

UNIVERSITY OF LUND RADIOCARBON DATES XI

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INTRODUCTION

Most of the ^{14}C measurements reported here were made between October 1976 and October 1977. Equipment, measurement, and treatment of samples are as reported previously (R, 1968, v 10, p 36-37; 1976, v 18, p 290).

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). 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 $\delta^{13}\text{C} = -25.0\text{‰}$ 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

Håkulls mosse series

Sediment from bog Håkulls mosse on hill ridge Kullaberg, NW Scania ($56^\circ 17' \text{N}$, $12^\circ 31' \text{E}$). Alt ca 125m. Coll 1975 and subm by B E Berglund, Dept Quaternary Geol, Univ Lund. Samples are from core taken with Livingstone sampler, 100mm diam. Depths refer to bog sur-

face. Site and older pollen diagram described earlier (Berglund, 1971). No carbonate content. All samples pretreated with HCl; Nos. 5, 6, and 8 also with NaOH.

Lu-1262. Håkulls mosse 1, 866 to 868cm	13,020 ± 135 $\delta^{13}C = -23.7\text{‰}$
Clay gyttja. Beginning of Bölling zone.	
Lu-1263. Håkulls mosse 2, 859 to 861cm	12,660 ± 125 $\delta^{13}C = -24.9\text{‰}$
Clay gyttja. Middle of Bölling zone.	
Lu-1264. Håkulls mosse 3, 854 to 856cm	12,440 ± 120 $\delta^{13}C = -22.9\text{‰}$
Clay gyttja. Later part of Bölling zone.	
Lu-1265. Håkulls mosse 4, 847 to 849cm	12,150 ± 120 $\delta^{13}C = -22.4\text{‰}$
Clay gyttja. Older Dryas zone.	
Lu-1331. Håkulls mosse 5, 806 to 808cm	11,240 ± 110 $\delta^{13}C = -24.4\text{‰}$
Gyttja. Transition Alleröd/Younger Dryas.	
Lu-1332. Håkulls mosse 6, 804 to 806cm	11,050 ± 110 $\delta^{13}C = -24.6\text{‰}$
Clay gyttja. Transition Alleröd/Younger Dryas.	
Lu-1333. Håkulls mosse 7, 753 to 755cm	10,430 ± 105 $\delta^{13}C = -24.3\text{‰}$
Clay gyttja. Later part of Younger Dryas zone.	
Lu-1334. Håkulls mosse 8, 730 to 732cm	10,240 ± 100 $\delta^{13}C = -26.0\text{‰}$
Clay gyttja. Transition Younger Dryas/Pre-Boreal.	
Lu-1335. Håkulls mosse 9, 724 to 726cm	10,110 ± 100 $\delta^{13}C = -26.9\text{‰}$
Clay gyttja. Transition Younger Dryas/Pre-Boreal.	
Lu-1336. Håkulls mosse 10, 653 to 655cm	9310 ± 95 $\delta^{13}C = -29.6\text{‰}$
Gyttja. Later part of Pre-Boreal zone.	

Jämjö series

Wood samples from silty and sandy deposits in valley of rivulet Åbyån, N of Jämjö, E Blekinge. Coll 1976 and subm by S Björck, Dept Quaternary Geol, Univ Lund. Dating is part of study of influence of sea-level changes on erosion and accumulation in valley and of relation between solifluction material and climatic and vegetational changes and/or human influence in area. Samples pretreated with HCl and NaOH.

Lu-1261. Jämjö church **1570 ± 50**

$$\delta^{13}C = -26.8\text{‰}$$

Wood fragments (*Alnus* sp) id by T Bartholin from humic sand and silt 1.7m below surface at Jämjö church (56° 11' 30" N, 15° 50' 5" E). Stratified sand and silt from 2.5m below surface and further down.

Lu-1296. Hagalund 6 **4890 ± 70**

$$\delta^{13}C = -26.5\text{‰}$$

Unid wood fragments from sand 2.25m below surface at Hagalund 6, ca 1km N of Jämjö church (56° 12' N, 15° 50' 15" E). Silt with clay layers from 3.5m below surface and further down. *Comment*: sample undersized; diluted; 91% sample.

Sämbosjön series

Sediment from Lake Sämbosjön, Halland, SW Sweden (57° 10' N, 12° 25' E). Alt 38m; area 0.2sq km; max depth 6m. Coll 1976 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dating is part of study of Flandrian development of lake and vegetational history of surrounding region. Samples come from profile in central part of lake (Livingstone sampler, diam 100mm). Water depth 6m at sampling point. Depths given are below sediment surface. Lu-1267 through Lu-1271 pretreated with HCl only. All other samples pretreated with HCl and NaOH.

Lu-1270. Sämbosjön, 610 to 615cm **9860 ± 95**

$$\delta^{13}C = -22.9\text{‰}$$

Clay gyttja.

Lu-1267. Sämbosjön, 595 to 600cm **9390 ± 95**

$$\delta^{13}C = -27.2\text{‰}$$

Slightly clayey detritus gyttja.

Lu-1268. Sämbosjön, 555 to 560cm **9170 ± 90**

$$\delta^{13}C = -27.2\text{‰}$$

Slightly clayey detritus gyttja.

Lu-1269. Sämbosjön, 515 to 520cm **9190 ± 90**

$$\delta^{13}C = -26.4\text{‰}$$

Slightly clayey detritus gyttja.

Lu-1271. Sämbosjön, 460 to 465cm **8280 ± 85**

$$\delta^{13}C = -25.6\text{‰}$$

Detritus gyttja.

Lu-1272. Sämbosjön, 420 to 425cm **7820 ± 85**

$$\delta^{13}C = -28.3\text{‰}$$

Detritus gyttja. *Comment*: part of this sample was dated without NaOH treatment at 7710 ± 80.

