COMMENTS ON THE USE OF RADIOCARBON DATING IN FINNISH ARCHAEOLOGY

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Abstract

The Radiocarbon Dating Laboratory of the University of Helsinki has, since its foundation in 1968, dated 456 archaeological samples, of which 304 are of charcoal from Stone Age or younger sites. Because of the great scatter of the ages they have been of restricted use for the archaeological chronology. Dates of separate finds, such as of skis, have been of greater use. In addition, a number of pollen diagrams in which the first signs of agriculture can be traced have been dated.

Introduction

Since its foundation in 1968, the Radiocarbon Dating Laboratory of the University of Helsinki has dated a number of archaeological samples for the National Board of Antiquities as well as for individual archaeologists. The use of the results naturally rests with the archaeologists but some general comments on the samples and their use may be permitted, even if somewhat similar comments have earlier been presented by Jungner (1977). The details of the samples submitted for dating in 1969—1979 are as given in the two date lists published by the Radiocarbon Dating Laboratory (Jungner 1979, Jungner and Sonninen 1983). In addition, some mention is going to be made of samples dated 1980—1984. The number of archaeological samples dated as compared to the total number of samples is as follows:

	1969—1979		1980—March 1984	
Archaeological samples				
Charcoal	168		136	
Wood or bark	86		17	
Bone or hair	4		32	
Other organic material	2		11	
	260	19 %	196	40 %
Total number of samples dated	1400		491	

In addition to the archaeological samples listed above, a number of samples of peats and muds have been dated from horizons of interest in the pollen analytical study of the changes in the vegetation caused by the activities of man and particularly the study of early agriculture. Before 1983, for instance, 31 samples directly related to records

of cereal grass pollen were dated from 22 sites in southern Finland (Donner 1984). The majority of samples submitted by archaeologists for dating consist of charcoal from Stone Age or younger dwelling sites. Of these 304 samples dated before March 1984, that is about 16 % of all dated samples, relatively many have been dated during the last years. It is therefore important to see to what extent this number of radiocarbon dates of charcoal is of use for archaeological interpretations. This question naturally also applies to other dated samples.

Charcoal dates

In the dating of Stone Age or younger dwelling sites in Finland it is usual that the only datable material is charcoal, found either in hearths or as separate pieces in the cultural layers. The charcoal pieces are, however, close to the surface and can therefore either represent a cultural layer or younger, more seldom older, charcoal pieces from forest fires or from hearths not connected with the occupation of the site. An admixture of young material was already suggested by Jungner (1977) in his comparison of radiocarbon ages with archaeologically estimated ages for samples from Finland. There is thus in many cases an element of uncertainty as to the origin of the charcoal sample dated from a site. All dated charcoal samples, however, are from archaeological sites. In Fig. 1 the charcoal dates ($\pm$ 1 σ) from Finland of samples submitted during 1969—1979 are given in the order in which they were submitted and published (Jungner 1979, Jungner and Sonninen 1983). Special symbols were used for those samples which have been linked to a particular period or phase in the archaeological chronology. Some of the sites from which there are many dates are singled out in Fig. 1. The chronological ranges of the relevant archaeological periods and phases are given on the left of the diagram, according to Huurre (1979), Carpelan (1979) and Siiriäinen (1982). As is seen, there are some differences in the interpretation of the duration of the periods and phases. In addition, the ages for Jäkärlä and Typical Comb ceramic, i.e. Comb ceramic II, as given by Meinander (1971), are included. These ages, which are older than the ages used by the above-mentioned authors, are median values of dates for the two cultural phases of samples dated in 1969, as shown in Fig. 1. For Jäkärlä Meinander gave an age of 5625 years B.P. and for Comb ceramic II:1 5430 years B.P. and for Comb ceramic II:1/2 5210 years B.P. The two latter are both given in Fig. 1. In Fig. 2 the ages of the charcoal samples dated between 1980—March 1984 are plotted, also in the order in which they were submitted. This diagram is included mainly to show the range of ages of recently dated samples. The oldest age in Fig. 2 is 7930 $\pm$ 110 B.P.

