NEW DATING EVIDENCE FOR NORTH SEA TRADE BETWEEN ENGLAND, SCOTLAND, AND NORWAY IN THE 11TH CENTURY AD

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ABSTRACT. This study follows on from previous research at Perth, Scotland, in which we dated carbonized food residues removed from the external surface of rim sherds of cooking pots of London Sandy Shellyware pottery (Museum of London Pottery Fabric Code SSW). The 15 residues that were dated produced ^{14}C ages between 910 ± 35 and 1085 ± 40 BP. We have now carried out radiocarbon measurements on similar residues from the same fabric obtained from the Billingsgate excavations in London and the Bryggen excavations in Bergen, Norway. The London and Bergen measurements gave age ranges of 905 ± 35 to 1115 ± 35 BP and 920 ± 35 to 1055 ± 35 BP, respectively, both very similar to the Perth age range. The measurements at each site are in agreement with our Bayesian model assumption that they belong to a single phase of activity. The model estimates the introduction of London Sandy Shellyware in London to *cal AD 820–1020*, in Perth to *cal AD 930–1020*, and in Bergen to *cal AD 980–1030* (*95% probability*). Further modeling predicts that it fell out of use in the reverse order.

INTRODUCTION

The modeling undertaken in our previous research (Hall et al. 2007) on dating food residues from the external surfaces of rim sherds of cooking pots indicated that Sandy Shellyware pottery first appeared in Perth, Scotland, around *cal AD 910–1020* (*95% probability*). This is contrary to expert opinion (A Vince, personal communication), which places these imported wares at no earlier than AD 1150. Vince identified the ware from Perth as London Sandy Shellyware, of a type that he proposed appears in London in the mid-12th century. His view is based on the fact that the London Sandy Shellyware was indirectly dated by dendrochronology and by association with other artifacts from excavations in London, particularly from Billingsgate Fish Market. The timbers used for the dendrochronology formed revetments on the banks of the River Thames and the potsherds and other artifacts are all from dumps of material forming the banks behind the timbers. However, that being the case, there is a strong possibility that the sherds originate from earlier deposits. A full discussion of this is contained in Hall et al. (2007). The most obvious way to help settle this issue of the Sandy Shellyware chronology was to date food residues from the same Sandy Shellyware pottery derived from the excavations at Billingsgate and also from Bryggen Wharf in Bergen, Norway (excavated in the late 1950s and early 1960s), where this pottery from London has also been identified (Blackmore and Vince 1994). Indeed, the dendrochronological work on the Billingsgate material has been used to infer the chronology for this fabric type at Bryggen and in turn, this was then applied to dating of the excavations (Steedman et al. 1992; Blackmore and Vince 1994:88–93).

As the Perth dates were suggesting dates at least 100 yr earlier, it was felt that dating the ceramics from London and Norway using the same technique was a vital next step.

METHODS AND RESULTS

The highly carbonized food residue coatings were scraped from the rim sherds using a scalpel, taking care not to incorporate mineral material from the sherd. This removes the possibility of incorporating potentially old carbon from organic coatings on the clay minerals (De Atley 1980). This car-

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bon has been shown to survive the firing process (Johnson et al. 1988) and, if present in sufficient quantity, could influence the radiocarbon ages. The residues were then pretreated as would be undertaken for charcoal samples using a standard acid/alkali/alkali/acid pretreatment scheme, followed by washing with reverse osmosis water and drying. The samples were all combusted in evacuated sealed quartz tubes using copper oxide as the oxidant and silver foil to react with and remove gaseous contaminants (mainly halides). The tubes were opened under vacuum and the CO_2 recovered and purified cryogenically. A subsample was taken for $\delta^{13}C$ analysis using a VG SIRA 10 stable isotope mass spectrometer, using NBS standards 22 (oil) and 19 (marble) to determine the 45/44 and 46/44 atomic mass ratios, from which the $\delta^{13}C$ value was calculated. A further sample (3 mL) was converted to graphite according to the method of Slota et al. (1987).

