Central Zagros Archaeological Project

Excavations at Bestansur, Sulaimaniyah Province, Kurdistan Regional Government, Republic of Iraq

1st April – 15th May 2017

Archive Report

Intact skull from Building 5, Space 50, undergoing cleaning in the field laboratory.

Preface

A seventh season of excavations at the site of Bestansur was conducted in spring 2017 as part of the Central Zagros Archaeological Project, co-directed by Roger Matthews, Kamal Rasheed Raheem and Wendy Matthews. The project operates under a Memorandum of Understanding issued by the Sulaimaniyah and Erbil Directorates of Antiquities and Heritage, with agreement from the State Board of Antiquities and Heritage, Baghdad, and from 2011-2015 was funded by a grant from the UK Arts and Humanities Research Council with the project title 'Sedentism and Resource Management in the Neolithic of the Central Zagros'. The spring 2017 season was funded by generous grants from the National Geographic Society and the British Institute for the Study of Iraq. We are very thankful to these bodies for their kind support.

We are extremely grateful to all our colleagues at Sulaimaniyah Directorate of Antiquities and Heritage, in particular its Director Kamal Rasheed Raheem, who made the project possible and provided vital support at every stage, as well as all the support staff and drivers. We also thank our colleagues at Erbil Directorate of Antiquities and Heritage, in particular its Director, Abubakir O. Zainadin (Mala Awat), for their ongoing support. We are very appreciative also of the considerable assistance provided by the staff of Sulaimaniyah Museum, led by its Director, Hashim Hama Abdullah. Our government representatives, Kamal Rouf Aziz and Parween Yawar Manda, gave support and advice in a great many ways as well as serving as a key team members. We also thank the villagers of Bestansur who worked with us on site and looked after us in the Expedition House.

The spring 2017 team comprised:

Trench 10 team:

Roger Matthews	University of Reading	Co-Director, lithics, excavation
Wendy Matthews	University of Reading	Co-Director, micromorphology, excavation
Kamal Rasheed Raheem	Sulaimaniyah Antiquities	Co-Director
Kamal Rouf Aziz	Sulaimaniyah Antiquities	Representative, excavation
Parween Yawar Manda	Sulaimaniyah Antiquities	Representative, excavation
Halala Hamid Salih	Sulaimaniyah Antiquities	Excavation
Amy Richardson	University of Reading	Finds, data management
Ingrid Iversen	University of Reading	Microarchaeology, flotation
Sam Walsh	Wainwright Fellow, Oxford	Human remains
Marta Portillo	University of Reading	Animal ethnoarchaeology
Julie Unruh	Independent	Conservation consultant
Kayce Herrick	University of Reading	Excavation
Samira Idriss	University of Reading	Excavation
Maria Rabbani	University of Reading	Excavation
Mubariz Rabbani	University of Reading	Excavation

Trench 14 team:

Lisa Cooper	University of British Columbia	Director
Lynn Welton	University of British Columbia	Excavation, surveying
Sheri Pak	University of British Columbia	Excavation, photogrammetry

The following report is a preliminary, provisional account of the results from the spring 2017 season, produced for distribution to the Sulaimaniyah, Erbil and Baghdad Directorates of Antiquities and Heritage, and to funding bodies, and is not intended for publication.

Contents

Figures

Tables

Chapter One: Research Issues, Strategy, Methods

Roger Matthews, Wendy Matthews, Kamal Rasheed Raheem

Aims, objectives, issues

The aims and objectives of the overall project are:

1. To investigate ecological and socio-cultural issues in the transition from hunter-forager to villager-farmer in the Central Zagros region by the application of modern scientific and humanities-based approaches to Early Neolithic societies of the eastern Fertile Crescent.

2. To address the imbalance in our knowledge and understanding of the Neolithic transition in Southwest Asia through fieldwork and research in the eastern Fertile Crescent, and through widespread dissemination of results and interpretations within academe and beyond.

3. In collaboration with colleagues, to produce high-quality outputs that maximise the outreach and impact of the project's achievements.

The project research questions are:

1. Sedentism, society and ritual
Did early settlements develop from seasonal and temporary to year-round and permanent?
How were these early settlements constructed and socialised?
How significant was ritual in social transformations in the Zagros Neolithic?

2. Resource management
What were Early Neolithic economic practices and do they suggest a 'broad spectrum revolution'?
How best do we investigate hunting, management, and domestication of wild goat?

3. Chronology of change
What is the chronology of change in the Zagros Neolithic? How does high-resolution evidence develop our understanding of sedentism and resource management in Southwest Asia?

Methods

The main approach is ongoing excavations at the Neolithic site of Bestansur, to investigate socio-economic and cultural strategies through the Early Neolithic. Recording and processing are managed through the web-based Integrated Archaeological Data-Base (IADB). Excavation is being conducted, employing trenches for diachronic investigation and open-area trenches to examine buildings, external areas, middens and streets/corridors, and 3D photogrammetry. Excavated deposits are quantified, sieved, floated, sampled, and processed for recovery and analysis of lithics, ground-stone, clay tokens, figurines, faunal and botanical remains (macro and micro), phytoliths, molluscs, micro-archaeological remains, microstratigraphic sequences and architectural materials.

Additionally, intensive field survey was conducted during 2013 in the vicinity of Zarzi cave, in the Iraqi Central Zagros, in order to investigate the Neolithic settlement of this fertile region. Further seasons of intensive field survey are planned for the Zarzi region.

Chapter Two: Excavations in Trench 10

Roger Matthews, Wendy Matthews, Kamal Rouf Aziz, Parween Yawar Manda, Sam Walsh

Introduction

Excavations of Early Neolithic levels at Bestansur in spring 2017 continued to focus on Trench 10 (Figs 2.1-2.2). There were two main aims for the Trench 10 excavations this season. Firstly, we intended to clarify the plan of Building 5 and adjacent structures. Secondly, we aimed to make further progress in excavating the exceptional quantity of human remains deposited within Space 50 of Building 5. In order to assist with these aims, we constructed a shelter and laid sheets of plastic to cover the area of excavations (Fig. 2.3), which served to protect the site from the elements, including occasional rainstorms, very strong sunshine and excessive drying-out of deposits.

