[RADIOCARBON, VOL. 19, NO. 3, 1977, P. 424-441]

UNIVERSITY OF LUND RADIOCARBON DATES X

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INTRODUCTION

Most of the ^{14}C measurements reported here were made between October 1975 and October 1976. Equipment, measurement, and treatment of samples are the same 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.

Corrections for deviations from $\delta^{13}C = -25.0‰$ in the PDB scale are applied for all samples; also for marine shells, because apparent age of recent marine shells is not always just counterbalanced by the effect of isotopic fractionation (see e g, Mangerud & Gulliksen, 1975). $\delta^{13}C$ values quoted are relative to the PDB standard.

The remark, "undersized; diluted", in *Comments* means the sample did not produce enough CO_2 to fill the counter to normal pressure and "dead" CO_2 from anthracite was introduced to make up the pressure. "% sample" indicates amount of CO_2 derived from the sample present in the diluted counting gas; the rest is "dead" CO_2. Organic carbon content reported for bone 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.

ACKNOWLEDGMENTS

The author thanks Kerstin Lundahl for sample preparation and routine operation of the dating equipment, and R Ryhage and his staff at the mass-spectrometric laboratory of Karolinska Inst, Stockholm, for the ^{13}C analyses.

SAMPLE DESCRIPTIONS

I. CHECK SAMPLES

Check sample series

Lu-1224:I. Ruds Vedby **10,900 ± 110**

$\delta^{13}C = -26.1‰$

New preparation from rest of wood sample dated 1966 as Lu-3; 10,840 ± 120 (R, 1968, v 10, p 38). *Comment:* no pretreatment (2 1-day counts in Counter I.)

Lu-1224:II. Ruds Vedby **10,910 ± 110**
$\delta^{13}C = -26.1‰$

Same preparation as Lu-1224:I. *Comment:* (2 1-day counts in Counter II.)

Lu-1240:I. Angelsta, Småland **2570 ± 55**
$\delta^{13}C = -22.5‰$

New preparation from rest of wood sample dated 1966 as Lu-2; 2510 ± 60 (R, 1968, v 10, p 38). *Comment:* no pretreatment (2 1-day counts in Counter I.)

Lu-1240:II. Angelsta, Småland **2460 ± 55**
$\delta^{13}C = -22.5‰$

Same preparation as Lu-1240:I. *Comment:* (2 1-day counts in Counter II.) Average value 2515 ± 40 for Lu-1240.

General Comment: good agreement with dates from 1966.

II. GEOLOGIC SAMPLES

A. Sweden

Hunneberg series

Sediment from lakes Domsjön (58° 18′ N, 12° 27′ E), Grågåsen (58° 17′ N, 12° 27′ E), Igelsjön (58° 18′ N, 12° 26′ E), Kvarnsjön (58° 18′ N, 12° 26′ E), and Kyrkesjön (58° 17′ N, 12° 29′ E) on Mt Hunneberg, NW Västergötland. Coll 1975 and 1976 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dating is part of study of highest sea shoreline in area. Isolation of lakes established by diatom analysis. Depths refer to sediment surface. All samples pretreated with HCl. Some samples undersized; diluted. Amount of CO_2 from sample is given in *Comments* below as "% sample".

Grågåsen

Lu-1125. Grågåsen, 522.5 to 526.5cm **11,440 ± 90**
$\delta^{13}C = -20.2‰$

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

Lu-1126. Grågåsen, 527.5 to 531.5cm **11,450 ± 110**
$\delta^{13}C = -19.8‰$

Kyrkesjön

Lu-1127. Kyrkesjön 1, 685 to 690cm **10,770 ± 105**
$\delta^{13}C = -17.1‰$

Clay gyttja. Ca 10cm above isolation level.

Lu-1128. Kyrkesjön 2, 352 to 356cm **11,290 ± 110**
$\delta^{13}C = -14.9‰$

Clayey gyttja. Ca 15cm above isolation level.

Lu-1129. Kyrkesjön 2, 357.5 to 362.5cm **11,120 ± 110**
$\delta^{13}C = -15.7‰$

Clayey gyttja. Ca 10cm above isolation level.

Kvarnsjön

Lu-1130. Kvarnsjön, 507 to 511cm **12,210 ± 120**
$\delta^{13}C = -16.9‰$

Clay gyttja. Ca 25cm below isolation level.

Lu-1131. Kvarnsjön, 479.5 to 483.5cm **11,110 ± 110**
$\delta^{13}C = -17.7‰$

Clay gyttja. At isolation level.

Lu-1253. Kvarnsjön, 482 to 484cm **11,110 ± 75**
$\delta^{13}C = -17.2‰$

Clay gyttja. Underlying isolation level. *Comment:* (2 2-day counts).

Lu-1252. Kvarnsjön, 479 to 481cm **10,890 ± 75**
$\delta^{13}C = -17.9‰$

Clay gyttja. Overlying isolation level. *Comment:* (2 2-day counts).

Lu-1132. Kvarnsjön, 453 to 457cm **10,140 ± 100**
$\delta^{13}C = -22.2‰$

Clayey gytta. At *Empetrum* max near Pleistocene/Holocene Boundary.

Lu-1133. Kvarnsjön, 432.5 to 437.5cm **9460 ± 95**
$\delta^{13}C = -24.9‰$

Detritus gyttja. At rational *Corylus* limit.

