

Ancient Monuments Laboratory  
Report 35/2000

TREE-RING ANALYSIS OF TIMBERS  
FROM ABBAS HALL, GREAT  
CORNARD, SUDBURY, SUFFOLK

M C Bridge

Opinions expressed in AML reports are those of the author and are not necessarily those of English Heritage (Historic Buildings and Monuments Commission for England).

Ancient Monuments Laboratory Report 35/2000

TREE-RING ANALYSIS OF TIMBERS FROM  
ABBAS HALL, GREAT CORNARD, SUDBURY,  
SUFFOLK

M C Bridge

Summary

A number of the oaks used in the primary phase of the aisled hall retained complete sapwood, with two samples having bark still present on them. One was felled in the spring of AD 1289, the others in the autumn or winter AD 1289 - 90. This date accords well with stylistic evidence which had suggested a date of construction of the hall in the latter decades of the thirteenth century. A single timber from an inserted floor, thought on stylistic grounds to have been added in the sixteenth century, was felled in AD 1548 - 9. The cross-wing is thought to be sixteenth century, but is thought on architectural grounds to be later than the inserted floor, and therefore would appear to date from the latter half of that century, but was not dated dendrochronologically.

Author's address :-

DR M C Bridge  
INSTITUTE OF ARCHAEOLOGY (LONDON)  
University College London  
31-34 Gordon Square  
London  
WC1H 0PY

# TREE-RING ANALYSIS OF TIMBERS FROM ABBAS HALL, GREAT CORNARD, SUDBURY, SUFFOLK

## Introduction

Abbas Hall (NGR TL 901404; Fig 1) has several phases of construction, of which the primary phase consists of an aisled hall and service cell. This primary phase is thought to date to the late-thirteenth century, and has many similarities with another Suffolk example, Purton Green Farmhouse at Stansfield. It has an open truss in which the arcade posts have moulded capitals and long braces with notched lap joints. A later inserted floor is thought to date from the sixteenth century, and a later cross-wing is also probably of sixteenth century origin (Aitkens pers comm). Abbas Hall was the house of the steward of the manor of Great Cornard during its ownership by the nunnery of West Malling in Kent from *c* AD 1107 to the dissolution *c* AD 1545 (Aitkens pers comm), and sits on a hillside on the boundary of an ancient woodland that was very likely the source of timber.

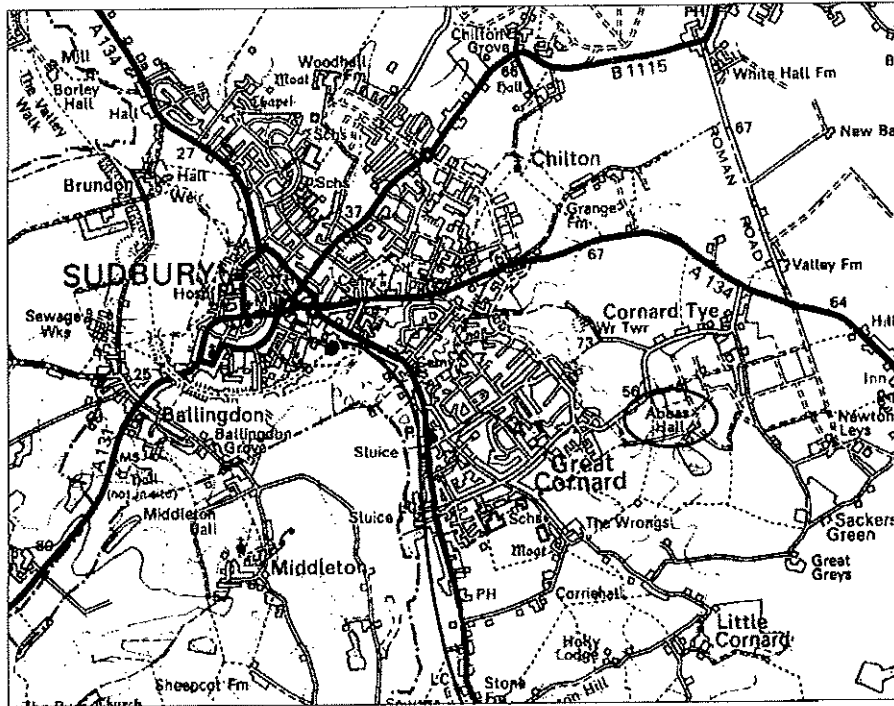
Dendrochronological dating was requested in order to provide a firm date for the aisled hall, which in turn may help interpret other halls in the region, and to assist a more detailed architectural and documentary survey of the building being undertaken by Philip Aitkens, who provided much of the background information and drawings used in this report. The primary trusses have a cambered tie beam, thought to be rare in the area before *c* AD 1300, and open notched-laps for braces, which are thought to be no later than this date (Aitkens pers comm).