Lu-1273. Sämbosjön, 380 to 385cm	6740 ± 75 $\delta^{13}C = -28.5\text{‰}$
Detritus gyttja.	
Lu-1274. Sämbosjön, 340 to 345cm	6220 ± 70 $\delta^{13}C = -28.3\text{‰}$
Detritus gyttja.	
Lu-1275. Sämbosjön, 300 to 305cm	5200 ± 65 $\delta^{13}C = -27.6\text{‰}$
Detritus gyttja.	
Lu-1276. Sämbosjön, 260 to 265cm	4270 ± 60 $\delta^{13}C = -28.4\text{‰}$
Detritus gyttja.	
Lu-1277. Sämbosjön, 220 to 225cm	3130 ± 55 $\delta^{13}C = -28.5\text{‰}$
Detritus gyttja.	
Lu-1278. Sämbosjön, 180 to 185cm	2440 ± 55 $\delta^{13}C = -28.3\text{‰}$
Detritus gyttja.	
Lu-1279. Sämbosjön, 140 to 145cm	2030 ± 50 $\delta^{13}C = -28.4\text{‰}$
Detritus gyttja.	

Hullsjön series

Sediment from Lake Hullsjön, Västergötland, central Sweden (58° 17' N, 12° 23' E). Alt 38m; area 1.8sq km; max depth 1.5m. Coll 1976 and subm by G Digerfeldt. Dating is part of study of Late Flandrian development of lake and vegetational history of surrounding region. Samples come from profile in central part of lake (Livingstone sampler, diam 60mm). Water depth 1.5m at sampling point. Depths given are below sediment surface. All samples pretreated with HCl.

Lu-1305. Hullsjön, 380 to 385cm	5440 ± 70 $\delta^{13}C = -27.8\text{‰}$
Clay gyttja.	
Lu-1306. Hullsjön, 355 to 360cm	4950 ± 65 $\delta^{13}C = -28.0\text{‰}$
Clayey detritus gyttja.	
Lu-1307. Hullsjön, 295 to 300cm	3490 ± 60 $\delta^{13}C = -27.5\text{‰}$
Clayey detritus gyttja.	
Lu-1308. Hullsjön, 255 to 260cm	2670 ± 55 $\delta^{13}C = -27.4\text{‰}$
Clay gyttja.	

Lu-1309. Hullsjön, 195 to 200cm **1410 ± 50**
 $\delta^{13}C = -28.1\text{‰}$

Clayey detritus gyttja.

Lu-1310. Hullsjön, 160 to 165cm **760 ± 50**
 $\delta^{13}C = -28.1\text{‰}$

Clay gyttja.

Långsjön series

Sediment from Lake Långsjön, Stockholm (59° 16' N, 17° 58' E). Alt 31m; area 0.3sq km; max depth 3.1m. Coll 1976 and subm by G Digerfeldt. Dating is part of study of Late Flandrian development of lake and vegetational history of surrounding region. Samples come from profile in deepest part of lake (Livingstone sampler, diam 60mm). Water depth 3.1m at sampling point. Depths given are below sediment surface. All samples pretreated with HCl.

Lu-1368. Långsjön, 481 to 486cm **4880 ± 65**
 $\delta^{13}C = -25.4\text{‰}$

Slightly clayey algae gyttja. Just above isolation level.

Lu-1338. Långsjön, 471 to 476cm **4940 ± 65**
 $\delta^{13}C = -24.8\text{‰}$

Slightly clayey algae gyttja.

Lu-1339. Långsjön, 421 to 426cm **4450 ± 65**
 $\delta^{13}C = -27.2\text{‰}$

Slightly clayey detritus gyttja.

Lu-1340. Långsjön, 371 to 376cm **4180 ± 60**
 $\delta^{13}C = -27.7\text{‰}$

Detritus gyttja.

Lu-1341. Långsjön, 321 to 326cm **4070 ± 60**
 $\delta^{13}C = -28.1\text{‰}$

Detritus gyttja.

Lu-1342. Långsjön, 271 to 276cm **3780 ± 60**
 $\delta^{13}C = -28.9\text{‰}$

Detritus gyttja.

Lu-1343. Långsjön, 221 to 226cm **3370 ± 60**
 $\delta^{13}C = -29.5\text{‰}$

Detritus gyttja.

Lu-1344. Långsjön, 171 to 176cm **2440 ± 50**
 $\delta^{13}C = -29.6\text{‰}$

Detritus gyttja.

Lu-1345. Långsjön, 121 to 126cm **2040 ± 50**
 $\delta^{13}C = -29.9\text{‰}$

Detritus gyttja.

Lu-1366. Långsjön, 95 to 97cm **1720 ± 50**
 $\delta^{13}C = -29.9\text{‰}$

Detritus gyttja.

Lu-1367. Långsjön, 70 to 72cm **990 ± 50**
 $\delta^{13}C = -29.7\text{‰}$

Detritus gyttja.

Lu-1297. Innaren **>40,600**
 $\delta^{13}C = -26.9\text{‰}$

Peat from ca 5m below surface found by well-digging near S end of Lake Innaren, South Swedish Upland (56° 58' 10" N, 14° 58' 55" E). Alt ca 180m. Coll Oct 1976 by U Lettevall; subm by G Digerfeldt.

Fjällsjön Series II

Sediment from Lake Fjällsjön, 3km SE of Sandhult church, central Västergötland (57° 45' 6" N, 12° 51' 40" E). Coll 1975 and subm by A Hilldén, Dept Quaternary Geol, Univ Lund. Dated as complement to Fjällsjön series (R, 1977, v 19, p 427-428). Depths refer to water surface. Water depth at sampling point ca 4m. Pretreated with HCl.

Lu-1363. Fjällsjön 1, 839 to 842cm **11,700 ± 125**
 $\delta^{13}C = -21.9\text{‰}$

Clay gyttja. *Comment*: undersized; diluted; 90% sample.

