Radiocarbon dating archaeobotanical remains from Howgill Brook

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The construction of the Bay Gateway link road in Lancashire led to an extensive programme of archaeological investigations by Oxford Archaeology North in the lower Lune Valley. These investigations revealed a long sequence of occupation activity, including medieval settlement remains dating from the twelfth to the mid-fifteenth century AD on either side of the Howgill Brook (site SMR4: Bradley and Howard-Davis 2018, 83). The buildings, kilns and channels excavated at the site are thought to represent the remains of watermills associated with a grange of Furness Abbey.

The excavations at this site produced a large assemblage of medieval charred plant remains, unusually rich for this part of England (Druce in Bradley and Howard-Davis 2018). The assemblage was of interest to the Feeding Anglo-Saxon England project (FeedSax), which sought to investigate the development of medieval farming strategies using bioarchaeological proxies such as charred plant remains. The original post-excavation programme for the Bay Gateway project had produced a large number of radiocarbon dates, but many of the medieval archaeobotanical samples from Howgill Brook had not been directly dated. In order to refine the chronology for these samples, FeedSax submitted charred grains from five samples to the Oxford Radiocarbon Accelerator Unit (ORAU) for radiocarbon dating. These cereal grains – mostly identifiable as oat (*Avena* L.), with rye (*Secale cereale* L.) in one sample – were selected from the archive and photographed at the University of Oxford by the author; the photographs are included in the project's photographic archive (McKerracher *et al.* in prep.).

The radiocarbon determinations obtained for these samples have been calibrated using IntCal20 (Reimer *et al.* 2020) and OxCal 4.4.2 (Bronk Ramsey 2009) as shown in the table below and figures at the end of this report.

Results

sample	structure	grains	laboratory no.	original phase	age BP	calibrated dates AD (confidence)
4002	Building 4023	2 x rye	OxA-39896	C11–13	1163±17	823–957 (80.4%)
10518	Kiln 10577	2 x oat	OxA-39899	C12–13	859±17	1163–1224 (95.4%)
10519	Kiln 10577	2 x oat	OxA-39900	C12–13	899±17	1047–1084 (31.1%), 1150–1217 (62.6%)
10514	Kiln 10532	2 x oat	OxA-39897	C15	524±17	1400–1435 (95.4%)
			OxA-39898		351±17	1474–1633 (95.5%)
10520	Kiln 10532	2 x oat	OxA-39901	C15	838±17	1175–1262 (95.4%)

The new radiocarbon dates presented in this report pertain to three structures at site SMR4, on the west side of the Howgill Brook: Building 4023 at the centre of the excavated area, originally dated to the mid-eleventh to mid-thirteenth centuries (Bradley and Howard-Davis 2018, 91–92); and Kilns 10557 and 10532 to the south, very near to each other and dated to the twelfth to thirteenth centuries and fifteenth century respectively (Bradley and Howard-Davis 2018, 93–94, 109–111).

Building 4023

Sample 4009 comes from a posthole (4008) of Building 4023. Charred grains from another posthole (4006) were radiocarbon-dated in the original project to cal. AD 1047–1258 (with 95.4% confidence), supporting a mid-eleventh- to mid-thirteenth-century date for the building (Bradley and Howard-Davis 2018, 91–92).[1] The new radiocarbon results for posthole 4008, however, returned a much earlier date range: cal. AD 823–957 (with 80.4% confidence). If those dated grains genuinely belong in posthole 4008, then that posthole must represent a much earlier structure, with perhaps more than two hundred years between this posthole and 4006. Although there is some evidence for posthole replacement in Building 4023 (e.g. 4010 cuts 4008), it seems unlikely that a twelfth- to thirteenth-century posthole would coincide so closely with a ninth- to tenth-century precursor, without any discernible intervening history of construction on that spot. Alternatively, it may be that the older grains represent reworked material from an (otherwise obscure) earlier phase of activity; or else that the younger grains in posthole 4006 could represent intrusive later material in a genuinely ninth- to tenth-century structure. Building 4023 is somewhat isolated in the centre of the excavated area, and it is not impossible that there was an earlier phase of occupation here which is now largely lost or outside the area of excavation.