There is a wide scatter of the ages of the charcoal samples submitted for dating, from recent to nearly 8000 years B.P., and many samples for which no information is given as to its archaeological connection. Some samples quoted as belonging to an archaeological period or phase have clearly given archaeologically unacceptable ages, as in the dates for Comb ceramic I from 1972 and 1979 and the date for the Pyheensilta culture from 1972. The only ceramic cultures for which there are a number of dates are Jäkärlä and Comb ceramic II, the ages of which were already discussed by Meinander (1971) on the basis of the samples dated in 1969. All dates in Figs 1 and 2 referred to Comb ceramic II are within the range of about 4800—5500 B.P. They are from 7 sites in southern and central Finland, from the Turku area in the southwest to Suonenjoki (Savo) in the northeast, but there is no detectable spatial age difference between them. All dates used in the figures are conventional radiocarbon ages. Thus, if they are converted to sidereal years they have to be calibrated. The age range for Comb ceramic II is, if the calibration tables by Klein et al. (1982) are used, about 5300—6500

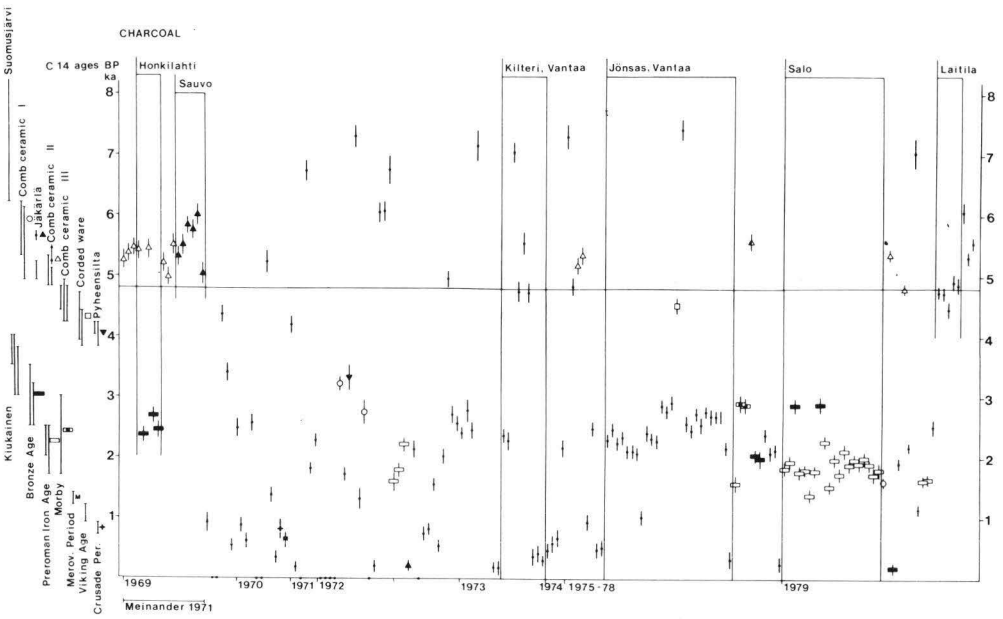

Fig. 1. Ages of charcoal samples submitted 1969—1979 dated at the Radiocarbon Dating Laboratory, University of Helsinki (from Jungner 1979, Jungner and Sonninen 1983). Symbols in diagram show to which period or phase the submitter of the sample has referred it. For further details see text.