Lu-1134. Kvarnsjön, 367.5 to 372.5cm **8330 ± 85**
$\delta^{13}C = -25.6‰$

Detritus gyttja. Overlying rational *Alnus* limit.

Igelsjön

Lu-1211. Igelsjön, 686 to 690cm **11,750 ± 120**
$\delta^{13}C = -24.9‰$

Clay gyttja.

Lu-1212. Igelsjön, 680 to 684cm **11,570 ± 135**
$\delta^{13}C = -26.5‰$

Clay gyttja. *Comment:* 65% sample. (3 1-day counts).

Domsjön

Lu-1213. Domsjön, 647 to 651cm **12,780 ± 175**
$\delta^{13}C = -17.9‰$

Clay gyttja. Ca 35cm below isolation level. *Comment:* 67% sample.

Lu-1214. Domsjön, 637 to 641cm **12,610 ± 130**
$\delta^{13}C = -17.7‰$

Clay gyttja. Ca 25cm below isolation level. *Comment:* 95% sample.

https://doi.org/10.1017/S003382220000374X Published online by Cambridge University Press

Lu-1215. Domsjön, 627 to 631cm **12,780 ± 145**
$\delta^{13}C = -18.0‰$

Clay gyttja. Ca 15cm below isolation level. *Comment:* 83% sample.

Lu-1216. Domsjön, 618 to 620cm **12,020 ± 130**
$\delta^{13}C = -18.5‰$

Clay gyttja. Underlying isolation level. *Comment:* 91% sample.

Lu-1217. Domsjön, 613 to 615cm **12,020 ± 130**
$\delta^{13}C = -20.5‰$

Clay gyttja. Underlying isolation level. *Comment:* 86% sample.

Lu-1218. Domsjön, 605 to 607cm **11,490 ± 155**
$\delta^{13}C = -20.6‰$

Clay gyttja. Overlying isolation level. *Comment:* 66% sample.

Lu-1219. Domsjön, 603 to 605cm **11,320 ± 135**
$\delta^{13}C = -21.3‰$

Clay gyttja. Overlying isolation level. *Comment:* 78% sample.

Ljungsjön series

Sediment from Lake Ljungsjön, Central Västergötland (57° 45′ N, 13° 19′ E). Alt +300m. Coll 1975 and subm by A Hilldén, Dept Quaternary Geol, Univ Lund. Dating of oldest organic sediment was part of study of ice recession in area. Depths refer to water surface. Pretreated with HCl.

Lu-1191. Ljungsjön, 854 to 858cm **12,410 ± 150**
$\delta^{13}C = -20.5‰$

Clay gyttja. *Comment:* undersized; diluted; 61% sample. (3 1-day counts.)

Lu-1198. Ljungsjön, 840 to 844cm **11,400 ± 110**
$\delta^{13}C = -19.3‰$

Clay gyttja.

Fjällsjön series

Sediment from Lake Fjällsjön, Central Västergötland (57° 45′ N, 12° 51′ E). Alt +285m. Coll 1975 and subm by A Hilldén. Dating is part of same study as Ljungsjön series, above. Depths refer to water surface. Pretreated with HCl.

Lu-1192. Fjällsjön 1, 843.5 to 848.5cm **12,240 ± 120**
$\delta^{13}C = -21.3‰$

Clay gyttja.

Lu-1193. Fjällsjön 2, 646 to 650cm **12,550 ± 125**
$\delta^{13}C = -21.4‰$

Clay gyttja. *Comment:* undersized; diluted; 76% sample. (3 1-day counts.)

Lu-1199. Fjällsjön 2, 633 to 637cm **11,070 ± 105**
$\delta^{13}C = -20.5‰$

Clay gyttja.

Dalaholmssjön series

Sediment from Lake Dalaholmssjön, 10km N of town of Skara, Västergötland (58° 28′ N, 13° 27′ E). Alt +116.5m; area 0.018sq km. Coll 1974 and subm by Th Persson, Dept Quaternary Geol, Univ Lund. Dated as part of study of Postglacial vegetational history of surrounding landscape. Depths refer to sediment surface. Water depth at sampling point, 5.3m. All samples consist of detritus gyttja, and were pretreated with HCl.

Lu-1139. Dalaholmssjön, 765 to 772cm **8630 ± 90**
$\delta^{13}C = -26.6‰$

Lu-1140. Dalaholmssjön, 745 to 750cm **6650 ± 75**
$\delta^{13}C = -31.0‰$

Slightly above rational limit of *Tilia*.

Lu-1141. Dalaholmssjön, 720 to 725cm **5970 ± 70**
$\delta^{13}C = -31.6‰$

Lu-1142. Dalaholmssjön, 710 to 715cm **5060 ± 65**
$\delta^{13}C = -31.0‰$

Distinct decrease of *Ulmus*.

Lu-1143. Dalaholmssjön, 695 to 700cm **4240 ± 60**
$\delta^{13}C = -32.1‰$

Beginning of further decrease of *Ulmus*.

Lu-1144. Dalaholmssjön, 675 to 680cm **3840 ± 60**
$\delta^{13}C = -29.2‰$

Lu-1145. Dalaholmssjön, 650 to 655cm **2990 ± 55**
$\delta^{13}C = -32.3‰$

Lu-1146. Dalaholmssjön, 630 to 635cm **2610 ± 45**
$\delta^{13}C = -28.9‰$

Comment: (3 1-day counts).

