

UNIVERSITY OF LUND RADIOCARBON DATES XXI

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 1986 and June 1987. Equipment, measurement, and treatment of samples are as reported previously (R, 1968, v 10, p 36–37; 1976, v 18, p 290; 1986, v 28, no. 3, p 1111).

Age calculations are based on a contemporary value equal to 95% of the activity of NBS oxalic acid standard (No. 4990A) and on the conventional half-life for ^{14}C of 5568 yr. Results are reported in years before 1950 (years BP). Errors quoted with the dates are based on counting statistics alone and are equivalent to ± 1 standard deviation ($\pm \sigma$).

Corrections for deviations from $\delta^{13}\text{C} = -25.0\text{‰}$ in the PDB scale are applied for all samples; also for marine shells. The apparent age for marine material due to the reservoir effect must be subtracted from our dates on such samples.

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 samples is calculated from the yield of CO_2 by combustion of gelatine remaining after treatment. Organic carbon lost during treatment is not included in the calculated percentage.

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

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GEOLOGIC SAMPLES

Sweden

Kurarps Mosse series

Sediment from ancient lake at Kurarps Mosse, S Scania (55° 31' 19" N, 13° 37' 16" E). Coll 1985 and subm by E Kolstrup, Dept Quaternary Geol, Univ Lund. Dated as part of study of local vegetational changes in area. Groundwater level ca 10cm below surface at sampling point. Depths refer to bog surface. Pollen analysis by submitter.

Lu-2587A. Kurarps Mosse, 3.45–3.48m **5780 ± 70**
 $\delta^{13}C = -30.9\text{‰}$

Acid-precipitated part of NaOH-soluble fraction from fine detritus gyttja. Sample just below Elm decline according to pollen analysis. Treated with HCl before extraction with NaOH. *Comment:* sample undersized; diluted; 81% sample. Hardwater error ca 600 yr.

Lu-2620. Kurarps Mosse, 0.96–0.99m **3140 ± 50**
 $\delta^{13}C = -28.3\text{‰}$

Coarse detritus gyttja. Early Subatlantic time according to pollen analysis. *Comment:* pretreated with HCl. Hardwater error probably ca 1000 yr.

Lu-2658A. Skottorp **10,140 ± 70**
 $\delta^{13}C = -27.3\text{‰}$

Acid-precipitated part of NaOH-soluble fraction of buried fossil soil horizon at Skottorp, S Halland (56° 27' N, 12° 59' E). Sample from wedge-shaped downbending 75 to 80cm below present surface and covered by sand; presumably from Postglacial transgression. Alt 8m. Coll July 1986 and subm by H Svensson, Dept Phys Geog, Univ Lund. Relict polygon patterns from area studied previously by submitter (Svensson, 1974, 1982). Sample treated with HCl before extraction with NaOH. *Comment:* presence of root hairs indicates risk of contamination with younger material. (HS): somewhat later than expected.

Sandsjön Series I

Sediment from Sandsjön, 5km NW Vrå, S Småland (56° 45' N, 13° 24' E), alt 155m. Coll 1985 and subm by M Thelaus, Dept Quaternary Geol, Univ Lund. Dated as part of study of paleohydrol changes in raised bogs and lake basins in S and central Småland. Depths refer to sediment surface. Samples were taken with Livingstone piston corer, diam 10cm. Water depth at sampling point ca 2.15m. Pollen analysis by submitter. All samples pretreated with HCl.

Lu-2697. Sandsjön, 8.675–8.725m **10,200 ± 90**
 $\delta^{13}C = -25.8\text{‰}$

Sandy gyttja with 0.9% CaCO₃. Transition Younger Dryas/Preboreal according to pollen analysis. *Comment:* expected date: ca 10,000 BP.

Lu-2698. Sandsjön, 8.525–8.575m **10,140 ± 90**
 $\delta^{13}C = -28.7\text{‰}$

Sandy gyttja with 2% CaCO₃. Transition Younger Dryas/Preboreal. *Comment:* expected date: ca 10,000 BP.

Lu-2699. Sandsjön, 8.125–8.175m **9440 ± 80**
 $\delta^{13}C = -31.0\text{‰}$

Sandy fine detritus gyttja with 2.9% CaCO₃. Transition Preboreal/Early Boreal. *Comment:* expected date: ca 9500 BP.

- Lu-2700. Sandsjön, 7.975–8.025m** 8850 ± 80
 $\delta^{13}C = -27.6\text{‰}$
 Fine detritus gyttja with 1.9% CaCO_3 . Transition Early/Late Boreal.
Comment: expected date: ca 8700 BP.

Bjärsjölagårds Mosse series

Peat from bog, S Scania (55° 45' N, 13° 40' E). Coll 1985 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dated as check on chronology of some S Scanian Holocene pollen-zone boundaries and levels with important vegetational changes. Depths refer to bog surface. All samples pretreated with HCl. Lu-2678, -2679 and -2680 were charred in nitrogen atmosphere before burning.

- Lu-2676. Bjärsjölagårds Mosse, 210–215cm** 4990 ± 60
 $\delta^{13}C = -26.1\text{‰}$
 Highly humified *Sphagnum* peat. Transition Late Atlantic/Early Sub-boreal (*Ulmus* decline) according to pollen analysis.

- Lu-2677. Bjärsjölagårds Mosse, 200–205cm** 4820 ± 60
 $\delta^{13}C = -27.0\text{‰}$
 Highly humified *Sphagnum* peat. Min of *Ulmus* pollen.

