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The Dovecote, South-West of the Manor House, Village Street, Naunton, Gloucestershire

Tree-ring Investigation of Oak Timbers

Daniel Miles and Martin Bridge

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Front Cover: The Dovecote at Naunton Manor in Gloucestershire. © Helmut Schulenburg. Source Historic England Archive IOE01/10938/08 (cropped)

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SUMMARY
Eight timbers, six lintels and two purlins, were sampled from the dovecote. Although three pairs of timbers were cross-matched, all the timbers showed abrupt growth-rate changes, and none were dated.

CONTRIBUTORS
Daniel Miles and Martin Bridge

ACKNOWLEDGEMENTS
The dendrochronological analysis was facilitated by Penny Hanks for the Naunton Dovecote Society. Photographs of the interior were taken by Penny and David Hanks.

ARCHIVE LOCATION
Historic England Archive
The Engine House
Firefly Avenue
Swindon SN2 2EH

HISTORIC ENVIRONMENT RECORD OFFICE
Gloucestershire County Council Archaeology Service
Shire Hall
Westgate Street
Gloucester
Gloucestershire GL1 2TH

DATE OF INVESTIGATION
2001

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CONTENT

INTRODUCTION

The dovecote to the south-west of the Manor House in Naunton, Gloucestershire (Fig 1) is believed to be seventeenth century or earlier (List Entry Number 1155655; https://historicengland.org.uk/listing/the-list/list-entry/1155655), but, at the time of this investigation, it was considered a Building at Risk and was about to undergo repairs. Dendrochronological investigation of the timbers was requested by English Heritage Historic Building Architect, Arnold Root, to inform the repair programme, and was commissioned by Peter Marshall (English Heritage).

The main body of the dovecote is of oolitic limestone, with freestone quoins, parapets, and dressings. The roof is cruciform in shape, and consists of two pairs of in-pitch purlins spanning between opposite gables. Rafters rise from each corner, supported on these purlins, and common rafters are nailed to them. There are a number of lintels over original windows. It was recorded in 1998 by John McCann, who found no evidence of a revolving ladder having been used. Similar examples are to be found at Fiddington Manor, Weston-sub-Edge, and Westington Old Manor, Gloucestershire.

METHODOLOGY

An assessment of the building for dendrochronological study was undertaken in May 2001, looking for timbers with more than 50 rings and any traces of sapwood. After assessment, those timbers judged to be potentially useful were cored using a 16mm auger attached to an electric drill. The cores were labelled and returned to the laboratory for subsequent analysis.

The samples were polished on a belt sander using 80 to 800 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The tree-ring sequence was then 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 initial analysis was written by Martin Allwright, and subsequent analysis employed Dendro for Windows by Ian Tyers (2004). Cross-matching was attempted by a process of qualified statistical comparison by computer, supported by visual checks. 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 on the computer monitor to allow visual comparisons to be made between series. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

In comparing one sample or site master against other samples or chronologies, *t*-values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious *t*-values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some *t*-value ranges of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified.

Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward.

Depending on the completeness of the final ring (ie if it has only the spring vessels or early wood formed, or the latewood or summer growth), a precise felling date and season can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using an empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* (*tpq*) or felled-after date.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 9–41 rings (Miles 1997). It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

RESULTS AND DISCUSSION

Details of the sampled timbers are provided in Table 1. Three timbers had two samples (a and b) taken from them to maximise the available information and obtain complete sapwood. These were cross-matched and combined to form single series for each of the three timbers. Cross-matching between the individual timbers revealed three matches between pairs of timbers, ntn3 *v* ntn4 (t = 4.2 with 43 years overlap), ntn5 *v* ntn6 (t = 8.6 with 83 years overlap), and ntn7 *v* ntn8 (t = 5.8 with 74 years overlap). Each of these pairs were combined to form three new sequences (ntn34, ntn56, and ntn78), which were used in subsequent analysis, along with each individual series. The ring width data are given in the Appendix, and the sampled lintels illustrated in Figures 2–5.

The ring-width series all showed abrupt growth rate changes (Fig 6), which is often associated with management of trees, and no acceptable consistent matches were found when the series were compared with the dated reference chronologies. All the timbers therefore remain undated.

