TREE-RING ANALYSIS OF TIMBERS FROM BRIDGE STREET, IPSWICH

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ABSTRACT

Seventy-nine timbers from the Saxon and later medieval revetments at Bridge Street, Ipswich, were sampled for tree-ring analysis with a view to dating the main revetments. The timbers from two of these were dated: the collapsed quay, 175, dated to AD 1197-1232, whilst revetment 170 was built after AD 1303. The dated timbers from the latter were imported, probably from the Baltic. The import of timber into Ipswich, plus the town's role as a distribution centre for British timber, made the production of a long tree-ring chronology impossible, and is likely to be the chief cause of the lack of tree-ring dating for East Anglia.

CONTENTS

Tree-Ring Analysis of Timbers from Bridge Street, Ipswich

Excavations at Bridge Street in Ipswich by Keith Wade of the Suffolk Archaeological Unit, yielded a large amount of wood and timber. The excavated trench, 26m long and 3m wide, cut through infilled river deposits on the north bank of the River Orwell, and revealed a series of wooden revetments and a stone wharf. The earliest, middle to late Saxon, revetments consisted of vertical posts with interwoven branches, whilst those of medieval date were of vertical plank construction. The larger oak timbers (Quercus spp) were sampled for tree-ring analysis (Table 1), and sent to the Sheffield Dendrochronology Laboratory where they were examined in 1984-85. The aims of the study were: first, to provide dates for the revetments; second, to extract any information of note about timbers; and third, to produce a tree-ring chronology for the Ipswich area. East Anglian timbers have so far proved difficult to date (eg Hillam 1980, 1983, 1985a), and it was hoped that this site, with its timbers of Saxon and medieval date, would provide a much-needed reference chronology for the area.

METHODS

The timbers were deep-frozen for 48 hours. Their cross-sections were then cleaned, whilst still frozen, with a surform plane. This produces a smooth surface on which the orientation of the rings can be seen, and the ring widths can be measured with some precision. Any timbers with less than 30 growth rings were rejected at this stage, although a record was kept of the number and orientation of the rings, the size of the cross-section and other details of note (Table 2).

Ring sequences of less than 30 rings cannot be dated reliably, but those with 30-50 rings sometimes can (Hillam et al 1986).

Great care must be taken with such samples at the crossmatching stage so timbers with more than 50 rings are generally preferred. The ring sequence of any Ipswich timber therefore with more than 30 rings was measured, and the ring width data used for crossmatching.

The ring widths were measured on a travelling stage which is connected to an Apple microcomputer (Hillam 1985b Fig 4). The sample to be measured is viewed through a 10X binocular microscope. As the stage is moved along, and a ring is traversed, a signal is sent to the Apple's memory where it is stored, and can be expressed as:a ring width. When all the rings have been measured, the complete ring sequence can be printed out (Appendix 1) or stored more permanently on floppy disc. The microcomputer, which uses software written by JR Filcher of the Belfast Tree-Ring Laboratory, is also used in the crossmatching process.

The sequence of ring widths (listings of all the measured sequences are given in Appendix 1) is plotted against time on transparent semi-logarithmic recorder paper. The resulting graphs are known as tree-ring curves or sequences. They are tested against each other for contemporaneity by superimposing one curve over another, and sliding it along year by year. The transparent paper makes it possible to see any similarities in pattern. Ring widths of any matching curves are averaged to produce a site master curve. The production of such a curve eliminates much of the 'background noise' due to local growth conditions of individual trees, and enhances the common climatic signal present in the growth rings.

Because of this, a master curve is more likely to produce a date when it is compared with dated reference chronologies than is a curve from a single timber.

Crossdating is facilitated by the use of a computer program (Baillie & Filcher 1973). This compares two sets of ring width data at each position of overlap, and calculates the amount of correlation between them. The measure of correlation is expressed by the Student's t-value, and values over 3.5 indicate a match, provided the visual match is acceptable. The computer program does not therefore replace visual matching, it merely speeds up the crossdating process, and gives some measure of the agreement between two curves. It is the visual match that is the decisive factor in the acceptance or rejection of a tree-ring match.

The Ipswich timbers were divided into groups, depending on their context and approximate date (Table 3). The ring sequences from each group were tested against each other for similarity. They were then tested against reference chronologies from Britain and Europe (Appendix 2).

RESULTS

1. The Timbers
The mid to late Saxon timbers were unsuitable for dating. They were either young, roundwood samples (Table 2: 421, 422), or they were so knotty that the ring patterns were completely obscured (eg 429, 493). Two of the timbers, 441 from structure 439 and 447 from layer 447, had suffered some injury in their fifteenth year of growth. They may well have been contemporary, and have suffered from the same adverse effect, such as fire.

The late Saxon timbers were much more variable. Some had few rings, whether they were roundwood (330) or worked timbers (288). Others, often of the same size, had over 100 rings. 363, for example, had 149 narrow rings, although its cross-section was only 130 x 50mm. The average width of the rings was less than 1mm. Three of the timbers, 257 from layer 257, and 363 and 369 from structure 258/275, were so similar in appearance that they must have derived from the same tree. This was confirmed when their ring patterns were examined: they were almost identical. The ring widths were therefore averaged (Appendix 3), and treated as one ring sequence, IAS0257ETC, in future comparisons.

The medieval timbers were also variable. and and 268 from structure 151 were radially-split planks, which came from trees which may have reached 200 years old when felled. The 12th century timbers from structure 566 were either roundwood (569) or worked timbers (579, 5.82). Most of them had few rings, although 580 was an exception in that it had 172 rings, and must have been cut from a tree over 200 years old. 581 may also have come from the same tree because their two ring patterns were almost identical (t=8.8). It was shaped from the inner portion of the trunk whilst 580 used most of the radius of the trunk (Fig 1).

The timbers from structures 499 (201, ,340) and 204 (205, 208) were all converted from small trees, .and the timbers retained some of their sapwood rings. Sapwood is the outer part of an oak tree, distinguishable from the heartwood by colour and the absence of tyloses (Fig 2).

It was often removed during the production of timber because of its susceptability to insect and fungus attack. (Its presence on archaeological timbers is important in the interpretation of tree-ring dates: see below, and Hillam 1986; Hillam et al 1986.)

The 23 timbers from the collapsed quay, 175, were mostly radially-split planks (Fig 1 183/6). Some had no sapwood, but others (eg 186) retained some sapwood rings. Again the size and age of the trees must have been variable, because some samples (eg 188) had few rings, whilst others had over 100 rings (eg 185.3).

Revetment 170 also produced radial planks (eg 221), all of which came from mature oak trees. Structure 498, on the other hand, contained mostly young roundwood timbers (eg 139). The post-medieval well timber from 379 was a radial plank from a mature tree.

2. Tree-Ring Dating
Apart from the timbers that came from the same tree (257, 363, 369; 580, 181), little similarity was found between the ring patterns. The ten measured sequences from 175, for example, Should overlap, but only three showed any correlation: 181 and 186 (t=4.4), and 183 and 186 (t=4.0). The ring widths of the three curves were averaged to produce a short master curve of 85 years (Table 4). No other convincing crossmatching was found for the individual ring sequences.

The measured sequences were next compared with dated reference chronologies for the appropriate period (Appendix 2). Many hundreds of t-values were generated, with numerous values over 3.5, but only six sequences gave consistently high t-values at the same position of overlap.

These fall into two groups: 181, 183, 186 (master IAS175); and 218, 218B, 220 (master IAS C14 MEAN). The first group match several dated chronologies (Table 5), and the master curve gives a t-value of 6.0 with England (Baillie & Pilcher, pers comm) for the period 1106-1190. The dates which these results produce are consistent with the relative dating described above (Fig 3). The dates of the heartwood-sapwood transitions of 181 and 186 are 1182 and 1187 respectively, whilst the outer heartwood ring of 183 is 1184. This indicates that the timbers were felled at the same time. The number of sapwood rings is estimated as 10-50. This figure describes 95% of the sapwood data examined in a recent study (Hillam et al 1986). The estimated felling date for the three timbers from quay 175 is therefore AD 1197-1232.