- Lu-2678. Bjärsjölagårds Mosse, 165–170cm** 4310 ± 60
 $\delta^{13}C = -25.5\text{‰}$
 Highly humified *Sphagnum* peat. Regeneration of *Ulmus* during Early Subboreal.

- Lu-2679. Bjärsjölagårds Mosse, 125–130cm** 3610 ± 60
 $\delta^{13}C = -26.5\text{‰}$
 Highly humified *Sphagnum* peat.

- Lu-2680. Bjärsjölagårds Mosse, 70–75cm** 2650 ± 50
 $\delta^{13}C = -26.0\text{‰}$
 Highly humified *Sphagnum* peat. Empirical *Fagus* limit.

Mullsjön series

Sediment from Mullsjön, ca 3km WNW of Hjo, E Västergötland (58° 17' N, 14° 14' E). Coll 1986 by S Björck and G Digerfeldt; subm by G Digerfeldt. Dated as part of paleoecol study of S Swedish lakes as basis for interpretation of Holocene landscape development and shore displacement. Samples were taken with Russian-type corer, diam 10cm. Depths refer to sediment surface. Water depth at sampling point ca 3m. All samples pretreated with HCl.

- Lu-2682. Mullsjön, 508–513cm** 9660 ± 90
 $\delta^{13}C = -27.0\text{‰}$
 Clay gyttja.

Lu-2681. Mullsjön, 495–500cm **8470 ± 80**
 $\delta^{13}C = -26.1\text{‰}$
 FeS-colored clayey gyttja.

Lu-2683. Mullsjön, 480–485cm **8200 ± 80**
 $\delta^{13}C = -27.8\text{‰}$
 Gyttja.

Dalsland series

Sediment and water moss from Bovattnet (58° 34' N, 12° 04' E) and N Madbergagölen (58° 36' N, 12° 10' E), SW Dalsland. Coll 1986 and subm by G Digerfeldt. Dated as part of study of Late Weichselian-Early Holocene shore displacement in area (*cf* Digerfeldt, 1979; Björck & Digerfeldt, 1982). Samples were taken with Russian-type corer, diam 10cm. All sediment samples pretreated with HCl; no pretreatment of small moss samples.

Bovattnet

Water depth 6.5m at sampling point. Depths refer to sediment surface.

Lu-2702. Bovattnet, 281–286cm **9570 ± 90**
 $\delta^{13}C = -27.4\text{‰}$
 Clayey gyttja.

Lu-2703. Bovattnet, 286–293cm **9750 ± 220**
 $\delta^{13}C = -39.4\text{‰}$
 Water moss. *Comment:* sample undersized; diluted; 28% sample. (3 1-day counts.)

N Madbergagölen

Samples taken from overgrown part of lake. Depths refer to present surface.

Lu-2705. N Madbergagölen, 817–822cm **10,310 ± 90**
 $\delta^{13}C = -20.8\text{‰}$
 Clayey gyttja.

Lu-2706. N Madbergagölen, 822–827cm **10,480 ± 100**
 $\delta^{13}C = -21.0\text{‰}$
 Clayey gyttja.

Lu-2707. N Madbergagölen, 827–832cm **10,220 ± 90**
 $\delta^{13}C = -23.1\text{‰}$
 Clay gyttja.

Lu-2708. N Madbergagölen, 832–837cm **10,430 ± 100**
 $\delta^{13}C = -23.5\text{‰}$
 Clay gyttja.

Lu-2709. N Madbergagölen, 837–842cm Clay gyttja.	10,520 ± 100 $\delta^{13}C = -24.2\text{‰}$
Lu-2710. N Madbergagölen, 842–847cm Clay gyttja.	10,590 ± 100 $\delta^{13}C = -24.5\text{‰}$
Lu-2711. N Madbergagölen, 847–852cm Clay gyttja.	10,710 ± 100 $\delta^{13}C = -23.6\text{‰}$
Lu-2712. N Madbergagölen, 852–857cm Clay gyttja.	10,860 ± 100 $\delta^{13}C = -23.8\text{‰}$
Lu-2713. N Madbergagölen, 857–862cm Clay gyttja.	11,260 ± 100 $\delta^{13}C = -23.0\text{‰}$
Lu-2715. N Madbergagölen, 853.5–857.5cm Water moss. <i>Comment:</i> sample undersized; diluted; 28% sample. (4 1-day counts.)	10,640 ± 190 $\delta^{13}C = -27.5\text{‰}$

Lake Fiolen series

Littoral sediment from Fiolen, S Småland (57° 05' N, 14° 32' E). Coll 1986 by G Digerfeldt and M Enell; subm by G Digerfeldt. Dating is part of study of Late Quaternary development of S Swedish reference lakes and their drainage areas, assoc with IGCP Proj 158B (Berglund, 1979). Depths refer to sediment surface. Water depth ca 1m at sampling point. All samples pretreated with HCl.

