Darganfod Hen Dai Cymreig
Discovering Old Welsh Houses

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Discovering Old Welsh Houses studies and celebrates the traditional houses of North Wales and the lives of the people who lived in them.

If you find the content useful, please consider becoming a *Member* to access the many benefits available.

Please note that these reports are being updated as part of an ongoing programme of revision. Older reports sometimes refer to the old names of the Group. Between 2005 and 2012 also known as The Snowdonia Dendrochronology Project, then the N W Wales Dendrochronology Project and then the Dating Old Welsh Houses Group.

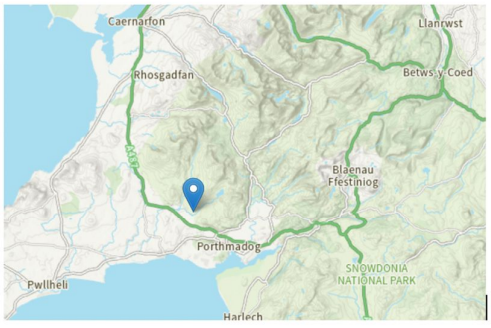
New reports will be added from time to time. Keep an eye on our website for updates.

TREE-RING DATING OF
CLENENNAU
DOLBENMAEN
(CAERNARFONSHIRE)
GWYNEDD

(NGR SH 532 424)

Tree-ring dating was commissioned by the Beddgelert Historical Society in association with the Royal Commission on the Ancient and Historical Monuments of Wales, Cadw and Snowdonia National Park. The work was carried out by the Oxford Dendrochronology Laboratory, Mill Farm, Mapledurham, Oxfordshire RG4 7TX (Dr Dan Miles). Additional research by Margaret Dunn and Richard Suggett.

1 SUMMARY



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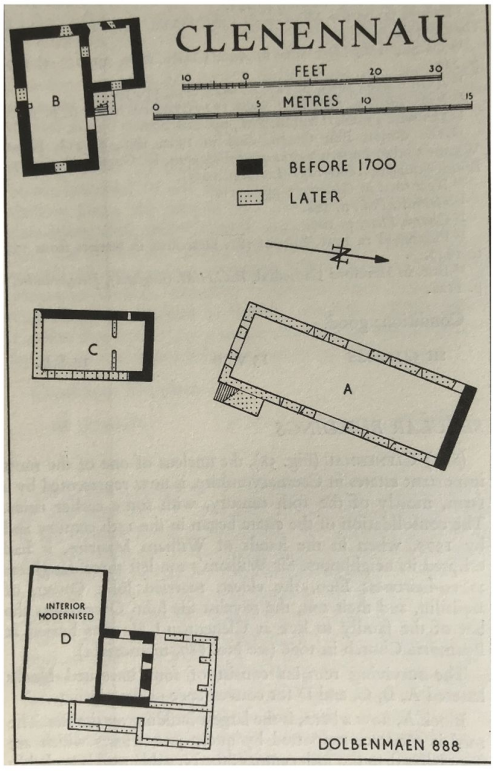
Clenennau was the historic centre of one of the largest estates in Eifionydd, south Caernarfonshire, but had been reduced to the status of a farmhouse by the 18th century and considerably modified. The site comprises a complex of four main buildings. Tree-ring

dating for the house (marked D on the plan) has shown the building sequence of this important house to be somewhat difficult to interpret, given the wide variety of felling date ranges – seven in all – and are in any case largely re-used.

However, the present stone-built L-plan structure has a 16th century origin: the front range retains two arch-braced trusses from a (parlour) cross-wing probably built c. 1550 and adjusted in the later16th century. The hall (with gallery referred to c. 1600) was reconstructed in 1732, and this rear range is now the working kitchen of the farmhouse.

Plan and description in RCAHMW, Caernarvonshire Inventory II (1960), 67-8, fig.58. National Monuments Record database contains images at

RCAHMW National Primary Record Number (NPRN)



Extract from the Tithe Map (above) aligned to correspond to the plan (right) taken from RCAHMW, *Caernarvonshire Inventory*, II, 68 (visited 1955) Crown Copyright: RCAHMW.

2 TECHNICAL DATA

The following summary of technical data regarding Clenennau is taken from *Vernacular Architecture* 38 (2007), 135. (https://doi.org/10.1179/174962906X158309).

Key to abbreviations: Complete sapwood is indicated by 'C' and where the character of the final ring has been identified, the seasonal felling dates are given: winter C (October to February); spring ¼ C (March to May); summer ½ C (June to September). For '*t*', see next section, which discusses reference chronologies (site masters) – in general, the higher the 't' value the more secure the dating.

(a) Front range *Felling date ranges:* **1520-50; 1522-52; 1535-49; 1551-2; 1574-1604; 1577-1607; 1581-1611**

(b) Rear wing *Felling date ranges:* **1556-86; 1571-1601**
(c) Repair phase to both ranges *Felling date:* **Spring/Summer 1732**

(a) Principal rafters 1512(3), 1518(7+33C NM), I*510(2+25 ½ C* NM); Purlins l570(h/s), *1566*(h/s); Raking struts (1/2) 1511(his); Ridge 1563(h/s); (b) Purlins 1545(h/s), 1560(h/s); (c) Principal rafters (3/4) 1731(24 ½ C,18 ¼ C),1714(2); Collars 1731(21 ¼ *C,* 16). *Site Masters* (a+b) 1406-1570 BDGLRT10 *(t* = 10.0 BDGLRTl7; 9.2 BDGLRT22; 8.9 ROYALHS3); (c) 1647-1731 BDGLRTlI *(t* = 6.4 BASINGDF; 5.5 CHAZEY2; 5.3 DRELM; 5.1 HANTS02) winter

3 BACKGROUND TO DENDROCHRONOLOGY (Daniel Miles)

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.

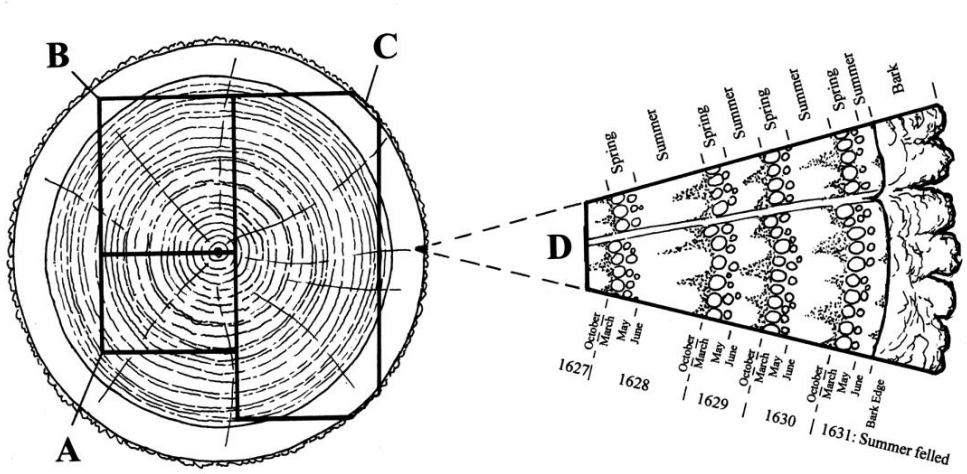
The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's t-test. The t-test compares the actual difference between two means in relation to 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.



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.

Notes compiled by Martin Cherry, June 2022, from material generated by the North-west Wales Tree-ring Dating Project. The origins of this programme of dating lay with the Beddgelert Historical Society under the direction of Margaret Dunn (see the ‘About Us’ page.) This report should be read in conjunction with the other reports in this section.