

UNIVERSITY OF LUND RADIOCARBON DATES VII

SÖREN HÅKANSSON

Radiocarbon Dating Laboratory, Department of Quaternary Geology
University of Lund, Sweden

INTRODUCTION

Most of the ^{14}C measurements reported here were made between October 1972 and October 1973. Equipment, measurement, and treatment of samples are the same as reported previously (R, 1968, v 10, p 36-37; 1970, v 12, p 534).

Age calculations are based on a contemporary value equal to 0.950 of the activity of NBS oxalic acid standard and on the "conventional" half-life for ^{14}C of 5568 yr. Results are reported in years before 1950 (years BP), and in the AD/BC system. Errors quoted ($\pm 1\sigma$) include standard deviations of count rates for the unknown sample, contemporary standard, and background. Corrections for deviations from the "normal" $^{13}\text{C}/^{12}\text{C}$ ratio for terrestrial plants ($\delta^{13}\text{C} = -25.0\text{‰}$ in the PDB scale) are applied for all samples; also for marine shells, because apparent age of recent marine shells is not always just counterbalanced by the effect of isotopic fractionation (*cf.* Recent marine shells series, R, 1973, v 15, p 506-507). $\delta^{13}\text{C}$ values quoted are relative to the PDB standard.

The remark, "undersized; diluted", in *Comments* means the sample did not produce enough CO_2 to fill the counter to normal pressure and "dead" CO_2 from anthracite was introduced to make up the pressure. "‰ sample" indicates amount of CO_2 derived from the sample present in the diluted counting gas; the rest is "dead" CO_2 . Organic carbon content reported for bone sample is calculated from yield of CO_2 by combustion of pretreated collagen. Organic carbon lost during treatment is not included in calculated percentage.

The description of each sample is based on information provided by the submitter.

ACKNOWLEDGMENTS

The author thanks Kerstin Lundahl for sample preparations and routine operation of the dating equipment, and R Ryhage and his staff at the mass-spectrometric laboratory of Karolinska Inst, Stockholm, for the ^{13}C analyses. Special thanks are due Christian Cavallin for assistance with the electronic equipment.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Sweden

Malghult Pool series

Sediment (Livingstone core sampler, diam 60mm) from deepest part of Malghult Pool, Kristdala parish, S Sweden ($57^\circ 22' \text{ N}$, $16^\circ 15' \text{ E}$). Coll 1970 and subm by M Aronsson, Dept Quaternary Geol, Univ Lund.

Dating is part of study on development of vegetation and cultural history in Kristdala area. Depths in sample titles refer to pool water level. Water depth 160cm at sampling point. Pollen analyses by submitter. Only weak pretreatment with HCl due to small samples.

Lu-508. Malghult Pool 8, 299 to 306cm **1490 ± 50**
AD 460
 $\delta^{13}C = -30.6\text{‰}$

Detritus gyttja. Low *Picea* value (ca 0.5%).

Lu-509. Malghult Pool 7, 284 to 291cm **1430 ± 50**
AD 520
 $\delta^{13}C = -28.4\text{‰}$

Detritus gyttja. Beginning of pronounced *Picea* increase.

Lu-510. Malghult Pool 6, 264 to 271cm **1180 ± 50**
AD 770
 $\delta^{13}C = -29.1\text{‰}$

Detritus gyttja. Continued *Picea* increase.

Lu-511. Malghult Pool 5, 244 to 251cm **920 ± 55**
AD 1030
 $\delta^{13}C = -28.9\text{‰}$

Detritus gyttja. Just below *Picea* maximum (ca 12%) combined with increase of cereal and weed pollen. *Comment*: undersized; diluted; 91% sample.

Lu-512. Malghult Pool 4, 224 to 231cm **730 ± 55**
AD 1220
 $\delta^{13}C = -29.2\text{‰}$

Detritus gyttja. *Comment*: undersized; diluted; 88% sample.

Lu-513. Malghult Pool 3, 223 to 230cm **720 ± 50**
AD 1230
 $\delta^{13}C = -29.4\text{‰}$

Detritus gyttja. *Comment*: samples 3 and 4 are from adjacent cores.

Lu-514. Malghult Pool 2, 198 to 209cm **1290 ± 80**
AD 660
 $\delta^{13}C = -28.9\text{‰}$

Detritus gyttja with lumps of another soil type containing littoral brown-mosses. *Comment* (MA): deviating age may be explained by presence of littoral plants, indicating temporary outflow of older littoral material and redeposition at sampling point. Undersized; diluted; 46% sample.

Lu-515. Malghult Pool 1, 184 to 191cm **610 ± 65**
AD 1340
 $\delta^{13}C = -30.6\text{‰}$

Detritus gyttja. *Comment*: undersized; diluted; 56% sample.

Gothenburg Botanical Garden series

Sediment from 2 cores from Gothenburg Botanical Garden (57° 41' 06" N, 11° 57' 18" E) were dated in conjunction with establishing a Pleistocene/Holocene boundary stratotype (Mörner, 1973). The Late glacial regression brought sea level down to ca +15.5m, the Regression Max or ALV-1 shoreline of Mörner (1969), followed by Postglacial transgressions bringing sea level up to +25.5m. Dates from Cores B 873 and B 870 relate to the ALV-1 stage and beginning of subsequent transgression. Numerous different analyses have been applied to Core B 873 (Mörner, 1973). Pretreated with HCl.

Core B 873

Foil piston core (diam 68mm) taken down to bedrock at 14.5m depth. Surface at +17.4m. Core was proposed as Pleistocene/Holocene boundary stratotype (Mörner, 1973). Coll 1970 and subm by N-A Mörner, Dept Geol, Univ Stockholm.

Lu-552. Core B 873, 188.5 to 191.5cm **9030 ± 100**
7080 BC
 $\delta^{13}C = -17.6\text{‰}$

Gyttja. Early part of PTM-2 transgression. *Comment:* undersized; diluted; 86% sample.

Lu-553. Core B 873, 205 to 207cm **9240 ± 115**
7290 BC
 $\delta^{13}C = -19.1\text{‰}$

Clayey gyttja. Early part of PTM-2 transgression. *Comment:* undersized; diluted; 72% sample.

Lu-554. Core B 873, 229 to 231cm **9050 ± 100**
7100 BC
 $\delta^{13}C = -18.5\text{‰}$

Gyttja. Earliest part of PTM-2 transgression. *Comment:* undersized; diluted; 90% sample.

Lu-555. Core B 873, 251 to 255cm **9740 ± 110**
7790 BC
 $\delta^{13}C = -22.6\text{‰}$

Clay with gyttja. Beginning of ALV-1 stage. Pollen Zone Boundary IV/V. *Comment:* undersized; diluted; 61% sample.

Core B 870

Surface at +17.8m, 40m from Core B 873. Samples from 15x15cm monolith cut from wall in dug out sec. Coll 1970 and subm by N-A Mörner.