The dating of the second group was so not so simple, and highlighted a problem which is likely to arise with timbers from the east coast ports - the problem of imported timbers (Hillam 1985c). The ring sequences from 218, 218B and 220, planks from revetment 170, did not match with each other, nor did they appear similar to any of the British chronologies. They did however give high t-values with two chronologies from northern Germany (Table 5). One chronology is made up of timbers from the Göttingen area of north-east Germany (Delorme 1972); the other is from the Schleswig-Holstein region, mostly from the Hedeby and Schleswig excavations (Eckstein pers comm). There was no match with Hollstein's (1980) chronology for the Trier area of Germany. The Ipswich curves did however crossmatch one of the panel painting chronologies (Fletcher 1977, Ref 4). Despite Fletcher's claim to the contrary (New Scientist, 24 January 1985), the oak boards for the panels probably originated in the forests around the Baltic (Baillie 1984; Baillie et al 1985).

The three Ipswich timbers therefore are matching well with three Continental chronologies, all from the Baltic area. It seems likely then that they were imported timbers, which is not surprising as Ipswich was the major port for Baltic timber. (The import of timber is discussed in detail by Salzman 1931 362-63, 1952 244-48.)

None of the three timbers had sapwood. Their outer rings date to AD 1271, 1293 and 1292 (Fig 3). The minimum allowance for missing sapwood is 10 years so they must have been felled after 1281, 1303 and 1302 respectively.

Although the individual ring sequences do not seem to match each other, a master curve, IAS C14 MEAN, was made from the three sets of data (Table 6). It gives t-values of 7.2, 4.1 and 5.3 with north Germany, Schleswig and Ref 4 respectively. This master may be useful for dating imported timbers from other sites in Ipswich and elsewhere on the east coast.

The remaining undated curves were tested against all the dated reference chronologies, both British and Continental, but no consistent crossmatching was found. The ring width data is presented at the end of the report for future reference (Appendix 1).

DISCUSSION

The aims of the tree-ring study did not succeed in that only two of the revetments were dated, and no reference chronology was produced for the Ipswich area. However, examination of the timbers shows that many were unsuitable for dating because they had insufficient rings (Fig 4). Out of 79 timbers, 38 were rejected immediately.

A further 7 had less than 50 rings and, although their rings were measured, their ring patterns could not be dated, and they were later rejected (143, 172, 18A, 190, 205, 242, 572). The Saxon revetments, in particular, provided few suitable timbers, but this relates to the method of construction rather than the inferiority of the timber. They were built of vertical posts, often whole stems, with interwoven branches, rather than the split vertical planks of the later revetments.

A total of 31 ring sequences had more than 50 rings, and 14 had more than 100. It is therefore necessary to examine why only six of these could be dated. Sequences with 50-80 rings are often more difficult to date reliably than those with over 80 rings. This may have contributed to the lack of success, but the chief problem was undoubtedly the lack of relative dating within the site: even the three dated curves from 170 did not match each other. Although it is true that we can date the majority of tree-ring chronologies for the historic period, it is not so for individual ring sequences (Hillam 1986). Previous studies on timber's from Ipswich and Norwich (eg Hillam 1980, 1985a) have shown that, without relative dating, individual East Anglian timbers are rarely dated.

If the timbers are examined in terms of the size and age of their parent tree, and the average width of their rings, it becomes obvious that there is a great variety of material, even within a single structure, such as 175. Some timbers, for example, were from young trees, whilst others were from mature trees grown in a dense woodland. This variety has been noticed at other urban sites, such as Coppergate in York, and suggests that the timbers were coming from more than one source (Hillam 1985c).

Ipswich is likely to have served as a distribution centre for British timber, and there is the added complication, in that oak timbers were imported from the Baltic. Although only the three dated timbers from 170 were identified as continental, others may also be imported. This will obviously tinder the creation of a reference chronology for East Anglia. Fine quality oak boards were imported from the Hanseatic ports around the Baltic throughout the Middle Ages (eg Rackham L980 151). This study shows that the boards were used in revetments, structures for which fine-quality timber was not necessarily required (although the revetment timbers could be re-used).

From a dendrochronological point of view, the dating of the imported Ipswich timbers was instrumental in helping to solve a major problem in the field: that of dating the Type-A tree-ring chronologies which are constructed mainly from panel painting boards (eg Bauch 1978; Fletcher 1977). These chronologies do not match with other British (Type-H) chronologies,.and it has long been suspected that they were constructed from imported timber. For this reason, their dating has never been satisfactory (Baillie 1984). The dating of the 170 timbers, along with other evidence, has now placed the Type-A chronologies correctly in time (full details are given in Baillie et al 1985). The problem of dating art-historical material has prompted workers in Hamburg to instigate a study of modern trees and archaeological timbers from Poland. The results of that study may help in resolving some of the problems that occur with the Ipswich timbers, since at present little is known about oak growth in the Baltic (Baillie 1984).

However, the fact that timbers from two revetments in Ipswich have been dated is encouraging, especially as many of the timbers were unsuitable for dating. It is important that future work in the area should involve as many timbers as possible. Even if, as at Bridge Street, the timbers look unsuitable, some may have sufficient rings. The collection of as many samples as possible will also aid the construction of site master curves and the interpretation of the tree-ring dates.

CONCLUSION

Although the aims of the study were not totally fulfilled, tree-ring analysis has provided dates for two of the revetments: the timbers for the collapsed quay 175 were felled, and probably used, in the period AD 1197-1232. The dating of revetment 122 is not as exact, but it cannot have been built before AD 1303. A precise felling date cannot be estimated because it is not known how many heartwood rings•, if any, were removed, or how much time was taken for transport, seasoning and possible re-use. The dating of 170 has also shown that some of its timbers were imported, probably from the Baltic. The import of timber from the Continent into Ipswich, plus timber possibly from other regions of Britain, will continue to make tree-ring dating in the area difficult. The results of the Bridge Street study show that, whilst timbers can be dated, much more work is needed in and around Ipswich. It will be worth persevering with such timbers because, apart from providing a tight dating framework, dendrochronology also has the potential to provide much information about the timber trade in Ipswich.

ACKNOWLEDGEMENTS

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Table 1: Description of timbers sent for tree-ring analysis.

sample no	Structure	function	Date (century)	no of rings	measured (Yes/No)
0133	498	horizontal	13/14	27	N
0136.2	498	vertical	13/14	8	N
0139	498		13/14	17	N
0143	498	slanting post	13/14	41	Y
0170	170	revetment	13/14	92	Y
0172	168	stake in layer 168	13/14	43	Y
0179	175	plank in collapsed quay	13	18	N
0179.2	175	plank	13	23	N
0180	175	plank	13	25	N
0180.2	175		13	28	N
0181	175	plank	13	57	Y
0183	175	plank	13	79	Y
0184	175	plank	13	39	Y
0185	175	plank	13	76	Y
0185.2	175-	plank	13	72	Y
0185.3	175	plank	13	135	Y
0186	175	plank	13	54	Y
0187	175	plank	13	19	N
0188	175	plank remnant	13	22	N
0189	175	plank	13	28	N
0190	498	vertical	13/14	35	Y
0196	175	slanting plank	13	28	N
0201	499	slanting plank	12/13	95	Y
0205	204	horizontal in front of 0208	12/13	36	N
0208	204	branch	12/13	20	N

Table 1 cont

sample no	Structure	function	Date (century)	no of rings	measured (Yes/No)
0128	170	Horizontal plank	13/14	129	Y
0218.2	170	Horizontal plank	13/14	152	Y
0220	170	Horizontal plank	13/14	165	Y
0221	170	Plank	13/14	143	Y
0233	175	Plank	13	25	N
0235	175		13	too broken	N
0236	175		13	60	Y
0237	175		13	93	Y
0238	175		13	23	N
0242	175		13	40	Y
0243	175		13	23	N
0244.	175		13	25	N
0251	251	in layer 251	late Saxon	13	N
0256	254	vertical plank	11/12	154	Y
0257	257	in layer 257	late Saxon	116	Y
0260	257	In layer 257	late Saxon	60	Y
0268	254	vertical plank	11/12	137	Y
0271	258/275	vertical post	late Saxon	57	Y
0285	258/275	Vertical post	late Saxon	12	N
0288	258/275	slanting post	late Saxon	29	N
0289	258/275	Slanting post	late Saxon	broken	N
0290	251	stray plank layer 251	late Saxon	110	Y
0295	258/275	vertical post	late Saxon	82	Y
0324	258/275	post	late Saxon	69	Y
0330	258/275	nearby horizontal	late Saxon	17	N
0334	258/275	post	late Saxon	24	N
0338	258/275	post	late Saxon	15	N

