# Desert Migrations Project XVII: Further AMS Dates for Historic Settlements from Fazzan, South-West Libya

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*Abstract*

A group of 25 new AMS (radiocarbon) dates for historic-era sites in Fazzan is presented. These provide further confirmation of the construction of numerous fortified villages and castle-like structures (*qsur*) in two of the main oases belts of Fazzan during the Garamantian period, primarily in the third – sixth centuries AD. Further precision is also provided on the dating of a Garamantian and early Islamic urban centre called Qasr ash-Sharraba and the early modern capital of Fazzan at Murzuq.

# Introduction

Radiocarbon dates have been crucial in the transformation of knowledge and understanding of prehistoric activity in the Sahara, as exemplified in the work of the Italian mission in the Tadrart Akakus, Wadi Tannzuft and Massak Sattafat (Cremaschi and di Lernia 1998; di Lernia and Manzi 2002; di Lernia *et al.* 2013). However, until recently there had been relatively limited application of radiocarbon dating technology to the historic periods of settlement (Daniels 1989; van der Veen 1992, for early dates from Zinkekra), though both Cremaschi *et al*. (2006, 150-51) and Liverani (2006, 363-74) have published some important results. Liverani, for instance, has obtained 32 dates from historic era settlements in the Ghat area, some 400 km south-west from Jarma (Aghram Nadarif, Fewet, Imassarajen and Adad). The Fazzan Project (1997-2001) commenced a major programme of AMS dating (Mattingly 2007, 294-302) and this has continued with more recent field research.

This article presents the results of a further batch of 30 samples, primarily extracted from structural mudbrick at sites identified as part of wide-ranging surveys in the Wadi al-Ajal near Jarma and in the Murzuq area to the south-east of Jarma (the methods for extracting the organic material from structural mudbrick are described in Sterry *et al.* 2012). As with previous batches of material, we have had the AMS radiocarbon dating conducted by the Oxford Radiocarbon Laboratory. Although three samples failed due to low yield and two gave a post-Atomic bomb date indicating modern intrusive material, the remaining 25 new dates add significant information about the historical pattern of human settlement and habitation (for previous dates from this part of Fazzan, see Higham *et al*. 2007; Mattingly *et al*. 2002; Sterry *et al*. 2012). These latest samples take the total number of successful radiocarbon dates for historic settlements in central Fazzan to 135 (Fig.1. For an overall location map within Libya, see Mattingly *et al.* 2007, 118, fig. 1). The Fazzan Project produced 78 published and three failed samples (see Mattingly 2007 and Pelling 2007), and 18 dates are already published for the Murzuq area, with two failed samples (Sterry *et al*. 2012). In addition, another nine (plus eight additional failed samples) soon to be published from Old Jarma (Mattingly forthcoming 2013) and four from Zuwila and one from a foggara in the Wadi al-Ajal (further articles in preparation). With limited survey and excavation currently feasible in Fazzan, AMS radiocarbon dating provides the only reliable method of refining the chronology for the Garamantian and later periods. All dates discussed within this article including those previously published have been calibrated with Oxcal v4.2.2 (Bronk Ramsey 2009) to the IntCal09 calibration curve (Reimer *et al*. 2009).

Conventional radiocarbon and AMS dates from excavations are particularly important. The long sequence of dates now available from the Zinkekra and Jarma excavations spans the last three millennia of human history and can be linked to stratified deposits, allowing the creation of dated ceramic typologies (Mattingly 2007, 305-431; 2010, 78; forthcoming 2013). However, while excavations remain few and far between, survey material offers the best hope of making sense of broader patterns of settlement. The method we have pioneered of extracting organic material from mudbricks of standing structures has proved successful in providing a *terminus post quem* for the manufacture of the mudbrick and construction of the buildings. By concentrating on annual crops and individual seeds (such as date stones) embedded in the mudbrick matrix, we hope to limit the potential for serious anomaly behind the apparent and actual date of construction, though there is certainly a possibility at multi-period sites of earlier material getting mixed into bricks as well as contemporary rubbish. For that reason we have tried where possible to obtain more than one date for each site (a full discussion of the methodology can be found in Sterry *et al*. 2012, 138-39).

# Results

The results are presented here in standard format with date ranges to a 95.4% confidence range (2-sigma) in both tabular (Table 1) and graphical form (Fig. 2). The dates will be discussed below in broad chronological order, from the Garamantian era to the early modern period, and in terms of several groups of sites with related morphology. The majority of the samples reported on here have come from castle-like or fort-like sites (*qasr*, *qsur* plural) in the Murzuq/al-Hufra basin and the Wadi al-Ajal. In total 12 new *qsur* were dated, and additional samples from six previously dated sites were processed. Additionally, new sets of samples were taken from two key urban sites of Qasr ash-Sharraba and Murzuq (Fig. 1). All of the samples described below were organic materials that were extracted from mudbricks at the site in question.

