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Tree-Ring Analysis of Timbers from the Gazebo, Shifnal Manor, Shifnal, near Telford, Shropshire

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Summary

Core samples were obtained from the ten oak timbers available at the Gazebo, Shifnal Manor. The analysis of this material produced a single site chronology, SHFBSQ01, comprising six samples, and having a combined overall length of 174 rings. This site chronology was dated as spanning the years AD 1455 to AD 1628.

Interpretation of the sapwood would indicate that all the dated timbers, representing both floor joists and window lintels, were cut in a single phase of felling in AD 1628. Such a date would indicate that the Gazebo is not part of Gilbert, the 7th Earl of Shrewsbury's late-sixteenth century improvements, but was undertaken when Anne Dacre, the Dowager Countess of Arundel was living at Shifnal.

Keywords

Dendrochronology
Standing Building

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Introduction

Shifnal Manor stands to the southwest of the town itself, about one kilometre down a track leading south from the A4169 Shifnal to Halesfield road (SJ 741 064, Figs 1 and 2). From about AD 1594 a programme of repairs and improvements were begun by Gilbert, 7th Earl of Shrewsbury, apparently to make it comfortable in the most fashionable manner. To this end the dining chamber was enlarged and given a great window to the east, the Earl's Parlour was paved, and the newel stair to his Great Chamber was widened.

Gilbert died in AD 1616 and was succeeded by his daughter Alathea. She married Thomas Howard (restored as Earl of Arundel and Surrey in AD 1604), son of Anne Dacre, Dowager Countess of Arundel. It is known that the Dowager Countess had been living at Shifnal Manor when she died in AD 1630.

Although only a small portion of Shifnal Manor now survives, a tall north - south range in red sandstone, maps of AD 1635 shows it to have been larger at that date and as having a sophisticated set of walled gardens. One such garden, the smaller, lay to the south-west of the house, and contained an elaborate circular parterre, with a central pool or basin. The other, larger, walled garden was laid out on a terraced spur running south from the house towards a small stream, the Wesley Brook.

At the centre of the retaining wall at the southern end of this larger built-up garden is an octagonal two-storeyed summer-house or gazebo, its lower story of sandstone and its upper level of brick with sandstone dressings beneath an ogee roof (Fig 3). The ground floor of the Gazebo is entered by a door on the west side, below and outside the walled garden. Inside is a fireplace in the east wall and several wall niches (Fig 4). A single two-light window pierces the south wall. The first floor is entered by a door in the north wall from within the walled garden itself. Inside there are three sets of two-light windows to the south walls originally overlooking further gardens in that direction. In the later nineteenth century it was said that this upper floor was panelled to the roof, with cupboards let in to the wainscot.

The date at which these gardens were laid out, and thus the date of the gazebo, is uncertain. It is believed possible that they are part of the late-sixteenth century improvements begun by the 7th Earl, but it is possible that they were not constructed until the early-seventeenth century, perhaps by Thomas Howard, in time to appear on the map of AD 1635.

Sampling

Sampling and analysis by tree-ring dating of the timbers within the Gazebo were commissioned by English Heritage. The purpose of this was to with greater reliability and accuracy the date of the structure, and its associated walls, to inform a possible addition to the Gardens Register.

The only timbers within the Gazebo suitable for tree-ring analysis form a first-floor frame of six close-set principal joists running east-west, supported at their east end by a single north-south bressummer beam (Fig 5). Some of these joists show

evidence, by way of redundant mortices of joint beds, of having been used previously in another structure, and would appear to be reused here. There are also lintels to the ground-floor door and window openings. There are no suitable timbers seen at first-floor level, or within the roof, this being made of small, apparently relatively modern, probably nineteenth century, softwood timbers.

From this material a total of ten different oak timbers were cored. Each sample was given the code SHF-B (for Shifnal, site "B") and numbered 01 – 10. The positions of these samples are marked on plans made at the time of sampling, reproduced here as Figure 6. Details of the samples are given in Table 1. In this Table the principal joists have been numbered from north to south, with other timbers being identified individually. In both Table 1 and Figure 6 apparently reused timbers are identified by the symbol ®.

The Laboratory would like to take this opportunity to thank Mr Sean Wilson, the owner of Shifnal Manor, for his enthusiasm and help for this programme of tree-ring dating. We would also like to thank Mr Stewart Morgan, Estate Manager, for his considerable efforts in bringing this programme to fruition in arranging access to the Gazebo.

Analysis

Each of the ten samples obtained was prepared by sanding and polishing and its annual growth-ring widths were measured. The growth-ring widths of all ten samples were compared with each other by the Litton/Zainodin grouping procedure (see appendix). At a minimum value of t=4.5 a single group of six samples was formed cross-matching with each other as shown in the bar diagram Figure 7.

The samples were combined at these off-set positions to form SHFBSQ01, a site chronology of 174 rings. Site chronology SHFBSQ01 was then satisfactorily dated by comparison to a number of relevant oak reference chronologies as spanning the years AD 1455 to AD 1628. The evidence for this dating is given in the t-values of Table 2.