Table 1 cont.

sample no	Structure	function	Date (century)	no of rings	Measured (Yes/No)
0340	499	vertical	12/13	62	Y
0343	254?	Slanting post	11/13	18	N
0363	258/275	Vertical post	late Saxon	149	Y
0369	258/275	Vertical post	late Saxon	117	Y
0381	381	layer 381	late Saxon	121	Y
0418	500	post	late Saxon	81	Y
0421	386	slanting post	Mid/late saxon	12	N
0422	386	Slanting post	Mid/late saxon	14	N
0429	404	stray plank	as above	Knotty	N
0441	439	slanting post	as above	19	N
0447	447	layer 447	as above	c20	N
0487	487	layer 487	as above	knotty	N
0493	404	driftwood	as above	knotty	N
0497	404	driftwood	as above	c 16	N
0569	566		12	38	N
0571	566		12	16	N
0572	566		12	47	Y
0573	566		12	30	N
0579	566-		12	35	N
0580	566		12	172	Y
0581	566		12	63	Y
0584	566		12	narrow rings	N
0590	566		12	60	Y
?	379	well timber	16/17	128	Y

Table 2: Details of the timbers. Sketches are not to scale; measurements to the nearest 5mm are given for the maximum cross-sectional dimensions. HS - heartwood-sapwood transition; fs felled summer; fw - felled winter. Sapwood - represented by shading on sketches.
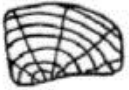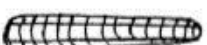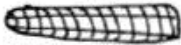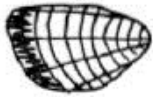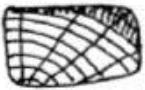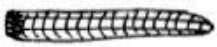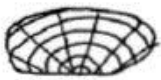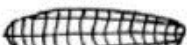
sample no	total no of rings	sapwood rings	sketch	dimensions (mm)
0133	27			125 x 80
0136.2	8			40 x 30
0139	17	6		105 x95
0143	41			120 x 120
0170	92			90 x 20
0172	43			90 x 70
0179	18			100 x 15
0179.2	+23			125 x 10
0180	25			160 x 20
0180.2	28			100 x 90
0181	57	2		175 x 25
0183	79			175 x 20

0184	39			145 x 20
0185	76	14		125 x 100
0185.2 (C)	72			80 x 15
0185.3 (B)	135	40		150 x 90
0186	54	4		145 x 15
0187	19		broken	c 135 x 20
0188	22			100 x 20
0189	28			140 x 20
0190	35			100 x 55
0196	28			95 x 20
0201	95	29 (+at least 2)		95 x 50
0205	36	13		180 x 90
0208	20	15 fs		150 x 70
0218	129			180 x 35
0218.2 (B)	152			145 x 20
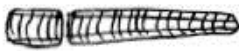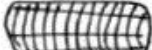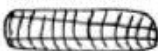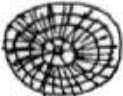
0220	165			185 x	35
0221	143			160 x	30
0233	+25			150 x	10
0235	badly broken				
0236	+60			210 x	30
0237	93			140 x	15
0238	23			70 x	20
0242	40			145 x	20
0243	23			95 x	15
0244	25			95 x	15
0251	13	12		95 x	95
0256	154	7		120 x	60
0257	116	15-34 fw		105 x	50
0260	60			120 x	45
0268	137			190 x	90
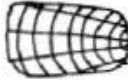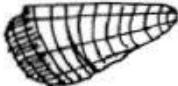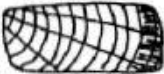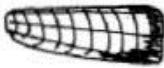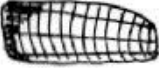
0271	57			105 x 70
0285	12	10		130 x 110
0288	29	16		90 x 75

0289   broken (less than 40 rings)

0290	110	1 (+ at least 33)		170 x 70
0295	82	15		125 x 100
0324	69	29 fw		125 x 120
0330	17	17		95 x 85
0334	24	24 fw		80 x 75
0338	15	15		115 x 100
0340	62	7		130 x 50
0343	18	7		broken
0363	149	18-34		130 x 50
0369	117	14-35		105 x 55
0381	+121	44 fw		155 x 35
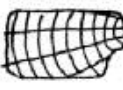
0418	81	31 (c 8/9 to bark)		75 x 70
0421	12	12		110 x 95
0422	14	10-14		125 x 110
0429	knotty			195 x 160
0441	19			130 x 80
0447	15+		Injury	100 x 90
0487	knotty	-		100 x 95
0493	knotty			215 x 130
0497	c 16			170 x 15
0569	38 -	38 fs		155 x 120
0571	16	8		90 x 15
0572	47			65 x 60
0573	30			90 x 60
0579	35			85 x 60
0580	172			195 x 110
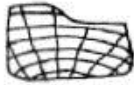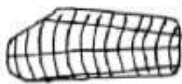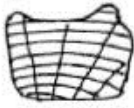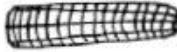
0581	63			100 x 75
0584	rings too narrow to measure			130 x 60
0590	60	5		90 x 70
?	128			125 x 15
?	29	8		240 x 210
?	14	9		broken
?	rings too narrow to measure			120 x 80

Table 3: Chronological order of the timbers; those suitable for ring measurement are marked with an asterisk.

timber	structure	timber	structure
mid-late Saxon		11-12th century	
421	386	256*	254
422		268*	
429	404	?343	
493		569	566
497		571 572*	
441	439	573 579	
447	447 (layer)	580*	
487	487 (layer)	581*	
		584	
late Saxon		590*	
271*	258/275		
285		12-13th century	
288		201*	499
289 290*		340*	
295*		205*	204
324* 330		208	
334			
338		13th century	
363*		179	175 (AD 1196 -1232)
369*		1792	
418	500	180	
251	251 (layer)	1802	
257*	257 (layer)	181*	
260*		183*	
381*	381 (layer)	184*	

185*   175 (AD 1196-1232)
185.2*
185.3
186
187
188
189
 196
233
235
 236*
237*
238
 242*
243
244

C 13-14th

                498

133
136.2
139
143*
190*

                170 (after AD 1303)

170*
218*
  218.2*
220*
221*

                168 (layer)

172

16-17th century

                379

 ? *

Table 4: Ring widths of the Ipswich master, IAS175, which includes data from 181, 183 and 186.
Widths in units of 0.02mm.

```
85

1     -  190 253 227 188 132 121 129 132 163 130

11    -  117 93  76  40  45  66  83  117 139 114

21    -  118 113 114 86  127 102 126 100 135 181

31    -  155 149 222 141 251 253 148 104 108 145

41    -  138 99  137 160 142 136 117 180 155 130

51    -  124 116 109 121 134 104 109 82  100 101

61    -  101 105 99  120 110 80  64  71  102 103

71    -  100 66  97  107 104 106 143 79  67  42

81    -  63  73  60  116 156
```

Trees included are: IAS0181, IAS0183, IAS0186.
Mean dates to AD 1106-1190

Table 5: Summary of Bridge Street tree-ring dates. (Details of reference chronologies are given in Appendix 2.)

sample no	date span	date of first sapwood ring	felled	t-values
181	1126-1182	1182	1197-1232	4.1 Southwark
183	1106-1184	-	1197-1232	5.3 Southwark 4.8 England
186	1137-1190	1187	1197-1232	3.3 Southwark 4.0 Glastonbury
Master IAS175	1106-1190			6.0 England
218	1143-1271		after 1281	3.1 N Germany 4.9 Schleswig 3.0 Ref 4
21813	1142-1293		after 1303	2.8 N Germany 4.8 Schleswig 3.7 Ref°4
220	1128-1292		after 1302	2.6 N Germany 4.5 Schleswig 5.0 Ref 4
Master C14 mean	1128-1293			4.1 N Germany 7.2 Schleswig 5.3 Ref 4

Table 6: IAS C14 MEAN. A master curve made up from 218, 218B and 220. (Ring widths in units of 0.02mm)

