

5. DENDROCHRONOLOGY

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Dendrochronological samples were taken from four locations, Rooms G02, G12 and F12 and the Turnpike Stair. Some 26 core samples were removed from oak joists, beams and rafters and, of these, 17 have been calendrically dated (Illus 38). The results are summarised below by room (full analytical results can be found in Crone 2013; 2016) and then discussed in terms of their contribution to the chronology of Riddle’s Court. The evidence for the source of the timber is presented and the significance of the assemblage is placed within the context of the contemporary timber trade and building construction in Edinburgh.

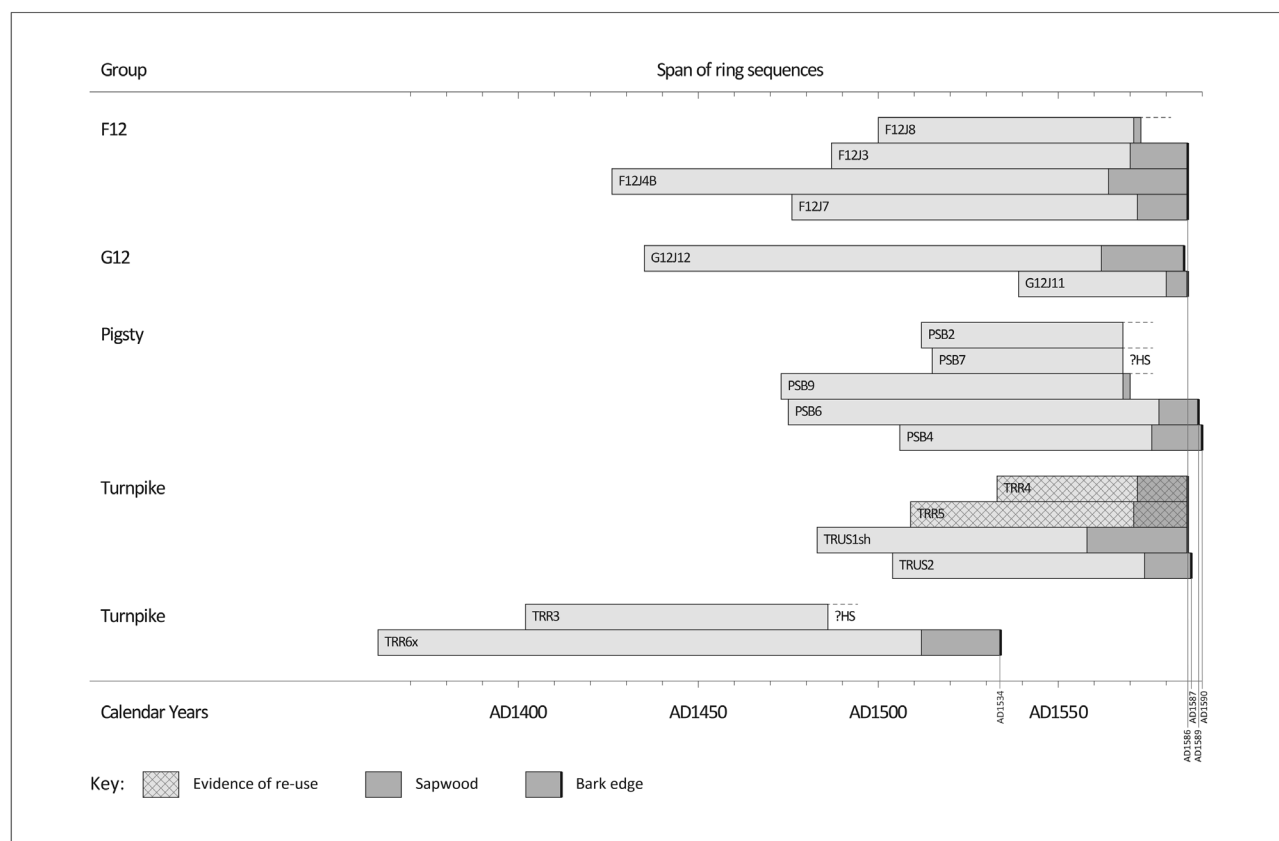
The nature of the outermost ring is critical in determining the felling date; this is explained here to avoid repetition below. If a complete ring is present under the bark then felling could have occurred in the autumn of the dated year or the spring of the following year; for example, a timber with a complete outer ring dated to 1600 could have been

felled in either the autumn of 1600 or the early spring of 1601, before new growth started again that year. Such a felling date will be referred below to as 1600/01. If new growth is just visible under the bark then the timber was felled in the spring of the following year, ie a timber with an outer complete ring dated to 1600 but displaying new growth will have been felled in the spring of 1601.