Site chronology SHFBSQ01 was also compared to the four remaining ungrouped samples but there was no further satisfactory cross-matching. Each of the ungrouped samples was than compared individually to the full range of reference chronologies, however all four failed to produce a satisfactory match.

Interpretation and conclusion

Analysis by dendrochronology has produced a single site chronology, SHFBSQ01, comprising six samples, its 174 rings dated as spanning the years AD 1455 to AD 1628. One of the six dated samples in this site chronology, SHF-B05, retains complete sapwood. This means that it has the last ring produced by the tree it represents before it was felled. This ring, and thus the felling of the tree, is dated AD 1628.

The relative position of the heartwood/sapwood boundaries on the other four dated samples, where it exists, is very similar and as such is indicative of a group of timbers having a single felling date. It is very likely, therefore, that all the dated timbers used in the Gazebo, as both floor joists and lintels, were felled at the same time in AD 1628. Such a date is somewhat later than might have been expected given the late-sixteenth century improvements that are known to have been undertaken here. Tree-ring analysis would suggest that the terracing of the gardens, the building of the retaining wall, and construction of the Gazebo probably belong to the period when Anne Dacre, the Dowager was living at Shifnal.

During the analysis it was seen that two samples, SHF-B04 and B07, cross-match with *t*-values high enough to suggest that the beams represented have been derived from the same tree. Other samples probably represent trees growing very close to each other, with values of t=9.5 and t=9.0 being seen between samples SHF-B03, B05, and B10 for example.

Four samples, SHF-B01, B02, B06, and B08, remain ungrouped and undated. Although all the ungrouped and undated samples have sufficient rings for reliable analysis, all are close to the limit. Furthermore, all the undated samples are from reused timbers and as such each may represent single timbers each felled at different times. Single timbers are often much more difficult to date than grouped timbers with replicated data. Some of the undated samples also show some signs of erratic growth. This too may make cross-matching and dating more difficult.

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Table 1: Details of samples from the Gazebo, Shifnal Manor

Sample number	Sample location	Total rings	*Sapwood rings	First measured ring date	Last heartwood ring date	Last measured ring date
	Roof timbers					
SHF-B01	Joist 1 (from north) ®	55	h/s	------	------	------
SHF-B02	Joist 2 ®	57	h/s	------	------	------
SHF-B03	Joist 3	126	h/s	AD 1483	AD 1608	AD 1608
SHF-B04	Joist 4	101	h/s	AD 1500	AD 1600	AD 1600
SHF-B05	Joist 5	134	20C	AD 1495	AD 1608	AD 1628
SHF-B06	Joist 6 ®	54	h/s	------	------	------
SHF-B07	Joist 7	133	3	AD 1475	AD 1604	AD 1607
SHF-B08	Bressummer beam ®	57	h/s	------	------	------
SHF-B09	Door lintel	158	2	AD 1455	AD 1610	AD 1612
SHF-B10	Window lintel	66	no h/s	AD 1499	------	AD 1564

*h/s = the heartwood/sapwood boundary is the last ring on the sample
C = complete sapwood is retained on the sample; the last measured ring date is the felling date of the timber
® = timber shows evidence for reuse

Table 2: Results of the cross-matching of site chronology SHFBSQ01 and relevant reference chronologies when first ring date is AD 1455 and last ring date is AD 1628

Reference chronology	Span of chronology	*t*-value	
Stoneleigh Abbey, Warwicks	AD 1398 – 1658	7.0	(Howard *et al* 2000)
Wales and West Midlands	AD 1341 – 1636	6.8	(Siebenlist-Kerner 1978)
26 Westgate Street, Gloucester	AD 1399 – 1622	6.6	(Howard *et al* 1998)
Combermere Abbey, Cheshire	AD 1363 – 1564	6.4	(Howard *et al* 2003)
England	AD 401 – 1981	6.2	(Baillie and Pilcher 1982 unpubl)
Lodge Park, Aldsworth, Glos	AD 1324 – 1587	6.2	(Howard *et al* 1995)
East Midlands	AD 882 – 1981	6.0	(Laxton and Litton 1988)
England London	AD 413 – 1728	5.9	(Tyers and Groves 1999 unpubl)

Figure 1: Map to show the general location of Shifnal Manor (scale = 1:30,000)

