7. DENDROCHRONOLOGICAL ANALYSIS

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7.1 Introduction

The ring-patterns of the pine boards used to make the coffins were assessed to determine which the best candidates for dendrochronological analysis were in terms of number of growth-rings, the greater the number usually ensuring greater success in dating (Crone 2008: 26). A mixture of both fast-grown and slow-grown pine was present. The presence of bark edge was also sought because this can provide a precise felling date, however since the boards had all been trimmed square there was little bark edge in evidence. Candidates were selected which would be representative of as many coffins as possible; in all 29 samples from nine coffins were measured, their sequences ranging in number of growth rings from 71 to 239 rings, though the majority retained well over 100 rings (Table 4). The pine boards had all been sawn tangentially across the log so in many cases the growth-rings lay obliquely to the flat surfaces of the boards, making radial measurement difficult.

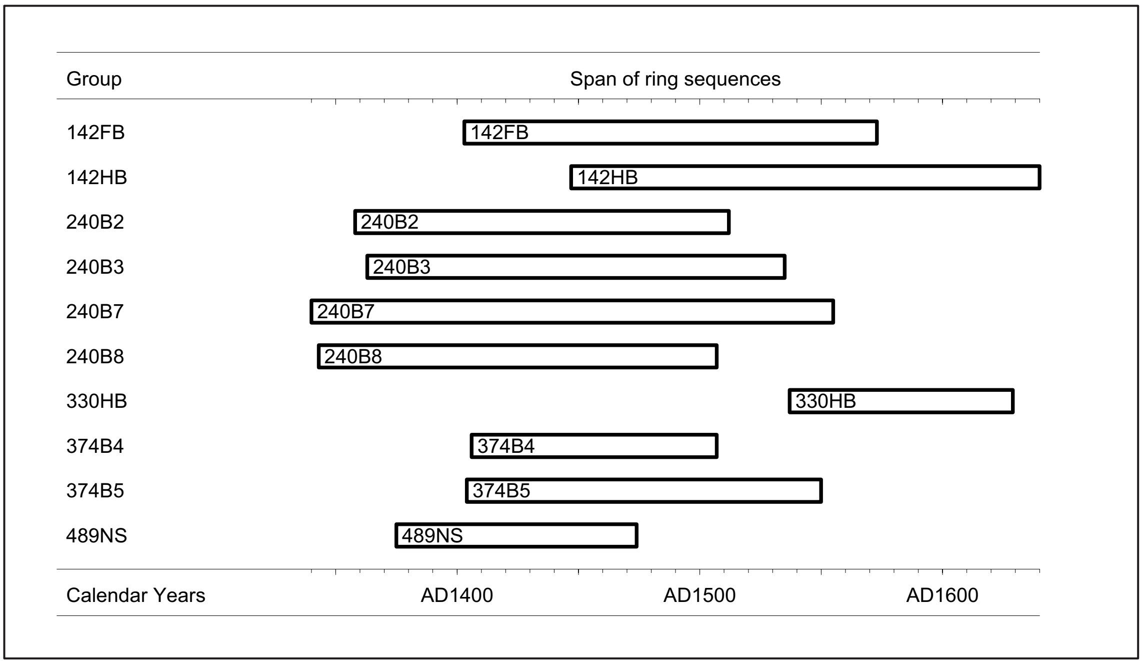
7.2 Methodology

Slices *c* 70–100mm thick were sawn from the selected boards and the sawn edge was then pared using a razor blade to reveal the ring-pattern. The slices were subsequently measured on a Heidenhain measuring table, under a low-power microscope, linked to a PC. Data capture, analysis and plotting were undertaken using the 'Dendro' suite of programs. The program produces 't' values as a measure of the degree of correlation between sequences, and as a general rule of thumb values above 3.5 are considered to be significant, although the length of overlap also has to be taken into account.

Construction of a site chronology usually proceeds in a stepwise fashion; the strongest internally replicated group is used to form the kernel of the site chronology first and then that chronology is compared with the remaining unmatched sequences to find further acceptable statistical and visual matches, which are then incorporated into the site master. The resulting site chronology is then compared against calendrically dated regional and site chronologies to find the position of best match.