# Discussion of Individual Samples

*Garamantian* qsur*/forts in the Wadi al-Ajal*

The first of three newly dated *qsur* in the Wadi al-Ajal was FJJ013 (Fig.3), comprising a substantial mudbrick fortified site (57 x 45 m, with walls and traces of external towers still standing to *c*.4m height, though very slumped). This was identified in our earlier work as a Classic Garamantian site on the basis of imported pottery (Mattingly 2007, 190-91) and the AMS result now refines this indication towards a Classic-Late Garamantian date (cal AD 264 (95.4%) 534). Two other structures for which dates have been obtained were previously thought more likely to be Islamic in date (FJJ056 and GRE015). FJJ056 consists of a high-standing central *qasr* *c*.18 m square, within a second fortified compound *c.*33 m square. Both these fortified structures had rectangular projecting towers at the corners and the larger structure had casement buildings built against its outer wall. Traces of small ‘musket loops’ in the central building and parts of the external enceinte suggested an early modern date for the final phase of the site, though the presence of Garamantian pottery and traces of a wider settlement around the *qasr* had hinted at earlier origins (Mattingly 2007, 194-95). The new AMS date would seem to confirm a Classic/Late Garamantian date for the 33 x 33 m *qasr* and associated settlement, with the smaller *qasr* perhaps being inserted at its centre more recently.

GRE015 comprises a 25 x 30 m enceinte with rectangular corner and central towers on each side that still stand up to 8 m height (Mattingly 2007, 202). In plan there are clear similarities with FJJ056 and the high tapering towers and flat yellow mudbricks are also paralleled at the nearby larger fort of Qasr Sidi Dawud (LEK017 – near LEK018 on Fig. 1; see also Mattingly 2007, 210). Both GRE015 and LEK017 have been hitherto considered as Islamic in date on account of their outstanding preservation, though LEK017 has yielded some Garamantian-era pottery. The Late Garamantian date now obtained from the samples for GRE015 (cal AD 430 (95.4%) 579 and cal AD 422 (95.4%) 541) highlights an emerging pattern for forts in the Wadi al-Ajal. The default interpretation of large rectangular fortifications in regular mudbrick, with external rectangular towers should perhaps be that these were Garamantian rather than later in date, unless, and until, evidence to the contrary emerges. As the next section shows, this class of site has been repeatedly dated to the Garamantian era in the Murzuq area, confirming the pattern argued for in our previous report (Sterry *et al.* 2012, 139-43).

*Garamantian* qsur *and fortified villages in the Murzuq area*

The larger sample of AMS dates from fortified sites in the Murzuq region has clarified some aspects of the development of this densely occupied area (for location of all sites, see Fig. 1). Most importantly the new samples confirm the initial dating of these sites on the evidence of surface ceramics alone and give greater confidence in predicting the dates of settlements identified from remote sensing only. There are examples of sites with both long and short histories of construction.

Additional samples from HHG006-008 (Fig. 3) provide dating evidence for all three of the *qsur* in this large unenclosed and agglomerated settlement (Sterry and Mattingly 2011, 108-09; Mattingly and Sterry 2013, 510-11, fig. 6). The spread of calibrated dates demonstrates the long-lived nature of this site and its continuing development with at least two phases of construction over at least 144 years and more likely several centuries: cal AD 76 (95.4%) 254 (HHG006), cal AD 139 (95.4%) 341 (HHG007), cal AD 398 (95.4%) 535 (HHG008). This site can be contrasted with HHG001, a rectangular fortified village site with a central *qasr* (Mattingly and Sterry 2013, 510-11, fig. 5), where three samples have had a consistent date for the construction of the *qasr* and enceinte: cal AD 425 (95.4%) 541, cal AD 415 (95.4%) 546 and cal AD 424 (95.4%) 541. It thus seems likely that this site was built in a single event

In each of the three areas near Murzuq for which multiple sites have now been dated (sites on Fig. 1 prefixed by HHG, GAT, ZZW) there are examples of both earlier and later sites within the Garamantian era. This does not support the idea of a single “pioneer” event in which the landscape was divided up and multiple villages established. Instead settlement density probably grew in all areas of the Murzuq basin in several phases of oasis development, over time creating clusters of *qsur*. The oasis development here starting in the first or second centuries AD appears to have occurred later than in the Wadi al-Ajal. However, it should be noted that the focus of our survey has been on the most visible structures (fortified villages and *qsur*), which are evidently of Classic and Late Garamantian date. It does not preclude the possibility that some of these settlements originated earlier as undefended sites or that there are additional undefended sites in the landscape that are not susceptible to remote identification on the satellite images.

Two of the new samples come from sites that were initially considered to have been medieval or later in date. MZQ007 produced a previous AMS date of cal AD 1308 (95.4%) 1409 (OxA-25825, Sterry *et al.* 2012, 140) and as the site is associated with Islamic burials there was certainly activity of that era here. However, a second sample now suggests that the site could have originated in the Late Garamantian phase: cal AD 389 (95.4%) 535. ZZW101 is a tower-like *qasr* with high upstanding walls and possible musket loops, but the AMS date, obtained from mudbrick at foundation level, suggests earlier origins: cal AD 440 (95.4%) 619. While it is still possible that this site also underwent alterations, perhaps quite substantially, the initial constructions may perhaps be dated to the fifth-seventh centuries AD.

