Ancient Monuments Laboratory
Report 26/96

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Summary

Dendrochronological analysis of a group of timbers from St Aylotts, a building that was probably a hunting lodge belonging to the abbey of Saffron Walden, has provided a felling date of AD 1500/ 1 for several of the first-floor storey posts.

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TREE-RING ANALYSIS OF TIMBERS FROM ST AYLOTTS, NEAR SAFFRON WALDEN, ESSEX

Introduction

The purpose of the study was to carry out dendrochronological analyses of timbers from a building known as St Aylotts, located around two miles north-east of Saffron Walden (NGR TL570399). The building originally belonged to the abbey of Saffron Walden. The high quality craftsmanship and the high decorative level within has led to the assumption that it was for the abbey's own use rather than for renting. The building has recently changed hands and undergone extensive restoration. The Royal Commission on Historical Monuments in England (RCHME) has undertaken a detailed survey of the building and English Heritage (EH) have funded part of the restoration. The dendrochronological assessment of the building was funded by RCHME, whilst the sampling and analysis reported here was funded by EH.

Methodology

The majority of the visible timbers were suitable for analysis: they were oak (*Quercus* spp.), included plenty of rings, most included sapwood, and in some cases bark survived. A decision was taken to concentrate initially on a single element type and attempt to obtain a broad date for the structure from the first phase of analysis. The storey posts were readily accessible from the inside, and looked suitable for analysis. Five of them were sampled using 15mm diameter corers attached to an electric drill. The cores were taken so as to maximise the number of rings within them. The ring sequences were revealed by sanding.

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. The ring sequences were plotted onto semi-log graph paper to enable visual comparisons to be made between sequences. In addition cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. These positions were checked using the graphs 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 these positions are supported by satisfactory visual matching.

All the measured sequences from this assemblage were compared with each other and those that were found to cross-match were combined to form a site master curve. This master curve was then 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 a calendar date for the ring-sequence.

These tree-ring dates can initially only date the rings present in the timber. Their interpretation 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 that may be 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. Alternatively, if bark-edge survives, then a felling date can be directly utilised from the date of the last surviving ring. The sapwood estimates applied through-out this report are a minimum of 10 and maximum of 55 annual rings, where these figures indicate the 95% confidence limits of the range. These figures are applicable to oaks from the British Isles (Hillam *et al* 1987). 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 reuse 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

The five samples obtained were oak (*Quercus* spp.). Four of these timbers proved to be suitable measurement. Sample **4**, although including enough rings, contained a highly compressed sequence within which individual rings could not be resolved. Consequently no further analysis could be undertaken with this sample (Table 1).

The measured sequences were compared with each other. During sampling and measurement it was noted that the material was remarkably diverse. Poor quality intra-assemblage cross-matching appeared to support this view (Table 2). This diversity presumably reflects the mechanism of timber supplies to the abbey. It seems unlikely on the basis of the cross-matching that the sampled timbers are derived from a single woodland area. The timbers were dated individually against independent reference chronologies. These and the subsequently produced master curve (Figure 1), were found to match to an extensive range of chronologies (Table 3). The site master chronology STAYLOTT, dated from AD 1281 to AD 1500 inclusive, is listed in Table 4.

Interpretation

Samples **2** and **3** have bark-edge and the outermost sapwood ring of both is dated to AD 1500. Both included a complete, or nearly complete, ring for AD 1500, suggesting that they were felled in late AD 1500 or in early AD 1501. Sample **1**, ending at the heartwood/sapwood boundary, is dated AD 1472 and sample **5** with 16 sapwood rings is dated to AD 1483. The results from these two timbers are entirely compatible with the date obtained from samples **2** and **3**. A date of felling of AD 1500/1 is therefore indicated by all the samples.

If the material was used green, which appears to be normal practice (Rackham 1990, 69), this interpretation indicates construction of the building in AD 1500/1, shortly after felling.

Discussion

The five samples taken from the storey posts were originally intended to be the first phase of a fairly detailed sampling programme, since past experience has shown that for most buildings in Essex extensive sampling is required to yield useful dendrochronological results. In the event, these samples produced a replicated felling date and the detailed structural survey concluded that only a single phase of construction was present (J Heward pers comm). The original plan to sample the roof elements and the attic floorboards has therefore been abandoned.

The provision of a construction date for this structure greatly assists vernacular studies in both Essex, and more widely in England, since the building has many important examples of early building materials and decorative features. These have now been provided with a precise date that may assist attempts to phase the typological development of such features.

Somewhat unusually for a building in Essex, St Aylotts has a surfeit of timbers suitable for analysis. However since it is an ecclesiastical property there are aspects of its construction that are different from the mainstream of Essex timber buildings of this period. It may be expected, for example, that the abbey obtained many of the timbers by gift from other landowners. Some diversity of tree-types may therefore be expected. There are still extant records from the abbey that may help to illuminate this aspect of its construction.

Conclusion

Analysis of timbers from St Aylotts demonstrates that a number of the principal structural timbers were felled in AD 1500/1. When combined with the results of the structural survey it is evident that this date is almost certainly a reflection of the construction date of the property.

