RESEARCH REPORT SERIES no. 54-2013

THE BAILIFF'S COTTAGE, ST OSYTH'S PRIORY, BURN ROAD, ST OSYTH, ESSEX
TREE-RING ANALYSIS OF TIMBERS FROM THE ROOF

SCIENTIFIC DATING REPORT

Martin Bridge

INTERVENTION AND ANALYSIS

ENGLISH HERITAGE

This report has been prepared for use on the internet and the images within it have been down-sampled to optimise downloading and printing speeds.

Please note that as a result of this down-sampling the images are not of the highest quality and some of the fine detail may be lost. Any person wishing to obtain a high resolution copy of this report should refer to the ordering information on the following page.

Research Report Series 54-2013

THE BAILIFF'S COTTAGE, ST OSYTH'S PRIORY, BURN ROAD, ST OSYTH, ESSEX

TREE-RING ANALYSIS OF TIMBERS FROM THE ROOF

Martin Bridge

NGR: TM 12061 15720

ISSN 2046-9799 (Print)
ISSN 2046-9802 (Online)

The Research Report Series incorporates reports by the expert teams within the Investigation & Analysis Division of the Heritage Protection Department of English Heritage, alongside contributions from other parts of the organisation. It replaces the former Centre for Archaeology Reports Series, the Archaeological Investigation Report Series, the Architectural Investigation Report Series, and the Research Department Report Series.

Many of the Research Reports are of an interim nature and serve to make available the results of specialist investigations in advance of full publication. They are not usually subject to external refereeing, and their conclusions may sometimes have to be modified in the light of information not available at the time of the investigation. Where no final project report is available, readers must consult the author before citing these reports in any publication. Opinions expressed in Research Reports are those of the author(s) and are not necessarily those of English Heritage.

Requests for further hard copies, after the initial print run, can be made by emailing:
Res.reports@english-heritage.org.uk
or by writing to:
English Heritage, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD
Please note that a charge will be made to cover printing and postage.

SUMMARY
This roof of 22 trusses is scissor-braced with notched lap joints and shows many features characteristic of thirteenth-century roofs, in particular with those at Gloucester Blackfriars. Eleven timbers dated, of which two were found to have been cut from the same tree. The empirically derived likely date range for the felling of the group of timbers used for construction of the roof is AD 1277–1309. A Bayesian derived *combined felling date range* for all eleven timbers is *AD 1284–92 (95% probability)*. It is most likely that the trees were used very soon after felling in this relatively humble building. This dates the probable construction of the roof some decades later than the similarly-styled Gloucester Blackfriars roof.

CONTRIBUTOR
Martin Bridge

ACKNOWLEDGEMENTS
I would like to thank Dr David Andrews of Essex County Council for his unpublished report and drawings of this site, and for drawing my attention to the parallels with the various roofs at Gloucester Blackfriars. The owner, Richard Sargeant, was most helpful in allowing access and supplying lighting, scaffold access, and electricity. This work was commissioned by the English Heritage Scientific Dating Team. I would like to thank various members of this team, past and present, specifically John Meadows, Peter Marshall, and Cathy Tyers for useful comments on an earlier draft of this report.

ARCHIVE LOCATION
Essex Historic Environment Record
Historic Environment
Environment and Commerce
County Hall
Chelmsford
Essex
CM1 1QH

DATE OF INVESTIGATION
2007

CONTACT DETAILS
Institute of Archaeology
University College London
31–34 Gordon Square
London
WC1H 0PY
Tel: 020 7679 1540
Email: martin.bridge@ucl.ac.uk

CONTENTS

INTRODUCTION

St Osyth's Priory (Figs 1 and 2) was an Augustinian house founded in AD 1128, and dissolved in AD 1539 (Andrews 2006). The Bailiff's Cottage forms one of a complex and relatively little-studied diverse group of buildings in the parkland surrounding the old priory buildings (Fig 1) which were converted into a Tudor mansion by Lord Darcy. It is at the northern end of a range of functional buildings, itself placed to the south-west of the main house.

Refurbishment during 2006 involved the removal of a plasterboard ceiling in the cottage, revealing a timber roof with thirteenth-century characteristics, consisting of 22 scissor-braced rafter couples set approximately 350mm apart (Fig 3) The timbers are oak (*Quercus* spp), of slight scantling, and appear to be mostly quarter trees retaining some sapwood, or at least the heartwood-sapwood boundary. There is a single wall plate located centrally beneath the middle of the sole pieces. The collars are tenoned to the rafters, but the braces have notched lap joints at the lower ends, and a bare-faced dovetail at their upper ends, the rafters being halved at their apex. The upper parts of the rafter couples, above the ashlar pieces, are lightly smoke blackened.

