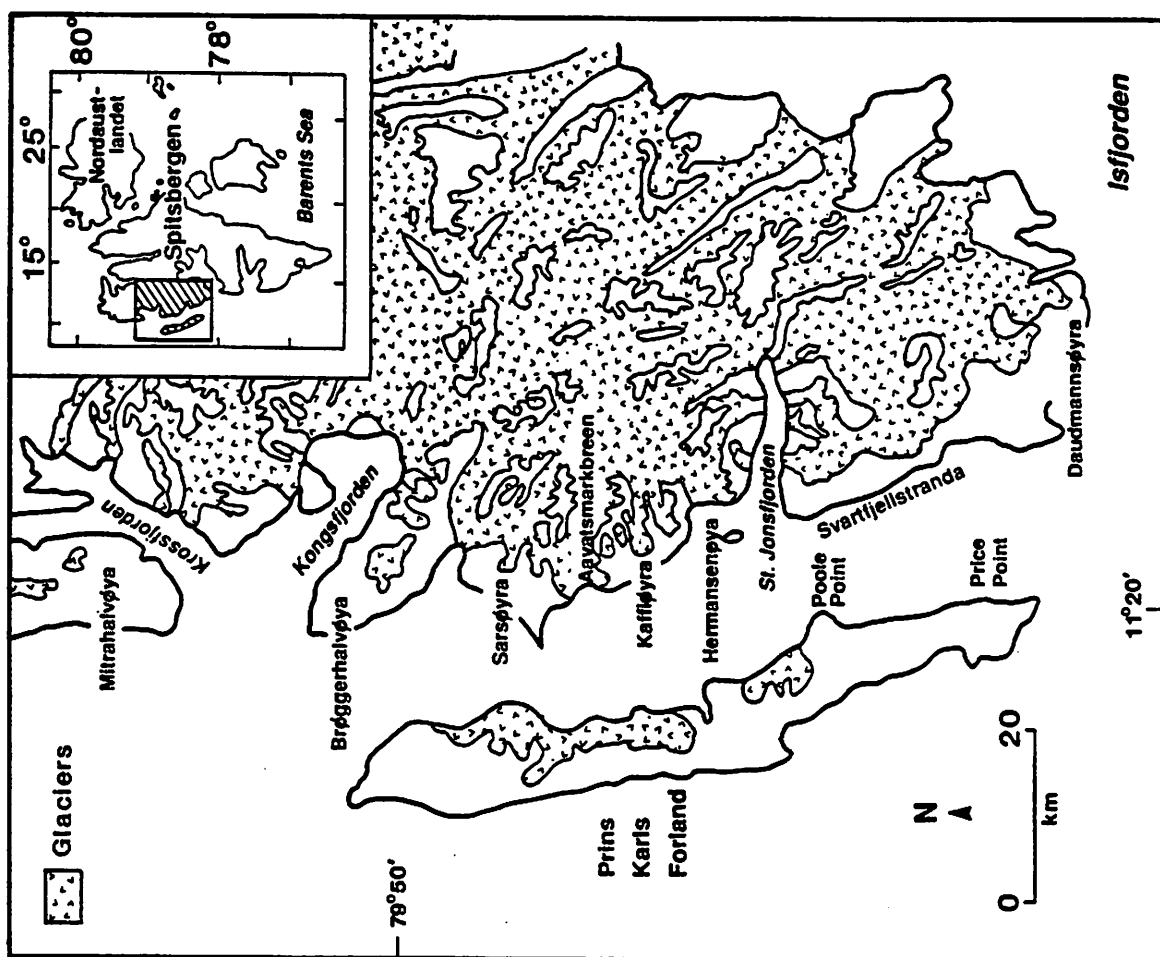


Figure 1: Location of sampled sites in Svalbard

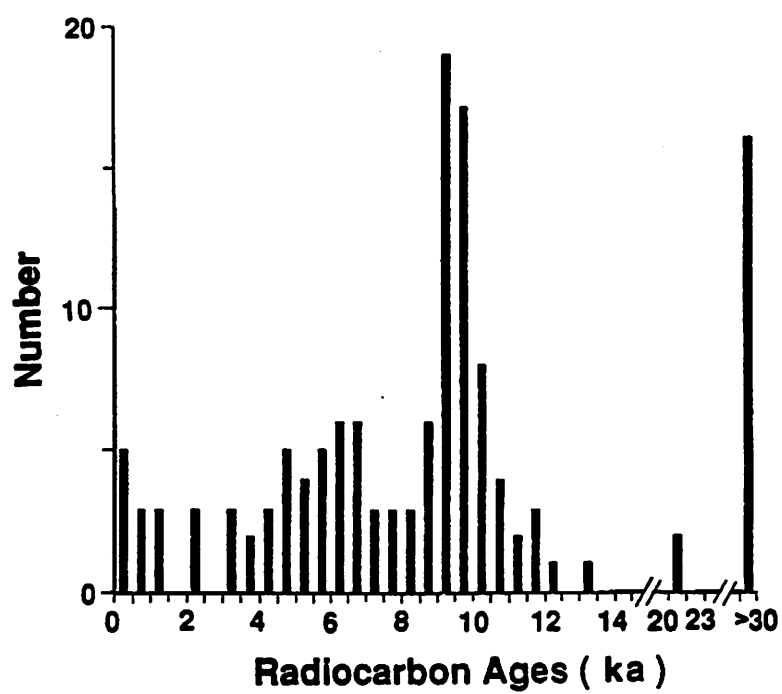


Figure 2: Frequency distribution of reported radiocarbon ages from Svalbard.

RAISED BEACH SERIES OF BRØGGERHALVØYA

Whalebones were collected from a series of raised beaches, adjacent to Kvadehukelva (Kvadehuk River), that span in elevation from 2 to 44 m asl. The well-preserved collagen fraction from the whalebones was dated. The apatite fraction from five whalebones yielded consistently younger ages than the collagen fraction. Single ages on whalebones is on the collagen fraction. The ^{14}C ages on the collagen fraction are considered finite estimates and are used to construct an emergence curve for Brøggerhalvøya (Forman et al., 1987).

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	^{13}C	Apatite Fraction	^{13}C	
GX-10106	B5	26	920 ± 135	-15.6	770 ± 175	-14.3	620 ± 135

An unidentified bone fragment collected from a fluvially dissected slope of a raised beach deposit that crests at 29 m asl ($78^\circ 57.5' \text{ N}$, $11^\circ 28' \text{ E}$). The bone was found on the surface not covered by vegetation. Collected by D.H. Mann and S.L. Forman, August 1983. (Comment) (S.L.F.): This is an anomalously young date compared to other dates obtained at this elevation. The sample's ^{13}C value indicates that the bone is from a mammal that existed on a marine diet (Schoeninger and Deniro, 1984), perhaps a polar bear, or marine mammal, the bone of which was carried by a polar bear or fox.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	^{13}C	Apatite Fraction	^{13}C	
GX-9908	B11	3	9670 ± 340	-17.0	9340 ± 285	13.6	9370 ± 340

A whale vertebra fragment collected from amongst numerous whalebones beneath a thick mat of vegetation. The bone was found on seaward side of raised recurved-spit, 50 m behind the modern storm-beach ($78^\circ 58' \text{ N}$, $11^\circ 22' \text{ E}$). Collected by S.L. Forman and D.H. Mann, August 1983. Comment (S.L.F.): This bone was collected from lowest raised beach feature on Brøggerhalvøya, a paleo-spit that formed at the mouth of the Kvadehuk River. Modern flotsam was found adjacent to bone.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10774	Sp. site	2	9680 ± 150	-16.7	9380 ± 150

A 2-m-long whale rib retrieved from beneath a thick cover of vegetation. The rib was collected from a raised recurved-spit and directly behind the modern storm beach (78° 58' N, 11° 22' E). Collected by D.H. Mann and S.L. Forman, August 1984. Comment (S.L.F.): The bone was collected from a same similar level as GX-9908, and ages compare favorably.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	¹³ C	Apatite Fraction	¹³ C	
GX-9892	B7	13	9805 ± 280	-16.8	8760 ± 55	-12.5	9505 ± 280