5.1 Results

5.1.1 Room F12

Four of the seven sampled joists from this room have been dated. Three of the timbers were felled in 1586/87. F12J8 was felled sometime after 1578, a *terminus post quem* calculated by adding the minimum number of missing sapwood rings to the heartwood/sapwood boundary. With three felling dates in the same year, and the absence of any evidence for reuse, it seems most probable that the timbers were imported into Scotland in the spring/summer of 1587 and used in Riddle’s Court that year.



Illus 38 The chronological relationships between the dated timbers. (© CFA Archaeology Ltd)

5.1.2 Room G12

Two of the five sampled joists from this room have been dated. G12J12 was felled in the spring of 1586 and G12J11 was felled in 1586/87. With only two dated joists it is difficult to be precise about the construction date of this floor. G12J11 cannot have been imported into Scotland until 1587 at the earliest, even if it was felled in the autumn of 1586 (see below) but the presence of a timber definitely felled in spring 1586 raises the possibility of other, later felling dates in the assemblage which have not been identified. The G12 joists cannot have been inserted earlier than 1587.

5.1.3 Room G02 ceiling

Five of the seven sampled beams from this room have been dated. Only two of the cores retained an intact sequence to bark edge; PSB4 was felled in the spring of 1590 while PSB6 was felled in 1589/90. Woodworm damage on the other cores meant that the sapwood was either missing or detached. Adding a sapwood estimate of 7–21 rings (see below) to the heartwood/sapwood boundary and taking into account the number of detached sapwood rings, it was possible to calculate felling ranges. Thus, PSB2 was felled sometime between 1580 and 1589, PSB7 between 1575 and 1589, and PSB9 between 1588 and 1589.

The interpretation of PSB4 is unequivocal; it was felled in the spring of 1590. All the other timbers could have been felled in either 1589 or 1590. In the absence of any evidence for the use of recycled timber, these timbers probably represent a shipment to Scotland in the spring/summer of 1590.

5.1.4 The Turnpike Stair roof (South Block)

Six of the seven rafters from this roof have been dated. Three of the timbers were felled in 1586/87 and one was felled in 1587/88. TRR6 was felled in the spring of 1534. The outermost rings of TRR3 were damaged by woodworm; consequently, the addition of the minimum number of sapwood rings to the outermost surviving ring provides at best a *terminus post quem* of 1493.

The dendrochronological results do not provide us with an unequivocal date for the construction of the Turnpike Stair roof. Two of the timbers felled

in 1586/7 display redundant joints, so they must have been reused in the construction of the roof sometime after that date. It seems reasonable to assume that a recently constructed building would not have been torn down to provide the timber, so it may have been many decades after the felling date when the roof was built, possibly sometime in the 17th century. Much older timber was also reused in the roof; TRR6 was felled in 1534, nearly half a century earlier than the other timber used in the roof, so the builders may have been using a stockpile of recycled timber from a variety of buildings.

5.2 Discussion

5.2.1 Building history

Illus 36 summarises the chronological relationships between the dated timbers from Riddle's Court. There is evidence for felling episodes in 1534, 1586, 1586/87, 1588/89, 1589/90 and 1590. Setting aside the earliest episode, the spread of felling dates over five years from 1586 to 1590 could represent the use of stockpiled timber in a complex building project (Crone & Mills 2012: 358–61). For example, at Edinburgh Castle, timber used to build the Great Hall roof had been imported and stockpiled from 1505 to 1509 before construction in 1510 (Crone & Gallagher 2008). Nonetheless, the 1586 and 1586/87 felling dates all occur in Rooms F12 and G12, while the 1589/90 and 1590 felling dates were found only in Room G02, which suggests that there is a chronological sequence throughout the complex, with Rooms F12 and G12 being built first and Room G02 a year or so later. Timbers from these building phases were then reused, possibly later in the 17th century, in the construction of the Turnpike Stair roof which appears to have been built with a mixture of reused timber from varied sources.