Lu-2693. Fiolen, 130–135cm Gyttja.	4890 ± 60 $\delta^{13}C = -29.2\text{‰}$
Lu-2694. Fiolen, 90–95cm Gyttja.	3610 ± 60 $\delta^{13}C = -28.1\text{‰}$
Lu-2695. Fiolen, 55–60cm Gyttja.	2810 ± 60 $\delta^{13}C = -27.6\text{‰}$
Lu-2696. Fiolen, 45–50cm Iron ocher with some organic content.	2180 ± 50 $\delta^{13}C = -26.6\text{‰}$

Eastern Småland series (III)

Sediment from lakes Bastgölen (57° 13' N, 16° 19' E), Vingölen (57° 08' N, 15° 57' E), Skvarran (57° 12' N, 16° 09' E), and Flågöl (57° 13' N, 16° 20' E), Kalmar län, E Småland. Coll 1982–1985 and subm by N-O Svensson, Dept Quaternary Geol, Univ Lund. Dated as complement to previous series (R, 1986, v 28, no. 1, p 141–143; v 28, no. 3, p 1114–1115). Depths refer to sediment surface or present surface (Flågöl). Samples were taken with Russian-type corer, diam 10cm. All samples pretreated with HCl. Organic carbon given in *Comments* is calculated as described previously (R, 1986, v 28, no. 3, p 1114). Pollen analysis by submitter.

Bastgölen

Water depth 1.2m at sampling point.

Lu-2661. Bastgölen 5, 3.465–3.495m **9270 ± 90**
 $\delta^{13}C = -23.1\text{‰}$

Clayey gyttja. Transition Preboreal/Early Boreal according to pollen analysis.

Lu-2666. Bastgölen 6, 3.19–3.25cm **8940 ± 90**
 $\delta^{13}C = -26.8\text{‰}$
Clayey gyttja.

Vingölen

Water depth 2.6m at sampling point.

Lu-2659. Vingölen 1, 5.61–5.65m **11,100 ± 90**
 $\delta^{13}C = -20.1\text{‰}$

Clay gyttja. *Comment:* organic carbon content: ca 1%. Sample under-sized; diluted; 84% sample. (3 1-day counts.)

Lu-2660. Vingölen 2, 5.56–5.60m **11,060 ± 80**
 $\delta^{13}C = -23.1\text{‰}$
Clay gyttja. *Comment:* organic carbon content: ca 3%. (3 1-day counts.)

Lu-2662. Vingölen 3, 5.505–5.535m **10,900 ± 100**
 $\delta^{13}C = -24.0\text{‰}$
Clay gyttja. *Comment:* organic carbon content: ca 3.5%.

Lu-2663. Vingölen 4, 5.375–5.425m **10,090 ± 90**
 $\delta^{13}C = -23.6\text{‰}$
Clay gyttja. *Comment:* organic carbon content: ca 2%.

Lu-2664. Vingölen 5, 5.285–5.315m **10,040 ± 90**
 $\delta^{13}C = -26.2\text{‰}$
Clayey gyttja. Early Preboreal. *Comment:* organic carbon content: ca 5%.

Lu-2665. Vingölen 6, 5.17–5.21m **9410 ± 90**
 $\delta^{13}C = -30.7\text{‰}$

Gyttja and dy. Transition Preboreal/Early Boreal. *Comment:* organic carbon content: ca 10%.

Skvarran

Water depth ca 4.6m at sampling point.

Lu-2727. Skvarran 6, 4.310–4.372m **11,310 ± 110**
 $\delta^{13}C = -21.3\text{‰}$

Clay gyttja. *Comment:* organic carbon content: ca 4.5%.

Flågöl

Samples taken from overgrown part of lake.

Lu-2728. Flågöl 3, 7.45–7.48m **8920 ± 80**
 $\delta^{13}C = -22.5\text{‰}$

Clayey silty gyttja. Early Boreal pollen zone.

Lu-2729. Flågöl 4, 3.59–3.71m **8550 ± 80**
 $\delta^{13}C = -30.8\text{‰}$

Gyttja. Transition Early/Late Boreal.

Lu-2667. Lina Myr, 2.755–2.885m **8920 ± 80**
 $\delta^{13}C = -21.3\text{‰}$

Calcareous clay gyttja from ancient lake at Lina Myr, Central Gotland (57° 33' N, 18° 37' E). Coll 1982 and 1985 and subm by N-O Svensson. Depth refers to present surface. Pretreated with HCl for complete removal of carbonates. *Comment:* expected age based on pollen analysis: 8600 BP. Sample pooled from same level in 2 separate cores taken with Russian-type corer, diam 7cm.

Nässja series

Charcoal, bark, and peat from 2 secs in peat-filled kettle hole at Nässja, W Östergötland (58° 28.3' N, 14° 50' E). Coll 1982–1986 and subm by H Göransson, Dept Quaternary Geol, Univ Lund. Dating important for study of human activities in area, especially in assoc with nearby Alvastra Pile Dwelling. Sec Nässja II ca 150m S of Nässja I. For previous date from Nässja I, see R, 1986, v 28, no. 3, p 1118. Peat samples pretreated with HCl and charred in nitrogen atmosphere before burning. Charcoal and bark pretreated with HCl and NaOH.

Nässja I

Samples taken in wall of newly dug trench. Depths (cm) refer to present peat surface.

Lu-2691. Nässja I, Sample 2, 118–127cm **4750 ± 60**
 $\delta^{13}C = -26.1\text{‰}$

Charcoal from 9cm thick layer of clay gyttja.

Lu-2735. Nässja I, ca 118cm	3800 ± 60 $\delta^{13}C = -26.4\text{‰}$
Bark from top of clay gyttja. Cf Lu-2691, above.	
Lu-2692. Nässja I, Sample 4, 75–80cm	2580 ± 50 $\delta^{13}C = -26.7\text{‰}$
Peat.	
Lu-2736. Nässja I, Sample 5, 60–65cm	2030 ± 50 $\delta^{13}C = -25.6\text{‰}$
Peat.	
Lu-2737. Nässja I, Sample 6, 50–55cm	1740 ± 50 $\delta^{13}C = -27.5\text{‰}$
Peat.	
Lu-2738. Nässja I, Sample 7, 35–40cm	1060 ± 45 $\delta^{13}C = -27.5\text{‰}$
Peat.	

