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THE OLDE BOAR'S HEAD, LONG STREET, MIDDLETON, MANCHESTER

TREE-RING ANALYSIS OF TIMBERS

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SUMMARY

Analysis by dendrochronology was undertaken on 14 core samples obtained from the first-floor timbers of bay 1 (the north-most bay or 'Meeting Room') of the Olde Boar's Head in Middleton, Manchester, as well as from some ground floor timbers of bays 2, 4, and 5. This analysis produced a single dated site chronology comprising 13 samples and having an overall length of 252 rings. These rings were dated as spanning the years 1403–1654.

Interpretation of the sapwood on the dated samples would indicate that the timbers of the Meeting Room and bay 2 are derived from trees that were probably all cut together in a single episode of felling in 1622, probably specifically for the construction of this part of the building, while those to bay 5 were felled together in 1654. It is estimated that the bresummer beam to bay 4 was felled at some point between 1556 at the earliest and 1581 at the latest and is probably reused in its present position.

One sample remains ungrouped and undated.

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Introduction

The Olde Boar's Head stands to the west side of Long Street, in Middleton (the A664 Middleton to Rochdale road), at its junction with Durnford Street (SD 87052 06266, Figs 1a/b). Having undergone some slight alteration over the years, the exact original form and layout is not completely clear, and the original function of the building is not known. However, given the form of the building and the level of decoration to the framing, it is perhaps more likely to have been a domestic site rather than an agricultural one.

The Olde Boar's Head presently comprises what may originally have been a cross-wing to its north end, bay 1 (see Fig 2), with a broad gable eastwards to the street, constructed of main posts, studs, and cross-rails forming rectangular panel framing. The apex of the gable is filled with quatrefoils in rectangular panels.

Attached to the south side of this 'cross-wing' is what appears to be a two-bay north–south range (bays 2 and 3) framed in similar rectangular panels (though the framing is not consistent), with a fireplace and stack in the northern of the two bays (bay 2).

To the south of this are two parallel, or a double pile, east–west ranges (bays 4 and 5), possibly further cross-wings, with bay 4 being slightly narrower than bays 1 and 5. Both ranges are framed in rectangular panels smaller than those to bay 1 by posts, studs, and cross-rails, though again the framing is not consistent. The apex of the gable to bay 4 is a relatively modern addition.

Sampling

Sampling and analysis by dendrochronology of the timbers within The Olde Boar's Head was instigated by Cliff Ivers and the Middleton Archaeological Society, whose meeting place it is. The overall date of the building is unknown (local traditions holding that there was once a stone here inscribed '*1632*') as is its sequential development and change. It was hoped that tree-ring analysis might more reliably and accurately determine the date of the structure and provide some insight into the relationship between its different parts.

An initial survey of the building was made to determine the suitability of the timbers within for tree-ring dating. This suitability is determined, amongst other factors, by the type of wood, the number of timbers available to each phase or part of the building, the number of rings each timber might have, and the relationship of the timber to the building, ie, is it primary to the construction, a reused timber, or a later insertion. The presence or absence of sapwood or the heartwood/sapwood boundary is also noted.

In this case, amongst those timbers that were available for inspection, it was noted that although there were sufficient timbers, the potential ring counts on them were variable. Some timbers, particularly those used as ceiling beams, were derived from fast-grown trees

and had too few rings for reliable analysis, whilst others had been obtained from more slowly grown trees and appeared to have sufficient numbers of rings. It was also noted that a number of timbers were potentially reused or had been inserted at some later date. There was, furthermore, some slight restriction in access and sampling due to the site operating as a restaurant and public house, some parts of the building (the private accommodation and the roof space) not being fully available for sampling.

It was thus decided that samples should be obtained from the first floor timbers of bay 1 (the 'Meeting Room'), with further samples being obtained from suitable ground floor timbers to bays 2, 4 and 5 (there being no truly suitable timbers in bay 3). Thus, from the first floor timbers of bay 1 a total of eight samples were obtained by coring, with a further six samples being obtained from the ground floor timbers. Each sample was given the tree-ring code MID-A (for Middleton, site 'A'), and numbered 01–14.

Details of the samples are given in Table 1, including the timber sampled, the total number of rings each sample has, and how many of these, if any, are sapwood rings. The individual date span of each dated sample is also given. The sampled timbers are located on a survey plan made by W J Smith in the 1908s and provided by the Middleton Archaeological Society, shown here as Figure 3, and further identified on annotated photographs, Figures 4a-h. In this report the front of the building is deemed to face site east towards Long Street, the rear of the building deemed to face site west.

The Nottingham Tree-ring Dating Laboratory would like to take this opportunity to thank the Middleton Township Heritage Lottery Fund for the initiative for this programme of analysis along with Rochdale Borough Council, the owners of the building. The Laboratory would also like to thank the licensee, Leanne Brogden, and staff at the Olde Boar's Head for agreeing to sampling and for the great cooperation shown during coring. Finally, we would like to thank Cliff Ivers and the members of the Middleton Archaeological Society for arranging this programme of work, as well as for their help with plans, background information, and their assistance with sampling.