*Garamantian and early Islamic urban sites: Qasr ash-Sharraba*

Three new samples were dated from Qasr ash-Sharraba (SCH020 on Fig. 1), a significant Garamantian and early Islamic town (Mattingly 2007, 262-65; Mattingly and Sterry 2013). The site is of urban scale (15 ha) with a substantial fort with projecting towers at its centre. There is a smaller *qasr* set within the fort’s north-east corner (*qasr* A) and a separate castle-like building (*qasr* B) further west within the town. Previous dates (all from *qasr* A) had indicated activity across several centuries: cal AD 237 (95.4%) 411, cal AD 568 (95.4%) 659, cal AD 1029 (95.4%) 1186. The new dates include a sample from *qasr* B cal AD 259 (95.4%) 417 and an additional date from *qasr* A of cal AD 439 (95.4%) 614. The final date came from a tower on the larger fort structure, which appeared to be earlier than *qasr* A, and the late date may thus relate to a repair there. It provides confirmation that activity at this site continued until at least the thirteenth century AD (cal AD 1212 (95.4%) 1274).

*Later Islamic* qsur *and villages*

FUG022 (Qasr Tuwiwa) is a *c.*20m square mudbrick castle with thick walls standing up to 10m high at the centre of the small early modern village of Tuwiwa. It was notable for employing the same mud-lump construction technique as found in the walls at Old Jarma and in fortified villages in the Murzuq area. A sample taken from the *qasr* (and divided into two sub-samples) suggests a date of cal AD 1440 (95.4%) 1619 or cal AD 1448 (95.4%) 1630. This is in keeping with other dated samples of this construction type (GER001.065, LEK018, MZQ021, HHG012) and seems to indicate a period of renewed building activity within the Wadi al-Ajal and Murzuq basin.

A new sample (OxA-2475-37) from the walls of a fortified village MZQ021 has a very late date, cal AD 1686 (95.4%) 1927. A previous sample from the central citadel (*qasabah*) at this site (OxA-25796) gave a date of cal AD 1411 (95.4%) 1450 for that structure. The new sample was taken on a small rodent bone in a crevice within the wall and could potentially relate to either a repair or perhaps intrusive material (a bird pellet?).

*Islamic towns: Murzuq*

Three new samples were dated from the town of Murzuq (MZQ001 on Fig. 1) allowing for substantial refinement of our knowledge of this site, which was the early modern capital of Fazzan. One further sample - AMS Sample 34 - was re-dated, but this again gave a post-Atomic bomb date. OxA-26492 relates to a mudbrick used in the original wall circuit round the southern sector of the town and suggests a construction date in the fifteenth or sixteenth century. A very similar date (OxA-26735) has also come from a mudbrick from one of the houses in the abandoned south part of the town. The consistency of these dates combined with the regular street layout is suggestive of some form of planning occurring in this part of the city. There is a clear chronological separation between these structures and the strengthening of the town walls with D-shaped towers (see below). It is tempting to suggest that these samples date the construction of the city itself, but there is a lack of data from the northern part of the site and no excavation has ever taken place here. However, the dates do correspond with the period when Murzuq emerged as the largest settlement and capital of Fazzan in the late fifteenth or early sixteenth centuries with the establishment of the Awlad Muhammad dynasty (el-Hesnawi 1990, xiii).

The sample OxA-26734, from one of the D-shaped towers in the wall, has a very similar calibrated date range to OxA-25827, also from a D-shaped tower at Murzuq (Sterry *et al.* 2012, 140-41). The latter part of the date range can be excluded as the southern part of the circuit with its D-shaped towers was by abandoned by the nineteenth century (Barth 1857, 152). The D-shaped towers are also described by Lyon (1821, 97): “The walls are of mud, having round buttresses with loopholes for musketry, rudely built, but sufficiently strong to guard against attack, they are about fifteen feet in height and at the bottom eight feet in thickness, tapering, as all the walls in this country do, towards the top.” Assuming that these were the result of a single construction phase, they thus give a combined calibrated date of cal AD 1696 (95.4%) 1727 (Fig. 4). This was also the period of renewed Ottoman domination of Fazzan under Muhammad al-Ghazayl al-Mukni and Ali al-Mukni, involving several sieges of the city from 1682-1733 (Mattingly 2003, 100). Barth (1857, 152) attributes Murzuq’s old wall to al-Mukni, which would fit with an Ottoman inspired refurbishment and the addition of the D-shaped towers in the late seventeenth or very early eighteenth century. Barth also recorded the reduction of the defended area as having taken place in the reign of the last Awlad Muhammad sultan, Abd al-Jalil (1830-42), though a record of demolition of part of the walls of Murzuq by Ottoman forces in 1732-33 could provide an earlier context for this (Mattingly 2003, 101).

In combination the suite of dates now available from Murzuq suggest the following sequence of events:

1. The construction of the town walls and houses in the southern part of the city, most likely during the late fifteenth century or early sixteenth century (a further peak in the calibrated date range in the early seventeenth century is less probable for the construction of town walls and housing here, though if so it would coincide with a revival of Khurman power from 1623-27, Mattingly 2003, 100).

2. The reinforcement of the town walls with D-shaped towers at the end of the seventeenth century or the start of the eighteenth century.