Nässja II

Samples were taken with Russian-type corer, diam 5cm. Depths refer to present peat surface.

Lu-2621. Nässja II, 318–330cm	5300 ± 60 $\delta^{13}C = -28.5\text{‰}$
Radical peat.	
Lu-2734. Nässja II, 300–310cm	4910 ± 60 $\delta^{13}C = -28.0\text{‰}$
Peat.	

Bjärsjöholmssjön series

Sediment from ancient Bjärsjöholmssjön, ca 3km NW of Ystad, S Scania (55° 27' N, 13° 47' E). Coll 1986 and subm by H Göransson. Dated to look for possible hardwater effect. Pollen study of lake sediment pub by Nilsson (1961). Depths refer to present surface. New pollen analysis by sub-mitter. Samples pretreated with HCl.

Lu-2716. Bjärsjöholmssjön, 471–476cm	5320 ± 50 $\delta^{13}C = -27.2\text{‰}$
Algal gyttja. Elm decline level according to pollen analysis. One pollen grain of <i>Spergula arvensis</i> at 475cm. <i>Comment</i> : expected age: 5150 ± 50 BP. (3 1-day counts.)	
Lu-2717. Bjärsjöholmssjön, 463–466.5cm	5260 ± 60 $\delta^{13}C = -29.1\text{‰}$
Algal gyttja. Transition AT/SB <i>sensu</i> T Nilsson (1961). One pollen grain of <i>Triticum</i> -type at 465cm. <i>Comment</i> : expected age: 5000 ± 25 BP.	

General Comment: hardwater error 170 ± 70 yr and 260 ± 65 yr, respectively.

Lu-2761. Toppeladugårds Mosse **8350 \pm 80**
 $\delta^{13}C = -21.6\text{‰}$

Collagen from antler of *Alces alces*, LUZN82/LZZ, coll 1869 at 6ft depth just W of farm building belonging to Toppeladugårds estate, S Scania (ca $55^{\circ} 40' N$, $13^{\circ} 23' E$); subm by B Liedberg Jönsson, Dept Quaternary Geol, Univ Lund. Find mentioned by Holst (1911, p 108) and Gertz (1926, p 29–30). Collagen extracted as described previously (R, 1976, v 18, p 290) without NaOH treatment. *Comment:* organic carbon content: 6.7%.

Lu-2762. Björkeröds Mosse, Wood 32B **10,890 \pm 120**
 $\delta^{13}C = -27.3\text{‰}$

Small wood fragments from silty algal gyttja, 286 to 292cm below fen surface in core Bjö BP1 ($56^{\circ} 17' N$, $12^{\circ} 30' E$). Coll 1984 and subm by B Liedberg Jönsson. Dated as complement to Björkeröds Mosse series (R, 1987, v 29, no. 3, p 353–379). Wood washed from sediment sample taken with 10cm Livingstone piston corer. *Comment:* expected age: ca 11,000 BP. No pretreatment; sample undersized; diluted; 60% sample; (3 1-day counts.)

Iceland

NE Iceland marine shell series

Marine bivalve shells from NE Iceland. Coll 1986 by C Hjort and H Norddahl; subm by C Hjort, Dept Quaternary Geol, Univ Lund. Dated as part of study of glacial chronology and paleoclimatology in Iceland.

Lu-2673. Fell 2 **9980 \pm 70**
 $\delta^{13}C = +0.3\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*) from silt overlain by transgression sediment at Fell, Hofsaðalur, Vopnafjörður ($65^{\circ} 41' N$, $14^{\circ} 56' W$). Sample coll at ca +23m, probably corresponding to marine level of +35 to 45m. *Comment:* outer 30% removed by acid leaching. (3 1-day counts.)

Lu-2674. Fell 3a **10,230 \pm 90**
 $\delta^{13}C = +1.1\text{‰}$

Shells (*Mya truncata*, *Hiatella arctica*) from silt overlain by regression sediment at same site as Lu-2673, above. Sample coll at ca +7m, corresponding to marine level of ≥ 33 m. *Comment:* outer 30% removed by acid leaching.

Lu-2675. Skógaeyri 1 **10,050 \pm 90**
 $\delta^{13}C = +0.4\text{‰}$

Thin shell fragments (*Mya truncata*, *Hiatella arctica*) from bottom-set beds of delta (silt-very fine sand) at Skógaeyri, Vesturáðalur, Vopnafjörður ($65^{\circ} 45' N$, $14^{\circ} 52' W$). Coll at ca +12m, corresponding to marine level of ca +45m. *Comment:* outer 11% removed by acid leaching.

General Comment: corrections for deviations from $\delta^{13}\text{C} = -25\text{‰}$ PDB are applied. No corrections are made for reservoir age of living marine mollusks. Reservoir age for waters of Iceland pub by Håkansson (1983).

Tunisia

Bahiret el Bibane series (II)

Carbonate samples from beach deposits at Bahiret el Bibane, Tunisia. Coll 1986 by A Strasser and E Davaud; subm by A Strasser, Dept Geol, Univ Geneva, Switzerland. Dated as complement to Bahiret El Biban series (R, 1986, v 28, no. 1, p 154). No pretreatment.