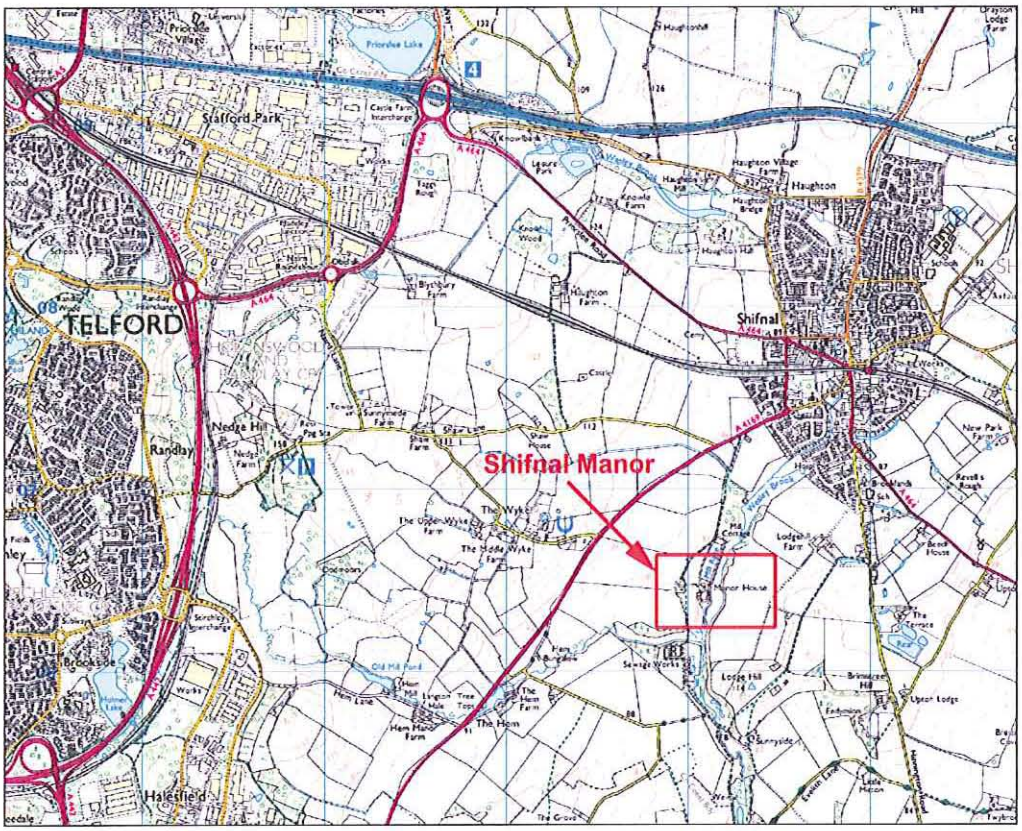


Figure 2: Map to show the location of the Gazebo, Shifnal Manor (scale = 1:1,500)

