Darganfod Hen Dai Cymreig
Discovering Old Welsh Houses

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DYDDIO HEN DAI CYMREIG | DATING OLD WELSH HOUSES

PROSIECT DENDROCRONOLEG GOGLEDD ORLLEWIN CYMRU | NORTH WEST WALES DENDROCHRONOLOGY PROJECT

Oxford Dendrochronology Laboratory
Report 2011/16

THE DENDROCHRONOLOGICAL INVESTIGATION OF A SCREEN AT, THE SARACEN'S HEAD, BEDDGELERT CAERNARFONSHIRE (NGR SH 589 481)

Summary
An old plank and muntin screen had been exposed during renovation works at the Saracen's Head. As an important part of the history of the building, in possibly one of the oldest buildings in the town, it was felt that the opportunity to sample this feature should be taken whilst it was exposed, and before cleaning and other works were done in the area. Five samples were taken from various muntins, the sill and a beam that cuts through the screen. Unfortunately these all proved to have too few rings to be datable.

Author: Dr M. C. Bridge FSA
Oxford Dendrochronology Laboratory
Mill Farm
Mapledurham
Oxfordshire
RG4 7TX

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The Dendrochronological Investigation of a Screen at The Saracen's Head, Beddgelert, Caernarfonshire (NGR SH 589 481)

BACKGROUND TO DENDROCHRONOLOGY

The basis of dendrochronological dating is that trees of the same species, growing at the same time, in similar habitats, produce similar ring-width patterns. These patterns of varying ring-widths are unique to the period of growth. Each tree naturally has its own pattern superimposed on the basic 'signal', resulting from genetic variations in the response to external stimuli, the changing competitive regime between trees, damage, disease, management etc.

In much of Britain the major influence on the growth of a species like oak is, however, the weather conditions experienced from season to season. By taking several contemporaneous samples from a building or other timber structure, it is often possible to cross-match the ring-width patterns, and by averaging the values for the sequences, maximise the common signal between trees. The resulting 'site chronology' may then be compared with existing 'master' or 'reference' chronologies.

This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. There is no defined minimum length of a tree-ring series that can be confidently cross-matched, but as a working hypothesis most dendrochronologists use series longer than at least fifty years.

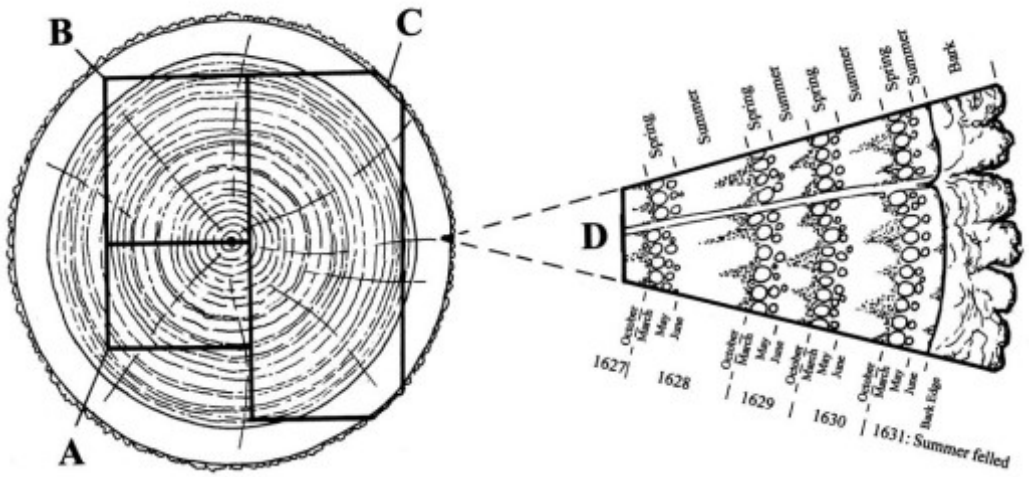
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's *t*-test. The *t*-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of matching between two datasets that has been adopted by dendrochronologists. The values of '*t*' which give an acceptable match have been the subject of some debate; originally values above 3.5 being regarded as acceptable (given at least 100 years of overlapping rings) but now 4.0 is often taken as the base value. It is possible for a random set of numbers to give an apparently acceptable statistical match against a single reference curve – although the visual analysis of plots of the two series usually shows the trained eye the reality of this match. When a series of ring-widths gives strong statistical matches in the same position against a number of independent chronologies the series becomes dated with an extremely high level of confidence.

