Centre for Archaeology Report 59/2005

Tree-Ring Analysis of Timbers from 3 Queen Street, Colchester, Essex

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ISSN 1473-9224

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Summary

A total of nine samples was collected from the primary timbers of this two-bay timber-framed building. Only three had fifty rings or more, with the maximum number of rings present being fifty-eight. The source trees were fast-growing trees with high year-to-year variation in ring width. None of the samples could be reliably dated.

Keywords

Dendrochronology
Standing Building

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Introduction

Number 3 Queen Street, Colchester (NGR TL 999 251; Fig 1) is a two-bay timber-framed building in the heart of historic Colchester. Whilst awaiting refurbishment and repair, a survey has revealed that the building was formerly double-jettied, possibly with shops in the ground floor and a carriageway through to a rear courtyard. Dendrochronological investigation of the structure was requested by John Neale, the local English Heritage Inspector of Historic Buildings, and subsequently commissioned by English Heritage, to inform grant-aided repairs.

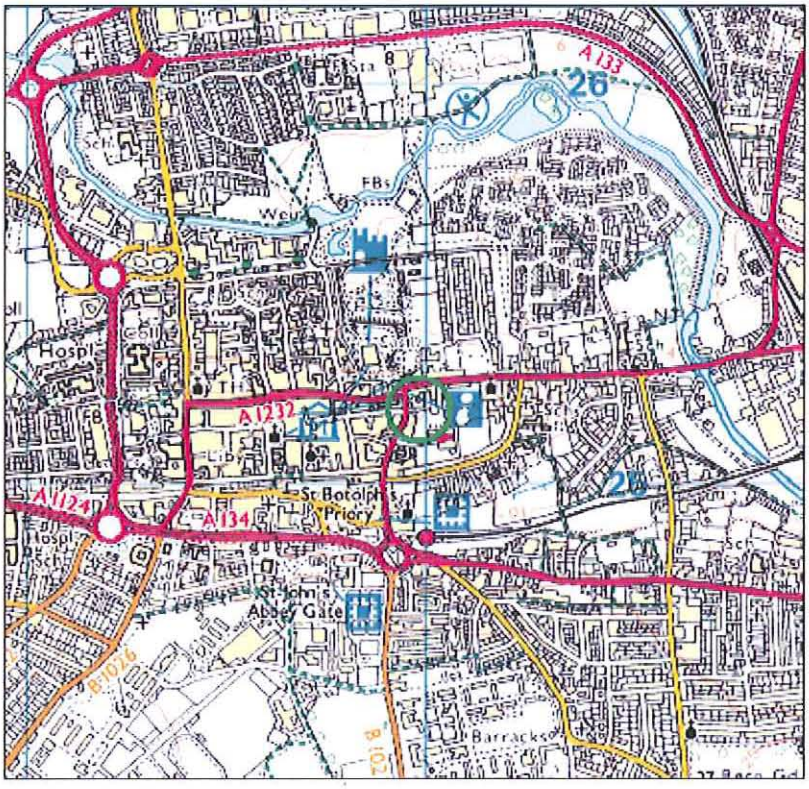

Figure 1: Map showing the location of 3 Queen Street, Colchester, Essex (circled).

Methodology

The site was visited in March 2005. In the initial assessment, accessible oak timbers with more than 50 rings and traces of sapwood were sought. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The approximate locations of the samples are shown on the plan in Figure 2. The cores were glued to wooden laths, labelled, and stored for subsequent analysis.

The cores were prepared for measuring by sanding, using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01, mm using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (1999). Cross-matching and dating was accomplished by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This method provides a measure of quality control in identifying any errors in the measurements when the samples cross-match.

In comparing one sequence or site sequence against another, *t*-values over 3.5 are considered significant, although in reality it is common to find *t*-values of 4 and 5 which are demonstrably spurious because more than one matching position is indicated. For this reason, it is necessary to obtain some *t*-values of 5, 6, and higher, and for these to be well replicated from different, independent chronologies and with local and regional chronologies well represented, unless the timber is imported. Where two individual sequences match with a *t*-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they most likely came from the same parent tree.

