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Ancient Monuments Laboratory Report 122/89

TREE-RING STUDY OF ANGLO-SCANDINAVIAN TIMBERS FROM YORK.

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Summary

This note describes the re-examination of oak samples from two excavations in York in 1973-74, at 6-8 Pavement and 5-7 Coppergate. Tree-ring dating was achieved on four timbers of tenth century date from Pavement, giving an indication of the relative correspondence of the complex stratigraphy between trenches. This report replaces AML Reports 3391 and 3467.

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LLOYD'S BANK, 6-8 PAVEMENT

1973, four exploratory trenches were dug in the cellars of 6-8 Ιn Pavement, prior to bank extensions, in order to examine the Anglo-Scandinavian deposits. During the excavation, parts of a number of timber structures were found. Samples from a small selection of split oak (Quercus spp.) planks and roundwood posts from trenches Ι, ΙI and IV were submitted for tree-ring dating, at a very early stage in the development of the method in Sheffield. At that time, very few dated chronologies with which to compare new data existed, and techniques were unsophisticated, using a magnifying lens containing a scale to measure the annual rings. Computer techniques for cross-matching were just being developed (Baillie & Pilcher 1973; Morgan 1988). Prior to publication, it has been necessary to re-examine the data and to remeasure those samples which still survive, using current computer methods of correlation and the now wide network of reference chronologies (Hillam 1987).

a total of 33 wood samples (largely from levels 12-13, 21-25 Out ΰf and 30-35), 25 were further examined. Seven of these were roundwood the remainder being radially (12 examples) or tangentially (6 posts, examples) split from larger trees. Tree diameters ranged from 8 to 40cm; no large timber trees were represented, and, given the use over of tangential splitting to maximise the possible plank width, may not have been available. The tangential planks and posts all came from trees under 70 years old; the radial planks, perhaps used as flooring, had up to 162 rings excluding outer sapwood and their original trees may have reached 200 years old.

Ring-widths were recorded on 17 samples with 45-162 rings. (Further details of the tree-ring method can be found in Baillie 1982; Hillam 1985; Morgan 1988; Schweingruber 1988). Internal cross-matching of 8 tree-ring patterns, four of which were of high quality, was suggested; Fig. 1 shows the relative time span of II F085 and II F127 (which probably originate in the same tree judging by the similarity in their tree-ring patterns), II FØ88 and I F22, over 205 uears. The correlations are supported by Student's t values (Baillie & Pilcher A further four tree-ring curves gave reasonable correlations 1973). with this group, but were not very consistent with each other. Initially a master chronology was made to include all 8 curves.

In 1977, J. Hillam succeeded in dating the longer II F127/F085 pair against a chronology for south-east England (REF6 - Fletcher 1977), spanning the years AD 778 to 939.

New examination of the material confirmed the consistent character of the group of four curves in Fig. 1, by giving significant matches at the correct calendar dates for each when compared to a range of reference chronologies. These include the chronology for Coppergate (Hillam pers.comm.), and a composite English chronology (Baillie pers.comm.):

T value against England Coppergate

Mean	8.0	8.4
I F22/1	4.1	6.7
II FØ88	4.2	4.5
II F127	6.3	5.0
II FØ85	7.0	4.9

Thus the end date for II F088, with 6 sapwood rings, is AD 956, and for I F22, with 17 sapwood rings, is AD 982. A new master chronology for these four curves was made, spanning AD 778 to 982. This matches the England chronology with a t value of 8.

other four curves were compared with this new master chronology The and with the dated chronologies from Coppergate and England, among Few significant matches occurred, and it must be concluded others.

that their apparent correlation with the longer Lloyd's Bank curves was spurious and that they cannot be dated.

Interpretation of the felling date of the dated trees is reliant on the presence or absence of sapwood. Quoting a specific sapwood width with standard deviation has been found misleading; the collation of data relating to sapwood width has led to a sapwood range of 10-55 years to be added to the heartwood-sapwood boundary (Hillam, Morgan & Tyers 1987). The absence of sapwood on the II F127/F085 pair results in a <u>terminus post quem</u>date of <u>afterAD 950-995</u>. Plank II F088 has 6 sapwood rings preserved, giving a felling date range of AD 960-1005. These three timbers come from levels 23-26. With 17 sapwood rings, I F22 can be dated to within the range AD 982-1020; a probable later felling date is consistent with its origin in the higher level 12 of the trench.