Lu-588. Core B 870, I, 176 to 177cm **8860 ± 70**
6910 BC
 $\delta^{13}C = -18.7\text{‰}$

Gyttja. Early part of PTM-2 transgression. *Comment:* undersized; diluted; 76% sample. (4 1-day counts.)

Lu-589. Core B 870, III, 183.5 to 187.5cm **9190 ± 100**
7240 BC
 $\delta^{13}C = -22.4\text{‰}$

Gyttja. End of ALV-1 stage. *Comment:* undersized; diluted: 87% sample.

Näckrosdammen series

Limnic sediment from ancient lake Näckrosdammen, Änggården, Göteborg (57° 40' N, 11° 57' E). Pollen-analytic investigation is part of study of Pleistocene/Holocene boundary (Berglund, 1973). Coll 1972 and subm by B E Berglund, Dept Quaternary Geol, Univ Lund. Depths given are below surface. Pretreated with HCl. All samples undersized; diluted.

Lu-738. Näckrosdammen 1 **10,120 ± 100**
8170 BC
 $\delta^{13}C = -22.4\text{‰}$

Fine detritus gyttja, 259 to 262cm. Pollen-analytically dated to transition zone Younger Dryas—Pre-Boreal. *Comment:* 77% sample. (3 1-day counts.)

Lu-740. Näckrosdammen 3 **10,250 ± 120**
8300 BC
 $\delta^{13}C = -20.6\text{‰}$

Muddy clay, 267 to 272cm. Pollen-analytically dated to the very end of Younger Dryas. *Comment:* 62% sample. (3 1-day counts.)

Lu-741. Näckrosdammen 4 **11,510 ± 105**
9560 BC
 $\delta^{13}C = -23.9\text{‰}$

Clay gyttja, 310 to 315cm. Pollen-analytically dated to end of Alleröd. *Comment:* 86% sample. (3 1-day counts.)

General Comment (BEB): dates of Samples 1 and 3 agree quite well with earlier dating of Pollen Zone Boundary Younger Dryas/Pre-Boreal. Sample 4 seems to be slightly older than expected.

Southern Baltic, pine stump series

Wood from pine stumps dredged by fishermen from bottom of S Baltic Sea at water depth 48 and 57m. Coll by H Berntsson; subm by B E Berglund. Pretreated with HCl and NaOH.

Lu-702. Southern Baltic 2 **9480 ± 95**
7530 BC
 $\delta^{13}C = -25.6\text{‰}$

Wood from pine stump coll 1972 ENE of Stenshuvud (55° 42' N, 14° 34' E) at 48m depth.

Lu-807. Southern Baltic 3**9750 ± 95****7800 BC** $\delta^{13}C = -25.3\text{‰}$

Wood from pine stump coll 1973 SE of Hanö (55° 49' N, 15° 14' E) at 57m depth.

General Comment (BEB): similar ages were obtained earlier for submerged pine stumps from bottom of Baltic (*cf* R, 1972, v 14, p 386).

Kullaberg series

Polar bear femur from depression E of Kullagård, Kullaberg, NW Scania (56° 18' N, 12° 29' E). Coll 1852 (Lindström, 1880, p. 4-5; Holst, 1902, p 11-12) and subm by B E Berglund. Bone from marl layer (Swedish *märgel*) underlain by gyttja. Bone dense and very well preserved. All samples undersized; diluted.

Lu-660. Kullaberg, inner part**12,710 ± 125****10,760 BC** $\delta^{13}C = -14.1\text{‰}$

Collagen from middle part of bone wall. *Comment*: organic carbon content: 4.5%; 80% sample. (3 1-day counts.)

Lu-661. Kullaberg, outer part**12,740 ± 170****10,790 BC** $\delta^{13}C = -14.4\text{‰}$

Collagen from spongy and superficial material inside bone cavity. *Comment*: organic carbon content: 6.3%; 56% sample. (3 1-day counts.)

Lu-602. Kullaberg, intermediate part**12,580 ± 100****10,630 BC** $\delta^{13}C = -13.1\text{‰}$

Collagen from bone material taken between inner and outer part. *Comment*: organic carbon content: 5.4%; 86% sample. (2 2-day counts.) *General Comment*: agreement between dates indicates contamination is absent or insignificant. No corrections made for apparent age of bones of living polar bears (see Recent polar bears series, below).

Recent polar bears series

Radiocarbon activity of bone collagen from 2 recent pre-bomb polar bears was measured to find their apparent ages.

Lu-715. Kapp Wijk**Apparent age: 480 ± 70** $\delta^{13}C = -14.6\text{‰}$

Collagen from cranium of young polar bear coll 1959 at Kapp Wijk, Dickson Fiord, Spitsbergen (78° 30' N, 15° 00' E) by Natascha Heintz, Paleontol Mus, Oslo, Norway; subm by S Håkansson. Time elapsed since death of bear estimated from state of preservation of cranium at 50 ± 50 yr (BP). Activity measurement corrected for this time interval.

Lu-779. Kap Stephensen**Apparent age: 495 ± 45** $\delta^{13}C = -16.2\text{‰}$

Collagen from humerus of ca 2-yr-old polar bear shot in 1932 outside Kap Stephensen, East Greenland (ca 68° 25' N, 28° 31' W) by U Møhl; subm by I Sørensen, Zool Mus, Univ Copenhagen, Denmark. Activity measurement age-corrected for time between 1932 and 1950.

Växjösjön series

Sediment from Lake Växjösjön at the town of Växjö, Central Småland (56° 52' N, 14° 49' E). Coll 1972-73 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dates were part of study of development of lake and surrounding landscape during latest ca 1500 yr. Dates to determine rate of sediment deposition. Depths refer to sediment surface. All samples consist of detritus gyttja.

Lu-734. Växjösjön, 15 to 20cm**760 ± 50****AD 1190** $\delta^{13}C = -26.0\text{‰}$

Comment: pretreated with HCl.

Lu-735. Växjösjön, 40 to 45cm**1120 ± 55****AD 830** $\delta^{13}C = -26.0\text{‰}$

Comment: mild pretreatment with HCl and NaOH. Undersized; diluted; 91% sample.

Lu-736. Växjösjön, 65 to 70cm**920 ± 50****AD 1030** $\delta^{13}C = -26.3\text{‰}$

Comment: same pretreatment as Lu-735.

Lu-674. Växjösjön, 85 to 90cm**790 ± 55****AD 1160** $\delta^{13}C = -26.2\text{‰}$

Comment: pretreated with HCl. 77% sample.

Lu-737. Växjösjön, 90 to 95cm**630 ± 55****AD 1320** $\delta^{13}C = -27.1\text{‰}$

Comment: mild pretreatment with HCl and NaOH. 89% sample.