Lu-1364. Fjällsjön 1, 831 to 833cm **11,250 ± 120**
 $\delta^{13}C = -22.4\text{‰}$

Clay gyttja. *Comment*: undersized; diluted; 91% sample.

Lu-1392. Ljungsjön, 833 to 837cm **11,160 ± 125**
 $\delta^{13}C = -25.8\text{‰}$

Clay gyttja from Lake Ljungsjön, 8km SW of Ulricehamn, central Västergötland (57° 44' 3" N, 13° 18' 38" E). Coll 1975 and subm by A Hilldén. Dated as complement to Ljungsjön series (R, 1977, v 19, p 427). Depth refers to water surface. Pretreated with HCl. *Comment*: undersized; diluted; 66% sample. (3 1-day counts.)

Björksjödamm series

Sediment from mire pool Björksjödamm, 1km N of Rya, 30km E of Göteborg (57° 42' 20" N, 12° 22' 35" E). Alt ca 87m. Coll 1977 and subm by A Hilldén. Samples are from core taken with Livingstone sampler, 100mm diam. Depths refer to water surface. Water depth ca 2m at sampling point. No carbonate content. Pretreated with HCl. All samples slightly undersized; diluted. Amount of CO₂ from sample is given in *Comment* below as "% sample".

Lu-1394. Björksjödamm 1 + 2, 842 to 848cm **12,550 ± 145**
 $\delta^{13}C = -25.1\text{‰}$

Muddy clay and silt. Bölling zone. *Comment*: 82% sample.

Lu-1395. Björksjödamm 3, 836 to 840cm **12,290 ± 140**
 $\delta^{13}C = -23.2\text{‰}$

Muddy clay. Older Dryas zone. *Comment:* 88% sample.

Lu-1396. Björksjödamm 4, 830 to 834cm **12,030 ± 125**
 $\delta^{13}C = -23.8\text{‰}$

Muddy clay. Beginning of Alleröd zone. *Comment:* 97% sample.

Lu-1393. Björksjödamm 6, 818 to 822cm **11,170 ± 90**
 $\delta^{13}C = -24.1\text{‰}$

Muddy clay. Transition Alleröd/Younger Dryas zone. *Comment:* 88% sample. (3 1-day counts.)

Lu-1397. Björksjödamm 5, 808 to 812cm **10,830 ± 120**
 $\delta^{13}C = -24.9\text{‰}$

Muddy clay. Beginning of Younger Dryas zone. *Comment:* 85% sample.

Lu-1362. Ven **>41,600**
 $\delta^{13}C = +0.8\text{‰}$

Redeposited marine shell fragments (*Mya truncata*, *Macoma calcarata*, and *Hiatella arctica*) id by K Strand Petersen, Geol Survey Denmark, Copenhagen, from gravelly sand at +2.5m near S end of Ven I. in Öresund, S Sweden (55° 53' 28" N, 12° 49' 53" E). Sand is part of glacial sequence. Dated to obtain maximum age of overlying tills. Coll 1976 and subm by L Adrielsson, Dept Quaternary Geol, Univ Lund. *Comment:* outer 23% of shells removed by acid leaching. (3 1-day counts.)

B. Norway

Varanger Peninsula Series II

Sediment from lakes on Varanger Peninsula, N Norway. Dated as complement to Varanger Peninsula series (R, 1974, v 16, p 317-318). For other dates from area, see also Angsnes series (R, 1977, v 19, p 431-432). Coll 1976 and subm by B Malmström and O Palmér, Dept Phys Geog, Univ Lund. Samples represent transition from minerogenic to organogenic deposits. Depths are below sediment-water interface. Pre-treated with HCl. All samples undersized; diluted. Amount of CO₂ from sample is given in *Comments* below as "% sample".

Lu-1254. Bergebyvand 1, 272 to 280cm **10,420 ± 160**
 $\delta^{13}C = -19.2\text{‰}$

Light greygreen muddy clay. *Comment:* 55% sample.

Lu-1258. Bergebyvand 5, 275 to 280cm **10,590 ± 145**
 $\delta^{13}C = -19.6\text{‰}$

Light greengray muddy clay. *Comment:* 51% sample. (3 1-day counts.)

Lu-1255. Holmfjeldvand, 265 to 270 cm **9200 ± 100**
 $\delta^{13}C = -20.8\text{‰}$

Graygreen clay gyttja. *Comment:* 86% sample.

Lu-1256. Østrevand 3, 200 to 205cm **11,640 ± 130**
 $\delta^{13}C = -24.1\text{‰}$

Light graygreen muddy clay. *Comment:* 69% sample. (3 1-day counts.)

Lu-1257. Østrevand 4-lb, 149 to 157cm **11,550 ± 140**
 $\delta^{13}C = -25.2\text{‰}$

Light graygreen muddy clay. *Comment:* 62% sample. (3 1-day counts.)

Lu-1259. Stjernevand, 197 to 209cm **9370 ± 150**
 $\delta^{13}C = -22.6\text{‰}$

Clayey gyttja. *Comment:* 54% sample.

Sotra series (I)

Sediment from small lakes on Sotra I., Hordaland, W Norway. Coll 1976 and subm by K Krzywinski, Hist Mus, Univ Bergen. Dated as part of study of sea-level changes in area. All samples pretreated with HCl and then separated in acid-precipitated part of NaOH-soluble fraction and insoluble residue (called soluble and residue, respectively, below).

Lu-1353A. Sotra no. 5815, soluble **9290 ± 95**
 $\delta^{13}C = -26.7\text{‰}$

Lacustrine dy from Lommatjønn (60° 15' N, 5° 02' E) from isolation contact formed during Pre-Boreal regression. Threshold alt +11.4m.