Kiln 10557

Charred grains from layer 10593 in the drying chamber of Kiln 10557 were dated in the original project to cal. AD 1164–1262, with 95.4% confidence (Bradley and Howard-Davis 2018, 93).[2] Grains from the two overlying layers (10577 and 10578) have now been dated by FeedSax, and the results are all mutually consistent: cal. AD 1163–1224 (with 95.4% confidence) and 1150–1217 (with 62.6% confidence), respectively. It is therefore likely that Kiln 10557 does indeed date from between the mid-twelfth and early thirteenth centuries.

Kiln 10532

Following an apparent hiatus in activity around the fourteenth century, there appears to have been 'a limited resumption of activity on the west side of the Howgill Brook during the fifteenth century, a new kiln (10532) being built close to its predecessor (kiln 10557)', and rebuilt at least once (Bradley and Howard-Davis 2018, 109). Charred plant remains associated with the first phase of the kiln were radiocarbon-dated in the original project to cal. AD 1413–1437, with 68.3% confidence.[3] Charcoal from a layer nearby, thought to represent the rakings-out from the second phase of the kiln, was radiocarbon-dated to cal. AD 1436–1465, with 68.3% confidence.[4] These dates thus strongly indicate a sequence of two successive kilns between the early and mid-fifteenth century.

One of the samples radiocarbon-dated by FeedSax, from another layer associated with the kiln (context 10544; sample 10514) has returned dates broadly compatible with this chronology. Two individual grains from this sample were dated separately, and returned mutually incompatible date

[1] SUERC-71346: 874±29, calibrated with IntCal20.
[2] SUERC-71357: 843±26, calibrated with IntCal20.
[3] SUERC-60265: 501±29, calibrated with IntCal20.
[4] SUERC-71356: 434±26, calibrated with IntCal20.

ranges: cal. AD 1400–1435 and 1474–1633 (both with 95.5% confidence). The laboratory results from ORAU included this statement: '*Two samples from HGB_10514 were dated. Both were individual seeds selected from within the bag of Avena sp. samples. We note the age discrepancy. We cannot see any evidence for a laboratory based reason for this offset in what we would expect to be reproducible samples. We wonder whether there might be a sample context/taphonomic reason for the difference in the two ages*.' In view of the original dates from this feature, it may be that these two oat grains were charred successively during the two phases of kiln-use (if the second kiln continued in use until at least the later fifteenth century) and then mixed in the same deposit by later disturbance.

The other sample (10520) dated by FeedSax, however, has returned an entirely incompatible date. This sample, from context 10573 (which overlies 10539, dated above to cal. AD 1436–1465), has returned a date range of cal. AD 1179–1256 (with 68.3% confidence). This date range is very similar to those obtained from the earlier kiln in the vicinity, 10577. Since the later kiln is said to have been built 'close to its predecessor' (Bradley and Howard-Davis 2018, 109), it is quite possible that material from the earlier period of crop processing was disturbed and redeposited as backfill in this later kiln.

Summary

The new dates have helped to confirm some aspects of the original dating, but have also revealed a degree of mixing in the deposits associated with the kilns, and significant ambiguity in the dating of Building 4023. Radiocarbon dates from two samples in the building's postholes would suggest a date between either the early ninth and mid-tenth centuries, or the mid-eleventh and mid-thirteenth centuries. In either case, the new date indicates that cereals were being processed on the site between the ninth and tenth centuries, in a hitherto unrecognised Late Saxon phase.