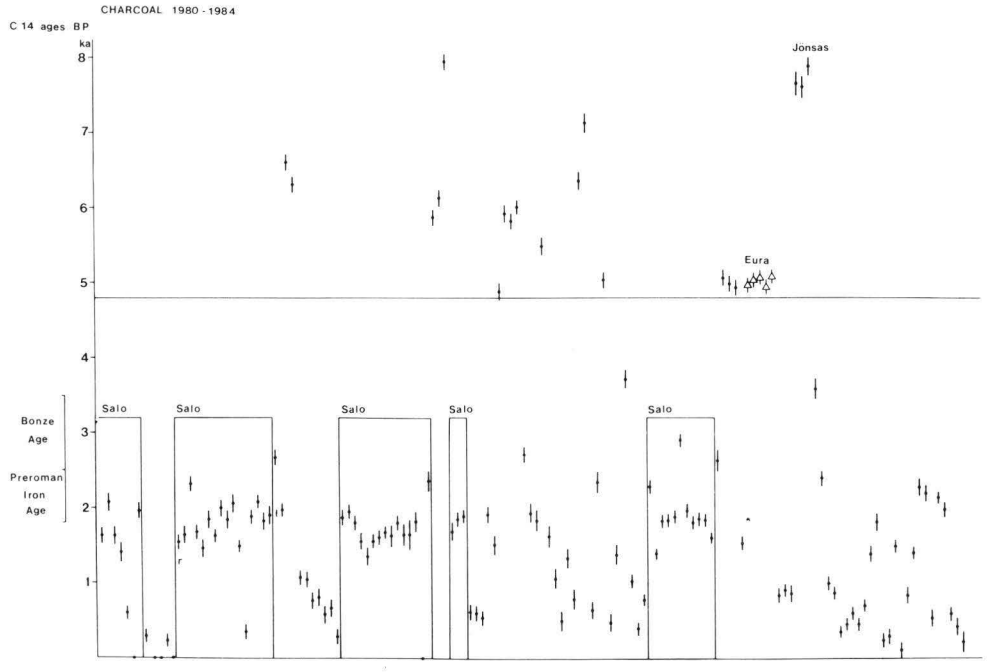

Fig. 2. Ages of charcoal samples dated 1980—March 1984. Symbols same as in Fig. 1.

B.P. (with ± 2 σ). If, however, the age of the wood burnt is taken into account, the real age range is probably about 200 years less (Siiriäinen 1974), or about 5100—6300 B.P. If a chronology is based only on conventional radiocarbon dates of charcoal it is not necessary to make any corrections but the age of the burnt wood affects the conclusions already in a comparison of dates of charcoal samples with other dates, as demonstrated by Siiriäinen (1974), and in some correlations, especially of younger periods, the calibrated radiocarbon ages have to be taken into account.

If all radiocarbon ages of charcoal from Finland are taken into account it can be concluded that there are only enough dates for the Jäkärlä culture and Comb ceramic II for their radiocarbon dating. The 6 Jäkärlä dates from Nummenharju, Sauvo (Fig. 1), are between 5030 ± 180 B.P. (Hel-63) and 6000 ± 180 B.P. (Hel-48), with a median age of 5625 B.P. (Meinander 1971), a range of ages greater than that generally given for this phase in the archaeological chronology. The age of the end of Comb ceramic II, 4800 B.P. (drawn in Figs 1 and 2), coincides with the age used in the archaeological chronology, whereas the oldest date, about 5500 B.P., is somewhat older than the age used in archaeology for the beginning of this phase. Thus, the charcoal samples dated so far from Stone Age dwelling sites in Finland have a wider age range than that which has been used in archaeological chronological tables. It must therefore be concluded that the charcoal dates have not been considered accurate enough for a change of the established chronology. It also follows that if charcoal samples from Stone Age sites are still to be dated they would add little to the chronology used. This chronology has, however, in addition to strictly archaeological correlations, been based on comparisons of the coastal dwelling sites with geologically dated shorelines, which in their turn have been dated with the help of radiocarbon dates. In this way, using a gradient/time curve, Comb ceramic II, for instance, was given an age of 4800—5300 years B.P. by Siiriäinen (1972, 1974), an age similar to that mentioned earlier. This also agrees with the results from the lake Saimaa area, where Saarnisto (1970) correlated the transgression maximum of the lake at about 5000 B.P. with the Typical Comb ceramic phase. As the radiocarbon dates of charcoal from the dwelling places of the Comb ceramic II phase are in agreement with dates obtained from comparisons with the shoreline displacement, carefully chosen charcoal samples representing other ceramic phases could be used in combination with a study of the shoreline displacement. This has in Finland been comparatively accurately dated with the help of radiocarbon dates from pollen analytically studied sequences from lakes and mires.

