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Summary

The dendrochronological study of medieval timbers from West Challacombe farmhouse and barn, Combe Martin, Devon, is described. No tree-ring dates were obtained for the constructions of either building.

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Introduction

West Challacombe farm (NGR: SS586475) was recently purchased by the National Trust. Following this acquisition a highly decorated, false hammer beam roof was discovered in what was originally the open hall of the farmhouse. The architectural style suggests a 15th century date for the open hall (Richardson pers comm). Adjacent to the farmhouse, on the east side, is the remains of a cruck barn which is thought to predate the farmhouse. Tree-ring analysis was undertaken, at the request of English Heritage and the National Trust, in late 1992 to determine precise dates for the timbers, and hence provide more precise dating evidence for the construction of the open hall and barn.

Method

All timbers were briefly assessed and those which looked most suitable for dendrochronological analysis were selected for study. The exposed cross-sections of three timbers were sanded, first with a belt sander and then by hand. The ring widths were measured *in situ* using a hand lens fitted with a scale accurate to 0.1mm. Cores were obtained from four other timbers using a 15mm diameter hollow borer attached to an electric drill. As many of the timbers were moulded the position of each core had to be selected with great care. The cores were polished with an electric sander and then by hand using fine silicon carbide paper so that the annual growth rings were clearly defined.

Any samples unsuitable for dating purposes were rejected before measurement but a note was made of the number of rings and the average growth rate. Unsuitable samples are usually those with unclear ring sequences or less than 50 rings. Ring patterns with fewer than 50 rings are generally unsuitable for absolute dating as they may not be unique (Hillam *et al* 1987).

The growth rings of the samples selected for dating purposes were measured to an accuracy of 0.01mm on a travelling stage. This is connected to an Atari microcomputer which uses a suite of dendrochronology programs written by Ian Tyers (pers comm 1992). The ring width data of those measured *in situ* were typed into the Atari and multiplied by 10 so that they were compatible with the data logged automatically into the computer. The ring sequences were plotted as graphs using an HI-80 Epson plotter attached to the Atari. The graphs were then compared with each other to check for any similarities between the ring patterns which might indicate contemporaneity. This process of crossmatching is aided by the use of programs on the Atari microcomputer. The crossdating routines are based on versions of CROS (Baillie & Pilcher 1973, Munro 1984) and measure the amount of correlation between two ring sequences. The Student's *t* test is then used as a significance test on the correlation coefficient. All *t* values quoted in this report are identical to those produced by the original CROS program (Baillie & Pilcher 1973). Generally a *t* value of 3.5 or over represents a match, provided that the visual match between the tree-ring graphs is acceptable (Baillie 1982: 82-5).

Dating is achieved by crossmatching ring sequences within a phase or building and combining the matching patterns to produce a site master curve. All previously unmatched ring sequences from the site are compared with this master curve and if any additional patterns are found to crossmatch these are incorporated into the site master curve. This master curve and any unmatched ring sequences are then tested against reference chronologies to obtain absolute dates. A master curve is used for absolute dating purposes whenever possible as it enhances the common climatic signal and reduces the background noise resulting from the local growth conditions of individual trees.

The results only date the rings present in the timber and therefore do not necessarily represent the felling date. If the bark or bark edge is present on a sample the exact felling year can be determined. In the absence of bark surface the felling date is calculated using the sapwood estimate of 10-55 rings. This represents the 95% confidence limits for the number of sapwood rings on British oak trees over 30 years old (Hillam *et al* 1987). Where sapwood is absent, the addition of 10 rings (the minimum number of sapwood rings expected) to the date of the last measured heartwood ring produces a probable *terminus post quem* for felling. During timber conversion a large number of outer rings could be removed but as this is unquantifiable the actual felling date could be much later.

Results

1. Farmhouse

During the initial assessment of the farmhouse it was noted that the major structural timbers were probably all oak (*Quercus* spp). The roof contained a mixture of timbers. Some appeared to be suitable for dendrochronological analysis, but others were clearly wide-ringed and contained less than the minimum 50 rings required for dating purposes. The latter, which were derived from fast-grown, young trees, were therefore rejected prior to sampling. The decorations and moulding made it impossible to obtain a general idea of the conversion type of most timbers but those sampled included timbers shaped from whole, halved and quartered trunks (Figures 1 & 2). In view of the carving of the timber it is not suprising that none of those sampled had retained any sapwood or that little evidence of sapwood could be found on any other timbers.