3. The abandonment of the southern area sometime during the eighteenth century or first half of the nineteenth century.

4. The strengthening of the qasabah walls between the late seventeenth and early twentieth century.

# General dating of fortified buildings and settlements (*qsur*) in Fazzan

The new dates, combined with those previously published, take the total number of AMS datings of Garamantian *qsur* in central Fazzan to 26 (Fig. 5; although the date of TAG011: cal BC 352 (95.4%) cal AD 83, looks suspiciously early and is considered unreliable in the analyses below). Additionally, a further 34 have been dated on the basis of ceramics or construction techniques. This is a substantial corpus and it is worth revisiting the initial dating schema proposed (Mattingly 2003, 146-54). It was argued that the origins of the *qsur* could be placed in the Garamantian period, with a large percentage dated to the third-sixth centuries AD and that TEK010 a rectangular *qasr* with projecting towers and an attached mosque shows some continuation of the form into the Islamic era (the AMS date provides a *TPQ* for this site of cal AD 860-1020). Nonetheless, for many of the *qsur* published in the gazetteer of *AF2* (Mattingly 2007), the Islamic period was considered the default period if no other diagnostic dating material was located in site visits, especially if the walls were particularly upstanding (as at GRE015). Sites that had been identified only on aerial photographs and not visited on the ground, were generally ascribed the time period ‘Garamantian to Early Modern’. The data now available suggest that *qsur* were constructed predominantly in the Garamantian period. Later Islamic period constructions can typically be identified through their use of mud lump construction instead of the large flat mudbricks. Although there are a few exceptions, the bulk of the *qsur* with regular mudbrick walls and square/rectangular plan and with external corner and central towers on the outer wall appear to be Garamantian in origin. There does, however, seem to have been re-use of some of the *qsur* during later periods. Elaborating on the scale and frequency of later adaptation should be a key aim of future research.

*Cumulative probability curve*

Used with some caution a summed probability function (the sum of multiple probability curves) can show an underlying trend in the data and can narrow down when the majority of the *qsur* were constructed. Williams (2012) has suggested that a minimum of 500 dates should be used in any such analysis for the results to be considered representative. This number of dates is not available for Fazzan nor will it be for some time as such this should be treated as a tentative model to test and challenge with future data. However, the dates can be constrained to ask a more precise question than varying levels of activity within a period. A total of 25 dates relate to the primary construction of *qsur* from a total sample of c.250. Furthermore these *qsur* were selected for survey and dating as a representative sample of site types and areas (although the Wadi al-Ajal is a little underrepresented in comparison to the Murzuq basin). Following the method proposed by Armit et al. (2013), a null hypothesis that *qsur* were constructed evenly throughout the Garamantian period was used as a comparative data set. This was created by creating 100 sets of 25 samples of 1500-2000 BP ± 20-40 from which mean, interquartile and minimum and maximum curves were derived. These can then be compared to the actual data (Fig. 6a). The curve for the *qsur* deviates substantially from the interquartile range and lies outside the minimum and maximum ranges in three places, prior to cal AD 135, cal AD 346-440 and cal AD 481-530. This suggests that *qsur* were infrequently constructed before the mid-second century and that there was a definite peak in construction between the mid-fourth and early sixth centuries. It is possible that there were two different peaks of construction that can be more precisely dated to the late fourth-early fifth century and the late fifth-early sixth century. The summed probability function of the *qsur* can be further compared to the random data set through the use of a 100-year rolling Pearson’s correlation coefficient (Armit et al. 2013: 436-37). The resulting graph (Fig. 6b) shows that the possible peaks in construction are significantly correlated to those of the randomly generated data set. Therefore these secondary peaks may relate primarily to variation in the radiocarbon calibration curve. Finally, the limits of the small sample size are likely to hide other important peaks and troughs in the data and we fully expect this model to develop as more dates are acquired.

Following the typology of Garamantian settlements (Mattingly 2003, 151-54; revised in Mattingly and Sterry 2013), it is possible to propose a development of *qasr* form, similar to that suggested for Tripolitanian *qsur* (Barker *et al.* 1996, 155-58). Key traits of the corpus of the sampled *qsur* have been tabulated, ordered by date and split into three broad phases: early, middle and late (Table 2). Of these, variations in ditches, towers, gates do not have a strong association with date, but are partly linked to size (a larger *qasr* allows a more complex form, for example with intermediate towers). Two aspects do appear to be linked to dating: the size of *qsur* (Fig. 7a) – with a wider range in the later periods – and the type of associated settlement (Fig. 7b) – with extramural settlements more common in the earlier period and walled settlements more common in the later period. It is particularly notable that quite a number of *qsur* in both the Murzuq area and the al-Ajal appear to have been founded or fortified as late as the fifth-sixth centuries AD, when Garamantian society has previously been thought to be in decline. Therefore the significant investment represented by these fortified structures may require some reconsideration of the vitality of the Late Garamantian period.

# Conclusion

Our programme of dating historic era settlement in the central Sahara is important because it provides both confirmations and corrections to assumptions based on surface ceramics, which for many periods are not closely diagnostic, and literary record of oral traditions. The new dates highlight the importance of the Garamantian era in the settlement record and allow us to propose some new relationships between settlement morphology and chronology. In particular, the prevalence and density of Late Garamantian fortified settlements are very striking. While distinctive Islamic era *qsur* and fortified villages have also been recognised they seem to have been much more thinly distributed in the landscape of Fazzan than the earlier Garamantian settlements.

Another feature of our work has been to show the potential to achieve greater precision in modelling the rather broad chronological range of AMS dates from early modern sites, where historical sources can help narrow down dating boundaries. This is particularly apparent at the site of Murzuq where we have been able to identify several phases despite a group of dates with significantly overlapping ranges of several centuries. This has implication for work at other historical towns in Africa.

