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UNIVERSITY OF LUND RADIOCARBON DATES XII

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 1977 and October 1978. Equipment, measurement, and treatment of samples are as reported previously (R, 1968, v 10, p 36-37; 1976, v 18, p 290) except for some minor improvements of the electronic equipment.

Age calculations are based on a contemporary value equal to 95% 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). Errors quoted ($\pm 1\sigma$) include standard deviations of count rates for the unknown sample, contemporary standard, and background. When measured activity is less than 2σ above background, minimum age is given. Basis for calculation of age limit is measured net activity plus 3σ. If net activity is negative, only $+3\sigma$ is used for age limit.

Corrections for deviations from $\delta^{13}C = -25.0‰$ in the PDB scale are applied for all samples; also for marine shells. The apparent age for marine material 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 yield of CO_2 by combustion of gelatine remaining after treatment. Organic carbon lost during treatment is not included in calculated percentage.

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

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Sweden

Herrestads mosse series

Sediment and peat from bog Herrestads mosse, S Scania (55° 25.5′ N, 13° 52′ E). Coll 1975 and subm by J Mikaelsson, Dept Quaternary Geol, Univ Lund. Dated as part of study of water-level changes in area and vegetational development in surrounding region (Mikaelsson & Liljegren,

1978). Depths given refer to bog surface. All samples pretreated with HCl. Some received additional mild treatment with NaOH.

Lu-1225. Herrestads mosse, 390cm **9620 ± 95**
$\delta^{13}C = -26.7‰$

Coarse detritus gyttja. *Comment*: additional mild NaOH treatment.

Lu-1226. Herrestads mosse, 380cm **9420 ± 95**
$\delta^{13}C = -27.3‰$

Coarse detritus gyttja.

Lu-1227. Herrestads mosse, 370cm **9250 ± 90**
$\delta^{13}C = -26.1‰$

Coarse detritus gyttja.

Lu-1228. Herrestads mosse, 335cm **8560 ± 85**
$\delta^{13}C = -23.5‰$

Coarse detritus gyttja. *Comment*: additional mild NaOH treatment.

Lu-1229. Herrestads mosse, 315cm **7680 ± 80**
$\delta^{13}C = -25.8‰$

Drift gyttja.

Lu-1230. Herrestads mosse, 305cm **7590 ± 80**
$\delta^{13}C = -25.6‰$

Fine detritus gyttja with some root material.

Lu-1231. Herrestads mosse, 250cm **6350 ± 75**
$\delta^{13}C = -26.5‰$

Fine detritus gyttja. *Comment*: additional mild NaOH treatment.

Lu-1232. Herrestads mosse, 200cm **6090 ± 70**
$\delta^{13}C = -26.8‰$

Fine detritus gyttja with few root hairs. *Comment*: additional mild NaOH treatment.

Lu-1233. Herrestads mosse, 150cm **5600 ± 70**
$\delta^{13}C = -27.0‰$

Fine detritus gyttja with some root material and few minute mollusk shells. *Comment*: additional mild NaOH treatment.

Lu-1234. Herrestads mosse, 120cm **5050 ± 65**
$\delta^{13}C = -26.5‰$

Fine detritus gyttja with many minute mollusk shells. *Comment*: additional mild NaOH treatment. Carbonate from this sample was dated separately at 5940 ± 125 ($\delta^{13}C = -7.7‰$).

Lu-1235. Herrestads mosse, 45cm **3590 ± 60**
$\delta^{13}C = -25.0‰$

Strongly humified peat. *Comment*: additional mild NaOH treatment.

Olsäng series

Peat and peaty drift gyttja from area with beach ridges (Mikaelsson, 1978) at Olsäng, SE Blekinge (56° 12.5′ N, 16° 58.5′ E). Coll 1976 and 1977 and subm by J Mikaelsson. Dated as part of study of chronology of beach ridges and of shoreline displacement in area. For stratigraphy of dated samples, see *op cit*, above, p 42-43, 47.

Lu-1461. Olsäng I, Bp 27 **5690 ± 70**
$\delta^{13}C = -26.4‰$

Strongly compacted peat from Boring Point 27. *Comment*: pretreated with HCl and NaOH.

Lu-1462. Olsäng II, Bp 23 **9150 ± 90**
$\delta^{13}C = -26.6‰$

Highly humified *Sphagnum* peat from Boring Point 23. *Comment*: no pretreatment; small sample.

Lu-1463. Olsäng III, Bp 11 **9220 ± 90**
$\delta^{13}C = -26.8‰$

Peat with some gyttja from Boring Point 11. *Comment*: no pretreatment; small sample.

Lu-1460. Olsäng IV, Bp 13 **9120 ± 90**
$\delta^{13}C = -26.0‰$

Peaty drift gyttja from Boring Point 13. *Comment*: pretreated with HCl and NaOH.

Sämbosjön series (II)

Sediment from Lake Sämbosjön, Halland, SW Sweden (57° 10′ N, 12° 25′ E). Coll 1976 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dated as complement to Sämbosjön series (R, 1978, v 20, p 418-419). Depths given are below sediment surface. Pretreated with HCl and NaOH.

Lu-1280. Sämbosjön, 100 to 105cm **1500 ± 50**
$\delta^{13}C = -28.2‰$

Detritus gyttja.

Lu-1281. Sämbosjön, 60 to 65cm **1200 ± 50**
$\delta^{13}C = -27.8‰$

Detritus gyttja.

Lu-1418. Sämbosjön, 25 to 30cm **1140 ± 50**
$\delta^{13}C = -25.4‰$

Detritus gyttja.

Åsbotorpsjön series

Sediment from Lake Åsbotorpsjön, Billingen, S Sweden (58° 25′ N, 13° 50′ E). Alt 280m; area 2.5ha; max depth 7.5m. Coll 1976 and subm by G Digerfeldt. Dating is part of study of Late Weichselian develop-

ment of lake and surrounding region. Samples come from profile in southern part of lake (Livingstone sampler, diam 10cm). Water depth ca 4m at sampling point. Depths given are below sediment surface. All samples pretreated with HCl.