Trench 10, Buildings 5 and 8

Fig. 2.4 shows a complete plan of Building 5, which demonstrates the large scale of the architecture and the importance of Space 50 within Building 5. Building 5 is constructed of reddish-brown mudbricks with whitish inclusions, set in a grey mortar, with grey plaster and white-wash on the interior wall faces. We have previously 14C-dated Building 5 to *ca*. 9700 cal BP, within the Pre-Pottery Neolithic period. The lithic assemblages from Trench 10 match well with this dating.

We developed our understanding of the relationship between Building 5 and contemporary and earlier buildings, as illustrated in Fig. 2.5. We have recovered almost all the plan of Building 8, which underlies Building 5 and is constructed of boat-shaped mudbricks set in mortar. Several of the Building 8 wall faces have multiple layers of plaster, and at least one has traces of painting (W56; Godleman *et al.* 2016). We provisionally interpret Building 8 as having an association with human burial similar to that of Building 5. In some cases, we can distinguish where cuts for human burials have intruded into the walls of Building 8, establishing that at least some of the burials post-date the abandonment of Building 8.

It is now clear that Walls 46-47 form the western boundary to Building 8, and directly to their west there are distinctive deposits, not yet excavated, diagnostic of a street or corridor aligned northwest-southeast, with mixed inclusions of small stones and debris. These deposits differ considerably from the clean deposits we have so far encountered in internal spaces in Trench 10. The corridor is bounded to its west by Wall 70 which, along with Walls 69 and 72, forms part of a separate building(s) which continues to the west where we have yet to excavate. The wall faces of this building, which is at least partly contemporary with Building 8, are well plastered and there is evidence for burning of the wall faces (Fig. 2.6). We will excavate this building and Building 8 in the future, after we have completed work on the overlying Building 5, to study the history of elaborate buildings and community relations in this sector of the community at Bestansur.

In excavating room fill deposits in the northwest corner of Space 50 (Fig. 2.7), we recovered traces of in-situ matting represented by phytoliths with possible evidence for red and black pigmentation or painting (Fig. 2.8). We also identified clear traces of oval pits, visible immediately below the floors of Space 50 (Figs 2.9). We will excavate these pits next season. We expect them to contain quantities of human remains. A single large white stone was set upright against the inner wall face of Wall 52, and may have served as a grave-stone for the oval pit(s) cut beneath the floor of the Space 50 in its northwest corner (Fig. 2.10)

Dr Sheri Pak carried out 3D photogrammetry of Building 5 (Fig. 2.10). We were also pleased to host a visit from Dr Tobin Hartnell of the American University of Iraq, Sulaimaniyah, who carried out a second phase of drone photography of the site.

We excavated more of the exceptional number of human remains buried within Space 50 of Building 5 (Fig. 2.11; see Chapter 5). A minimum of 17 individuals were excavated this season, with a further six skulls and a group of long bones left for future excavation. In addition to human remains excavated in previous seasons, this results in a minimum number of 65 excavated individuals with at least six more adults and additional infant remains not yet excavated, bringing the total to at least 71 individuals, with more expected in the c. 3 oval pits in the north-west corner of Space 50. We will continue excavation of this extraordinary deposit of human remains and associated buildings in future seasons.

A Neolithic 'House of the Dead'

As previously discussed, the best parallels for Building 5 at Bestansur consist of so-called 'Houses of the Dead' from other Neolithic sites of Southwest Asia. The famous Skull Building at Çayönü appears to have been in use for up to 1000 years from *c*. 8500 BC, with at least 450 individuals represented by disarticulated remains (Özdoğan 1999). Further west, at the site of Abu Hureyra on the Syrian Euphrates, the Phase 8 building in Trench B, dating to *c*. 9000 BC, is a most informative parallel for Bestansur Building 5 (Moore and Molleson 2000). Room 3 of the Abu Hureyra building has the remains of at least 24 individuals, some laid on its successive floors through a lengthy period of time. The 'House of the Dead' at Dj'ade al-Mughara, on the Syrian Euphrates and dated to *c*. 8000 BC (Coqueugniot 2000), also provides stimulating evidence with which to consider the Bestansur material. The Dj'ade 'House of the Dead' consists of four small rectilinear rooms within which the remains of at least 38 individuals were found, mainly of infants and young adults.

Outreach

We are delighted that, following its nomination by the Iraqi government, the site of Bestansur has now been accepted on the UNESCO World Heritage Tentative List: http://whc.unesco.org/en/tentativelists/6172/. We continued a programme of outreach activities (Figs 2.12-2.13), including engagement with media and TV companies, including KurdSat TV, who are preparing a documentary on our work at Bestansur. We were also visited by Dr Rafida, Dr Mohammed-Amin, and colleagues from Sulaimani University and Sulaimani Polytechnic University.

Figure 2.1. Remote image of Bestansur to show location of Trench 10 (image courtesy Lynn Welton).

Figure 2.2. Excavations underway in Space 50, Building 5, Trench 10, looking southeast.

Figure 2.3. View of Trench 10 under shelter, looking southwest.