Lu-1353. Sotra no 5815, residue **9340 ± 95**
 $\delta^{13}C = -27.9\text{‰}$

Lu-1354A. Sotra no. 5830, soluble **7400 ± 100**
 $\delta^{13}C = -28.3\text{‰}$

Lacustrine dy from Lommatjønn from transition to brackish gyttja deposited during Tapes-transgression. *Comment:* sample undersized; diluted; 68% sample.

Lu-1354. Sotra no. 5830, residue **7380 ± 80**
 $\delta^{13}C = -29.6\text{‰}$

Lu-1355A. Sotra no. 5884-5, soluble **5490 ± 65**
 $\delta^{13}C = -30.0\text{‰}$

Lacustrine gyttja from Lommatjønn from isolation contact formed during regression following Tapes-transgression.

Lu-1355. Sotra no. 5884-5, residue **5400 ± 65**
 $\delta^{13}C = -31.0\text{‰}$

Comment: sample undersized; diluted; 75% sample. (3 1-day counts.)

Lu-1358A. Sotra no. 5940-1, soluble **4260 ± 60**
 $\delta^{13}C = -26.6\text{‰}$

Lacustrine dy from Midtjønn (60° 14' N, 5° 02' E) from isolation contact formed during regression following Tapes-transgression. Threshold alt +7.9m.

Lu-1357A. Sotra no. 6109, soluble **9150 ± 100**
 $\delta^{13}C = -24.5\text{‰}$

Lacustrine dy from Klokkarvatnet (60° 15' N, 5° 02' E) from isolation contact formed during regression before Tapes-transgression. Threshold alt +6.9m. *Comment:* sample undersized; diluted; 89% sample.

Lu-1356A. Sotra no. 6199, soluble **3990 ± 60**
 $\delta^{13}C = -29.0\text{‰}$

Lacustrine dy from Klokkarvatnet from isolation contact formed after Tapes-transgression.

Lu-1359A. Sotra no. 6281, soluble **4340 ± 60**
 $\delta^{13}C = -27.3\text{‰}$

Lacustrine dy from Kaldavatn (60° 16' N, 4° 58' E) from isolation contact formed during regression following Tapes-transgression. Threshold alt +7.55m.

Lu-1360A. Sotra no. 6358, soluble **8060 ± 85**
 $\delta^{13}C = -25.8\text{‰}$

Lacustrine dy from Kaldavatn from ingression contact formed during Tapes-transgression.

Lu-1361A. Sotra no. 6368, soluble **9340 ± 90**
 $\delta^{13}C = -24.7\text{‰}$

Lacustrine dy from Kaldavatn from isolation contact formed during Pre-Boreal regression.

C. Greenland

East Greenland series (VI)

Bivalve shells from emerged marine sediments, and lake sediment samples from Hochstetter Forland, Shannon Ö, and Ardencaple Fjord, NE Greenland. Coll by the Swedish-Danish Expedition of 1976 (C Hjort, L Adrielsson, H Bruch, and J Mikaelsson) and subm as part of study of glaciation chronology, shore-line displacement, and vegetation history. For other East Greenland dates from this lab, see 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. According to Hjort (1973) a sea correction of -550 yr should be applied to shell dates, below.

Lu-1288. Åsen **39,000 +2400**
-1800
 $\delta^{13}C = +1.1\text{‰}$

Shell fragments (*Mya truncata*, *Hiatella arctica*) from beach gravel overlying laminated silt and sand deposited in front of and dating

terminal moraine on S Hochstetter Forland (75° 13' N, 19° 55' W). Alt 90m. *Comment:* outer 40% of shells removed by acid leaching. (3 1-day counts.)

Lu-1289. Mönstedhus**9190 ± 90** $\delta^{13}C = -4.7\text{‰}$

Shells (*Portlandia arctica*) from silt at 22m, underlying delta built up to 53m near Mönstedhus, N Hochstetter Forland (75° 43' N, 19° 40' W). Dates deglaciation of area. *Comment:* no surface leaching; small sample. Shells well preserved with periostracum intact.

Lu-1290. Ailsa, Sample 1**13,970 ± 200** $\delta^{13}C = -23.2\text{‰}$

Clay gyttja from lowermost part of sediment core from lake near Ailsa, S Hochstetter Forland (75° 19' N, 19° 40' W). Above Late Weichselian marine limit. *Comment:* pretreated with HCl. Undersized; diluted; 53% sample. (3 1-day counts.)

Lu-1291. Agnetesöelven, Lake A, Sample 1**8900 ± 110** $\delta^{13}C = -21.5\text{‰}$

Clay gyttja from lowermost part of sediment core from lake S of Agnetesöelven, N Hochstetter Forland (75° 35' N, 19° 50' W). Dates deglaciation of area. *Comment:* pretreated with HCl. Undersized; diluted; 71% sample.

Lu-1292. Ardencaple Fjord 1**7450 ± 75** $\delta^{13}C = +0.4\text{‰}$

Shell fragments (*Mya truncata*, *Hiatella arctica*) from base of 20m thick silt deposit 6km NW of Kap Buch, Ardencaple Fjord (75° 12' N, 20° 35' W). Coll at 3m. In same level were also some shells of *Portlandia arctica*. *Comment:* outer 26% removed by acid leaching.

Lu-1298. Kap Tramnitz**19,000 ± 190** $\delta^{13}C = +0.8\text{‰}$

Shell fragments (*Hiatella arctica*) from silt deposit underlying beach-ridge at 55m ca 3km NE of Kap Tramnitz, S Shannon Ö (75° 02' N, 18° 52' W). *Comment:* outer 56% removed by acid leaching. (3 1-day counts.)

Lu-1299. Peters Bugt**>42,400** $\delta^{13}C = +0.7\text{‰}$

Shell fragments (*Mya truncata*) from laminated silt and sand underlying terminal moraine parallel to but younger than that one dated by Lu-1288, above. Coll at ca 45m, Peters Bugt, S Hochstetter Forland (75° 18' N, 20° 00' W). *Comment:* outer 71% removed by acid leaching. (3 1-day counts.)