Lu-675. Växjösjön, 105 to 110cm**640 ± 55****AD 1310** $\delta^{13}C = -26.7\text{‰}$

Comment: pretreated with HCl. 77% sample.

Lu-676. Växjösjön, 125 to 130cm**500 ± 55****AD 1450** $\delta^{13}C = -26.8\text{‰}$

Comment: pretreated with HCl. 67% sample.

- Lu-677. Växjösjön, 145 to 150cm** **450 ± 55**
AD 1500
 $\delta^{13}C = -26.5\text{‰}$
Comment: pretreated with HCl. 75% sample.
- Lu-678. Växjösjön, 165 to 170cm** **480 ± 55**
AD 1470
 $\delta^{13}C = -26.7\text{‰}$
Comment: pretreated with HCl. 72% sample.
- Lu-679. Växjösjön, 185 to 190cm** **440 ± 55**
AD 1510
 $\delta^{13}C = -26.7\text{‰}$
Just above strong increase of *Juniperus*. *Comment:* pretreated with HCl. 80% sample.
- Lu-680. Växjösjön, 205 to 210cm** **610 ± 55**
AD 1340
 $\delta^{13}C = -27.6\text{‰}$
Comment: pretreated with HCl. 91% sample.
- Lu-681. Växjösjön, 225 to 230cm** **770 ± 50**
AD 1180
 $\delta^{13}C = -28.2\text{‰}$
Comment: pretreated with HCl.
- Lu-682. Växjösjön, 245 to 250cm** **970 ± 50**
AD 980
 $\delta^{13}C = -28.0\text{‰}$
Comment: pretreated with HCl.
- Lu-683. Växjösjön, 265 to 270cm** **980 ± 55**
AD 970
 $\delta^{13}C = -28.5\text{‰}$
Comment: pretreated with HCl. 93% sample.
- Lu-856. Växjösjön, 285 to 290cm** **1220 ± 60**
AD 730
 $\delta^{13}C = -28.3\text{‰}$
Comment: mild pretreatment with HCl and NaOH. 75% sample.
- Lu-857. Växjösjön, 305 to 310cm** **1340 ± 60**
AD 610
 $\delta^{13}C = -28.0\text{‰}$
Slight increase of *Juniperus*. *Comment:* same pretreatment as Lu-856. 82% sample.
- Lu-858. Växjösjön, 325 to 330cm** **1400 ± 60**
AD 550
 $\delta^{13}C = -28.3\text{‰}$
Just above rational *Picea* limit. *Comment:* same pretreatment as Lu-856. 77% sample.

Lu-859. Växjösjön, 345 to 350cm **1370 ± 75**
AD 580
 $\delta^{13}C = -28.6\text{‰}$

Comment: same pretreatment as Lu-856. 50% sample.

General Comment (GD): upper samples (from ca 1.5m and upwards) are disturbed and corresponding dates are erroneous due to redeposition of older sediment related to sediment dredging in lake during end of 19th century and beginning of this century.

Solingsmyran series

Marine sediment from beneath peat bog Solingsmyran, Västmanland, Central Sweden (59° 50' N, 16° 30' E). Coll 1971 and subm by S Welinder, Dept Quaternary Geol, Univ Lund. Depths given are below surface. Pretreated with HCl.

Lu-718. Solingsmyran 1, 2.44 to 2.49m **6270 ± 70**
4320 BC
 $\delta^{13}C = -18.5\text{‰}$

Clayey mud.

Lu-719. Solingsmyran 2, 2.93 to 2.98m **6450 ± 75**
4500 BC
 $\delta^{13}C = -15.9\text{‰}$

Clayey mud.

Rövalsmossen series

Peat from the emerged bog Rövalsmossen, Västmanland, Central Sweden (59° 45' N, 16° 17' E). Coll 1971 and subm by S Welinder. Depths are below surface. Pretreated with HCl and NaOH.

Lu-720. Rövalsmossen 1, 0.45 to 0.50m **200 ± 50**
AD 1750
 $\delta^{13}C = -22.0\text{‰}$

Sphagnum peat.

Lu-721. Rövalsmossen 2, 0.50 to 0.55m **780 ± 50**
AD 1170
 $\delta^{13}C = -24.5\text{‰}$

Sphagnum peat.

Hasslöv series

Samples from ca 15cm peat underlain by gravel and overlain by sand at Hasslöv, S Halland (56° 25' N, 13° 00' E). Coll 1972 and subm by H Svensson, Swedish Nat Sci Res Council, Stockholm.

Lu-805. Hasslöv C, peat **9550 ± 95**
7600 BC
 $\delta^{13}C = -27.0\text{‰}$

Upper part (ca 1cm) of peat. Depth 60cm below surface. *Comment:* pretreated with HCl and NaOH.

Lu-805A. Hasslöv C, humic acid **8600 ± 90**
6650 BC
 $\delta^{13}C = -27.0\text{‰}$
 Acid-precipitated part of NaOH-soluble fraction from Lu-805.

Lu-805:2. Hasslöv C, new preparation **10,010 ± 100**
8060 BC
 $\delta^{13}C = -24.9\text{‰}$
 Remaining material from preparation for Lu-805 was given stronger pretreatment with NaOH for removal of more humic acid.

Lu-806. Hasslöv D, peat **2850 ± 55**
900 BC
 $\delta^{13}C = -27.0\text{‰}$
 Bottom part (ca 1cm) of peat. Depth 75cm below surface. *Comment:* pretreated with HCl and NaOH.

Lu-806A. Hasslöv D, humic acid **2400 ± 55**
450 BC
 $\delta^{13}C = -26.5\text{‰}$
 Acid-precipitated part of a NaOH-soluble fraction from Lu-806.

Lu-788. Lake Striern, *Pinus* stump **3680 ± 60**
1730 BC
 $\delta^{13}C = -24.8\text{‰}$
 Wood from stump (*Pinus silvestris* L), coll 1972 on land near W shore of Lake Striern, Östergötland (58° 05' N, 15° 47' E) and subm by H Göransson, Dept Quaternary Geol, Univ Lund. For other dates from Lake Striern, see R, 1970, v 12, p 541-543. Pretreated with HCl and NaOH. *Comment* (HG): stump was preserved by a lacustrine transgression, indicating climatic change. Shore with stumps became land by lowering of lake water level ca 100 yr ago. Date as expected.

Lake Vän series

Sediment from Lake Vän, 6.3km SE of Brokind RR Sta, Östergötland (58° 11' N, 15° 47' E). Alt of lake: +92.4m; size: ca 400x400m. Coll 1969 and subm by H Göransson. Samples taken with 36mm Livingstone core sampler, except Lu-814, which was aggregated from repeated samplings with Hiller sampler. All samples consist of fine detritus gyttja, somewhat clayey in lowest sample. Depths are below sediment-water interface. Water depth at sampling point, 3.8m. Dated as complement to Lake Striern series (R, 1970, v 12, p 541-543). No pretreatment of Lu-822 and -823; all other samples pretreated with HCl.