7.3 Results

The 29 growth-ring sequences were compared against each other. This produced several groups with strong internal statistical and visual correlations, mainly within coffin groups (Illus 8). For Coffin C142, 142B5 and 142B7 correlated very strongly



Illus 8 Chronological relationships between the components of SMSL×10 © Wardell Armstrong LLP

Table 4 Dendrochronological data

Context	Sample code	Conv	No. rings	Pith	Outer rings
142	HB	CT	194	Y	
142	FB	OT	171		
142	B5	OT	211		
142	B7	OT	239		
240	B2	OT	155		
240	B3	OT	173		
240	B7	CT	216	Y	
240	B8	CT	165		
300	HB	MT	184		
330	HB	MT	93		
374	HB	CT	113		
374	FB	CT	135		
374	B1	CT	106		
374	B3	CT	90		
374	B4	CT	102		
374	B5	OT	147 + 2/3		
374	B7	CT	165		
398	B3	CT	90		
398	B5	CT	147		
398	B6	CT	137		
398	B7	CT	117		
398	B8	CT	128	Y	
398	RS	CT	158	Y	
398	LS	CT	142		
457	FB	CT	145		
489	NS	CT	100		
489	B	CT	207		be
524	B1	MT	71		
524	B2	MT	133 + 1		be?

with each other (t = 7.3) and a mean chronology, 142MN×2, 271 years in length was constructed. For Coffin C240, all the measured components correlated very strongly with each other (Table 5) and a mean chronology 240MN×4, 216 years in length was constructed.

For Coffin C374, 374FB and 374HB produced such a high correlation (t = 14.1) as to indicate that the two boards had been sawn from the same tree and a tree mean, 374RW was constructed. 374B4 and 374B5 also matched well (t = 4.65) and a mean chronology, 374B4_5, 147 years in length was constructed. For Coffin C398, four of the base slats, B5, B6, B7 and B8 correlated very strongly with each other (Table 6), the correlations between three of the slats, B5, B6 and B7, suggesting that they had been sawn from the same tree. A mean chronology 398MN×4, 164 years in length was constructed.

7.4 Discussion

The mean chronologies and the individual sequences were then compared against a suite of dated master pine chronologies from Scotland and northern Europe. Some of the mean chronologies and individual sequences produced low but consistent correlations against some of the dated master chronologies. Consequently, a site chronology SMSL×10 was constructed, 301 years in length, which produced enhanced correlations against the dated master chronologies, dating SMSL×10 to AD 1340–1640 (Table 7).

The chronological relationships between the components of the site chronology, SMSL×10 are shown in Illus 8. Components from Coffins C142, C240, C330, C374 and C489 have been dated. The outermost rings have been trimmed on all the dated sequences so AD 1640 provides a *terminus post quem* for the felling of the timbers, and a *terminus ante quem* for the construction of the coffins. The timber must have been felled after 1641 and taken to Leith, sawn into lengths and turned into coffins within a few years, at most, of felling. The trimming of the boards means that it is not possible to determine chronological relationships between the coffins.

The master chronologies with which SMSL×10 produced the strongest correlations are all based on pine from Norway (Table 7). IMPORT×8 is a master chronology incorporating pine sequences from buildings in Edinburgh, Leith, Stirling and Fife (Crone et al 2017: 30), all of which have been sourced to southern Norway. Norway is therefore the probable source of the pine boards used in the construction of the coffins. This is not unexpected; the trade in boards, or deals as they were known,

Table 5 Statistical correlations within 240MN×4

	Begin	End				
240B8	4	168	*	9.03	8.98	7.47
240B2	19	173	*	*	7.30	5.55
240B3	24	196	*	*	*	7.20
240B7	1	216	*	*	*	*

Table 6 Statistical correlations within 398MN×4

	Begin	End	398B8	398B5	398B6	398B7
398B8	1	128	*	6.28	7.88	6.51
398B5	18	164	*	*	13.64	9.54
398B6	17	153	*	*	*	10.38
398B7	17	133	*	*	*	*

Table 7 Statistical correlations between SMSL×10 and master chronologies from Norway and 'import' chronologies from Scotland

Chronology	@ end-year Location	SMSL×10 1640
IMPORT×8 (AD 1329–1671)	Scottish imports (see text)	7.15
Anne Crone		
NOMK0908 (AD 1121–1863)	W & E Agder, S Norway	6.96
Thomas Bartholin pers comm		
99200010 (AD 871–1986)	SE Norway	5.30
Terje Thun pers comm		
K010301s (AD 1395–1706)	Lower Saxony (Norwegian source)	5.30
Sigrid Wrobel pers comm		
N007m005 (AD 1471–1622)	Bolvaerk, Oslo	4.18
Aoife Daly pers comm		

between Scotland and Norway in the 17th century was vast and well documented (ibid). The lack of heterogeneity in the St Mary's (Leith) assemblage, ie the lack of statistical correlations between the sequences, reflects the multiple sources of timber in the cargoes arriving in Scotland. Pine boards from the same tree or same source did occasionally remain together in the merchants' stockpile, as witnessed by the fact that boards from the same tree and/or source occasionally ended up being incorporated in one coffin, as seen with Coffins C142, C240, C374 and C398.