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Ancient Monuments Laboratory
Report 31/94

THE DENDROCHRONOLOGICAL POTENTIAL OF TIMBERS FROM WITHOW GAP, SKIPSEA, HUMBERSIDE

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Summary

The tree-ring analysis of eight wood samples from a beaver dam is described. Oak, ash, and alder were identified, two of the ash samples possibly showing evidence of beaver activity. No crossmatching was obtained either within or between species, nor did any of the ring sequences produce absolute dates. This suggests that the site has poor potential for dendrochronological dating.

Author's address :-

Miss Jennifer Hillam

Department of Archaeology & Prehistory
University of Sheffield
Sheffield
S10 2TN

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Withow Gap, Skipsea (TA 1839 5463; site CAS 489)), was excavated by the Central Archaeological Service in 1993. The timbers, some of which had been gnawed by beavers, were found lying across what is assumed to have been a channel between two meres. A neolithic date for timber deposition is suggested from previous work in the area (McAvoy pers comm). The dendrochronological study was undertaken to assess the potential of the timbers to provide first, an absolute date for the beaver activity and second, information about the contemporary woodland in the area.

Oak and ash were identified during the excavation, but only the ash showed signs of beaver activity. Since there are no continuous ash tree-ring chronologies, the ash timbers would have to be dated in the following way:

1. Construct a site oak chronology,
2. Date it against existing oak reference chronologies,
3. Construct a site ash chronology,
4. Crossmatch the Skipsea ash chronology against the Skipsea oak. Oak and ash timbers have been crossmatched and dated in this way from the Sweet Track in the Somerset Levels (Hillam *et al* 1990) and the Caldicot Castle Lake excavations in Gwent (Hillam unpubl).

Methods

The larger samples were spilt radially into segments for ease of handling. The samples were prepared by freezing them for at least 48 hours and then cleaning their cross-sections with a surform plane. Oak and ash were identified at this stage by examining their cross-sections. Samples that were not oak or ash were identified by comparing thin sections from the transverse, longitudinal and tangential surfaces with wood keys (eg Schweingruber 1990) and reference slides.

The ring widths of the oak and ash samples were measured to an accuracy of 0.01mm on a travelling stage which is connected to an Atari microcomputer running a suite of dendrochronology programs written by Ian Tyers (pers comm 1993). Although one set of measurements is generally sufficient for oak samples, two radii per sample were measured on the ash. The two sets of measurements were then averaged to give a single tree sequence (for more details on the dendrochronology of non-oak species in Britain, see Groves and Hillam 1988). The measured ring sequences were plotted as graphs using an Epson HI-80 plotter, also connected to the Atari. Crossmatching was carried out first visually by comparing the graphs on a light box, and then using a computer program to measure the amount of correlation between two ring sequences. The crossmatching routines are based on the Belfast CROS program (Baillie and Pilcher 1973; Munro 1984), and all the *t* values quoted in this report are identical to those produced by the first CROS program (Baillie and Pilcher 1973). Generally *t* values of 3.5 or above indicate a match provided that the visual match between the tree-ring graphs is acceptable (Baillie 1982, 82-5).

Dating is achieved by averaging the data from the matching sequences to produce a site master curve, and then testing that master for similarity against dated reference chronologies. A site master is used for dating whenever possible because it enhances the general climatic signal at the expense of the background noise from the growth characteristics of the individual samples. Any unmatched sequences are tested individually against the reference chronologies. All potential tree-ring dates are then checked by examining the quality of the visual match between the graphs.

If a sample has bark or bark edge, the date of the last measured ring is the year in which the tree died. A complete outer ring indicates that the tree was felled during its period of dormancy between late autumn and early spring. A partially formed ring indicates that the tree was felled in late spring or summer, although it is not always possible to distinguish between an incomplete ring and a complete narrow ring. In the absence of bark edge, felling dates of oak timbers are calculated using the sapwood estimate of 10-55 rings. This is the range of the 95% confidence limits for the number of sapwood rings in British oak trees over 30 years old (Hillam *et al* 1987). Where sapwood is absent, felling dates are given as *termini post quem* by adding 10 years, the minimum number of missing sapwood rings, to the date of the last measured heartwood ring. The actual felling date could be much later depending on how many heartwood rings have been removed or eroded. Ash has no recognisable sapwood band and therefore in the absence of bark the *terminus post quem* for felling is the date of the last measured ring.

Results

Samples *542* and *695* were identified as oak (*Quercus* spp); *599*, *600*, *623*, and *661* were ash (*Fraxinus excelsior* L), and *607*, *782*, and *810* were alder (*Alnus glutinosa* (L) Gaertner).

1. The oak timbers. *542* and *695* had 113 and 91 heartwood rings respectively. *542* was an incomplete section, representing less than half the tree trunk. Neither sample had sapwood. There was no match between the ring sequences of *542* and *695*, nor was there any similarity with dated tree-ring chronologies (eg Brown and Baillie 1992; Hillam *et al* 1990).

