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TITLE Analysis of the timbers from Coppergate development

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COPPERGATE DENDROCHRONOLOGY

III. ANALYSIS OF THE TIMBERS FROM COPPERGATE DEVELOPMENT

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(March 1986)

ABSTRACT

Twenty four oak timbers from the watching brief which followed the main excavation at Coppergate in York, and a single timber from the main excavation itself, were sampled for dendrochronological analysis. The timbers were associated with tenth century and later medieval structures. A total of seven timbers were dated, including five samples from the sunken buildings phase.

Analysis of the timbers from Coppergate Development

INTRODUCTION

This report is the third in the Coppergate Dendrochronology series, of which I is completed (Hillam 1985a) and II and IV are in preparation. Tree-ring analysis of the 24 oak samples from the watching brief which followed the main Coppergate excavation (herewith known as Coppergate Development) was carried out at Sheffield Dendrochronology Laboratory. In addition a single sample from the main excavation was also included in this analysis. The samples are from several timber structures (Table 1) and are associated with periods 5b (sunken buildings phase) and 6 (medieval phase). Five of the timbers are from structures 5/1 and 5/3, both of which are discussed in detail in report I which describes the dating of the sunken buildings and will be refered to as CDI. In brief the sunken buildings were structures consisting of oak planks and posts which were partially sunk below the ground. They were constructed in the tenth century and replaced the structures associated with periods 3-5a (post and wattle phase). The medieval timbers analysed are mostly associated with waterfront structures on the River Foss. Two timbers, however, 90 and 91 were isolated and their function unknown. Archaeological evidence indicates that they were medieval.

TREE-RING DATING

The samples were prepared, measured and crossmatched following the method given by Hillam (1985b). Of the 25 samples received only three were unsuitable for measurement. The annual growth rings on samples 45 and 48 were badly distorted due to the presence of knots. Sample 79 was badly broken and a ring sequence of over 30 annual growth rings could not be obtained. Ring sequences with less than 30 rings are generally not unique and so cannot be dated readily. Details of orientation and number of rings of all the samples are given in Table 2.

All thirteen samples associated with the sunken building phase were suitable for measurement. Samples 131, 135 and 138 are from structure 5/9, thought to be tenth century and situated north of the main excavation. Archaeological evidence indicates that 131 and 135 are both re-used timbers but the ring patterns of these samples do not crossmatch each other or sample 138. Three samples (121, 122 and 123) are associated with a wall or drain also situated to the north of the main excavation. The ring pattern of 122 was distorted. The ring sequences of these three associated timbers did not crossmatch. The four samples from structure 5/1 consisted of two planks (4 and 51) and two

posts (32 and 55) but there was no similarity between their ring patterns.

As no conclusive crossmatching could be obtained between the thirteen tenth century samples, the individual ring sequences were compared with absolutely dated reference chronologies from York (Hillam unpublished), Beverley (eg Groves & Hillam 1985), East Midlands (Laxton et al 1982) and England (Baillie & Pilcher pers comm). Four timbers, 4, 51, 123 and 172, were dated (Table 3). A tentative date was also obtained for sample 9203 by comparison with the Coppergate Viking reference chronology. The visual match appeared acceptable but no other t-values of over 3.5 could be obtained with other reference chronologies at the same position. However, when the ring sequence of 9203, a plank from structure 5/3, was compared with three previously dated planks (E3, E2 and S2) from the same building (see CDI), t-values of 4.0, 4.0 and 3.2 respectively were obtained. This confirms that the outermost measured ring of sample 9203 is dated to AD 877.

Only seven medieval timbers were suitable for dating purposes. Four of the samples (46, 47, 49 and 50) were from a group of piles or pile supports adjacent to the River Foss. No crossmatches were obtained when the four ring sequences were compared.

Sample 74 consisted of two radially split planks with a fibrous material inbetween them. The ring sequences of both planks, 74A and 74B, were measured but did not crossmatch, and were therefore treated as individual samples.

The remaining medieval samples were two isolated timbers, 90 and 91. It was thought that they may be contemporary but the two ring sequences did not crossmatch.