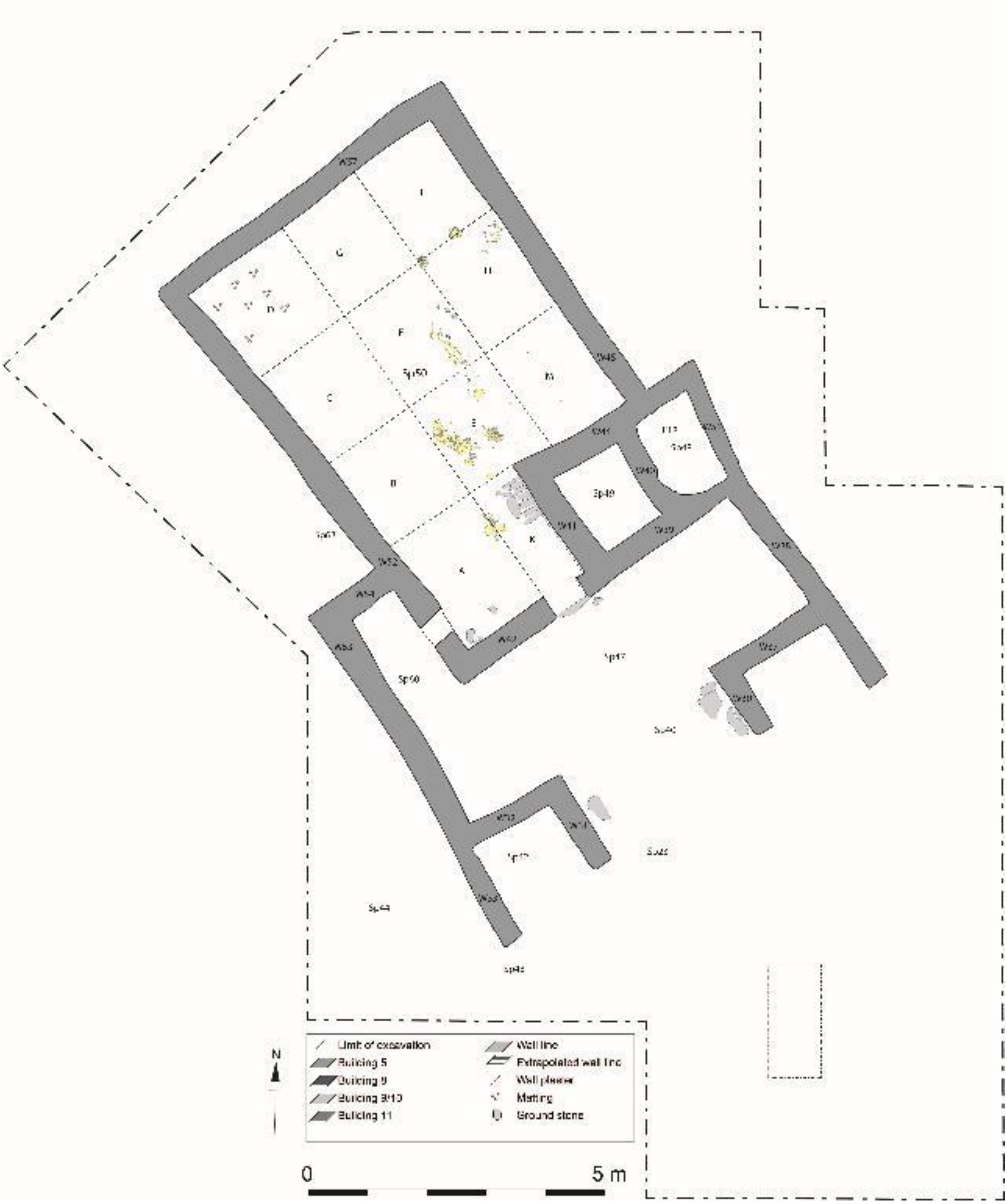


Figure 2.4. Complete plan of Building 5, Trench 10.

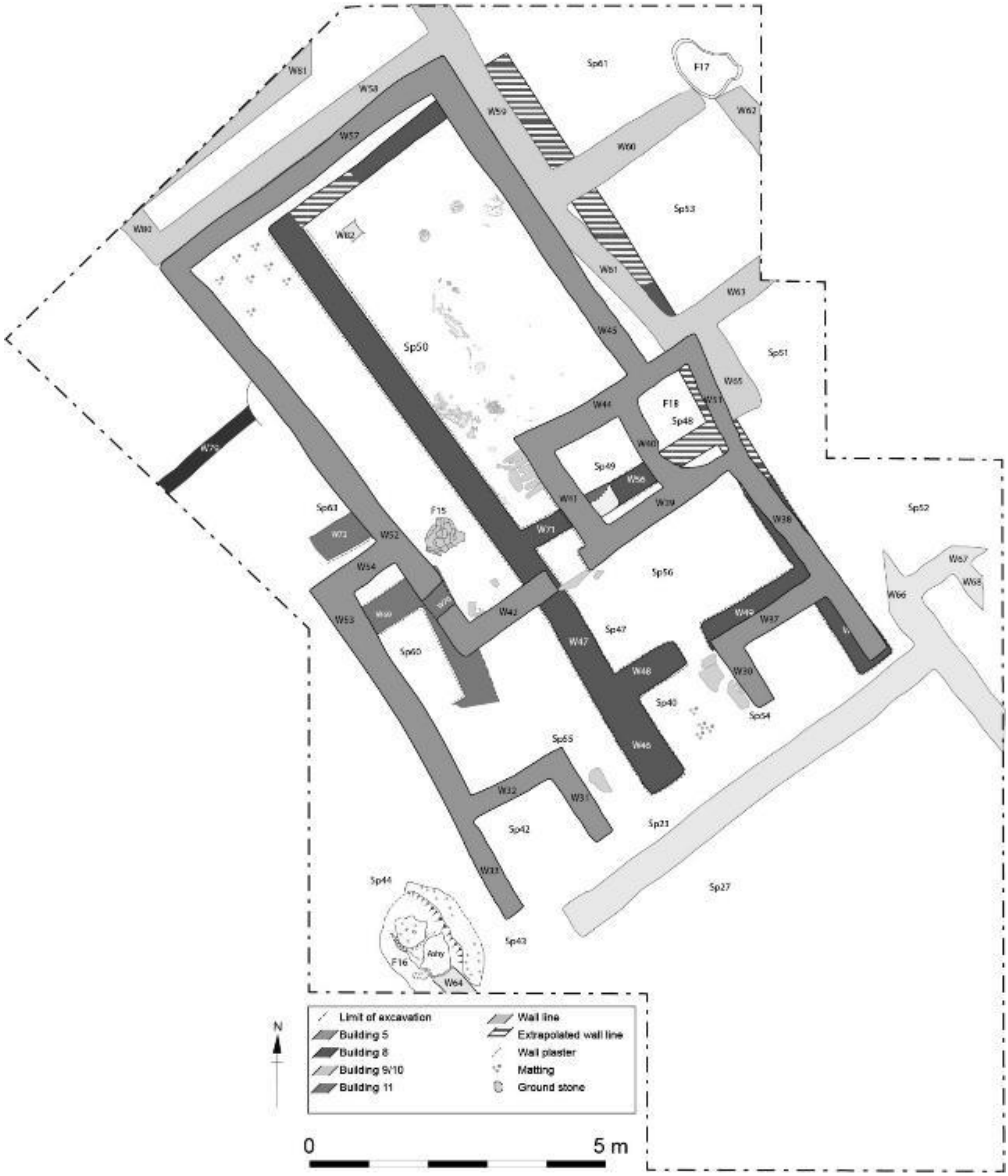


Figure 2.5. Composite plan of buildings in Trench 10.