Lu-1448. Åsbotorpsjön, 587 to 589.5cm **14,020 ± 155**
$\delta^{13}C = -25.1‰$

Clay gyttja. *Comment*: sample undersized; diluted; 67% sample. (3 1-day counts.)

Lu-1449. Åsbotorpsjön, 584 to 586cm **12,010 ± 130**
$\delta^{13}C = -25.0‰$

Clay gyttja. *Comment*: sample undersized; diluted; 80% sample.

Lu-1450. Åsbotorpsjön, 576 to 578cm **11,520 ± 120**
$\delta^{13}C = -25.2‰$

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

Lu-1451. Åsbotorpsjön, 569.5 to 571.5cm **10,440 ± 105**
$\delta^{13}C = -23.9‰$

Clayey gyttja. *Comment*: sample undersized; diluted; 92% sample.

Lu-1452. Åsbotorpsjön, 566 to 568cm **10,200 ± 100**
$\delta^{13}C = -25.8‰$

Clayey gyttja.

Lu-1453. Åsbotorpsjön, 558 to 560cm **9670 ± 90**
$\delta^{13}C = -30.0‰$

Clayey gyttja.

Lu-1454. Åsbotorpsjön, 548 to 550cm **9170 ± 85**
$\delta^{13}C = -28.5‰$

Clayey gyttja.

Lu-1455. Åsbotorpsjön, 538 to 540cm **9020 ± 85**
$\delta^{13}C = -28.2‰$

Detritus gyttja.

Lu-1456. Åsbotorpsjön, 522 to 524cm **8630 ± 85**
$\delta^{13}C = -27.3‰$

Detritus gyttja.

Lillsjön series

Sediment from Lake Lillsjön, Stockholm (59° 20′ N, 17° 57′ E). Alt 0.3m; area 12ha; max depth 2.9m. Coll 1976 and subm by G Digerfeldt. Dating is part of study of isolation and recent development of lake. Samples come from profile in central part of lake (Livingstone corer, diam 6cm). Water depth 2.9m at sampling point. Depths given are below sediment surface. Pretreated with HCl. All samples undersized; diluted. Amount of CO_2 from sample is given in *Comments* below as "% sample".

Lu-1430. Lillsjön, 90 to 92.5cm **850 ± 55**
$\delta^{13}C = -28.3‰$

Clay gyttja. *Comment*: 75% sample.

Lu-1429. Lillsjön, 70 to 72.5cm **780 ± 50**
$\delta^{13}C = -29.3‰$

Clay gyttja. *Comment*: 86% sample.

Lu-1428. Lillsjön, 50 to 52.5cm **640 ± 50**
$\delta^{13}C = -28.7‰$

Clay gyttja. *Comment*: 91% sample.

Lu-1426. Laduviken **320 ± 50**
$\delta^{13}C = -18.7‰$

Algae gyttja from 95 to 97.5cm below sediment surface in profile in central part of Lake Laduviken, Stockholm (59° 22′ N, 18° 05′ E). Alt 0.7m; area 6ha; max depth 1.5m. Coll 1976 and subm by G Digerfeldt. Dated as part of study of recent development of lake. Water depth 1.5m at sampling point. Pretreated with HCl. *Comment*: 95% sample.

Lu-1427. Långsjön **490 ± 50**
$\delta^{13}C = -30.1‰$

Detritus gyttja from 52.5 to 55cm below sediment surface in profile in deepest part of Lake Långsjön, Stockholm (59° 16′ N, 17° 58′ E). Coll 1976 and subm by G Digerfeldt. Dated as complement to Långsjön series (R, 1978, v 20, p 420-421). Pretreated with HCl.

Sjömyretjärn series

Sediment from Lake Sjömyretjärn, Dalsland, W Sweden (58° 48′ N, 12° 05′ E). Alt 152m; area 10ha; max depth 4.55m. Coll 1977 and subm by G Digerfeldt. Dating is part of study of Holocene development of lake and vegetational history of surrounding region. Samples come from profile in central part of lake (Livingstone corer, diam 10cm). Water depth 4.55m at sampling point. Depths given are below sediment surface. All samples pretreated with HCl. Lu-1418, -1420, -1491, and -1492 received additional treatment with NaOH.

Lu-1486. Sjömyretjärn, 405 to 410cm **9750 ± 90**
$\delta^{13}C = -23.5‰$

Clay gyttja.

Lu-1487. Sjömyretjärn, 375 to 380cm **9500 ± 90**
$\delta^{13}C = -22.5‰$

Clayey gyttja.

Lu-1488. Sjömyretjärn, 345 to 350cm **9630 ± 90**
$\delta^{13}C = -23.1‰$

Clayey gyttja.

Lu-1489. Sjömyretjärn, 315 to 320cm **8880 ± 85**
$\delta^{13}C = -24.0‰$

Detritus gyttja.

Lu-1490. Sjömyretjärn, 275 to 280cm **7680 ± 75**
$\delta^{13}C = -29.2‰$

Detritus gyttja.

Lu-1491. Sjömyretjärn, 235 to 240cm **7050 ± 90**
$\delta^{13}C = -29.7‰$

Detritus gyttja. Insoluble fraction. *Comment*: undersized; diluted; 72% sample.

Lu-1491A. Sjömyretjärn, 235 to 240cm, soluble **7030 ± 75**
$\delta^{13}C = -29.3‰$

Acid-precipitated part of NaOH-soluble fraction.

Lu-1492. Sjömyretjärn, 195 to 200cm **5490 ± 65**
$\delta^{13}C = -29.9‰$

Detritus gyttja.

Lu-1493. Sjömyretjärn, 155 to 160cm **4390 ± 60**
$\delta^{13}C = -27.6‰$

Detritus gyttja.

Lu-1494. Sjömyretjärn, 115 to 120cm **3770 ± 60**
$\delta^{13}C = -25.6‰$

Detritus gyttja.