The farmhouse door, which has clearly undergone a number of repairs, was also examined. It contained some oak panelling which may have sufficient growth rings but, as neither sampling or *in situ* measurements could be carried out without taking the door apart, no further work could be undertaken during this study.

Full details of the tree-ring samples are given in Table 1. (The nine trusses of the decorated roof are numbered from the west end.) In the farmhouse cores were removed only from moulded timbers at positions where they would not be clearly visible at first floor level. It was noted that some false hammer beams on the south side contained sufficient growth rings for dating purposes but due to being at eye-level these were avoided at this stage. No samples and only one set of *in situ* measurements were obtained from the east section of the roof past truss 5 as this area was inaccessible due to the lack of stability of the ceiling.

The ring patterns of two (02, 07) of the five measured samples crossmatched (t = 4.7) at the position indicated on Figure 3. Their data were averaged to produce a 93-year master curve (Table 2). This and the unmatched samples were compared with numerous dated reference chronologies from the British Isles spanning the medieval period to the present day, as well as with French and Irish chronologies which are frequently useful for dating purposes in the south-west region. No reliable results were obtained for any of the sequences so the timbers remain undated.

2. Barn

The two surviving cruck blades in the barn were also oak and were shaped from halved trunks (Figure 2). They both retained some sapwood and were probably derived from trees under 100 years old when felled. It was noted that other structural timbers of later date included some elm (*Ulmus* spp) timbers.

Details of the two samples (08, 09) are given in Table 1. The ring patterns crossmatched (t = 7.0) and were combined to produce a master sequence of 82-years (Table 3). This was compared with the ring sequences obtained from the farmhouse timbers as well as numerous reference chronologies but no consistent results were obtained. The barn timbers therefore also remain undated.

Discussion

No tree-ring dates could be obtained for the medieval timbers in either the farmhouse or barn. The shortness of the ring sequences and poor intra-site crossmatching must be contributory reasons for not obtaining a date. The production of a phase/site master curve from a number of individual timbers maximises the dating potential (see above). A master sequence of as little as 60 rings may be datable, assuming that there are appropriate reference chronologies available, whereas a single sequence of 80 or even 100 rings may not (see for example Hillam *et al* 1987). However, in this instance, the lack of local reference material may also be a problem.

Very few dendrochronological studies have been carried out on standing buildings in Devon, or the south-west peninsula in general. Previous analyses have demonstrated the difficulties in obtaining dates for what are presumed to be local timbers (see for example Mills 1988). Consequently there are currently relatively few local reference chronologies available for an area whose very nature, with its varied topograpy, may well increase the need for such local data. It is hoped that this situation will be, at least in part, remedied over the next few years by the concentrated analysis of a geographical and chronological range of buildings in Devon under the auspices of a proposed project funded by English Heritage and Devon County Council. Additionally a study of crossmatching between ring sequences from living trees across the peninsula may be useful in providing comparative material which would indicate the level of crossmatching expected. The dendrochronological analysis of standing buildings in Devon may then be expected to become far more productive, not only in producing independent dates but also in providing information concerning medieval and post-medieval woodland cover, exploitation and management.

Conclusion

Although the timbers from West Challacombe farmhouse and barn are at present undated it is hoped that as appropriate local reference chronologies become available it may be possible to obtain a dendrochronological date for them. Once the future of the building has been determined the removal of additional samples, with the aim of producing a well replicated site master, would also increase the likelihood of obtaining a date.