Surprisingly few buildings have been recorded with clear evidence of reuse of timber (Crone & Mills 2012: 362) but given the shortage of native timber and the need to import supplies recycling must have been commonplace, and indeed is referenced during Duchess Anne of Buccleuch's later renovations (see 3.4.1 'Upper lodging' above). The Turnpike Stair roof is a prime example of the difficulties of interpreting structures which included mixed cargoes and recycled timber.

5.2.2 Timber source and the timber trade

The Riddle's Court sequences were dated by comparison against a suite of master reference chronologies, generating the highest correlations with chronologies from Scandinavia and thus identifying that region as the source of the timber (Crone & Mills 2012: 330–1). The sequences compare most strongly with Norway, as well as with other Scottish 'import' chronologies (Table 1). The source of the timber is important when estimating felling ranges because sapwood estimates vary across Europe. As Norway has been identified as the source of these timbers, a sapwood range of 7–21 years (Christensen & Havemann 1998) has been used in calculating the felling ranges and *termini post quem* quoted above.

The source of the timber would also have had an impact on transportation times to Scotland, creating a lag between felling and use (Crone & Mills 2012: 361). In Scandinavia, timber processing was carried out in spring and autumn when floodwater and meltwater respectively made sawmilling easy (Lillehammer 1999: 13), yet all the timber ships from the region arrived in Scotland between May and September, the optimum time of year for sailing across the North Sea (Smout 1963: 155). This means that timber felled and processed in the autumn of one year will not have been imported into Scotland until the following

summer, thus introducing a lag of at least one year. This lag has been taken into account when interpreting the felling dates above.

Large numbers of ships must have been arriving in the ports along the Forth loaded with timber to fuel the building boom in Edinburgh between c 1550 and 1650 when the population of the city tripled (Glendinning 2003), and the heterogeneous nature of these cargoes is reflected in the timber in Riddle's Court. The assemblage is very mixed, with timbers varying in age from 48 to 178 years, the age and average ring-widths reflecting widely differing growing conditions. As there are multiple felling dates which must represent shipments over up to five years, the timber must come from different woodlands and this is reflected in the low level of heterogeneity within the assemblage, ie the degree to which each sequence compares visually and statistically with the other. For instance, the two sequences from Room G02, PSB4 and PSB6, did not correlate at all with the other G02 sequences or with other sequences in the assemblage, suggesting that they came from a very distinct and different source. This heterogeneity has been noted in many other assemblages of imported timber (Crone & Mills 2012: 343).

5.2.3 Context

Every 16th- and 17th-century building in Edinburgh and the Lothians which has been dated

Table 1 Riddle's Court full dendrochronological sequence correlations (Note: RCMN×15 is a building chronology combining all dated sequences from Riddle's Court. The numbers in the right-hand column are t-values, the statistic which quantifies the correlation between RCMN×15 and the reference and site chronologies in the left-hand columns)

Sequence code	Site name	Date range (AD)	t-values compared with RCMN×15 AD 1426–1590
Norwegian chronologies			
N053N027	Vennesla+Bjorvatn	1480–1678	7.89
Z010m001	Larvik 5 & 6 (boat)	1480–1727	6.93
Z062m001	Oslo Vaterland (boat)	1384–1512	4.87
Scottish 'import' chronologies			
BRECHIN2	High Street, Brechin, Phase 2	1451–1575	5.89
ACMN×8	Advocate's Close, Edinburgh	1428–1590	4.45

by dendrochronology has been built with oak or pine imported from Scandinavia, and principally from Norway (Crone & Mills 2012; Crone et al 2017), and indeed pine planks from Sweden and Norway are referenced during Duchess Anne of Buccleuch's early 18th-century renovations (see 3.4.1 'Upper lodging' above). Along the Royal Mile this includes Edinburgh Castle, tenements at 302–304 Lawnmarket, 375 High Street and

John Knox House, and Abbey Strand and Queen Mary's Bathhouse at Holyrood. In a recent study of eight of the painted ceilings so characteristic of this period, including those in 302–304 Lawnmarket and Abbey Strand, all were found to have been built using Norwegian oak and pine (Crone et al 2017), so it is possible to be confident in asserting that the painted ceilings in Riddle's Court were also built with Norwegian timber.