Acknowledgements

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Figure 1

Bar diagram showing relative positions of the dated sequences

White bars - heartwood rings; hatched bars -sapwood rings; HS heartwood/sapwood boundary; B - bark-edge

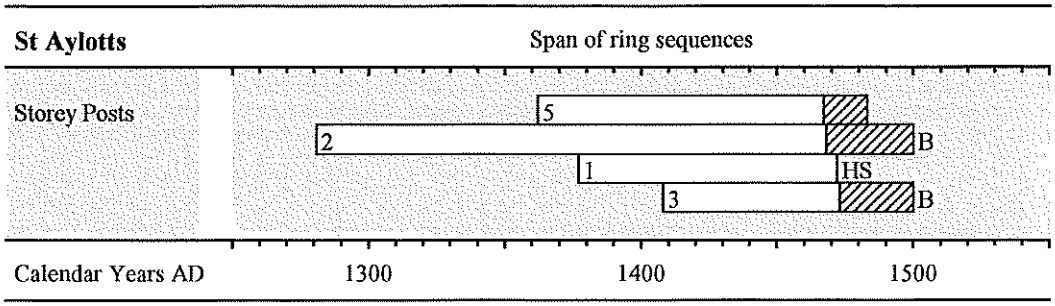

Table 1

List of samples.

Core	Origin of core	Analysis undertaken	Wood type	Total Rings	Sap Rings	mm/year	Result	Date of sequence
1	Truss 2 West Storey post	Tree-ring sequence measured	Oak	96	0	1.84	Dated	AD1377 - AD1472
2	Truss 3 West Storey post	Tree-ring sequence measured	Oak	220	32	0.81	Dated	AD1281 - AD1500
3	Truss 6 East Storey post	Tree-ring sequence measured	Oak	93	27	1.69	Dated	AD1408 - AD1500
4	Truss 7 East Storey post	Species Identification only	Oak				-	-
5	Truss 8 West Storey post	Tree-ring sequence measured	Oak	122	16	1.53	Dated	AD1362 - AD1483

Table 2

Correlation between the dated material from St Aylotts. (- = t-value below 3.0)

		t-values	
sample		**samples**	
	2	*3*	*5*
1	3.7	-	4.4
2		-	-
3			-

Table 3

Dating of the master curve and the individual samples from St Aylotts, Essex. *t*-values with dated reference chronologies. All the reference curves are independent. (- = t-value below 3.0)

Area	**Reference chronology**	***t*-values for sequence**				
		mean	*1*	*2*	*3*	*5*
Essex	Essex chronology 2 (Tyers unpubl)	7.4	4.6	6.6	3.4	3.6
Hereford	Widemarsh St Hereford (Tyers 1996)	5.9	3.7	4.7	-	3.1
Kent	Halden Church (Bridge pers comm)	5.5	4.1	5.7	-	-
	Kent Master (Laxton and Litton 1989)	5.0	3.6	4.7	4.8	-
London	Sutton House (Tyers 1991)	6.1	5.3	5.8	-	-
	Southwark medieval chronology (Tyers unpubl)	6.3	-	5.9	3.1	-
Northants	Brixworth (Hillam pers comm)	6.7	3.9	-	-	3.5
Somerset	Lancin Farmhouse (Tyers 1994)	6.4	3.6	4.7	4.8	-

Table 4

Ring-width data of the site master curve, STAYLOTT, dated AD 1281 - AD 1500 inclusive

year	ring widths (0.01mm)										number of trees per year									
AD 1281	243	379	237	199	300	256	216	203	235	207	1	1	1	1	1	1	1	1	1	1
	225	256	189	104	128	118	108	115	111	177	1	1	1	1	1	1	1	1	1	1
AD 1301	114	108	97	101	93	113	125	199	196	137	1	1	1	1	1	1	1	1	1	1
	102	131	78	122	176	199	136	84	82	116	1	1	1	1	1	1	1	1	1	1
	122	108	93	77	66	62	73	96	129	71	1	1	1	1	1	1	1	1	1	1
	65	50	58	75	84	102	68	81	86	94	1	1	1	1	1	1	1	1	1	1
	79	85	63	59	75	83	85	69	81	84	1	1	1	1	1	1	1	1	1	1
AD 1351	138	107	101	88	59	63	63	62	44	47	1	1	1	1	1	1	1	1	1	1
	41	189	231	212	179	166	155	122	133	147	1	2	2	2	2	2	2	2	2	2
	81	66	64	72	82	80	147	212	273	245	2	2	2	2	2	2	3	3	3	3
	211	247	208	150	190	229	234	194	169	136	3	3	3	3	3	3	3	3	3	3
	99	88	101	79	72	133	155	215	179	111	3	3	3	3	3	3	3	3	3	3
AD 1401	101	165	145	197	161	186	171	184	170	153	3	3	3	3	3	3	3	4	4	4
	145	150	150	137	102	99	116	130	116	154	4	4	4	4	4	4	4	4	4	4
	151	136	193	180	177	198	190	190	186	221	4	4	4	4	4	4	4	4	4	4
	196	213	147	117	119	124	143	117	106	122	4	4	4	4	4	4	4	4	4	4
	125	144	139	140	120	120	120	120	128	115	4	4	4	4	4	4	4	4	4	4
AD 1451	128	104	122	175	159	153	134	101	91	105	4	4	4	4	4	4	4	4	4	4
	114	143	159	108	125	118	101	115	95	106	4	4	4	4	4	4	4	4	4	4
	110	108	82	82	86	70	68	67	77	77	4	4	3	3	3	3	3	3	3	3
	81	77	77	80	80	84	91	81	72	81	3	3	3	2	2	2	2	2	2	2
	86	78	72	83	69	86	72	55	55	50	2	2	2	2	2	2	2	2	2	2