The roof is largely as built, although there is evidence of some timber replacement at the bottoms of some trusses where the walls have been rebuilt. At the south end, the end truss is of two plain timbers of later origin, whilst the penultimate truss is made of two re-used rafters from a scissor-braced truss turned round and inverted. This unusual arrangement of trusses at the southern end suggests that the roof may have originally been longer, and was truncated on the construction of the building to the south (Andrews 2006). The use of lap joints without 'refined entry' and the general arrangement of the roof suggest an early date, and it is in many ways comparable to the roofs at Gloucester Blackfriars, described in detail elsewhere (Rackham *et al* 1978) one of which has been tree-ring dated to AD 1230–69 (Hillam and Groves 1993).

Tree-ring dating was requested by Debbie Priddy, English Heritage Inspector of Ancient Monuments, in order to inform urgent repairs to this Building at Risk.

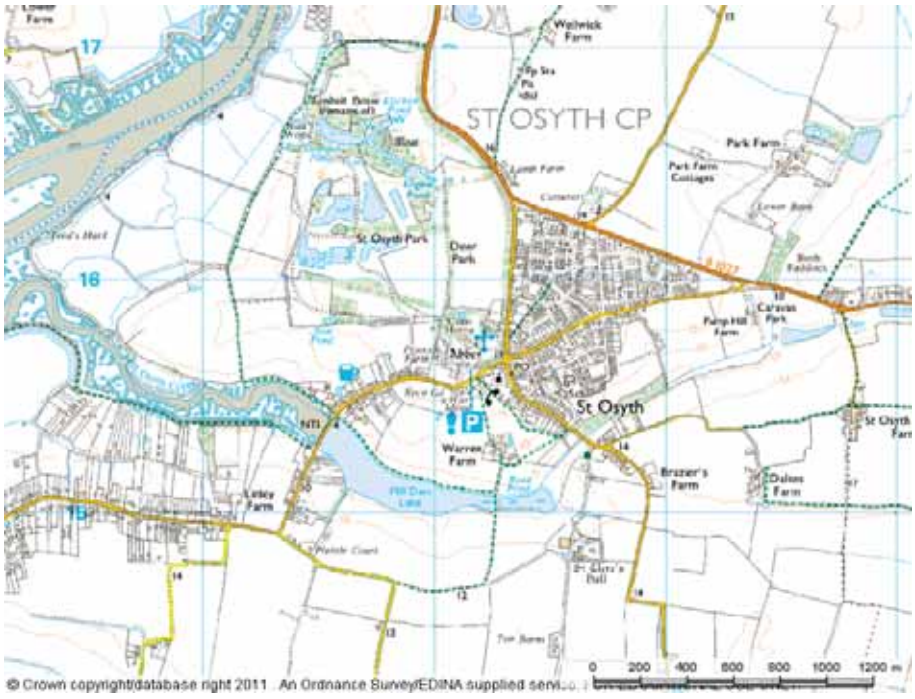

Figure 1: Map showing the general location of the Bailiff's Cottage, St Osyth's Priory. © Crown Copyright and database right 2013. All rights reserved. Ordnance Survey Licence number 100024900