Due to the lack of conclusive crossmatching, the individual ring sequences of all the medieval timbers were compared with various reference chronologies. Two timbers, 74B and 91, were dated (Table 3).

The final two samples (101 and 187) had not been assigned an approximate date, the only information being that 101 was found in the same pit as the Coppergate helmet (Hall 1984). These were therefore compared with all the Coppergate Development samples and with Saxon and later medieval reference chronologies. This proved unsuccessful and these two samples remain undated.

THE TIMBERS

The later medieval timbers appear to originate from trees of varying size and age. The number of rings present ranges from 36 to 152. The tenth century samples had 48 to 208 rings. The method by which the trunks have been worked varies according to the size of tree available and the function of the finished piece. The two planks (4 and 51) from structure 5/1 had been radially split from trees of at least 500mm in diameter. Two other samples, 135 and 138 from structure 5/9, also came from trees of a similar size. The age of these large trees appears variable, ranging from at least 91 to over 200 years. The remaining tenth century samples, including tangential planks and posts, appear to have originated from trees of approximately 100 years old or less and with diameters smaller than 500mm.

INTERPRETATION AND DISCUSSION

Tree-ring dates were obtained for five timbers associated with the sunken buildings phase, two of which had retained some sapwood, and two timbers from the medieval phase. The number of sapwood rings in oak is relatively constant at 10-55 (Hillam et al, 1986). Consequently even if a sample has retained only a small amount of sapwood, it is possible to estimate the felling year with some accuracy. If there is no sapwood present the addition of the minimum sapwood allowance (10 rings) to the date of the last heartwood ring produces a terminus post quem for felling. This sapwood estimate of 10-55 rings has been recently updated from 10-50 rings, so differs slightly from that used in the first Coppergate Dendrochronology report. The estimated felling dates of the seven dated timbers are presented in Table 3.

The felling dates of 4 and 51 indicate that these are contemporary with previously dated timbers from 5/1 (see CDI) and were therefore felled between AD 961-986. The terminus post quem of AD 897 for sample 9203 is also consistent with the previously dated planks of structure 5/3 (see CDI).

No samples from building 5/9 were dated, but a felling range of AD 960-1003 was obtained for timber 172 which was used in the construction of the covered drain to the south of 5/9. Sample 123 produces a felling range of AD 965-1011 and consequently a more precise indication of the construction date for the wall or drain north of the main excavation. The felling ranges obtained indicate that the covered drain and wall/drain are contemporary with the sunken buildings from the main excavation.

Of the two dated medieval timbers, 91 was an isolated timber of unknown function. The other, 74B from a revetment, gave a

terminus post quem for felling of AD 1084. However, as this is thought to be a re-used ship's timber the construction of the revetment may well be much later.

Two main classes of trees are suggested in CDI. Firstly those producing radially split planks which had diameters of at least 500mm and secondly those producing the remaining timbers, both tangential planks and posts, which had diameters of less than 500mm and were usually less than 100 years old. Samples 4, 51, 135 and 138 appear to fall into the first class and all remaining samples into the second class. The radial timbers usually came from trees subjected to more limiting conditions of growth, but sample 135 has a wider mean ring width than most. This indicates that it grew under more favourable conditions possibly in less dense woodland or on the fringe of forests.

The variation in mean ring widths and ring patterns of both the tenth century and later medieval timbers from Coppergate Development suggests that there was more than one woodland source. It has indeed already been suggested in CDI that there were two different sources, and probably two different types, of woodland producing the two classes of trees used in the sunken buildings phase.

CONCLUSIONS

Felling dates were successfully obtained for seven timbers, six from the Coppergate Development watching brief and one from the main excavation. These indicate that the covered drain to the south of structure 5/9 was constructed during the period AD 960-1003 and the wall/drain north of the main excavation during AD 965-1011. The felling dates of the three timbers from structures 5/1 and 5/3 do not allow any further refinement of the construction dates indicated in CDI.

Felling dates for two medieval timbers were estimated. Timber 74B, probably a re-used ship's timber, was associated with a revetment. The construction date of the revetment was probably much later than the terminus post quem of AD 1048. The other sample was from an isolated timber of unknown function.