Ipswich IAS C14 mean

166

1	–	75	34	78	52	123	62	70	77	74	42
11	–	69	41	59	66	72	56	44	57	56	67
21	–	66	79	73	51	68	82	58	71	53	68
31	–	61	82	92	63	76	59	62	50	54	57
41	–	71	48	54	66	82	66	57	50	62	66
51	–	53	57	50	51	46	55	80	69	68	73
61	–	65	45	68	50	47	44	39	70	48	47
71	–	74	55	65	66	44	57	52	54	46	59
81	–	46	39	65	51	59	47	67	55	52	47
91	–	42	72	57	41	47	42	46	43	38	48
101	–	57	59	55	51	39	36	38	36	39	56
111	–	50	55	44	45	34	46	53	62	55	43
121	–	54	65	60	47	44	56	53	65	45	58
131	–	44	42	44	50	57	48	53	46	59	42
141	–	54	38	45	55	32	38	33	48	40	34
151	–	33	28	24	30	31	38	30	35	36	33
161	–	34	28	29	26	27	28				

Trees included are IAS 0220, IAS 0218B, IAS0218
Mean dates to AD 1128-1293
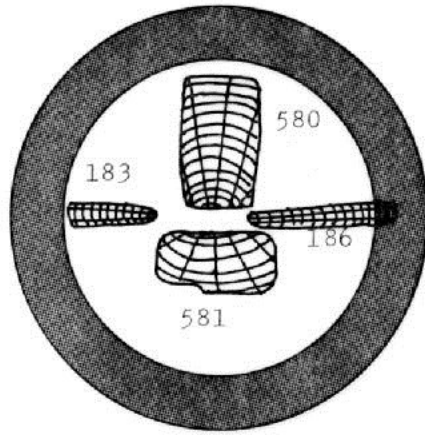
Fig 1: Sketch (not to scale) showing positions of some of the timbers. 580, 581 are from the same tree: the trunk is first split in half, and then split again. 183, 186 are radially-split planks. (Sapwood - shading)

Fig 2: Timber 257 showing the difference between heartwood (left) and lighter-coloured sapwood (right). The number of sapwood rings in this small section varies from a minimum of 15 to a maximum of 34. Note that, although the sample is small, it contains 116 rings. Photo: PW Kingsland.
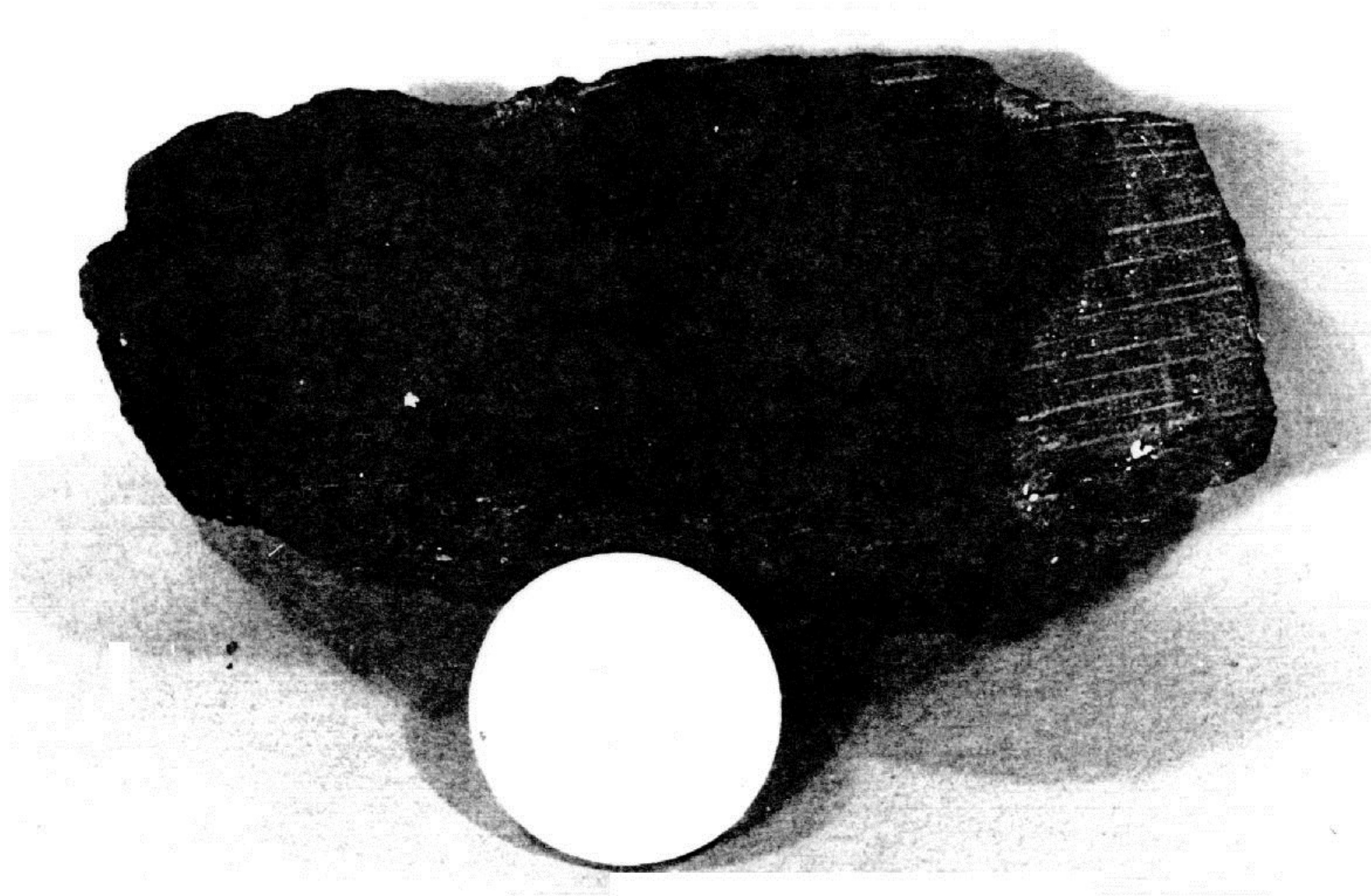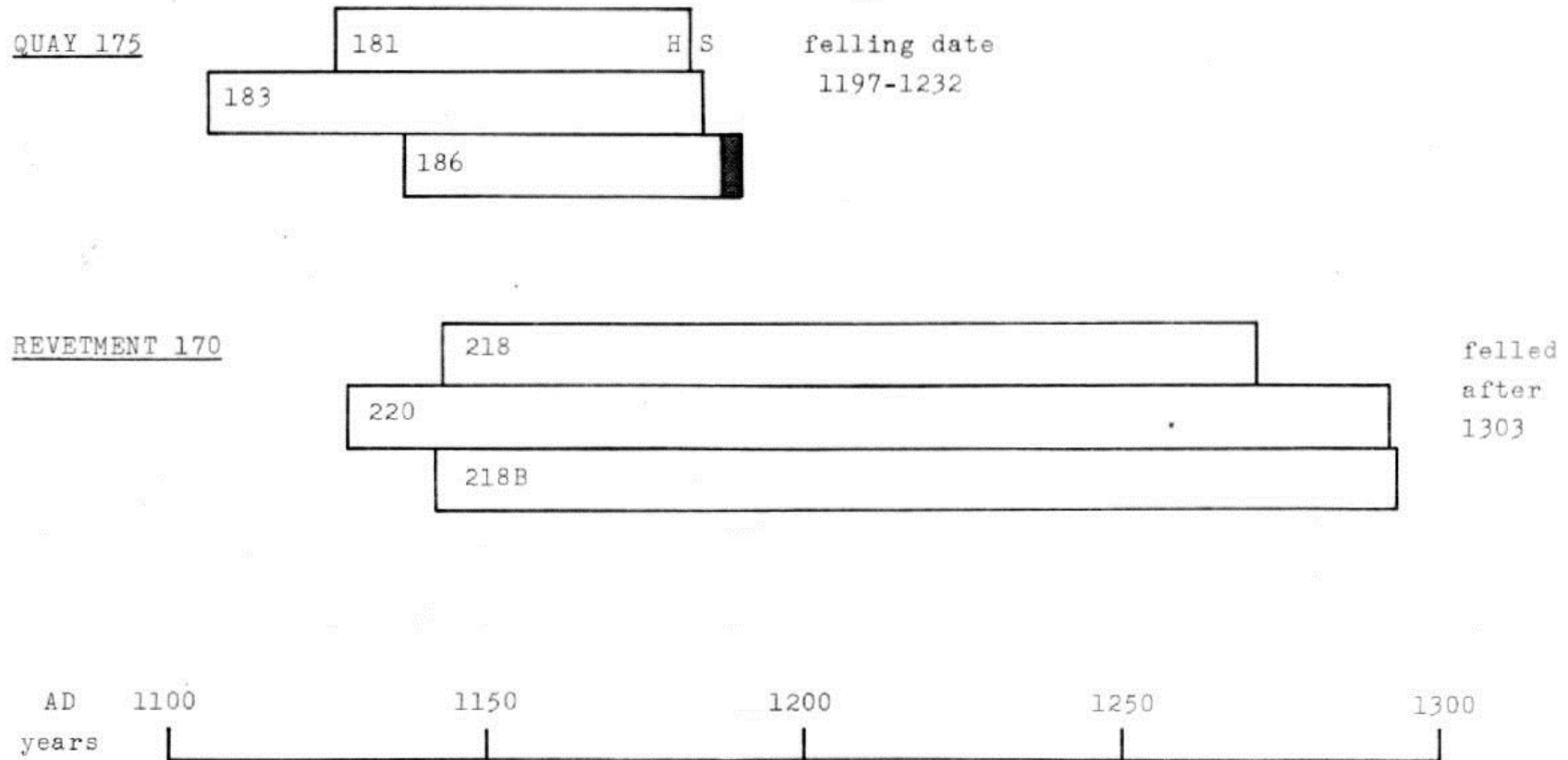
Fig 3: Bar diagram showing temporal relationship between the dated ring sequences. Although all the trees had some period of growth in common, their ring patterns are not always similar. (White bar - heartwood; shaded bar - sapwood; HS - heartwood-sapwood transition)