Acknowledgements

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References

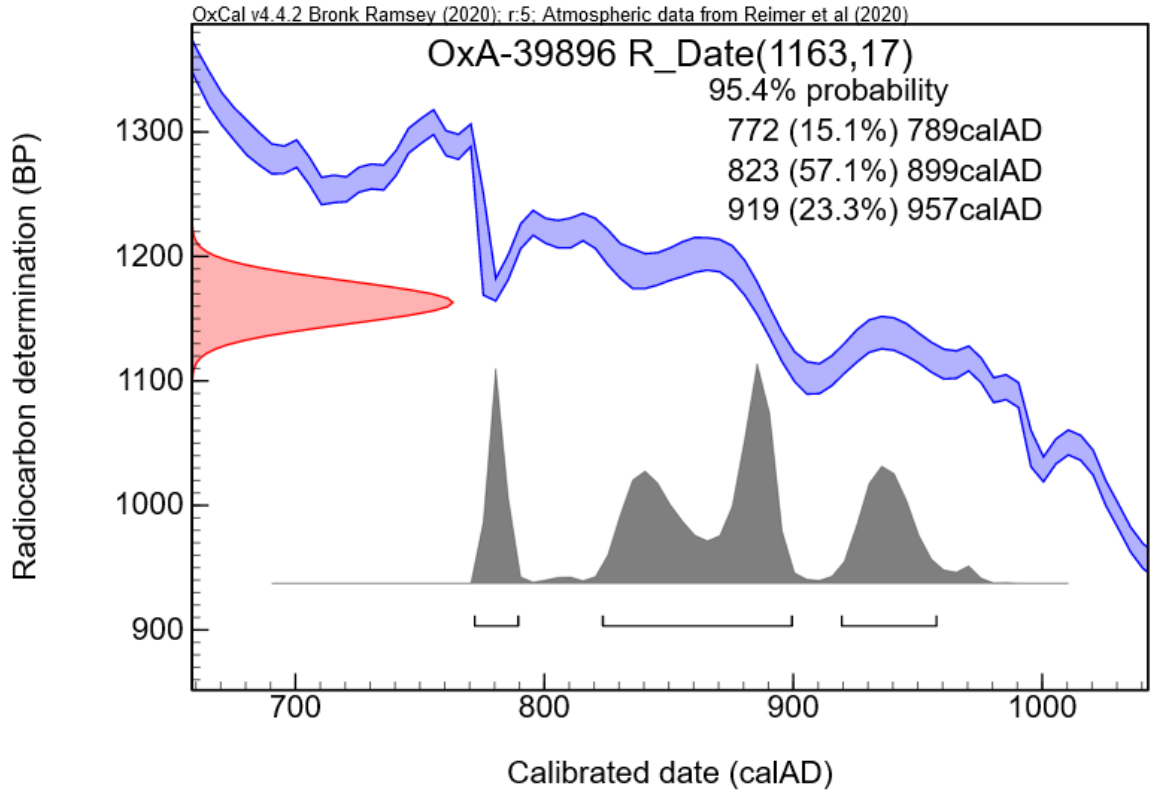
Bradley, J. and Howard-Davis, C. (2018). *From Mesolithic Encampment to Medieval Estate: The Archaeology of the Bay Gateway* (Lancaster: Oxford Archaeology North).