A whale rib collected from amongst numerous whalebones on the crest of 0.5-m-high regressive strandline (78° 57.5' N, 11° 24' E). Collected by S.L. Forman and D.H. Mann, August 1983). Comment (S.L.F.): Taphonomy of bones suggest that a whale beached close to this site. Provides an accurate age for the 13 m asl regressive strandline.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10730	F84-424	30	10,045 ± 155	-16.3	9745 ± 155

A 2-m-long whale rib collected from beneath a mat of vegetation. The rib was found within a concentration of whalebones, in a swale 20 m behind the crest of the 30 m asl raised beach (78° 57.5' N, 11° 28' E). The sample is well preserved with bone patina intact. Collected by S. L. Forman and A. Werner, August 1984. Comment (S.L.F.): Upper limiting date on the construction of broad 30 m asl raised beach. The morphology of this raised beach as well as ¹⁴C ages indicates that sea level was relatively stable during construction of this feature.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3122	M83-S208	15	10,850 ± 90	0	10,425 ± 90

Whole paired valves of Mya truncata and Hiatella arctica from blue-gray sublittoral sands at site 19d along the northern coast of Brøggerhalvøya. Comment (G.H.M.): Site contains a diverse molluscan fauna, including at least six separate genera.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
Beta-13800	8/20/85B	0	10,320 ± 120	0.79	9895 ± 120

Unpaired valves of Hiatella arctica from ice-wedge polygons exposed at low tide several meters seaward of the gravelly barrier beach. Collected by D.H. Mann and A. Hequette, August 1985. Comments (D.H. Mann): Permafrost features may exist on shelf areas off of W. Spitsbergen. Age indicates that these ice-wedge polygon features are younger than ca. 9.9 ka.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	¹³ C	Apatite Fraction	¹³ C	
GX-9893	B8	7	10,240 ± 365	-16.8	8695 ± 280	-12.4	9940 ± 365

A moderately well-preserved whale rib found on regression strandline at 7 m asl buried by a mat of vegetation. (78° 57.5' N, 11° 24' E). Collected by S.L. Forman and D.H. Mann, August 1983). Comment (S.L.F.): This age is statistically identical to ages on shell from 5 m asl and on whalebone from 2 to 30 m asl.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-9894	Sp. 1	5	10,400 ± 290	2.0	9975 ± 290

Large shell fragments collected from 25 to 75 cm depth from crest of raised spit (78° 58' N, 11° 22' E). Collected by D. Mann, July 1983. Comment (D.H.M.): Shells are allotchonous and may predate deposit.

Laboratory Number	Field Number	Elevation (masl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	¹³ C	Apatite Fraction	¹³ C	
GX-9891	B6	22	10,360 ± 315	-17.0	7890 ± 315	-13.9	10,060 ± 315

A moderately well preserved whale rib collected from beneath a vegetation mat on the seaward side of 1-m high regression strandline at the base of the 30 m asl terrace (78° 57.5' N, 11° 25' E). Collected by S.L. Forman and D.H. Mann August, 1983. Comment (S.L.F.): Radiocarbon ages on whalebone collected between 2 and 30 m asl overlap by one sigma indicating that emergence was rapid (30 m/1000 yr) for the interval 10 to 9 ka.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10731	F84-448	36	11,320 ± 170	-15.0	11,020 ± 170

A large whale rib or jaw bone collected from the broad crest (50 to 100 m wide) of the 36 m asl raised beach, which is the first prominent paleo-beach ridge below the Late Weichselian marine limit at 45 m asl raised beach (78° 56.5' N, 11° 26' E). The bone was partially buried by beach gravel and was well preserved with patina intact. Collected by S.L. Forman and D.H. Mann August 1984. Comment (S.L.F.): This bone was found on a surface 9 m below the Late Weichselian marine limit. Whale bones are rare on and above this surface to the marine limit. This age constrains the timing for construction of the 36 m asl raised beach and provides a minimum age estimate on the establishment of the Late Weichselian marine limit.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	¹³ C	Apatite Fraction	¹³ C	
GX-9909	B12	36	12,200 ± 430	-15.2	11,090 ± 350	-12.4	11,900 ± 430
I-13,793	B12	36	12,240 ± 180	20.0			11,940 ± 180

A well-preserved 3-m-long whale rib collected from a concentration of bones in a swale 50 m behind the crest of 36 m asl raised beach (78° 56.5' N, 11° 26' E). The bone was buried by < 50 cm of beach gravels and covered by a thick mat of vegetation. Collected by S.L. Forman and D.H. Mann, August 1983 and recollected in August 1984. Comment (S.L.F.): Portions of this sample yielded near identical collagen dates from two laboratories giving an added measure of confidence to dating. The Late Weichselian marine limit at 45 m asl formed prior to ca. 12,000 yr B.P. These dates and a previous one (GX-10731) suggest that sea level was relatively stable between 11,900 and 11,000 yr B.P. which resulted in the construction of the broad 36 m asl terrace. Taphonomy of whalebones indicate that a large whale beached at this site. These are some of the oldest whalebone dates associated with postglacial raised beach deposits, indicating that at ca. 12,000 yr. B.P. that the adjacent seas were at least seasonally ice-free to allow the migration of whales.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10105	B3	36	22,660 ± 600	-16.8	22,360 ± 600

An unidentified poorly preserved whalebone fragment covered by a thick mat of vegetation collected from seaward slope of the raised beach at 36 m asl (78° 57.5' N, 11° 28' W). Collected by D.H. Mann and S.L. Forman, August 1983. Comment (S.L.F.): This bone yielded an anomalously old age compared to other ages on whalebone at the same elevation. This bone is probably of infinite age that has been contaminated by modern carbon. The poor preservation and anomalous age indicates that the bone is allotchthonous and thus is not used to constrain the relative sea level history.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10306	B14	44	36,150 - 3070/+ 5070	16.7	35,850 - 3070/+ 5070

A well-preserved whale vertebra from a concentration of four vertebrae and other whalebones found 150m behind Late Weichselian marine limit near the base of 50 m asl pre-Late Weichselian raised beach (78° 57' N, 29' E). The bone was covered by a thick mat of vegetation in water saturated ground. Collected by S.L. Forman and D.H. Mann, August 1983 and in August 1984. Comment (S.L.F.): The age confirms a middle Weichselian or older age for the intermediate raised beach sequence on Brøggerhalvøya (Forman and Miller, 1984). Taphonomy of bones indicate that a whale beached at this site and the Late Weichselian transgression did not rework these whalebones.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-9907	Brogger 1	44	-15.7	>36,000

An individual well-preserved whale vertebra found in a swale 15 m behind the Late Weichselian marine limit on a pre-Late Weichselian raised beach surface. The vertebra was found at the transition from Late Weichselian to older deposits, imbedded in < 50 cm of beach gravels and covered by a thin mat of vegetation. Collected by D.H. Mann and S.L. Forman, August 1983. Comment (S.L.F.): Unabraded condition of the vertebra indicates that it was not retransported and provides a minimum limiting age for the construction of intermediate raised beach sequence. This intermediate raised beach sequence is mapped between 45 to 55 m asl on the basis of geomorphology and soil development. Amino acid ratios on shell fragments from intermediate raised beach gravels suggest that these sediments were deposited sometime between 40 to 160 ka (Forman and Miller, 1984).

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-14006	F83-B15	48	-16.6	>45,000

Moderately well preserved whale rib collected from beneath a mat of vegetation on pre-Late Weichselian raised beach deposit that crests at 50 m asl. Collected by S.L. Forman and D.H.

Mann, August 1983. Comment (S.L.F.): This age is consistent with age estimates of 40 to 160 ka based on amino acid ratios on molluscs from this deposit and correlative units and also the qualitative differences in soil development (cf. Forman and Miller, 1984).

ENGELSKBUKTA SERIES

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-2903	F84-68	7.5	9950 ± 90	0	9525 ± 90

Large, robust, paired valves of the marine pelcypod, Mya truncata were collected from the upper part of a moderately sorted sublittoral sand capping a deglacial emergence sequence (See Forman, 1989). Shells from section EG4 located on the north side of Engleskbukta, 0.5 km west of the Camp Derten Hut (78° 51'N, 11° 44'E). Collected by S.L. Forman, July 1983 and re-collected July 1984. Comment (S.L.F.): Lodgement till at base of section indicates that this site was covered by Late Weichselian glaciers and was deglaciaded >9.5 ka.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
AA-3356	F84-MP	23	11,630 ± 150	0	11,205 ± 150

Elphidium excavatum f. clavata forams concentrated from ice-proximal glacial sediments 20 cm above Late Weichselian till at Section EG4 (78° 51' N, 11° 44' E). Sample weighed 7.2 mg and was dated by AMS at the University of Arizona. Collected by S.L. Forman and J. Walters, July 1984: Comment (S.L.F.): This age is a close estimate on deglaciation of this site. Shells in the overlying sublittoral sand dated to ca. 9.5 ka, indicating that the deglacial emergence sequence was deposited in < 2000 yr.