Lu-814. Vän, 420 to 430cm **9390 ± 95**
7440 BC
 $\delta^{13}C = -30.0\text{‰}$
 Samples 85+86. Rational *Alnus* limit.

- Lu-815. Vån, 370 to 380cm**
7800 ± 80
5850 BC
 $\delta^{13}C = -30.9\text{‰}$
 Samples 75+76. Empiric *Tilia* limit.
- Lu-816. Vån, 350 to 360cm**
7170 ± 80
5220 BC
 $\delta^{13}C = -29.4\text{‰}$
 Samples 71+ 72. Rational *Tilia* limit.
- Lu-817. Vån, 265 to 275cm**
5960 ± 70
4010 BC
 $\delta^{13}C = -29.4\text{‰}$
 Samples 54+55. Classical *Ulmus* decline; rise of *Alnus*; 1st find of *Triticum*.
- Lu-818. Vån, 235 to 245cm**
5640 ± 70
3690 BC
 $\delta^{13}C = -28.9\text{‰}$
 Samples 48+49. Rise of *Ulmus* after decline; start of continuous *Juniperus* curve.
- Lu-819. Vån, 165 to 175cm**
4800 ± 65
2850 BC
 $\delta^{13}C = -28.2\text{‰}$
 Samples 34+35. Slightly decreasing *Tilia* in Pollen Zone SB 1.
- Lu-820. Vån, 140 to 150cm**
4460 ± 60
2510 BC
 $\delta^{13}C = -30.8\text{‰}$
 Samples 29+30. Significant decline of *Ulmus* in SB 1.
- Lu-821. Vån, 60 to 70cm**
3020 ± 60
1070 BC
 $\delta^{13}C = -28.8\text{‰}$
 Samples 13+14. Below empiric *Picea* limit; fairly high values of *Plantago lanceolata* and *Rumex acetocella coll*; below *Secale* limit. *Comment*: undersized; diluted; 89% sample.
- Lu-822. Vån, 30 to 40cm**
1410 ± 60
AD 540
 $\delta^{13}C = -29.9\text{‰}$
 Samples 7+8. Final decline of *Quercetum Mixtum* components. *Comment*: undersized; diluted; 75% sample.
- Lu-823. Vån, 10 to 20cm**
710 ± 60
AD 1240
 $\delta^{13}C = -30.5\text{‰}$
 Samples 3+4. Temporary decline of *Picea* indicating clearing; strong rise of *Juniperus*, *Rumex acetocella coll*, and *Cerealea*. *Comment*: undersized; diluted; 67% sample.
General Comment (HG): as Lake Vån is very small, it possibly dried out during part of Boreal time and perhaps also during other short

periods. Sedimentation rate is very low between 430 and 350cm, and between 70cm and surface layer, indicating possible hiata. Some characteristic levels (eg, rational *Alnus* limit; empiric *Tilia* limit) are distinctly older than in nearby lake Striern. Classical *Ulmus* decline seems older here than in other parts of Scandinavia.

Lu-824. Hindbyhornet **11,330 ± 110**
9380 BC
 $\delta^{13}C = -20.3\text{‰}$

Collagen from antler (*Megaceros giganteus*) from Late glacial sediment in small ancient lake at Hindby, Malmö (55° 35' N, 13° 02' E). Coll 1972 by B Salomonsson; subm by R Liljegren, Dept Quaternary Geol, Univ Lund. Pollen investigation by submitter. *Comment* (RL): pollen study not yet completed, but preliminary results do not contradict date. Organic carbon content: 5.1%.

B. Norway

Lu-716. Domsängen, inner fraction **11,260 ± 110**
9310 BC
 $\delta^{13}C = -1.0\text{‰}$

Shells (*Macoma calcaria*) from sediment overlain by glaciofluvial material at Domsängen, ca 5km NW of Tönsberg, SE Norway (59° 18' N, 10° 21' E). Coll 1972 by S Håkansson. Date is important for chronology of Ra end moraine. Other dates connected with this moraine are summarized by Mangerud (1970, p 135). Many shell pairs were articulated when coll. *Comment*: inner fraction (46% of shells) was used.

Lu-717. Domsängen, outer fraction **11,350 ± 110**
9400 BC
 $\delta^{13}C = -1.3\text{‰}$

Outer fraction of shells used for Lu-716. *Comment*: outer fraction was 43% of shells; outermost 11% removed by acid leaching. *General Comment*: corrections for deviations from "normal" $^{13}C/^{12}C$ ratio for terrestrial plants ($\delta^{13}C = -25.0\text{‰}$ in PDB scale) are applied also for shell samples. No corrections are made for apparent age of shells of living marine mollusks. Apparent age in area is studied by Mangerud (1972).

Varanger Peninsula series

Peat from different parts of old moraine line on Varanger Peninsula, N Norway. Studies in area by Svensson (1971a) and Svensson *et al* (1972). Coll 1972 by B Malmström and O Palmér, Dept Phys Geog, Univ Lund; subm by H Svensson.

Lu-782. Torvvand, peat **5540 ± 70**
3590 BC
 $\delta^{13}C = -27.8\text{‰}$

Sample I(1:1) from base of peat, overlying glacial clay at Torvvand

(70° 28' 20" N, 18° 19' 15" E). *Comment:* pretreated with HCl and NaOH.

Lu-782A. Torvvand, humic acid **5590 ± 70**
3640 BC
 $\delta^{13}C = -27.8\text{‰}$

Acid-precipitated part of NaOH-soluble fraction from Lu-782.

Lu-709. Holmfjeldet, 3A+3B **7230 ± 195**
5280 BC
 $\delta^{13}C = -25.6\text{‰}$

Samples 3A+3B from base of peat, overlying glacial clay at Holmfjeldet (70° 15' N, 19° 40' E). *Comment:* no pretreatment; small sample; diluted; 31% sample.

Lu-783. Holmfjeldet, II(1:2) **8050 ± 85**
6100 BC
 $\delta^{13}C = -26.6\text{‰}$

Sample II(1:2) from base of peat, overlying glacial clay at Holmfjeldet (70° 13' 20" N, 19° 37' 50" E). *Comment:* mild pretreatment with HCl and NaOH.

Lu-784. Holmfjeldet, II(2:2) **6800 ± 75**
4850 BC
 $\delta^{13}C = -26.3\text{‰}$

Sample II(2:2) from upper part of base peat, underlying sand. *Comment:* mild pretreatment with HCl and NaOH.

Lu-785. Holmfjeldet, III(1:1) **7190 ± 80**
5240 BC
 $\delta^{13}C = -24.5\text{‰}$

Sample III(1:1) from base of peat, overlying till at Holmfjeldet (70° 13' 40" N, 19° 33' 38" E). *Comment:* mild pretreatment with HCl and NaOH.