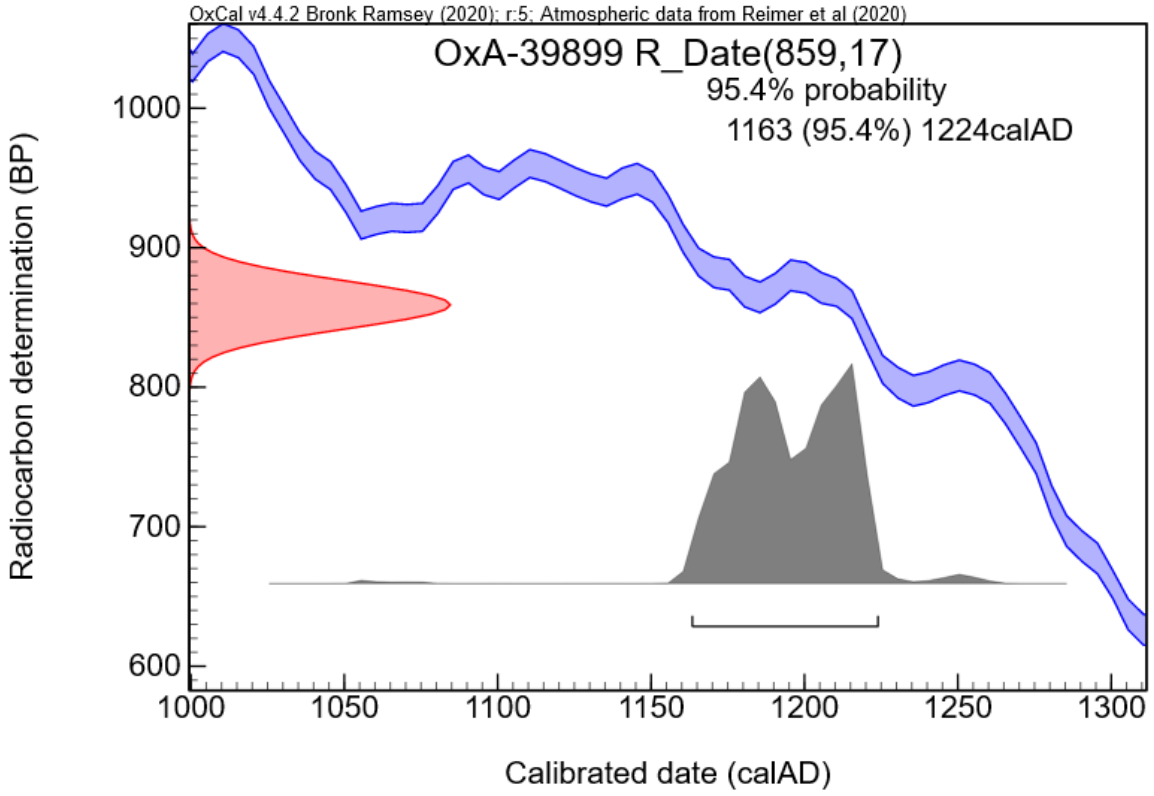
Bronk Ramsey, C. (2009). 'Bayesian analysis of radiocarbon dates', *Radiocarbon* 51(1), pp.337–360.

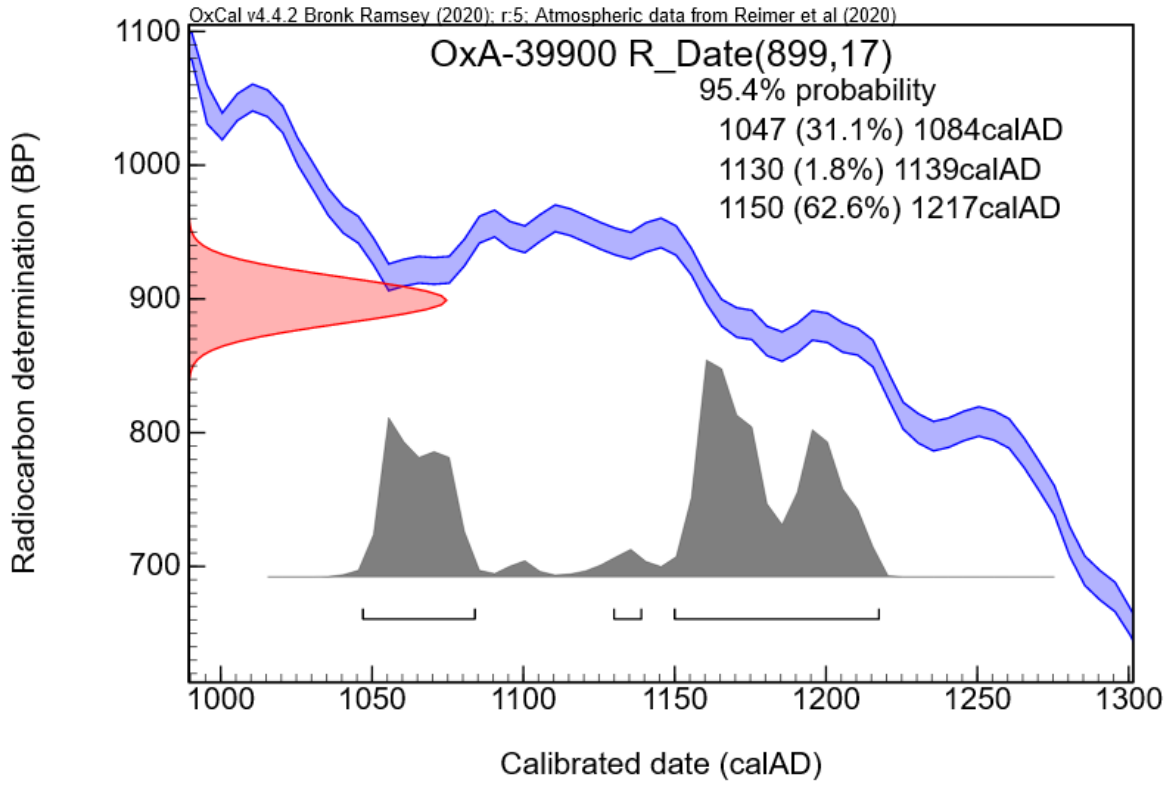
McKerracher, M., Bogaard, A., Bronk Ramsey, C., Charles, M., Forster, E., Hamerow, H., Holmes, M., Hodgson, J., Neil, S., Roushannafas, T., Stroud, E. and Thomas, R. (in prep.). 'Feeding Anglo-Saxon England (FeedSax): the Haystack bioarchaeological database and digital archives', *Internet Archaeology*.