Figure 2.6. Walls 69 and 72, visible in plan below Wall 54, each with clear burnt plaster wall faces, looking northeast.

Figure 2.7. Excavation of northwest corner of Space 50, looking west, with white stone placed against Wall 52.

Figure 2.8. Traces of woven matting above floor in northwest corner of Space 50.

Figure 2.9. Oval pits cut beneath floor of Space 50, northwest corner, looking northwest.

Figure 2.10. Large stone set against inner face of Wall 52 in northwest corner of Space 50.

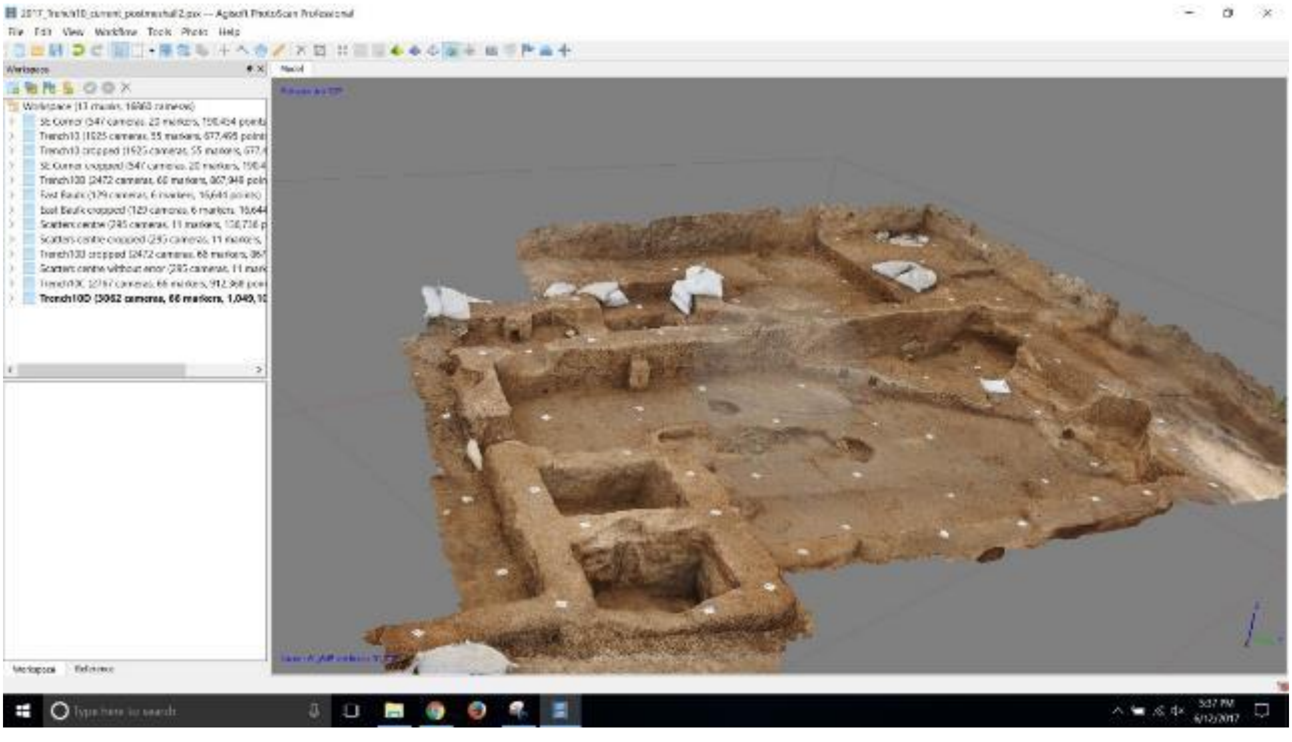


Figure 2.10. Screen shot of 3D photogrammetry of Space 50 and adjacent spaces, Building 5, image courtesy Sheri Pak.

Figure 2.11. Group of human burials in Space 50, Contexts C1868 and C1871.

Figure 2.12. On-site filming for KurdSat TV documentary.

Figure 2.13. Visit to Bestansur of staff and students from Sulaimani Polytechnic University, led by Dr Rozhen Mohammed-Amin.

Chapter Three: Built Environment & Use of Space

Wendy Matthews with Marta Portillo

Research context and aims and objectives

The earthen buildings uncovered in Trench 10 represent remarkable examples of a long history of earthen building traditions and technologies stretching back more than 10,000 years in the Middle East. Our major aims are to analyse the materials and micro-histories of these buildings to study early architectural technology, innovation and sustainability, use of space and living conditions in early built environments, and continuity and change in organisation of economic and social activities, strategies in early settled communities.

Our specific aims this season were to analyse the materials, construction and life-history of Building 5 (Fig. 2.4) to investigate how this may have been a 'House of the Dead' or a 'House of the living and the dead'. We exported four micromorphological and archaeobotanical blocks and fourteen smaller block and spot samples. Our specific objectives were:

- to analyse the materials and construction of Building 5 to establish the level of technological complexity, elaboration and maintenance of the building and whether it is exceptional and potentially differentiated from others at the site and in the Neolithic
- to study micro-residues to investigate the nature and diversity of activities conducted within Building 5
- to examine the context of the high number of burials within Building 5 Space 50, in particular to identify traces of cuts and their stratigraphic sequence
- to investigate end-life of building to identify any evidence of potential closure events and stages.

Research Methods

In the field micro-stratigraphic approaches were closely integrated with larger-scale excavation, by:

- examination of microstratigraphic sequences in the field in plan and in sections cleaned with artist's pallet knife and rocket blower, photographed at high-resolution and 3D photogrammetry, and drawn at 1:5-1:10.
- correlating macroscopic observations in the field with microscopic observations in large resin-impregnated thin-sections at x40-400, and integrated organic and inorganic analyses including: phytolith, GC-MS, IR and SEM EDX analyses (Godleman *et al.* 2016)
- integrating micro-stratigraphic data with other interdisciplinary data at the scale of individual excavation contexts through the site database and interdisciplinary discussions and reports in the field and in post-excavation.