Although it was the primary phase that was of interest here, the opportunity was taken whilst on site to assess the potential for dating other phases, and other timbers were investigated. This was done in order to further the knowledge of the development of the building. Few samples were taken from these timbers as it was quickly realized that they had insufficient rings for further study.

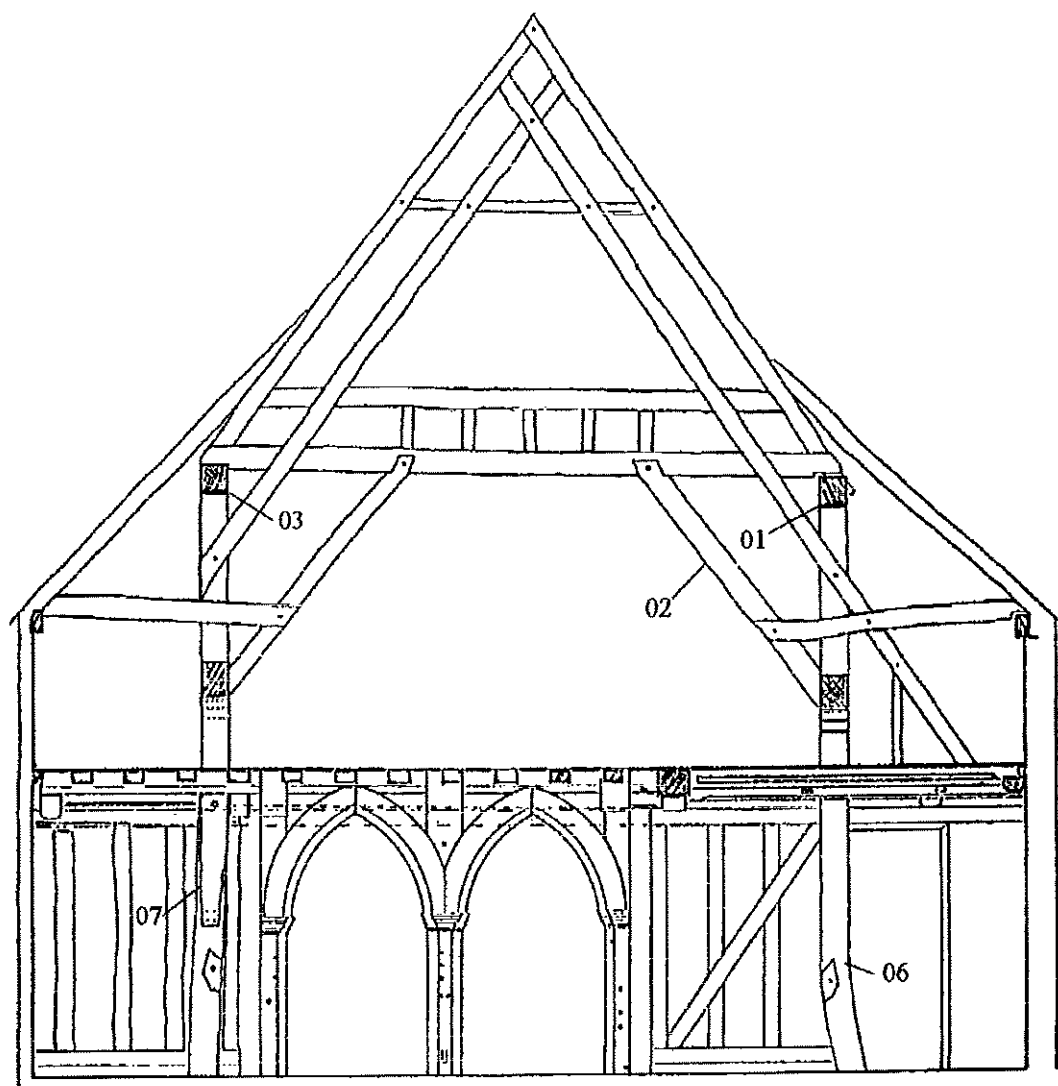
## Methodology

The site was visited in March AD 1999, when the timbers were assessed for their potential use in dendrochronological study. Samples were taken from twelve timbers, the locations of which are described in Table 1 and seven are illustrated in Figures 2 and 3. No suitable drawings were available on which to mark the remaining five sample locations.