Lu-1147. Dalaholmssjön, 575 to 580cm **2620 ± 45**
$\delta^{13}C = -26.7‰$

Comment: (3 1-day counts).

Lu-1148. Dalaholmssjön, 525 to 530cm **2130 ± 50**
$\delta^{13}C = -27.6‰$

Picea reaches 1%.

Lu-1204. Dalaholmssjön, 475 to 480cm **1450 ± 50**
$\delta^{13}C = -28.5‰$

Lu-1205. Dalaholmssjön, 420 to 425cm **1360 ± 50**
$\delta^{13}C = -25.0‰$

Lu-1206. Dalaholmssjön, 375 to 380cm **1300 ± 50**
$\delta^{13}C = -25.7‰$

Lu-1207. Dalaholmssjön, 325 to 330cm **1310 ± 50**
$\delta^{13}C = -25.8‰$

Lu-1208. Dalaholmssjön, 275 to 280cm **1340 ± 50**
$\delta^{13}C = -25.3‰$

Lu-1209. Dalaholmssjön, 225 to 230cm **840 ± 50**
$\delta^{13}C = -26.1‰$

Lake Striern series

Sediment from Lake Striern, Östergötland (58° 05′ N, 15° 47′ E). Coll 1966 and 1972 and subm by H Göransson, Dept Quaternary Geol, Univ Lund. All samples consist of fine detritus gyttja. Depths are below sediment-water interface. For other dates from Lake Striern, see R, 1970, v 12, p 541-543; 1975, v 17, p 181-182. All samples pretreated with HCl.

Lu-1220. Striern I, 290 to 300cm **5050 ± 70**
$\delta^{13}C = -23.1‰$

Atlantic-Sub-Boreal Chronozone Boundary. Coll 1966; water depth at sampling point: 0.85m. *Comment*: undersized; diluted; 83% sample.

Lu-1221. Striern I, 265 to 275cm **4340 ± 60**
$\delta^{13}C = -23.1‰$

Upper part of *Quercus–Tilia–Ulmus* sub-zone. Coll 1966. *Comment*: diluted; 86% sample.

Lu-1194. Striern II, 497.5 to 501.5cm **8650 ± 90**
$\delta^{13}C = -28.6‰$

Rational *Alnus* limit. Coll 1972; water depth 0.63m.

Harplinge ristipp series

Shells (*Hiatella arctica*) from clay grading upwards into sandy and gravelly beach deposits and underlain by glaciofluvial material in deserted gravel pit used as brushwood dump (*Sw ristipp*) at Särdal, Harplinge, Halland (56° 45′ 03″ N, 12° 39′ 15″ E). Coll 1974 (Lu-1104) and 1975 (Lu-1165) and subm by E Lagerlund, Dept Quaternary Geol, Univ Lund. Dated as part of extensive study of deglaciation (Berglund, B E, The deglaciation of southern Sweden — a tentative radiocarbon chronology; Rept 10, Dept Quaternary Geol, Univ Lund [In cooperation with Bjelm, L, Digerfeldt, G, Hilldén, A, Knutsson, G, Lagerlund, E, and Ringberg, B], ms in preparation).

Lu-1104. Harplinge, Sample 1 **13,930 ± 135**
$\delta^{13}C = +0.3‰$

Comment: outer 14% removed by acid leaching.

Lu-1165. Harplinge, Sample 2 **13,860 ± 140**
$\delta^{13}C = +0.2‰$

Comment: many shell pairs were still articulated. Outer 40% removed by acid leaching.

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 mollusks. For apparent age of recent shells in area, see R, 1975, v 17, p 183-184, and Håkansson (1975b).

Marine shells series

Marine subfossil shells from Halland and Bohuslän, W Sweden. Coll 1975 and subm by Å Hillefors, Dept Phys Geog, Univ Lund. Dated as part of study of deglaciation of this area (Hillefors, 1975).

Lu-1171. Fjärås bräcka, *Mytilus* **13,030 ± 130**
$\delta^{13}C = -2.2‰$

Shell fragments (*Mytilus* sp) from varved clay overlain, successively, by nonvarved clay, glaciofluvial material, clay, and wave-washed material at S part of Fjärås bräcka, Halland (57° 25′ 30″ N, 12° 13′ 07″ E). Coll in same gravel pit as shells dated as Lu-165: 13,090 ± 130 and Lu-167: 12,850 ± 130 (R, 1969, v 11, p 439-440; Wedel, 1969). *Comment*: outer 37% removed by acid leaching.

Lu-1172. Fjärås bräcka, *Balanus* **13,120 ± 130**
$\delta^{13}C = +0.1‰$

Small shells (*Balanus* sp) from same deposit as Lu-1171. *Comment*: outer 54% removed by acid leaching.

Lu-1174. Ågård, Sample 2:1 **13,160 ± 130**
$\delta^{13}C = +0.8‰$

Shells (*Hiatella arctica*) from clay underlain by sand in clay pit at Ågård, E of town of Falkenberg, Halland (56° 54′ 07″ N, 12° 33′ 12″ E). Coll ca 20 cm above transition sand/clay. Mollusk shells from this site were studied previously (Asklund, 1936, p 8-9; Mörner, 1969, p 168-169). *Comment*: outer 41% removed by acid leaching.