The 15 samples from Perth were measured and reported as previously described in Hall et al. (2007). The Billingsgate samples were prepared in 2006 and measured at the SUERC AMS facility using the NEC 5MV terminal voltage instrument, with carbon in the 4+ charge state (terminal voltage for C^{4+} = 4.5 MV). The Bergen samples were measured in 2008 at the SUERC AMS facility using the NEC 250kV SSAMS, with carbon in the 1+ charge state. The results for the Bergen and Billingsgate samples are given in Tables 1 and 2.

Table 1 ^{14}C ages of carbonized residues from Billingsgate, London.

Laboratory code	Sample code	$\delta^{13}C$ (‰)	Age (BP) ±1 σ	Calibrated range
GU-6349	SUERC-8979	–27.2	1115 ± 35	AD 860 (93.6%) 1020
GU-6352	SUERC-8980	–24.5	1105 ± 35	AD 860 (95.4%) 1020
GU-6354	SUERC-8981	–25.0	1035 ± 35	AD 890 (94.0%) 1050
GU-6355	SUERC-8982	–24.8	1000 ± 35	AD 970 (95.4%) 1160
GU-6356	SUERC-8983	–23.2	955 ± 35	AD 1010 (95.4%) 1160
GU-6357	SUERC-8984	–25.0	1000 ± 35	AD 970 (95.4%) 1160
GU-6358	SUERC-8985	–28.4	905 ± 35	AD 1030 (95.4%) 1210

Table 2 ^{14}C ages of carbonized residues from Bergen, Norway.

Laboratory code	Sample code	$\delta^{13}C$ (‰)	Age (BP) ±1 σ	Calibrated range
GU-16476	SUERC-17879	–24.8	990 ± 35	AD 980 (95.4%) 1160
GU-16477	SUERC-17880	–25.9	915 ± 35	AD 1020 (95.4%) 1210
GU-16478	SUERC-17881	–25.9	965 ± 35	AD 1010 (95.4%) 1160
GU-16479	SUERC-17882	–24.1	1050 ± 35	AD 890 (95.4%) 1030
GU-16480	SUERC-17886	–24.9	960 ± 35	AD 1010 (95.4%) 1160
GU-16481	SUERC-17887	–24.6	1035 ± 35	AD 890 (94.0%) 1050
GU-16482	SUERC-17888	–27.3	1020 ± 35	AD 950 (91.7%) 1160
GU-16483	SUERC-17889	–23.9	1065 ± 35	AD 890 (95.4%) 1030
GU-16484	SUERC-17890	–24.5	995 ± 35	AD 980 (95.4%) 1160
GU-16485	SUERC-17891	–25.0	980 ± 35	AD 990 (95.4%) 1160
GU-16486	SUERC-17892	–26.2	1025 ± 35	AD 890 (95.4%) 1150
GU-16487	SUERC-17896	–24.4	985 ± 35	AD 980 (95.4%) 1160

A Bayesian approach was applied to these carbonized residue results using OxCal 4.1.03 (Bronk Ramsey 1995, 2001). The model defined the residue measurements at each site as a single phase. The start and end dates were then estimated as boundaries. The model assumes that the ages are uniformly distributed over the historic use/life of the fabric (Figures 1–3).

DISCUSSION

Perth, Scotland

The chronological model for Sandy Shellyware in Perth is as previously described in Hall et al. (2007). It is composed of the ^{14}C measurements on 15 carbonized residues from 11 different archaeological contexts. The measurements are in agreement with the model assumption that they belong to a single phase of activity (Figure 1). This activity dates the introduction of Sandy Shellyware in Perth to *cal AD 930–1020* (*95% probability*; *start Sandy Shellyware: Perth, Scotland*) [*cal AD 960–1000* (*68% probability*)]. Sandy Shellyware fell out of use in Perth in *cal AD 1020–1120* (*95% probability*; *end Sandy Shellyware: Perth, Scotland*) [*cal AD 1030–1070* (*68% probability*)].