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*Figure 1: Location map of dated 14C AMS samples presented in this article and previous samples from Sterry* et al. *2012 and Mattingly 2007. The lower image represents an enlarged view of the rectangular area marked to bottom right of the upper image. Imagery copyright ESRI.*

*Figure 2. Calibrated radiocarbon results from central Fazzan showing normalised probability curves. For each sample the 1σ and 2σ ranges are shown, meaning that there is a 68.2% and a 95.4% chance respectively of the actual date of the sample falling within the range indicated by the upper and lower brackets respectively.*

*Figure 3. Comparative plans of newly dated qsur. Top row (Wadi al-Ajal): FJJ013, FJJ056; GRE015; b) Bottom row (Murzuq region): HHG006-008 and HHG001*

*Figure 4. Calibrated radiocarbon results from Murzuq, 2σ ranges are marked. The Tower Fortification probability curve is calculated using the Combine function on the likelihood that the two dates on different towers: <35> OxA-25827 and <37> OxA-26734, relate to the same construction event and that must lie within the chronological boundaries of AD 1650-1750.*

*Figure 5. Calibrated radiocarbon results of all dated* qsur *showing normalised probability curves. For each sample the 1σ and 2σ ranges are shown, meaning that there is a 68.2% and a 95.4% chance respectively of the actual date of the sample falling within this range the range indicated by the upper and lower brackets respectively.*

*Figure 6. a) Summed Probability Function (SPF) of all dated* qsur *compared to a dataset of 100 randomly generated 14C proxy curves (mean, interquartile ranges and maximum and minimum values shown) b) Running correlation coefficient of SPF with mean of 100 randomly generated 14C proxy curves. Significance level ρ=0.05 illustrated.*

*Figure 7. a) Scatter graph of size vs mean calibrated date of* qsur*; b) Bar chart of associated settlement types of* qsur *by phase*

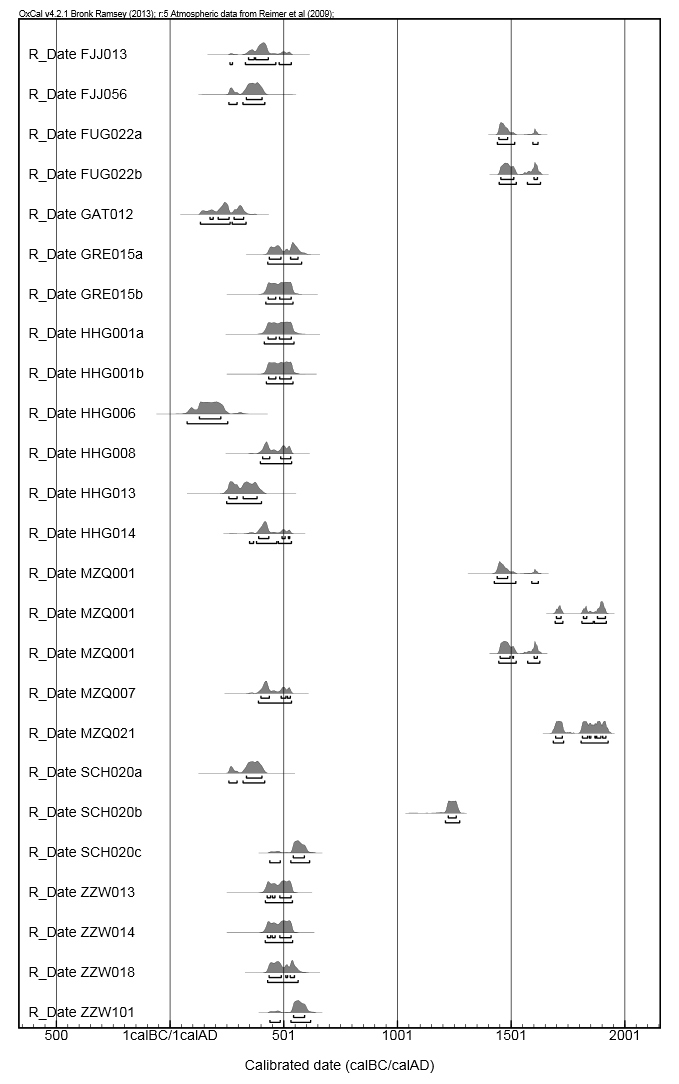
*Table 1. New radiocarbon results from Fazzan.*