The majority of the dated charcoal samples are from the Bronze or Iron Ages or younger. After a number of charcoal dates had been dated from various sites in the beginning of the 1970's the dating was concentrated to fewer sites, with occasional scattered samples from elsewhere, as particularly seen in Fig. 2. There has clearly been a tendency after 1980 to date younger samples, with a few exceptions such as the samples from Jönsas and Eura. Most of the samples dated 1975—1978 from Jönsas in Vantaa, however, group themselves between 2000 and 3000 years B.P. A site which has received particularly much attention in the dating programme of archaeological samples is the Isokylä area near Salo, from which 72 charcoal samples have been dated since 1979 (Figs 1 and 2). The site has remains of both Bronze Age and Iron Age settlements, with two Iron Age house complexes. The charcoal is mostly from postholes and fireplaces from the excavated house remains (Uino 1982). The site was used also for a comparison of radiocarbon dates with thermoluminescence dates of pottery and burnt clay (Carpelan and Jungner 1982). These dates were found to agree with calibrated radiocarbon dates and the dates from the site represent either the Bronze Age or the Iron Age (in Fig. 1 only the Preroman Iron Age is given, whereas the Roman

Iron Age lasted until about 1600 B.P.). The Iron Age radiocarbon or TL dates are not, however, accurate enough for a separation of the house complexes at the site, according to the conclusions by Carpelan and Jungner (1982). The Salo site has been used to test the accuracy of the dating methods and shows the limitations of them. As the accuracy of the radiocarbon dating based on charcoal samples does not seem to permit more than the separation of the Bronze Age habitation from the Iron Age habitation and an estimation of the length of the habitation at the site, this result could help in the use of charcoal samples at other sites.

The demonstration above of the limitations of the use of charcoal samples from archaeological sites for radiocarbon dating, as generally reflected in Figs 1 and 2, should, when the future use of the Radiocarbon Dating Laboratory is planned, be taken into account. The effect of the 304 charcoal samples, dated before March 1984, on the archaeological chronology has so far been comparatively small, but it is hoped that some of the dates which have not been referred to a particular period or cultural phase by the submitters of the samples are in fact closely related to archaeologically defined cultural layers from sites of which reports are soon going to be published.

Dates of separate finds

Whereas the interpretation of radiocarbon dates of charcoal is hampered by uncertainties dates of separate archaeological finds are often not difficult to interpret. Therefore only some of the dates of separate finds will be mentioned in this context. The oldest find dated is from Antrea in Korpilahti on the Karelian Isthmus, now in the USSR. There the remains of a net were found at 110 cm depth on top of clay and covered by lake mud, together with stone implements of the Suomusjärvi culture. According to the pollen diagram from the site the net was at a horizon corresponding to the zone boundary IV/V (Sauramo 1951), i.e. the boundary between the birch assemblage zone and the pine assemblage zone. Later radiocarbon datings of the zone boundary indicate that it may be slightly older than 9000 years B.P. in southeastern Finland. The two following radiocarbon dates were obtained for bark floats of the Antrea net:

1972	Hel-269	9230 ± 210 B.P.
1979	Hel-1303	9310 ± 140 B.P.

These dates thus agree with the above-mentioned pollen stratigraphical results and give a minimum age for the beginning of the Suomusjärvi culture. Of other relatively old objects a carved elk's head from Lehtojärvi, Rovaniemi, may be mentioned, with an age of 7740 ± 170 B.P. (Hel-168).

The largest group of dates for separate finds is that for skis (Fig. 3). The 35 ages for skis from various parts of the country obtained from samples submitted 1969—1979, are used for a typological investigation. One find, from Salla in northeastern Finland, has an age of 4470 ± 110 B.P (Hel-1330), whereas of the others the oldest has an age of 2370 ± 140 B.P. (Hel-596). No further comments can here be made of the dating of the skis and their typological changes as the study is not yet published. The sledges and sledge runners dated are also shown in Fig. 3, the two oldest from Kuusankoski and Noormarkku being about 5000 years old. A still older date, 5690 ± 110 (Hel-1195), of a sledge runner from Kuusamo is, however, not shown in Fig. 3.