INNER KONGSFJORDEN, NY ÅLESUND

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age	Reservoir Corrected Age
Beta - 10978	F84-420	2	9150 ± 100	1.33	8725 ± 100

Whole and paired valves Mya truncata and Hiatella arctica were collected below beach gravel, from a sand lens resting on Late Weichselian till. This section is located on the south side of Kongsfjorden at the boat dock for Ny Ålesund (78° 55' N, 11° 56' E). Collected by S.L. Forman and A. Werner, August 1984. Comment (S.L.F.): The contact between sand lens and till is unconformable thus the shells provide a minimum limiting age on deglaciation of inner Kongsfjord.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1810	JDP 52/79	-----	-22.9	48,400 + 1442 - 1220

Cellulose isolated from small tree trunk or large branch at base of till deposit 4 km NW of Ny Ålesund, Spitsbergen (78° 58' N, 11° 53' E). Collected by J.D. Peacock, 1979. Comment (J.D.P): This is locality 89 in Section 1e, Figure 3 of Miller (1982). Timber may have been incorporated into the till from the underlying beach deposit of Aminozone H. Date should probably be regarded as >45,000 B.P.

NEOGLACIAL MORaine, CONWAYBREEN, INNER KONGSFJORDEN

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3073	AW-101-84	5	450 ± 40	0	25 ± 40

The marine bivalve, Astarte undata was collected from a Neoglacial push moraine fronting the outermost left lateral Neoglacial moraine of Conwaybreen (Conway Glacier) on the inner north side of Kongsfjorden (79° N, 12° 25' E). The push moraine is composed mostly of fjord-mud and

the shells were collected from the surface. Most shells retain surface ornamentation and periostricum. Only whole valves were submitted for dating. Shells were collected by A. Werner July 1983. Comment (A.W.): The shells were pushed up from the adjacent fjord during a Neoglacial advance. The shells provide a maximum limiting date on the age of this Neoglacial event. Lichen diameters (maximum diameter: 20 mm) on boulders on the moraine, suggest the moraine is < 500 yr old, which is corroborated by the date.

TONSNESET, INNER KONGSFJORDEN

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-9899	TO5	5	6340 ± 210	-16.6	6040 ± 210

A well-preserved Baleen whale skull found amongst modern drift material, directly behind the modern storm beach. Collected by D.H. Mann, July 1983. Comment (D.H.M.): The bone's well-preserved condition and great mass indicates that it is an in situ find. This age is evidence for a mid-Holocene transgression to at least 5 m asl.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-9898	-----	15	9890 ± 360	-16.6	9590 ± 360

Whale vertebrate from surface of raised beach deposit. Collected by D.H. Mann, summer 1983.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10104	TO3	10	10,510 ± 170	+1.7	10,085 ± 170

Pelecypod and barnacle fragments retrieved from <1 m depth from a raised beach. Collected by D.H. Mann July 1983. Comment (D.H.M.): Raised beaches are inset within glacial drift deposited during the Late Weichselian, providing a minimum age on deglaciation.

OSSIAN SARSFJELLET, INNER KONGSFJORDEN

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
Beta-10972	OSS1	10	9870 ± 130	1.98	9445 ± 130

Bivalve shells collected from the surface of an ice-wedge polygon developed in orange (marine) silt. Collected by D.H. Mann, July 1984: Comment (D.H.M.): Age provides a minimum limiting estimate on deglaciation of inner Kongsfjorden.

BRANDALPYNTEN SECTIONS, INNER KONGSFJORDEN

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-14713	FL188-146	22	9900 ± 275	-24.8	9475 ± 275

Sample from upper most marine peat (seaweed?) bed at site 12b (79° 54' N, 11° 48' E). Peat is intercalated with fine sand/silt beds interpreted to be lagoonal deposits associated with the ca. 30 m asl sea level. Collected by S.L. Forman and S.J. Lehman, July 1988. Comment (S.L.F.): Lagoon formed behind an arcuate paleo-barrier beach at 30 m asl. Establishment of a lagoon implies relatively stable sea level during the earliest Holocene.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-14990	FL88-132	18.5	10,826 ± 290	2.0	10,400 ± 290

Paired valves of the mollusc Mya truncata from sublittoral sand at site 12b (79° 54' N, 11° 48' E). Shells are well preserved with periostracum intact. Collected by S.L. Forman and S.J. Lehman, July, 1988. Comment (S.L.F.): Shells are from the base of sublittoral sands that grade into overlying lagoonal deposits. This age constrains deglaciation of this site to prior to 10.4 ka.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-14713	FL88-144	21.0	11,190 ± 370	24.8	10,765 ± 370

Sample from lower marine peat (seaweed) bed at site 12b (79° 54' N, 11° 48' E). Peat is interstratified with fine sand and silt and interpreted as lagoonal sediments. Collected by S.L. Forman and S.J. Lehman, July 1988. Comment (S.L.F.): Three radiocarbon ages from site 12b from sublittoral and lagoonal sediments overlap at 2 sigma indicating that sea level was relatively stable 10.5 to 9.5 ka ago, which agrees with the relative sea-level record from adjacent Brøggerhalvøya (Forman, et al., 1987).

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
AA-3355	M83-S60	-----	11,210 ± 125	0	10,785 ± 125

Elphidium incertumia forams concentrated from sublittoral sediments approximately 2 m above Late Weichselian till at site 12A (79° 54' N, 11° 48' E). Sample weighed 12.4 mg and was dated by AMS at the University of Arizona. Collected by G.H. Miller and S. Forman, July 1983. Comment (S.L.F.): Site 12A is within 1 to 5 km of the inferred terminus of the outlet glacier that filled Kongfjorden during the Late Weichselian. This age provides a minimum estimate on deglaciation of this fjord.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
WHG-532	FL88-114	-----	12,355 ± 125	0	11,930 ± 125

Elphidium excavatum f. clavata forams collected from glacial-marine silt approximately 30 cm on top of lodgement till from site 12A (79° 54' N, 11° 48' E). Sample weighs 8 mg and was processed into graphite at Wood Holes Oceanographic Institution and analyzed at the University of Arizona AMS facility. Collected by S.J. Lehman and S.L. Forman, July, 1988. Comment (S.L.F.): This is the first sample above the till at this site with an adequate number of unreworke

forams suitable for dating. Age provides a close limiting estimate on deglaciation of this site, near the inferred terminus of Late Weichselian glaciers in Kongsfjorden.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
WHG-531	FL88-110	-----	12,710 ± 110	0	12,285 ± 110

Elphidium excavatum f. clavata forams retrieved from glacial-marine sediments approximately 60 cm above a lodgement till at Site 12, Brandalpynten, Kongsfjord. Sample weighed 6.8 mg and was processed into a graphic target at Woods Hole Oceanographic Institution and dated at the University of Arizona AMS facility. Collected by S.J. Lehman and S.L. Forman, July 1988:

Comment (S.L.F.): This age and a previous one indicates that glacial marine sediment at this site was deposited rapidly (<2000 yr) as glaciers retreat up fjord.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
AA-4671	FL88-181	15.5	0	>44,700

Paired valves of the mollusc Macoma calcaria from a interclast of marine silt in a lodgement till at Site 12C. Collected by S.J. Lehman, July 1988: Comment (S.J.L.): Shells and enclosing marine silt are "erratics" in the Late Weichselian till and thus provide maximum limiting age on glaciation.