Lu-1300:1. Hochstetter east 1, inner fraction **9470 ± 90**
 $\delta^{13}C = +0.3\text{‰}$

Thick shells (*Hiatella arctica*) from silt at 13m, SE Hochstetter Forland (75° 17' N, 19° 28' W). *Comment*: inner fraction (29% of shells) was used.

Lu-1300:2. Hochstetter east 1, outer fraction **9520 ± 90**
 $\delta^{13}C = +0.7\text{‰}$

Outer fraction of shells used for Lu-1300:1. *Comment*: outer fraction was 32% of shells; outermost 39% removed by acid leaching.

Lu-1301. Peters Bugt Lake, Sample 1 **12,960 ± 235**
 $\delta^{13}C = -22.3\text{‰}$

Clay gyttja from lowermost part of sediment core from lake at Peters Bugt, S Hochstetter Forland (75° 19' N, 20° 03' W). *Comment*: pretreated with HCl. Small sample; diluted; 40% sample. (3 1-day counts.)

Lu-1302. Hill 150 **33,500 +1550**
-1300
 $\delta^{13}C = +1.2\text{‰}$

Shells (*Hiatella arctica*) from silt on top of 150m high hill. Highest deposit of its kind on S Hochstetter Forland (75° 15' N, 19° 48' W). *Comment*: outer 53% removed by acid leaching.

Lu-1303. Kildedalen **8930 ± 90**
 $\delta^{13}C = \pm 0.0\text{‰}$

Thin shell fragments (*Mya truncata*) from deltaic sand overlying silt. Coll at 20 to 25m but probably dates or closely postdates local marine limit at 50m and deglaciation of outermost Kildedalen, Arden-caple Fjord (75° 15' N, 20° 55' W). *Comment*: outer 53% removed by acid leaching.

Lu-1304. Agnetesöelven, Lake B, Sample 1 **7630 ± 120**
 $\delta^{13}C = -27.2\text{‰}$

Clay gyttja from lowermost part of sediment core from lake S of Agnetesöelven, N Hochstetter Forland (75° 34' N, 19° 53' W). *Comment*: pretreated with HCl. Small sample; diluted; 45% sample. (3 1-day counts.)

Lu-1384. Nanok **9810 ± 95**
 $\delta^{13}C = +1.0\text{‰}$

Large thick shells (*Mya truncata*) from silt at 30m 3km W of Nanok, S Hochstetter Forland (75° 10' N, 19° 51' W). Postdates part of same terminal moraine as predates by Lu-1299, above. *Comment*: outer 57% removed by acid leaching.

Lu-1385. Northern Shannon **40,200** $\begin{smallmatrix} +1800 \\ -1500 \end{smallmatrix}$
 $\delta^{13}C = +1.1\text{‰}$

Shells (*Hiatella arctica*) coll at 39m on silt-covered hill reaching 48m, ca 4.5km N of pt 54m on N Shannon Ö (75° 18' N, 18° 32' W). *Comment*: outer 52% removed by acid leaching. (4 1-day counts.)

Lu-1386. Hochstetter east 2 **9400 ± 90**
 $\delta^{13}C = +0.8\text{‰}$

Shells (*Mya truncata*) from sand overlying silt at 30m, SE Hochstetter Forland (75° 19' N, 19° 25' W). *Comment*: outer 57% removed by acid leaching.

Lu-1387. Hochstetter east 3 **35,400** $\begin{smallmatrix} +1200 \\ -1050 \end{smallmatrix}$
 $\delta^{13}C = +0.3\text{‰}$

Shell fragments (*Mya truncata*, *Hiatella arctica*) from silt at 60 to 65m, SE Hochstetter Forland (75° 27' N, 19° 23' W). *Comment*: outer 40% removed by acid leaching. (4 1-day counts.)

Lu-1388. Hochstetter east 4 **>43,500**
 $\delta^{13}C = +0.1\text{‰}$

Shells (*Hiatella arctica*) from sand overlain by till bed, SE Hochstetter Forland (75° 17' N, 19° 27' W). *Comment*: outer 48% removed by acid leaching. (4 1-day counts.)

Lu-1389. Kap Copeland **9370 ± 90**
 $\delta^{13}C = +0.8\text{‰}$

Shells (*Hiatella arctica*) from silt reaching 41m at Kap Copeland, N Shannon Ö (75° 20' N, 18° 55' W). Postdating ice moving S along Shannon Sund. *Comment*: outer 64% removed by acid leaching.

Lu-1390. Ardencaple Fjord 2 **8570 ± 85**
 $\delta^{13}C = +0.7\text{‰}$

Large shells (*Mya truncata*) from sandy silt at 30 to 40m, 11km NW of Kap Buch, Ardencaple Fjord (75° 13' N, 20° 40' W). Local marine limit 50m. *Comment*: outer 60% removed by acid leaching.

D. Finland

Merijänjärvi series

Eriophorum-Sphagnum peat from bog situated beside Lake Merijänjärvi, Ii parish, Oulu province, Finland (65° 17' 30" N, 25° 30' 30" E). Alt 30m. Coll 1975 and subm by M Hjelmroos, Dept Quaternary Geol, Univ Lund. Dating is part of study on vegetational development and human influence in area. Depths given are below bog surface. All samples pretreated with HCl.

Lu-1311. Merijänjärvi, 183 to 193cm **2790 ± 55**
 $\delta^{13}C = -26.9\text{‰}$

First signs of human influence recorded in pollen diagram.