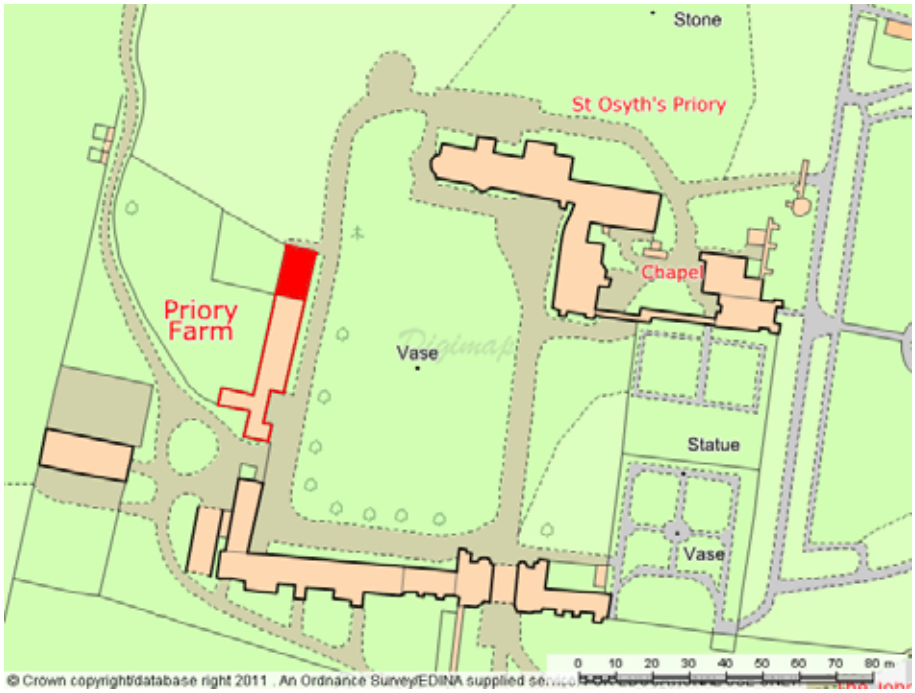

Figure 2: Map showing the position of Bailiff's Cottage (in red) within St Osyth's Priory. © Crown Copyright and database right 2013. All rights reserved. Ordnance Survey Licence number 100024900

METHODOLOGY

The site was visited in October 2006. In the initial assessment, accessible oak timbers with more than 50 rings and traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis. On a further visit to the site, a number of *ex situ* roof timbers, removed during the course of the repairs, were extracted from a skip and were sectioned for further analysis.

The samples 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 0.01mm, 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 (2004). 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 empirical sapwood estimate (95% confidence interval) used here of 9–41 rings is based on that proposed for this area by Miles (1997). Where complete sapwood or bark is present, the exact date of tree felling may be determined.

An alternative method of estimating felling date ranges has been developed (Miles 2005) which runs as a function implemented in OxCal (Bronk Ramsey 2009; Miles 2006). Following the methodology set out by Millard (2002), Bayesian statistical models are used to produce individual sapwood estimates for samples using the variables of number of heartwood rings present, the mean ring width of those heartwood rings, the heartwood/sapwood boundary date, and the number of any surviving sapwood rings or a count of those lost in sampling. These individual probability distributions for the felling dates (expressed at the 95% probability level), may then be combined to produce a highest probability density estimate for the *combined felling date range*. When carried out within OxCal, this uses a sapwood model that has to be defined. Miles (2005) suggested several such models, of which the one that applies to the timbers in this case is that for 'post-Roman mainland Britain'. This model is based on timbers from throughout Britain, with a bias to those in the most densely-dated counties of Shropshire, Somerset, Hampshire, Oxfordshire, and Kent, and is thought appropriate for these Essex timbers.