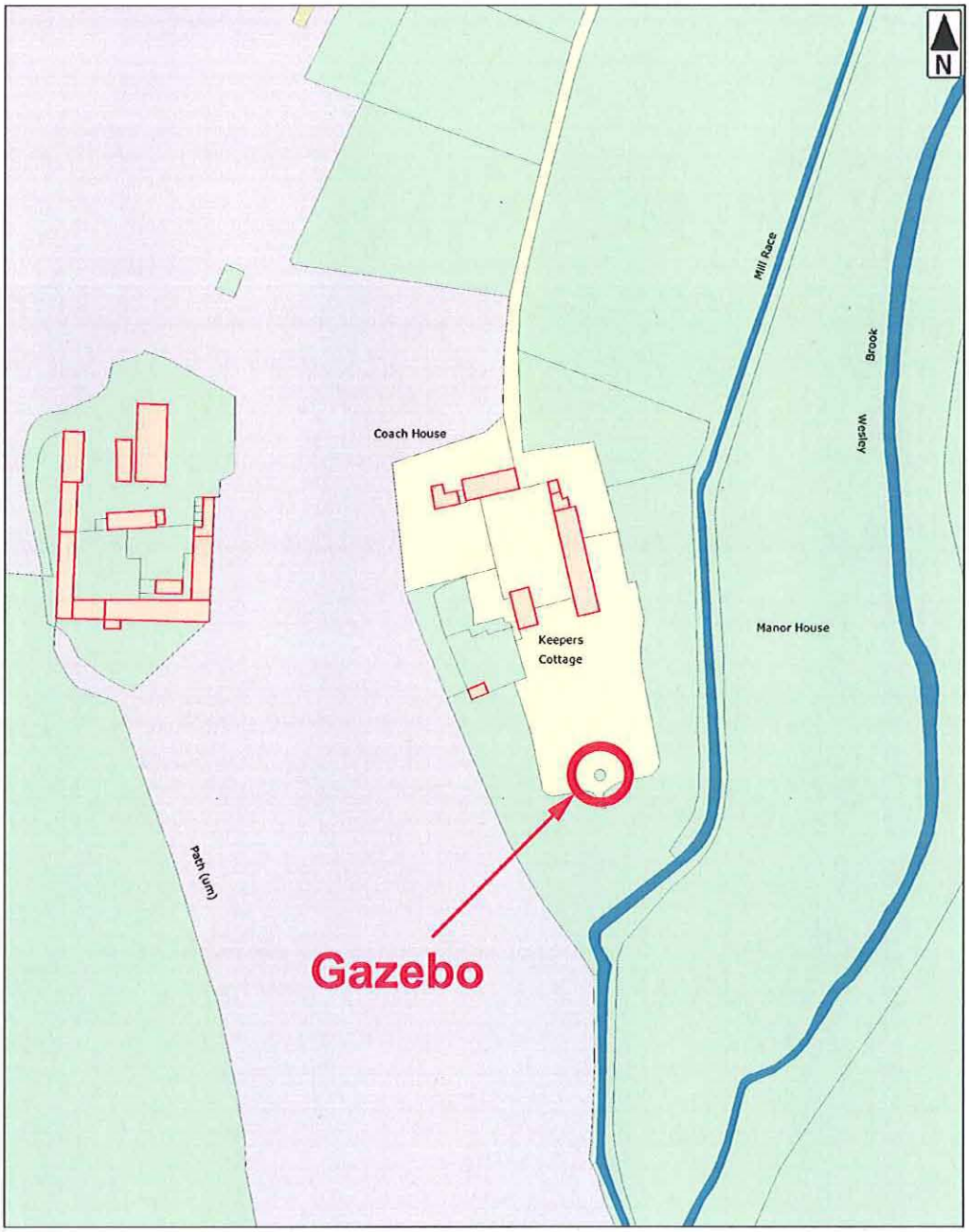


Figure 3: View of the gazebo from the south-west with retaining wall of terraced garden behind