- Lu-1312. Merijänjärvi, 169 to 175cm** **2640 ± 55**
 $\delta^{13}C = -27.5\text{‰}$
First *Picea* maximum; one grain of *Plantago lanceolata*.
- Lu-1313. Merijänjärvi, 138 to 142cm** **1790 ± 50**
 $\delta^{13}C = -26.2\text{‰}$
Decrease of *Picea*.
- Lu-1314. Merijänjärvi, 110 to 115cm** **1770 ± 50**
 $\delta^{13}C = -26.6\text{‰}$
Maximum of *Urtica*.
- Lu-1315. Merijänjärvi, 72 to 78cm** **2160 ± 55**
 $\delta^{13}C = -26.7\text{‰}$
Maximum of heath components.
- Lu-1316. Merijänjärvi, 66 to 70cm** **2320 ± 55**
 $\delta^{13}C = -26.7\text{‰}$
Further decrease of *Picea*.
- Lu-1317. Merijänjärvi, 25 to 32cm** **1430 ± 50**
 $\delta^{13}C = -26.0\text{‰}$
Rational limit of Cerealia.

Pilpajärvi series

Sediment from Lake Pilpajärvi, Oulu province, Finland (64° 57' N, 25° 49' E). Alt 40m. Coll 1976 by M Hjelmroos and C Renaud; subm by M Hjelmroos. Part of same project as Merijänjärvi series, above. Depths given are below sediment surface. Water depth at sampling point ca 5m. All samples pretreated with HCl.

- Lu-1369. Pilpajärvi, 194 to 200cm** **4000 ± 60**
 $\delta^{13}C = -27.2\text{‰}$
Clay gyttja. First pollen grains of Cerealia.
- Lu-1370. Pilpajärvi, 179 to 187cm** **3660 ± 60**
 $\delta^{13}C = -28.3\text{‰}$
Gyttja. Maximum of herb components.
- Lu-1371. Pilpajärvi, 156 to 164cm** **3370 ± 55**
 $\delta^{13}C = -29.0\text{‰}$
Gyttja. Decrease of *Urtica* and Cerealia.
- Lu-1372. Pilpajärvi, 130 to 138cm** **2420 ± 50**
 $\delta^{13}C = -29.1\text{‰}$
Gyttja. Empiric limit of Cerealia.
- Lu-1318. Kaakonlantto** **920 ± 50**
 $\delta^{13}C = -26.0\text{‰}$
Peat from 22cm below surface in small bog near archaeol excavations of Ylitornio, Tornio Lappland, Finland (66° 13' N, 23° 46' E).

Alt 50m. Coll 1975 and subm by M Hjelmroos. Dating is part of study on human settlement history by means of pollen analysis. Sample corresponds to level with earliest occurrence of pollen grains of Cerealia.

Lu-1248. Oravaisensaari**390 ± 70**

$$\delta^{13}C = -24.1\text{‰}$$

Small wood fragments from 45cm below surface on Oravaisensaari I., 8km N of Tornio, Finland (65° 55' N, 24° 10' E). Alt 5.9m above Tornio R. Coll 1974 and subm by M Hjelmroos. Sample comes from cultural layer, archaeol dated to Early Middle ages. Dated as part of study on human settlement history in area assoc with pollen analysis.

*E. Poland***Lower Vistula valley series (II)**

Marine mollusk shells from same stratigraphic level as shells previously dated in this series (R, 1976, v 18, p 303-304). Coll 1976 and subm by E Drozdowski, Inst Geog, Polish Acad Sci, Toruń, Poland. Dated to solve chronologic problem assoc with redeposited mollusk fauna in lower Vistula R valley (Galon, 1934).

Lu-1326. Mała Słońca 1, *Nassa* and *Cardium***37,400 +2000
-1600**

$$\delta^{13}C = -0.6\text{‰}$$

Shells (*Nassa reticulata*, *Cardium edule*) id by C Hjort, from intermorainic sandy-gravelly sediments between 2nd and 3rd morainic strata, 11 to 18m above floodplain, at Mała Słońca (54° 03' N, 18° 48' E). *Comment*: outer 43% of shells removed by acid leaching. (4 1-day counts.)

Lu-1327. Mała Słońca 1, thick fragments**>42,300**

$$\delta^{13}C = -1.5\text{‰}$$

Thick unidentifiable bivalve fragments from same sample as Lu-1326. *Comment*: outer 44% removed by acid leaching. (3 1-day counts.)

Lu-1328. Mała Słońca 2, *Nassa reticulata***40,700 +2650
-2000**

$$\delta^{13}C = -1.0\text{‰}$$

Shells (*Nassa reticulata*) id by C Hjort, from layer of fine gravel, 6 to 7cm thick, 5m below morainic stratum and ca 20m above floodplain at Mała Słońca. *Comment*: outer 29% removed by acid leaching. (3 1-day counts.)

Lu-1329. Biola Góra**>41,900**

$$\delta^{13}C = \pm 0.0\text{‰}$$

Shells and shell fragments (*Cardium edule*, *C echinatum*, *Macoma balthica*, *Cyprina islandica*, *Nassa reticulata*, and *Bittium reticulatum*) id by C. Hjort from sandy-gravelly sediments between 2nd and 3rd morainic strata at Biola Góra (53° 57' N, 18° 55' E). Shells were coll ca 2 to 8m above flood terrace. *Comment*: outer 28% removed by acid leaching. (3 1-day counts.)

Mammoth bone series

For other mammoth dates, see R, 1976, v 18, p 291-293 and Berglund *et al* (1976).

Lu-1346. Bzianka **14,080 ± 165**
 $\delta^{13}C = -20.0\%$

Collagen from bone fragment from skull of *Mammuthus primigenius* from small stream near Bzianka, Rzeszów, S Poland (ca 50° N, 22° E). Coll 1851 by Lozinski; subm by H Kubiak, Inst Systematic and Experimental Zool, Polish Acad Sci, Cracow, Poland. For details about mammoth find, see Hauer (1851), Kulczycki (1955, Pl I), and Kubiak (1965, p 17-18). *Comment*: collagen extracted as described previously (R, 1976, v 18, p 290); no NaOH treatment. Organic carbon content: 3.3%. Sample undersized; diluted; 71% sample. (3 1-day counts.)