One can develop long reference chronologies by cross-matching the innermost rings of modern timbers with the outermost rings of older timbers successively back in time, adding data from numerous sites. Data now exist covering many thousands of years and it is, in theory, possible to match a sequence of unknown date to this reference material.

It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the common signal resulting from widespread influences such as the weather. However, a single sequence can be successfully dated, particularly if it has a long ring sequence.

Growth characteristics vary over space and time, trees in south-eastern England generally growing comparatively quickly and with less year-to-year variation than in many other regions (Bridge, 1988). This means that even comparatively large timbers in this region often exhibit few annual rings and are less useful for dating by this technique.

When interpreting the information derived from the dating exercise it is important to take into account such factors as the presence or absence of sapwood on the sample(s), which indicates the outer margins of the tree. Where no sapwood is present it may not be possible to determine how much wood has been removed, and one can therefore only give a date after which the original tree must have been felled. Where the bark is still present on the timber, the year, and even the time of year of felling can be determined. In the case of incomplete sapwood, one can estimate the number of rings likely to have been on the timber by relating it to populations of living and historical timbers to give a statistically valid range of years within which the tree was felled. For this region the estimate used is that 95% of oaks will have a sapwood ring number in the range 11 – 41 (Miles 1997).



Section of tree with conversion methods showing three types of sapwood retention resulting in **A** *terminus post quem*, **B** a felling date range, and **C** a precise felling date. Enlarged area **D** shows the outermost rings of the sapwood with growing seasons (Miles 1997, 42)

SARACEN'S HEAD

The oak plank-and-muntin partition at the Saracen's Head Hotel, Beddgelert, is typical of an internal ground floor wall extending from the front to back elevation of a "Snowdonia plan" house of the late sixteenth – early seventeenth century. A similar example survives in the late sixteenth century National Trust building, Ty Isaf, just across the River Colwyn from the Saracen's Head Hotel, formerly called Ty Uchaf, in the centre of the present village of Beddgelert, though this could not be dated. The two buildings are known to have been farms in the late sixteenth century, after the Dissolution, and long before any village existed.

SAMPLING

Sampling took place in March 2011. All the samples were of oak (*Quercus* spp.). Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were numbered using the prefix **sahd**. The samples were removed for further preparation and analysis. Cores were mounted on wooden laths and then these were polished using progressively finer grits down to 400

to allow the measurement of ring-widths to the nearest 0.01 mm. The samples were measured under a binocular microscope on a purpose-built moving stage with a linear transducer, attached to a desktop computer. Measurements and subsequent analysis were carried out using DENDRO for WINDOWS, written by Ian Tyers (Tyers 2004).

RESULTS AND DISCUSSION

No sapwood was visible on the structure, and the accumulated surface grime made it difficult to determine how many rings there might be in the posts, sill and the beam that cut through the top of the screen at the west end. Sampling stopped after 5 samples when it became clear that there were insufficient rings in any of the timbers to be useful for dendrochronological dating. Indeed, two sequences were too short to have been any use and were not measured. The details of the sequences are given in Table1. As so many buildings in the immediate area had been dated, the decision was taken to attempt to date the rather short sequences obtained. None of the sequences obtained matched each other, and neither did the sequences give reliable dates against the dated reference material, but this is no surprise, given how short they were.

Table 1: Details of samples taken from the screen at the Saracen's Head, Beddgelert.

Sample number	Timber and position	Sapwood complement	No of rings	Mean width mm	Mean sens
sahd01	West (LH) end post	-	40	2.25	0.40
sahd02	Beam at west end	-	43	2.28	0.30
sahd03	Sill beam	-	<40	NM	-
sahd04	2nd muntin from W	-	41	1.41	0.25
sahd05	5th muntin from W	-	<40	NM	-

Key: H/S bdry = heartwood/sapwood boundary - last heartwood ring date; C = complete sapwood, winter felled; std devn = standard deviation; mean sens = mean sensitivity.

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