Lu-1420. Sjömyretjärn, 75 to 80cm **2350 ± 55**
$\delta^{13}C = -29.1‰$

Detritus gyttja.

Lu-1419. Sjömyretjärn, 35 to 40cm **1190 ± 50**
$\delta^{13}C = -29.8‰$

Detritus gyttja.

Central Blekinge series (I)

Sediment from lakes in Central Blekinge, SE Sweden. All samples except Lu-1554 coll 1977 and subm by S Björck, Dept Quaternary Geol, Univ Lund. Dating is part of study of age of isolation level in lakes of different alt and of pollen zonation in area. Samples are from cores taken with Livingstone sampler, diam 10cm, except Lu-1554 (diam 6cm). Depths refer to water surface, except for overgrown Lake Paddegölen, where depths refer to quagmire surface. Most of the samples were undersized and were diluted. Amount of CO_2 from sample is given in *Comments* below as "% sample". All samples pretreated with HCl.

Galtsjön

(56° 13′ N, 15° 13′ E), alt 32m. Water depth ca 5m at sampling point.

Lu-1422. Galtsjön, 794 to 797cm **11,000 ± 175**
$\delta^{13}C = -20.8‰$

Muddy clay, overlying isolation level. *Comment*: 48% sample.

Lu-1423. Galtsjön, 778.5 to 781.5cm **10,470 ± 110**
$\delta^{13}C = -22.3‰$

Muddy clay. *Comment*: 83% sample.

Lu-1424. Galtsjön, 762 to 765cm **10,050 ± 100**
$\delta^{13}C = -22.0‰$

Clay gyttja. *Comment*: 91% sample.

Lu-1425. Galtsjön, 759 to 761cm **10,020 ± 120**
$\delta^{13}C = -22.8‰$

Clayey gyttja. *Comment*: 67% sample.

Paddegölen

(56° 11′ N, 15° 13′ E), alt 27m.

Lu-1471. Paddegölen, 615 to 620cm **13,670 ± 295**
$\delta^{13}C = -21.9‰$

Clay. *Comment*: 24% sample. (4 1-day counts.)

Lu-1472. Paddegölen, 596 to 600cm **11,310 ± 175**
$\delta^{13}C = -22.5‰$

Clay, underlying isolation level. *Comment*: 38% sample. (3 1-day counts.)

Lu-1473. Paddegölen, 592 to 595cm **10,820 ± 110**
$\delta^{13}C = -19.7‰$

Clay gyttja, at isolation level. *Comment*: 84% sample.

Lu-1474. Paddegölen, 576 to 578.5cm **10,100 ± 95**
$\delta^{13}C = -21.0‰$

Fine detritus gyttja.

Kroksjön

(56° 16′ N, 15° 01′ E), alt 46m. Water depth ca 2m at sampling point.

Lu-1477. Kroksjön, 510 to 515cm **13,920 ± 340**
$\delta^{13}C = -20.7‰$

Clay, overlying isolation level. *Comment*: 26% sample. (3 1-day counts.)

Lu-1479. Kroksjön, 491 to 494cm **11,710 ± 115**
$\delta^{13}C = -21.2‰$

Clay gyttja. *Comment*: 67% sample. (3 1-day counts.)

Lu-1480. Kroksjön, 484 to 487cm **11,100 ± 130**
$\delta^{13}C = -22.6‰$

Clay gyttja. *Comment*: 68% sample.

Lu-1481. Kroksjön, 468 to 472cm **10,460 ± 95**
$\delta^{13}C = -21.8‰$

Clay gyttja.

Lu-1482. Kroksjön, 456 to 459cm **10,330 ± 95**
$\delta^{13}C = -21.6‰$

Clay gyttja.

Bredsjön

(56° 10′ N, 15° 12′ E), alt 12m. Water depth ca 1.7m at sampling point.

Lu-1555. Bredsjön, 533 to 540cm **14,310 ± 265**
$\delta^{13}C = -23.7‰$

Slightly muddy clay, underlying isolation level. *Comment*: 43% sample.

Lu-1556. Bredsjön, 526 to 530cm **11,380 ± 160**
$\delta^{13}C = -22.8‰$

Slightly muddy clay, at isolation level. *Comment*: 44% sample. (3 1-day counts.)

Lu-1557. Bredsjön, 522 to 525cm **10,230 ± 105**
$\delta^{13}C = -25.3‰$

Clay gyttja, overlying isolation level. *Comment*: 86% sample.

Logylet

(56° 18′ N, 14° 59′ E), alt 61m. Water depth ca 5.5m at sampling point.

Lu-1444. Logylet II, 970 to 974cm **11,430 ± 140**
$\delta^{13}C = -23.6‰$

Clay gyttja. *Comment*: 69% sample.

Sjalbredan

(56° 17′ 30″ N, 15° 01′ 30″ E), alt 42m. Coll 1978 by R Liljegren and J Mikaelsson; subm by S Björck.

Lu-1554. Sjalbredan, 577 to 581cm **10,990 ± 135**
$\delta^{13}C = -21.1‰$

Clay gyttja, overlying isolation level. *Comment*: 53% sample. (3 1-day counts).

Öppenskär I series

Peat from soil profile in *Calluna* heath on Öppenskär I., Torhamn archipelago, SE Blekinge (56° 04′ N, 15° 47′ E). Coll 1977 and subm by B E Berglund, Dept Quaternary Geol, Univ Lund. Area described by Berglund (1966, p 107-108). Pollen diagram from profile discussed by Berglund (1978). Depths refer to soil surface. Pretreated with HCl and NaOH.

Lu-1485. Öppenskär I:1, 25 to 26.5cm, insoluble **130 ± 45**
$\delta^{13}C = -26.0‰$

Insoluble fraction of fen peat from just above mineral soil and below *Calluna* peat.

Lu-1485A. Öppenskär I:1, 25 to 26.5cm, soluble **220 ± 45**
$\delta^{13}C = -26.6‰$

Acid-precipitated part of NaOH-soluble fraction of same peat. *Comment* (BEB): dates expansion of *Calluna* and possibly a local embogging. Lu-1485A indicates that younger roots may influence date of insoluble fraction.