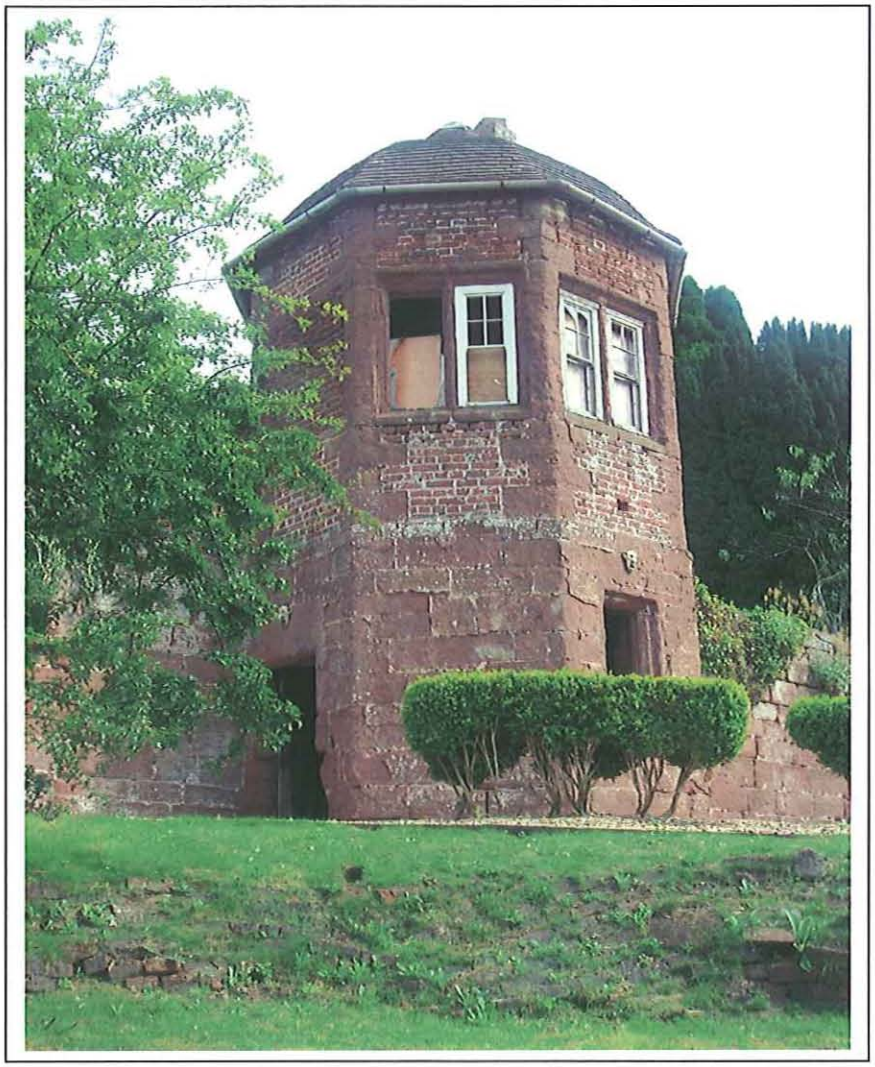


Figure 4: Internal view of the gazebo showing fireplace and niches in walls

Figure 5: View of the ground-floor ceiling beams with the bressummer to the east

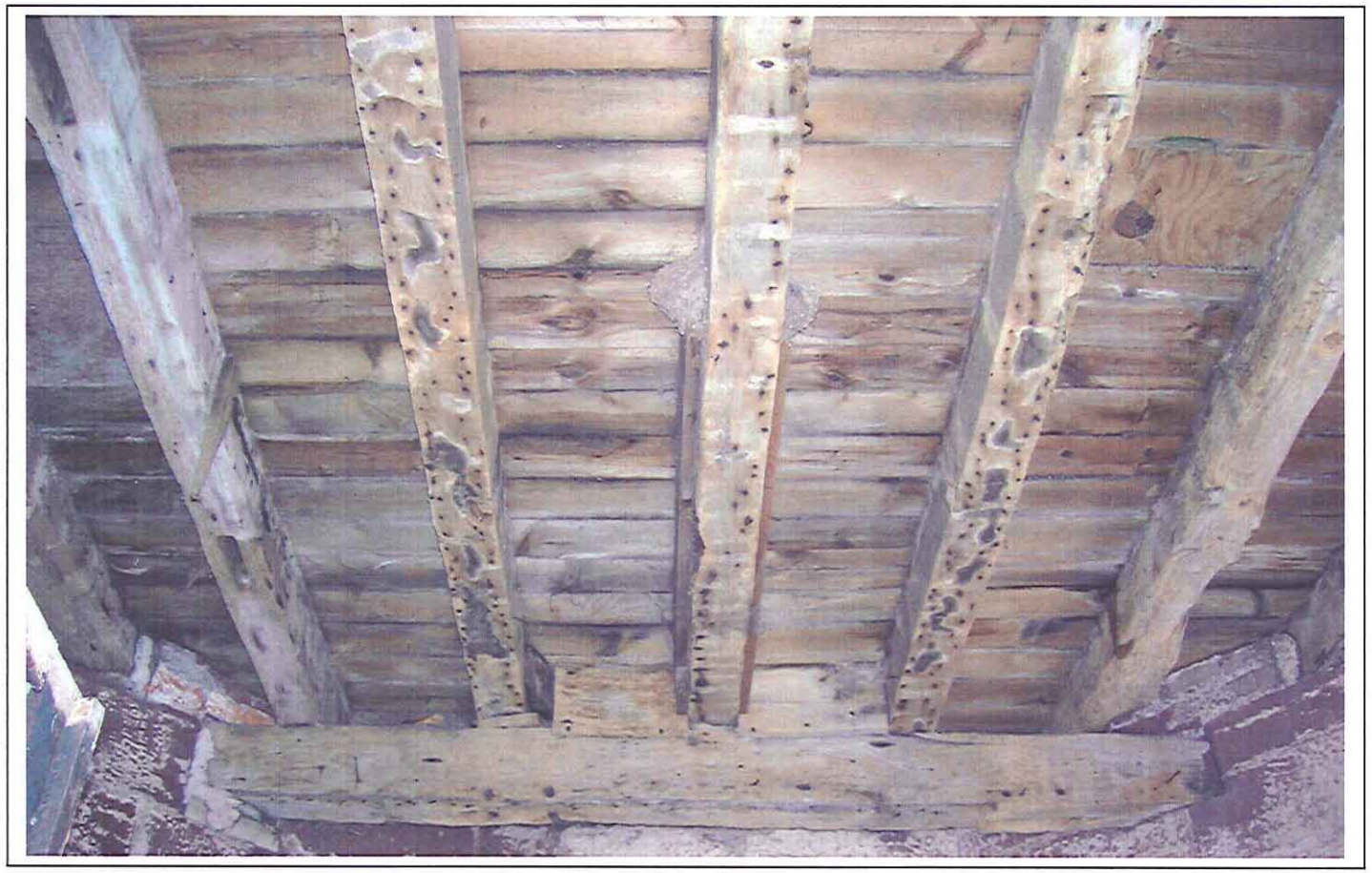


Figure 6: Plan of the first-floor frame of Shifnal Manor Gazebo
to show sample locations
(after Richard Sheppard)