Lu-1175. Ågård, Sample 2:2 **12,870 ± 125**
$\delta^{13}C = -0.4‰$

Shells (*Balanus hammeri*) from same deposit as Lu-1174. *Comment*: outer 59% removed by acid leaching.

Lu-1176. Ågård, Sample 3 **12,730 ± 130**
$\delta^{13}C = +0.6‰$

Shells (*Hiatella arctica*) from same site as Lu-1174 and -1175 but coll ca 1m above transition sand/clay. Some shell pairs still articulated. *Comment*: outer 18% removed by acid leaching. Undersized; diluted; 73% sample. (3 1-day counts.)

Lu-1173. Fagerfjäll, Sample 1 **12,140 ± 120**
$\delta^{13}C = +0.9‰$

Thick shells (*Mya truncata* and *Hiatella arctica*) from lower part of gray silty-sandy late-glacial clay underlain by sand (10 to 30cm) and ? till at Fagerfjäll, Tjörn, Bohuslän (57° 59′ 10″ N, 11° 39′ 23″ E). *Comment*: outer 52% removed by acid leaching.

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 mollusks. For apparent age of recent shells in area, see R, 1975, v 17, p 183-184 and Håkansson (1975b).

Lu-606. Fjärås bräcka, mixed shells **12,910 ± 125**
$\delta^{13}C = -1.5‰$

Shells (*Balanus balanus*) id by G Digerfeldt, and shell fragments (*Mytilus* sp & *Pecten* sp) from clay underlain by stratified sand and overlain by wave-washed gravel in deserted gravel pit at Fjärås bräcka (57° 25′ 45″ N, 12° 12′ 50″ E). Dated shells are from layer enriched in shells ca 25cm above transition sand/clay. Sample also contained 2 small shells of *Hiatella arctica* and 1 of *Macoma calcarea*. Coll 1971 by S Håkansson. *Comment*: outer 37% removed by acid leaching.

B. Norway

Angsnes series

Marine shells from submarine formed end moraine at Angsnes, Finnmark, N Norway (70° 09′ 42″ N, 28° 45′ 25″ E). Alt ca +10m. Coll 1975 and subm by B Malmström and O Palmér, Dept Phys Geog, Univ Lund. Dated as part of study of deglaciation of Varanger Peninsula. For other dates from area, see Varanger Peninsula series, R, 1974, v 16, p 317-318. Stratigraphic sequence from surface and down: 0.5m ablation till, 0.7m gray clay, and >0.4m red clay.

Lu-1201. Angsnes I **8510 ± 80**
$\delta^{13}C = +0.3‰$

One pair of large shells (*Mya truncata*), 0.5m below surface, from transition gray clay/ablation till. *Comment*: outer 37% removed by acid leaching.

Lu-1202. Angsnes II **9640 ± 160**
$\delta^{13}C = +0.2‰$

Shell fragments (*Mya truncata*), 1.2m below surface, from transition red clay/grey clay. *Comment*: undersized; diluted; 49% sample. Outer 15% removed by acid leaching.

Lu-1203. Angsnes III **10,480 ± 315**
$\delta^{13}C = +0.1‰$

Shell fragments, 1.4m below surface, from red clay. A few fragments id as (*Pecten sp, Hiatella arctica,* and *Mya truncata*). *Comment*: very small sample; no superficial leaching; diluted; 20% 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 maine mollusks. For apparent age of recent shells in area, see Mangerud & Gulliksen (1975, p 269, fig 4).

C. Iceland

Mosfell series

Peat from cultivated hill-side bog (*Icel* Hallamýri) ca 300m S of Mosfell farm, Grímsnesi, S Iceland (64° 08′ N, 20° 36′ W). Coll 1975 and subm by M Hallsdóttir, Dept Quaternary Geol, Univ Lund. Dated to determine age of volcanic ash layer VII a+b, the so-called "landnám" layer (Thorarinsson, 1944; 1970, p 305-308, 323-324) in connection with pollen-analytic study of peat profile. Samples are from wall of 2m deep drainage ditch. Lu-1168 ca 15×15×1cm; all others ca 10×10×1cm each. Depths refer to surface of bog. All samples received mild pretreatment with NaOH and HCl.

Lu-1166. Mosfell, 88 to 89cm **1100 ± 45**
$\delta^{13}C = -26.0‰$

Comment: sample charred in nitrogen atmosphere prior to combustion. Undersized; diluted; 77% sample. (3 1-day counts.)

Lu-1167. Mosfell, 89 to 90cm **1190 ± 50**
$\delta^{13}C = -25.5‰$

Lu-1168. Mosfell, 90 to 91cm **1180 ± 50**
$\delta^{13}C = -25.3‰$

Peat containing main part of Ash Layer VII a+b.