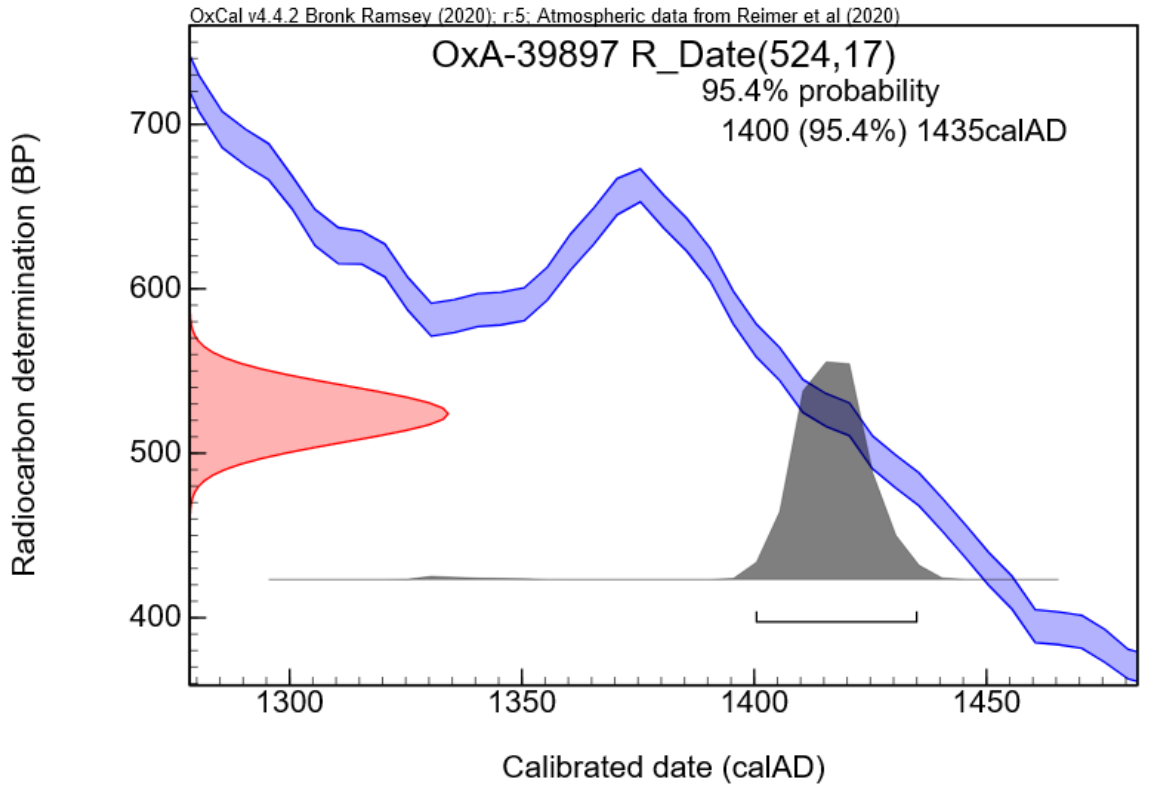
Reimer, P., Austin, W., Bard, E., Bayliss, A., Blackwell, P., Bronk Ramsey, C., ... Talamo, S. (2020). 'The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP)', *Radiocarbon* 62(4), pp.725–757. doi:10.1017/RDC.2020.41