Lu-2652. Bahiret el Bibane, No. 1515 **4370 \pm 60**
 $\delta^{13}\text{C} = +5.2\text{‰}$

Beach rock composed of ooids and mollusk shell fragments, depth 27cm, 4m from shoreline (landwards) (33° 18' N, 11° 07' E).

Lu-2653. Bahiret el Bibane, No. 1516 **3340 \pm 50**
 $\delta^{13}\text{C} = +2.8\text{‰}$

Beach rock composed of mollusk shells and shell fragments and small part of ooids, depth 62cm, 4m from shoreline (landwards). Same site as Lu-2652, above.

Lu-2654. Bahiret el Bibane, No. 1534 **1670 \pm 45**
 $\delta^{13}\text{C} = +2.9\text{‰}$

Non-cemented coquina composed of *Cerithium* shells, depth 65cm, 6m from shoreline (landwards) (33° 14' N, 11° 10' E).

Lu-2655. Bahiret el Bibane, No. 1535 **3820 \pm 60**
 $\delta^{13}\text{C} = +4.6\text{‰}$

Non-cemented ooids, depth 55cm, 6m from shoreline (landwards). Same site as Lu-2654, above.

Lu-2656. Bahiret el Bibane, No. 1537 **3470 \pm 50**
 $\delta^{13}\text{C} = +4.6\text{‰}$

Beach rock composed of ooids, mollusk shell fragments, and foraminifera tests, depth 45cm, 6m from shoreline (landwards). Same site as Lu-2654, above.

Czechoslovakia

Sivárňa series

Peak from bog at Sivárňa, E of High Tatra Mts, Slovakia (49° 20' N, 20° 35' E), alt ca 600m. Coll Aug 1984 by V Jankovská and J Lazebníček, Inst Experimental Phytotech, Czechoslovak Acad Sci, Brno; subm by B Berglund. Dating is part of paleoecol study belonging to IGCP Proj 158B (Berglund, 1979). Samples were taken from wall of excavated trench (Profile SK-6-A). Depths refer to bog surface. All samples pretreated with HCl.

- Lu-2672. Sivárna 1, 45–47cm** **5130 ± 60**
 $\delta^{13}C = -27.0\text{‰}$
Moderately humified peat. Max in *Picea* pollen curve.
- Lu-2671. Sivárna 2, 64.5–65.5cm** **8380 ± 80**
 $\delta^{13}C = -26.1\text{‰}$
Highly humified peat. Max in *Tilia* pollen curve.
- Lu-2670. Sivárna 4, 127–130cm** **12,360 ± 110**
 $\delta^{13}C = -25.4\text{‰}$
Highly humified peat. *Pinus silvestris*-*Pinus cembra*-*Larix* pollen assemblage zone.
- Lu-2669. Sivárna 6, 162–165cm** **13,710 ± 100**
 $\delta^{13}C = -26.2\text{‰}$
Calcareous highly humified peat. *Juniperus*-*Larix* pollen assemblage zone. Max in *Juniperus* pollen curve. *Comment*: prolonged HCl treatment for total removal of carbonate. (3 1-day counts.)
- Lu-2668. Sivárna 8, 189.5–190.5cm** **13,670 ± 130**
 $\delta^{13}C = -26.5\text{‰}$
Highly humified basal peat with small wood fragments. Pollen assemblage zone with *Juniperus*, *Salix*, *Betula*, *Pinus silvestris*, and *P cembra*.

Crete

Calcite nodules series

Calcite nodules from loess deposits at Tylisos (35° 18' N, 25° 01' E), Zaros (35° 08' N, 24° 53' E), Anu Mulia (35° 05' N, 24° 58' E), and charcoal from Damasta (35° 21' N, 24° 58' E), Crete. Coll 1986 and subm by T Nihlén, Dept Phys Geog, Univ Lund. Dating is part of study of eolian deposits in N Africa and Mediterranean area (Nihlén, 1985; Nihlén & Solyom, 1986; Rapp & Nihlén, 1986). No pretreatment of carbonate samples; charcoal pretreated with HCl and NaOH.

- Lu-2718. Tylisos 1:1986** **4520 ± 60**
 $\delta^{13}C = -10.2\text{‰}$
Small calcite nodules coll 1.2m below ground surface and 0.4m from profile surface in 3m thick pale yellow loess deposit at Tylisos. Alt ca 200m.
- Lu-2719. Tylisos 2:1986** **3440 ± 60**
 $\delta^{13}C = -9.9\text{‰}$
Small calcite nodules coll 1.8m below ground surface and 0.7m from profile surface. Same site as Lu-2718, above.
- Lu-2720. Zaros 3:1986** **3050 ± 100**
 $\delta^{13}C = -9.8\text{‰}$
Small calcite nodules coll 1.1m below ground surface and 0.2m from

profile surface in 1.8m thick pale yellow loess deposit at Zaros. Alt ca 400m.
Comment: sample undersized; diluted; 28% sample (3 1-day counts.)

7370 ± 90
 $\delta^{13}C = -10.3\text{‰}$

Lu-2721. Anu Mulia 4:1986

Small calcite nodules coll 1.2m below ground surface and 0.2m from profile surface in 1.8m thick pale yellow loess deposit at Anu Mulia. Alt ca 400m. *Comment:* sample undersized; diluted; 77% sample.

60 ± 45
 $\delta^{13}C = -27.1\text{‰}$

Lu-2722. Damasta 5:1986

Charcoal coll 0.5m below ground surface and 0.2m from profile surface in 1.7m thick reddish yellow loess deposit at Damasta. Alt ca 300m.