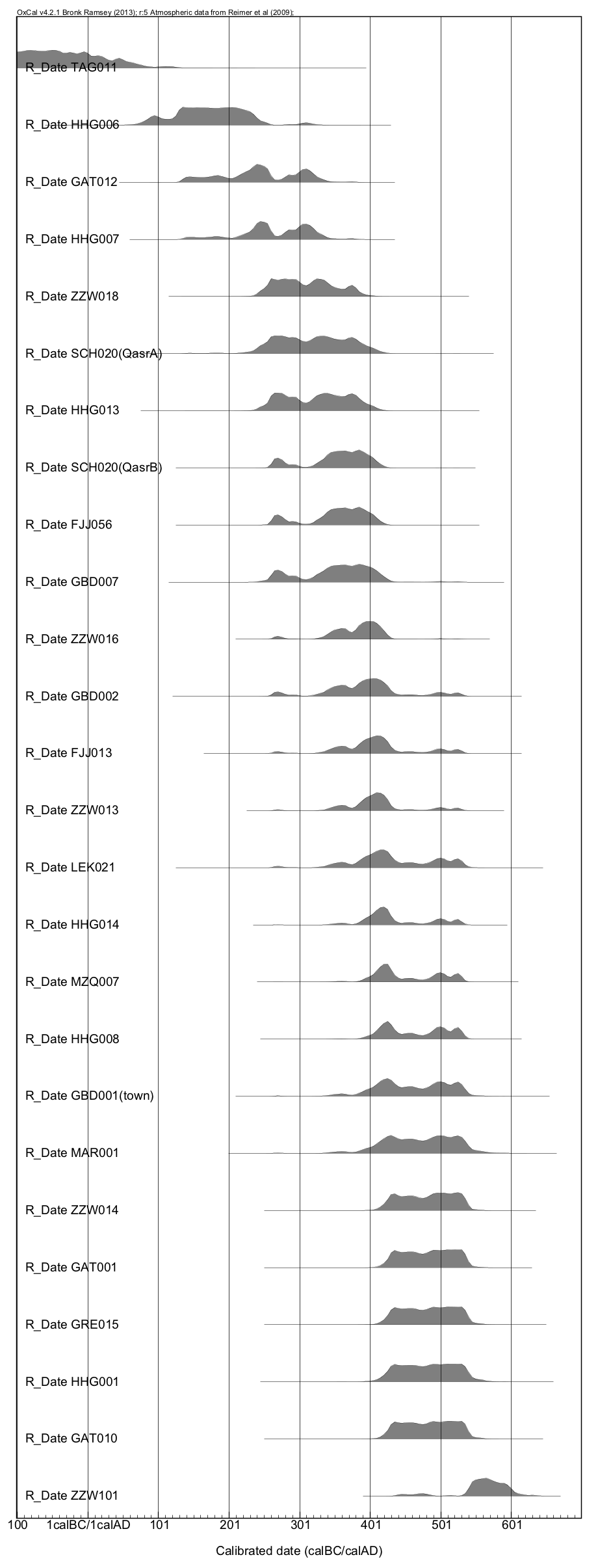
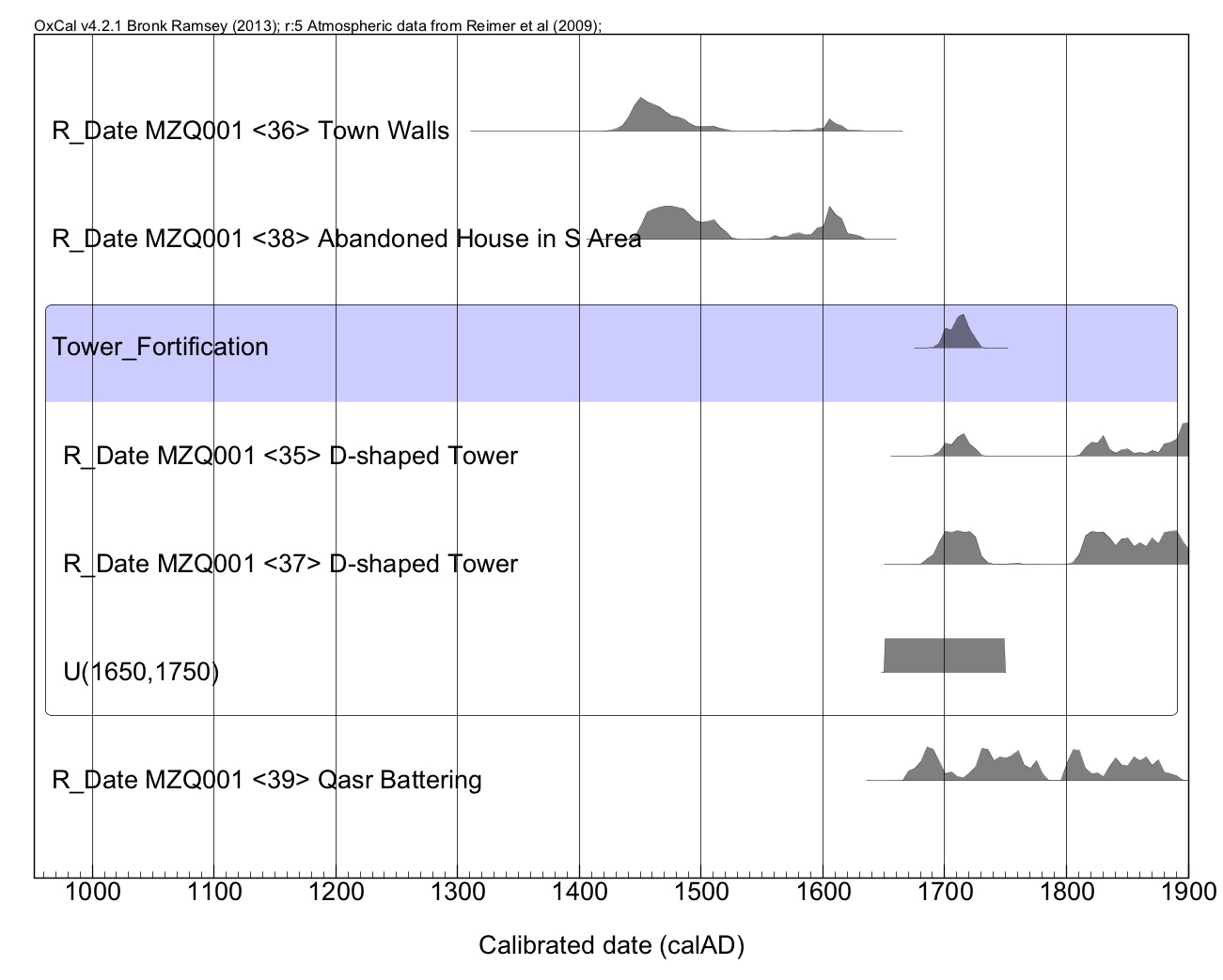
*Table 2. Main attributes of dated* qsur