REFERENCES

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

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

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

TABLES

Table 1: Details of samples taken from Naunton Dovecote

Sample number	Timber and position	No of rings	Sapwood rings	Relative year	Mean ring-width (mm)	Mean sensitivity
ntn1	Inner lintel, upper window, north side	50	22¼C		1.83	0.21
ntn2	Inner lintel, east window	56	20C		1.56	0.27
ntn3a	Middle lintel, east window	34	10+8¼C NM	14–47 [34]	2.41	0.26
ntn3b	*Ditto*	39	20 ?C	18–56 [34]	2.00	0.22
ntn3	*Mean of 3a and 3b*	*43*	*20 ?C*	14–56 [34]	*2.13*	*0.23*
ntn4	Inner lintel, west window	56	25C	1–56 [34]	1.93	0.21
ntn5a	Outer lintel, west window	100	-	1–100 [56]	1.19	0.26
ntn5b	*Ditto*	68	-	11–78 [56]	1.57	0.21
ntn5	*Mean of 5a and 5b*	*100*	-	1-100 [56]	*1.35*	*0.22*
ntn6	Middle lintel, south window	92	11	18–109 [56]	1.55	0.20
ntn7a	South lower main purlin	52	h/s	21–72 [78]	1.69	0.19
ntn7b	*Ditto*	76	21C	21–96 [78]	1.60	0.20
ntn7	*Mean of 7a and 7b*	*76*	*21C*	21–96 [78]	*1.56*	*0.19*
ntn8	North lower main purlin	94	31¼C	1–94 [78]	1.33	0.29

Key: ¼C = complete sapwood, felled the following spring; C = complete sapwood felled during winter; h/s = heartwood/sapwood boundary; NM = not measured; [34] = relative years within ntn34; [56] = relative years within ntn56; [78] = relative years within ntn78