Three radiocarbon samples were submitted in 1974 from selected rings of the F127/F085 series. The results are shown below:

Rings AD C14 date AD

Lab.no.

818-838	910	+/60	HAR548
848-888	78Ø	+/80	HAR549
918-938	820	+/60	HAR550

5-7 COPPERGATE

From two trenches excavated in 1974 by R. Hall, a number of timbers were sampled for possible tree-ring dating. They included 12 oak pieces (at least 3 from each trench). In the base of trench I was a fine plank (sample 1) 240mm wide and 55mm thick, split with the rings and rays at a 45 angle to the plank surface. This plank provided a series of 171 rings. Adjacent to it was a split roundwood timber with sapwood (sample 20), with a hole cut through it. Nearby was a squared stake (sample 17) from a tree around 60 years old; the date of this vertical stake was uncertain. Seven other small pieces (samples 4-10) were split in various ways from small trees, with 28-96 rings.

None of the wood collected from trench II was suitable for further study.

Samples 1 and 7 revealed a very similar tree-ring pattern (t=13) suggesting an origin in the same tree. Comparison of the 4 measured ring series with the Lloyd's Bank, Hillam's Coppergate and various reference chronologies gave a few suggestions of 10th century dates but no certain correlations could be found.



Fig.

Time span of the dated tree-ring series from trenches I and II at Lloyd's Bank. Without sapwood, the upper two planks came from trees felled some time after AD 950-995; sapwood (hatched) on the lower two limited the felling dates to AD 960-1005 and AD 982-1020 respectively.

TABLE 1 Details of the timbers examined.

* ring-widths measured

Sample No.of No.of Ave. Dimen- Sketch no. rings sap ring sions/ rings width Diam. mm

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6-8 PAVEMENT

						1 A
1	F1Ø	16	5		160×140	
	F17	20	10		78	
	F21	c15	6		160	
	F22/1*	75	16	1.55	115×2Ø	
	F22/2*	74	<u> </u>	1.02	70×20-35	曲
	F32	31	12		160×120	
	4Ø*	52		2.14	120×30	
1	IF12	32			190	0
	FØ85*	161		1.07	16Ø×15	
	FØ85	20	20		105	0
	F088*	56	6	2.5	140×35-55	
	F70	27	10		160×35	IIIIQUE
	F127*	154		1.02	160×10-20	
	F128*	52		0.99	50x30	
	30×	92		1.55	150×20	
	31*	94	12	1.61	170×70	

32*	47	15	1.41	175×40
IVF100M*	71		1.21	375×30
F1ØØN1*	45	10	1.66	27Ø×4Ø
F33*	47	18	1.63	80
30*	22		1.59	145×20
31A*	80	•.	1.49	125×60
31B	115			160×50
32×	56	26	1.Ø	55×
35*	80		0.69	60×30



5-7 COPPERGATE

1*	171		235X55
4×	96		125X50
5	39	~.	105X40
6	31		55X25
7≚	110		100X60
8	34		120X60
9	28		150
10	30		85X60
13	28		210
17*	59	14	160X30
20	88	23	170X70-100



Table 2 Lloyd's Bank, York - mean curve from four timbers dated to AD 778-982.

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	205											
	1		15	Ģ	8	10	10	9	Ģ	Ģ	11	10
	11	•	5	8	9	Ģ	9	7	8	7	7	8
	21		5	6	7	8	9	9	8	12	10	12
	31		12	11	10	11	10	16	16	16	14	15
	41		12	13	11	13	11	10	10	10	11	5
	51		10	8	8	Ģ	8	7	9	10	9	12
	61		to	11	11	13	8	8	6	9	9	ç
	71		8	10	12	8	12	10	9	7	10	9
	81	•	8	10	7	6	6	8	7	7	8	7
	71		11	10	9	8	11	12	10	10	10	8
	101		6	7	8.	8	7	9	ς	10	13	11
	111	••	8	8	9	10	8	9	1, 1,	14	12	10
	121		to	10	14	13	14	16	17	16	17	18
í	131	••••	18	20	16	18	21	18	15	14	15	13
	141	- 14	17	15	14	15	15	15	18	16	11	17
	151	۰	16	22	20	18	18	12	19	12	18	19
	161		17	16	18	19	16	13	10	12	16	21
	171		19	17	15	13	10	8	11	16	14	6
	181		11	10	11	9	8	12	1.5	14	17	28
	191		36	27	36	31	29	25	27	31	29	26
	201		18	32	27	15	24					