Tree-ring dating

Tree-ring dating relies on a few simple, but quite fundamental, principles. Firstly, as is commonly known, trees (particularly oak trees, the timber most commonly used in building construction until the introduction of pine from the late eighteenth century onwards) grow by adding one, and only one, growth-ring to their circumference each, and every, year. Each new annual growth-ring is added to the outside of the previous year's growth just below the bark. The width of this annual growth-ring is largely, though not exclusively, determined by the weather conditions during the growth period (roughly March–September). In general, good conditions produce wider rings and poor conditions produce narrower rings. Thus, over the lifetime of a tree, the annual growth-rings display a climatically influenced pattern. Furthermore, and importantly, all trees growing in the same area at the same time will be

influenced by the same growing conditions and the annual growth-rings of all of them will respond in a similar, though not identical, way (Fig 5).

Secondly, because the weather over a certain number of consecutive years is unique, so too is the growth-ring pattern of the tree. The pattern of a shorter period of growth, 20, 30**,** or even 40 consecutive years, might conceivably be repeated two or even three times in the last one thousand years, and is considered less reliable. A short pattern might also be repeated at different time periods in different parts of the country because of differences in regional micro-climates. It is less likely, however, that such problems would occur with the pattern of a longer period of growth, that is, anything in excess of 45 years or so. In essence, a short period of growth, anything less than 30 rings, is not reliable, and the longer the period of time under comparison the better.

Tree-ring dating relies on obtaining the growth pattern of trees from sample timbers of unknown date by measuring the width of the annual growth-rings. This is done to a tolerance of 1/100 of a millimeter. The growth patterns of these samples of unknown date are then compared with a series of reference patterns or chronologies, the date of each ring of which is known. When the growth-ring sequence of a sample 'cross-matches' repeatedly at the same date span against a series of different reference chronologies the sample can be said to be dated. The degree of cross-matching, that is the measure of similarity between sample and reference, is denoted by a '*t*-value'; the higher the value the greater the similarity. The greater the similarity the greater is the probability that the patterns of samples and references have been produced by growing under the same conditions *at the same time*. The statistically accepted fully reliable minimum *t*-value is 3.5.

However, rather than attempt to date each sample individually it is usual to first compare all the samples from a single building, or phase of a building, with one another, and attempt to cross-match each one with all the others from the same phase or building. When samples from the same phase do cross-match with each other they are combined at their matching positions to form what is known as a 'site chronology'. As with any set of data, this has the effect of reducing the anomalies of any one individual (brought about in the case of tree-rings by some non-climatic influence) and enhances the overall climatic signal. As stated above, it is the climate that gives the growth pattern its distinctive pattern. The greater the number of samples in a site chronology the greater is the climatic signal of the group and the weaker is the non-climatic input of any one individual.

Furthermore, combining samples in this way to make a site chronology usually has the effect of increasing the time-span that is under comparison. As also mentioned above, the longer the period of growth under consideration, the greater the certainty of the cross-match. Any site chronology with less than about 55 rings is generally too short for reliable dating.

Having obtained a date for the site chronology as a whole, the date spans of the constituent individual samples can then be found, and from this the felling date of the trees represented may be calculated. Where a sample retains complete sapwood, that is, it has the last or

outermost ring produced by the tree before it was cut, the last measured ring date is the felling date of the tree.

Where the sapwood is not complete it is necessary to estimate the likely felling date of the tree. Such an estimate can be made with a high degree of reliability because oak trees generally have between 15 to 40 sapwood rings. For example, if a sample with, say, 12 sapwood rings has a last sapwood ring date of 1400 (and therefore a heartwood/sapwood boundary ring date of 1388), it is 95% certain that the tree represented was felled sometime between 1403 (1400+3 sapwood rings (12+3=15)) and 1428 (1400+28 sapwood rings (12+28=40)).

Analysis

Each of the 14 core samples obtained from all timbers of the Olde Boar's Head were prepared by sanding and polishing to clearly show the annual growth rings. The widths of these annual growth rings were then measured, the data of these measurements then being compared with each other as described in the notes above. This comparative process produced a single group comprising 13 samples, the samples cross-matching with each other as shown in Figure 6. The 13 cross-matching samples were combined at their indicated offset positions to form site chronology MIDASQ01, this having an overall length of 252 rings.

Site chronology MIDASQ01 was then compared to an extensive corpus of reference material for oak matching repeatedly and consistently with a number of these when the date of its first ring is 1403 and the date of its last growth ring is 1654. The evidence for this dating is given in the *t*-values of Table 2.

Site chronology MIDASQ01 was then compared with the single remaining ungrouped sample, but there was no further satisfactory cross-matching. The single remaining sample was, therefore, compared individually with the full corpus of reference material but there was no further cross-matching and thus it must remain undated.

Interpretation

Three of the core samples in site chronology MIDASQ01, MID-A01, A08, and A12, retain sapwood complete to the bark. This means that all three have the last growth ring produced by the trees represented before they were felled (this being denoted by upper case 'C' in Table 1 and the bar diagram).

1622 phase

In two cases, MID-A01 and A08, this last, complete, sapwood ring, and thus the felling of the trees represented, is dated 1622. As may be seen from Table 1 and the bar diagram Figure 6, a number of other samples in site chronology MIDASQ01, MID-A02, A03, A04, A05, A07, A09, and A10, retain some sapwood or at least the heartwood/sapwood boundary (h/s). Given that the boundary on these samples is at a similar position and date to that on samples MID-A01 and A08, this suggests that these timbers originally had similar numbers of sapwood rings. As such it is more likely than not that the trees were felled at the same time in 1622, or at least at a very similar time. All these timbers are in bays 1 and 2.

