Centre for Archaeology Report 102/2003

Tree-Ring Analysis of Subfossil Oaks from the Barton Foreshore, Humberside

Nigel Nayling

ISSN 1473-9224

The Centre for Archaeology Report Series incorporates the former Ancient Monuments Laboratory Report Series. Copies of Ancient Monuments Laboratory Reports will continue to be available from the Centre for Archaeology (see back cover for details).

Centre for Archaeology Report 102/2003

Tree-Ring Analysis of Subfossil Oaks from the Barton Foreshore, Humberside

Nigel Nayling

Summary

Four samples from subfossil oaks exposed in the southern foreshore of the Humber Estuary at Barton (immediately east of the Humber Bridge) were measured and their ring sequences compared with each other and previously dated prehistoric sequences from Britain. No significant correlations were identified either within the group of sequences or with external chronologies. It is suggested that the production of well-replicated chronologies from such coastal exposures requires the provision of a substantial number of samples given the effect of additional variables on oak growth such as relative sea level rise.

Keywords

Dendrochronology

Author's address

Lampeter Dendrochronology Laboratory, Heritage and Archaeology Research Practice, University of Wales, Newport, Gwent, Wales, NP9 8JL. Email: n.nayling@lamp.ac.uk

Introduction

This document is a technical archive report on the tree-ring analysis of oak trees from the intertidal zone on the southern shore of the Humber at Barton (NGR TA032236). Only recently has the south shore between the Humber Bridge and Grimsby been highlighted as harbouring similar potential to that of the northern shore at Melton and North Ferriby (Chapman *et al* 2001). The area was surveyed as part of the English Heritage funded Humber Wetlands Project and the results published in Wetland Heritage of the Lincolnshire Marsh (Ellis *et al* 2001). The Barton foreshore lies on the south bank of the Humber immediately east of the Humber Bridge. It also has areas of peat and buried forest exposed at the lowest tides but has received little attention in comparison to the north shore exposures. The samples were taken and supplied by Gavin Thomas and William Fletcher of the Centre for Wetland Research at Hull.

Methodology

Methods employed at the Lampeter Dendrochronology Laboratory follow those described in English Heritage (1998). Details of the methods used for the dating of this building are described below.

The samples provided were frozen for 48 hours and the cross-grain surfaces then cleaned with a 'surform' plane to expose the tree-ring sequences.

The complete sequences of growth rings in the samples that were selected for dating purposes were measured to an accuracy of 0.01mm using a micro-computer based travelling stage (Tyers 1999). Cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. The ring sequences were plotted electronically and exported to a computer graphics software package (Coreldraw™) to enable visual comparisons to be made between sequences at the positions indicated and, where these were satisfactory, new mean sequences were constructed from the synchronised sequences. The *t*-values reported below are derived from the original CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match, although this is with the proviso that high *t*-values at the same relative or absolute position must be obtained from a range of independent sequences, and that satisfactory visual matching supports these positions.

All the measured sequences are compared with each other and any found to cross-match are combined to form a site master curve. These and any remaining unmatched ring sequences are tested against a range of reference chronologies, using the same matching criteria: high *t*-values, replicated values against a range of chronologies at the same position, and satisfactory visual matching. Where such positions are found these provide calendar dates for the ring-sequence.

The tree-ring dates produced by this process initially only date the rings present in the timber. The interpretation of these dates relies upon the nature of the final rings in the sequence. If the sample ends in the heartwood of the original tree, a *terminus post quem (tpq)* for the felling of the tree is indicated by the date of the last ring plus the addition of the minimum expected number of sapwood rings which are missing. This *tpq* may be many decades prior to the real felling date. Where some of the outer sapwood or the heartwood/sapwood boundary survives on the sample, a felling date range can be calculated using the maximum and minimum number of sapwood rings likely to have been present. The sapwood estimates applied throughout this report are a minimum of 10 and maximum of 46 annual rings, where these figures indicate the 95% confidence limits of the range. These figures are applicable to oaks from the British Isles (Tyers 1998). Alternatively, if bark-edge survives, then a felling date can be directly utilised from the date of the last surviving ring. The dates obtained by the technique do not by themselves necessarily indicate the date of the structure from which they are derived. It is necessary to incorporate other specialist evidence concerning the re-use of timbers and the repairs of structures before the dendrochronological dates given here can be reliably interpreted as reflecting the construction date of phases within the structure.

Results

All four samples supplied had sufficient rings to merit measurement. Where possible, multiple radii were measured and raw data files produced from these for each sample. Details of the samples are given in Table 1. No significant correlations were noted between the samples, and comparison with previously dated prehistoric sequences from Britain did not produce any dates.

A notable feature of the samples is their slow growth rates, with three samples having average ring widths of less than 1mm per annum. One sample (**03**) had an unusually large number of apparent sapwood rings (60). This could be a function of post-depositional processes leading to decay of tyloses and discolouration of heartwood close to the true heartwood/sapwood boundary. This feature has been seen by the author in subfossil oak samples recovered from intertidal and subtidal contexts. The lack of absolute dating is disappointing but, given the relatively small number of samples provided, not surprising. The production of well-replicated chronologies from coastal subfossil oaks generally requires a relatively large number of samples as, in addition to hydrological variables associated with bog formation and climate, relative sea level change may be influencing oak growth.

Acknowledgements

The sampling and analysis programme was funded by English Heritage. Gavin Thomas kindly provided information on the study area.

References

Baillie, M G L, and Pilcher, J R, 1973 A simple crossdating program for tree-ring research, *Tree Ring Bulletin*, **33**, 7-14

Chapman, H P, Fletcher, W G, and Thomas, G, 2001 Quantifying the effects of erosion on the archaeology of intertidal environments, *Conservation & Management of Archaeological Sites*, **4**, 233-40

Ellis, S, Fenwick, H, Lillie, M, and Van de Noort, R, (eds) 2001 *Wetland heritage of the Lincolnshire Marsh: an archaeological survey*, Hull, 263-4

English Heritage, 1998 *Dendrochronology: guidelines on producing and interpreting dendrochronological dates*, London

Munro, M A R, 1984 An improved algorithm for crossdating tree-ring series, *Tree Ring Bulletin*, **44**, 17-27

Tyers, I, 1998 *Tree-Ring analysis and wood identification of timbers excavated on the Magistrates Court Site, Kingston upon Hull, East Yorkshire*, ARCUS Rep, **410**

Tyers, I, 1999 *Dendro for Windows program guide 2nd edition*, ARCUS Rep, **500**

Table 1

List of samples

Sample No	Cross-section size (mm)	Cross-section of tree	Species	Total rings	Sapwood rings	ARW mm/year	Date of sequence
01	295 x 180	Whole	Oak	203	-	0.70	Undated
02	330 x 340	Whole	Oak	236	-	1.37	Undated
03	220 x 200	Whole	Oak	180	60+B	0.67	Undated
04	155 x 140	Whole	Oak	91+7h	+?HS	0.84	Undated

Total rings = all measured rings, +value means additional rings were only counted, the felling period column is calculated using these additional rings.
Sapwood rings: ?HS possible heartwood/sapwood boundary, +B = bark-edge
ARW = average ring width of the measured rings