Lu-1347. Debica **25,300 ± 500**
 $\delta^{13}C = -20.1\%$

Collagen from bone fragment of *Mammuthus primigenius*, id by H Kubiak, from river gravels of Wisłoka R near Debica, S Poland (50° 10' N, 21° 30' E). Coll 1975 by schoolboys; subm by H Kubiak. Preliminary report about find pub by submitter (Kubiak, 1976). *Comment*: collagen extracted in same way as Lu-1346 but including NaOH treatment. Organic carbon content: 5.4%.

II. ARCHAEOLOGIC SAMPLES

*Sweden***Ingelstorp series**

Charcoal from settlement areas and grave fields at Ingelstorp, Scania. Coll March 1974 to Nov 1976 and subm by M Strömberg, Hist Mus, Univ Lund. Preliminary report pub by submitter (Strömberg, 1977). For other dates from Ingelstorp, see R, 1976, v 18, p 314; 1977, v 19, p 435-436. All samples pretreated with HCl and NaOH.

Lu-1250. Ingelstorp 10, Sample 11:75-76 **3760 ± 60**
 $\delta^{13}C = -24.8\%$

Charcoal from coffin in Grave 2 (1974), Ingelstorp 10 (55° 25' N, 14° 03' E). Assoc with flint objects. *Comment* (MS): date as expected.

Lu-1293. Ingelstorp 13, Sample 13:75-76 **2830 ± 55**
 $\delta^{13}C = -23.4\%$

Charcoal from Hearth No. 24, Ingelstorp 13 (55° 25' N, 14° 02' E). Assoc with pottery. *Comment* (MS): on new map property designation changed to Ingelstorp 110:1.

Lu-1294. Ingelstorp 13, Sample 14:75-76 **2890 ± 55**
 $\delta^{13}C = -23.9\%$

Charcoal from Hearth No. 6, Ingelstorp 13.

Lu-1295. Ingelstorp 13, Sample 15:75-76 **2920 ± 55**
 $\delta^{13}C = -23.3\text{‰}$

Charcoal from Hearth No. 18, Ingelstorp 13. *Comment* (MS): 3 dates from Ingelstorp 13 agree well mutually and are of expected age judging from archaeol evidence.

Lu-1321. Ingelstorp 32⁵, Prov 1:HT76 **3100 ± 60**
 $\delta^{13}C = -24.7\text{‰}$

Charcoal from pit near Grave 40 (urn grave), Ingelstorp 32⁵ (55° 25' N, 14° 03' E). Report from study of other Bronze age graves in area pub by submitter (Strömberg, 1975, p 67-69). *Comment* (MS): ca 700 yr older than expected.

Lu-1322. Ingelstorp 32⁵, Sample 2:HT76 **4580 ± 60**
 $\delta^{13}C = -26.8\text{‰}$

Charcoal from fire pit (Grave 41), Ingelstorp 32⁵. *Comment* (MS): expected to be of same age as Lu-1321.

Lu-1323. Ingelstorp 32⁵, Sample 3:HT76 **3150 ± 65**
 $\delta^{13}C = -24.7\text{‰}$

Charcoal from Grave 43 (oak trunk grave), Ingelstorp 32⁵. Assoc with helically ornamented bronze object. *Comments*: sample undersized; diluted; 82% sample (MS): somewhat older than expected.

Lu-1324. Ingelstorp 32⁵, Sample 4:HT76 **1980 ± 50**
 $\delta^{13}C = -24.0\text{‰}$

Charcoal from fire pit (Grave 49), Ingelstorp 32⁵. Assoc with pottery. *Comment* (MS): somewhat younger than expected.

Lu-1325. Ingelstorp 32⁵, Sample 5:HT76 **2720 ± 55**
 $\delta^{13}C = -24.0\text{‰}$

Charcoal from fire pit (Grave 54), Ingelstorp 32⁵. Assoc with pottery. *Comment* (MS): ca 400 yr older than expected.

Lu-1348. Ingelstorp 32⁵, Sample 6:HT76 **3180 ± 60**
 $\delta^{13}C = -23.6\text{‰}$

Charcoal from stratum above Grave 63. Assoc with earthenware pots. *Comments*: only mild pretreatment with NaOH and HCl. Sample undersized; diluted; 92% sample. (MS): date is reasonable for this Late Neolithic grave, presence of which may explain unexpected old dates for some samples from Ingelstorp 32⁵. Samples were originally all expected to be from Late Bronze age or Early Iron age.

Lu-1249. Ingelstorp 32⁸, Sample 10:75-76 **3010 ± 55**
 $\delta^{13}C = -26.0\text{‰}$

Charcoal from Grave 32 (cremation grave), Ingelstorp 32⁸ (55° 25' N, 14° 03' E). Assoc with pottery. *Comment* (MS): date much older than expected.

Lu-1251. Ingelstorp 32^s, Sample 12:75-76 **1910 ± 50**

$$\delta^{13}C = -24.6\text{‰}$$

Charcoal (25%) and soot (75%) from fire pit (Grave 34:1975), Ingelstorp 32^s. Assoc with earthenware pots and spindle whorl. *Comment* (MS): date agrees with assoc finds.

Lu-1349. Hagestad 98¹A, Sample 7:1976 **4700 ± 65**

$$\delta^{13}C = -27.0\text{‰}$$

Charred food remains from inside of earthenware pot (No. 18) from Early Neolithic TRB culture settlement at Hagestad 98¹A, Löderup parish, Scania (55° 24' N, 14° 11' E). Coll 1968 and subm by M Strömberg. Assoc with flint objects and other pottery. No pretreatment due to small sample size. *Comment* (MS): date is reasonable.