Acknowledgements

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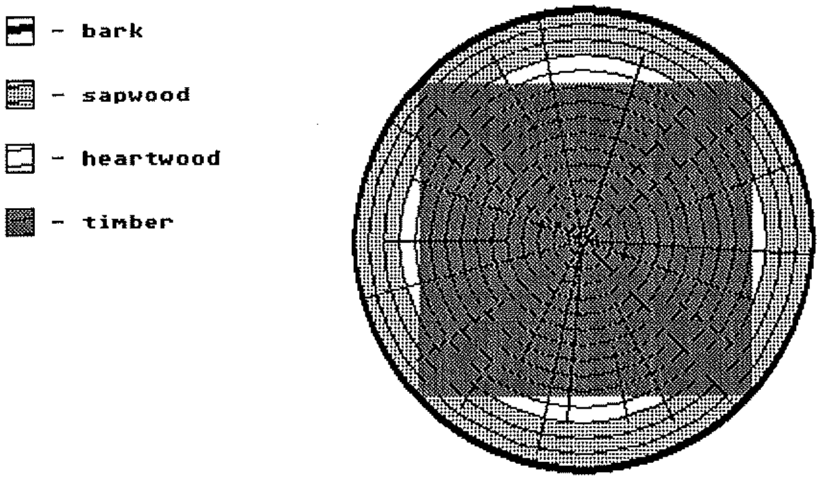

Figure 1: Diagram showing the method of conversion of timbers shaped from whole trunks.

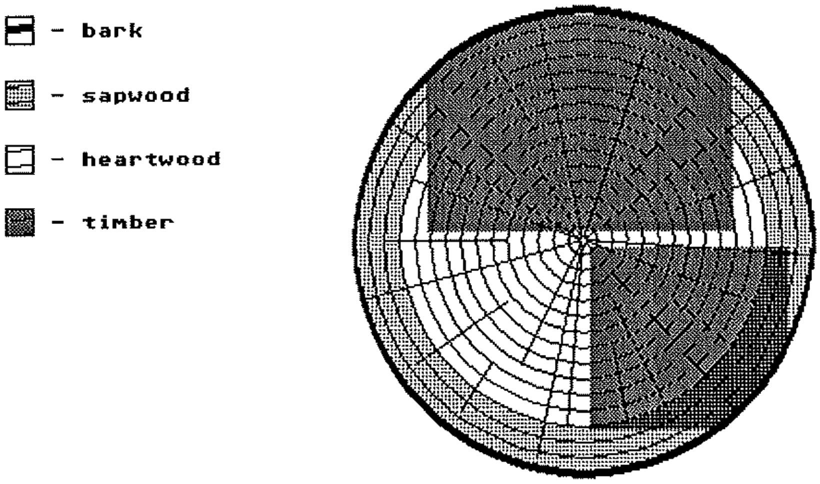

Figure 2: Diagram showing the method of conversion of timbers shaped from halved and quartered trunks.

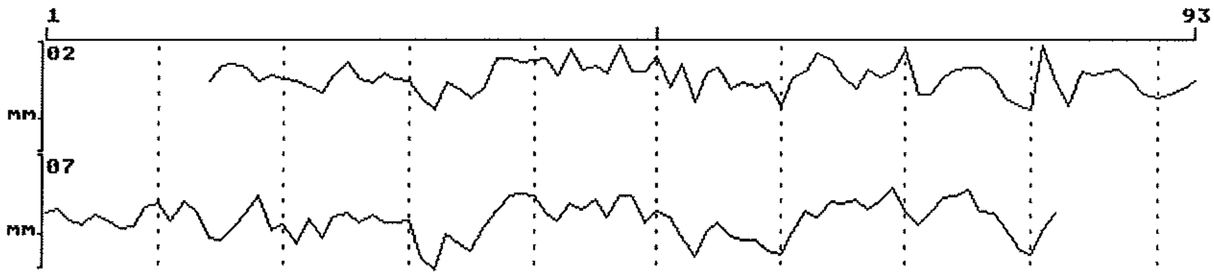

Figure 3: Diagram showing the relative positions of the matched ring sequences from the farmhouse.