The interpretation of a single-phase felling for these timbers is further supported by the fact that the samples cross-match well with each other meaning that the source trees were originally growing close to each other in the same woodland. As such, it would be an unusual coincidence (had they been felled at different times) that they should come to be used together in the same part of the building; single programmes of felling followed immediately by construction was of course the usual the procedure followed by builders of the period.

1654 phase

In the third case, sample MID-A12, the last, complete, sapwood ring, and thus the felling of the tree represented, is dated 1654. As again may be seen from Table 1 and the bar diagram Figure 6, a further timber, represented by sample MID-A13, has complete sapwood on it but, due to the fragile nature of this part of the wood, some of the sapwood (about 5mm) has been lost from the sample in coring. It is estimated that this lost portion contained about 5–8 sapwood rings which, given that the last extant sapwood ring on sample MID-A13 is dated 1648, would suggest that this tree was also felled in, or about, 1654. These two timbers are in bay 5.

Later 16th century phase

It is highly likely that a later sixteenth century phase of felling is represented by sample MID-A11, from a bresummer beam in bay 4. This sample does not retain complete sapwood, and it is thus not possible to reliably indicate a precise felling date for the timber. The sample does, however, retain the heartwood/sapwood transition, this being dated 1541. Allowing for a minimum of 15 sapwood rings, and a maximum of 40 (the usual 95% probability range), this would give the timber an estimated likely felling date of between 1556 at the earliest and 1581 at the latest. As such the timber is probably reused in its present position

Undated sample

Of the 14 samples obtained, only one, MID-A06, remains undated. The sample shows no problem with its growth rings such as compression or distortion which might make cross-matching difficult, and the reason for its lack of dating is unknown. The phenomenon of

having some undated samples is, however, a common feature of most programmes of tree-ring analysis.

Woodland source

It will be seen from Table 2 that site chronology MIDASQ01 matches particularly well with a reference chronology made up of material from the nearby Tonge Hall, on Williams Street, also in Middleton. Although the source woodland for that building is itself not known, it suggests that the timbers used there and at the Olde Boars Head were sourced from, presumably relatively local, adjacent woodlands, if indeed not the very same woodland. Site chronology MIDASQ01 also matches well with reference chronologies made up of material from buildings in Eccles (Monk's Hall) and Stockport (Staircase Cafe). This would again support the view that timbers were sourced from relatively local woodlands.

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Table 1: Details of tree-ring samples from The Olde Boar's Head, Long Street, Middleton, Manchester

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date (AD)	Heart/sap boundary (AD)	Last measured ring date (AD)
	Bay 1 'Meeting Room'					
MID-A01	Main north-east corner post	124	18C	1499	1604	1622
MID-A02	Main north-west corner post	77	11	1541	1606	1617
MID-A03	North-west mid-rail	87	h/s	1511	1597	1597
MID-A04	East gable tiebeam	70+30-40 nm	no h/s	1524	------	1593
MID-A05	East window sill	97	16	1524	1604	1620
MID-A06	Main south-east corner post	77	16	------	------	------
MID-A07	South-west mid-rail	145	h/s	1454	1598	1598
MID-A08	Main south-west corner post	99	15C	1524	1607	1622
	Ground floor timbers					
MID-A09	North-east corner post, start bay 2	98	4	1509	1602	1606
MID-A10	East wall post, end bay 2	101	3	1507	1604	1607
MID-A11	Bresummer to bay 4	79	h/s	1463	1541	1541
MID-A12	West stud post bay 5	108	25C	1547	1629	1654
MID-A13	West wall post, bay 5	165	36c	1484	1612	1648
MID-A14	Cross rail to west stud post bay 5	126	no h/s	1403	------	1528

h/s = heartwood/sapwood boundary, i.e., only the sapwood rings are missing

C = complete sapwood is retained on the sample, the last ring date is the felling date of the tree represented

c = complete sapwood is found on the timber but all or part has been lost from the sample in coring

nm = not measured

Table 2: Results of the cross-matching of site chronology MIDASQ01 and the reference chronologies when the first ring date is 1403 and the last ring date is 1654		
Reference chronology	*t*-value	
Tonge Hall, Middleton, Lancashire	11.2	(Arnold and Howard 2014b)
Staircase Cafe, Stockport, Cheshire	7.6	(Howard *et al* 2003)
Bells Farm, Kings Norton, Birmingham	7.4	(Howard *et al* 1989 unpubl)
Dandra Garth, Garsdale, Cumbria	7.1	(Arnold and Howard 2014a)
Oak House Barn, West Bromwich	6.8	(Howard *et al* 1991)
Monk's Hall, Eccles, Cheshire	6.6	(Arnold and Howard 2010)
Tean Hall, Tean, Staffordshire	6.4	(Arnold and Howard 2007)
Turton Tower, Turton, Lancashire	6.2	(Arnold and Howard 2008)

Site chronology MIDASQ01 is a composite of the data of the relevant cross-matching samples as seen in the bar diagram Figure 6 below. This composite data produce an 'average' tree-ring pattern, where the possible erratic variations of any one individual sample are reduced and the overall climatic signal of the group is enhanced. This 'average' site chronology is then compared with several hundred reference patterns covering every part of Britain for all time periods, cross-matching with a number of these only at the date span indicated above. The table gives only a small selection of the very best matches as represented by '*t*-values' (ie, degrees of similarity between site chronology and the reference chronologies).