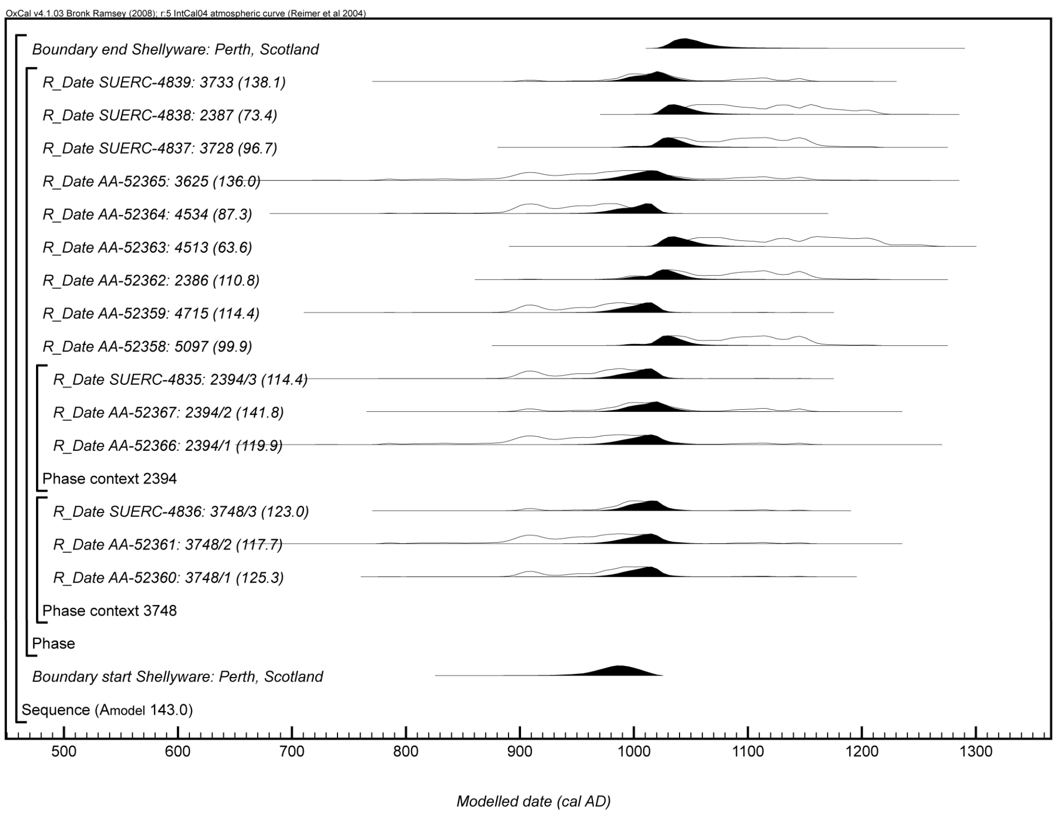

Figure 1 Graphical representation of the calibration of ^{14}C results for carbonized residues on London Sandy Shellyware from Perth, Scotland.

Billingsgate, London, England

The chronological model for Sandy Shellyware in London is composed of the ^{14}C measurements on the 7 carbonized residues (Table 1 and Figure 2). The measurements are in agreement with the model assumption that they belong to a single phase of activity. This activity dates the start of Sandy Shellyware at Billingsgate Lorry Park, London, to *cal AD 820–1020* (*95% probability*; *start Sandy Shellyware: Billingsgate Lorry Park, London*) [*cal AD 900–990* (*68% probability*)]. Sandy Shellyware fell out of use in this area in *cal AD 1020–1220* (*95% probability*; *end Sandy Shellyware: Billingsgate Lorry Park, London*) [*cal AD 1030–1130* (*68% probability*)].