To enhance integrated archaeobotany we have collected blocks of sediment adjacent to micromorphological blocks for micro-sampling in the laboratory for integrated phytolith, dung spherulite, SEM EDX, anthracological and charred plant remains analyses in collaboration with Dr Marta Portillo EU MASCA IF, Georgia Allistone in a University of Reading UROP placement in Summer 2017, and ongoing collaborative research with Amy Bogaard, Michael Charles and Jade Whitlam, University of Oxford archaeobotany team.

Ethnoarchaeological research on dung and early animal management was conducted by Dr Marta Portillo as part of a two-year EU H2020 Marie-Sklodowska Curie Action Individual Fellowship (702529) at the University of Reading, in collaboration with Kamal Rouf Aziz who translated the research, supervised by W. Matthews

(Fig. 3.1). This research is entitled 'Human-animal interactions in early sedentary and urban societies in the Near East and northern Africa: microarchaeology of livestock dung' (abbreviated Microarchaeodung), and will contribute significantly to our understanding of early animal management and human-animal relations, and research conducted by Sarah Elliott. It includes integrated phytolith, micromorphology and GC-MS analyses.

Figure 3.1. Dr Marta Portillo, EU Marie-Sklodowska Curie Individual Fellow discussing research on livestock dung and animal management, translated by Kamal Rouf Aziz.

Preliminary results

Construction materials and techniques: building elaboration and maintenance

Walls

As further walls were exposed, it is evident that Building 5 was constructed from mudbricks from a single material type, a reddish brown silty clay-silty clay loam with calcitic aggregates, and greyish brown silty clay mortar, suggesting a coherent construction plan and organisation. The interior faces of Space 50 were coated with a thick greyish brown plaster and thin white-wash, which is currently being analysed by SEM EDX and IR for comparison to the elaborate plasters, wall-painting and construction techniques analysed in pilot studies for the underlying Building 8 (Godleman *et al.* 2016).

Posts

As the span of Space 50, at *c*. 4.8m, is greater than 3m, the traditional limit for safe use of poplar roofing beams, it is possible either that posts were used to help support the roof at intervals or that other timbers capable of spanning the room width were used. A possible post-hole for an upright wooden post was identified in the north-west corner of Space 50, set into Wall 56. The base of this hole was filled with gravel, which resembles the calcareous river-bed gravel used in the foundation level to line the edges of Space 50. Pending further excavation, there remains a possibility also that this may be the remains of a burrow.

Light-earth roof

Greenish and reddish brown earthen materials with abundant plant materials were identified in building fill across the centre and north-west corner of Space 50, in between large-segments of collapsed wall, and are currently being analysed. These may have been used, as today, as a light-earth for a mud roof. These added plant stabilisers are currently exceptionally well- preserved and mineralised, suggesting rapid burial (Fig. 3.2).

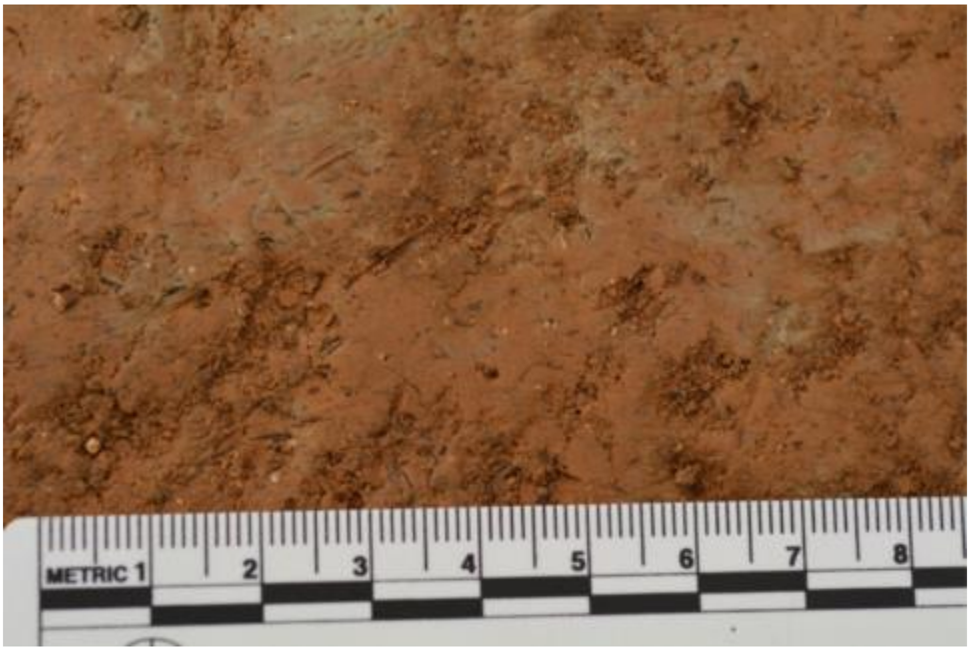


Figure 3.2. Space 50 Well-preserved mineralised plant remains in building infill, possibly from roofing material.

Floor plasters

The floors of Space 50 were repeatedly coated with thin reddish brown and greyish brown silty clay plasters, often <1-2mm thick, visible after cleaning with an artist's palette knife in the field (Fig. 3.3), and in thin-sections from across this space (Archive Report 4 (2013), Fig. 4.7). The thinness and smoothness of these plasters and the absence often of any micro-residues on the surfaces of these floors suggests that this was a well-maintained and roofed space.

Figure 3.3. Multiple layers of thin floor plasters, often <1-2mm thick, Building 5 Space 50, looking north west.

Matting

One of the major discoveries this season, was the detection of further phytolith traces of woven matting across floors in the north-west of Space 50, some of which were pigmented (Fig. 3.4; CA1877), and as traces of plant phytoliths and/associated with dark mineralised staining in the south-west of Space 50, on removal of a microstratigraphic plinth (Fig. 3.5; C1878; SA2545). At least two different phases of mats/coverings on floors were detected in the north-west (Fig. 3.4). The segments of matting were block lifted and archived in Iraq. Loose samples, around the intact segments, were collected for materials analysis.

Traces of mats were also uncovered in north of Space 50 in Spring 2014 (Archive Report 5 (2014), Fig. 3.4), and as surface impressions throughout sequences of floors in thin-section (Archive Report 4 (2013), Fig. 4.7). Together, these traces suggest that mats were extensively and repeatedly used across this large interior space, and would have been major furnishings and embellishments in this space. The materials and the social, cultural and environmental health significance of these are currently being investigated. At, *c.* 7,660 BC, further study of these mats will provide important insights into the nature and range of woven materials at Neolithic sites (Zhang *et. al.* 2016).