It will be seen from this Table that the timbers from the Olde Boar's Head match extremely well with those from Tonge Hall, also in Middleton and only a short distance away. Although the location of the source woodlands for both buildings is unknown, the high level of matching between them would suggest that the timbers for both buildings were sourced from the same, or at least very closely adjacent, woods.

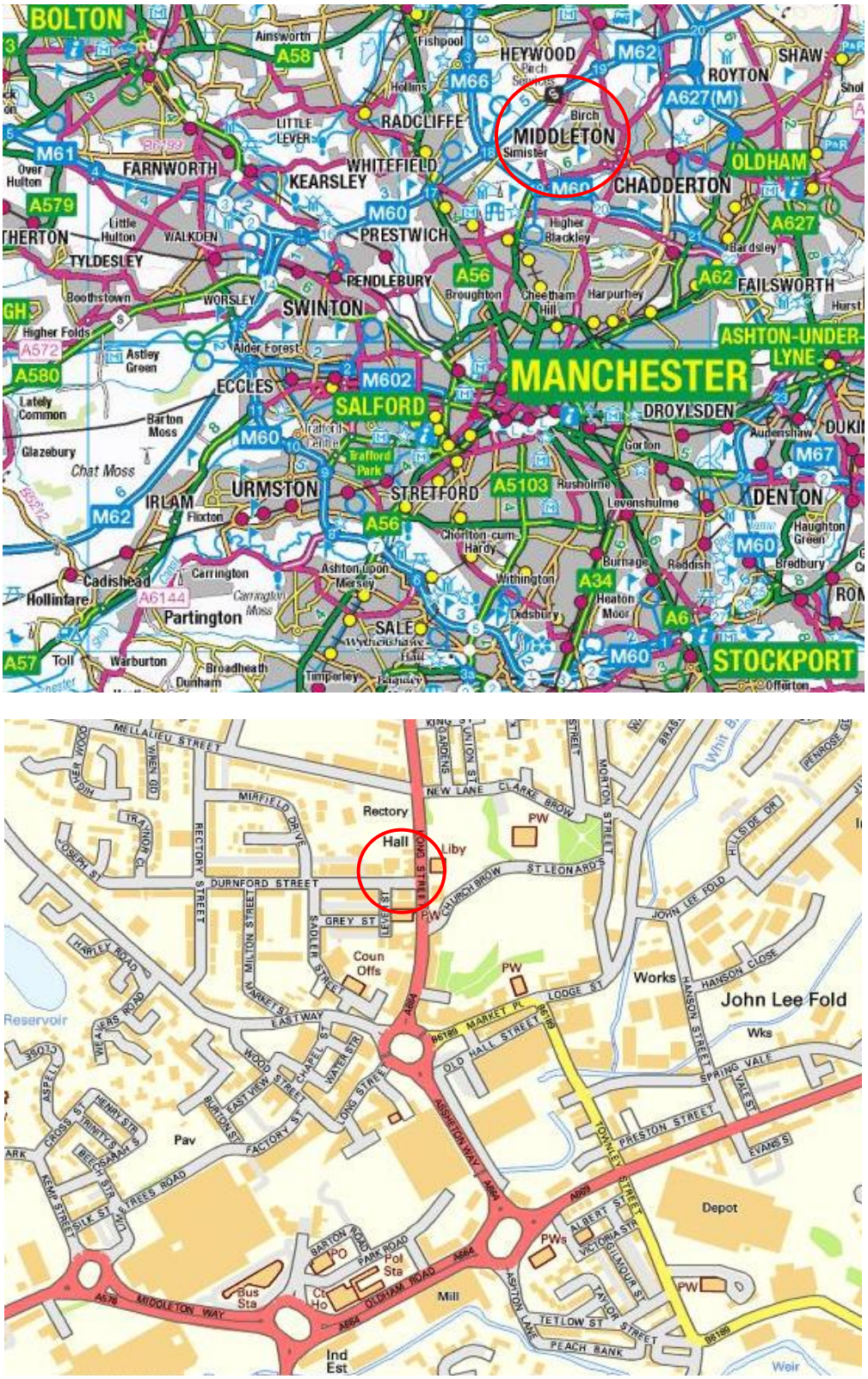


Figure 1a/b: Maps to show location of Middleton (top) and The Olde Boar's Head (bottom)