OUTER KONGSFJORDEN, SOUTHSIDE

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
-----	FL88-17	21.5	0	42,160 ± 1850

Cibicides lobatulus forams were isolated from stoney red glacial marine-silt in section 5B. The sample weighed 6.7 mg and was prepared into graphite at Woods Hole Oceanographic Institution

and dated by AMS at the University of Arizona. Collected by S.L. Forman and S.J. Lehman, July 1988. Comment (S.L.F.): This age indicates that the red glacial-marine sediment and till at this site is pre-Late Weichselian.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C
GX-14989	FL88-19	22	1.2	>38,050

Whole paired valves of *Hiatella arctica* from gray glacial-marine silt in section 5B. Collected by S.L. Forman and S.J. Lehman, July, 1988. Comment (S.L.F.): This and above age indicates that entire glacial marine sequence at this site is pre-Late Weichselian. The overlying sublittoral and littoral sediments are Late Weichselian. There is an unconformity in this section that was not detectable in the field.

RAISED BEACH SERIES OF MITRAHALVØYA

Whalebones were retrieved from the well-preserved raised beach sequence between Diesetelva (Dieset River) and Mitrvatna (Lake Mitra). All bones were found below 20 m asl on the Late Weichselian/Holocene raised beach sequence. One date in this series (B-10968) was published in Forman et al., (1987).

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10771	F84-436	2	465 ± 75	-15.6	165 ± 75

A whole whale vertebra found on a wave eroded bedrock surface approximately 200 m behind the modern storm beach at upper limit of modern drift-material (79° 9' N, 11° 17' E). Collected by S.L. Forman and D.H. Mann, August 1984. Comment (S.L.F.): Age of bone suggests that sea level has been close to its present level for the last ca. 100 yr.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-1722	M79/SB1	-----	9660 ± 50	-16.9	9360 ± 150

Collagen fraction in whalebone 4 m below Holocene marine limit Kap Mitra, West Spitsbergen (79° 7' N, 11° 11' E). Collected by G.H. Miller, 1979.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10775	F84-437	5	9855 ± 155	-16.6	9555 ± 155

Moderately well preserved whale rib found within a concentration of whalebones collected from the seaward slope of a raised beach (79° 9' N, 11° 17' E). Collected by S.L. Forman and D.H. Mann, August 1984. Comment (S.L.F.): Taphonomy of whalebones in this area suggest that a whale beached near this site. This age constrains the timing of construction of raised beaches below 5 m asl and compares favorably with ages on Brøggerhalvøya from similar elevation.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10773	F84-438	7	9945 ± 155	-16.8	9645 ± 155

A whole whale rib amongst numerous whalebones retrieved from the seaward side of a raised strandline that crests at 8 m asl (79° 9' N, 11° 17' E). Collected by S.L. Forman and D.H. Mann, August 1984. Comment (S.L.F.): The ubiquity of whalebones indicates that a whale beached near this site.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10778	F84-430	4	10,040 ± 150	-15.6	9740 ± 150

A whale rib found buried by <1 m of beach gravels and covered by a thick mat of vegetation. Collected by S.L. Forman and D.H. Mann, August 1984 from the crest of a raised strandline

directly behind the modern storm beach (79° 11' N, 11° 17' E). Comment (S.L.F.): Date indicates that sea level fell below present by ca. 9700 yr B.P. Note that this date is statistically identical to GX-10773 from a slightly higher elevation.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10772	F84-432	10	10,280 ± 160	-16.5	9980 ± 160

A well-preserved 2-m long whale rib found buried vertically in beach gravels (79° 11' N, 11° 17' E). Collected from the crest of regression strandline by S.L. Forman and D.H. Mann, August 1984. Comment (S.L.F.): Ages on whalebone from 10 to 4 m asl overlap at one sigma, indicating that the fall in relative sea level was rapid (10 m/1000 yr) during the earliest Holocene.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10103	Mitra 1	15	10,750 ± 330	-17.7	10,450 ± 330

A well-preserved dense skull-bone (?) of a whale collected from broad raised beach surface (79° 11' N, 11° 17' E). Collected by D.H. Mann, July 1983; recollected by S.L. Forman and D.H. Mann, August 1984. Comment (S.L.F.): A concentration of whalebones suggest that a whale beached near this site. This bone provides minimum limiting age for construction of broad upper terrace and attainment of marine limit at 20 m asl. Whalebones above 15 m asl are rare, possibly indicating severe sea-ice conditions prior to ca. 10,500 yr B.P.

Laboratory Number	Field Number	Elevation (masl)	Lab Age	¹³ C	Reservoir Corrected Age
Beta -10968	F84-435	19	13,400 ± 190	-17.41	13,100 ± 190

A well-preserved dense skull-bone (?) of a whale collected from the surface of truncated recurved-spit that forms the Late Weichselian marine limit at 20 m asl (79° 11' N, 11° 17' E). An isolated find retrieved by D.H. Mann and S.L. Forman, August 1984. Comment (S.L.F.): The date indicates that deglacial unloading of western Spitsbergen occurred prior to 13,000 yr B.P. The

change in raised beach morphology from a recurved spit at the marine limit to strandlines that parallel the present shoreline at lower elevations indicates a change in the direction and energy of wave attack, possibly reflecting ameliorating sea-ice conditions. This is the oldest whalebone found at the Late Weichselian marine limit on Svalbard; suggesting at least for a short interval at ca.13,000 yr B.P. that the adjacent seas were ice-free long enough to allow the migration of whales to the shores of Spitsbergen.

HERMANSENØYA

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
DIC-3053	F84-387	1	-25.0	2200 ± 90

Well-preserved platy sphagnum peat layer, 15 to 50 cm thick, buried by <1 m of modern storm beach gravels. The peat layer also occurs as pods and lenses and is traceable along coastal exposures for at least 50 m. Section fronts the southeasternmost beach on Hermansenøya (78° 32' N, 12° 16' E). The upper 2 cm of peat was collected for dating by S.L. Forman, August 1984. Comment (S.L.F.): The peat layer was traced inland to be continuous with modern peat formation. Date indicates that peat formation below 1.5 m asl was disrupted by a rise in sea level ca. 2200 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-2905	M79-Sh105	23	10,250 ± 90	0	9825 ± 90

Paired valves of the bivalve Mya truncata were collected from a sublittoral sand above a lodgement till, exposed in sections on the northeastern end of the island (78° 34' N, 12° 10' E). Collected by G.H. Miller in August, 1979 and recollected by S.L. Forman, August, 1984. Comment (S.L.F.): This age provides a minimum limiting estimate on deglaciation of Hermansenøya.

NORTHERN PRINS KARLS FORLAND

Laboratory Number	Field Number	Elevation (m asl)	Lab Age
T-5112	M1-30WS	10	46,800 ± 3500

A whale rib collected from aminozone B (Miller 1982; Lehman 1985) sublittoral sands within permafrost (78° 52' N 10° 46' E) Collected by S.J. Lehman and M. Whiton, July 1982.

Comment (S.J.L.): This age was obtained on the collagen fraction from gas that was stored for 15 weeks; the same sample when stored for only 3.5 weeks yielded a younger age of 40,500 ± 250 yr B.P. This indicates that the deposit from which the bone was retrieved may have been unusually enriched in uranium (S. Gulliksen, written comm. 1985). The apparent age differences for the 3.5 and 15 week stored samples may indicate that more ²²⁶Ra was present in the sample than would completely disappear in the normal 3.5 week storage time.

Laboratory Number	Field Number	Elevation (m asl)	inner fraction	outer fraction
T-5113	M1-30Sh	8	46,800 ± 6400	50,800 ± 3300

Whole and paired valves of Mya truncata collected from aminozone B (Miller, 1982; Lehman, 1985), sublittoral sands within permafrost at McVitiepynten (78° 52' N, 11° 46' E). Collected by S.J. Lehman and M. Whiton, July 1982. Comment (S.J.L.): This shell collection is from the same stratigraphic unit as the whalebone (above) but ca. 2 m lower down in the section. It is interesting to note that the shells provided a greater radiocarbon age than bone collagen from the same stratigraphic level. The inner shell fraction date was obtained from counting gas stored for 8 weeks and the outer fraction longer stored gas fraction may again be related to a decrease in the activity of ²²⁶Ra.

SARSØYRA

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-14005	F84-202	62	-16.8	>44,800

Dense whalebone fragment collected from highly dissected pre-Late Weichselian raised beach deposits on southern Sarsøyra. Soils on this surface are equivalent to soils developed on episode B raised beaches (40-160 ka) on Brøggerhalvøya (Forman and Miller, 1984). Collected by S.L. Forman and J. Walters, July 1984. Comment (S.L.F.): Age further demonstrates the ubiquity of pre-Late Weichselian raised beach deposits on western Spitsbergen.