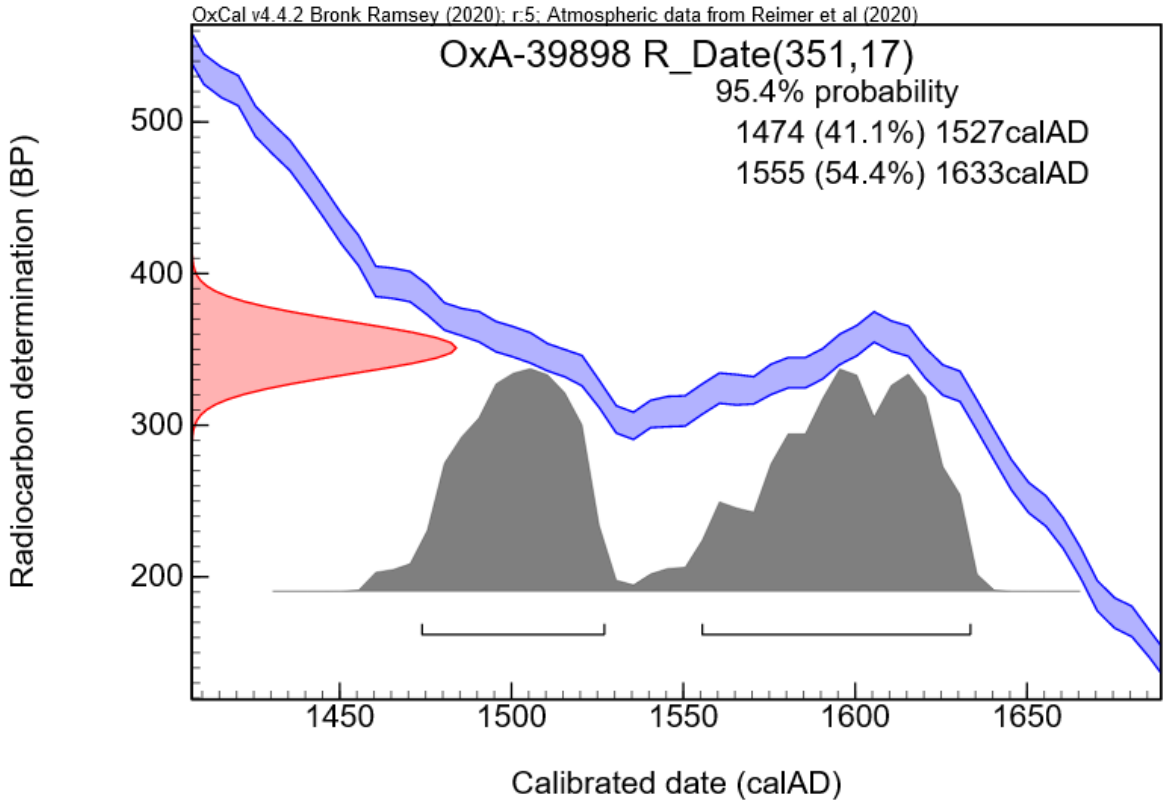
Calibration of radiocarbon determinations