The analysis of these 25 timbers also support the suggestions put forward in CDI of there being two classes of trees utilised and possibly two distinct types of woodland sources.

ACKNOWLEDGEMENTS

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Table 1: Description of samples sent for tree-ring analysis, listed in order of their sample number.

sample number	structure/function	approximate date	number of rings	measured
4*	plank - structure 5/1	10th	120	Y
32*	post - structure 5/1	10th	48+	Y
45	pile support	later medieval	c40	N
46	pile or pile support	later medieval	69	Y
47	pile or pile support	later medieval	152	Y
48	pile or pile support	later medieval	knotty	N
49	pile or pile support	later medieval	36	Y
50	pile or pile support	later medieval	57	Y
51	plank - structure 5/1	10th	208	Y
55	post - structure 5/1	10th	86	Y
74A	post and plank revetment	later medieval	151	Y
74B	post and plank revetment	later medieval	145	Y
79	post and plank revetment	later medieval	knotty	N
90	isolated	later medieval	77	Y
91	isolated	later medieval	141+	Y
101	within the helmet pit	?	114	Y
104	post and wattle alignment	10th	48	Y
121	wall or drain	10th	82	Y
122	wall or drain	10th	80	Y
123	wall or drain	10th	72	Y
131	from structure 5/9	10th	+68	Y
135	sill - structure 5/9	10th	91+	Y
138	floor beam - structure 5/9	10th	157	Y
172	covered drain	10th	61	Y
187	?	?	50	Y
9203[x]	plank - west wall structure 5/3	10th	66+	Y

(* indicates site code 1981-22; [x] indicates site code 1979-7; all other samples have the site code 1982-22)

Table 2: Details of the samples. '+' indicates the presence of rings that have been counted rather than measured.

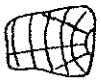
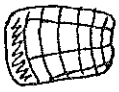
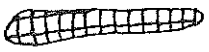
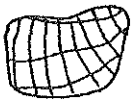
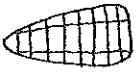
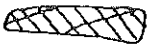
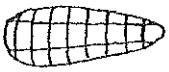
sample number	number of rings	sapwood	mean ring width (mm)	sketch	maximum dimensions (mm)
4	120	-	1.73		235x40
32	48 +10	-	1.99		135x120
45	c40	y	knotty		210x150
46	69	-	2.53		170x60
47	152	21	1.03		150x70
48	-	-	knotty		190x60
49	36	-	3.30		225x130
50	57	11	1.45		230x90
51	208	-	1.16		275x35
55	86	-	1.78		150x125
74A	151	-	1.12		190x35
74B	145	-	1.11		190x35
79	-	-	-	badly broken	-
90	77	-	2.15		180x70
91	141 +11	-	1.23		225x30
101	114	-	1.27		150x40
104	48	5	1.36		155x50

Table 2 (cont)

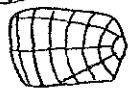
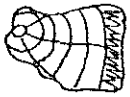
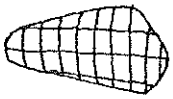
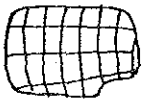
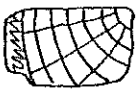
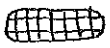
sample number	number of rings	sapwood	mean ring width (mm)	sketch	maximum dimensions (mm)
121	882	-	1.87		195x110
122	80	-	1.97		165x155
123	72	9	2.37		295x65
131	+68	6	1.21		115x85
135	91 +27	-	2.75		280x180
138	157	-	1.53		300x230
172	61	12	2.20		260x65
187	50	7	2.20		170x105
9203	66 +10	-	1.11		90x25

Table 3: Dating the timbers.

sample number	Viking	Cu Med Mean	East Midlands	Beverley	England	date (AD)	felling date (AD)
4	4.4	-	-	4.3	-	788-907	after 917
51	5.3	-	4.4	-	-	730-937	after 947
74B	-	4.3	4.5	4.5	5.0	930-1074	after 1084
91	-	-	3.9	4.2	4.6	1038-1189	after 1199
123	4.7	-	4.7	-	3.0	894-965	965-1011
172	6.2	-	6.1	-	3.1	900-960	960-1003
9203	3.8	-	-	-	-	812-887	after 897