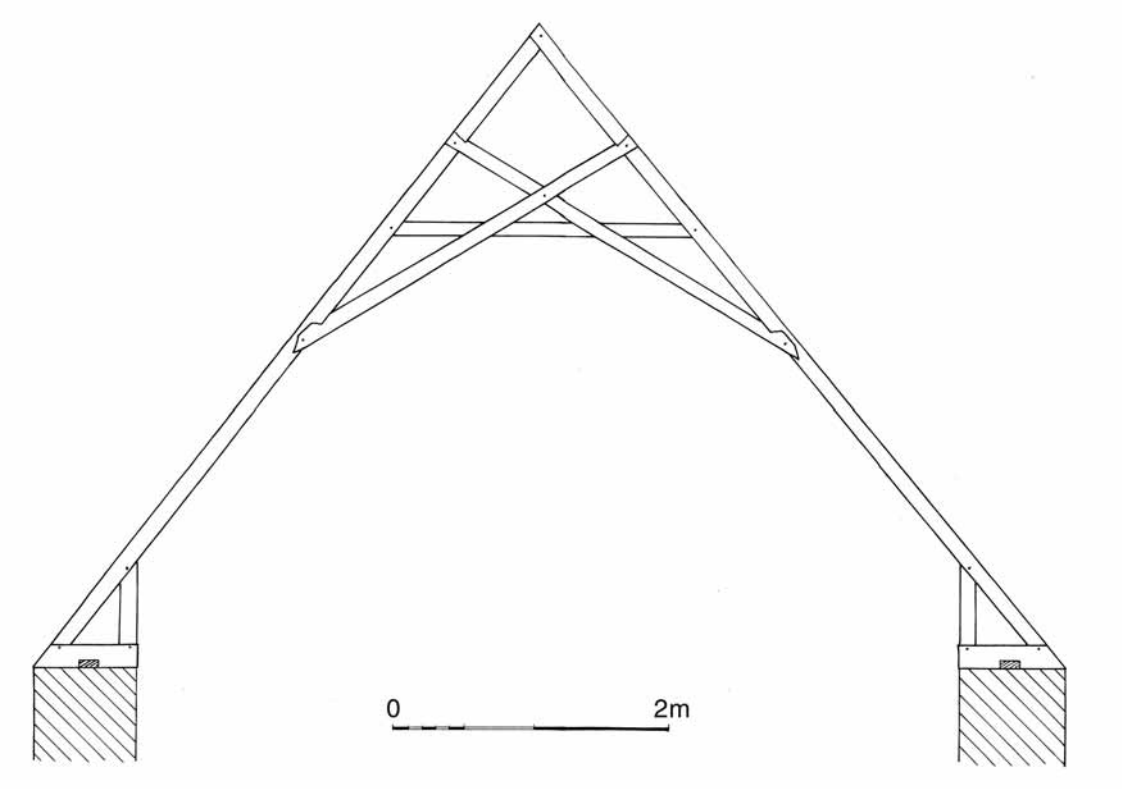

Figure 3: Section drawing of a typical scissor-braced truss from Bailiff's Cottage, St Osyth, based on an original by Dr David Andrews (Essex County Council)

RESULTS AND INTERPRETATION

All timbers sampled were of oak (*Quercus* spp). Details of the samples are given in Table 1. Most of the timbers were quartered trees which meant that despite their small scantling, they contained reasonable numbers of rings. Sample bso03 contained only 41 rings and was not included in further analysis. Amongst the remaining series, two (bso01 and bso09), were found to match each other very well (t = 11.3 with 59 years overlap), and visual comparison of the plots of these two series strongly suggested they had been cut from the same tree. These two series were therefore combined into a single-tree series, bso0109m, for further analysis. Cross-matching between this series and the remaining dated series is shown in Table 2. The data are presented in the Appendix.

Ten ring-width series, representing 11 timbers, were combined into a single-site chronology, STOSYTBC, which was subsequently dated by comparison to a database of dated series, the best results being shown in Table 3. Figure 4 illustrates the derived dating of each sample relative to the others and shows their likely felling date ranges based on an empirical sapwood estimate. In the case of the two combined series, 01 and 09, the latest sapwood date was used to ensure the maximum spread of dates calculated for likely felling. The mean heartwood-sapwood transition date for the ten series, representing 11 timbers, is AD 1268, giving a likely felling date range for the group of AD 1277–1309.

This group of timbers appears to be an ideal candidate for the application of the Bayesian modelling technique, being a group of timbers likely to have all been felled at the same time, and with none of the timbers showing unusual characteristics. They are also within the geographical range of the data used to create the sapwood model used within OxCal (Mainland Britain post-Roman), developed by Miles (2005), and being composed of young relatively fast-grown timbers are more likely to give accurate results (Tyers 2008).

OxCal v4.1 (Bronk Ramsey 2011) was used to produce the sapwood estimates for each of the ten tree series in the site chronology (Table 1; Fig 5). As the group had similar individual sapwood ranges a Bayesian approach to combining individual sapwood estimates following the methodology of Millard (2002), was used to derive the likely combined felling date range (Fig 5). The combined index agreement for this group (Acomb148%, A 22.4%, n=10), shows this to be a coherent group.

This methodology derives a *posterior density estimate* for the *combined felling date range* of *AD 1284–1292 (at 95.4% probability)*, when using all ten tree series and construction is assumed to have taken place within months of the trees being felling. It should be noted that this *posterior density estimate* may vary if a different combination of samples was used, but there is no reason in this case to reject any of the samples.

DISCUSSION

The 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 reuse of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965; Miles 2005).

The use of timber and the general construction of this roof show many parallels with the roofs of Gloucester Blackfriars, described by Rackham *et al* (1978). The *combined felling date range* estimate (*AD 1284–92*) is, however, several decades later than the dendrochronological date for the roof of the south range at Gloucester Blackfriars (AD 1230–69).

The cross-matching of the site series suggests that the timber was likely to have been sourced fairly locally, although it is interesting to note that, as has been found on several occasions previously, the tree rings from this monastic site date best against other monastic and ecclesiastical ring series.

Table 1: Details of oak (Quercus spp) timbers sampled from the roof of Bailiff's Cottage, St Osyth, Essex. Trusses are numbered from the south end of the roof