Vieskär III series

Charcoal and peat from fen profile in bedrock depression on Vieskär I., Torhamn archipelago, SE Blekinge (56° 04′ N, 15° 47′ E). Coll 1977 and subm by B E Berglund. Pollen diagram discussed by Berglund (1978). Depths refer to fen surface. Peat pretreated with HCl and NaOH.

Lu-1468. Vieskär III:1, 34cm **1210 ± 50**
$\delta^{13}C = -26.5‰$

Charcoal of *Betula* and *Salix* or *Populus*, id by T Bartholin, from drift gyttja layer. Dates clearing phase, expansion of *Calluna* heath, and local embogging. *Comment*: no pretreatment; small sample; diluted; 65% sample. (3 1-day counts.)

Lu-1484. Vieskär III:2, 27 to 28.5cm, insoluble **420 ± 45**
$\delta^{13}C = -27.7‰$

Insoluble fraction of fen peat which dates end of *Calluna* phase and expansion of grass-juniper heath.

Lu-1484A. Vieskär III:2, 27 to 28.5cm, soluble **420 ± 45**
$\delta^{13}C = -27.4‰$

Acid-precipitated part of NaOH-soluble fraction of same peat.

Lummelunda Cave series

Gyttja from Lummelunda Cave, N Gotland (57° 44′ 18″ N, 18° 24′ 44″ E). Coll 1977 by R Engh; subm by L Engh, Dept Phys Geog, Univ Lund. Dated as part of study of chronology of cave deposits. In samples were some small fresh-water mollusks. Pretreated with HCl.

Lu-1511. Lummelunda Cave, Sample 8 **3570 ± 45**
$\delta^{13}C = -24.1‰$

Sample from 7cm thick gyttja layer in Mailbox Hall, overlain by silt and underlain by travertine alternating with silt. *Comment*: 3 1-day counts.

Lu-1512. Lummelunda Cave, Sample 24 **3530 ± 60**
$\delta^{13}C = -24.3‰$

Sample from 22cm thick gyttja layer in Siphon Hall, overlain by coarse sand and underlain by ca 1m laminated sandy sediments.

Lu-1513. Strimasund **8080 ± 80**

$\delta^{13}C = -26.9‰$

Peat from rd cutting 700m E of Strimasund farm at Rd E79, SW Lappland (66° 03′ 10″ N, 14° 52′ 09″ E). Coll 1976 and subm by L Engh. Peat is underlain by glaciofluvial deposits in fossil canyon.

Svedaskogen series

Barnacle and bivalve shells from Svedaskogen, ca 3km N of Fjärås church, Halland (57° 28′ 45″ N, 12° 10′ 30″ E). Coll 1977 and subm by Å Hillefors, Dept Phys Geog, Univ Lund. Dated as part of study of deglaciation of area (Hillefors, 1975; R, 1976, v 18, p 295-297).

Lu-1446. Svedaskogen, Sample 1:1977 **13,290 ± 125**

$\delta^{13}C = +0.1‰$

Shells (*Balanus* sp) from silty clay underlain by glaciofluvial material and overlain by wave-washed sand and gravel. Some specimens still had all side plates attached to basal plate. Sample also contained few shells of bivalves (*Macoma calcarea, Hiatella arctica, Mya truncata,* and *Mytilus edulis*); not used for dating. *Comment*: outer 45% removed by acid leaching.

Lu-1447. Svedaskogen, Sample 2:1977 **12,970 ± 120**

$\delta^{13}C = -0.2‰$

Barnacle shells (*Balanus* spp) and few fragments of bivalve shells (*Mytilus* sp) from glacial-tectonized glacial-marine clay overlain by till. *Comment*: outer 13% removed by acid leaching. Sample undersized; diluted; 78% sample. (3 1-day counts.)

General Comment: corrections for deviations from $\delta^{13}C = -25‰$ PDB are applied also for shell samples. No corrections are made for apparent age of shells of living marine organisms. For apparent age of recent mollusk shells, see R, 1975, v 17, p 183-184 and Håkansson (1975b).

B. Finland

Iso-Mustajärvi series

Sediment from Lake Iso-Mustajärvi, Ylitornio, Finland (66° 13′ 30″ N, 23° 48′ E). Alt ca 75m. Coll 1976 and subm by M Hjelmroos, Dept Quaternary Geol, Univ Lund. Dated as complement to Merijänjärvi and Pilpajärvi series (R, 1978, v 20, p 427-428). Samples are from core taken with Livingstone sampler. Depths given are below sediment surface. Water depth ca 1.3m at sampling point. Pretreated with HCl.

Lu-1431. Iso-Mustajärvi I, 206 to 215cm **5380 ± 65**

$\delta^{13}C = -28.8‰$

Slightly clayey gyttja. First impact of human influence; max of *Plantago major, Urtica,* and *Humulus.*

Lu-1432. Iso-Mustajärvi II, 84 to 93cm **3910 ± 60**

$\delta^{13}C = -29.1‰$

Gyttja. Grazing stage with *Plantago lanceolata;* empiric *Calluna* limit.

C. Norway

Lu-1421. Haugalia, Kvam **>43,400**

$\delta^{13}C = -19.5‰$

Collagen from mammoth tusk fragment from *Skarsanden* gravel pit at Haugalia, Kvam, Gudbrandsdalen (61° 39′ 36″ N, 9° 37′ 57″ E). Coll June 1977 and subm by K Garnes, Geol Dept, Univ Bergen, Norway. Deposits at Haugalia studied by submitter (Bergersen & Garnes, 1971). For other mammoth dates from area, see Berglund *et al* (1976, p 185) and Garnes (1978, p 197). Collagen extracted as described previously (R, 1976, v 18, p 290) including NaOH treatment. Organic carbon content: 5.8%. *Comments*: 4 1-day counts. Three σ were used for calculation of min age. Average net activity was almost exactly zero. (KG): in Garnes (1978, p 197) because of printing error this date is quoted as a definite date 43,400 BP.