Lu-786. Kobberhovedet, IV(1:1) **5870 ± 70**
3920 BC
 $\delta^{13}C = -27.5\text{‰}$

Sample IV(1:1) from base of peat, overlying glacial clay. *Comment:* mild pretreatment with HCl and NaOH.

C. Spitsbergen

Lu-743. Advent Fiord **240 ± 50**
AD 1710
 $\delta^{13}C = -23.8\text{‰}$

Wood from tree from top surface of "Lagoon-pingo", in Moskus lagoon, inner part of Advent Fiord, Westspitsbergen (78° 14' N, 15° 45' E). Coll 1972 by R Åhman; subm by H Svensson. Report of study in Advent Fiord area by submitter (Svensson, 1971b). For other date from same area, see R, 1970, v 12, p 546. Pretreated with HCl and NaOH.

D. Greenland

East Greenland series (III)

Marine shells from emerged marine sediments in Kong Oscars Fjord - Vega Sund dist, Central East Greenland. Coll 1970 to 1972 and subm by C Hjort, Dept Quaternary Geol, Univ Lund; part of 3-yr study of ice oscillations and shoreline displacement. For other dates from area, see R, 1972, v 14, p 388-390; 1973, v 15, p 504-507. For apparent age of recent shells in area, see R, 1973, v 15, p 506-507 and Hjort (1973).

Lu-710. Kap Biot**9820 ± 95****7870 BC** $\delta^{13}C = +0.7\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*) from silt covering end moraine at Kong Oscars Fjord, side mouth of Edderfugledal (72° 56' N, 22° 40' W). Coll at +40m.

Lu-711. Lyells Land E**8920 ± 85****6970 BC** $\delta^{13}C = +0.1\text{‰}$

Shells (*Mya truncata*) from silt at +72 to +85m on E Lyells Land (72° 36' N, 24° 44' W). Highest shell-bearing locality in this part of dist.

Lu-712. Gudenelv**9980 ± 95****8030 BC** $\delta^{13}C = -0.2\text{‰}$

Shells (*Hiatella arctica*) from delta sediment at ca +90m (alt from map; only approx) at middle reaches of Gudenelv (72° 30' N, 23° 05' W), interior of Traill Ö. Highest shell-bearing deposit in this part of Traill Ö.

Lu-713. Rhedins Fjord**7310 ± 85****5360 BC** $\delta^{13}C = +0.7\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*) from silt on inner side of end moraine in fjord valley. Coll at +20 to +26m, and probably closely postdates ice retreat (72° 36' N, 26° 23' W).

Lu-714. Månedal, Sample 1**9070 ± 90****7120 BC** $\delta^{13}C = +0.7\text{‰}$

Shells (*Mya truncata*) from delta sediment at mouth of Månedal, N Traill Ö (72° 42' N, 22° 58' W). Coll at +20 to +25m, but delta surface at +50m.

Lu-764. Henrik Möller Dal**9880 ± 95****7930 BC** $\delta^{13}C = +0.2\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*) from clay, covered by delta sediments, Henrik Möller Dal, Fleming Fjord (71° 53' N, 22° 55' W).

Coll at +35m but probably assoc with strandline +60m, and closely dates ice retreat from outer Fleming Fjord.

Lu-765. Murgangsdalen

7320 ± 75

5370 BC

$\delta^{13}C = -0.3\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*, *Clino-cardium ciliatum*, and *Mytilus edulis*) from stony glaciomarine silt at +10m in outer part of Murgangsdalen, Kempe Fjord, Suess Land side (72° 55' N, 25° 45' W). Probably a close date for deglaciation of outer part of valley.

Lu-766. Kap Palander

8420 ± 80

6470 BC

$\delta^{13}C = +1.5\text{‰}$

Shells (*Hiatella arctica*, *Mya truncata*, *Nicania* [*Astarte*] *montagui*) from silt at +10m W of Kap Palander, N Traill Ö (72° 38' N, 22° 41' W).

Lu-767. Kap Hedlund

7860 ± 80

5910 BC

$\delta^{13}C = +0.6\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*) from stony glaciomarine silty clay at +40m, Kap Hedlund, Kempe Fjord (72° 44' N, 26° 10' W). Highest shell-bearing sediment at locality, and probably deposited soon after ice retreat. Cf Noe-Nygaard (1932).

Lu-768. Östernaesdeltat, Sample 1

9030 ± 85

7080 BC

$\delta^{13}C = +1.5\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Tridonta* [*Astarte*] *borealis*, *Nicania* [*Astarte*] *montagui*, *Bathyarca* [*Arca*] *glacialis*) from clay, overlain and underlain by sand and silt. Coll at +22m but deposited when sea level was higher than +30m. Probably closely dates retreat of ice from terminal zone a few km inland. Delta W of Östernaes on N Traill Ö (72° 49' N, 23° 17' W).

Lu-789. Antarctic Dal

9510 ± 100

7560 BC

$\delta^{13}C = -0.2\text{‰}$

Shells (*Mya truncata*) from delta built up to ca +50m. Coll at +40m at mouth of Majdal in Arctic Dal (Kolledal), Scoresby Land (72° 00' N, 23° 20' W). *Comment*: undersized; diluted; 85% sample.

Lu-790. Kap Petersens

9130 ± 90

7180 BC

$\delta^{13}C = -0.5\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*) from sandy sediment underlain by clay and overlain by gravelly subaerial sediment. Coll at +50 to +55m; dates sea level around or somewhat above +60m. Highest shell-bearing sediment at Kap Petersens, Kong Oscars Fjord (72° 25' N, 24° 35' W).

Lu-791. Polhems Dal N, Sample 1**7970 ± 80****6020 BC** $\delta^{13}C = -0.8\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*) from sandy, silty bed underlain by varved clay (cf Lu-825, below) and clay; overlain by gravelly/sandy sediment. Coll at +32m but deposited when sea level was ca +70m. N mouth of Polhemsdal, Lyells Land (72° 44' N, 25° 05' W).

Lu-792. Skipperdal**8550 ± 85****6600 BC** $\delta^{13}C = -1.1\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*) from clay underlying delta built up to +60m at mouth of Skipperdal, Segelsällskapets Fjord (72° 24' N, 24° 55' W). Clay lies directly on striated and glacially sculptured rocks, and sample probably approximates deglaciation of this fjord. Coll at +38m.

Lu-793. Kap Laura**8830 ± 85****6880 BC** $\delta^{13}C = +0.3\text{‰}$

Shells (*Mya truncata*) from delta built up to +40m. Coll at +20m. Kap Laura (name on Norwegian map 1:50.000), S Geog Soc Ö (72° 53' N, 23° 25' W). Cf Lu-646, R, 1973, v 15, p 505.