IPSWICH, BRIDGE STREET
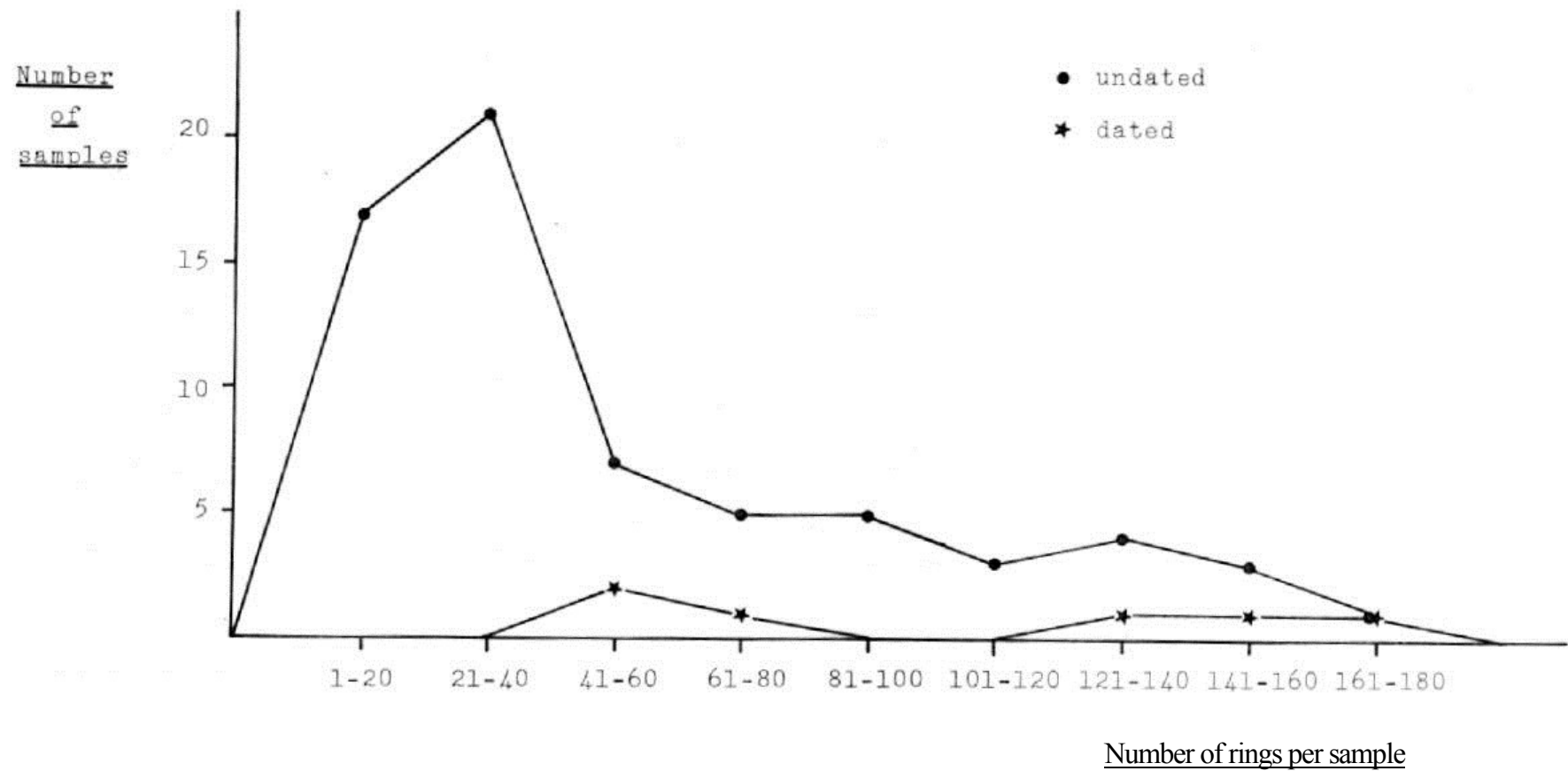
Fig 4: Relationship between the number of rings per sample, and the number of samples dated or undated.

APPENDIX 1

Ring width data of the 38 Ipswich timbers which were used for ring measurement. Six of these (143, 170, 184, 190, 205, 242) were too short for dating purposes).

First two lines identify the site and sample; third line – total number of measured ring widths; fourth and subsequent lines -ring widths in units of 0.02mm. Notes are given at the end of the data if the ring pattern is in any way unusual eg sapwood, abnormal rings, rings which cannot be measured accurately. HS -heartwood-sapwood transition.

IPSWICH
IAS0143
41

1	-25	42	67	76	92	49	94	144	77	110
11	-99	238	227	194	161	98	63	39	26	47
21	-84	75	53	71	141	107	101	80	75	62
31	-109	141	146	58	38	22	26	31	20	26
41	-49									

COMMENT- NEAR PITH

IPSWICH
IAS0170
92

1	-76	68	102	75	90	65	87	60	57	81
11	-101	83	77	80	84	88	53	71	53	55
21	-65	73	52	58	93	89	84	49	38	25
31	-23	25	26	21	34	34	29	39	46	35
41	-66	54	38	55	36	49	55	35	59	44
51	-36	28	46	42	58	33	34	41	29	30
61	-31	29	30	26	37	28	35	21	17	20
71	-16	19	31	25	38	25	39	32	44	25
81	-23	22	32	21	31	38	28	42	43	39
91	-54	42								

IPSWICH
IAS 0143
43

1	- 209	192	103	84	66	88	67	55	91	108
11	- 74	60	43	56	28	33	24	28	47	63
21	- 80	103	128	149	113	102	87	73	56	57
31	- 55	84	66	79	74	70	64	97	100	67
41	- 52	67	4							

COMMENT -

IPSWICH
IAS0181
57

1	- 146	161	139	111	173	129	185	146	197	306
11	- 250	144	179	116	235	299	171	105	114	148
21	- 169	121	151	143	146	126	97	163	135	148
31	- 110	139	165	145	149	117	115	109	121	113
41	- 139	143	10	123	145	102	75	105	133	157
51	- 128	89	130	158	133	154	224			