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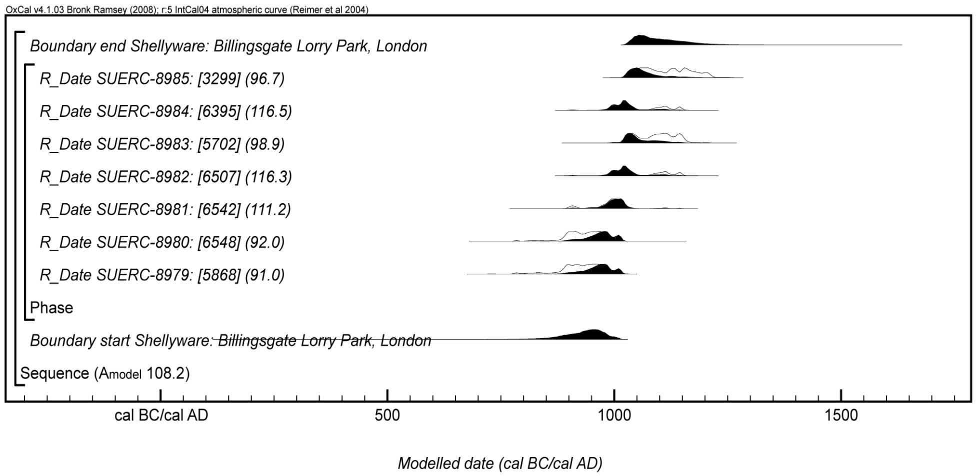

Figure 2 Graphical representation of the calibration of ^{14}C results for carbonized residues on London Sandy Shellyware from Billingsgate, England.

Bryggen, Bergen, Norway

The chronological model for Sandy Shellyware in Bryggen is composed of the ^{14}C measurements on the 12 carbonized residues (Table 2 and Figure 3). The measurements are in agreement with the model assumption that they belong to a single phase of activity. This activity dates the introduction of Sandy Shellyware in Bryggen to *cal AD 980–1030* (*95% probability*; *start Sandy Shellyware: Bryggen, Bergen*) [*cal AD 1000–1030* (*68% probability*)]. Sandy Shellyware fell out of use in Bryggen in *cal AD 1010–1070* (*95% probability*; *end Sandy Shellyware: Bryggen, Bergen*) [*cal AD 1020–1050* (*68% probability*)].

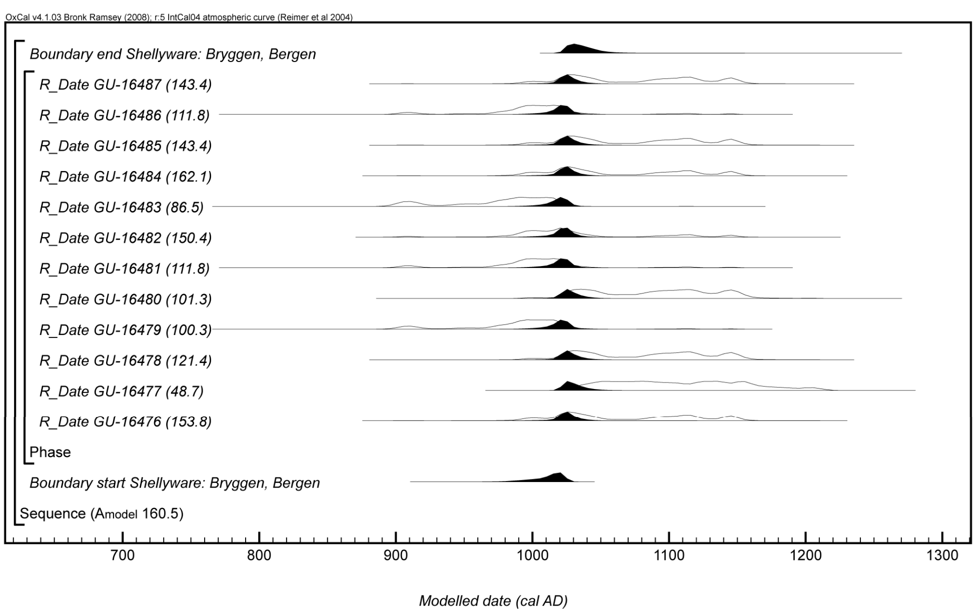

Figure 3 Graphical representation of the calibration of ^{14}C results for carbonized residues on London Sandy Shellyware from Bryggen, Norway.