Sotra series (II)

Sediment from small lakes on Sotra I., Hordaland, W Norway. Coll 1977 by K Krzywinski, B Stabell, M Kvamne, and E Risnes; subm by B Stabell and K Krzywinski, Bot Mus, Univ Bergen. Dated as complement to Sotra series (R, 1978, v 20, p 423-424). Preliminary repts of study pub by Krzywinski and Stabell (1978) and Berge *et al* (1978). Acid-precipitated part of NaOH-soluble fraction used for dating, except for Lu-1552 (dated on total organic material).

Lu-1495A. Sotra No. 10526/27 **2790 ± 55**

$\delta^{13}C = -27.6‰$

Lacustrine gyttja from Bakketjønn (60° 23′ N, 4° 59′ E) overlying isolation contact.

Lu-1496A. Sotra No. 10613 **4880 ± 65**

$\delta^{13}C = -28.2‰$

Lacustrine gyttja from "Einerhaugen", Tjørna (60° 21′ N, 4° 59′ E), overlying isolation contact formed after Tapes-transgression.

Lu-1497A. Sotra No. 10648/49 **7720 ± 80**

$\delta^{13}C = -27.7‰$

Lacustrine gyttja from "Einerhaugen", Tjørna, underlying ingression contact.

Lu-1498A. Sotra No. 10665 **9460 ± 90**

$\delta^{13}C = -22.4‰$

Lacustrine gyttja from "Einerhaugen", Tjørna, overlying isolation contact formed during 1st postglacial regression.

Lu-1527A. Sotra No. 10442 **2240 ± 55**

$\delta^{13}C = -18.3‰$

Lacustrine gyttja from Angeltveitvatnet, Angeltveit (60° 24′ N, 5° 00′ E), overlying isolation contact. *Comment*: sample undersized; diluted; 81% sample.

Lu-1528A. Sotra No. 10730 **2490 ± 55**

$\delta^{13}C = -29.2‰$

Lacustrine gyttja from Skrubbisvatn, Telavåg (60° 15′ N, 4° 59′ E), overlying isolation contact.

Lu-1529A. Sotra No. 12006 **10,260 ± 100**

$\delta^{13}C = -23.6‰$

Lacustrine gyttja from Tresskjønn, Kårtveit (60° 23′ N, 5° 00′ E), overlying isolation contact. *Comment*: sample undersized; diluted; 87% sample.

Lu-1530A. Sotra No. 12168 **9920 ± 90**

$\delta^{13}C = -23.5‰$

Lacustrine gyttja from Sekkingstadtjønn, Sekkingstad (60° 21′ N, 5° 00′ E), overlying isolation contact.

Lu-1552. Sotra No. 10904 **10,870 ± 195**

$\delta^{13}C = -23.9‰$

Sediment from ingression contact in Kvemavatn, Fjaereide (60° 22′ N, 5° 04′ E). *Comment*: very small organic content, hence dated on total organic material. Insoluble fraction combusted at <650°C. Sample diluted; 29% sample. (3 1-day counts.)

Lu-1553A. Sotra No. 12237 **6050 ± 70**

$\delta^{13}C = -28.4‰$

Sediment from Torkevikstjønn (60° 23′ N, 4° 58′ E); mainly lacustrine gyttja but with a thin layer showing marine influence and representing absolute max of Tapes-transgression.

D. Iceland

Lu-1433. Flateyjardalur **9650 ± 120**

$\delta^{13}C = -17.3‰$

Gyttja from lake at Flateyjardalur, N Iceland (66° 05′ 55′ N, 17° 54′ 20″ W). Coll 1977 by H Norddahl and G Hjaltason; subm by H Norddahl, Dept Quaternary Geol, Univ Lund. Dated as part of study of deglaciation of area. *Comment*: no pretreatment; small sample; diluted; 51% sample. (3 1-day counts.)

E. Greenland

Lu-1506. Sengstackes Bugt **44,700 +4700 −2900**

$\delta^{13}C = +0.3‰$

Large shells (*Mya truncata*) from clay reaching ca +30m SW of Sengstackes Bugt, N Shannon Ö, NE Greenland (75° 20′ N, 18° 26′ W). Coll 1976 by C Hjort and H Bruch; subm by C Hjort, Dept Quaternary Geol, Univ Lund. Dated as complement to East Greenland Series I through VI (R, 1972, v 14, p 388-390; 1973, v 15, p 504-507; 1974, v 16, p 319-322; 1975, v 17, p 184-187; 1976, v 18, p 301-303; 1978; v 20, p 424-427). *Comment*: outer 58% removed by acid leaching. (3 1-day counts.)

F. Spitsbergen

Lu-1508. Kaffiöyra **9700 ± 90**

$\delta^{13}C = -16.5‰$

Collagen from well-preserved unid. whale bone from surface of elev marine terrace, alt +6 to 7m, ca 700m from recent sea cliff at Kaffiöyra, Spitsbergen (78° 36′ N, 12° 10′ E). Coll 1975 by E Drozdowski and J Szypryczyński; subm by J Szupryczyński, Inst Geog, Polish Acad Sci, Toruń, Poland. Dated as part of continued study of glacial history of Spitsbergen (Klimaszewski, 1960). *Comment*: organic carbon content: 7.5%.

G. Poland

Lu-1507. Male Słońca **>39,500**

$\delta^{13}C = -1.4‰$

Thick shell fragments, mostly of *Arctica* (*Cyprina*) *islandica*, from glaciofluvial deposits at Małe Słońca, S of Tczew in lower Vistula valley, N Poland (54° 03′ N, 18° 50′ E). Coll 1977 and subm by E Drozdowski, Inst Geog, Polish Acad Sci, Toruń, Poland. Dated as complement to Lower Vistula valley series (R, 1976, v 18, p 303-304; 1978, v 20, p 429). *Comment*: outer 67% removed by acid leaching. (4 1-day counts.)