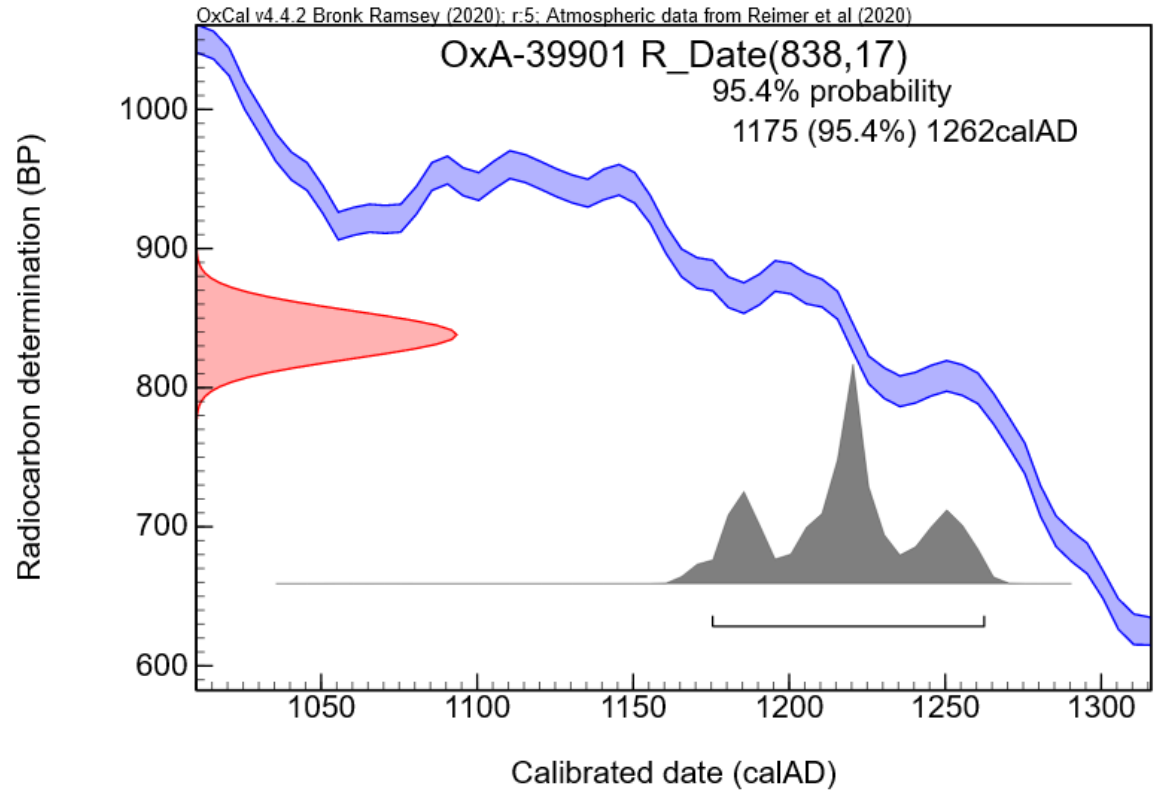





OxCal v4.4.2 Bronk Ramsey (2020); r:5; Atmospheric data from Reimer et al (2020)
OxA-39900 R_Date(899,17)
95.4% probability
1047 (31.1%) 1084calAD
1130 (1.8%) 1139calAD
1150 (62.6%) 1217calAD
Radiocarbon determination (BP)
1100
1000
900
800
700
1000
1050
1100
1150
1200
1250
1300
Calibrated date (calAD)


OxCal v4.4.2 Bronk Ramsey (2020); r:5; Atmospheric data from Reimer et al (2020)
OxA-39897 R_Date(524,17)
95.4% probability
1400 (95.4%) 1435calAD
Radiocarbon determination (BP)
700
600
500
400
1300
1350
1400
1450
Calibrated date (calAD)


OxCal v4.4.2 Bronk Ramsey (2020); r:5; Atmospheric data from Reimer et al (2020)
OxA-39898 R_Date(351,17)
95.4% probability
1474 (41.1%) 1527calAD
1555 (54.4%) 1633calAD
Radiocarbon determination (BP)
500
400
300
200
1450
1500
1550
1600
1650
Calibrated date (calAD)


OxCal v4.4.2 Bronk Ramsey (2020); r:5; Atmospheric data from Reimer et al (2020)
OxA-39901 R_Date(838,17)
95.4% probability
1175 (95.4%) 1262calAD
Radiocarbon determination (BP)
1000
900
800
700
600
1050
1100
1150
1200
1250
1300
Calibrated date (calAD)