Sample Number	Timber and position	No of heartwood rings	Mean heartwood ring width (mm)	H/S boundary (AD)	No of sapwood rings	Dates spanning (AD)	Mean sensitivity	Empirical felling date ranges (AD) (95% confidence)	*OxCal-derived felling date range (95% probability)*
bso01	West rafter, truss 2	71	1.93	1273	2	1203–75	0.31	1282–1314	*1282–1308*
bso02	West rafter, truss 4	79	1.77	1270	0	1192–1270	0.28	1279–1311	*1279–1307*
bso03	West rafter, truss 5	36	2.48	-	5	undated	0.31	unknown	-
bso04	East rafter, truss 8	47	3.13	1273	0	1227–73	0,38	1282–1314	*1281–1303*
bso05	South brace, truss 6	55	1.53	1263	2	1209–65	0,26	1272–1304	*1273–1300*
bso06	West rafter, truss 11	76	1.84	1265	0	1190–1265	0.30	1274–1306	*1274–1301*
bso07	East rafter, truss 14	78	1.41	1265	1	1188–1266	0.31	1274–1306	*1275–1304*
bso08	East rafter, truss 15	62	1.77	1261	0	1200–61	0.22	1270–1302	*1270–1297*
bso09	East rafter, truss 13	57	1.82	1269	2	1213–71	0.29	1278–1310	*1278–1304*
bso10	East sole piece, truss 13	55	1.44	1274	0	1220–74	0.36	1283–1315	*1284–1312*
bso11	West rafter, truss 21	67	1.99	1271	1	1205–72	0.35	1280–1312	*1280–1306*
bso12	West rafter, truss 17	65	1.95	1269	0	1205–69	0.29	1278–1310	*1278–1304*
bso0109m	Samples bso01 and bso09	71	1.85	1273	2	1203–75	0.30	1282–1314	*1282–1309*

Table 2: Cross-matching between dated samples from the roof of Bailiff's Cottage, St Osyth, Essex

	t-values								
SAMPLE	bso02	bso04	bso05	bso06	bso07	bso08	bso10	bso11	bs012
bso0109m	4.2	5.9	6.3	5.8	7.0	7.9	4.0	6.4	6.5
bso02		3.6	5.5	5.4	2.8	4.3	4.4	5.5	6.7
bso04			5.7	5.1	4.3	3.9	6.3	5.3	6.4
bso05				6.0	6.2	4.2	6.9	4.4	6.8
bso06					6.2	6.0	7.2	7.9	5.9
bso07						4.7	4.9	4.4	4.8
bso08							3.0	5.4	6.6
bso10								5.5	5.4
bso11									6.4

Table 3: Dating evidence for the site chronology STOSYTBC AD 1188–1275 (regional multi-site chronologies have the file name in bold)

County/ region:	Chronology name:	Reference:	File name:	Spanning: (years AD)	Overlap (years)	*t*-value
Gloucestershire	Winterborne Tithe Barn	Miles and Worthington 2000	WNTERBR1	1187–1316	88	7.2
Hertfordshire	Wymondleybury	Groves *et al* 2005	WYMNDBRY	1184–1379	88	6.7
Suffolk §	Abbas Hall, Great Cornard	Bridge 2000	ABBAS1	1150–1289	88	6.6
East Anglia	East Anglia Master Chronology	Bridge 2003	ANGLIA03	944–1789	88	6.4
Hertfordshire	Presbytery Roof, Abbey Church, St Albans	Howard *et al* 2001	STACSQ01	1151–1263	76	6.2
Somerset	Wells Cathedral, Chapel	Miles *et al* 2003	WLSC0203	1169–1325	88	6.1
London	London Master Chronology	Tyers pers comm	**LONDON**	413–1728	88	6.0
Southern England	Southern England Master	Bridge 1988	**SENGLAND**	1083–1589	88	5.8
Kent	Brookland Bell Tower	Miles and Bridge 2010	BRKLND1	1064-1251	64	5.7
Bedfordshire	Chicksands Priory	Howard *et al* 1998	CHKSPQ01	1200–1541	88	5.7
Kent	Kent Master Chronology	Laxton and Litton 1989	**KENT88**	1158–1540	88	5.6
Devon	Bury Barton, Lapford	Groves 2005	LFBB-T16	1132–1323	88	5.5