When cross-matching between samples is found, their ring-width sequences are averaged to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence is established. This is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the measured rings in each sample. These dates require interpretation for the construction date of the phase under investigation to be determined. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. The sapwood estimates used here are based on those proposed for this area by Miles (1997), in which 95% of oaks contain 9–41 rings. Where complete sapwood or bark is present, the exact date of tree felling may be determined.

Any dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

Results and Discussion

All of the samples taken were of oak (*Quercus* spp.). The material was considered borderline on assessment because of the lack of rings, but nevertheless it was felt after on-site discussion that any timber that looked as if it might just have sufficient rings should be sampled.

Details of the locations of the samples are given, along with other information in Table 1, and those from the east wall are illustrated in Figure 2, with a further sample location illustrated in Figure 3. Five samples were found to have insufficient rings for further analysis. Four samples were prepared and had their ring-width series measured. The longest series was only fifty-eight years long, with two series reaching fifty years and one only forty-six years long. The timbers were found to be from fast-grown trees, and exhibited relatively high year-to-year variation in ring width (Fig 4). The series did not match each other, nor did they give acceptable results when compared with the dated reference material, and they remain undated. The use of these fast-grown timbers is fairly typical of secular buildings in this part of Essex during the late medieval period. Further sampling at this site would not be likely to increase the chances of obtaining a date.

Table 1: Details of oak (*Quercus* spp.) timbers sampled from 3 Queen Street, Colchester

Sample Number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Sapwood complement
QSC01	Rear post, east wall	46	2.63	0.29	H/S +10NM
QSC02	North upper wallplate, east wall	<45	NM	-	present
QSC03	Mid-rail, east wall	<45	NM	-	present
QSC04	South upper wallplate, east wall	50	2.42	0.26	H/S
QSC05	South frame of east arch	<45	NM	-	present
QSC06	Upper plate, west (front) wall	50	2.89	0.29	H/S
QSC07	North-east corner post	58	2.34	0.32	H/S
QSC08	Central post, north carriageway	<45	NM	-	present
QSC09	Main north-south floor beam	<45	NM	-	present

Key: H/S = heartwood/sapwood boundary - last heartwood ring date; NM = not measured; mean sens = mean sensitivity.