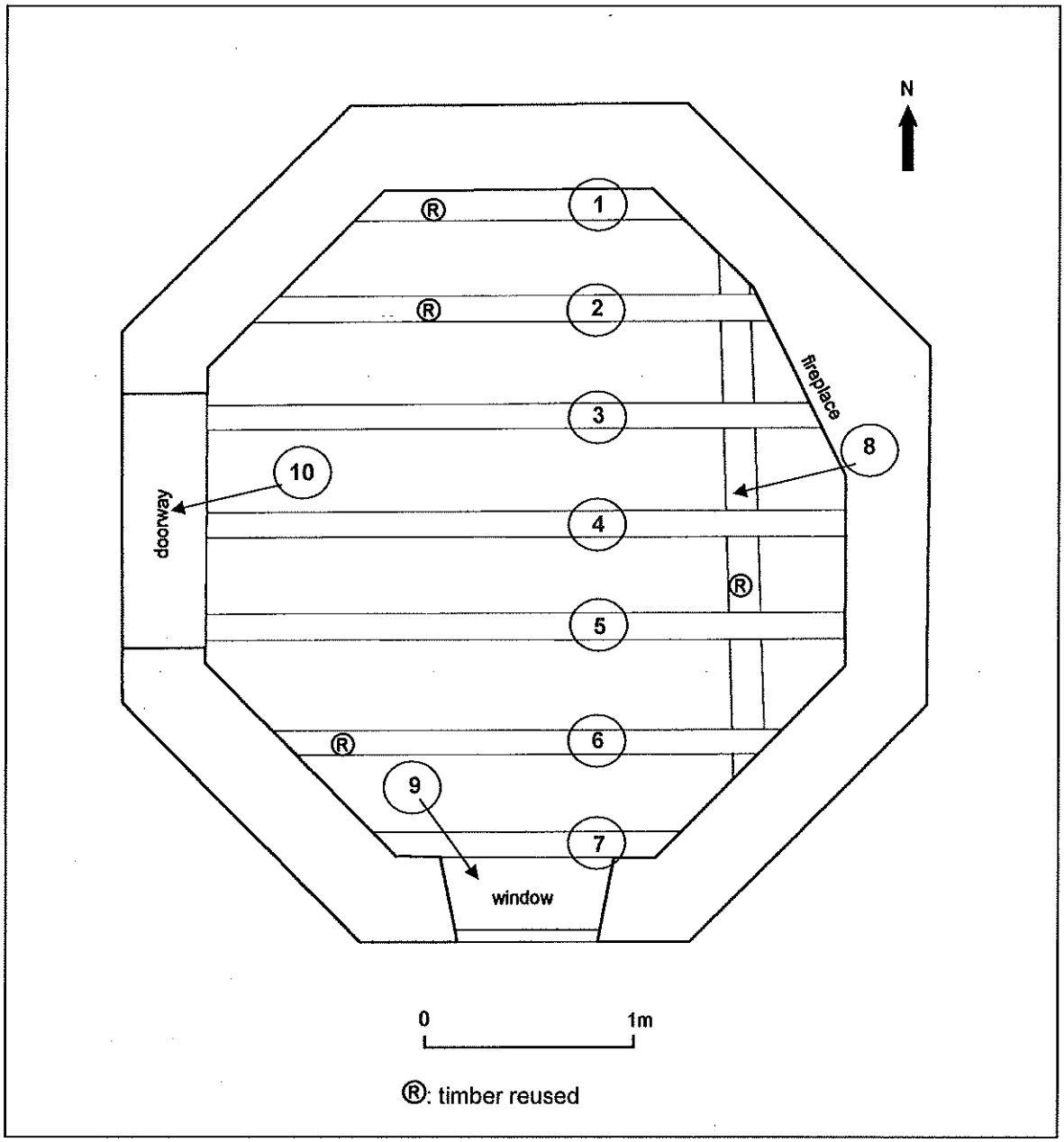
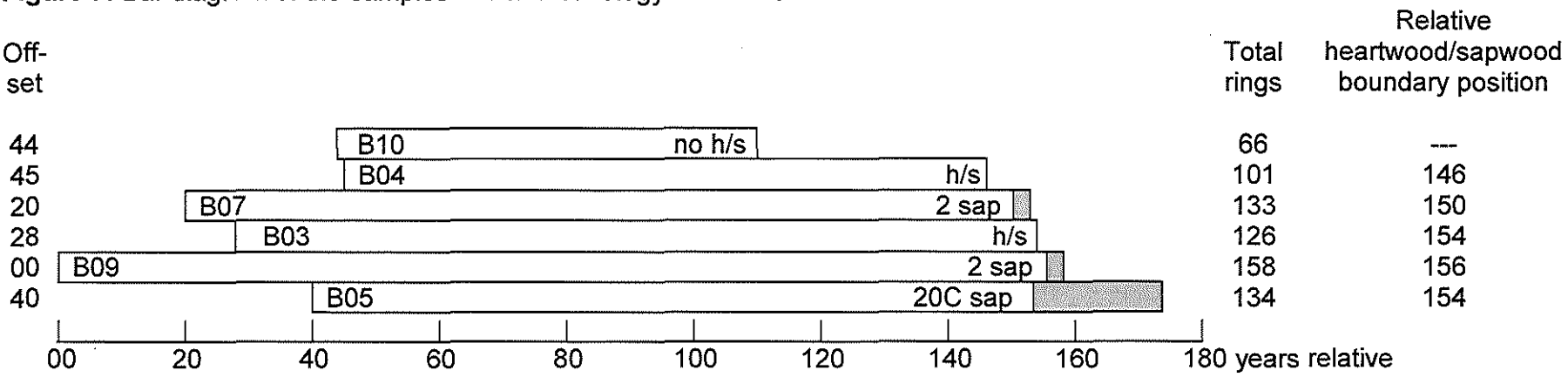


Figure 7: Bar diagram of the samples in site chronology SHFBSQ01



White bars = heartwood rings, shaded area = sapwood rings
h/s = heartwood/sapwood boundary
C = complete sapwood retained on the sample; last measured ring date is the felling date of the timber