H. Switzerland

Lu-1483. Genève **>44,500**

$\delta^{13}C = -24.9‰$

Lignite from sec exposed at Pont de Sous-Terre (Jayet & Amberger, 1969, p 630-632) in town of Geneva (46° 12′ 16″ N, 6° 07′ 56″ E). Coll 1968 and subm by G F Amberger, Service Cantonal de Geol, Geneva, Switzerland. Stratigraphy, fauna, and flora described by Jayet and submitter (*op cit*, above); pollen study by Girard (1970). *Comment*: sample pretreated with HCl and NaOH. (5 1-day counts).

II. ARCHAEOLOGIC SAMPLES

Sweden

Varris series

Charcoal from Sites Raä 518b and Raä 503 at Varris, Lake Malgomaj, Vilhelmina parish, Lappland (64° 42′ N, 16° 25′ E). Coll 1976 and

subm by L G Spång, Västerbottens Mus, Umeå. Dated as part of archaeol study of Stone age sites at Lake Malgomaj. Lu-1382 received normal pretreatment with HCl and NaOH; all other samples were small and received only mild pretreatment with NaOH and HCl.

Lu-1374. Varris, Raä 518b, K 1 **950 ± 50**

$\delta^{13}C = -23.8‰$

Charcoal from earth oven in piled up sand bank; depth ca 15cm.

Lu-1375. Varris, Raä 518b, K 2 **940 ± 55**

$\delta^{13}C = -24.7‰$

Charcoal from same earth oven as Lu-1374; depth ca 25cm. *Comment*: sample undersized; diluted; 80% sample.

Lu-1376. Varris, Raä 518b, K 3 **1160 ± 55**

$\delta^{13}C = -24.2‰$

Charcoal from same earth oven as Lu-1374; depth ca 40cm. *Comment*: sample undersized; diluted; 81% sample.

Lu-1377. Varris, Raä 518b, K 4 **1090 ± 50**

$\delta^{13}C = -24.9‰$

Charcoal from same earth oven as Lu-1374; depth ca 45cm.

Lu-1383. Varris, Raä 503, K 2 **1570 ± 50**

$\delta^{13}C = -24.8‰$

Charcoal from bottom of earth oven with heat-cracked stone.

Vojmsjöluspen series

Charcoal from Site Raä 554 at Vojmsjöluspen, Vilhelmina parish, Lappland (64° 52′ N, 16° 45′ E). Coll 1976 by L G and K Spång; subm by L G Spång. Dated as part of archaeol study of Stone age sites at Lake Vojmsjön. All samples were small and received therefore only mild pretreatment with NaOH and HCl. All except Lu-1381 undersized; diluted. Amount of CO_2 from sample is given in *Comments* below as "% sample".

Lu-1373. Vojmsjöluspen, Raä 554, Sample 1 **5540 ± 75**

$\delta^{13}C = -24.5‰$

Charcoal from layer with soot and heat-cracked stone ca 30cm below surface. Sq X108, Y322; +416.53 to 416.68. *Comment*: 86% sample.

Lu-1378. Vojmsjöluspen, Raä 554, Sample 2 **5320 ± 70**

$\delta^{13}C = -23.7‰$

Charcoal from refuse pit in till, depth ca 50cm. Sq X110, Y316; +416.17, K 1. Assoc with quartzite scrapers. *Comment*: 93% sample.

Lu-1379. Vojmsjöluspen, Raä 554, Sample 3 **5150 ± 65**

$\delta^{13}C = -23.6‰$

Charcoal from bank of heat-cracked stone ca 50cm below surface. Sq X107, Y321; +416.48. *Comment*: 60% sample. (4 1-day counts.)

Lu-1380. Vojmsjöluspen, Raä 554, Sample 4 **5340 ± 70**
$\delta^{13}C = -24.0‰$

Charcoal from silty sand ca 30cm below surface. Sq X112, Y318; +416.60 to 416.87. Assoc with quartzite core and quartz scraper. *Comment*: 68% sample. (3 1-day counts.)

Lu-1381. Vojmsjöluspen, Raä 554, Sample 5 **5550 ± 70**
$\delta^{13}C = -24.1‰$

Charcoal from bottom of refuse pit in humous gravel with bones. Sq X110, Y315; +416.0.

Lu-1382. Vojmsjöluspen, Raä 554, Sample 6 **3410 ± 90**
$\delta^{13}C = -23.3‰$

Charcoal from layer of rust-earth, depth ca 20cm, in till at Brännåker 1:70. *Comment*: 39% sample. (3 1-day counts.)

Valleberga series

Charcoal from settlement area at Valleberga, SE Scania (Strömberg, 1978a). Coll 1973 and 1977 and subm by M Strömberg, Hist Mus, Univ Lund. For other dates from Valleberga, see R, 1974, v 16, p 324-325; 1975, v 17, p 192-193; 1976, v 18, p 313-314. Pretreated with HCl and NaOH.

Lu-1415. Valleberga 29:12, Sample 8:76-77 **8610 ± 85**
$\delta^{13}C = -23.6‰$

Charcoal from hearth in settlement layer at Valleberga 29:12 (55° 24′ N, 14° 03′ E). Assoc with pottery and flints. *Comment* (MS): older than expected judging from archaeol finds.

Lu-1416. Valleberga 33[1] A, Sample 9:76-77 **1060 ± 50**
$\delta^{13}C = -25.0‰$

Charcoal from pit-house at Valleberga 33[1] A (55° 25′ N, 14° 04′ E). Assoc with pottery indicating Early Middle ages. *Comment* (MS): slightly older than expected.

Lu-1417. Valleberga 50[4], Sample 10:76-77 **3810 ± 60**
$\delta^{13}C = -25.2‰$

Charcoal from hearth at base of cultural layer, Trench II, Sq x = +2, y = +9 (*op cit*, above, p 90 and 95) at Valleberga 50[4] (55° 24′ N, 14° 04′ E). Assoc with flints and pottery. *Comment* (MS): date agrees with archaeol estimate based on assoc pottery.