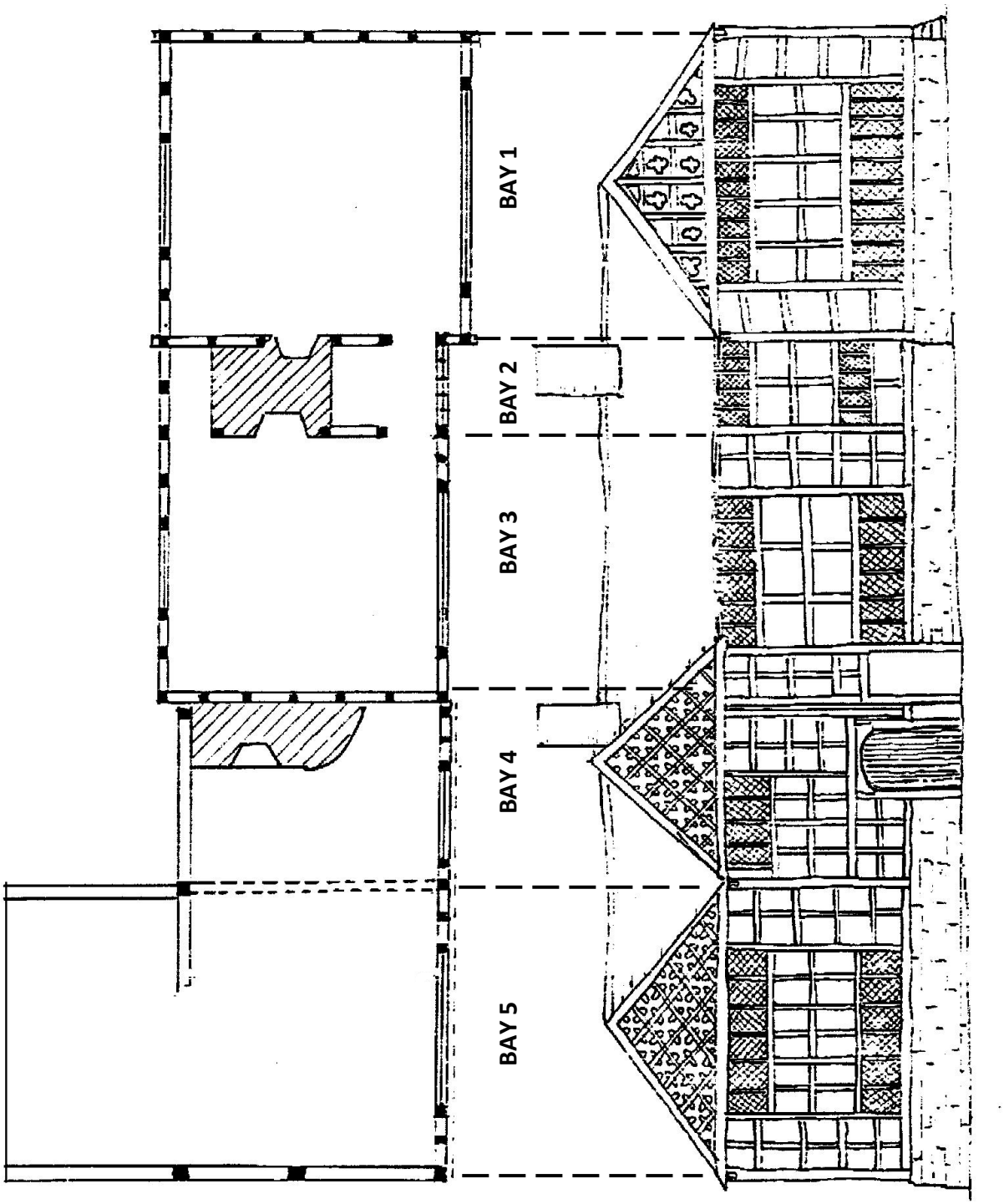


Figure 2: Plan (at first floor level) and front elevation of the Olde Boar's Head to show the layout and arrangement of the bays (after W J Smith)