KAFFIØYRA SERIES

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10733	F84-209	2	1625 ± 80	-15.1	1325 ± 80

A well-preserved 5-m-long whale (Baleen) jaw-bone resting on the crest of the modern storm-beach. Collected on northern Kaffiøyra, approximately 1 km south of the Polish hut near Avatsmark glacier (78° 40' N, 11° 52' E) by S.L. Forman and J. Walters, July 1984. Comment (S.L.F.): The completeness and preservation of bone indicates that it is not reworked but contemporaneous with the deposit. Age suggests that sea level was close to its present position ca. 1300 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-2904	3KAFF	4.5	9510 ± 80	0	9085 ± 80

Robust paired valves of Mya truncata excavated from a silty-sand glacial-marine sediment in a deglacial emergence sequence on the north coast of Kaffiøyra, approximately 3 km south of the Polish hut near Avatsmark glacier (78° 38' N, 11° 56' E). Collected by S.L. Forman, August 1983. Comment (S.L.F.): This site was covered by Late Weichselian outlet glaciers evidenced by till with strong E-W fabric below the glacial marine unit. The vertical orientation of paired

molluscs indicate that they may have burrowed down from overlying sublittoral sand. A correlative unit, 20 m to the north contains diverse fauna including a thermophilous mollusc, Mytilus edulis. Shells provide minimum limiting age for deglaciation of the Kaffiøyra coast.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10038	3KAFTC	7.5	9620 ± 270	+0.8	9195 ± 270

Paired valves of Mytilus edulis were collected from a gravelly beach deposit below a buried soil on southern Kaffiøyra, 0.5 km north of Snippyten (78° 36' N, 12° 12' E). Other species present include Mya truncata, Hiatella arctica, Macoma calcarea, Astarte borealis, Astarte sp. and Balanus sp. The B horizon of the buried soil was 15 to 25 cm thick and at places was "welded" with the surface soil. Collected by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): This is one of the oldest dates on Svalbard for the extralimital mollusc Mytilus edulis, indicating that by ca. 9200 yr B.P. near shore waters were warmer than today. The beach gravels below the buried soil and enclosing the molluscs were deposited during an early Holocene (9 to 10 ka) regression. The beach gravels on top of the buried soil probably were deposited during a mid-Holocene transgression (5000-7000 yr B.P.). Thus, the well-formed buried soil developed during approximately 3000 yr of mild climate; similar to soil developed that has occurred in the last ca. 6000 yr.

SOUTHERN PRINS KARLS FORLAND SERIES

Whalebone and shell collected from below the Late Weichselian/marine limit of 36 m asl between Poole Point (Poolepyten) and Price Point (Pricepyten), Southern Prins Karls Forland.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10734	F84-342	3	810 ± 80	-15.9	510 ± 80

Bone fragment from a 2-m-long Baleen whale-skull resting in the swale behind the modern storm-beach approximately 3 km north of Price Point (78° 18' N, 12° 4' E). Modern drift material is scattered around skull and the skull was infilled by fine sediment. Collected by S.L. Forman and J. Walters, August 1984. Comment (S.L.F.): Condition of skull suggests that it was not retransported and that a whale beached near this site. This age suggests that sea level has at least been at its present position during the past ca. 500 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10735	F84-362	4	1240 ± 80	-15.9	960 ± 80

A complete whale vertebra was collected from surface of modern storm-beach approximately 1 km north of Price Point (78° 17' N, 12° 4' E). The bone is dense and well preserved and partially buried by beach gravels. Collected by S.L. Forman, August 1984. Comment (S.L.F.): This sample is one amongst many whalebones on the modern storm-beach. Similar in context to GX-10734. Age suggests that sea level has been close to the present level for at least the last 950 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10732	F84-320	3	5365 ± 100	15.9	5065 ± 100

A 5-m-long whale rib found just behind the crest of 3 m asl raised beaches approximately 0.5 km SW of Poole Point (78° 27' N, 11° 56' E). The raised beach is 200 m behind the modern storm-beach. Collected by S.L. Forman and J. Walters, July 1984. Comment (S.L.F.): Bone found on upper reaches of a terrace that crosscuts early Holocene strandlines. Geomorphology and age are evidence for a mid-Holocene transgression that probably did not exceed 3 m asl. The bone was collected at the upper limit of the transgression indicating that sea level began to fall soon after 5000 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3054	E84-329	3	9380 ± 90	0	8955 ± 90

Paired valves of the pelecypod Mytilus edulis found at the base of a buried soil developed in beach gravels, approximately 5 km north of Price Point (78° 18' N, 12° 2' E). Other species present include Mya truncata, Hiatella arctica, Macoma calcarea, and unidentified gastropods. The buried soil has 10-to-15-cm-thick B horizon that is often composite with the modern soil. Collected by S.L. Forman and J. Walters, August 1984. Comment (S.L.F.): The beach gravel containing the molluscs, below the buried soil was deposited during the early Holocene (9 to 10 ka) regression.

After emergence, a soil developed during the early to mid-Holocene, which was subsequently buried by gravels deposited during a mid-Holocene (7 to 5 ka) transgression.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3052	F84-317	10	9860 ± 90	0	9435 ± 90

Slightly abraded (many retaining periostracum) whole valves of the pelecypod Hiatella arctica and Mya truncata were collected from the lower 20 to 40 cm of the 12 m asl terrace from a coastal-section 4 km north of Poole Point (78° 27' N, 11° 44' E). Collected by S.L. Forman and J. Walters, July 1984. Comment (S.L.F.): The shells date the 10 to 12 m asl raised beach deposits; adjacent to the present shoreline.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
I-13794	F84-355	32	10,910 ± 160	-19.2	10,610 ± 160

A whale rib found on the crest of second raised beach down from the Late Weichselian marine limit. Collected approximately 4 km northwest of Price Point (78° 18'N, 11° 54'E) by S.L. Forman and J. Walters, August 1985. Comment (S.L.F.): The rib dates the upper broad 32 m asl raised beach and provides a minimum limiting age for construction of a 2 km long spit at the Late Weichselian marine limit. The spit is truncated by the 32 m asl terrace indicating a change in wave intensity and direction during the latest Weichselian. The change in beach morphology and the paucity of whalebones above 30 m asl is evidence for more severe sea-ice conditions that dampened wave activity and restricted the migration of whales.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
I-13795	F84-287	36	11,650 ± 180	-19.2	11,350 ± 180

A well-preserved Baleen jaw-bone found partially buried by gravel on the crest of 36 m asl raised beach. Bone was collected approximately 5 km southwest of Poole Point (78° 27'N, 11° 42'E)

by S.L. Forman and J. Walters, July 1984. Comment (S.L.F.): This age indicates that regional deglacial unloading commenced prior to 11,300 yr B.P. and that emergence was slow (0.15 m/1000 yr) between 10,000 and 11,000 yr B.P. Note, these ages and calculated emergence rates are in agreement with data from Brøggerhalvøya and Mitrahalvøya.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3055	F84-407	13.0	9640 ± 90	0	9535 ± 90

Robust paired-valves of the pelecypod Mya truncata were collected from a sandy ice-distal glacial-marine sediment overlying a lodgement till. Other species included in the collection are Hiatella arctica, Macoma calcarea and Chlamys islandicus. Shells were retrieved from an exposure on the north side of St. Jonsfjorden in the second valley infjord, approximately 2 km east of Ankerneset (78° 33'N, 12° 27'). Collected by S.L. Forman and J. Walters, August 1984. Comment (S.L.F.): Site is within the limit of Late Weichselian glaciers, evidenced by till in section that can be traced to 55 m asl above the site. The marine limit is notched into the till at 35 m asl. Shells provide minimum limiting age on deglaciation and invasion of the sea.

DAUDMANNSØYRA SERIES

Whalebone, shell, and driftwood collected from raised beach deposits from strandflats north of Steinpyten. Late Weichselian marine limit is at 48 m asl with older beach deposits extending to 61 m asl.