§ = component of ANGLIA03

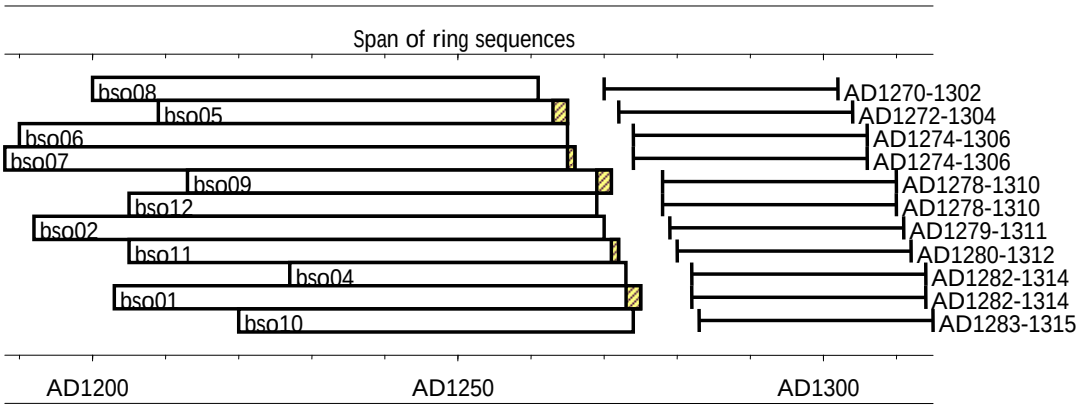

Figure 4: Bar diagram showing the relative positions of overlap of the dated sequences and their empirically-derived individual felling date ranges. White bar is heartwood, yellow hatched bar is sapwood

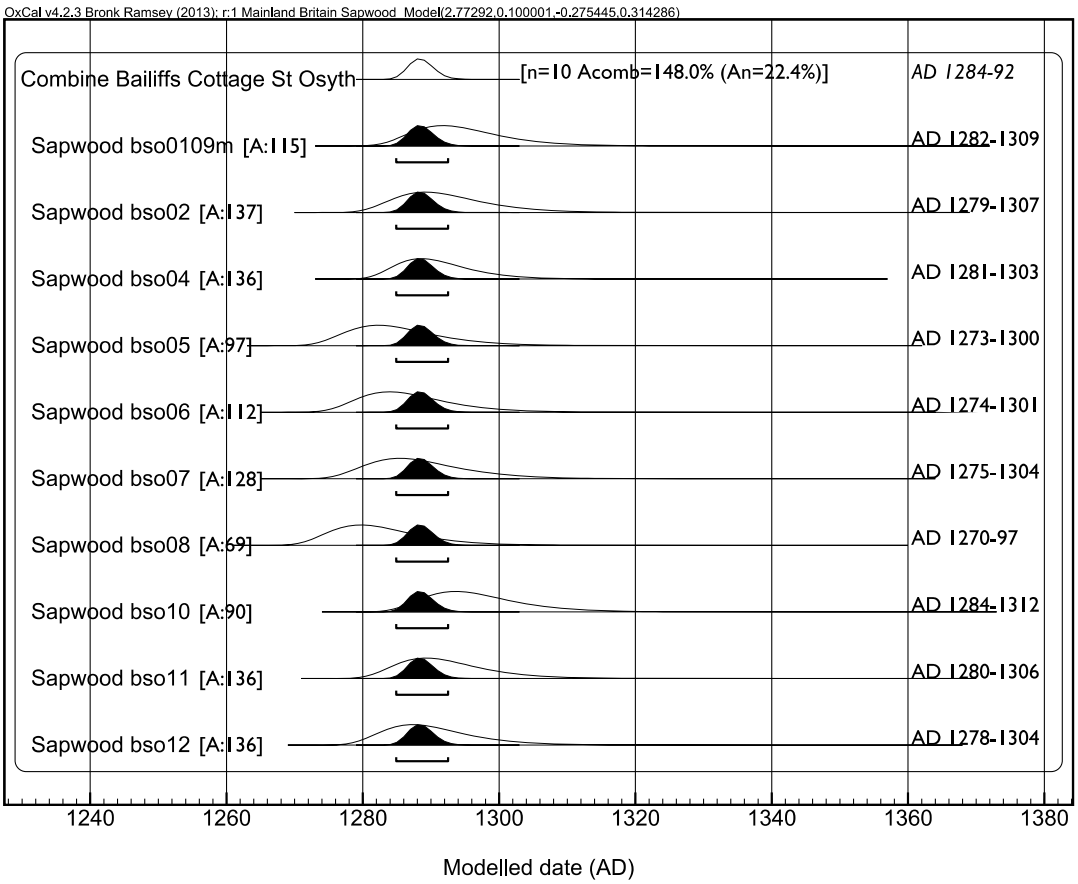

Figure 5: Bailiff's Cottage, St Osyth, Essex: combined felling date range and individual felling date distributions for timbers from the roof. Individual felling date distributions are shown in grey and the 95.4% probability individual felling dates ranges are listed. The 95.4% probability combined felling date range is shown in black and in italic text

BIBLIOGRAPHY

Andrews, D, 2006 St. *Osyth's Priory, the roof of the Bailiff's Cottage*, unpubl report, Essex County Council

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

Bridge, M C, 1988 The dendrochronological dating of buildings in southern England, *Medieval Archaeol*, **32**, 166–74

Bridge, M C, 2000 *Tree-ring analysis of timbers from Abbas Hall, Great Cornard, Suffolk*, Anc Mon Lab Rep, **35/2000**