Lu-825. Polhems Dal N, Sample 2**8270 ± 80****6320 BC** $\delta^{13}C = +0.3\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*) from varved clay at bottom of sequence described under Lu-791 above. Coll at +24m. N mouth of Polhemsdal, Lyells Land (72° 44' N, 25° 05' W).

Lu-826. Holms Bugt, Sample 1**8910 ± 85****6960 BC** $\delta^{13}C = -0.2\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*), from delta built up to +50m. Coll at +45m. Holms Bugt, S Traill Ö (72° 31' N, 23° 58' W).

Lu-827. Holms Bugt, Sample 2**7190 ± 75****5240 BC** $\delta^{13}C = -0.2\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*, *Nicania [Astarte] montagui*) from delta sediment at +15m. Probably dates shoreline at +20m. Holms Bugt (72° 31' N, 23° 58' W).

Lu-828. Holms Bugt, Sample 3**5570 ± 65****3620 BC** $\delta^{13}C = -0.5\text{‰}$

Shells (*Mya truncata*, *Macoma calcarea*, *Serripes groenlandica*, *Clino-cardium ciliatum*) from sandy, silty sediment at +8m. Probably dates

shoreline at +9m. Holms Bugt (72° 31' N, 23° 58' W). For other dates from Holms Bugt, see also Lu-489, -490, -529 (R, 1972, v 14, p 388-389).

Lu-829. Månedal, Sample 2

8250 ± 80

6300 BC

$\delta^{13}C = +0.1\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Tridonta* [*Astarte*] *borealis*) from delta sediment at +12m. Dates sea level at ca +18m. *Mytilus edulis* and *Chlamys* [*Pecten*] *islandicus* occur in sediment but not in dated part of sample. Mouth of Månedal, N Traill Ö (72° 42' N, 22° 58' W). Cf Lu-714 above.

Lu-830. Östernaesdeltat, Sample 2

8270 ± 80

6320 BC

$\delta^{13}C = -0.3\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*, *Nicania* [*Astarte*] *montagui*, *Mytilus edulis*) from sandy, silty sediment at +30m. Delta W of Östernaes on N Traill Ö (72° 49' N, 23° 17' W).

Lu-831. Mestersvig

4130 ± 60

2180 BC

$\delta^{13}C = -0.3\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*, *Macoma calcarea*, *Clino-cardium ciliatum*) from delta foreset beds at +4m. Predates sea level at +6m. Mouth of Tunnelelv in Noret, Mestersvig (72° 13' N, 23° 53' W). Cf Washburn and Stuiver (1962).

General Comment: corrections for deviations from "normal" $^{13}C/^{12}C$ ratio for terrestrial plants ($\delta^{13}C = -25.0\text{‰}$ in PDB scale) are applied also for shell samples. No corrections are made for apparent age of shells of living marine mollusks.

E. Ireland

Blanket bog pine stump series

Wood from stumps and root parts (*Pinus silvestris* L.) from blanket bog areas in different parts of Ireland. Coll 1972 and subm by N Malmer, Dept Plant Ecol, Univ Lund. Studied for earliest possible beginning of blanket bog peat formation in those areas. Pretreated with HCl and NaOH.

Lu-772. Killarney

4600 ± 65

2650 BC

$\delta^{13}C = -24.8\text{‰}$

Wood from pine stump layer in contact zone between peat and underlying mineral soil, on N slope of Carrantoohill, 1km S of small village Carrantoohill, 14km WSW of Killarney, Co Kerry (52° 01' N, 9° 43' W). Alt 250m. Peat ca 1m deep; highly humified.

Lu-773. Wicklow**4200 ± 60****2250 BC** $\delta^{13}C = -23.3\text{‰}$

Wood from pine stump layer in contact zone between peat and underlying mineral soil, SE of TV sta ca 4km SSW of Glencree, 20km S of Dublin, Co Wicklow (53° 09' N, 6° 17' W). Alt 630m (Wicklow mts). Peat ca 1m deep; highly humified.

Lu-774. Carrowmoore, Sample a**4340 ± 65****2390 BC** $\delta^{13}C = -25.0\text{‰}$

Wood from pine stump layer in peat ca 20cm above mineral soil, along rd from Glenamoy to Carrowmoore, 1km W of Bellonaboy Bridge, Co Mayo (54° 14' N, 9° 44' W). Alt 30m. Peat ca 1.2m deep; highly humified.

Lu-775. Carrowmoore, Sample b**7110 ± 75****5160 BC** $\delta^{13}C = -25.6\text{‰}$

Wood from pine root from mineral soil underlying blanket bog peat, same place as Lu-774. Root may be referred to pine stumps in contact zone between peat and underlying mineral soil. Charcoal found at this level.

*F. Poland***Leba series**

Charcoal from fossil soil humus layer, Leba Bay Bar, S coast of Baltic Sea, N Poland. Coll 1972 and subm by K Tobolski, Dept Plant Taxonomy and Phytogeog, A Mickiewicz Univ, Poznań, Poland. Fossil soils in area are described by Tobolski (1972a). Pretreated with HCl and NaOH.

Lu-761. Leba Bay Bar, Sample 3**1540 ± 50****AD 410** $\delta^{13}C = -24.8\text{‰}$

Pinus charcoal from lowest part of humus horizon in fossil podsol soil bei Czołpino (54° 43' 44" N, 17° 15' 51" E).

Lu-762. Leba Bay Bar, Sample 17**1940 ± 50****AD 10** $\delta^{13}C = -24.5\text{‰}$

Quercus charcoal from charcoal layer 1 to 2cm thick underlain by sandy humus and overlain by raw humus in fossil soil horizon by Łaska-Dune (54° 45' 09" N, 17° 25' 16" E). High percentages of *Fagus*-pollen above, and *Quercus*-pollen below charcoal layer.

Lu-763. Ustka, Sample 31/71, insoluble**11,800 ± 115****9850 BC** $\delta^{13}C = -24.5\text{‰}$

Insoluble part of organic matter from layer with tundra vegetation remnants from coastal cliff near Ustka (54° 35' 53" N, 16° 54' 11" E).

Coll 1972 and subm by K Tobolski. Cliff stratigraphy and fossil plants described by submitter (Tobolski, 1972b). Pretreated with HCl and NaOH.

Lu-763A. Ustka, Sample 31/71, humic acid **11,850 ± 115**
9900 BC
 $\delta^{13}C = -26.3\%$

Acid-precipitated part of NaOH-soluble fraction from Lu-763. *Comment*: agreement between fractions indicates absence of contamination with younger humus.

II. ARCHAEOLOGIC SAMPLES

Sweden

Hagestad series

Charcoal from Hagestad, Löderup parish, Scania. Coll 1964 to 1972 and subm by M Strömberg, Hist Mus, Univ Lund. For other dates from Hagestad, see R, 1972, v 14, p 394-395; 1973, v 15, p 509. Pretreated with HCl and NaOH.