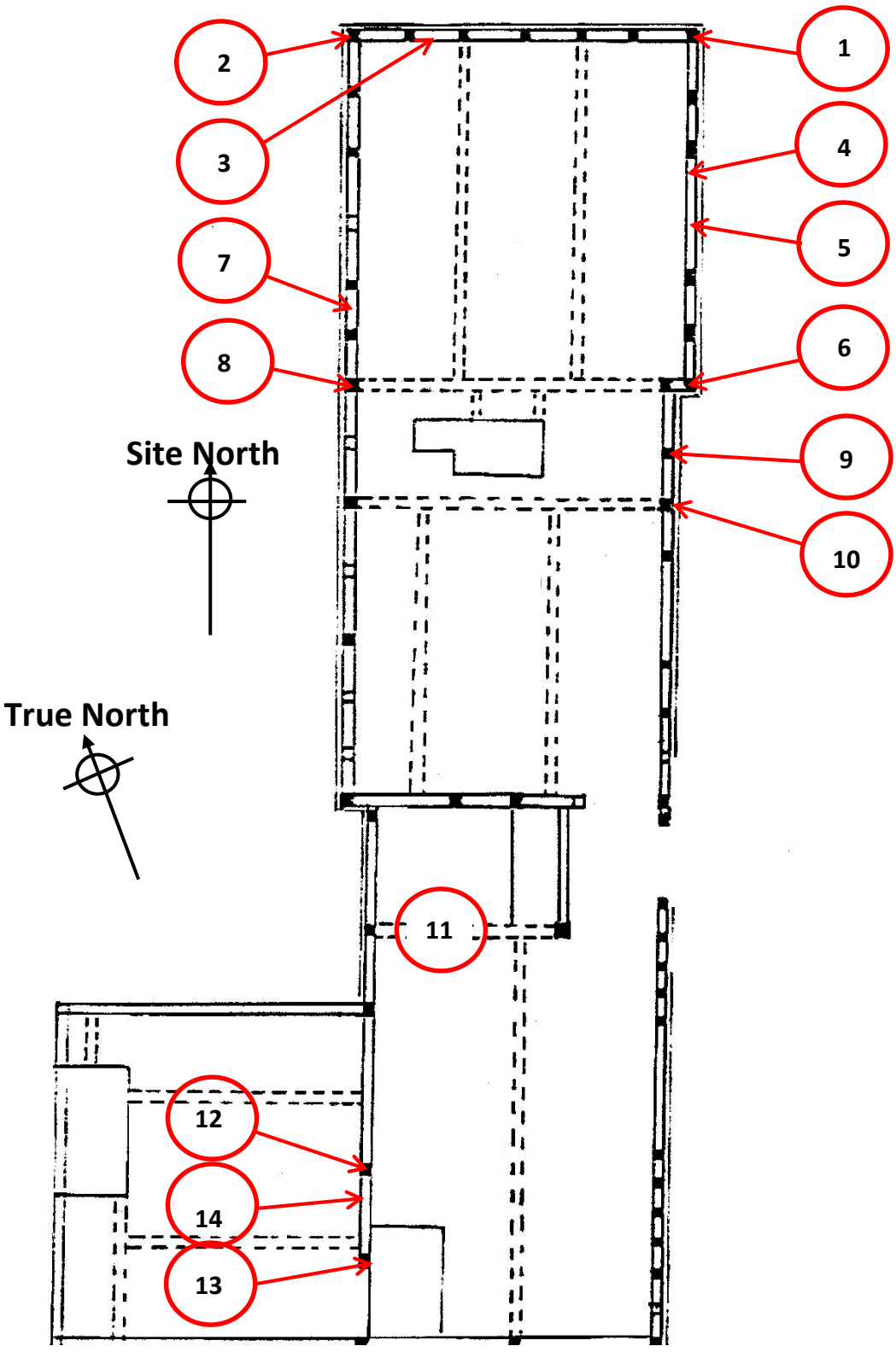


Figure 3: Plan (based on ground-floor survey drawing) to show the approximate positions of the sampled first-floor timbers (see Table 1) (after W J Smith)

Figure 4a/b: Views of bay 1 to help identify the sampled timbers (see Table 1)