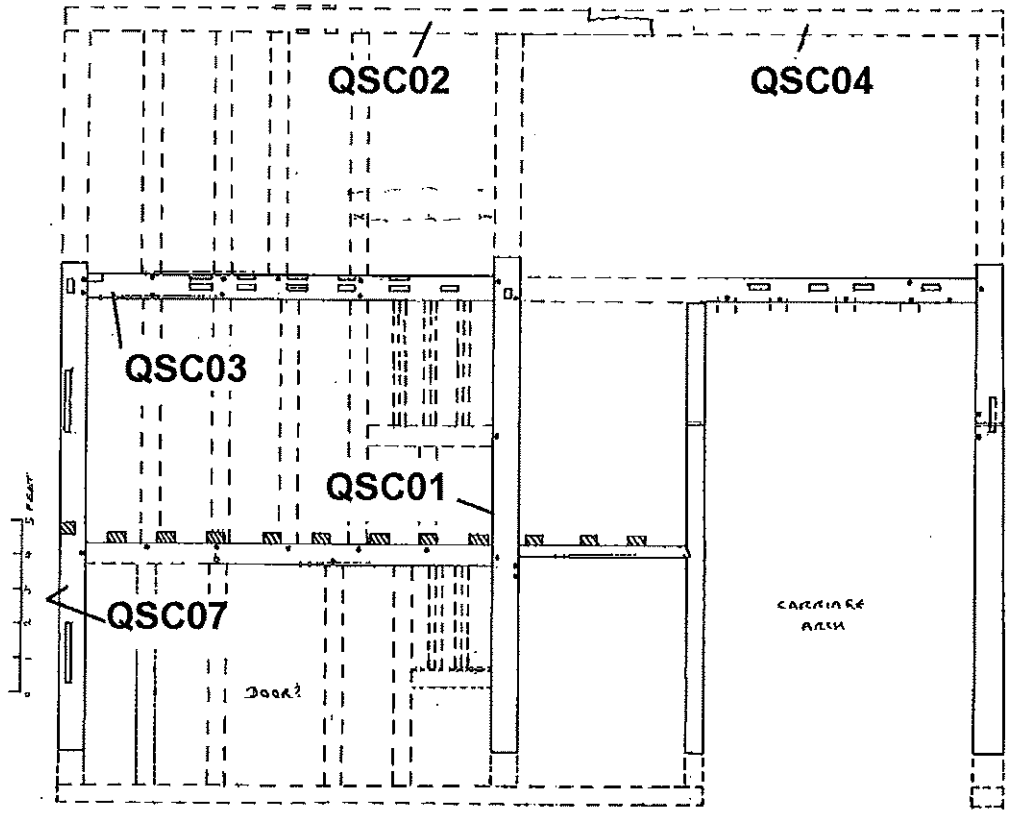

Figure 2: Drawing of the rear (east) wall of the property showing the approximate locations of some of samples taken for dendrochronology. The upper wallplates are shown in dotted lines because they have been lowered from their original position. Adapted from an original drawing by R Shackle