Lu-700. Hagestad 40¹, Sample 9 **2540 ± 55**
590 BC
 $\delta^{13}C = -25.6\%$

Charcoal from trench with stone feature containing Bronze age finds, on field S of rd Hagestaborg-Ramshög, Hagestad 40¹ (55° 24' N, 14° 09' E). Coll 1964.

Lu-701. Hagestad 50³, Sample 10 **3270 ± 55**
1320 BC
 $\delta^{13}C = -24.3\%$

Charcoal from hearth on field N of brook, Hagestad 50³ (55° 23' N, 14° 09' E). Coll 1971. Assoc with Bronze age finds.

Lu-781. Hagestad 44⁶ D, Sample 1 **1830 ± 50**
AD 120
 $\delta^{13}C = -24.5\%$

Charcoal from hearth spatially connected with Late Neolithic as well as Roman Iron age features at Hagestad 44⁶ D (55° 23' N, 14° 08' E). Coll 1972.

General Comment (MS): dates agree well with archaeol results based on artifact assemblage.

Valleberga series

Charcoal, wood, and bone from grave field at Valleberga, Scania (55° 24' N, 14° 04' E). Coll Dec 1972 to March 1973 and subm by M Strömberg.

Lu-798. Valleberga 5 **1990 ± 55**
40 BC
 $\delta^{13}C = -24.6\%$

Charcoal from burnt post near urn grave at Valleberga 5. *Com-*

ments: pretreated with HCl and NaOH. (MS): somewhat later than expected.

Lu-803. Valleberga 6^r B, Sample 10

3190 ± 55

1240 BC

$\delta^{13}C = -25.3\text{‰}$

Wood fragments from remains of oak trunk coffin from Bronze age grave at Valleberga 6^r B. Assoc with bronze objects from Period II. *Comment:* only weak pretreatment with NaOH due to poor state of preservation.

Lu-804. Valleberga 6^r B, Sample 11

3170 ± 55

1220 BC

$\delta^{13}C = -18.6\text{‰}$

Collagen from human bone from coffin dated as Lu-803. *Comments:* bone treated as described previously (R, 1970, v 12, p 534). Organic carbon content: 5.5%. (MS): agrees well with Lu-803 and with time estimate based on assoc archaeol finds.

Löderup series

Charcoal from grave field at Löderup 15, Löderup parish, Scania (55° 23' N, 14° 07' E). Coll Dec 1972 to March 1973 and subm by M Strömberg. For other dates from Löderup 15, see R, 1973, v 15, p 509-510. Pretreatment with HCl and NaOH.

Lu-799. Löderup 15, Grave 75

3360 ± 60

1410 BC

$\delta^{13}C = -24.1\text{‰}$

Charcoal from bottom of Grave 75 (oak trunk grave).

Lu-800. Löderup 15, Grave 60

2520 ± 55

570 BC

$\delta^{13}C = -26.2\text{‰}$

Charcoal from hearth near Grave 60 (urn grave).

Lu-801. Löderup 15, Grave 91

4130 ± 60

2180 BC

$\delta^{13}C = -25.0\text{‰}$

Oak charcoal, id by T Bartholin, from Grave 91 (oak trunk grave). Assoc with flint axe.

Lu-808. Löderup 15, Grave 100

3840 ± 60

1890 BC

$\delta^{13}C = -25.6\text{‰}$

Charcoal from Grave 100 (oak trunk grave).

Lu-809. Löderup 15, Grave 92

4060 ± 60

2110 BC

$\delta^{13}C = -24.1\text{‰}$

Charcoal from pit near Grave 92. Assoc with arrowhead.

Lu-810. Löderup 15, Sample 8**2560 ± 55****610 BC** $\delta^{13}C = -26.5\text{‰}$

Charcoal from hearth in cultural layer N of Mound 3 on grave field. Late Bronze age pottery in adjacent cultural layer.

Lu-811. Löderup 15, Grave 106**1850 ± 50****AD 100** $\delta^{13}C = -24.7\text{‰}$

Charcoal from cremation burial at bottom of complex grave feature. Assoc with bone comb from Roman Iron age.

General Comment (MS): all dates agree well with results based on archaeol investigation.

Gårdlösa series

Charcoal from Gårdlösa, Smedstorp parish, SE Scania (55° 34' N, 14° 08' E). Coll 1971 and 1972 by A Nilsson; subm by B Stjernquist, Hist Mus, Univ Lund. Dated for study of continuity of Iron age settlement in Gårdlösa area. For other dates from area and references, see R, 1972, v 14, p 264-266, 392-393; 1973, v 15, p 510-511. Lu-708 only pre-treated with HCl (small sample); all other samples pretreated with HCl and NaOH.

Lu-703. Gårdlösa 3, House LVIII**1570 ± 50****AD 380** $\delta^{13}C = -24.4\text{‰}$

Charcoal from pit at bottom of house foundation.

Lu-704. Gårdlösa 71¹, Kiln 5**2550 ± 55****600 BC** $\delta^{13}C = -24.7\text{‰}$

Charcoal from mixed layer in remnants of kiln.

Lu-705. Gårdlösa 71¹, Grave 97**1890 ± 55****AD 60** $\delta^{13}C = -24.7\text{‰}$

Charcoal from Grave 97, just below plough-disturbed surface layer.

Lu-706. Gårdlösa 71¹, Hearth 194**2480 ± 55****530 BC** $\delta^{13}C = -25.4\text{‰}$

Charcoal from hearth.

Lu-707. Gårdlösa 71¹, house foundation**2460 ± 55****510 BC** $\delta^{13}C = -23.8\text{‰}$

Charcoal from hearth in W part of house foundation.

Lu-708. Gårdlösa 10**340 ± 60****AD 1610** $\delta^{13}C = -25.4\text{‰}$

Charcoal from post-hole below stone pavement. *Comment* (BS):

unexpected young date; charcoal apparently not contemporaneous with stone feature.

General Comment (BS): all dates except Lu-708 agree well with estimates based on archaeol material.

Slädö Ship series

Oak wood from ancient ship on bottom of strait at Slädö I, Listerby, Blekinge (56° 04' N, 15° 25' E). Ship was said to be from Viking age. Coll by Blekinge Mus; subm by B E Berglund. Pretreated with HCl and NaOH.

Lu-744. Slädö Ship 1 **290 ± 50**
AD 1660
 $\delta^{13}C = -23.8\text{‰}$

Wood, probably from ship frame. Coll 1941. Object K 5070.

Lu-745. Slädö Ship 2 **590 ± 50**
AD 1360
 $\delta^{13}C = -24.8\text{‰}$

Small piece of wood, origin unknown. Object B1. M. 16111:4.