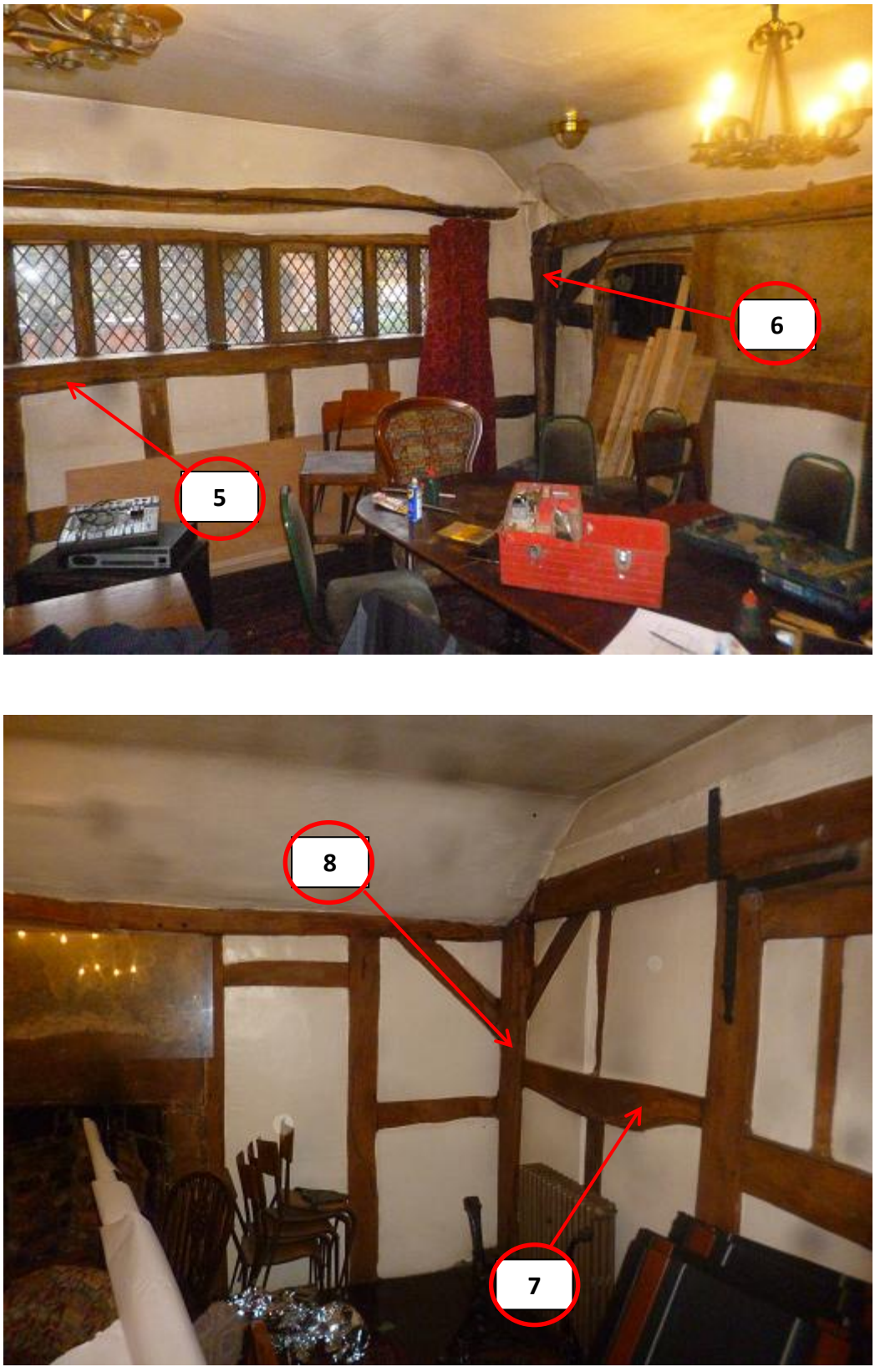


Figure 4c/d: Views of bay 1 to help identify the sampled timbers (see Table 1)

Figure 4e/f: Views of bay 2 to help identify the sampled timbers (see Table 1)

Figure 4g/h: Views of bay 4 (top) and bay 5 (bottom) to help identify the sampled timbers (see Table 1)

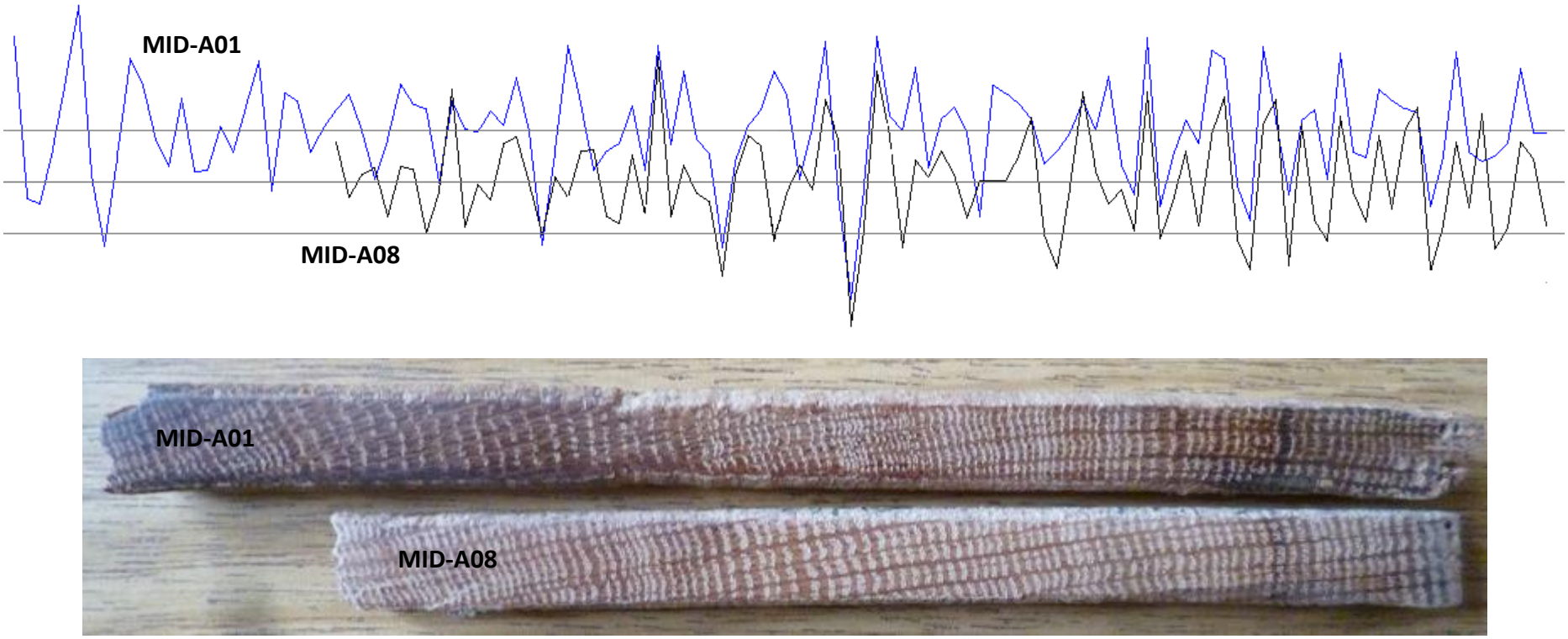
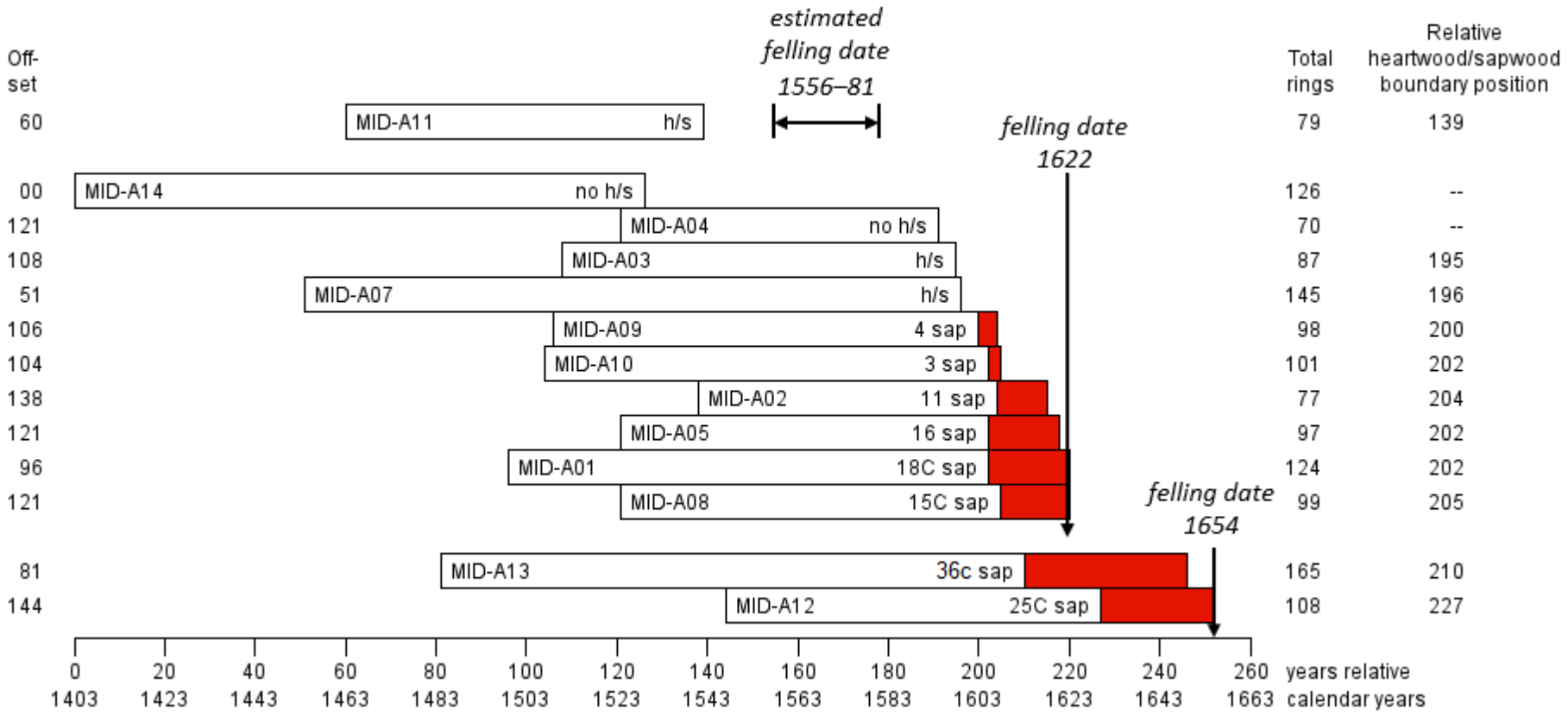