COMMENT - HS 56

IPSWICH
IAS0183
79

1	-190	253	227	188	132	121	129	132	163	130
11	-117	93	76	40	45	66	83	117	139	114
21	-91	66	89	61	81	75	67	55	73	57
31	-61	92	209	132	227	196	122	78	123	136
41	-93	67	95	150	101	86	103	124	113	87
51	-122	93	76	84	123	87	123	75	112	115
61	-86	77	92	133	108	73	62	42	67	79
71	-82	.52	93	119	118	106	128	93	69	

COMMENT — BREAK AROUND RING 30

IPSWICH
IAS0184
39

1	-156	256	312	209	218	155	234	174	189	253
11	-190	208	249	175	329	253	168	142	137	184
21	-194	154	130	118	95	100	81	144	132	169
31	-196	183	149	106	136	199	166	163	136	

IPSWICH
IAS0185
76

1	-52	28	39	55	44	29	49	56	37	57
11	- 60	40	44	67	89	62.	57	61	61	60
21	- 63	57	68	61	43	62	91	59	70	56
31	-93	69	59	38	77	72	75	50	69	66
41	-75	92	77	65	97	132	158	146	120	65
51	-111	99	149	122	117	85	117	38	55	101
61	-152	166	127	151	93	83	62	59	61	160
71	-122	100	130	111	124	99				

COMMENT — RINGS NEAR PITH SQUASHED —HS 63

IPSWICH
IAS0185B
135

1	-116	90	71	46	37	7	63	61	36	75
11	-57	59	47	70	112	92	52	67	49	28
21	-31	31	48	61	56	21	28	30	30	35
31	-45	39	25	44	34	30	21	21	26	24
41	- 22	16	22	24	37	42	64	51	50	57
51	- 52	50	49	144	122	136	125	101	65	44
61	- 40	25	30	24	29	22	39	48	39	31
71	- 27	29	22	22	23	21	27	23	48	33
81	- 32	32	27	17	10	7	17	23	14	18
91	- 24	22	31	40	58	53	65	46	51	65
101	-33	50	48	60	35	33	59	45	61	46
111	-40	59	40	36	28	56	39	49	36	51
121	-39	29	38	28	29	67	43	43	35	57
131	- 50	48	46	46	63					

COMMENT-HS 97-PLUS AT LEAST TWO MORE RINGS

IPSWICH
IAS 0185C
72

1	-88	76	75	56	56	64	37	51	38	46
11	-60	58	45	73	57	50	57	55	53	70
21	-49	42	86	54	58	45	36	47	53	52
31	-79	52	76	50	72	65	80	75	65	59
41	-59	44	63	63	57	40	43	56	47	51
51	-44	68	52	28	39	45	60	49	49	48
61	-42	37	39	51	26	25	34	53	53	46
71	-38	37								

COMMENT-

IPSWICH
IAS0186
54

1	-213	278	175	292	266	152	129	88	150	153
11	-110	165	187	179	198	151	253	217	156	140
21	-116	87	134	132	109	91	63	69	77	78
31	-97	95	104	79	67	55	66	106	75	91
41	-58	70	44	62	60	79	65	66	42	63
51	-73	60	116	156						

COMMENT- HS 51

IPSWICH
IAS0190
35

1	-144	169	166	72	82	85	49	51	93	99
11	-66	70	43	59	28	28	37	33	60	49
21	-67	92	122	101	95	76	60	59	54	50
31	-52	84	42	62	47					

COMMENT-NEAR PITH

IPSWICH
IAS0201
95

1	-140	158	129	109	83	62	127	133	54	81
11	-49	65	65	63	25	20	22	16	41	32
21	-47	48	56	49	37	30	15	31	44	94
31	-95	64	68	48	41	31	25	30	70	48
41	-62	64	70	56	47	25	41	40	32	33
51	-46	41	39	31	27	30	35	39	53	34
61	-62	49	38	28	28	31	32	39	53	35
71	-36	43	40	29	30	31	20	25	31	38
81	-34	55	41	29	52	45	31	57	51	41
91	-35	36	41	41	22					

COMMENT-HS 68- PLUS AT LEAST TWO RINGS

IPSWICH
IAS0205
36

7	-128	96	109	159	92	132	140	145	115	108
11	-199	168	173	189	193	159	159	192	143	177
21	-228	148	135	170	121	145	85	124	93	79
31	-64	43	36	29	78	105				

COMMENT- HS-24

IPSWICH
IAS0218
129

1	-71	33	62	59	66	50	66	53	43	65
11	-69	73	59	84	70	64	78	77	60	73
21	-56	60	63	68	75	69	58	69	77	88
31	-59	55	69	55	88	56	75	53	69	60
41	-52	87	75	77	96	85	58	91	62	69
51	-51	53	99	64	54	97	73	82	91	66
61	-82	54	89	47	107	87	56	109	86	82
71	-67	78	76	60	60	57	95	75	55	63
81	-57	90	65	49	65	86	84	72	67	67
91	-53	40	48	55	80	54	72	64	63	47
101	-58	78	83	61	56	72	78	67	52	46
111	-69	49	79	47	73	43	64	43	59	87
121	-84	72	64	75	52	55	48	57	94	

COMMENT-? LAST 5 RINGS SAPWOOD

IPSWICH
IAS0218B
152

1	-84	45	43	49	54	70	81	94	94	61
11	-74	96	53	64	40	61	44	69	81	56
21	-64	75	57	51	46	48	67	26	47	49
31	-49	47	54	31	59	48	43	45	54	42
41	-44	37	53	28	58	61	49	36	53	49
51	-34	32	38	54	41	35	50	38	46	53
61	-29	38	55	36	59	37	30	36	52	40
71	-55		60	53	45	53	32	64	43	32
81	-28	30	25	40	40	44	58	60	53	34
91	-23	24	29	20	22	33	26	34	31	
101	-31	44	43	57	49	36	43	59	45	56
111	-22	42	64	59	48	65	40	31	32	55
121	-42	21	29	33	35	40	45	40	55	35
131	-31	37	34	40	44	38	33	21	22	30
141	-35	33	33	33	37	38	33	22	34	30
151	-23	28								

COMMENT- 111/2 MAY BE ONE RING-SAMPLE BROKEN HERE

1	-75	34	78	52	123	62	70	77	74	42
11	-69	41	59	66	60	54	57	62	55	65
21	- 67	78	73	49	65	83	48	90	36	75
31	- 76	100	119	74	93	47	70	37	49	48
41	-77	60	47	74	109	94	64	52	73	64
51	-61	51	45	42	35	77	101	105	69	64
61	-63	43	62	41	38	49	33	58	41	53
71	-75	54	68	56	38	52	47	38	32	
81	-21	25	:36	30	41	32	63	36	53	28
91	-37	59	54	38	51	40	24	26	27	35
101	-29	35	40	52	28	33	47	42	40	56
111	-72	60	38	37	26	38	40	47	56	37
121	-49	53	70	34	65	57	48	57	40	36
131	-50	32	58	36	43	39	58	41	68	34
141	- 62	26	25	36	34	38	32	57	37	:30
151	- 34	36	26	30	28	43	27	37	.36	28
161	- 36	35	25	23	31					

IPSWICH
IAS0221
143

1	- 16	16	37	51	67	57	49	33	27.	40
11	- 67	122	67	82	68	43	36'	41	49	60
21	- 87	88	50	125	97	61	29	43	55	53
31	- 54	62	49	77	79	88	59	48	83	95
41	- 78	96	81	8853	112	84	67	37	63	75
51	- 82	85	81	64	58	53	75	68	54	65
61	- 79	59	65	55	37	21	30	43	34	44
71	- 32	59	42	42	34	41	21	28	38	35
81	- 37	48	42	39	39	30	40	29	47	58
91	- 39	36	40	39	34	37	42	1.9	28	25
101	- 47	39	36	27	35	39	23	35	53	35
111	- 31	44	64	51	88	91	73	57	94	78
121	- 39	97	35	87	73	37	32	36	35	26
131	- 51	55	38	53	41	43	36	26	29	30
141	- 49	28	53							

IPSWICH
IAS0236
60

1	-108	74	39	45	42	28	41	47	45	54
11	-68	67	75	58	67	86	62	84	83	72
21	-81	65	74	72	52	79	56	67	70	54
31	-67	71	50	66	59	71	80	82	77	60
41	-46	64	56	98	77	109	100	112	73	80
51	-81	80	86	88	83	56	97	90	87	124