Ystad series

Charcoal and bone from settlement area at Block Tankbåten in W part of Ystad town, S Scania (55° 25′ N, 13° 48′ E). Coll 1977 and subm by M Strömberg. Preliminary excavation rept with comment on this series pub by Strömberg (1978b). Charcoal pretreated with HCl and NaOH; bone collagen extracted as described previously (R, 1976, v 18, p 290).

Lu-1435. Kv Tankbåten, Sample 11:76-77 **1430 ± 50**

$\delta^{13}C = -24.8‰$

Charcoal from hearth in SW sec of Pit-house 2:77 (*op cit,* above, p 20, Fig 4), just below plough-disturbed soil. Assoc with animal bone and pottery.

Lu-1436. Kv Tankbåten, Sample 12:76-77 **1310 ± 50**

$\delta^{13}C = -24.6‰$

Charcoal from hearth at base of cultural layer in NE sec of Pit-house 2:77. Assoc with bone and pottery.

Lu-1437. Kv Tankbåten, Sample 1:HT77 **1640 ± 50**

$\delta^{13}C = -22.5‰$

Charcoal from hearth close to and NE of Pit-house 12:77 (*op cit,* above, p 25, Fig 9).

Lu-1438. Kv Tankbåten, Sample 2:HT77 **1620 ± 50**

$\delta^{13}C = -24.5‰$

Charcoal from hearth E of Pit-house 3:77 (*op cit,* above, p 21, Fig 5). Assoc with bones.

Lu-1439. Kv Tankbåten, Sample 3:HT77 **1310 ± 50**

$\delta^{13}C = -25.0‰$

Charcoal from bottom layer in Pit-house 10:77 (*op cit,* above, p 25, Fig 9).

Lu-1440. Kv Tankbåten, Sample 4:HT77 **1210 ± 50**

$\delta^{13}C = -24.4‰$

Charcoal from oven in SW sec of Pit-house 13:77 (*op cit,* above, p 26-27, Figs 10-11; p 46, Fig 18). Assoc with pottery and bones.

Lu-1514. Kv Tankbåten, Sample 5:HT77 **1470 ± 50**

$\delta^{13}C = -20.5‰$

Collagen from bone of *Bos,* id by O Persson, from gyttja layer in Trench III (*op cit,* above, p 50-52, Fig 21; p 85, Fig 38). Assoc with bone, horn, and some sherds of pottery. *Comment*: organic carbon content: 2.9%.

General Comment (MS): dates support archaeol dating of main occupation of settlement area to Vendel period.

Lödde kar series

Wood from underwater structures assoc with Viking period harbor (Ohlsson, 1973; Lindqvist, 1976) of the mouth of Lödde R, E Scania (55° 45′ N, 13° 00′ E). Coll 1975 and 1977 by T Ohlsson and P-I Lindqvist; subm by T Ohlsson, Hist Mus, Univ Lund. For other dates from underwater structures of similar age, see R, 1968, v 10, p 50; 1969, v 11, p 448-449; 1972, v 14, p 397-398; 1974, v 16, p 327; 1977, v 19, p 433-434. Pretreated with HCl and NaOH.

Lu-1159. Lödde kar, Log No. 1 **930 ± 50**
$\delta^{13}C = -25.5‰$

Unid. wood from 5 annual rings taken ca 10 rings inside bark.

Lu-1466. Lödde kar, Log No. 2 **980 ± 50**
$\delta^{13}C = -24.7‰$

Oak wood, id by T Bartholin, from ca 15 of outermost annual heartwood rings. Only few sapwood rings remained uneroded.

Lu-1467. Lödde kar, Log No. 4 **890 ± 50**
$\delta^{13}C = -26.4‰$

Beech wood, id by T Bartholin, from relatively superficial part of log with ca 35 annual rings.

Löddeköpinge No. 10 series (I)

Human bones from grave field at Löddeköpinge No. 10, Löddeköpinge parish, E Scania (55° 45′ N, 13° 00′ E). Coll 1976 and subm by T Ohlsson. Rept from excavation of Viking age settlement at Löddeköpinge pub by submitter (Ohlsson, 1976). For other dates on material from Löddeköpinge area, see R, 1973, v 15, p 512-513; 1976, v 18, p 317-318, and Lödde kar series, above. Collagen extracted as described previously (R, 1976, p 290), but without NaOH treatment. Vertebrae and other bones with thin outer walls and consisting mainly of spongiose bone, were not crushed before extraction.

Lu-1398. Löddeköpinge No. 10, Structure 10 **1010 ± 45**
$\delta^{13}C = -18.9‰$

Collagen from mixture of small human bones. *Comment*: undersized; diluted; 82% sample. (3 1-day counts.) Organic carbon content: 6.6%.

Lu-1399. Löddeköpinge No. 10, Structure 63 **910 ± 40**
$\delta^{13}C = -18.3‰$

Collagen from mixture of ill-preserved human bones. *Comment*: organic carbon content: 1.8%. (3 1-day counts.)

Lu-1400. Löddeköpinge No. 10, Structure 76 **1000 ± 50**
$\delta^{13}C = -18.2‰$

Collagen from 2 ankle bones, 1 vertebra, and other small human bones. *Comment*: organic carbon content: 7.7%.

Lu-1401. Löddeköpinge No. 10, Structure 81 **990 ± 50**
$\delta^{13}C = -18.4‰$

Collagen from human vertebrae. *Comment*: organic carbon content: 7.4%.

Lu-1402. Löddeköpinge No. 10, Structure 94 **980 ± 50**
$\delta^{13}C = -18.8‰$

Collagen from mixture of ill-preserved human bones. *Comment*: organic carbon content: 4.1%.

Lu-1403. Löddeköpinge No. 10, Structure 153 890 ± 50
$\delta^{13}C = -18.9‰$

Collagen from mixture of ill-preserved human bones. *Comment*: organic carbon content: 3.2%.

Lu-1404. Löddeköpinge No. 10, Structure 155 990 ± 50
$\delta^{13}C = -18.1‰$

Collagen from fragments of ill-preserved human bones. *Comment*: organic carbon content: 3.2%.