Lu-1365. Simris 2³ **1960 ± 50**

$$\delta^{13}C = -27.2\text{‰}$$

Resin from Grave 1972:2 (inhumation burial), Simris 2³, Simris parish, SE Scania (55° 32' N, 14° 19' E). Coll 1972 and subm by B Stjernquist, Hist Mus, Univ Lund. For details about settlement sites and grave fields in Simris area, see Stjernquist (1955, 1961, 1965). Other samples from Simris were dated by Uppsala lab (R, 1959, v 1, p 98; 1960, v 2, p 125). Pretreated with HCl. *Comment* (BS): somewhat older than expected.

Brunn series

Seal bones, id by E Iregren, from Pitted Ware site Brunn, Ösmo parish, Södermanland (58° 55' 50" N, 17° 47' 50" E). Coll 1928 by I Schnell; subm by S Welinder, Univ Oldsaksamling, Oslo. All samples probably from Test Sq H18 (Schnell, 1930). Collagen extracted as described previously (R, 1976, v 18, p 290), including NaOH treatment.

Lu-1282. Brunn 1 **4640 ± 65**

$$\delta^{13}C = -15.6\text{‰}$$

Collagen from ribs of seal. *Comment*: organic carbon content: 4.0‰.

Lu-1283. Brunn 2 **4610 ± 65**

$$\delta^{13}C = -15.8\text{‰}$$

Collagen from ribs of seal. *Comment*: organic carbon content: 4.1‰.

Lu-1284. Brunn 3 **4650 ± 65**

$$\delta^{13}C = -15.5\text{‰}$$

Collagen from ribs of seal. *Comment*: organic carbon content: 3.5‰.

Korsnäs series

Bones from Sq No. 106 579 on Pitted Ware site Korsnäs, Grödinge parish, Södermanland (59° 09' 20" N, 17° 48' 30" E). Coll 1970 by E Baudou; subm by S Welinder. Collagen extracted in same way as for Brunn series, above. Bone id by K Sörensen, Zool Mus, Copenhagen.

Lu-1285. Korsnäs 1 **4190 ± 60**

$$\delta^{13}C = -20.8\text{‰}$$

Collagen from bone of terrestrial animals from Layer I, 0 to 10cm below surface. *Comment:* organic carbon content: 3.4‰.

Lu-1286. Korsnäs 2 **4270 ± 60**

$$\delta^{13}C = -19.5\text{‰}$$

Collagen from bone of terrestrial animals and seal (*Phoca groenlandica*) from Layer II, 10 to 20cm below surface. *Comment:* organic carbon content: 3.4‰.

Lu-1287. Korsnäs 3 **4560 ± 60**

$$\delta^{13}C = -17.9\text{‰}$$

Collagen from bone, mainly of seal, from Layer III, 20 to 30cm below surface. *Comment:* organic carbon content: 3.7‰.

General Comment for Brunn and Korsnäs series: dates on collagen from marine animals must be corrected because of apparent ^{14}C age of such animals during their lifetime. Size of correction is not yet known for seals in this area, but -200 to -400 yr may be a fair estimate of expected range.

Hjulberga series

Charcoal and carbonized hazel-nut shells from Early Neolithic TRB site Hjulberga 1, Eker parish, Närke (59° 21' N, 15° 07' E). Coll 1976-77 and subm by S Welinder.

Lu-1319. Hjulberga 1:A, Sample 7 **4830 ± 65**

$$\delta^{13}C = -22.2\text{‰}$$

Carbonized hazel-nut shells coll from excavated trench. *Comment:* pretreated with HCl and NaOH.

Lu-1320. Hjulberga 1:A, Sample 8 **2460 ± 95**

$$\delta^{13}C = -24.8\text{‰}$$

Charcoal and bark of *Pinus*, id by T Bartholin, from Pit W18, containing also main part of Sample 7, above. *Comment:* no pretreatment; sample undersized; diluted; 33% sample. (3 1-day counts.)

Lu-1434. Hjulberga 1:A, Sample 9 **4340 ± 80**

$$\delta^{13}C = -22.1\text{‰}$$

Carbonized hazel-nut shells sieved from large sample from basal part of culture layer. *Comment:* no pretreatment; sample undersized; diluted; 48% sample. (3 1-day counts.)

General Comment (SW): Lu-1320 much too late like 3 other dates on charcoal from same site dated at Stockholm lab: St 5396, 1985 ± 100; St 5397, 3370 ± 100; St 5398, 590 ± 105. Excavations unpub (cf Bagge, 1949).

Lu-1350. Nordansjö 1:5**1060 ± 135** $\delta^{13}C = -24.9\text{‰}$

Wood fragments (*Betula* sp) id by T Bartholin from hole for handle in iron-ax exposed by wave action at shore of Lake Malgomaj, Site Raä 756, Nordansjö 1:5, Vilhelmina parish, Lappland (64° 42' N, 16° 22' E; Sw Grid Ref x7177,2; y1527,0). Shore erosion caused by storage-capacity regulation of lake. Coll 1975 by B Eriksson; subm by A Huggert, Västerbottens Mus, Umeå. *Comment*: no pretreatment; very small sample; diluted; 15% sample. (4 1-day counts.)

Karlsbacka series

Charcoal from Site Raä 572, Karlsbacka 1:2, Vilhelmina parish, Lappland (64° 41' N, 16° 27' E; Sw Grid Ref x7175,8; y1530,6). Coll 1976 by K Wijkander; subm by A Huggert.

Lu-1351. Karlsbacka 1:2, Sample 1**160 ± 45** $\delta^{13}C = -25.5\text{‰}$

Charcoal from hearth above layer of cracked stones. *Comment*: no pretreatment; small sample.

Lu-1352. Karlsbacka 1:2, Sample 2**220 ± 70** $\delta^{13}C = -26.4\text{‰}$

Charcoal from upper part of rust-colored soil below layer of cracked stones. *Comment*: no pretreatment; undersized; diluted; 51% sample.

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