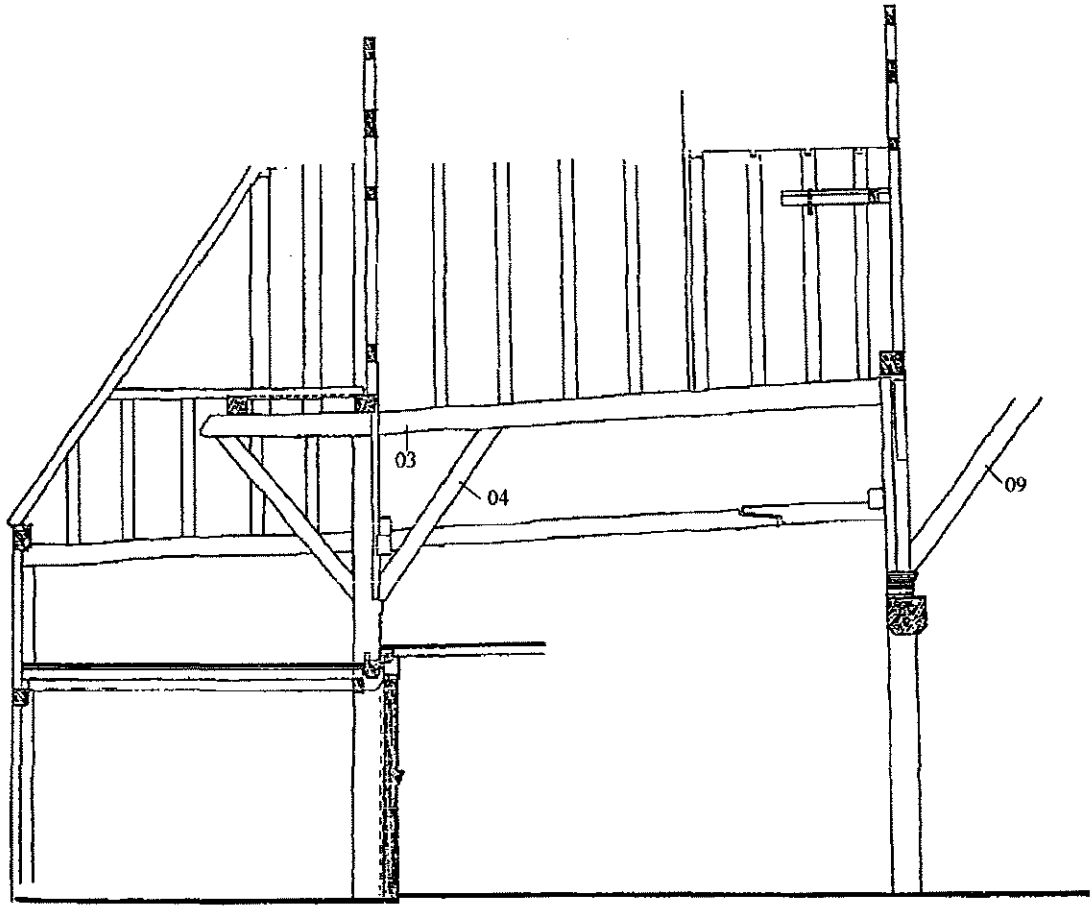
Core samples were obtained using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis. The cores were prepared for measuring by sanding using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Only samples with more than 45-50 rings were measured and used in subsequent analyses as sequences with fewer than this number of rings rarely give reliable crossmatching. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01 mm using a specially constructed system utilizing a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to an Atari desktop computer. The software used in measuring and subsequent analysis was written by Ian Tyers (pers comm 1992).