COMMENT- INNER SECTION OF TIMBER TOO DEGRADED TO MEASURE

IPSWICH
IAS0237
93

1	-91	107	67	50	82	101	95	77	64	87
11	-73	102	103	61	69	96	96	81	62	83
21	-78	68	82	78	112	101	133	69	49	63
31	-62	90	76	69	65	52	70	74	82	98
41	-64	92	65	52	90	61	76	62	74	60
51	-56	64	54	41	55	69	80	71	61	78
61	-80	67	113	94	87	71	40	57	57	71
71	-62	72	55	56	65	63	61	86	83	49
81	-75	72	69	71	48	44	72	63	49	61
91	-40	39	60							

COMMENT-

IPSWICH
IAS0242
40

1	-138	98	233	150	183	191	7	f10	130	97
11	-240	244	132	83	114	216	187	151	153	213
21	-143	227	290	397	255	102	68	77	101	146
31	-131	72	106	135	94	77	134	136	136	149

COMMENT — BREAK AT RING 8 COULD BE A YEAR OUT

IPSWICH
IAS0256
154

1	- 56	70	49	69	45	51	33	43	36	28
11.	-26	30	44	54	52	51	36	46	44	36
21.	-76	65	61	54	32	33	59	71	59	39
31.	-55	33	24	45	56	38	78	2.9	45	51
41	-47	44	52	42	47	60	33	42	31	40
51	-55	40	35	23	42	23	32	31	45	54
61	-55	59	44	58	61	33	45	41	27	29
71	-33	25	70	52	59	43	52	64		55
81	-42	59	48	134	79	94	64	90	58	57
91	-48	35	30	27	32	43	47	48	56	
101	-47	32	37	27	60	54	50	76	79	80
111	-64	48	89	75	99	43	56	60	103	88
121	-65	97	76	57	69	86	72	65	126	87
131.	-79	100	67	58	75	141	79	117	135	112
141	-126	111	126	76	124	149	137	138	118	98
151	-126	77	88	76						

COMMENT-ERROR AT 94/95?-HS 148

IPSWICH
IAS0257
116

1	-115	74	80	96	96	119	88	74	56	44
11	- 38	59	56	57	69	50	30	23	31	51
21	- 53	43	38	46	46	35	57	50	46	47
31	- 48	66	74	43	52	56	68	54	40	41
41	- 47	57	39	33	44	33	38	42	65	52
51	- 42	37	34	29	42	31	31	39	37	25
61	- 36	30	25	41	32	19	33	36	33	27
71	- 24	21	34	40	25	52	35	40	43	23
81	-17	16	23	38	23	51	27	51	34	36
91	- 36	31	30	31	33	40	30	24	25	19
101	- 21	27	53	33	21	21	23	33	30	72
111	-31	38	32	31						

COMMENT-FIRST HS 83 AND LAST 102-BARK FELLED WINTER

IPSWICH
IAS0260
60

1	- 159	148	131	165	139	83	140	150	111	117
11	-118	44	75	129	151	156	95	146	93	88
21	- 74	95	129	108	150	99	76	66	119	130
31	- 80	96	48	102	115	89	51	63	84	81
41	- 82	75	91	61	70	54	41	61	90	79
51	- 75	75	52	102	61	46	73	101	58	85

COMMENT -

IPSWICH
IAS0268
137

1	119	135	95	80	103	42	84	92	105	93
11	- 109	129	138	122	95	126	99	108	72	35
21	- 24	18	13	26	19	26	18	27	28	58
31	-64	43	64	77	57	62	58	89	64	96
41	- 74	55	45	53	57	71	55	74	60	50
51	-73	52	85	59	87	115	112	104	134	121
61	-106	144	105	65	47	77	91	62	59	65
71	-74	64	79	69	54	63	53	44	54	61
81	-73	80	105	68	59	46	62	32	73	60
91	-52	49	58	65	46	66	67	45	52	42
101	-55	54	47	50	47	53	66	61	60	78
111	-79	63	76	97	77	88	75	87	64	54
121	-64	52	60	69	57	85	69	78	51	59
131	-60	73	60	45	51	34	45			

IPSWICH
IAS0271
57

1	- 193	153	160	170	142	143	103	98	48	71
11	- 91	103	100	113	93	84	114	80	63	67
21	- 96	111	90	55	49	73	95	114	62	77
31	- 36	25	34	43	24	56	46	64	86	92
41	- 64	88	74	46	9	41	75	69	60	
51	- 88	97	64	77	53	67	76			

IPSWICH
IAS0290
110

1	-40	33	22	44	87	70	59	53	48	94
11	-79	98	67	96	70	100	57	96	72	79
21	-58.	74	56	55	49	87	63	45	44	46
31	-46	39	28	16	24	28	30	37	44	70
41	-44	59	57	44	19	21	31	25	23	19
51	-27	25	49	40	50	53	43	55	45	56
61	-66	74	52	74	58	56	50	43	38	33
71	-50	34	49	33	41	66	49	39	23	51
81	-36	42	52	47	51	42	60	50	34	33
91	-23	22	21	20	17	36	19	20	28	22
101	-24	20	33	15	23	18	19	23	13	17

COMMENT- NEAR PITH FIRST HS 110 — LAST C 20 YRS AFTER -AT

LEAST 12 MORE AFT ER THAT

IPSWICH
IAS0295
82

1	-18	23	31	36	31	31	57	35	51	68
11	-54	28	42	55	56	75	61	43	32	68
21	-85	59	46	60	60	48	77	51	75	65
31	-55	70	88	61	78	57	84	86	56	39
41	-58	38	58	46	64	57	77	69	54	39
51	-66	.98	108	83	71	41	78	75	113	92
61	-109	78	106	39	59	111	134	151	125	149
71	-92	91	79	87	73	171	143	113	119	109
81	-132	116								

COMMENT — HS 68

IPSWICH
IAS0324
69

1	- 46	82	65	27	48	78	64	37	36	59
11	- 47	56	40	41	68	79	52	68	43	52
21	- 62	39	49	45	50	33	25	33	45	30
31	-33	37	37	35	23	26	35	42	23	21
41	- 27	34	20	28	31	23	26	28	34	42
51	- 31	37	37	25	37	33	36	35	40	47
61	- 46	43	30	34	46	46	44	37	37	

COMMENT-PITH-HS 41- FELLED WINER-TOO DECAYED TO SEE

HS VARIATION

IPSWICH
IAS0340
62

1	- 185	136	125	165	176	182	168	107	87	123
11	-144	137	101	100	87	64	77	84	44	52
21	- 90	100	87	93	107	69	56	76	80	98
31	-109	65	59	104	61	65	51	36	52	46
41	-40	51	51	59	58	63	75	86	94	124
51	-104	124	135	130	155	187	142	154	147	137
61	-140	96								

COMMENT-HS 68

1	-86	117	100	75	41	22	36	38	31	23
11	-30	29	45	37	22	44	55	47	40	40
21	-20	23	28	40	24	40	52	64	65	29
31	-101	72	52	77	91	115	138	68	89	104
41	-91	110	64	85	51	52	36	51	47	51
51	-63	52	38	31	32	46	32	43	41	47
61	-47	39	49	49	41	46	44	58	62	43
71	-48	50	55	41	34	44	46	49	36	43
81	-50	33	39	36	63	72	57	46	41	34
91	-40	38	35	35	40	41	27	27	24	33
101	-27	20	26	28	33	24	18	20	24	27
111	-27	36	27	33	33	26	22	14	33	35
121	-45	55	28	48	27	42	38	27	20	29
131	-30	26	20	17	20	19	23	27	56	28
141	-17	15	13	19	16	15	15	21	16	

COMMENT-52 COULD BE TWO RINGS-FIRST HS 116-LAST AT C 132

1	-99	130	69	85	101	97	127	90	74	62
11	-47	36	60	50	66	68	54	34	22	33
21	-44	30	38	45	46	40	43	52	45	58
31	-51	43	57	68	50	41	53	69	48	40
41	-51	51	61	34	39	48	29	43	36	54
51	-62	45	36	36	28	36	29	36	28	50
61	-37	31	23	19	30	24	14	31	29	36
71	-25	21	19	25	29	23	43	33	42	33
81	-18	19	17	31	43	35	62	26	46	37
91	-42	26	27	26	34	28	43	31	28	24
101	-22	24	34	76	36	17	16	19	31	25
111	-37	29	32	33	29	23	23			