RECENT PLANT SAMPLES

Results are given as difference, Δ , from our radiocarbon standard (95% activity of NBS oxalic acid standard No. 4990A, age corrected to 1950):

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

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

Terrestrial plant series (III)

Juncus sp coll yearly at shore of pond at Måryd, S Scania (55° 42' 05" N, 13° 22' 25" E) to determine atmospheric ^{14}C activity. Measured as complement to previous series (R, 1977, v 19, no. 3, p 439; 1987, v 29, no. 3, p 353–379). All samples coll by S Håkansson. No pretreatment.

$\Delta = 342 \pm 5.9\text{‰}$
 $\delta^{13}C = -28.9\text{‰}$

Lu-2685. Måryd 1978

Juncus sp coll Oct 1, 1978. *Comment:* sample coll July 1979 was erroneously given colln yr 1978 in previous series (Lu-1978, R, 1987, v 29, no. 3, p 368).

$\Delta = 254 \pm 5.7\text{‰}$
 $\delta^{13}C = -27.8\text{‰}$

Lu-2686. Måryd 1982

Juncus sp coll Sept 17, 1982.

$\Delta = 234 \pm 5.7\text{‰}$
 $\delta^{13}C = -28.0\text{‰}$

Lu-2687. Måryd 1983

Juncus sp coll Sept 24, 1983.

$\Delta = 223 \pm 5.6\text{‰}$
 $\delta^{13}C = -28.6\text{‰}$

Lu-2688. Måryd 1984

Juncus sp coll Sept 16, 1984.

Lu-2689. Måryd 1985*Juncus* sp coll Oct 26, 1985.

$$\Delta = 206 \pm 5.6\text{‰}$$

$$\delta^{13}\text{C} = -29.2\text{‰}$$

Lu-2690. Måryd 1986*Juncus* sp coll Oct 18, 1986.

$$\Delta = 189 \pm 5.5\text{‰}$$

$$\delta^{13}\text{C} = -28.7\text{‰}$$

ARCHAEOLOGIC SAMPLES

*Sweden***Lu-2657. Gammelstad 6:1**

$$430 \pm 45$$

$$\delta^{13}\text{C} = -24.7\text{‰}$$

Charcoal from excavation at Gammelstad 6:1, Nederluleå parish, Norrbotten (65° 39' N, 21° 30' E). Coll 1985 by M Petersson; subm by T Wallerström, Norrbottens Mus, Luleå. Assoc with crushed bricks indicating Late Medieval-Early Modern time. *Comment:* mild pretreatment with NaOH and HCl.

Ystad project series (II)

Charcoal from various sites around Ystad. Subm by S Tesch, Inst Archaeol, Univ Lund. For other dates from area, see St Köpinge Series I and II (R, 1986, v 28, no. 1, p 156–158; v 28, no. 3, p 1128–1130) and Ystad project series (R, 1987, v 29, no. 3, p 372–373). Charcoal id by T Bartholin, Dept Quaternary Geol, Univ Lund.

Lu-2644. Köpinge 21:2, A 20A

$$1350 \pm 45$$

$$\delta^{13}\text{C} = -25.1\text{‰}$$

Charcoal (*Corylus*, *Acer*, *Alnus*, *Quercus*, & *Fraxinus*) from floor level in pit house at Köpinge 21:2 (55° 26' N, 13° 59' E). Coll 1985 by P Karsten. Assoc with pottery, loom weights, animal bone, flint, and whetstone of slate. Finds indicate Late Iron Age. *Comment:* pretreated with HCl.

Lu-2645. L:a Köpinge 3:15, A 23

$$1310 \pm 45$$

$$\delta^{13}\text{C} = -25.5\text{‰}$$

Charcoal (*Populus* sp) from hearth (B3 Pt 50) at L:a Köpinge 3:15 (55° 27' N, 13° 56' E). Coll 1985 by P Karsten. No assoc artifacts. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2646. L:a Köpinge 9:1, A 22

$$2060 \pm 80$$

$$\delta^{13}\text{C} = -25.7\text{‰}$$

Charcoal (*Corylus*, *Alnus*, *Quercus*, & *Tilia*) from pit house (B3 Pt 45 A 22) at L:a Köpinge 9:1 (55° 27' N, 13° 56' E). Coll 1985 by P Karsten. Assoc with pottery indicating Late Iron Age. *Comment:* no pretreatment; sample undersized; diluted; 35% sample. (3 1-day counts.)

Lu-2647. L:a Köpinge 12:1, A 80 **1700 ± 60**
 $\delta^{13}C = -25.4\text{‰}$

Charcoal (*Quercus*, *Betula*, *Fraxinus*, *Salix*, *Alnus*, & *Acer*) from hearth (B3 Pt 41 A 80) at L:a Köpinge 12:1 (55° 27' N, 13° 56' E). Coll 1985 by P Karsten. Assoc with pottery indicating Early Iron Age. *Comment*: no pretreatment; sample undersized; diluted; 71% sample.

Lu-2648. Ystad, N Bellevue, A 9 **2190 ± 70**
 $\delta^{13}C = -25.7\text{‰}$

Charcoal (*Corylus*, *Quercus*, *Alnus*, & *Pomoideae*) from Ystad, N Bellevue, A 9 (55° 26' N, 13° 49' E). Coll 1984 by L Wallin. No assoc artifacts. *Comment*: mild pretreatment with NaOH and HCl; sample undersized; diluted; 63% sample.