**Figure 1:** Map to show the general location of Abbas Hall



**Figure 2:** Drawing of the west face of the closed truss of the primary phase of construction at Abbas Hall, showing the locations of samples taken for dendrochronological study (based on an original drawing by Philip Aitkens)



**Figure 3:** Drawing of the cross-truss of the primary phase of construction at Abbas Hall, showing the locations of samples taken for dendrochronological study

control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

When crossmatching between samples is found, their ring-width sequences are meant to form an internal site mean sequence which is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual series thought to have sufficient rings, which are not included in the site mean(s), are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the rings available on each sample. Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997), in which 95% of samples are likely to have from 9 to 41 sapwood rings. Where bark is present on the sample the exact date of felling of the tree used may be determined. The season of felling may also be determined by analyzing the types of cells immediately under the bark edge.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except where re-used timbers are employed, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

## **Results**

All the timbers were of oak (*Quercus* spp.). Only eight timbers (samples 01-04 and 06-09) from the primary phase were assessed as having sufficient rings for dendrochronological study and exhibiting sapwood or a heartwood-sapwood boundary, essential for estimating felling date ranges. Seven of these samples matched each other, the degree of matching being shown in Table 2. These timbers were combined into a site chronology ABBAS1 (Fig 4), which was dated against a range of regional and site chronologies, the results being shown in Table 3. A single timber from the inserted floor (AHC11) was also dated against a number of regional and site chronologies, the results being shown in Table 4. Details of the ring-width series are given in Table 5.

Bands of varying width rings were noted in the north arcade plate near the open truss. This timber was not therefore sampled, although a different timber forming this plate further along (AHC01) gave good results.

The ring-width series from the intermediate post (AHC05), ceiling joist (AHC10), and a stud in the west wall (AHC12), all thought to be from secondary phases of building, did not contain sufficient rings to be dated. This was only apparent after sampling, and it was decided not to sample these phases further. Sample AHC08, from a collar thought not to be original (Aitkens pers comm) had 78 rings, and gave no consistent matches against the available chronologies.

**Table 1:** Oak (*Quercus* spp.) timbers sampled from Abbas Hall, Suffolk.

h/s = heartwood-sapwood boundary, complete sapwood does not have bark present on the sample.

Sample number	Origin of core	Total no of years	Average growth rate (mm yr <sup>-1</sup> )	Sapwood details	Date of sequence AD	Felling date of timber AD
AHC01	North arcade plate	133	1.32	31	1150 - 1282	1283 - 1292
AHC02	North brace to closed truss	106	1.49	26 complete	1184 - 1289	1289/90
AHC03	South arcade plate	95	1.28	-	1161 - 1255	after 1264
AHC04	Brace	87	1.33	17 + bark	1202 - 1288	Spring 1289
AHC05	Intermediate post, first floor	78	1.36	28 + bark	unknown	unknown
AHC06	North arcade post, closed truss	66	1.50	24 complete	1224 - 1289	1289/90
AHC07	South arcade post, closed truss	56	2.55	17 + bark	1234 - 1289	1289/90
AHC08	Collar, open truss	46	unmeasured	9	unknown	unknown
AHC09	Brace in bedroom	99	1.19	5 + 16 unmeasured	1157 - 1256	1276 - 1292
AHC10	Ceiling joist, kitchen	24	unmeasured	4	unknown	unknown
AHC11	Ceiling beam, living room	128	1.57	17 + bark	1421 - 1548	1548/49
AHC12	Stud to west wall	48	unmeasured	4	unknown	unknown

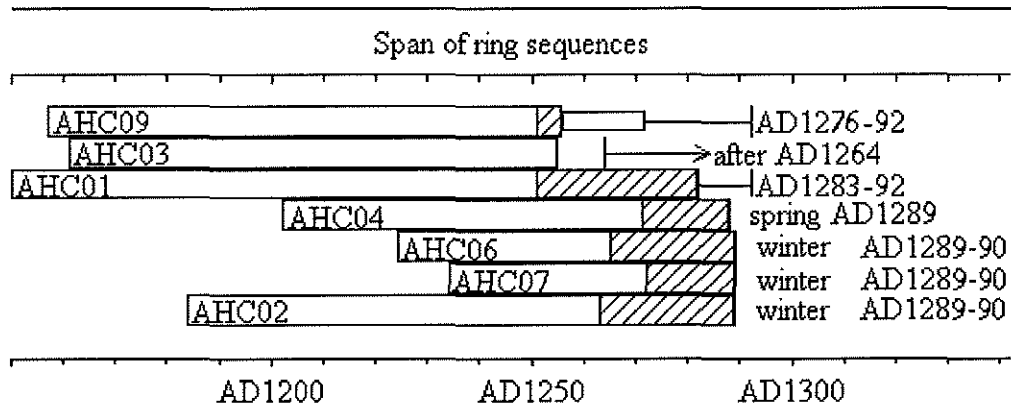
**Table 2:** Crossmatching between dated oak samples from the primary phase at Abbas Hall