Figure 5: Graphic representation of the cross-matching of two samples, MID-A01 and A08

When cross-matched at the correct positions, as here, the variations in the rings of these two samples (where they overlap) correspond with a high degree of similarity. As the ring widths of one sample increase (represented by peaks in the graph), or decrease (represented by troughs), so too do the annual ring widths of the second sample. This similarity in growth pattern is a result of the two trees represented having grown at the *same time* in the *same place.* The growth ring pattern of two samples from trees grown at different times would never correspond so well.



blank bars ☐ = heartwood rings, shaded bars ▬ = sapwood rings
C = complete sapwood is found on the timber, the last measured ring date is the felling date of the tree represented
h/s = heartwood/sapwood boundary, i.e., only the sapwood rings are missing

Figure 6: Bar diagram of the samples in site chronology MIDASQ01

Figure 6 shows the cross-matching samples in the form of 'bars' illustrating where the ring variations match with each other, this similarity being produced by the trees represented growing at the *same time* as each other in the *same place.* The samples are combined to form a 'site chronology', which is dated by comparison with the 'reference' chronologies (see Table 2).

The earliest phase of felling detected in this programme of analysis is represented by sample MID-A11, from a bresummer beam in bay 4. This sample does not retain complete sapwood, and it is thus not possible to reliably indicate a precise felling date for the timber. The sample does, however, retain the heartwood/sapwood transition, this being dated 1541. Allowing for a minimum of 15 sapwood rings, and a maximum of 40 (the usual 95% probability range), this would give the timber an estimated likely felling date of between 1556 at the earliest and 1581 at the latest.

Samples MID-A01 and A08 retain complete sapwood, this meaning that they have the last growth ring produced by the trees represented before they were felled. On both cores this last growth rings, and thus the felling of the trees, are dated 1622. Given that the heartwood/sapwood boundary on a number of other samples is at a similar relative position to that on MID-A01 and A08, and that the total number of sapwood rings on oak trees lie within fairly fixed limits, it is likely that the trees represented by these them were also felled about, if not in, 1622 as well. All these samples are from timbers in bays 1 and 2.

A further sample, MID-A12, also retains complete sapwood, the last growth ring on it, and thus the felling of the tree, being dated 1624. In addition, the timber represented by sample MID-A13 has complete sapwood on it but some of the sapwood (about 5mm) has been lost from the sample in coring. It is estimated that this lost portion contained about 5–8 sapwood rings. Given that the last extant sapwood ring on this sample is dated 1648, this would suggest that this tree was also felled in, or about, 1654. These two timbers are in bay 5.