A visual examination of the start and end probabilities from each location suggests that Sandy Shellyware come into fashion in the order London-Perth-Bryggen and falls out of fashion in the reverse order. The model supports this with an 89% probability that London precedes Perth and that Perth precedes Bryggen (98% probability London precedes Bryggen) for the introduction of Sandy Shellyware. Furthermore, there is a 79% probability that Sandy Shellyware falls out of fashion in Bryggen prior to Perth and an 80% probability that it falls out of fashion in Perth prior to London (Figure 4).

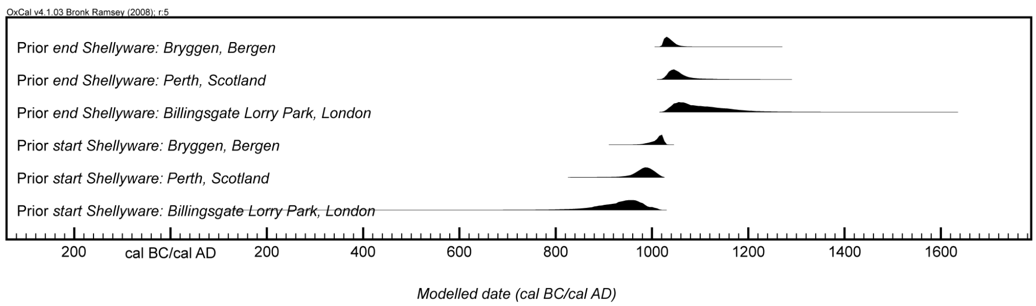

Figure 4 Graphical representation of the start and end probabilities for Sandy Shellyware pottery in Perth, Billingsgate and Bryggen.

CONCLUSIONS

This project has now produced 34 ^{14}C age measurements from carbonized London Sandy Shellyware vessels from 3 different sites that places them all significantly earlier than the mid-12th century. We discounted the possibility of a reservoir effect (either from freshwater or marine resources) giving anomalously old ages on 2 accounts: 1) We also dated leather samples from the same contexts at Perth and produced entirely comparable ages (Hall et al. 2007). 2) The Bergen and Billingsgate sites produced similar tight groupings of ages to those from Perth with no obvious anomalies. Also, there were no unusually heavy or light δ^{13}C values, which might indicate a non-terrestrial resource, although in carbonized food remains these data can be difficult to interpret as illustrated by the study of Fischer and Heinemeier (2003). If it is accepted that the trade in this ceramic type is associated with the fish trade in the North Sea, then it can be argued that it was taking place at least 100 yr earlier than had been previously thought. ICP-MS sourcing has now confirmed that the Perth samples definitely originate in the Thames Basin, so the question of provenance is no longer an issue (Vince, forthcoming).

Without a doubt, the main question that a ceramicist would ask is: What date is this material? With the improvements in the precision of AMS dating, potentially the answer is yes but we cannot overstress the importance of the stratigraphic location of the samples. For example, all of the Perth samples were from stratified layers associated with first phase buildings on the site, so it is possible to argue that the dates are absolute and do relate directly to the use of the pots in those structures. Both the Billingsgate and Bryggen excavations produced samples that were from dumped layers behind timber revetments, so the use of dendrochronological dates from those revetments to date the use of the pots seems tenuous. If our argument for the earlier dating of London Sandy Shellyware is correct, then it would seem sensible to date some well-stratified samples from sites in London in the same manner. Also, the pottery assemblage from the Bryggen excavations needs to be completely reassessed, particularly in light of recent work on the development of the town (Hansen 2005).

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