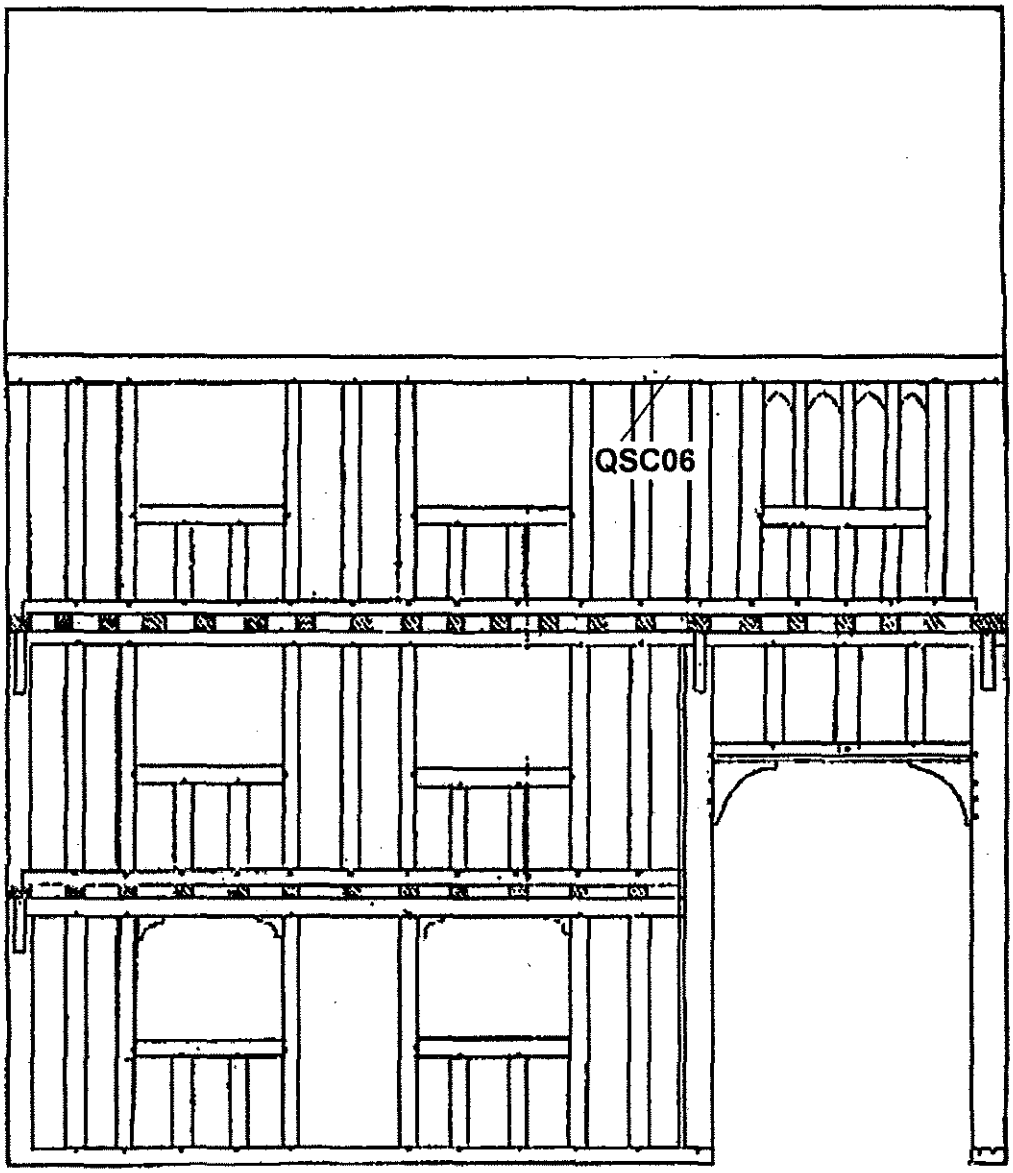

Figure 3: Drawing of the front (west) wall of the property showing the approximate location of a sample taken for dendrochronology. Adapted from an original drawing by R Shackle

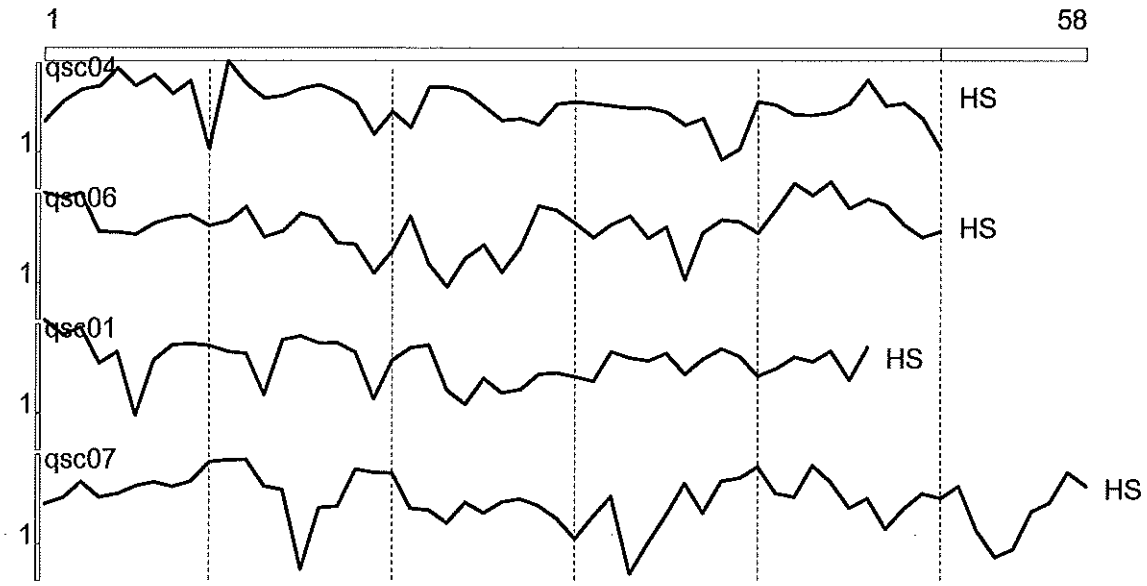

Figure 4: Plots of the four longest sequences showing the relatively high year-to-year variation in ring width of these fast-grown trees. The y-axis is ring width in mm on a logarithmic scale

Acknowledgements

I thank the staff of the local tourist information office (the keyholders) for allowing access and the use of their washing facilities. Richard Shackle introduced me to the building and supplied the drawings used as a basis for recording the positions of sampling. I would like to thank Cathy Groves (Sheffield University) and John Meadows (English Heritage), who both made useful comments on an earlier draft of this report.

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