Lu-1169. Mosfell, 91 to 92cm **1150 ± 50**
$\delta^{13}C = -22.2‰$

Lu-1170. Mosfell, 92 to 93cm **1290 ± 50**
$\delta^{13}C = -21.9‰$

III. FAUNAHISTORICAL SAMPLES

Lu-1223. Arrie, *Alces alces* **10,960 ± 110**
$\delta^{13}C = -19.5‰$

Collagen from 3rd cervical vertebra of *Alces alces*, id by J Lepiksaar, from gravel pit at Arrie, Scania (ca 55° 32′ N, 13° 07′ E). Coll 1962 by O Persson; subm by R Liljegren, Dept Quaternary Geol, Univ Lund. *Comments*: organic carbon content: 7.3%. (RL): pollen study not possible.

Lu-1059. Arrie, *Rangifer tarandus* **11,170 ± 110**
$\delta^{13}C = -18.3‰$

Collagen from subfossil antler of *Rangifer tarandus* (Liljegren, 1975, p 80) from gravel pit at Risebjär, Arrie, Scania (55° 31′ 15″ N, 13° 06′ 10″ E). Subm by B E Berglund, Dept Quaternary Geol, Univ Lund. *Comment*: organic carbon content: 5.4%. *Cf* date Lu-1223, above.

Lu-1060. Börringe, *Rangifer tarandus* **9810 ± 95**

$\delta^{13}C = -18.4‰$

Collagen from subfossil antler of *Rangifer tarandus* (Liljegren, 1975, p 82) from unspecified site in Börringe area, Scania (ca 55° 30′ N, 13° 21′ E). Subm by B E Berglund. *Comment*: organic carbon content: 7.7%.

Lu-1236. Östergötland, *Cervus elaphus* **2400 ± 55**

$\delta^{13}C = -22.0‰$

Collagen from subfossil antler of *Cervus elaphus* coll with part of skull in unspecified site in Östergötland (ca 58.5° N, 15.5° E). Subm by E Dahl, Dept Zool, Univ Lund. *Comment*: organic carbon content: 7.7%.

Lu-1237. Nävlinge, *Alces alces* **8920 ± 100**

$\delta^{13}C = -20.4‰$

Collagen from subfossil antler of *Alces alces* probably coll 1930 with skull E of Vinne peat bog, Nävlinge, Scania (ca 56° 2.5′ N, 13° 50′ E). Cat no. LUZM 135 (Liljegren, 1975, p 76). Subm by E Dahl. *Comment*: organic carbon content: 7%. Undersized; diluted; 80% sample.

Lu-1238. Sövestad, *Alces alces* **9160 ± 100**

$\delta^{13}C = -20.2‰$

Collagen from subfossil skull of *Alces alces* coll 1830 with both antlers at ca 1.5m depth in "Broma" peat bog, Sövestad parish, Scania (ca 55° 29′ N, 13° 48′ E). Cat no. LUZM 27 (Liljegren, 1975, p 77). Subm by E Dahl. *Comment*: organic carbon content: 6.9%. Diluted; 66% sample. (3 1-day counts.) Shellac preservative removed by 2 days repeated extraction with alcohol.

Lu-1260. Göteborg, St Förö, *Bos primigenius* **3940 ± 60**

$\delta^{13}C = -21.1‰$

Collagen from bone fragment of *Bos primigenius* from 108cm depth in peat bog in central part of isle of St Förö, Göteborg (57° 37′ 45″ N, 11° 51′ E). Coll 1975 and subm by S Mathiasson, Göteborg Mus Nat Hist. Cat no. GNM 1975-14142. *Comment*: organic carbon content: 5.3%. *General Comment*: collagen extracted from all faunahistorical samples as described previously (R, 1976, v 18, p 290).

IV. ARCHAEOLOGIC SAMPLES

A. Sweden

Östanön-Kvalmsö-Helgeö-Almö series

Wood from artificial blockings at 2 to 5m depth in Listerby-Förkärla Archipelago, Blekinge. Coll 1972 to 1974 by Blekinge Mus; subm by B E Berglund. Other dates from similar blockings in area reported previously (R, 1974, v 16, p 327). Wood id by Th Bartholin. All samples pretreated with HCl and NaOH.

Lu-988. Almö-Kvalmsö **950 ± 50**
$\delta^{13}C = -25.7‰$

Wood from alder pile from blocking between Almö and Kvalmsö (56° 10′ 05″ N, 15° 26′ 20″ E).

Lu-1137. Östanön-Kvalmsö **920 ± 50**
$\delta^{13}C = -26.6‰$

Wood from ash pile from blocking between Östanön and Kvalmsö (56° 09′ 45″ N, 15° 25′ 25″ E). *Comment*: cf Lu-769, 940 ± 50 (*op cit*, above).

Lu-1138. Helgeö-Kvalmsö **1010 ± 50**
$\delta^{13}C = -25.8‰$

Wood from ash pile from blocking between Helgeö and Kvalmsö (56° 10′ N, 15° 24′ 55″ E). *Comment*: *cf* Lu-770, 1050 ± 50 (*op cit*, above).

Lu-1136. Helgeö-Östanön **950 ± 75**
$\delta^{13}C = -27.0‰$

Wood from lime pile from blocking between Helgeö and Östanön (56° 09′ 50″ N, 15° 24′ 45″ E). *Comment*: *cf* Lu-771, 960 ± 50 (*op cit*, above). Sample undersized; diluted; 50% sample.

Lu-987. Östanön-Stutaflåtarna **990 ± 50**
$\delta^{13}C = -26.8‰$

Wood from aspen pile from blocking between Östanön and Stutaflåtarna (56° 09′ 40″ N, 15° 24′ 55″ E).