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Site code | Lab code | Sample codes | Material dated | Description | 14C age BP | Calibrated date range  (2*σ* confidence) |
| FJJ013 | OxA-26493 | AMS Sample 45 | plant remains, unknown | Mudbrick from Et wall of *qasr* | 1645 ± 31 BP | cal AD 264 (1.6%) 275  cal AD 332 (80.3%) 466  cal AD 481 (13.6%) 534 |
| FJJ056 | OxA-26736 | AMS Sample 46 | plant remains, *Phoenix dactylifera* | Mudbrick from the corner of the base of the outer enceinte around the upstanding *qasr* | 1687 ± 25 BP | cal AD 259 (14.7%) 295  cal AD 321 (80.7%) 417 |
| FUG022 | OxA-26737 | AMS Sample 47 | seeds, *Phoenix dactylifera* | Wall fabric from the Tawiwa *qasr* gate | 399 ± 23 BP | cal AD 1440 (83.7%) 1516  cal AD 1596 (11.7%) 1619 |
| FUG022 | OxA-26738 | AMS Sample 47 | seeds, *Phoenix dactylifera* | Wall fabric from theTawiwa *qasr* gate | 374 ± 23 BP | cal AD 1448 (64.1%) 1523  cal AD 1572 (31.3%) 1630 |
| GAT012 | P-31787 | AMS Sample 25 |  | Failed due to low yield |  |  |
| GAT012 | OxA-26491 | AMS Sample 24 | plant remains, cereal | Mudbrick from the *qasr* | 1783 ± 29 BP | cal AD 134 (65.2%) 265  cal AD 274 (30.2%) 335 |
| GRE015 | OxA-26750 | AMS Sample 86 | charcoal, *Phoenix dactylifera* | Mudbrick from the *qasr* | 1542 ± 25 BP | cal AD 430 (95.4%) 579 |
| GRE015 | OxA-26751 | AMS Sample 86 | charcoal, *Phoenix dactylifera* | Mudbrick from the *qasr* | 1581 ± 25 BP | cal AD 422 (95.4%) 541 |
| HHG001 | OxA-26487 | AMS Sample 8 | plant remains, unknown | Mudbrick from the SW corner of the outer enceinte | 1581 ± 30 BP | cal AD 415 (95.4%) 546 |
| HHG001 | OxA-26726 | AMS Sample 7 | plant remains, unknown | Mudbrick from the gate of the *qasr* | 1578 ± 24 BP | cal AD 424 (95.4%) 541 |
| HHG006 | OxA-26490 | AMS Sample 16 | plant remains, unknown | Mudbrick from the NE corner of the *qasr* | 1840 ± 38 BP | cal AD 76 (95.4%) 254 |
| HHG008 | OxA-26728 | AMS Sample 15 | plant remains, unknown | Mudbrick from the NE corner of the *qasr* | 1614 ± 24 BP | cal AD 398 (95.4%) 535 |
| HHG013 | OxA-26488 | AMS Sample 10 | plant remains, chaff | Mudbrick from theSW corner of *qasr* | 1714 ± 31 BP | cal AD 250 (95.4%) 403 |
| HHG014 | OxA-26489 | AMS Sample 12 | plant remains, unknown | Mudbrick from the central tower on top of the *qasr* | 1.36896 ± 0.00437 BP |  |
| HHG014 | OxA-26727 | AMS Sample 13 | charcoal, *Phoenix dactylifera* | Material from a possible abandonment phase | 1630 ± 24 BP | cal AD 350 (3.1%) 368  cal AD 381 (68.1%) 470  cal AD 477 (24.3%) 534 |
| MZQ001 | OxA-26492 | AMS Sample 36 | plant remains, chaff | Mudbrick from the S-side of the town wall | 415 ± 31 BP | cal AD 1427 (84.9%) 1521  cal AD 1591 (10.5%) 1620 |
| MZQ001 | OxA-26733 | AMS Sample 34 | seeds, *Phoenix dactylifera* | Mudbrick from the SW-side of the town wall | 1.04707 ± 0.00289 BP |  |
| MZQ001 | OxA-26734 | AMS Sample 35 | plant remains, unknown | Mudbrick from Date D-shaped tower on S-side of the town wall | 71 ± 22 BP | cal AD 1694 (24.1%) 1728  cal AD 1812 (22.4%) 1862  cal AD 1867 (48.9%) 1919 |
| MZQ001 | OxA-26735 | AMS Sample 38 | plant remains, unknown | Wall fabric from house in abandoned S area | 380 ± 23 BP | cal AD 1446 (69.0%) 1523  cal AD 1573 (26.4%) 1627 |
| MZQ007 | OxA-26725 | AMS Sample 2 | wood | Mudbrick from the SW corner of the *qasr* | 1621 ± 23 BP | cal AD 389 (95.4%) 535 |
| MZQ021 | OxA-X-2475-37 | AMS Sample 3 | bone, rodent | Wall fabric from the N-side of the enceinte | 97 ± 26 BP | cal AD 1686 (26.5%) 1731  cal AD 1808 (68.9%) 1927 |