Bridge, M C, 2003 Compilation of master chronologies from East Anglia, unpubl computer file ANGLIA03, University College London Dendrochronology Laboratory

Bronk Ramsey, C, 2009 Bayesian analysis of radiocarbon dates, *Radiocarbon*, **51**, 337–60

Bronk Ramsey, C, 2011 OxCal version 4.1, interface build 62, c14.arch.ox.ac/oxcal.html

Groves, C, 2005 *Dendrochronological Research in Devon: Phase I*, Centre for Archaeol Rep, **56/2005**

Groves, C, Locatelli, C, and Bridge, M, 2005 *Tree-ring analysis of oak timbers from Wymondleybury, Little Wymondley, Hertfordshire*, Centre for Archaeol Rep, **14/2005**

Hillam, J, and Groves, C, 1993 *Tree-ring analysis of oak timbers from the south range roof of the Blackfriars Priory, Gloucester, Gloucestershire*, Anc Mon Lab Rep, **26/93**

Hollstein, E, 1965 Jahrringchronologische von Eichenholzern ohne Walkande, Bonner *Jahrbuecher*, **165**, 12–27

Howard, R E, Laxton R R, and Litton, C D, 1998 *Tree-ring analysis of timbers from Chicksands Priory, Chicksands, Bedfordshire*, Anc Mon Lab Rep, **30/98**

Howard, R E, Laxton, R R, and Litton, C D, 2001 *Tree-ring analysis of timbers from the Presbytery Roof, Abbey Church of St Alban's, St Albans, Hertfordshire*, Centre for Archaeol Rep, **32/2001**

Laxton, R R, and Litton, C D, 1989 Construction of a Kent Master Chronological Sequence for Oak, 1158–1540 AD, *Medieval Archaeol*, **33**, 90–8

Miles, D, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect*, **28**, 40–56

Miles, D W H, 2005 *New Developments in the Interpretation of Dendrochronology as Applied to Oak Building Timbers*, Unpubl DPhil thesis, Hertford College, Oxford Univ

Miles, D, 2006 Refinements in the interpretation of tree-ring dates for oak building timbers in England and Wales, *Vernacular Architect*, **37**, 84–96

Miles, D H, and Worthington, M J, 2000 Tree-ring dates, *Vernacular Architect*, **31**, 90–113

Miles, D H, Worthington, M J, and Bridge, M C, 2003 Tree-ring dates, *Vernacular Architect*, **34**, 109–13

Miles, D H, and Bridge, M C, 2010 Tree-ring dates, *Vernacular Architect*, **41**, 102–5

Millard, A, 2002 A Bayesian approach to sapwood estimates and felling dates in dendrochronology, *Archaeometry*, **44**, 137–43

Rackham, O, Blair, W J, and Munby, J T, 1978 The thirteenth-century roofs and floor of the Blackfriars Priory at Gloucester, *Medieval Archaeol*, **22**, 105–22

Salzman, L F, 1952 *Building in England down to 1540*, Oxford

Tyers, C, 2008 Bayesian interpretation of tree-ring dates in practice, *Vernacular Architect*, **39**, 91–106

Tyers, I, 2004 *Dendro for Windows Program Guide 3rd edn*, ARCUS Report, **500b**

APPENDIX

Ring width values (0.01mm) for the sequences measured

bso01

190	115	91	68	118	197	164	154	121	121
131	108	82	168	209	162	259	251	253	131
222	286	295	349	179	238	280	222	167	125
248	235	182	115	180	163	112	121	147	165
376	180	242	243	226	82	101	234	205	159
335	259	253	156	130	172	281	171	276	298
248	179	276	176	101	156	240	191	264	229
233	106	99							

bso02

206	172	121	107	111	82	103	114	195	208
86	262	163	104	192	182	167	102	131	114
180	247	205	152	206	251	219	229	214	166
78	92	150	207	286	216	197	220	139	115
105	160	189	141	98	141	151	109	110	150
125	244	128	157	177	145	200	260	252	188
167	195	255	226	136	257	166	182	169	205
248	165	230	321	230	201	181	284	262	

bso03

201	306	292	403	435	552	430	569	354	395
401	419	180	395	211	284	340	403	123	157
150	257	210	260	218	189	173	220	162	123
151	122	206	144	112	127	199	44	75	72
98									

bso04

199	573	502	181	264	356	694	499	312	182
341	249	159	132	158	184	357	271	310	352
200	105	245	299	307	151	288	229	287	187
251	141	355	477	413	430	347	246	273	225
178	499	625	568	526	254	329			

bso05

265	241	243	285	363	227	188	231	276	234
236	232	174	75	144	185	180	305	221	291
249	104	112	90	107	129	134	141	193	164
108	68	74	56	143	100	100	129	91	46
96	71	81	74	99	84	146	93	98	89
119	105	110	143	100	103	127			

bso06

268	333	350	417	284	281	447	390	360	198
337	463	325	215	152	107	120	143	243	148
102	89	115	194	120	72	118	103	110	133
160	158	83	121	187	151	338	310	457	456
195	127	129	227	301	216	149	209	155	126
92	101	88	172	121	121	150	80	69	78
143	158	109	102	214	149	103	114	66	56