Lu-986. Torkö-Helgeö **150 ± 45**
$\delta^{13}C = -25.8‰$

Wood from alder pile from blocking between Torkö and Helgeö (56° 09′ 40″ N, 15° 24′ 40″ E).

Lu-1008. Almö-Tromtö 1 **140 ± 45**
$\delta^{13}C = -25.6‰$

Wood from pine pile from blocking between Almö and Tromtö (56° 09′ 30″ N, 15° 27′ 50″ E).

Lu-1135. Almö-Tromtö 2 **940 ± 50**
$\delta^{13}C = -28.6‰$

Wood from birch pile from blocking between Almö and Tromtö (56° 09′ 30″ N, 15° 27′ 50″ E).

General Comment (BEB): new dates confirm older ones from this archipelago, *ie*, blockings apparently built ca AD 1000. Two dated piles have given too low ages; they probably belong to fishing tools.

Eketorp Fen series

Samples from 1m deep open sec in fen deposits E of Eketorp fortress, Gräsgård parish, S Öland, S Sweden (56° 17′ 45″ N, 16° 29′ 30″ E). Coll 1974 and subm by B E Berglund. Archaeol conditions described by

https://doi.org/10.1017/S003382220000374X Published online by Cambridge University Press

Stenberger (1966). Since deposits are calcareous, only fragments of bone and wood were used for dating. A pollen diagram covers entire sec.

Lu-1150. Eketorp Fen 1 **1100 ± 55**
$\delta^{13}C = -20.7‰$

Collagen from fragment of lower jaw of horse, id by R Liljegren, 50cm below surface in upper part of clay gyttja layer. *Comment*: collagen extracted as described previously (R, 1976, v 18, p 290). Organic carbon content: 3.1%. Undersized; diluted; 53% sample. (3 1-day counts.)

Lu-1149. Eketorp Fen 2 **1190 ± 50**
$\delta^{13}C = -27.6‰$

Wood from twig of *Malus* sp, id by Th Bartholin, ca 90cm below surface in bottom layer of limestone debris. *Comment*: pretreated with HCl and NaOH.

Ingelstorp series

Charcoal and bone from sites in Ingelstorp parish, Scania (55° 25′ N, 14° 03′ E). Coll 1975 and subm by M Strömberg, Hist Mus, Univ Lund. For other dates from area, see R, 1975, v 17, p 192-193; 1976, v 18, p 313-314. Charcoal pretreated with HCl and NaOH. Bone treated as described previously (R, 1976, v 18, p 290).

Lu-1151. Ingelstorp 10, Sample 1:HT75 **2540 ± 55**
$\delta^{13}C = -23.3‰$

Charcoal from hearth near lime pit. *Comment* (MS): older than expected from find circumstances.

Lu-1152. Ingelstorp 10, Sample 2:HT75 **1850 ± 50**
$\delta^{13}C = -25.1‰$

Charcoal from lime pit (*cf* Lu-1151, above). Assoc with bones, web-weights, and iron objects.

Lu-1153. Ingelstorp 10, Sample 3:HT75 **1380 ± 50**
$\delta^{13}C = -20.5‰$

Collagen from mandible fragment, probably from young animal of cattle, from same lime pit as Sample 2:HT75. *Comment*: organic carbon content: 7%.

Lu-1177. Ingelstorp 31, Sample 4:HT75 **3020 ± 55**
$\delta^{13}C = -24.5‰$

Charcoal from charred wooden coffin in Grave 51. Assoc with helical bronze-ring and flint objects.

Lu-1188. Ingelstorp 32[5], Sample 5:HT75 **1960 ± 50**
$\delta^{13}C = -25.8‰$

Charcoal from cremation grave. Assoc with pottery, bronze buckle, and burnt bones.

Lu-1189. Ingelstorp 31[6], Sample 6:HT75 **1840 ± 65**
$\delta^{13}C = -19.6‰$

Collagen from human skull fragment from skeleton grave (No. 50). Assoc with unusual pottery and bronze buckle. *Comment*: organic carbon content: 1.7%. Undersized; diluted; 62% sample.

Lu-1196. Ingelstorp 32[8], Sample 7:HT75 **3090 ± 60**
$\delta^{13}C = -23.9‰$

Charcoal from coffin in skeleton grave (No. 5). Assoc with fragment of bronze fibula.

Lu-1210. Ingelstorp 32[5], Sample 9:75-76 **2730 ± 55**
$\delta^{13}C = -25.5‰$

Charcoal from cremation grave (No. 18). Assoc with pottery.
General Comment (MS): all dates except Lu-1151 agree well with archaeol estimates based on assoc artifacts.

Lu-1200. Stendala **1310 ± 50**
$\delta^{13}C = -23.8‰$

Charcoal from bottom of pit house at Stendala, Järrestad parish, Scania (55° 32′ N, 14° 17′ E). Coll 1975 and subm by M Strömberg. Assoc with brittle-burnt stones. In pit house were also iron objects, mold fragment, bone, and pottery. *Comment*: date agrees with assoc finds.