FIGURES

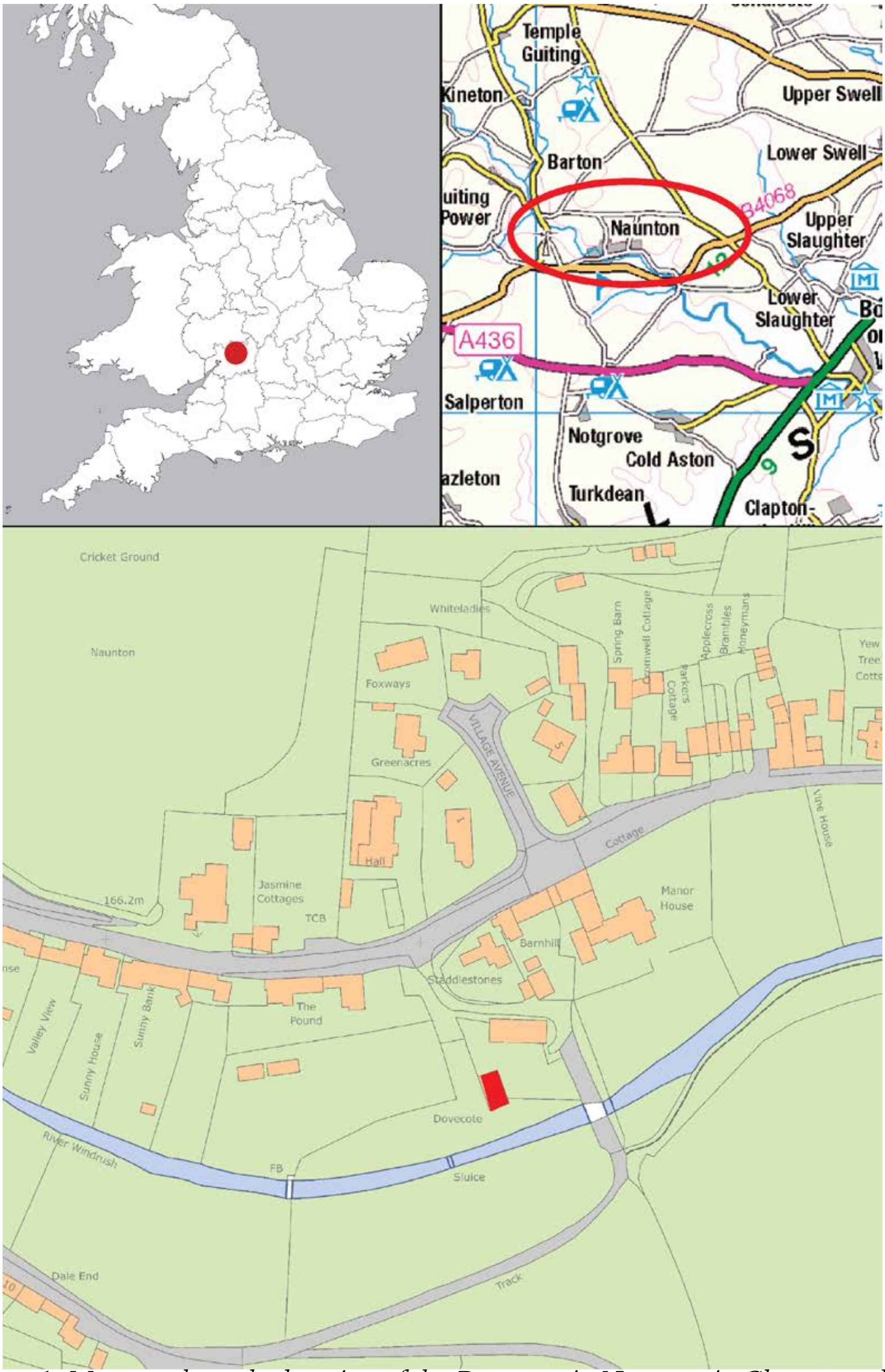

Figure 1: Maps to show the location of the Dovecote in Naunton in Gloucestershire, marked in red. Scale: top right 1:105,000, bottom 1:1650 © Crown Copyright and database right 2024. All rights reserved. Ordnance Survey Licence number 100024900

Figure 2: View of the internal north wall showing the lintel sampled as ntn1 (photograph Penny and David Hanks)

Figure 3: View of the east internal wall showing the lintels sampled as ntn2 and ntn3 (photograph Penny and David Hanks)

Figure 4: View of the internal west wall, showing the lintels sampled as ntn4 and ntn5 (photograph Penny and David Hanks)

Figure 5: View of the internal south wall, showing the lintel sampled as ntn6 (photograph Penny and David Hanks)

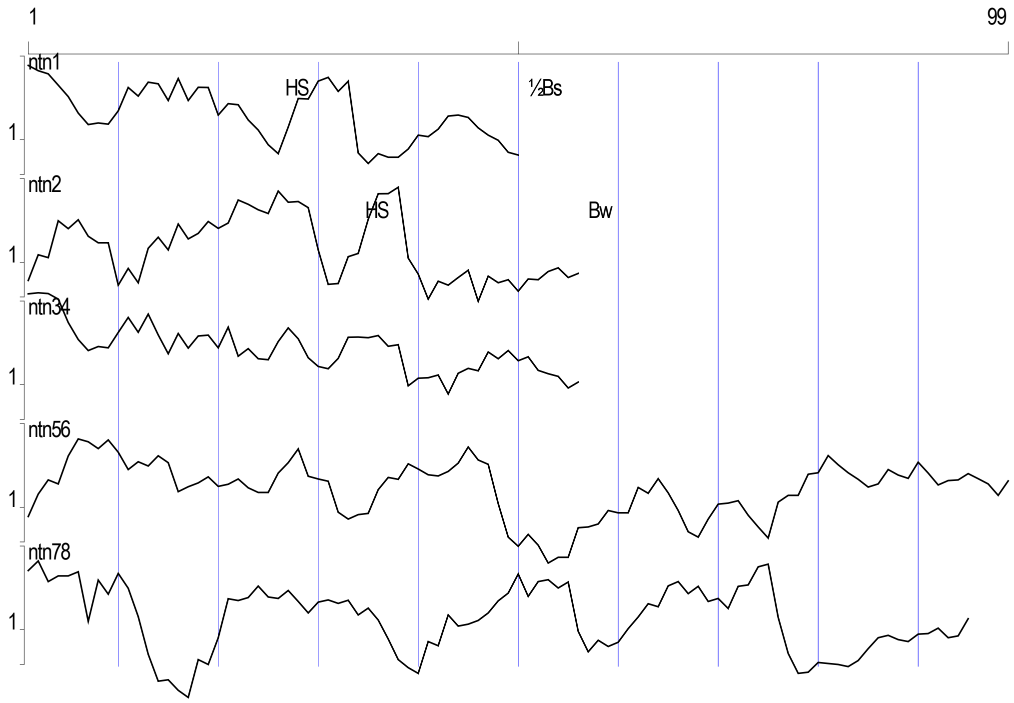

Figure 6: Plots of the ring width series for ntn1, ntn2, ntn34, ntn56, and ntn78 showing the several abrupt growth changes present in each series. Relative years (within each ring-width series) are shown on the x-axis and the y-axis is ring-widths in mm on a logarithmic scale