Sample no	<i>t</i> values					
	02	03	04	06	07	09
01	4.9	5.9	3.6	-	5.1	7.4
02		5.0	4.3	4.2	5.6	5.5
03			4.3	4.2	-	7.9
04				-	-	4.2
06					4.1	4.5
07						3.6

Values of *t* below 3.5 are shown as -

**Table 3:** Dating of the oak site chronology ABBAS1

Dated reference or site master chronology	ABBAS1 AD 1150 - 1289	
	<i>t</i> -value	Overlap (yrs)
Oxon93 (Miles pers comm)	8.3	140
London1175 (Tyers pers comm)	7.7	140
East Midlands (Laxton and Litton 1988)	7.1	140
Southern England (Bridge 1988)	7.0	140
New Inn, Oxford (Miles and Haddon-Reece 1996)	7.1	126
Cressing1, Essex (Tyers 1993)	6.4	98
Glastonbury, Somerset (Bridge 1983)	6.1	140
King Street, Odiham, Hampshire (Miles pers comm)	6.1	121
Middle Row, Dunstable, Bedfordshire (Bridge 1983)	5.8	118
Bradwell Abbey, Buckinghamshire (Bridge 1983)	5.6	130



**Figure 4:** Bar diagram showing the relative positions of overlap of the components of the site chronology ABBAS1

**Table 4:** Dating of the oak ceiling beam AHC11, Abbas Hall, Suffolk

Dated reference or site master chronology	Abbas Hall AD 1421 - 1548	
	<i>t</i> -value	Overlap (yrs)
East Midlands (Laxton and Litton 1988)	5.1	128
Hereford and Worcester (Siebenlist-Kerner 1978)	4.9	128
Kent (Laxton and Litton 1989)	4.4	120
London 1175 (Tyers pers comm)	4.2	128
Acton (Miles pers comm)	5.7	128
Nuffield College, Oxford (Miles pers comm)	5.7	128
Gosfield, Essex (Bridge 1998)	5.4	88
Marriots Warehouse, Norfolk (Tyers 1999)	5.3	128

### **Interpretation and Discussion**

The timbers from the primary phase match each other well, and the resulting site master, ABBAS1, exhibits high *t* values against a wide range of regional and site chronologies from a wide geographical area. The timbers are most likely to have come from the neighbouring woodland which formed part of the estate on which the house was built, although there is no direct evidence for this.

One timber came from a tree felled in the spring of AD 1289, whilst the others with complete sapwood were felled in the winter of AD 1289/90. Assuming that construction took place very soon after felling, this puts the most likely date of building late in AD 1289, or early in AD 1290, or very soon thereafter. This agrees well with the stylistic evidence, which put the building in the last decades of the thirteenth century.

The bands of narrow rings noted in the north arcade plate suggest that the tree used for this timber may have suffered from some form of management, insect attack, or disease which has influenced the ring-width pattern in a different way to the other timbers from this phase.

The floor inserted into the hall has mortices to support the joists which are thought typical of the sixteenth century. A different pattern of mortices was used in the beams of the cross wing, also thought to be sixteenth century, probably around AD 1580 (Aitkens pers comm). The floor insertion and the cross wing are therefore thought on architectural grounds to be non-contemporaneous, but both of sixteenth century origin. Although only a single timber was dated from the inserted floor, the felling date of AD 1548/49 fits well with the current interpretation of the building. This date is just post-Dissolution, which may be relevant to the history of the building. One has to be cautious about dating a phase on the basis of a single timber, but it does suggest the floor being inserted in the mid-sixteenth century, with the later cross-wing being built a few decades later.

These results confirm the suspected dates of construction for this building and give extra confidence in the interpretation of similar building styles in the region. The data provide a useful

addition to the tree-ring information available for Suffolk, which is currently under-represented in dendrochronological terms.