Ageröd series (II)

Charcoal and bark from Site Ageröd VI in Mesolithic settlement area at raised bog Ageröds mosse, Munkarp parish, Scania (55° 56.5′ N, 13° 25′ E). Coll 1975 and subm by L Larsson, Hist Mus, Univ Lund. Dated as complement to Ageröd series (R, 1976, v 18, p 304-308).

Lu-1156. Ageröd VI, Sample 1 **7320 ± 80**
$\delta^{13}C = -24.9‰$

Bark (? *Alnus* sp) from lowest part of occupation layer. *Comment*: normal pretreatment with HCl and NaOH.

Lu-1157. Ageröd VI, Sample 2 **5240 ± 65**
$\delta^{13}C = -25.3‰$

Charcoal from stratum just above occupation layer. *Comment*: mild pretreatment with NaOH and HCl; small sample.

Lu-1158. Ageröd VI, Sample 3 **6810 ± 75**
$\delta^{13}C = -25.6‰$

Charcoal from occupation layer. *Comment*: mild pretreatment with NaOH and HCl; small sample.

Lu-1195. Spjälkö **2890 ± 55**
$\delta^{13}C = -23.7‰$

Charcoal (*Fraxinus excelsior*) id by Th Bartholin, from Test-pit 5 on Pitted Ware culture site at Spjälkö, Ronneby parish, Blekinge (56°

10′ N, 15° 13′ E). Coll 1975 and subm by S Welinder, Hist Mus, Univ Lund. *Comment*: pretreated with HCl and NaOH.

B. Denmark

Lu-1222. Svendborg, Site 263 IV, C391/75 **650 ± 50**
$\delta^{13}C = -24.1‰$

Charcoal (*Corylus avellana*) id by Th Bartholin, from fire-stratum in excavation N of monastery church in town of Svendborg, Fyn (55° 03′ N, 10° 36′ E). Coll 1976 by J Bech; subm by H M Jansen, Inst Hist & Soc Sci, Univ Odense, Denmark. Dated as complement to Svendborg series (R, 1976, v 18, p 318-319). Pretreated with HCl and NaOH.

V. GEOCHEMICAL SAMPLES

Results are given as a difference, Δ, from our radiocarbon standard (95% activity of NBS oxalic acid standard, age corrected to 1958):

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

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

Submerged plants series

Recent submerged plants from various S Swedish lakes coll 1974 and 1975. Aim of study was to compare ^{14}C activities in different kinds of lakes in order to acquire information about possible hard-water effects. Details about lakes and discussion of results were presented elsewhere (Håkansson, S, Radiocarbon activity in submerged plants from various South Swedish lakes; 9th internatl radiocarbon conf, Los Angeles and San Diego, June 1976, ms in preparation.) All samples except Lu-1162 and -1187 pretreated with HCl.

Lu-1184. Ämmern 1975, *Elodea* **Δ = 264.9 ± 6.5‰**
$\delta^{13}C = -17.2‰$

Elodea canadensis from Lake Ämmern, Östergötland (58° 07′ 30″ N, 15° 43′ 30″ E). Coll Sept 6, 1975 by H Göransson, Dept Quaternary Geol, Univ Lund.

Lu-1186. Ämmern 1975, *Potamogeton* **Δ = 263.9 ± 6.2‰**
$\delta^{13}C = -17.4‰$

Potamogeton perfoliatus from Lake Ämmern. Coll Sept 6, 1975 by H Göransson.

Lu-1011. Striern 1974, *Myriophyllum* **Δ = 297.8 ± 6.7‰**
$\delta^{13}C = -20.0‰$

Myriophyllum spicatum from Lake Striern, Östergötland (58° 05′ N, 15° 47′ E). Coll Sept 7, 1974 by H Göransson.

Lu-1185. Striern 1975, *Myriophyllum* $\Delta = 284.7 \pm 6.3‰$
$\delta^{13}C = -19.8‰$

Myriophyllum spicatum from Lake Striern. Coll Sept 6, 1975 by H Göransson.

Lu-1015. Vån 1974, *Elodea* $\Delta = 287.9 \pm 6.2‰$
$\delta^{13}C = -17.6‰$

Elodea canadensis from Lake Vån, Östergötland (58° 11′ N, 15° 47′ E). Coll Sept 30, 1974 by H Göransson.

Lu-1187. Vån 1975, *Elodea* $\Delta = 260.3 \pm 7.1‰$
$\delta^{13}C = -18.2‰$

Elodea canadensis from Lake Vån. Coll Sept 6, 1975 by H Göransson. *Comment*: sample undersized; diluted; 78% sample.

Lu-1181. Hinnasjön 1975, *Myriophyllum* $\Delta = 270.4 \pm 6.3‰$
$\delta^{13}C = -24.3‰$

Myriophyllum alterniflorum from Lake Hinnasjön, Småland (56° 53′ N, 14° 56′ E). Coll Sept 21, 1975 by Th Persson.

Lu-1009. Odensjön 1974, *Myriophyllum* $\Delta = 153.2 \pm 6.0‰$
$\delta^{13}C = -18.7‰$

Myriophyllum alterniflorum from Lake Odensjön, NW Scania (56° 00′ 15″ N, 13° 16′ 45″ E). Coll Sept 17, 1974 by S Håkansson.

Lu-1183. Odensjön 1975, *Myriophyllum* $\Delta = 123.4 \pm 5.8‰$
$\delta^{13}C = -20.4‰$

Myriophyllum alterniflorum from Lake Odensjön. Coll Sept 20, 1975 by H Göransson.