Lu-1405. Löddeköpinge No. 10, Structure 164 990 ± 50
$\delta^{13}C = -18.5‰$

Collagen from mixture of ill-preserved small human bones. *Comment*: organic carbon content: 3.4%.

Lu-1406. Löddeköpinge No. 10, Structure 179 1010 ± 50
$\delta^{13}C = -18.6‰$

Collagen from 2 heel bones, 2 ankle bones, 2 kneecaps, and some other small human bones. *Comment*: organic carbon content: 6.4%.

Lu-1407. Löddeköpinge No. 10, Structure 211 1000 ± 50
$\delta^{13}C = -18.8‰$

Collagen from 1 heel bone, 1 ankle bone, 2 kneecaps and some other small human bones. *Comment*: organic carbon content: 8.2%.

Lu-1408. Löddeköpinge No. 10, Structure 216 1050 ± 50
$\delta^{13}C = -18.9‰$

Collagen from 2 heel bones, 2 ankle bones, and some other small human bones. *Comment*: organic carbon content: 6.8%.

Lu-1409. Löddekopinge No. 10, Structure 237 950 ± 50
$\delta^{13}C = -18.5‰$

Collagen from tubular human bones. *Comment*: organic carbon content: 7.8%.

Lu-1410. Löddeköpinge No. 10, Structure 248 1130 ± 50
$\delta^{13}C = -18.0‰$

Collagen from 1 heel bone, 1 ankle bone, and some human vertebrae. *Comment*: organic carbon content: 6.2%.

Lu-1411. Löddeköpinge No. 10, Structure 251 990 ± 50
$\delta^{13}C = -18.4‰$

Collagen from ill-preserved human femur. *Comment*: organic carbon content: 3.3%.

Lu-1412. Löddeköpinge No. 10, Structure 272 910 ± 50
$\delta^{13}C = -19.0‰$

Collagen from fragments of human vertebrae and heel bones. *Comment*: organic carbon content: 5.7%.

Lu-1413. Löddeköpinge No. 10, Structure 274 **1030 ± 50**
$\delta^{13}C = -18.9‰$

Collagen from mixture of ill-preserved small human bones: *Comment*: organic carbon content: 3.7%.

Lu-1414. Löddeköpinge No. 10, Structure 311 **970 ± 50**
$\delta^{13}C = -18.6‰$

Collagen from fragments of ill-preserved vertebrae, rib bones, and other small human bones. *Comment*: organic carbon content: 3.0%.

General Comment: all dates are older than expected judging from coins found in some graves. Bones from those graves will be dated to give information about age discrepancies, which are too large to be explained by ^{14}C variations and apparent age of bone collagen in living adult humans due to the slow turnover in bone material (R, 1972, v 14, p 112). Discrepancies may possibly be explained by influence from frequent use of marine food, which is deficient in ^{14}C compared to food from terrestrial environments when it is normalized to the same $^{13}C/^{12}C$ ratio (R, 1972, v 14, p 112-113).

Ageröd series (II)

Charcoal and bone from Mesolithic settlement area at raised bog Ageröds mosse, Munkarp parish, Scania (55° 56.5′ N. 13° 25′ E). Coll 1974 and 1977 and subm by L Larsson, Hist Mus, Univ Lund. Results of archaeol study pub by submitter (Larsson, 1978). Dated as complement to Ageröd series (R, 1976, v 18, p 304-308). Charcoal id by T Bartholin; bone id by O Persson. No pretreatment of charcoal samples; undersized; diluted. Collagen extracted from bone sample as described previously (R, 1976, v 18, p 290).

Lu-1499. Ageröd I:HC, Sample 15 **7820 ± 90**
$\delta^{13}C = -24.9‰$

Charcoal (*Ulmus, Corylus,* and *Quercus*) from bottom layer. *Comment*: 84% sample.

Lu-1500. Ageröd I:HC, Sample 16 **7200 ± 90**
$\delta^{13}C = -24.9‰$

Charcoal (*Corylus, Alnus, Quercus,* and *Salix* or *Populus*) from upper peat. *Comment*: 75% sample.

Lu-1502. Ageröd V, Sample 4 **6710 ± 70**
$\delta^{13}C = -21.4‰$

Collagen from fragment of scapula of red deer from refuse layer, Sq C17. *Comment*: organic carbon content: 5.5%.

Lu-1501. Segebro, Sample 6 **7140 ± 75**
$\delta^{13}C = -24.0‰$

Charcoal (*Corylus, Ulmus,* and *Tilia*) from hearth on Mesolithic settlement Segebro in delta of Sege R, SW Scania (55° 37′ 25″ N, 13° 03′

35″ E). Coll 1976 and subm by L Larsson. Dated as complement to Segebro series (R, 1976, v 18, p 308-309).

Saxtorp series

Charcoal from Mesolithic pit-house and refuse pit (Larsson, 1975) at Saxtorp 11[9], Saxtorp parish, W Scania (56° 17′ N, 12° 57′ E). Coll 1972 and subm by L Larsson. Assoc finds of arrowheads and other worked flints indicate Kongemose culture. Pretreated with HCl and NaOH.

Lu-1524. Saxtorp 11[9], Sample 1 **6970 ± 70**

$\delta^{13}C = -23.1‰$

Charcoal (*Pinus*) from pit-house bottom. Assoc with oblique arrowheads and flint waste.

Lu-1525. Saxtorp 11[9], Sample 2 **4860 ± 65**

$\delta^{13}C = -24.2‰$

Charcoal (*Quercus*) from small refuse pit. Assoc with oblique arrowheads, transverse arrowhead, and flint waste.

Lu-1464. Källby **270 ± 45**

$\delta^{13}C = -20.8‰$

Collagen from horse tibia found in secondary position assoc with human bones during excavation for artificial dam at Källby, Lund, SW Scania (55° 41′ N, 13° 10′ E). Coll 1971 by O Persson, who id the bones; subm by J Callmer, Hist Mus, Univ Lund.

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