General Comment (BEB): ship seems much younger than expected; probably not > 300 yr old

Östanön-Kvalmsö-Helgeö series

Wood from artificial blocking at 2 to 3m depth in strait named Kålfjärden between is. Östanön, Helgeö, and Kvalmsö, Listerby, Blekinge (56° 10' N, 15° 25' E). Coll 1972 by Blekinge Mus; subm by B E Berglund. Other dates from similar blockings reported previously (R, 1968, v 10, p 50; 1969, v 11, p 448-449; 1972, v 14, p 397-398). Pretreated with HCl and NaOH.

Lu-769. Östanön 2 **940 ± 50**
AD 1010
 $\delta^{13}C = -26.6\text{‰}$

Wood and bark from huge ash pile standing in mud.

Lu-770. Kvalmsö 5 **1050 ± 50**
AD 900
 $\delta^{13}C = -25.4\text{‰}$

Wood from ash pile.

Lu-771. Helgeö **960 ± 50**
AD 990
 $\delta^{13}C = -27.7\text{‰}$

Wood from alder pile.

General Comment (BEB): new dates confirm older ones from E part of this archipelago, *ie*, blockings apparently built ca AD 1000.

Norrvidinge series

Charcoal from buildings from Late Neolithic to Early Bronze age at Norrvidinge, Scania (55° 51' N, 13° 06' E). Coll 1971 and subm by

J Callmer, Hist Mus, Univ Lund. Preliminary report by submitter (Callmer, 1973).

Lu-836. Norrvidinge 3²²⁻²³, Feature 338 **3620 ± 135**
1670 BC
 $\delta^{13}C = -25.5\%$

Charcoal from post-hole in pit-dwelling (Feature 338). Assoc with flint and pottery. *Comment*: no pretreatment (small sample).

Lu-837. Norrvidinge 3²²⁻²³, Feature 339:8 **2960 ± 55**
1010 BC
 $\delta^{13}C = -23.0\%$

Charcoal from Sec 8 of pit-dwelling (Feature 339). Assoc with daub, flint, and pottery.

General Comment (JC): agrees fairly well with archaeol date.

Löddesborg series

Charcoal from settlement area at Löddesborg, Scania (55° 45' N, 12° 59' E). For other date from Löddesborg, see R, 1973, v 15, p 508. Site is culturally closely connected to area studied at Norrvidinge (above). Coll 1972 to 1973 and subm by J Callmer. Pretreated with HCl and NaOH.

Lu-838. Fårabacken, Löddesborg, House 1 **3440 ± 55**
1490 BC
 $\delta^{13}C = -24.2\%$

Charcoal from bottom layer in House 1. Assoc with flint and pottery (Late Neolithic to Early Bronze age).

Lu-839. Fårabacken, Löddesborg, Feature I-73 **3720 ± 60**
1770 BC
 $\delta^{13}C = -23.6\%$

Oak charcoal, id by T Bartholin, from 0.5m below surface in pit with Middle Neolithic pottery and flint (Battle-axe culture).

General Comment (JC): agrees fairly well with archaeol date.

Lu-742. Näsums Gudahage **610 ± 70**
AD 1340
 $\delta^{13}C = -21.2\%$

Collagen from part of poorly preserved human skull from grave at Gudahagen, Näsüm parish, Scania (56° 09' 55" N, 14° 30' E). Skull from gravel 0.6m below surface. Coll 1972 by N-G Larsson; subm by M P Malmer, Hist Mus, Univ Lund. For other date from this site, see R, 1969, v 11, p 449. *Comment*: expected age 550 to 950 yr. Sample under-sized; diluted; 51% sample. Organic carbon content: 1.4%.

III. MODERN PLANT SAMPLES

Rogen series (II)

Samples from thick carpets of lichen (*Cladonia alpestris*) growing in open mt region above tree line, alt 900m, at Lake Rogen, Härjedalen

(62° 30' N, 12° 30' E). Coll 1964, 1968, and 1970 by Lidén, Persson, and Mattsson; subm by S Mattsson, Radiation Phys Dept, Univ Lund. First part of Rogen series pub previously (R, 1972, v 14, p 399). See also comprehensive report by submitter (Mattsson, 1972). All samples pretreated with HCl.

Results are given as a difference, Δ , from our radiocarbon standard (95% activity of NBS oxalic acid standard, age corrected to 1950):

$$\Delta = \delta^{14}\text{C} - (2\delta^{13}\text{C} + 50) \left(1 + \frac{\delta^{14}\text{C}}{1000} \right)$$

where $\delta^{14}\text{C}$ is observed deviation from radiocarbon standard in per mil and $\delta^{13}\text{C}$ deviation from PDB standard in per mil.

Lu-723. Rogen, V 532, 1964 $\Delta = 142 \pm 6\%$
 $\delta^{13}\text{C} = -22.0\%$

Unfractionated sample (*Cladonia alpestris*). Coll Sept 29, 1964.

Lu-724. Rogen, V 786, 1968 $\Delta = 184 \pm 6\%$
 $\delta^{13}\text{C} = -22.2\%$

Unfractionated sample (*Cladonia alpestris*). Coll Oct 1, 1968.

Lu-725. Rogen, V 919 A, 1970 $\Delta = 584 \pm 7\%$
 $\delta^{13}\text{C} = -21.5\%$

Top fraction, 0 to 3cm (*Cladonia alpestris*). Coll Sept 28, 1970.

Lu-726. Rogen, V 919 B, 1970 $\Delta = 371 \pm 7\%$
 $\delta^{13}\text{C} = -21.2\%$

Middle fraction, 3 to 6cm from top (*Cladonia alpestris*).

Lu-727. Rogen, V 919 C, 1970 $\Delta = 101 \pm 6\%$
 $\delta^{13}\text{C} = -21.8\%$

Lower fraction, below 6cm from top (*Cladonia alpestris*).

Lu-728. Rogen, V 919 D, 1970 $\Delta = 27 \pm 6\%$
 $\delta^{13}\text{C} = -22.4\%$

Bottom fraction (gelatinous layer and decomposed lichen material; cf Mattsson, 1972, p 8-9).

Lu-729. Rogen, V 927 A, 1970 $\Delta = 613 \pm 8\%$
 $\delta^{13}\text{C} = -22.4\%$

Top fraction, 0 to 3cm (*Cladonia alpestris*). Coll. Sept 29, 1970.

Lu-730. Rogen, V 927 B, 1970 $\Delta = 347 \pm 7\%$
 $\delta^{13}\text{C} = -21.8\%$

Middle fraction, 3 to 6cm from top (*Cladonia alpestris*).

Lu-731. Rogen, V 927 C, 1970 $\Delta = 59 \pm 6\%$
 $\delta^{13}\text{C} = -21.7\%$

Lower fraction, below 6cm from top (*Cladonia alpestris*).

Lu-732. Rogen, V 927 D, 1970

$$\Delta = -1 \pm 6\%$$

$$\delta^{13}C = -22.1\%$$

Bottom fraction (gelatinous layer and decomposed lichen material).

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