72 107 147 112 123 153

bso07

157 60 92 136 168 142 91 91 172 142
92 64 179 195 129 56 64 68 62 111
143 92 120 86 77 88 58 38 47 44
58 71 100 82 50 120 128 185 263 232
321 305 216 112 137 163 232 218 152 127
161 84 76 128 129 160 212 163 201 125
78 169 183 201 185 322 208 191 113 94
101 157 227 190 332 229 140 130 131

bso08

229 357 329 314 260 192 247 305 344 263
297 267 283 349 223 133 157 144 137 192
169 161 107 152 134 179 240 129 130 138
133 101 88 191 206 161 128 149 121 105
96 134 102 150 95 111 119 146 81 120
197 182 174 154 178 169 155 127 98 133
180 126

bso09

140 113 90 143 152 132 198 170 177 92
171 222 255 310 190 189 239 186 129 127
179 176 170 136 178 144 126 98 129 157
211 191 249 273 171 88 166 261 376 239
384 255 206 167 103 132 333 214 269 302
176 166 149 95 57 91 151 156 161

bso10

234 147 55 116 165 153 263 186 320 234
95 100 123 160 165 161 133 107 185 81
84 124 97 228 130 140 145 110 64 140
185 197 107 174 183 178 89 179 101 97
161 158 234 135 206 68 62 41 133 145
120 123 126 141 107

bso11

202 312 245 283 206 261 212 196 247 181
138 157 180 178 225 236 210 84 80 112
137 276 235 288 281 188 120 154 255 300
251 265 396 259 175 192 267 186 489 212
249 276 162 66 145 256 503 255 217 282
84 77 121 74 72 121 126 226 143 111
173 81 39 118 161 199 115 122

bso12

215 189 192 253 132 243 185 223 178 146
68 137 162 166 155 139 84 57 126 141
203 285 227 227 148 148 124 173 293 320
246 185 340 281 197 233 194 188 319 227
231 307 226 135 220 252 332 179 184 182
268 128 175 123 170 198 185 216 101 136
174 125 118 232 301

ENGLISH HERITAGE RESEARCH AND THE HISTORIC ENVIRONMENT

English Heritage undertakes and commissions research into the historic environment, and the issues that affect its condition and survival, in order to provide the understanding necessary for informed policy and decision making, for the protection and sustainable management of the resource, and to promote the widest access, appreciation and enjoyment of our heritage. Much of this work is conceived and implemented in the context of the National Heritage Protection Plan. For more information on the NHPP please go to http://www.english-heritage.org.uk/professional/protection/national-heritage-protection-plan/.

The Heritage Protection Department provides English Heritage with this capacity in the fields of building history, archaeology, archaeological science, imaging and visualisation, landscape history, and remote sensing. It brings together four teams with complementary investigative, analytical and technical skills to provide integrated applied research expertise across the range of the historic environment. These are:

* Intervention and Analysis (including Archaeology Projects, Archives, Environmental Studies, Archaeological Conservation and Technology, and Scientific Dating)
* Assessment (including Archaeological and Architectural Investigation, the Blue Plaques Team and the Survey of London)
* Imaging and Visualisation (including Technical Survey, Graphics and Photography)
* Remote Sensing (including Mapping, Photogrammetry and Geophysics)

The Heritage Protection Department undertakes a wide range of investigative and analytical projects, and provides quality assurance and management support for externally-commissioned research. We aim for innovative work of the highest quality which will set agendas and standards for the historic environment sector. In support of this, and to build capacity and promote best practice in the sector, we also publish guidance and provide advice and training. We support community engagement and build this in to our projects and programmes wherever possible.

We make the results of our work available through the Research Report Series, and through journal publications and monographs. Our newsletter *Research News*, which appears twice a year, aims to keep our partners within and outside English Heritage up-to-date with our projects and activities.

A full list of Research Reports, with abstracts and information on how to obtain copies, may be found on www.english-heritage.org.uk/researchreports

For further information visit www.english-heritage.org.uk

ENGLISH HERITAGE

ISSN 2046-9799 (Print)
ISSN 2046-9802 (Online)