| SCH020 | OxA-26740 | AMS Sample 92 | charcoal, *Phoenix dactylifera* | Mudbrick from wall of *Qasr* B | 1687 ± 24 BP | cal AD 259 (14.2%) 295  cal AD 322 (81.2%) 417 |
| SCH020 | OxA-26741 | AMS Sample 93 | plant remains, multiple species | Mudbrick from NW tower of the larger fort structure | 795 ± 23 BP | cal AD 1212 (95.4%) 1274 |
| SCH020 | OxA-26742 | AMS Sample 107 | plant remains, *Phoenix dactylifera* | Mudbrick from wall of *Qasr* A | 1509 ± 24 BP | cal AD 439 (8.3%) 485  cal AD 532 (87.1%) 614 |
| ZZW013 | P-31788 | AMS Sample 26 |  | Failed due to low yield |  |  |
| ZZW013 | P-31790 | AMS Sample 28 |  | Failed due to low yield |  |  |
| ZZW013 | OxA-26729 | AMS Sample 27 | plant remains, cereal | Mudbrick from the SE corner of the secondary *qasr* | 1589 ± 23 BP | cal AD 420 (95.4%) 539 |
| ZZW014 | OxA-26731 | AMS Sample 31 | plant remains, unknown | Mudbrick from the SE corner of the *qasr* | 1587 ± 24 BP | cal AD 419 (95.4%) 540 |
| ZZW018 | OxA-26732 | AMS Sample 41 | plant remains, unknown | Mudbrick from the SE corner of the *qasr* | 1552 ± 24 BP | cal AD 430 (95.4%) 564 |
| ZZW101 | OxA-26730 | AMS Sample 30 | plant remains, unknown | Mudbrick from the SE corner of the *qasr* | 1507 ± 25 BP | cal AD 440 (7.9%) 485  cal AD 532 (87.5%) 619 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Start Date | End Date | Mean Date | Size (m2) | Ditch | Central Tower | Corner Towers | Intermediate Towers | Gates | Enclosed Settlement | Extramural Settlement | E-facing building | Rebuilds |
| TAG011 | -352 | 83 | -85 | 325 |  |  | Circular |  | E |  | Yes |  |  |
| HHG006 | 76 | 254 | 174 | 333 | Yes |  | Square |  | E |  | Yes |  |  |
| GAT012 | 134 | 335 | 244 | 374 |  |  | Square |  | N | Yes | Yes |  | Yes |
| HHG007 | 139 | 341 | 266 | 506 | Yes | Yes | Square |  | E |  | Yes |  |  |
| ZZW018 | 245 | 385 | 310 | 1087 |  |  | Square | ? | N |  | Yes |  |  |
| SCH020A | 237 | 411 | 318 | 371 |  |  | Square | Square | S? | Yes | Yes |  |  |
| HHG013 | 250 | 403 | 325 | 1136 | Yes? |  | Square | Square | ? |  | Yes |  |  |
| GBD007 | 256 | 426 | 353 | 223 |  |  | Square |  | W? |  |  |  |  |
| FJJ056  (outer) | 259 | 417 | 353 | 482 (1402) | Yes |  | Square |  | E |  | Yes |  | Yes |
| SCH020B | 259 | 417 | 354 | 302 |  |  | Square | Square | N |  | Yes |  |  |
| ZZW016 | 261 | 432 | 382 | 420 | Yes |  | Square |  | E | Yes |  | Yes |  |
| GBD002 | 259 | 533 | 394 | 959 |  |  |  |  | S |  |  |  |  |
| FJJ013 | 264 | 534 | 410 | 2272 |  |  | Square | Square | ? |  |  |  |  |
| ZZW013 | 336 | 533 | 410 | 2400 | Yes |  | Square |  | E | Yes |  | Yes | Yes |
| LEK021 | 342 | 536 | 434 | 72 |  | Yes |  |  | ? |  |  |  |  |
| HHG014 | 350 | 534 | 437 | 857 | Yes | Yes | Square |  | E? |  | Yes |  |  |
| MZQ007 | 389 | 535 | 453 | 1310 |  |  | Square | Square | N |  | Yes |  | Yes |
| GBD001 | 355 | 542 | 459 | 848 |  |  | Square |  | ? | Yes |  |  |  |
| HHG008 | 398 | 535 | 463 | 590 | Yes |  | Square |  | ? |  | Yes |  |  |
| MAR001 | 382 | 560 | 470 | 87 |  | Yes |  |  | ? |  |  |  |  |
| ZZW014 | 419 | 540 | 481 | 2624 | Yes | Yes | Square | Square | E? | Yes |  |  | Yes |
| GAT001 | 424 | 539 | 483 | 726 | Yes |  | Square |  | N | Yes |  | Yes |  |
| GAT010 | 423 | 541 | 483 | 899 | Yes |  | Square? | ? | E/N | Yes |  |  | Yes |
| GRE015 | 422 | 541 | 483 | 996 |  |  | Square | Square | N |  |  |  |  |
| HHG001 | 415 | 546 | 483 | 1966 | Yes |  | Square | Square | E | Yes |  | Yes |  |
| ZZW101 | 440 | 619 | 560 | 736 |  | Yes | Circular |  | ? |  |  |  | Yes |

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1. School of Archaeology and Ancient History, University of Leicester [↑](#footnote-ref-1)