### Acknowledgements

I am very grateful to Philip Aitkens for arranging access, assisting with the fieldwork, supplying drawings, and useful discussion on site. Cathy Groves (University of Sheffield) also made useful comments on an earlier draft of this report.

### References

Baillie, M G L, and Pilcher, J R, 1973 A simple cross-dating program for tree-ring research, *Tree Ring Bulletin*, **33**, 7-14

Bridge, M C, 1983 *The use of tree ring-widths as a means of dating historic timbers*, unpubl PhD thesis, CNA A

Bridge, M C, 1988 The dendrochronological dating of buildings in southern England, *Medieval Archaeol*, **32**, 166-74

Bridge, M C, 1998 *Tree-ring analysis of timbers from Gosfield Hall, Essex*, Anc Mon Lab Rep, **19/98**

Hollstein, E, 1965 Jahrringchronologische von Eichenholzern ohne Walkande, *Bonner Jahrb*, **165**, 12-27

Laxton, R R, and Litton, C D, 1988 An East Midlands master tree-ring chronology and its use for dating vernacular buildings, University of Nottingham, Dept of Classical and Archaeological Studies Monograph Series, **III**

Laxton, R R, and Litton, C D, 1989 Construction of a Kent master chronological sequence for oak, 1158 - 1540 AD, *Medieval Archaeol*, **33**, 90-98

Miles, D W H, and Haddon-Reece, D, 1996 *The tree-ring dating of the New Inn, 26-28 Cornmarket, Oxford*, Anc Mon Lab Rep, **20/96**

Miles, D, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect*, **28**, 40-56

Munro, M A R, 1984 An improved algorithm for crossdating tree-ring series, *Tree Ring Bulletin*, **44**, 17-27

Salzman, L F, 1952 *Building in England down to 1540*, Oxford

Siebenlist-Kerner, V, 1978 The chronology, 1341-1636, for certain hillside oaks from Western England and Wales, in *Dendrochronology in Europe* (ed J M Fletcher), BAR Int Ser, **51**, 157-61

Tyers, I, 1993 Tree-ring dating at Cressing Temple, and the Essex curve, in *Cressing Temple: A Templar and Hospitaller Manor in Essex* (ed D D Andrews), Essex County Council, 77-83

Tyers, I, 1999 *Tree-ring analysis of timbers from Marriot's Warehouse, King's Lynn, Norfolk*, Anc Mon Lab Rep, **11/99**

**Table 5:** Ring-width data for the site chronology ABBAS1 and sample AHC11, Abbas Hall

Year	ring widths (0.01mm)	no of trees
<b>ABBAS1</b>		
AD1150	211	1
AD1151	202 204 290 283 373 227 351 350 418 422 302 297 189 196 176 164 165 162 256 216 177 133 96 114 157 131 89 122 135 100 128 205 138 158 198 194 195 144 138 156 144 117 219 185 190 236 206 156 112 109	1 1 1 1 1 1 2 2 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
AD1201	143 138 157 126 141 105 153 163 129 124 130 77 119 107 116 114 105 78 136 152 159 111 128 145 162 215 174 181 205 130 123 124 140 172 122 122 164 137 161 142 125 83 112 70 111 123 120 63 109 109	4 5 6 6 6 6 6 6 6 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
AD1251	114 109 138 148 153 145 183 137 178 172 176 221 171 150 139 142 121 145 141 141 161 136 162 108 115 120 137 106 109 136 115 100 111 113 122 143 120 122 125	7 7 7 7 7 6 5 4 4 4 4 4 4 3
<b>AHC11</b>		
AD1421	229 91 89 111 114 122 108 158 166 150 237 271 229 268 309 210 243 146 121 145 153 170 183 165 191 322 615 348 336 229	
AD1451	250 217 211 246 205 249 224 252 208 232 247 213 217 145 205 165 188 205 175 175 198 189 177 166 190 183 122 104 93 112 140 145 158 136 141 133 195 174 189 219 78 71 77 70 98 136 100 65 77 74	
AD1501	58 78 91 97 86 91 66 74 88 81 121 127 115 108 108 136 101 119 120 132 115 100 124 166 147 149 135 132 109 92 150 142 122 128 165 165 144 117 123 133 104 89 113 130 136 133 116 130	