Laboratory ID	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-9911	3DAU157	2	-25	<200

A small (0.5-m-long) unlumbered log partially covered by vegetation was collected from a flat raised beach at 2 m asl, 30 m behind the modern storm beach and within the modern drift-material limit. Collected from the NE side of Farmhamna (78° 20'N, 12° 50'E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): The log's radiocarbon activity is $99.2 \pm 1.6\%$ of the standard (95% of the activity of N.B.S. Oxalic acid) indicates that it was deposited sometime during the past century. Log is allochthonous and postdates the construction of the 2 m asl terrace.

Laboratory Number	Field Number	Elevation (m asl)	13C	Lab Age
DIC-2902	3DAU14	5.5	-25	5590 ± 90

A 2-m long Larix sp. log with bark and root-plate intact buried by 0.5 m of gravels in a raised beach that crests at 6 m asl. The outer ring was sampled for ¹⁴C dating. Collected 2.5 km north of Steinpyten (78° 17' N, 12° 57' E) by S.L. Forman and J. Rhode July, 1983. Comment (S.L.F.): 6 m asl terrace is traceable for 3 km and truncates early Holocene (9 to 9.5 ka) strandlines. Geomorphology and date are evidence for a mid-Holocene transgression that probably did not reach above 6 m asl. Log found near the elevational limit of the transgression indicates that sea level began to fall at about 5000 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	13C	Reservoir Corrected Shell Age
GX-10037	3DAUS	4	6480 ± 200	+0.4	6055 ± 200

Paired valves of the pelecypod Mytilus edulis collected at 2 m depth from a raised beach that crests at 6 m asl. The shells occur in a distinct bed that can be traced laterally for 50 m. Collected from the northernmost island on the southern side of Eidembukta (78° 20' N, 12° 50' E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): The occurrence of Mytilus edulis in a bed configuration is restricted to the intertidal zone. Beach gravels over these shells is evidence for a mid-Holocene transgression that probably started prior to 6000 yr B.P. Also, the presence of this molluscs indicates that near shore waters were warmer than today during the mid-Holocene.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	13C	Reservoir Corrected Age
GX-10777	3DAU4	10	9250 ± 140	-17.9	8950 ± 140

A 2-m-long whale rib retrieved from beneath a mat of vegetation on the crest of a 20-m-long spit remnant. The feature is truncated at the present shoreline. Collected from the southeast shore of Farnhamna (78° 20' N, 12° 55' E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): Paleo-spit formed in protected wake of rock outcrop. Bone provides age of raised beaches adjacent to present shoreline.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10776	3DAU11	14	9490 ± 165	-16.8	9190 ± 165

A whole whale vertebra found on crest of 1 m high strandline. Collected approximately 2 km NNE of Steinpyten (78° 17'N, 12° 55'E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): Bone from lower regressional strandline and provides a limiting age on raised beaches that occur just above the present cliff-line.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10593	3DAU7	30	9735 ± 160	-16.0	9435 ± 160

A whale vertebra found amongst many bones on crest of raised beach built against bedrock. Collected by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): Abundance and variety of whalebones indicate that a whale beached near this site. Age constrains the timing of construction of prominent raised beach at 30 m asl.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10591	3DAU12	38	9795 ± 165	-16.6	9495 ± 160

Whale rib collected from a concentration of whalebones on the seaward slope of the 40 m asl terrace. Bone covered by vegetation and moderately well preserved. Collected approximately 2 km NE of Steinpyten (78° 17' N, 12° 57' E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): The bone was collected from regressional strandlines that front a broad 40 m asl raised beach, providing a limiting date on construction of this feature. This age and four other ¹⁴C ages from lower elevations overlap at two-sigma indicating that sea level fell rapid, 5 to 10 m between 9 and 10 ka.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10592	3DAU10	24	9860 ± 170	-17	9560 ± 170

A well-preserved whale vertebra excavated from 0.5 meter of partially frozen gravels. The bone was retrieved from seaward slope of 1-m-high regressional strandline. Collected 1.5 km north of Steinpyten (78° 17' N, 12° 55' E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): This bone is one of many found in permafrost at this site. Note similar age as whalebone GX-10593 from 30 m asl.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age				Reservoir Corrected Collagen Age
			Collagen Fraction	¹³ C	Apatite Fraction	¹³ C	
GX-9910	3DAU13	42	10,380 ± 310	-17.5	9280 ± 380	14.4	10,080 ± 310

A well-preserved whale rib excavated from permafrost on lower seaward slope of a raised beach that crests at 44 m asl. Collected approximately 2 km east of Steinpyten (78° 16'N 12° 55'E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): This is the highest whalebone found and provides a limiting age for the Late Weichselian marine limit at 48 m asl. The limit is defined by a 2 km long recurved spit which is truncated by regressional strandlines. Whalebones are rare above 40 m asl. Raised beach morphology and rates of uplift are similar to Brøggerhalvøya and southern Prins Karls Forland.

ST JONSFJORDEN SERIES

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-2908	3SVATH	13.0	8850 ± 75	0	8525 ± 75

Large abraded fragments of the pelecypod Mytilus edulis collected from frost boils on the strandline crest. Many fragments are coated by secondary pedogenic carbonate. Prior to dating, most of the carbonate coats were mechanically removed and then 50% by weight of the shell was

removed with HCl. Collected 3 km north of Eidempyten, Svarfjellstranda (78° 22' N, 12° 40' E) by S.L. Forman and J. Rhode, July 1983. Comment (S.L.F.): Date is about 600 yr younger compared to dates on whalebones (i.e. 9194 ± 160, GX-10776) retrieved from similar elevations on the adjacent strandflat of Daudmansøya. Although care was taken to rid the sample of secondary carbonate, the younger age may be from contamination by younger carbon.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3056	F84-410	3.5	8690 ± 80	0	8265 ± 80

Paired valves of the pelecypod Mya truncata excavated from sublittoral sands at the base of a raised beach that crests at 7 m asl. Other species present include Hiatella arctica, Macoma calcarea, Astarte crenata, Astarte borealis, Modiolus modiolus, Mytilus edulis, Littorina littorea, and an unidentified limpet. Collected from inner St. Jonsfjord, 1 km south from Piriepyten (78° 32' N, 13° 5' E) by S.L. Forman and J. Walters, August, 1984. Comment (S.L.F.): The shells cannot be related to a specific sea level but provide maximum limiting date for the construction of the 7 m asl terrace. This age compared to ages from raised beaches at similar elevation outside St. Jonsfjord indicate that there is a strandline tilt of approximately 1 m/km. Till and striae on adjacent bedrock indicates that glaciers expanded into this fjord during the Late Weichselian. The shell age indicates that the inner part of the fjord was deglaciation prior to 8300 yr B.P. Presently the marine environment in St. Jonsfjord is dominated by sea ice and icebergs 9 to 10 months/year. This faunal assemblage suggests warmer waters than today at ca. 8300 yr B.P.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
AA-2842	F84-Sh406	9.5	10,915 ± 150	0	10,490 ± 150

A single paired valve of Hiatella arctica collected from an ice-proximal glacial marine unit 40 cm above lodgement till form an exposure on the north side of St. Jonsfjord, 4 km in from the fjord mouth. The mollusc was well preserved with periostracum and ornamentation preserved. Sample weighed 2 g and was dated by AMS at the University of Arizona. Collected by S.L. Forman and J. Walters, August 1984. Comment (S.L.F.): This site is approximately 2 km inside the inferred Late Weichselian glacier limit of this fjord. This age provides a minimum estimate on deglaciation

of this site and the marine limit at 35 m asl. Radiocarbon age of ca. 9.5 ka on molluscs 4 m above this sample in sublittoral sands indicates that this deglacial emergence sequence was deposited in ca. 1000 yr.