2. The ash timbers. These contained 86-139 rings. All of the samples came from whole trunks, often complete with bark. Bark usually forms around the circumference of the youngest annual ring, but on samples *600* and *623*, the bark cut across several rings (Figs 1and 2). There were no obvious scars which might be indicative of an event such as fire. It is therefore possible that the abnormality was caused by beaver activity.

There was poor agreement between the pairs of radii from each sample. Whereas two radii from the same oak sample would be expected to give a t value between 10 and 30, the ash radii from Skipsea gave between 6 and 9. (Similar low intra-tree crossmatching was also observed on two ash samples collected by the author from an adjacent site in 1982.) In view of this poor intra-sample crossmatching, it is not surprising that there was no agreement between the ring sequences from different samples. This does not necessarily indicate that the samples are a different date, but it does suggest that the Skipsea ash samples are likely to be unsuitable for dendrochronology.

It is not known what type of environment produces the variation in ring width within the ash timbers. It has not been observed in the few studies carried out on living ash trees (Groves and Hillam 1988), and therefore there is currently no modern equivalent with which Skipsea can be compared.

3. The alder timbers. *607* and *810* were from a branch and trunk of the same tree, the trunk having about 90 annual rings. It was not possible to count the rings on *782*. The rings of alder are not very clear, nor are they always complete around the circumference of the trunk. This makes alder unsuitable for dating purposes.

Conclusion

Unless many more oak timbers are found at or around the site, the potential for constructing a well-replicated oak chronology would appear to be poor. Similarly the poor within sample crossmatching of the ash samples suggests that the Skipsea ash cannot be used to construct a site chronology. It is therefore unlikely that dendrochronology can be used to date the beaver activity at the site. There are too few samples of each species to be able to extract information about contemporary woodland conditions. In the case of the ash timbers, the poor intra-sample correlation cannot be interpreted because there are no modern equivalents.

Acknowledgements

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TABLE 1: Details of the tree-ring samples. ARW - average ring width.

sample	timber	species	no. of rings	ARW (mm)	sketch	dimensions (mm)	comments
542	2005	oak	113	1.4		240x165	
599	2025	ash	99	0.9		195x190	bark; plus *c*15 inner rings
600	2013	ash	139	0.8		255x210	bark crosses rings; beavers?
607	2032	alder	-	-		205x165	knotty
623	2029	ash	91	0.9		155x140	bark crosses rings; beavers?
661	2047	ash	86	0.7		110x100	bark
695	2061	oak	91	2.1		340x310	
782	2087	alder	-	-		*c*230x155	
810	2032	alder	*c*90	*c*1.9		285x265	

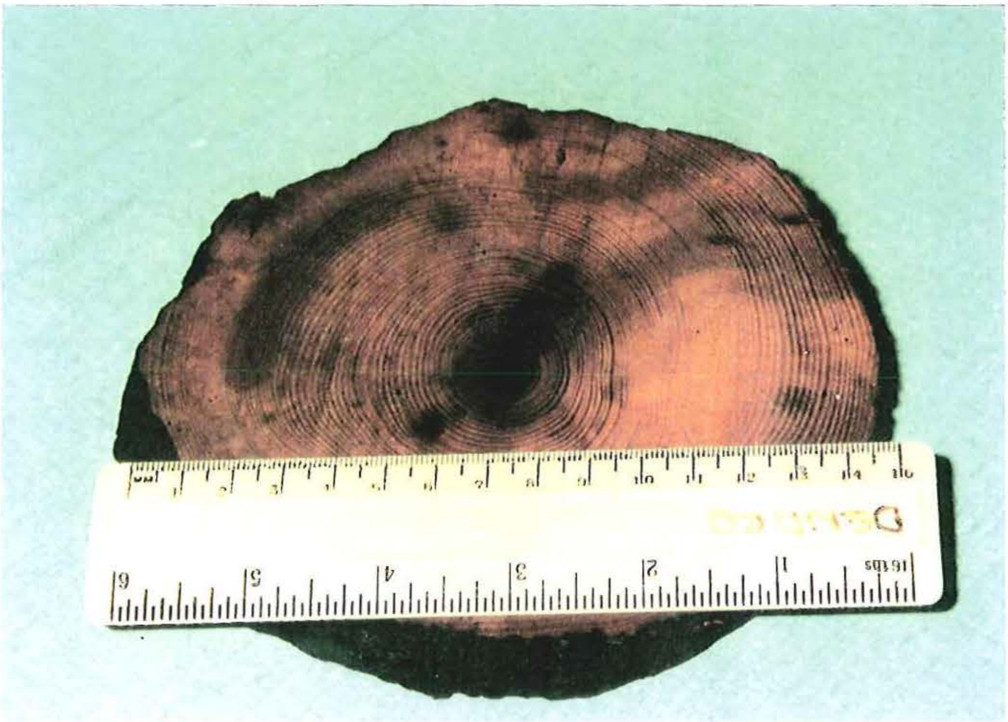

FIGURE 1: Photograph of ash sample 623 (context 2029) showing the bark surface cutting across the growth rings.

FIGURE 2: Close-up of 623.