Lu-2649. Herrestad 68:88, F7 **2970 ± 80**
 $\delta^{13}C = -26.5\text{‰}$

Charcoal (*Quercus*, *Fraxinus*, *Alnus*, *Acer*, *Salix*, & *Rhamnus cathartica*) from hearth (F 7) by refuse layer at Herrestad 68:88 (55° 27' N, 13° 54' E). Coll 1984 by S Tesch. Assoc with pottery indicating Roman Iron Age. *Comment*: normal pretreatment with HCl and NaOH. Sample undersized; diluted; 51% sample.

Lu-2650. Herrestad 68:88, A 105 **3000 ± 90**
 $\delta^{13}C = -25.6\text{‰}$

Charcoal (*Betula*) from cooking pit (A 105) at same site as Lu-2649, above. Coll 1985 by S Tesch. Assoc with bronze fragment indicating Bronze or Iron Age. *Comment*: no pretreatment; sample undersized; diluted; 40% sample.

Mossby series

Charcoal from Iron Age settlement at Mossby 10:4A (55° 00' N, 13° 37.5' E) and 12:12 (55° 00' N, 13° 38' E), S Scania. Subm by D Olausson, Inst Archaeol, Univ Lund. Dating is part of study belonging to Ystad Proj, above. Charcoal id by T Bartholin.

Lu-2635. Mossby 10:4A, Anl 1 **1180 ± 45**
 $\delta^{13}C = -26.5\text{‰}$

Charcoal (*Pomoideae*) from hearth ? (Anl 1). Coll 1985 by E Ryberg. Assoc with firecracked rock, burned clay, and undecorated potsherds. Artifact assemblage from site indicates Late Iron Age. *Comment*: normal pretreatment with HCl and NaOH.

Lu-2636. Mossby 12:12, Anl 16 **1260 ± 45**
 $\delta^{13}C = -25.8\text{‰}$

Charcoal (*Rhamnus cathartica* & *Betula*) from soot-mixed sand in hearth? (Anl 16). Coll 1985 by S Svensson. Assoc with burned bone fragments, burned clay daub, and flint flakes, Archaeol estimate (uncertain): Early Iron Age. *Comment*: normal pretreatment with HCl and NaOH.

Lu-2637. Mossby 12:12, Anl 29**1270 ± 45** $\delta^{13}C = -26.5\text{‰}$

Charcoal (*Tilia*) from soot-mixed sand in hearth ? (Anl 29). Coll 1985 by S Svensson. Assoc with fragmented grinding stone, fired clay, and flint flakes. Archaeol estimate (uncertain): Early Iron Age. *Comment*: normal pretreatment with HCl and NaOH.

Lu-2638. Mossby 12:12, Anl 42**1210 ± 45** $\delta^{13}C = -25.8\text{‰}$

Charcoal (*Fagus*, *Corylus*, & *Acer*) from soot-mixed sand in hearth ? (Anl 29). Coll 1985 by D Olausson. Assoc with fire-cracked rock, burned clay, and flint flakes. Archaeol estimate (uncertain): Early Iron Age. *Comment*: normal pretreatment with HCl and NaOH.

Lu-2639. Mossby 12:12, X38 Y33.5**7340 ± 70** $\delta^{13}C = -25.6\text{‰}$

Charcoal (*Pinus*) from concentration of sooty sand underlying presumed culture layer, Sq X = 38 Y = 33.5. Coll 1985 by S Svensson. No assoc artifacts. Archaeol estimate: Stone Age.

Lu-2684. Ö Vemmenhög 7:40/1985**4920 ± 90** $\delta^{13}C = -26.1\text{‰}$

Charcoal from hearth pit below culture layer in settlement area (Late Middle Neolithic Funnel Beaker culture) at Ö Vemmenhög 7:40, S Scania (55° 23' 30" N, 13° 29' 20" E). Coll 1985 and subm by L Larsson, Inst Archaeol, Univ Lund. Assoc with flint implement and pottery. For other dates from site, see R, 1986, v 28, no. 3, p 1128. *Comments*: mild pretreatment with NaOH and HCl; sample undersized; diluted; 58% sample. (LL): older than expected from assoc archaeol finds.

Lu-2724. Storegård**3020 ± 110** $\delta^{13}C = -26.2\text{‰}$

Charcoal from fireplace (x = 6; y = 24) near passage grave at Storegård, Barsebäck parish, W Scania (55° 45' 06" N, 12° 59' 04" E). Coll 1986 and subm by B Hårdh, Inst Archaeol, Univ Lund. Assoc with flint waste and pottery indicating Middle Neolithic age. *Comment*: no pretreatment; sample undersized; diluted; 33% sample.

Skanör series

Charcoal from Medieval settlement area at Skanör, SW Scania. Coll 1986 and subm by L Ersgård, Inst Archaeol, Univ Lund. Dated as complement to Skanör-Falsterbo series (R, 1987, v 29, no. 3, p 374–375). Normal pretreatment with HCl and NaOH.

Lu-2725. Skanör 1986:1**550 ± 45** $\delta^{13}C = -26.0\text{‰}$

Charcoal from Tr A, Layer D, at Hovbacken, Skanör (55° 25' N, 12° 50' E).

Lu-2726. Skanör 1986:2**760 ± 45**
 $\delta^{13}C = -23.8\text{‰}$

Charcoal from Tr A, Layer 9, at Stg 3:2, Skanör (55° 26' N, 12° 51' E).