REINSDYRFLYA SERIES

Whalebone and shell were collected from raised marine terraces on northern and eastern Reinsdyrflya. Many of these dates, in addition to those in Salvigsen, and Osterholm (1982), were used to construct an uplift curve for Reinsdyrflya.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-9985	SL24-32	33	1.9	23,220 ± 1350

Whole and fragmented valves of Hiatella arctica collected from pea-gravels exposed in river cut in prominent terrace at 33 m asl (79° 48' N, 13° 20' E). Collected by S.J. Lehman and R.J. Donahue, July 1983. Comment (S.J.L.): Small sample (ca. 20 g carbonate). The age of this date appears to suggest either a mixed population of shells or the possibility of an "infinite" age. I prefer the latter interpretation because the site is above the local Late Weichselian marine limit and beyond the Late Weichselian ice limit making it difficult to incorporate "young" shells into the collection. It is also possible that young soil carbonate may have contaminated a sample of "infinite age" but most carbonate of this origin is removed by leaching prior to dating.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-1129	SL84-37	23	-17.0	10,290 ± 135

Whale rib retrieved from beneath a vegetation mat at the Late Weichselian marine limit on northern Reinsdyrflya (79° 50' N, 13° 20' E). Collected by S.J. Lehman, G.K. Hovelsrud and E.D. Radack, August 1984. Comment (S.J.L.): This date provides a minimum estimate of the age of the LWML on Reinsdyrflya at a position beyond the late Weichselian ice margin in Liefdefjord.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-99846	SL22-20	20	1.5	>36,500

Collection of reworked Hiatella arctica from a river cut in the Late Weichselian marine limit terrace at 23 m asl (79° 47' N, 13° 40' E). Collected by S.J. Lehman and R.J. Donahue, July 1983.

Comment (S.J.L.): Small sample (ca. 20 g carbonate). This collection was obviously reworked from an older marine unit or sampled from older beach materials stratigraphically below the LWML terrace; a whalebone date of the LWML provides a minimum age estimate for this feature of ca. 10 ka BP.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
GX-10685	SL84-39	9.5	9575 ± 210	-17.2	9275 ± 210

A 1-m-long specimen of whale rib collected from beneath a vegetation mat at 9.5 m asl on northern Reinsdyrflya (79° 51' N, 13° 50' E). Collected by S.J. Lehman, G.K. Hovelsrud and E.D. Radack, August 1984. Comment (S.J.L.): This date records a position of sea level above the collection site.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-3076	SL84-33	5	9800 ± 80	0	9375 ± 80

Paired valves of Mytilus edulis collected from pea-gravels within a raised marine terrace at 5 m asl on eastern Reinsdyrflya (79° 45' N, 14° 00' E). Collected by S.J. Lehman, G.K. Hovelsrud, and E.D. Radack, August 1984. Comment (S.J.L.): This sample may be confidently related to a 5 m asl. This date also provides a maximum estimate of the age of incursion of M. edulis onto the north coast of West Spitsbergen (together with identical data no. T-3098 on M. edulis of Salvigsen and Osterholm [1982]).

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
DIC-2858	RD29	1.5	9170 ± 85	0	9065 ± 85

Paired valves of Hiatella arctica collected from frost boiled muds at 1.5 m asl (79° 52' N , 13° 39' E). Collected by R.J. Donahue and S.J. Lehman, July 1983. Comment (S.J.L.): This date probably records a sea-level stand not more than 3 m above the collection site.

AMSTERDAMØYA, NORTHWESTERN SPITSBERGEN

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
GX-13206	Ab37	14.5	1.6	>44,000

Paired robust valves of Mya truncata from a sublittoral sand overlying a glacial marine sediment. Collected by A. Werner, July 1986. Comment (S.L.F. for A.W.): Shells yielded amino acid ratios similar to Holocene shells. This site appears not to have been submerged during the last glacial/deglacial cycle thus experienced colder diagenetic temperatures than sites below the Late Weichselian marine limit. Age is evidence for a pre 40 ka glaciation of greater magnitude than the Late Weichselian event.

KAPP WIJK, DICKSONFJORDEN

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
Beta-11291	KW1	1	8840 ± 110	0.83	8415 ± 110

Single valves of Mya truncata from a till overlying striated bedrock on the east side of Kapp Wijk lagoon. Striae on bedrock trend SW-NE. The till contains abundant red sandstone clast transported from Dicksonfjord. One small fragment of Mytilus edulis was noticed in the till. Collected by D.H. Mann, August 1984. Comment (D.H. Mann): Shells were reworked from marine muds during an early Holocene re-advance in Dicksonfjord.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR-2210	JDP 49	-----	-17.4	34,480 + 590/ - 550

Collagen from whalebone at base of beach sediments and above glaciomarine sediments Kjaersvika, West Spitsbergen (78° 54' N, 11° 30' E). Collected by J.D. Peacock, 1979.

Comment (J.D.P): Collected from sublittoral sands of the upper emergence cycle (Aminozone B, see Miller, 1982, Figure 6, Section 3a). Other ^{14}C determinations are (1) GX-7991-A (bone apatite), GX-7991-G (bone collagen), both yielding ages of >37,000 B.P. and (2) QL-1693 (>61,000 B.P.)

WEST EDGEØYA SERIES

Whalebone and driftwood in beach deposits West Edgeøya, Spitsbergen. Collected 1979 by G.S. Boulton and N. Eyles. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2161	GB129	49	9440 ± 50	-17.1	9140 ± 50

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR-2162	GB76	44.7	-24.5	9200 ± 50

Cellulose from large driftwood log in sands immediately underlying gravel top of beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2163	GB75	8.3	5380 ± 40	-16.9	5180 ± 40

Collagen from whalebone rib embedded in gravels of beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2164	NE41	6	9970 ± 60	-16.9	9670 ± 60

Collagen from whalebone rib deeply embedded in beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2165	GB81	7.9	-24.4	2400 ± 40

Cellulose from driftwood deeply embedded in beach cordon .

SMELLEDALEN SERIES

Whalebone, driftwood, moss and marine shell in raised beach deposits Smelledalen, West Edgeøya, Spitsbergen (77° 57' N, 22° 28' E). Collected by G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2166	GB101	24.1	3950 ± 50	-18.4	3650 ± 50

Collagen from whalebone deeply embedded in sandy terrace surface.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2167	GB105	16.2	-22.3	4430 ± 50

Cellulose from large driftwood log deeply embedded in gravelly beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR-2168	GB99	15.2	-22.3	4390 \pm 40

Cellulose from driftwood in topsets of marine terrace. Terrace surface at 18.2 m asl.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR -2169	GB84	-----	-25.5	7360 \pm 50

Cellulose from driftwood.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR -2170	GB85	-----	-25.7	9990 \pm 80

Moss in basal horizon of bed as described in SRR-2169.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR -2171	GB97	-----	3440 \pm 100	+2.6	3015 \pm 100

Marine shells (Mya truncata) within beach sediments below braided stream deposits.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR -2172	GB88	5.4	-22.6	2280 \pm 80

Cellulose from driftwood log in sandy beach ridge.

BETTYBUKTA SERIES

Whalebone and driftwood deeply embedded in raised beach gravels of well-defined coarse-gravel strandlines extending up to a marine limit at 42 m asl, Bettybukta, Sorkapland, Spitsbergen (76° 43' N, 17° 16' E). Collected by N. Eyles and G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR -2174	NE61	9.5	6580 \pm 50	-17.5	6280 \pm 50

Collagen from whalebone.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR -2175	NE59	18	-24.1	840 \pm 40

Cellulose from driftwood.

Laboratory Number	Field Number	Elevation (m asl)	^{13}C	Lab Age
SRR -2176	GB153	5	-26.1	1330 \pm 40

Cellulose from driftwood.

MOHNBUKTA/REVNØSA SERIES

Whalebone and driftwood in sandy-gravelly strandlines between Mohnbukta and Revnøsa, Starfjorden, Spitsbergen (78° 3' N, 19° 4' E). Region exhibits rapidly changing marine limit from 52.5 m asl at Mohnbukta to 35 m asl at Revnøsa. Collected by B. Horsefield, 1979. Comments from J. D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2177	BH62	45.5	7770 ± 50	-18.1	7470 ± 50

Collagen from whalebone deeply embedded in raised beach gravels.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2178	BH52	15.5	-24.2	4830 ± 40

Cellulose from driftwood deeply embedded in beach sediment.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2179	BH42	22.1	7000 ± 50	-16.1	6700 ± 150

Collagen from whalebone of fragmented carcass on beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2180	BH43	12.2	-22.5	4900 ± 40

Cellulose from driftwood within coarse beach gravels.