Figure 3.4. Segments of woven matting preserved on floor surfaces in north-west corner of Space 50, Building 5, with traces of pigments, notably red (CA1877).

Figure 3.5. Phytolith traces of matting and mineralised remains on floor surface in south west of Space 50, looking south east.

Activities and use of space

Building 5 Space 50 and burial cuts

Like other areas of this large space, *c*. 4.8 x 7.7m, the north-west corner was repeatedly plastered and kept immaculately clean, with few to no macroscopic traces of activity residues in the microstratigraphic sequences in the field (Fig. 3.3) and in thin-section (Archive Report 4 (Summer 2013), Fig. 4.7). The repeated use of mats would also have restricted that accumulation of micro-debris on floor surfaces. Whilst this repeated maintenance, furnishing and cleanliness itself is important evidence of the significance of this space, the sparsity of macroscopic and microscopic traces of the range of activities conducted within this large room, provide few clues as to the use of this space and building and whether or not it was lived in. The activities currently attested in Space 50 include those associated with burial and reception. Other activities that leave few residues, such as sleeping, are also being considered. Now that all floor surfaces have been excavated and sampled across this room, we are integrating the last wide ranging interdisciplinary data collected from four seasons of excavation, to elucidate further the nature and range of activities conducted in this large space (see also Iversen this volume).

Microstratigraphic excavation and section cleaning revealed many more burial cuts in 2017, adding to those identified by similar approaches in 2016 (Archive Report 2016). Of particular note, are the three probable burial cuts, pending future excavation, in the north-west of Space 50, identified after removal of <c.1-2cm of floor surfaces (Fig. 3.6). These cuts are very proximate and dense and have left only of islands of intact reddish-brown silty clay loam sub-floor packing and deposits.

Figure 3.6. Multiple cuts with grey fill into reddish brown packing, looking north west.

Building 5 Space 60

That other rooms within Building 5 were less well-maintained and used for a wider range of activities, is attested by evidence from excavation of the last remaining floors in Space 60. Here there were thicker accumulations of occupation deposits, and higher concentrations of lithics and other micro-artefacts (Fig. 3.7), as attested in thin-section, and micro-archaeological residues (Iversen this volume).

Figure 3.7. Occupation deposits with abundant lithics and a ground stone, Space 60, Building 5, looking north west.

Space 63

More extensive excavations in this area revealed that this is not a corridor within Space 50, but probably a larger external space. Here, late phase surfaces and accumulations of occupation deposits are thicker and include diverse activity residues. In earlier phase deposits, further macroscopic traces of red pigment were visible in the field associated with those in thin-section SA2313 (Fig. 3.8).

Figure 3.8. Occupation deposits with abundant traces of ochre, Space 63, Building 5, looking north west.

Building 8 Space 54

To prepare for future excavation of Building 8, which underlies Building 5 (Fig. 2.5), a block sample was collected to ascertain the nature and formation of surfaces and deposits in the entranceway Space 54, exposed in Summer 2013, (Fig. 3.9; SA 2585; Archive Report 4 Summer 2013, Fig. 2.7). One objective in the micro-morphological analyses is to investigate whether this sequence represents in-situ accumulation during the use of Building 8, or a late/post-use phase. This sample was collected from the extant eastern section after removing some of the back-fill, which was replaced after sampling.

Figure 3.9. Accumulated deposits and micromorphology block sample SA2585 in east section of entrance-way Space 54, Building 8, looking north east.

End-life of Building 5

One exception to the clean floors within Space 50, was the latest surface which, in the north-west corner, has traces of black probably charred remains, ash and burnt aggregates, some of which are shaped (C1884; Fig. 3.10). These may also be associated with the 'soot-like' deposits on the surface of the large white stone (SF 764) placed against the wall edge, and represent specific sets of activities associated with the end-life and closure of this building (Fig. 3.10). To investigate the nature of these, a micromorphological block sample (SA2603) was collected from the floors onto/into which the white-stone was set, and will be analysed shortly (Fig. 3.10), in addition to the micro-archaeological analyses conducted by Iversen through controlled volume wet-screening and flotation.

Space 50 appears to have been rapidly infilled. The walls appear to have been pushed in, based on their inward slope, and the large intact segments of collapsed wall with wall-plaster still adhering, and massive deposits, at some of which may be from roofing, as discussed above and in Archive Report 6, Spring 2016 (p. 16, Fig. 3.6).