APPENDIX

Ring-width values (0.01mm) for the sequences measured

ntn1

404	366	345	279	225	165	133	137	134	172
267	227	295	286	209	316	209	268	267	159
197	193	145	120	91	77	127	217	215	301
323	248	300	78	64	77	72	72	84	109
106	122	156	159	152	125	109	99	79	75

ntn2

71	115	109	218	188	222	163	144	144	65
89	68	130	160	126	205	155	172	215	189
209	322	297	268	250	381	309	313	279	126
66	67	111	118	224	362	363	409	108	80
50	70	65	75	86	48	77	68	72	58
73	72	84	90	75	81				

ntn3a

244	160	252	165	315	334	262	348	252	261
222	186	337	401	363	256	190	156	225	316
318	330	310	260	305	110	123	141	140	98
142	190	183	294						

ntn3b

291	272	225	409	222	256	179	162	202	335
257	157	156	125	195	238	261	288	365	263
271	138	113	95	136	102	134	116	116	168
195	200	201	198	181	161	152	118	138	

ntn4

552	563	555	500	322	234	190	205	200	267
354	268	377	265	197	271	233	197	204	155
211	105	135	124	146	180	214	163	124	108
128	117	210	199	175	166	150	136	72	107
110	102	68	109	118	110	138	131	180	113
139	80	84	82	69	71				

ntn5a

185	189	238	115	59	59	43	45	43	47
52	58	84	85	84	161	176	144	175	190
129	109	139	122	156	159	133	143	126	166
114	122	93	72	69	76	97	116	183	135
97	81	45	38	52	45	111	131	200	184
184	173	159	233	312	216	134	48	29	23
28	38	32	29	31	40	59	57	131	106
93	144	130	218	134	87	61	73	88	148
116	98	73	46	41	80	103	118	131	134
245	349	184	166	184	172	239	176	161	197

ntn5b

84	128	167	155	262	361	342	376	439	331
219	268	233	270	193	115	168	179	203	159
174	159	146	136	142	203	202	247	141	113
107	79	68	73	78	123	163	168	219	218
180	182	199	229	298	238	240	102	45	44
48	45	34	36	30	61	59	69	88	84
74	125	102	131	106	101	68	50		

ntn6

225	268	230	187	202	200	255	268	152	125
137	150	137	133	180	142	127	122	177	260
350	217	227	219	102	91	100	100	155	186
169	233	191	188	177	193	228	322	248	207
111	69	52	72	52	36	42	47	75	79
77	100	96	106	165	158	210	155	86	58
63	80	106	108	113	86	69	56	110	125
125	186	191	264	222	191	169	146	155	203
183	172	233	190	152	165	167	188	171	155
125	164								

ntn7a

200	219	230	241	255	237	253	203	186	227
184	250	288	175	193	141	94	63	65	52
84	76	122	109	102	120	130	136	183	209
183	243	275	241	358	121	67	79	72	75
90	122	125	162	218	219	205	204	183	159
148	205								

ntn7b

227	156	170	297	245	272	306	213	179	176
145	223	257	183	184	147	85	68	47	33
47	46	67	66	85	100	116	205	239	327
249	304	301	250	372	149	117	101	92	110
128	175	200	205	231	237	227	255	187	181
177	252	251	331	333	136	76	54	55	61
67	66	65	65	64	95	119	90	97	93
104	108	108	98	123	80				

ntn8

304	364	247	275	275	297	117	254	195	288
218	128	63	38	39	32	28	57	52	86
143	157	165	184	120	104	138	131	90	134
184	90	75	84	110	95	77	48	42	45
94	86	169	126	127	128	151	173	186	302
157	220	223	191	125	58	40	73	63	65
94	105	162	124	230	265	178	221	155	190
134	222	213	320	353	115	49	55	33	34
37	40	37	42	68	81	72	76	66	87
93	99	62	67						

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