MISTAKODDEN SERIES

Whalebone (collagen fraction) in beach gravels in Mistakodden, NW Barentsøya, Spitsbergen (78° 31' N, 20° 14' E). Collected by B. Horsefield, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2181	BH68	20.5	5780 ± 50	-17.2	5480 ± 50

Fragmented whole carcass on raised beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2182	BH66	16.5	5910 ± 50	-16.6	5610 ± 50

Fragmented whalebone deeply embedded in beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2183	BH71	9.5	3640 ± 40	9.5	3340 ± 40

Whalebone from beach terrace.

ILLADALEN SERIES

Whalebone and driftwood in raised beach deposits Illadalen, SE Barentsøya, Spitsbergen (78° 17' N, 21° 53' E). Collected by G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2184	GB115	-----	8220 ± 50	-18	7920 ± 50

Collagen from large whalebone fragments deeply embedded in sands which had soliflucted from marine terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2185	GB116	69.5	9210 ± 50	-18.2	8910 ± 50

Collagen from whalebone fragments deeply embedded in sands and gravels of prominent beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2186	GB114	32.1	6430 ± 50	-16.6	6130 ± 50

Collagen from whalebone of fragmented carcass on surface of beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2187	GB117	28.4	-22.3	5710 ± 40

Cellulose from large driftwood log within gravel beach foresets exposed in stream section and related to beach surface.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2188	GB113	9.2	3630 ± 50	-17.3	3330 ± 50

Collagen from whalebone deeply embedded in gravels on broad beach terrace.

STRUKKEDALEN SERIES

Whalebone and driftwood in beach deposits in Strukkedalen, northern Edgeøya, Spitsbergen (78° 13' N, 21° 49' E). At this locality a major mass of deltaic sediment has been transgressed, presumably at some time during the Holocene. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2189	NE46	68	7090 ± 60	-17.9	6790 ± 60

Collagen from whalebone rib deeply embedded in beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2190	GP135	34.4	7960 ± 50	-25.9	7660 ± 50

Cellulose from large driftwood log deeply embedded within beach topsets.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	^{13}C	Reservoir Corrected Age
SRR-2191	GP133	27.5	6890 ± 50	-17.0	6590 ± 50

Collagen from large whalebone fragment in deltaic foresets at 18 m asl but projecting back to topsets at 27.5 m asl.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2192	GB131	18	-22.3	5320 ± 50

Cellulose from large driftwood log in beach foresets.

KAPP HEUGLIN SERIES

Whalebone and driftwood in beach deposits at bay south of Kapp Heuglin, Edgeøya, Spitsbergen (78° 13' N, 22° 53' E). Collected by G.S. Boulton and N. Eyles, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2193	GB141	43.3	-23.8	8000 ± 50

Cellulose from driftwood deeply embedded in gravel beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2194	NE54	38.5	-21.6	6010 ± 50

Cellulose from driftwood log deeply embedded in beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2195	NE52	30.5	5980 ± 50	-16.4	5680 ± 50

Collagen from large whalebone rib deeply embedded in beach foresets related to terrace.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2196	GB139	23.3	-22.9	5600 ± 40

Cellulose from driftwood embedded in beach terrace.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2197	NE50	17.5	-23.7	380 ± 40

Cellulose from driftwood deeply embedded in beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2198	GB146	9.8	-21.4	3580 ± 50

Cellulose from driftwood deeply embedded in gravel terrace.

ARKVATNET SERIES

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2199	GB2160880	-----	9670 ± 50	+1.6	9245 ± 50

Shells (*Mya truncata*) within glaciomarine silts immediately overlying till. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2200	GB5160880	35	-25.6	9330 ± 50

Cellulose from large driftwood log within gravel foresets related to terrace surface. Comments from J.D. Peacock.

VINDBUKTA SERIES

Whalebone and driftwood in beach gravels Vindbukta, Nordaustlandet, Spitsbergen (80° 19' N, 22° 24' E). Collected by G.S. Boulton, 1980. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2201	GB1150880	-----	-23.9	6430 ± 50

Cellulose from driftwood log in heavily weathered gravels overlain by presumed Holocene beach sequence.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2202	GB2150880	-----	-24	6510 ± 50

Cellulose as for SRR-2201.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2203	GB6150880	-----	8760 ± 50	-19.8	8460 ± 50

Collagen from large whalebone rib deeply embedded in presumed Holocene beach gravels.

TALavera SERIES

Whalebone, driftwood and moss in series of sand and gravel beaches reaching up to a marine limit of 53 m asl, Talavera, southern Barentsøya, Spitsbergen (78° 15' N, 21° 7' E). Collected by G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2204	GB122	33.5	6850 ± 50	-18.4	6550 ± 50

Collagen from whalebone deeply embedded in gravelly beach ridge.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2205	GB125	30.5	6880 ± 50	-17.2	6580 ± 50

Collagen from whalebone rib deeply embedded in gravel beach at 30.5 m asl and just above the succeeding transgression limit.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2206	GB123	-----	-26.1	10,370 ± 60

Moss deposited in braided stream sediments underlying beach gravels.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-2207	GB124	28.5	-24.3	7210 ± 40

Cellulose from deeply embedded driftwood log at 28.5 m asl and immediately below the highest position of the post-braided stream transgression.

TJUVEFJORD SERIES

Whalebone and marine shell in beach deposits, Tjuvefjord, southern Edgeøya, Spitsbergen (77° 31' N, 22° 30' E). Collected by G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2208	GB64	27.5	5110 ± 40	-16.6	4810 ± 40

Collagen from whalebone of disintegrated carcass on marine terrace.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-2209	GB63	20.6	4830 ± 40	-16.8	4530 ± 40

Collagen from whalebone carcass on beach ridge.

DELTANESET SERIES, WEST SPITSBERGEN

Wood and moss rich silt in exposure Deltanaset, Isfjord, West Spitsbergen (78° 17' N, 15° 36' E). Stratigraphic sequence comprises a) ca. 7 m solifluction deposit, b) ca. 4 m littoral gravel unconformity, c) ca. 2 m lacustrine silts, and d) ca. 3 m highly weathered littoral gravel resting on bedrock. Collected by G.S. Boulton, 1979. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1719	GB13/79	-----	-21.9	4960 ± 50

Cellulose fraction in driftwood log at base of stratigraphic unit b.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1720	PG2/79	-----	-25	7970 ± 50

Organic, moss rich, silt in stratigraphic unit c.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1721	GB12/79	-----	-24	4465 ± 45

Cellulose fraction in driftwood log at top of stratigraphic unit d.

BARENTS SEA

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C	Reservoir Corrected Age
SRR-1556	-----	-----	9430 ± 450	2.6	9005 ± 450

Marine shell fragments (Chlamys islandicus, Macoma calcarea, and Astarte elliptica) at 24 m depth in core (V27-65-24) taken from sea bed, Barents Sea (74° 22' N, 22° 58' E). Collected by G.S. Boulton, 1978.

SARSBUKTA SERIES, WEST SPITSBERGEN

Marine shell fragments in cores taken from sea bed, Sarsbukta, West Spitsbergen (78° 42' N, 12° 1' E). Collected by G.S. Boulton, 1978. Comments from J.D. Peacock.

Laboratory Number	Field Number	Elevation (m asl)	Lab Age	¹³ C
SRR 1557	-----	-----	>14,180	0.1

Hiatella arctica at 7 m depth in core M 3149.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1558	M3149	-----	2.0	>31,230

Hiatella arctica and Mya truncata at 9.2 depth in core M 3151.

Laboratory Number	Field Number	Elevation (m asl)	¹³ C	Lab Age
SRR-1559	M3151	-----	1.5	>35,540

Hiatella arctica, Astarte elliptica, and unidentified species at 10 m depth in core M 3152.

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Numbers 1 through 5, and 9, 11, 12, 16, 17, 18, 21, 23, 31, 37, and 39 are out of print. A second edition of Number 1 is available from the author. Numbers 2, 3, 4, 5, 9, and 11 are available from National Technical Information Service, U.S. Department of Commerce. For details, please write to INSTAAR.

6. *Guide to the Mosses of Colorado*. By W.A. Weber. 1973. 48 pp. Order from the author, University of Colorado Museum, Boulder, Colorado 80309. \$2.50.
7. *A Climatological Study of Strong Downslope Winds in the Boulder Area*. By W.A.R. Brinkmann. 1973. 228 pp. Order from the author, Institute for Environmental Studies, University of Wisconsin, 1225 West Dayton Street, Madison, Wisconsin 53706.
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