Data of measured samples – measurements in 0.01 mm units

SHF-B01A 55
208 185 182 100 160 250 181 234 203 132 127 98 163 131 158 120 126 117 237 257
193 174 152 115 163 132 73 73 61 57 189 164 134 142 231 183 182 131 129 145
90 97 124 95 127 121 97 114 133 173 121 102 115 109 97
SHF-B01B 55
221 177 190 94 159 239 232 211 201 143 117 100 162 130 166 119 122 116 222 254
197 190 144 116 155 136 85 77 59 58 193 195 120 136 220 198 174 131 132 160
89 100 130 100 131 121 101 121 136 171 124 105 110 109 89
SHF-B02A 57
146 210 271 187 272 342 293 324 388 773 444 291 289 297 439 321 416 454 533 504
443 526 545 430 351 322 328 228 198 217 331 283 224 190 148 154 166 120 260 188
166 283 264 254 154 148 188 249 192 185 193 117 96 90 57 65 92
SHF-B02B 57
132 220 296 166 265 349 309 335 367 764 447 292 263 304 427 337 412 444 536 505
440 529 588 404 370 322 351 213 199 224 306 293 216 194 137 163 153 135 252 178
171 286 279 252 168 152 180 218 223 172 199 115 99 80 63 57 76
SHF-B03A 126
159 167 190 203 195 177 149 168 122 134 115 170 222 243 187 131 108 118 120 102
107 119 109 109 85 117 179 129 141 153 113 78 99 70 99 118 155 111 104 113
69 110 100 143 160 158 132 125 158 106 133 111 90 122 121 91 114 88 96 57
79 71 72 63 36 59 78 64 85 58 68 62 56 57 72 54 81 78 75 94
72 80 36 36 54 41 55 70 71 68 58 54 57 54 58 61 106 89 82 65
74 91 113 114 73 48 84 68 60 116 113 121 139 77 81 65 79 74 113 109
109 161 101 85 112 127
SHF-B03B 126
144 199 186 192 205 154 151 153 126 138 111 178 216 250 194 135 106 121 124 103
103 124 108 110 87 114 187 121 139 152 105 105 86 63 110 139 121 140 107 114
87 93 95 142 159 178 141 121 155 108 117 114 88 128 116 96 106 98 87 58
84 82 85 59 47 69 66 78 78 87 66 59 62 52 78 62 81 85 71 94
61 74 48 34 46 62 47 67 72 62 64 58 60 48 53 72 103 81 76 82
69 101 110 108 81 49 81 63 66 118 114 117 148 77 86 59 90 67 117 106
114 162 104 86 121 142
SHF-B04A 54
168 134 54 33 31 54 84 90 183 168 222 303 363 240 391 323 206 267 252 279
370 293 249 230 299 305 274 231 310 396 282 238 217 195 210 291 322 214 283 269
382 396 277 316 248 145 250 345 267 210 180 157 114 141
SHF-B04B 54
164 135 56 34 30 55 80 91 170 162 227 296 359 241 381 321 197 282 259 276
368 290 256 225 313 301 277 231 286 400 288 253 227 190 210 287 328 219 276 260
372 392 271 322 251 149 246 338 265 218 183 163 119 138
SHF-B05A 134
234 143 169 136 137 143 131 86 115 102 134 115 80 104 162 109 148 154 94 103
82 68 95 154 177 128 129 128 91 157 111 164 175 153 173 105 190 131 191 145
168 183 163 170 175 144 140 79 127 103 174 149 114 138 137 157 152 123 164 125
105 75 109 117 144 118 135 188 153 105 63 49 53 66 83 82 93 79 90 64
50 64 66 69 97 82 78 50 75 93 106 91 75 51 73 64 62 90 94 115
111 90 73 54 63 85 104 94 76 125 93 101 114 111 140 163 124 116 102 84
93 141 142 144 126 104 116 120 119 50 65 83 97 131
SHF-B05B 134
196 190 169 143 138 137 149 88 125 108 131 123 75 126 164 111 132 147 96 105
87 67 98 154 181 130 117 142 93 153 106 173 175 163 161 119 174 145 170 142
168 190 165 170 171 143 129 84 130 110 165 159 117 134 146 151 146 124 153 124
108 69 116 118 145 118 149 186 152 98 68 51 62 58 80 83 92 82 88 61
44 65 59 77 87 84 78 55 68 103 101 95 71 49 78 50 73 86 107 107
108 79 75 57 79 66 108 98 82 110 105 92 116 112 137 162 138 116 98 81
80 138 159 158 92 116 117 111 109 57 72 61 111 140