COMMENT-FIRST HS 83-LAST HS 104-FELLED WINTER

IPSWICH
IAS0381
121

1	-28	40	43	45	45	35	53	40	55	41
11	-45	60	47	44	36	53	48	36	49	77
21	-43	37	44	43	39	48	35	41	34	40
31	-38	43	33	25	38	44	44	63	48	44
41	-39	29	27	39	41	27	39	41	53	46
51	-43	51	54	41	52	45	38	46	44	28
61	-36	37	43	41	29	37	41	30	38	
71	-31	34	29	32	43	30	30	35	30	20
81	-20	22	22	28	33	28	30	32	26	26
91	-23	23	15	24	32	23	34	21	19	30
101	-24	29	24	23	22	25	29	28	32	43
111	-33	33	32	34	29	24	22	31	43	26
121	-35									

COMMENT-INNER RINGS NOT MEASURED-HS 78-BARK FELLED WINTER

IPSWICH
IAS0418
81

1	-61	48	54	42	39	35	46	40	34	27
11	-27	38	28	33	36	33	41	33	39	48
21	-35	20	45	40	34	41	34	48	48	30
31	-44	57	56	54	39	46	51	57	29	31
41	-55	59	49	30	45	52	38	46	66	46
51	-37	59	72	48	57	44	60	47	40	44
61	-44	45	48	49	47	46	59	48	43	39
71	-23	29	38	60	39	32	25	25	38	31
81	-20									

COMMENT- HS 51- PROBABLY 8 OR 9 RINGS TO BARK EDGE

IPSWICH
IAS0489
128

1	-51	61	60	66	52	51	57	59	70	98
11	-70	54	40	64	63	76	65	38	52	46
21	-42	32	32	45	42	42	67	45	62	44
31	-65	61	73	59	61	52	65	70	57	47
41	-46	45	66	57	50	63	71	61	41	53
51	-58	71	54	43	34	62	35	71	33	52
61	-41	46	61	30	40	29	42	35	44	50
71	-38	44	57	39	24	70	44	39	34	30
81	-34	38	54	31	49	29	44	49	27	45
91	-32	29	34	41	21	48	45	39	32	26
101	-36	48	33	44	37	53	49	42	29	33
111	-40	39	27	41	34	44	28	55	37	31
121	-40	37	41	37	30	28	44	23		

COMMENT-

IPSWICH
IAS0572
47

1	-36	69	100	51	36	80	111	96	68	58
11	-118	78	93	111	121	65	72	77	123	101
21	-90	87	60	47	94	94	95	56	118	88
31	-66	34	26	43	96	135	81	130	103	124
41	-61	121	60	97	139	87	109			

COMMENT-

IPSWICH
IAS0580
172

1	-156	113	124	85	64	40	81	97	90	111
11	-85	69	47	60	55	93	72	74	93	48
21	-82	49	27	42	55	76	38	34	49	27
31	-51	34	51	32	58	45	25	35	32	55
41	-42	27	52	49	88	96	36	29	30	49
51	-39	38	29	44	78	36	56	37	48	50
61	-34	49	43	62	57	83	52	35	44	35
71	-38	42	54	54	30	25	19	30	29	20
81	-55	72	68	56	47	34	92	60	64	44
91	-57	34	91	71	105	56	76	134	127	110
101	-75	54	70	74	78	50	34	44	68	54
111	-44	74	110	82	71	55	27	27	32	44
121	-84	47	28	54	47	33	34	23	59	72
131	-55	82	65	48	34	61	53	433	40	49
141	-63	67	62	50	63	37	46	53	30	47
151	-72	74	40	54	63	59	55	79	101	83
161	-100	48	43	52	65	61	44	33	54	26
171	-33	29								

COMMENT - RINGS DIFFICULT TO MEASURE

IPSWICH
IAS0581
63

1	-58	73	61	59	63	60	102	61	60	56
11	-56	70	48	41	55	37	62	36	43	49
21	-46	46	41	56	61	91	100	66	85	90
31	-88	108	49	33	34	47	41	40	39	52
41	-70	43	64	48	57	56	43	63	63	52
51	-56	73	62	48	45	59	4'73	54	61	66
61	-41	36	66							

COMMENT- ? LAST 13 RINGS INCLUDED SAPWOOD?

IPSWICH
IAS0590
60

1	-93	110	139	119	101	125	73	80	106	95
11	-78	60	73	38	49	50	59	69	62	73
21	-66	59	52	36	27	41	70	57	42	35
31	-28	37	33	40	25	28	23	28	26	21
41	-21	23	25	31	50	38	49	30	36	51
51	-111	169	142	84	87	67	43	25	28	33

COMMENT — HS 56

APPENDIX 2

List of the dated reference chronologies used in this study.

Chronology	Date	Reference
Bradwell Abbey	1083-1279	Bridge 1983
Bristol	1032-1239	Hillam 1984
Britain	401-1981	Baillie & Pilcher, pers comm
Droitwich	1178-1415	Hillam, unpubl
Dublin	855-1306	Baillie 1977
England	404-1981	Baillie & Pilcher, pers comm
Germany, north	1004-1970	Delorme 1972
Germany, Schleswig	741-1460	Eckstein, pers comm
Germany, west	700BC-1975	Hollstein 1980
Lincoln	882-1184	Laxton et al 1982
London, City	682-968	Hillam 1981
London, Southwark	779-1227	Tyers, pers comm;
*Ref 1	1214-1606	Fletcher, pers comm.
*Ref 2/3/5 MKII	1152-1622	"
*Ref 4	1124-1403	Fletcher 1977
Ref 6	780-1193	"
Ref 7	993-1267	Fletcher, pers comm
Wick, St Cuthberts	1255-1496	Bridge 1983
York, Coppergate	715-1011, 1031-1248	Hillam unpubl "
*York, Zouche	1118-1386	Fletcher & Morgan 1981
Glastonbury	1095-1334	Bridge 1983

(* - dates of these chronologies are as in Baillie et al 1985)

APPENDIX 3: Average ring sequence from samples 257, 363 and 261. (Ring widths in units of 0.02mm)

IPSWICH
IAS0257 ETC
152

1-	86	117	100	75	41	22	36	38	31	23
11-	30	29	45	37	22	44	55	47	40	40
21-	20	23	28	40	24	40	52	64	65	29
31-	101	72	52	77	91	107	127	70	84	100
41-	94	118	80	77	56	47	36	56	51	58
51-	66	52	34	25	32	47	31	41	41.	46
61-	44	39	51	48	48	48	45	60	68	45
71-	47	53	64	47	38	45	48	55	36	38
81-	47	31	40	38	60	62	48	39	37	30
91-	39	32	34	34	39	34	31	26	22	34
101-	27	17	30	31	34	25	21	20	27	32
111-	25	43	31	38	36	22	19	15	29	38
121-	34	56	26	48	32	40	33	28	25	31
131-	30	16	27	23	23	20	22	29	61	32
141-	18	17	18	27	23	28	25	30	27	30
151-	23	22								

TREES INCLUDED ARE-IAS0257 IAS 0363 IAS 0369

Undated; sequences are probably from same tree.
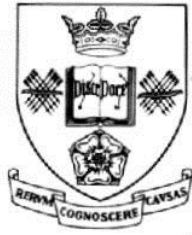
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Sheffield S10 2TN
Tel: Sheffield 78555 ×6082
STD code:0742

Mr K Wade
Archaeology Section
County Planning Office
St Edmund House
Rope Walk IPSWICH IP4 1LZ   19 February 1985

Dear Keith

Bridge Street Dendrochronology

Enclosed is the report on the Bridge Street timbers. I worked on the tree-ring data for quite a long time again after I last wrote to you, but without much progress. I was, however, able to date three timbers from revetment 175: the timbers were felled during the period AD 1197-1232.
I now have an assistant - at least for the next six months or so - so I hope to start on the next lot of Ipswich timbers before too long. I had a look at the timbers at the York Conservation Lab, and attempted to take cores. Most of the timbers did not have many rings, and were rather soft. I am not therefore too optimistic about chances of dating the cores, but will give it a try.

Yours sincerely

Jennifer Hillam

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