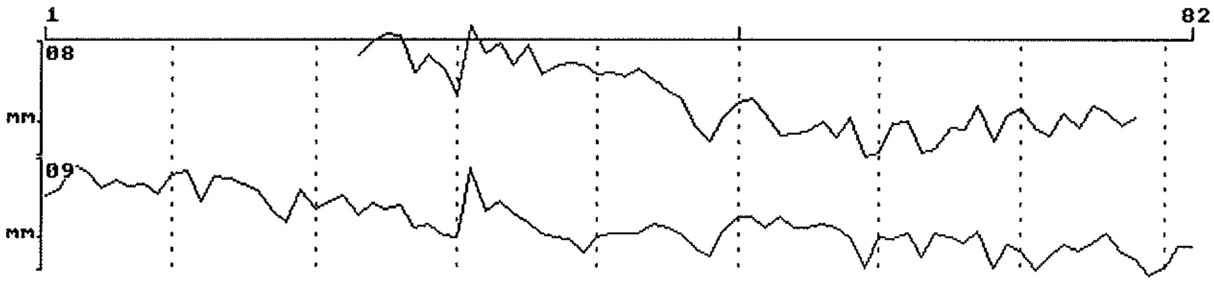

Figure 4: Diagram showing the relative positions of the matched ring sequences from the barn.

Table 1: Details of the tree-ring samples from West Challacombe, Combe Martin, Devon. 01-07 are from the farmhouse and 08-09 are from the barn. + - number of unmeasured rings on core; hs - heartwood/sapwood boundary; G - more than 10 rings to the pith; C - pith present; AGR - average growth rate (mm/year).

Sample	Location	Total no of rings	Sapwood rings	Pith	AGR	Conversion type	Comment
01	Truss 3, north false hammer beam	62	-	C	2.2	whole trunk	*in situ*
02	Truss 4/5, north lower purlin	80(+6)	-	G	2.4	quarter trunk	*in situ*
03	Truss 7, north arch brace	55	-	G	1.8	half trunk	*in situ*
04	Truss 4/5, south upper purlin	15	-	G	2.1	?half trunk	core
05	Truss 3/4, south middle purlin	10	-	G	2.4	?half trunk	core
06	Truss 5, south arch brace	50	-	G	2.9	quarter trunk	core
07	Truss 3, south arch brace	82	-	G	1.4	quarter trunk	core
08	East cruck blade	56(+2)	11(+2)	G	2.0	half trunk	core
09	West cruck blade	82(+2)	32(+2)	G	1.5	half trunk	core

Table 2: Ring width data of the site master chronology from West Challacombe farmhouse.

year	ring widths (0.01mm)										numbers of trees per year									
1	148	165	130	118	143	129	109	117	168	183	1	1	1	1	1	1	1	1	1	1
	129	186	158	152	190	207	216	210	174	170	1	1	1	2	2	2	2	2	2	2
	147	161	131	189	230	172	174	188	172	170	2	2	2	2	2	2	2	2	2	2
	106	86	150	131	112	152	250	276	265	268	2	2	2	2	2	2	2	2	2	2
	246	184	292	216	242	196	326	235	192	254	2	2	2	2	2	2	2	2	2	2
51	165	198	103	176	202	139	145	139	136	100	2	2	2	2	2	2	2	2	2	2
	167	207	256	253	206	190	215	208	256	284	2	2	2	2	2	2	2	2	2	2
	140	156	217	240	257	220	184	132	103	94	2	2	2	2	2	2	2	2	2	2
	268	174	131	261	241	261	271	211	161	151	2	2	1	1	1	1	1	1	1	1
	161	181	211								1	1	1							

Table 3: Ring width data of the site master chronology from West Challacombe barn.

year	ring widths (0.01mm)										numbers of trees per year									
1	231	255	425	379	268	309	278	288	240	353	1	1	1	1	1	1	1	1	1	1
	372	207	340	329	285	261	167	132	260	175	1	1	1	1	1	1	1	1	1	1
	205	228	262	337	363	363	190	242	191	134	1	1	2	2	2	2	2	2	2	2
	515	272	327	232	288	178	192	201	189	176	2	2	2	2	2	2	2	2	2	2
	183	173	192	175	149	133	83	67	109	148	2	2	2	2	2	2	2	2	2	2
51	152	116	113	99	102	113	97	102	52	77	2	2	2	2	2	2	2	2	2	2
	95	101	61	83	94	86	122	61	98	101	2	2	2	2	2	2	2	2	2	2
	69	72	100	82	111	114	83	87	47	55	2	2	2	2	2	2	2	2	1	1
	81	82									1	1								