Lu-1162. Håkulls mosse 1975 $\Delta = 247.7 \pm 6.1‰$
$\delta^{13}C = -25.9‰$

Submerged brown-mosses from water-filled peat-cutting at Håkulls mosse, NW Scania (56° 17′ 20″ N, 12° 31′ 20″ E). Coll Sept 6, 1975 by S Håkansson.

Lu-1019. Börringesjön 1974, *Sium* $\Delta = 283.4 \pm 6.4‰$
$\delta^{13}C = -29.5‰$

Sium sp from rivulet connecting N and S part of Lake Börringesjön, S Scania (55° 30′ 10″ N, 13° 19′ 10″ E). Coll Oct 12, 1974 by S Håkansson.

Lu-1026. Åmossen 1974, *Ceratophyllum* $\Delta = 287.4 \pm 6.4‰$
$\delta^{13}C = -24.5‰$

Ceratophyllum sp from small lake at Åmossen, S Scania (55° 27′ 10″ N, 13° 15′ 30″ E). Coll Oct 26, 1974 by S Håkansson.

Lu-1178. Åmossen 1975, *Ceratophyllum* $\Delta = 255.9 \pm 6.2‰$
$\delta^{13}C = -22.4‰$

Ceratophyllum sp from same lake as Lu-1026. Coll Oct 12, 1975 by S Håkansson.

Terrestrial plants series

Sedges and grass coll near some lakes, above, to determine corresponding atmospheric ^{14}C activity. All samples pretreated with HCl.

Lu-1012. Striern 1974, *Carex* $\Delta = \mathbf{426.3 \pm 6.6}‰$, $\delta^{13}C = -26.3‰$

Carex sp from shore of Lake Striern. Coll Sept 7, 1974 by H Göransson.

Lu-1014. Ämmern 1974, *Carex* $\Delta = \mathbf{425.3 \pm 6.6}‰$, $\delta^{13}C = -27.7‰$

Carex sp from shore of Lake Ämmern. Coll Sept 7, 1974 by H Göransson.

Lu-1016. Vån 1974, *Carex* $\Delta = \mathbf{425.8 \pm 6.6}‰$, $\delta^{13}C = -27.4‰$

Carex elata from shore of Lake Vån. Coll Sept 30, 1974 by H Göransson.

Lu-1182. Hinnasjön 1975, *Molinia* $\Delta = \mathbf{388.8 \pm 6.5}‰$, $\delta^{13}C = -27.9‰$

Molinia caerulea from shore of Lake Hinnasjön. Coll Sept 21, 1975 by Th Persson.

Lu-1010. Odensjön 1974, *Carex* $\Delta = \mathbf{426.8 \pm 6.5}‰$, $\delta^{13}C = -27.4‰$

Carex sp from shore of Lake Odensjön. Coll Sept 17, 1974 by H Göransson.

Lu-1027. Åmossen 1974, *Carex* $\Delta = \mathbf{415.9 \pm 6.5}‰$, $\delta^{13}C = -27.4‰$

Carex sp from shore of lake at Åmossen. Coll Oct 26, 1974 by S Håkansson.

Lu-1179. Åmossen 1975, *Carex* $\Delta = \mathbf{393.1 \pm 6.8}‰$, $\delta^{13}C = -29.4‰$

Carex sp from shore of lake at Åmossen. Coll Oct 12, 1975 by S Håkansson.

Lu-1180. Måryd 1975, *Juncus* $\Delta = \mathbf{390.2 \pm 6.5}‰$, $\delta^{13}C = -28.0‰$

Juncus sp from shore of pond at Måryd, S Scania (55° 42′ 05″ N, 13° 22′ 25″ E). Coll Oct 11, 1975 by S Håkansson.

Surface sediment series

Since ^{14}C activity was abnormally low in submerged plants from Lake Odensjön (*cf* Lu-1009 and -1183, above), surface sediment samples

from deepest part of this lake were assayed for ^{14}C content. Coll with 1m Mackereth corer (Mackereth, 1969) Sept 17, 1974 by G Digerfeldt. Depths given are below sediment surface measured in core tube after settling. No pretreatment; small samples; diluted. Amount of CO_2 from sample is given in *Comments* below as "% sample".

Lu-1241. Odensjön, 0 to 1cm $\Delta = -135.8 \pm 12.8‰$, $\delta^{13}C = -29.4‰$

Comment: 20% sample. Activity corresponds to a ^{14}C age of 1170 ± 120 BP.

Lu-1242. Odensjön, 1 to 3cm $\Delta = -150.7 \pm 10.8‰$, $\delta^{13}C = -29.0‰$

Comment: 31% sample. ^{14}C age 1310 ± 105 BP.

Lu-1243. Odensjön, 3 to 5cm $\Delta = -164.6 \pm 9.3‰$, $\delta^{13}C = -29.4‰$

Comment: 28% sample. (3 1-day counts.) ^{14}C age 1440 ± 90 BP.

Lu-1244. Odensjön, 5 to 7cm $\Delta = -159.9 \pm 9.9‰$, $\delta^{13}C = -29.0‰$

Comment: 27% sample. (3 1-day counts.) ^{14}C age 1400 ± 95 BP.

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