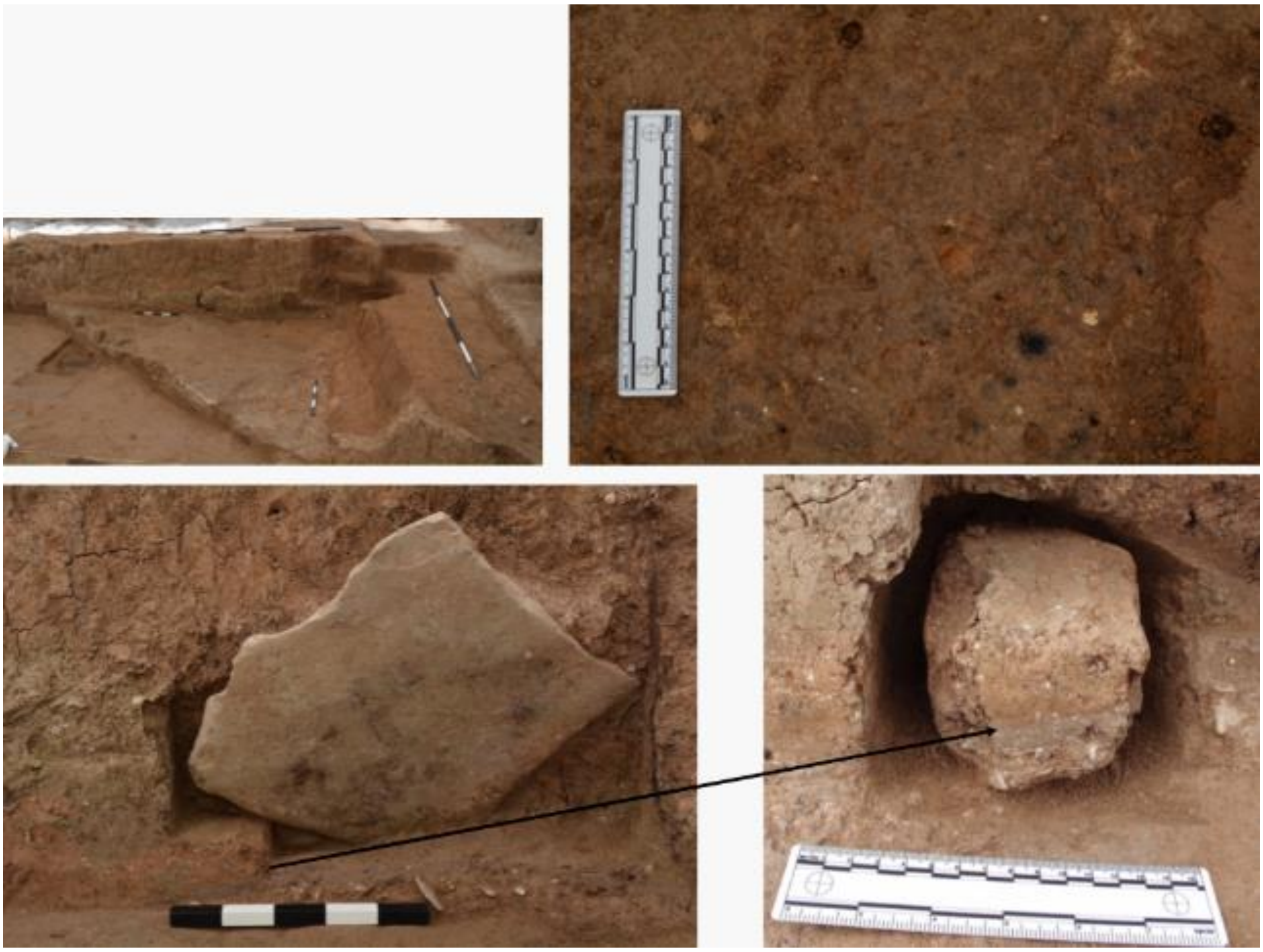


Figure 3.10. North west corner of Space 50, Building 5; ash and burnt aggregates on latest floor (C1884), white stone with traces of probable soot on surface (SF 764) and micromorphology block samples (SA2603).

Plant remains preservation and post-depositional alterations

Deposits at Bestansur have been subject to bioturbation by roots and soil fauna, but the effects are localised and affect < c. 20-30% of deposits, based on thin-section observations. The preservation of in-situ matting

(Figs. 3.4-5) and mineralised plant remains (Fig. 3.2), however, further attests to the good preservation of a range of articulated plant remains at Bestansur, and the need for interdisciplinary integrated archaeobotanical approaches in understanding plant taphonomy and utilisation (Archive Report 4 Summer 2013, p35-8, Figs. 4.2-5; W. Matthews 2010, 2016). To investigate the diverse and fragile plant remains, a range of which do not survive flotation, we exported additional archaeobotanical blocks from previous seasons for micro-excavation and sampling in the laboratory, notably a) from Space 48 Building 5 to investigate what was burnt within this building and at what temperatures; and b) from midden/open area in Trench 12/13 Space 25, for comparison, together with Marta Portillo and the Oxford archaeobotany team.

Conclusions and Future Directions

At the end of this season, we succeeded in excavating, sampling and analysing the microstratigraphy of all floor surfaces within Building 5 from which to complete reconstruction in detail the history of its use. The density of cuts in the north-west corner is similar to that observed in other areas of Space 50 (see e.g. Archive Report 6, Fig. 3.7), and highlights the intensity of activities associated with deposition and probable removal of human remains from this large room and elaborate building throughout its life-time of use. Building 5 and the underlying Building 8, clearly represent an important sequence of high-status buildings, in which were invested elaborate materials and furnishing and burial of >72 individuals. Details of results discussed here and from previous seasons are currently being written up for publication in a major interdisciplinary volume on Bestansur excavations 2011-17, and journal articles. This and future research includes study of early agricultural and sedentary life-ways and living conditions within early Neolithic built environments and the implications for health and socio-economic relations in early settled communities.

Chapter Four: Flotation and heavy residue

Ingrid Iversen

Introduction: research context, rationale and objectives

The primary purpose of flotation of excavated sediment and the processing of the resulting heavy residue during the season reflected the main objective of the excavation; namely to investigate the human burials and associated material. Additional samples were processed from other areas to examine how these spaces may have been used (For a discussion of the approach adopted in previous seasons see the archive reports (Iversen 2013a, 2013b). The method for the sorting and recording of heavy residue remains as before as does the measurement and reporting of the results for the density of material (Iversen 2014: 27).

Spring 2017 activity

Flotation

A total of 74 flotation samples were collected and processed during the season. The average size of samples collected from Trench 10 was around 24 litres, ranging from one sample of 115 litres collected from a burial context in the centre of Space 50 (Square E) to one of less than one litre comprising the sediment found below an animal horn recovered in Space 63. Eighteen samples, totalling 302 litres were collected from Trench 14 and were floated but the heavy residue has not been sorted.

FLOTATION	#	Volume (l)	Average sample size (l)
All samples	74	1637	22.1
Trench 10	56	1335	23.8
Of which: Neolithic contexts	55	1309	23.8
Trench 14	18	302	16.8

Table 4.1. Flotation: summary of activity

Heavy residue

The 56 samples from Trench 10, amounting to 1,335 litres, have been sorted; all but one of the samples came from Neolithic contexts. Just under half of the samples were collected from contexts associated with burials and represent the whole context. These samples were fully sorted in both the 4mm and 2mm size fractions to ensure full recovery of beads and small bones and teeth. The majority of beads recovered from heavy residue were found in the smaller 2mm size fraction.

In addition to the 26 samples categorised as being collected from burial contexts, a further five samples had fragments of human bone in the heavy residue, and in three of these samples beads were recovered. The remaining samples have been fully sorted in the 4mm size fraction and at least 50% of the 2mm size fraction was sorted. In total, 80 percent of the samples from Trench 10 were sorted in full.

Over 90% of the samples sorted were from Space 50 (51 of the 55 samples) with two from Space 63 and one each from Space 54 and Space 60.

