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Summary

Seven cores were taken from Walmgate Bar during recent renovation work. All the samples were thought to be from primary timbers inserted during the 17th century. Three cores proved suitable for tree-ring dating, and two were dated to the late 16th century.

Authors' address :-

Miss Jennifer Hillam & Miss Cathy Groves

Department of Archaeology & Prehistory
Sheffield University
Clarke House Lane
Sheffield, South Yorkshire
S10 2TN

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Walmgate Bar was renovated and restored by York City Council in 1990 with the aid of a grant from English Heritage. It was probably constructed in the mid 12th century but has undergone several phases of repair and restoration since that date. There are records that the Bar was repaired in 1584-6 as well as in 1644-8 when it was heavily restored. During the 1990 restoration work samples were taken from those oak timbers which were thought to be primary to the 17th restoration (Oxley per comm).

Methods

Cores were taken using a corer attached to an electric drill. The cross-sections of the cores were prepared using a sander. The ring widths of those samples with more than 50 rings were measured on a travelling stage connected to an Apple II microcomputer (Hillam 1985, Fig 4). Ring patterns with less than 50 rings are unlikely to be unique and might not produce reliable dates - see Hillam *et al* 1987 for further details. The measured ring sequences were plotted as graphs using a graphing program on the Prime mainframe (Okasha 1987). The graphs were then compared with each other on a light box to check for any similarities between the ring patterns which might indicate contemporaneity. For crossmatching purposes, the ring width data were also transferred to an Atari ST microcomputer with hard disk. The tree-ring software for the Atari was written and developed by Ian Tyers (pers comm 1990). The crossmatching routines are based on the Belfast CROS program (Baillie & Pilcher 1973; Munro 1984), and all the *t* values quoted in this report are identical to those produced by the first CROS program (Baillie & Pilcher 1973). Generally *t* values of 3.5 or above indicate a match provided that the visual match between the tree-ring graphs is acceptable (Baillie 1982, 82-5).

Dating is achieved by crossmatching ring sequences within a phase or building, combining the matching sequences into a site master, and then testing that master for similarity against dated reference chronologies. A site master is used for dating whenever possible because it enhances the general climatic signal at the expense of the background noise from the growth characteristics of the individual samples. Any unmatched sequences are tested individually against the reference chronologies.

If a sample has bark or bark edge, the date of the last measured ring is the year in which the tree was felled. In the absence of bark edge, felling dates are calculated using the sapwood estimate of 10-55 rings. This is the range of the 95% confidence limits for the number of sapwood rings in British oak trees over 30 years old (Hillam *et al* 1987). Where sapwood is absent, felling dates are given as *termini post quem* by adding 10 years, the minimum number of missing sapwood rings, to the date of the last measured heartwood ring. The actual felling date could be much later depending on how many heartwood rings have been removed.

Results

Full details of the tree-ring samples are set out in Table 1. Four of the cores (2, 5, 6, 7) had less than 50 rings and were rejected. The remaining three samples had 71-125 rings; the only measured sample to retain any sapwood rings was 4. Samples 6 and 7 differed from the other timbers cored in that they had wider rings. This suggests that 6 and 7 had come from trees growing under more favourable conditions.

No similarities were found between the ring sequences from samples 1, 3 and 4. However when the ring width data (Table 2) were tested against dated reference chronologies, both 1 and 3 gave consistently high t values (Table 3). The ring sequence from 1 spanned the period AD1435-1555 and that of 3 AD1443-1567. No match was found for sample 4.

Visual comparison of the graphs from 1 and 3 with the reference chronologies confirmed that the computer results were acceptable. It should be noted however that the two ring sequences do not match each other. This may indicate that the timbers came from different sources.

Precise felling dates cannot be given because neither sample had sapwood. 1 was felled some time after 1565 and 3 after 1577. It is probable therefore that the two timbers were felled for use in the renovation of 1584-6.

Acknowledgements

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Table 1: Details of the tree-ring samples. Exact locations of the timbers can be seen on drawings D/S/7869A and D/S/7870A by the City of York Development Services.

no	timber	total no of rings	sapwood rings	average ring width (mm)	date span	felled	comments
1	C1 - 2nd floor beam	120	-	1.2	AD1435-1555	1565+	
2	B25	21	-	-	-	-	insufficient rings
3	B35 - 1st floor window sill	125	-	1.0	AD1443-1567	1577+	
4	C5 - 2nd floor post	71	11	1.9	-	-	
5	A5 - post	47	-	1.2	-	-	insufficient rings
6	crossbeam in entrance room near staircase	49	12	2.6	-	-	insufficient rings
7	joist near sample 6	47	3	2.4	-	-	insufficient rings

Table 2: Ring width data in units of 0.02mm.

sample 1, AD1435-1555

45	49	62	37	57	75	45	41	44	44
48	28	40	46	40	38	65	71	54	64
73	64	51	41	43	56	62	58	86	76
82	54	130	103	67	102	151	80	169	86
122	96	116	136	181	123	120	65	113	181
84	86	149	108	145	141	113	157	128	99
132	131	123	93	113	106	108	86	108	86
87	131	105	78	103	90	70	112	116	104
141	122	87	96	84	77	155	132	88	76
69	82	91	72	46	71	102	102	61	82
102	100	118	87	107	53	60	50	69	58
55	62	58	50	58	71	100	70	83	64
125									

sample 3, AD1443-1567

70	49	34	28	42	31	30	36	37	46
48	32	39	47	38	49	32	54	39	45
43	50	46	41	39	52	51	37	32	36
37	32	48	67	62	57	55	45	28	25
24	22	23	23	30	35	31	31	40	35
37	40	41	41	37	31	34	49	41	43
45	50	63	58	39	48	48	60	57	63
64	56	55	55	52	67	63	63	71	91
76	120	108	117	95	107	131	128	153	143
127	114	183	143	121	142	135	130	83	91
108	123	182	146	75	115	134	144	202	138
120	130	190	95	98	119	215	157	162	144
160	125	76	121	137					

sample 4, undated

201	245	200	43	32	41	54	61	40	24
79	114	123	107	105	117	92	88	105	68
116	75	97	101	110	112	112	45	31	24
60	33	59	77	96	67	54	65	67	54
49	41	40	27	34	87	147	155	156	234
139	177	110	148	194	178	163	130	116	169
90	75	127	85	105	72	136	107	57	54
47									

Table 3: Absolute dating: t values with dated reference chronologies. (All the chronologies are independent of each other.)

chronology	1	3
Bishops' House, Sheffield (Morgan 1977)	3.0	5.7
Doncaster buildings "Doncmed" (Morgan pers comm)	3.3	3.0
East Midlands (Laxton & Litton 1988)	5.1	5.5
Elland Old Hall, West Yorkshire (Hillam 1984)	4.5	3.7
Golden Cock, Wakefield (Groves & Hillam unpubl)	3.9	6.3
Welsh Border (Siebenlist-Kerner 1978)	-	3.5
South Central Scotland (Baillie 1977)	-	4.7
Yorkshire buildings "Yorkmed" (Hillam unpubl)	3.4	3.2