In addition to the above-mentioned objects wood from boats, including dugouts, from ships, churches, Lapp cottages and huts, mostly less than 1000 years old, have

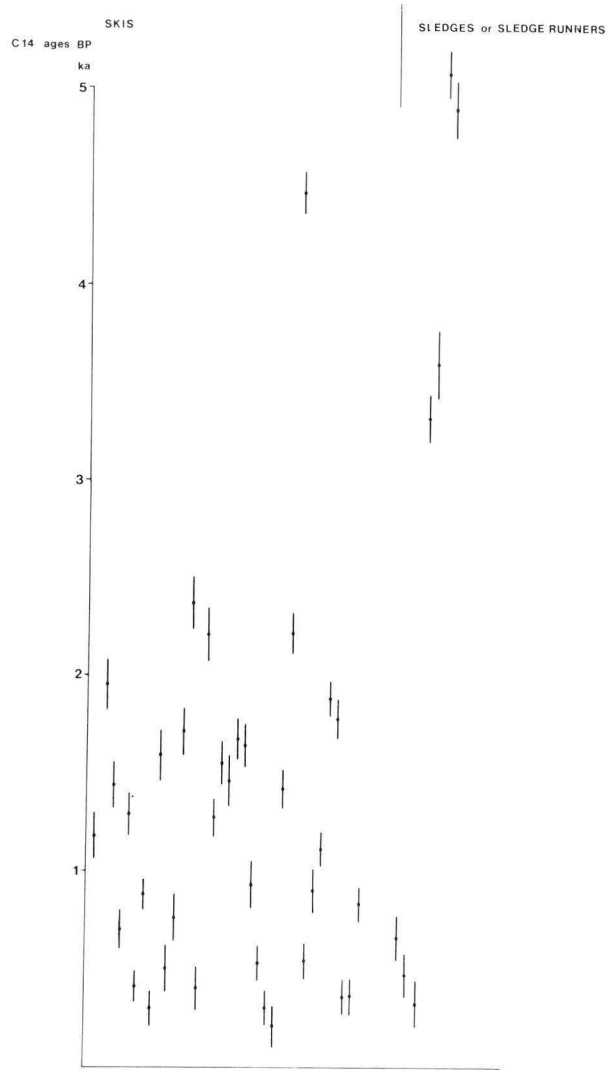

Fig. 3. Ages of skis, sledges and sledge runners of wood samples submitted 1969—1979.

been dated. Young pieces of bone from archaeological sites have also been dated, especially since 1980.

Early agriculture

The results from the radiocarbon dating of horizons with cereal grass pollen in pollen diagrams has been discussed earlier (Donner 1984). The oldest records of agriculture in southern Finland are from the beginning of the Bronze Age and the introduction of rye was dated at about 950—1500 B.P. The pollen analytical study and dating of the early influence of man is more difficult. The increasing effect towards the present time on the forest cover and its composition and on the vegetation generally can be seen in pollen diagrams, especially from southern Finland, and is being studied in connec-

tion with archaeological excavations. The most dramatic environmental changes are, however, comparatively young in Finland and difficult to date with the radiocarbon method. Other methods have therefore been employed, such as the use of annual microvarves in lake sediments.

Conclusions

From the above-mentioned review of how most radiocarbon samples connected with archaeology have been taken and how the dates have been used some general questions arise as to the best use of the radiocarbon dating method in Finland. Archaeologists employed by the National Board of Antiquities or elsewhere are naturally aware of how most effectively to use radiocarbon dates in their work and possess more details about the samples submitted for dating than those working in the dating laboratory, but some remarks may here be permitted. As to the use of charcoal samples it should by now be obvious that the number of samples could be drastically cut down. Further, the accuracy of the dates is often not enough for, for instance, a demonstration of age differences within Iron Age sites and when this has been shown at a site like that at Salo further similar experiments are perhaps not needed. It is also obvious that additional samples from sites of Comb ceramic cultures could, when carefully sampled, yield useful results. One aspect which has not been given much attention is the dating of a particular period or phase in a large area of the country in order to detect possible spatial age differences. This could be even more rewarding if such a period or phase has been separated and dated outside Finland. The same applies to the dating of early agriculture. Now most studied sites are from a comparatively small area in southern Finland. If the whole country were systematically studied and put into context with the dating of the complex spread of farming from the Aegean to northern Europe (see Waterbolk 1968), results of more general bearing may emerge. The radiocarbon dating method still offers good opportunities to improve our knowledge of former cultural changes. If greater numbers of radiocarbon dates are soon going to be used as a result of improved equipment the choice of meaningful samples will be of the utmost importance.

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