Hindby Mosse series

Charcoal from settlement site (Middle Neolithic Funnel Beaker culture) at Hindby Mosse, S Malmö, S Scania (55° 34' N, 13° 02' E). Coll by Malmö Hist Mus 1966–1974; subm by M Svensson, Inst Archaeol, Univ Lund. Dating is part of study of large settlement site at Hindby Mosse and 20 smaller sites in limited area in present-day Malmö community (Svensson, 1986). Collagen from cattle bone from Hindby Mosse site dated at 4430 ± 70 BP (Lu-2568, R, 1987, v 29, no. 3, p 374). Normal pretreatment with HCl and NaOH.

Lu-2730. Hindby Mosse, MHM 1386**2030 ± 50**
 $\delta^{13}C = -26.0\text{‰}$

Charcoal from hearth pit (Anl 1 B) coll 1966. Assoc with pottery, flint and other rock implements, and animal bone. *Comments:* sample undersized; diluted; 90% sample. (MS): date ca 2000 yr too young. Hearth pit obviously not Neolithic but from Iron Age.

Lu-2731. Hindby Mosse, MHM 1505:1**4240 ± 60**
 $\delta^{13}C = -25.1\text{‰}$

Charcoal from settlement layer (Sqs 15/69, 16/69, and 15/70). Coll 1968. Same artifact assemblage as for Lu-2730, above. Archaeol estimate: 4250 to 4050 BP.

Lu-2733. Hindby Mosse, MHM 1505:2**4130 ± 90**
 $\delta^{13}C = -26.4\text{‰}$

Charcoal from settlement layer ("lower peaty layer," Sq 87/109) coll 1974. Same artifact assemblage and same archaeol estimate as for Lu-2731, above. *Comment:* sample undersized; diluted; 48% sample.

Lu-2732. Järnyxegatan**4430 ± 100**
 $\delta^{13}C = -26.6\text{‰}$

Charcoal from black settlement layer (Omr 1) at Järnyxegatan. Site assoc with main site Hindby Mosse. Coll 1968. *Comment:* sample undersized; diluted; 47% sample.

Hörsås series

Charcoal from 2 settlement areas (Late Neolithic-Bronze Age) at Hörsås 6:1, Getinge parish, Halland (56° 49' N, 12° 43' E). Coll 1986 by L Carlie; subm by E Rosengren, Stiftelsen Hallands Länsmuseum, Halmstad. No artifacts or other finds assoc with sample material.

Area A

Lu-2741. Hörsås 6:1, Anl 5 **2890 ± 50**
 $\delta^{13}C = -26.7\text{‰}$

Charcoal from Anl 5. Alt 24.85m. *Comment:* mild pretreatment with NaOH and HCl.

Lu-2742. Hörsås 6:1, Anl 17 **2860 ± 50**
 $\delta^{13}C = -26.7\text{‰}$

Charcoal from Anl 17. Alt 23.40m. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2743. Hörsås 6:1, Anl 18 **2780 ± 50**
 $\delta^{13}C = -27.0\text{‰}$

Charcoal from Anl 18. Alt 23.57m. *Comment:* normal pretreatment with HCl and NaOH.

Area C

Lu-2744. Hörsås 6:1, Anl 4 **2880 ± 50**
 $\delta^{13}C = -26.5\text{‰}$

Charcoal from Anl 4. Alt 32.90m. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2745. Hörsås 6:1, Anl 6 **2950 ± 50**
 $\delta^{13}C = -26.7\text{‰}$

Charcoal from Anl 6. Alt 33.0m. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2746. Hörsås 6:1, Anl 22 **2900 ± 50**
 $\delta^{13}C = -26.4\text{‰}$

Charcoal from Anl 22. Alt 32.9m. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2739. Hörsås 6:1, Anl 36 **4590 ± 60**
 $\delta^{13}C = -27.5\text{‰}$

Charcoal from Anl 36. Alt 33.4m. *Comment:* pretreated with HCl only; sample undersized; diluted; 88% sample.

Lu-2747. Hörsås 6:1, Anl 107 **2960 ± 50**
 $\delta^{13}C = -26.7\text{‰}$

Charcoal from Anl 107. Alt 32.75m. *Comment:* normal pretreatment with HCl and NaOH.

Lu-2740. Stenstorp 3:6, Anl 2 **1990 ± 50**
 $\delta^{13}C = -27.2\text{‰}$

Charcoal from Anl 2 at Stenstorp 3:6, Slöinge parish, Halland (56° 49'

N, 12° 43' E). Alt 19.45m. Coll 1986 by L Carlie; subm by E Rosengren.
Comment: normal pretreatment with HCl and NaOH.

Verkeån series (II)

Wood (*Fagus silvatica*), id by A Bråthen, Lab Dendrochronology, Trollhättan, from series of posts visible at low tide N of mouth of Verkeån, Ravlunda parish, E Scania (55° 43.4' N, 14° 12' E). Coll March 1984 (Lu-2763) and April 1987 and subm by L Hansen, Inst Culture Research, Kivik. Dated as complement to Verkeån series (R, 1987, v 29, no. 3, p 377). Pretreated with HCl and NaOH. Lu-2764 and -2765 were charred in nitrogen atmosphere before burning.

Lu-2763. Verkeån 2	330 ± 45 $\delta^{13}C = -26.1\text{‰}$
Lu-2764. Verkeån 218	310 ± 45 $\delta^{13}C = -27.9\text{‰}$
Lu-2765. Verkeån 210	360 ± 45 $\delta^{13}C = -27.0\text{‰}$

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