SHF-B06A 101
82 124 107 112 123 132 118 68 88 138 113 117 129 114 103 92 61 82 123 115
94 140 161 88 145 95 166 156 116 127 131 126 113 124 115 88 111 142 103 136
91 97 88 66 83 80 117 74 105 120 93 96 57 91 76 68 54 76 66 90
90 87 86 75 57 59 53 28 40 47 39 32 35 47 33 34 26 24 21 32
36 40 23 38 49 55 52 57 52 41 35 54 64 61 70 89 48 46 50 44
42
SHF-B06B 101
84 122 112 106 125 128 118 70 86 136 107 132 141 112 106 90 70 76 114 126
101 134 169 84 133 110 162 155 123 135 131 120 115 121 112 81 123 128 113 118
88 110 80 70 78 85 121 73 97 122 100 100 54 95 78 68 54 68 73 79
88 83 92 68 55 69 43 32 35 48 32 31 40 54 23 31 29 22 26 43
34 48 30 40 40 58 52 52 38 45 44 44 57 62 72 80 55 41 51 49
58
SHF-B07A 133
164 318 221 240 214 206 207 206 227 251 269 278 310 239 244 214 179 166 160 188
236 231 204 178 166 145 145 105 102 137 141 112 63 102 127 114 133 155 104 123
84 55 92 116 127 103 146 172 94 127 102 163 153 123 131 128 126 106 125 128
99 107 141 100 128 103 99 87 73 96 81 119 72 106 123 117 106 58 94 84
66 58 86 99 74 88 77 91 76 71 64 44 44 43 48 44 39 43 41 33
27 25 27 32 39 43 38 39 40 52 61 54 56 45 63 36 53 64 65 78
87 60 53 49 48 61 71 61 79 87 76 65 77
SHF-B07B 133
308 359 235 221 219 210 228 200 204 247 263 278 323 246 205 242 181 157 153 191
252 228 202 186 166 151 145 111 128 114 129 113 71 95 141 91 126 132 111 117
84 64 81 121 124 102 145 177 87 136 101 167 150 122 132 128 122 103 133 121
100 108 141 108 122 101 101 92 64 89 86 122 77 106 127 118 102 55 103 76
73 57 88 86 74 95 78 95 70 74 55 54 40 44 46 42 42 37 42 28
34 32 26 29 41 41 49 37 37 52 56 60 54 47 51 38 55 69 64 75
89 65 48 49 54 56 69 77 64 80 65 77 76
SHF-B08A 56
68 62 47 45 66 60 51 46 33 47 62 92 55 68 48 47 55 49 39 54
44 34 37 58 59 58 70 39 28 67 56 72 86 64 62 85 35 77 95 79
56 42 31 76 69 68 40 99 74 85 68 90 78 106 139 135
SHF-B08B 56
90 66 54 44 66 59 53 39 28 49 58 95 44 71 50 47 53 58 47 48
44 31 43 55 60 55 80 41 30 70 53 72 79 66 70 79 38 73 95 84
59 43 33 75 71 63 42 97 78 83 59 96 80 106 138 140
SHF-B09A 158
449 475 293 278 271 392 217 224 255 141 172 247 179 103 91 135 143 132 174 220
382 325 315 306 218 301 319 169 208 201 244 275 263 246 239 183 165 165 176 193
213 198 195 132 142 169 204 202 201 182 176 188 183 214 289 265 277 256 161 160
135 129 161 265 278 171 264 191 139 145 137 198 229 230 258 186 218 168 172 136
155 186 145 148 150 123 139 128 136 126 122 104 77 77 91 120 114 88 109 103
83 75 102 98 91 80 105 111 106 87 75 39 43 69 87 109 128 135 124 97
85 84 88 92 126 142 149 127 118 159 167 187 159 112 109 110 126 138 143 151
165 167 148 142 161 154 165 137 178 120 106 157 190 219 239 235 227 267
SHF-B09B 158
435 451 290 307 263 418 216 264 227 119 142 215 153 114 98 122 135 151 175 227
395 328 318 299 236 285 321 189 200 199 253 261 283 237 243 185 162 164 177 208
205 201 180 147 140 160 219 186 198 174 196 171 178 220 290 262 278 244 159 174
136 144 148 296 278 183 237 207 137 149 131 200 221 251 237 187 230 162 176 134
150 188 150 143 146 128 132 134 136 128 113 105 80 83 87 120 116 86 115 75
93 87 99 97 90 83 98 109 101 81 83 50 41 59 87 113 124 137 120 102
80 78 83 103 132 150 125 127 121 140 156 193 164 113 106 112 121 136 145 157
169 170 138 155 167 150 164 143 173 148 111 164 198 198 237 236 231 260

SHF-B10A 66
120 149 142 141 109 141 146 130 96 135 154 145 169 176 150 129 99 69 105 201
245 184 170 184 90 138 103 216 211 217 134 142 166 119 162 167 147 184 177 151
171 165 117 112 123 139 200 202 141 200 176 194 183 142 182 138 122 110 154 138
232 177 208 182 218 143
SHF-B10B 66
136 149 144 142 108 135 143 133 102 139 205 151 164 177 152 136 90 74 107 182
191 212 136 201 98 131 114 211 201 234 144 134 162 118 157 161 142 166 186 160
173 167 135 99 112 147 193 187 143 214 161 202 192 139 186 132 124 114 163 131
235 177 209 207 223 149