HEAVY RESIDUE SORTING		
Number of samples		56
Volume (litres)		1335
Number of contexts		23
% sorted	4mm	100
	2mm	80

Table 4.2. Heavy residue sorting: summary of activity

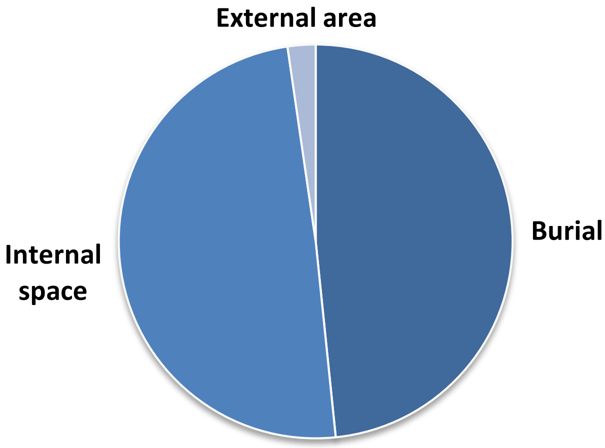


Figure 4.1. Samples processed shown by spatial category, by volume

Both the volume and number of samples processed during the season, while greater than in 2016, remains below the average of earlier years (see Fig. 4.2). The nature of the excavation with the focus on human burials results in lesser amounts of sediment than is the case with other context types. For example, the volume of sediment floated and sorted from Square D in Space 50, which did not contain human bone, is much higher than elsewhere in Space 50 as shown in Fig. 4.3.

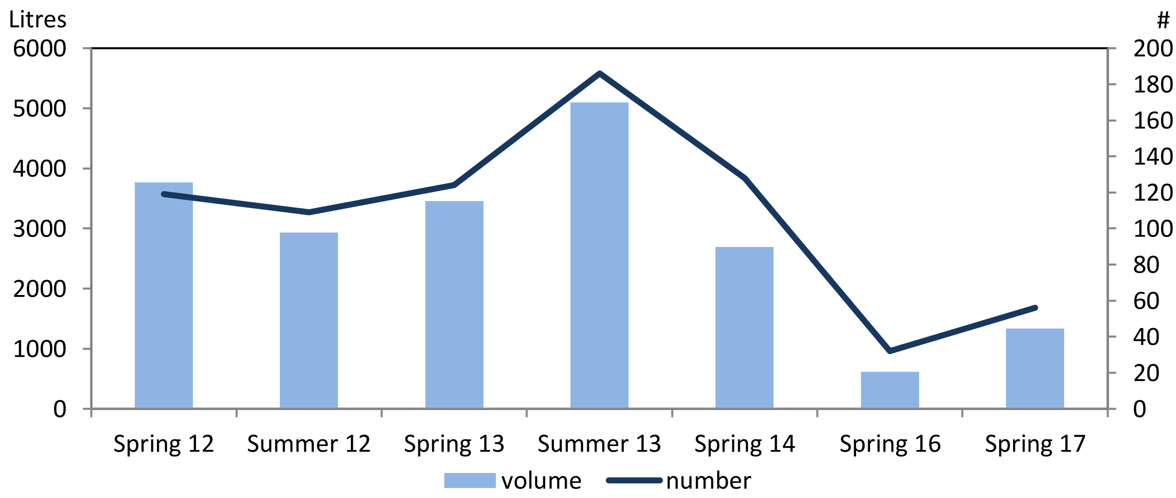


Figure 4.2. Heavy residue sorting: volume and number of samples by season

Location of samples
In Space 50, the horizontal grid which had been established in previous seasons of excavation was maintained and the samples processed from this space can be connected to a specific 'square' within this grid (see Fig. 4.4)(Iversen 2014, 32). Figure 4.3 shows the volume processed from each square ordered from the north-west to the south-east of Space 50. Square D and Square I are not characterised as burial contexts (although a very small amount of human bone was recovered from one sample taken in Square I).

All the sediment excavated in this space was floated allowing an accurate calculation of the density of all artefacts including those handpicked before flotation.

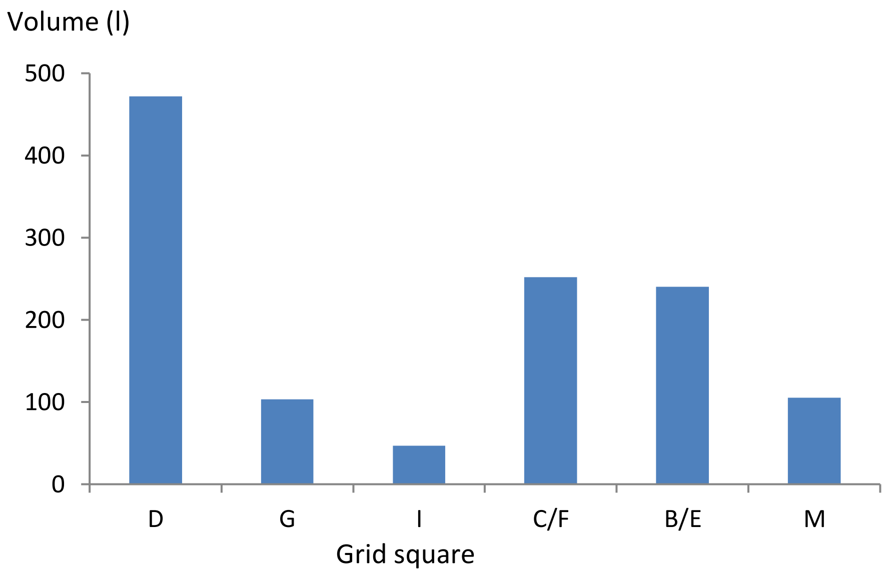


Figure 4.3. Volume of sediment processed by grid square

Results

Space 50
The density of microartefacts recovered from heavy residue is low when compared with both the site and the trench averages for internal spaces. While mollusc shell is found in all the samples and chipped stone is recovered from 85% of the samples, the amounts are very small with an average of 0.2g per litre for molluscs (compared with an average of 0.4g for all internal spaces) and 0.04g per litre of chipped stone.

Fragments of human bone were recovered from samples originating in six of the eight squares excavated in Space 50. The samples from two sets of two squares, which adjoin each other in the centre of Space 50, have been combined and are shown as C/F and B/E. This reflects how the area was excavated and the samples collected (see Fig. 4.5).

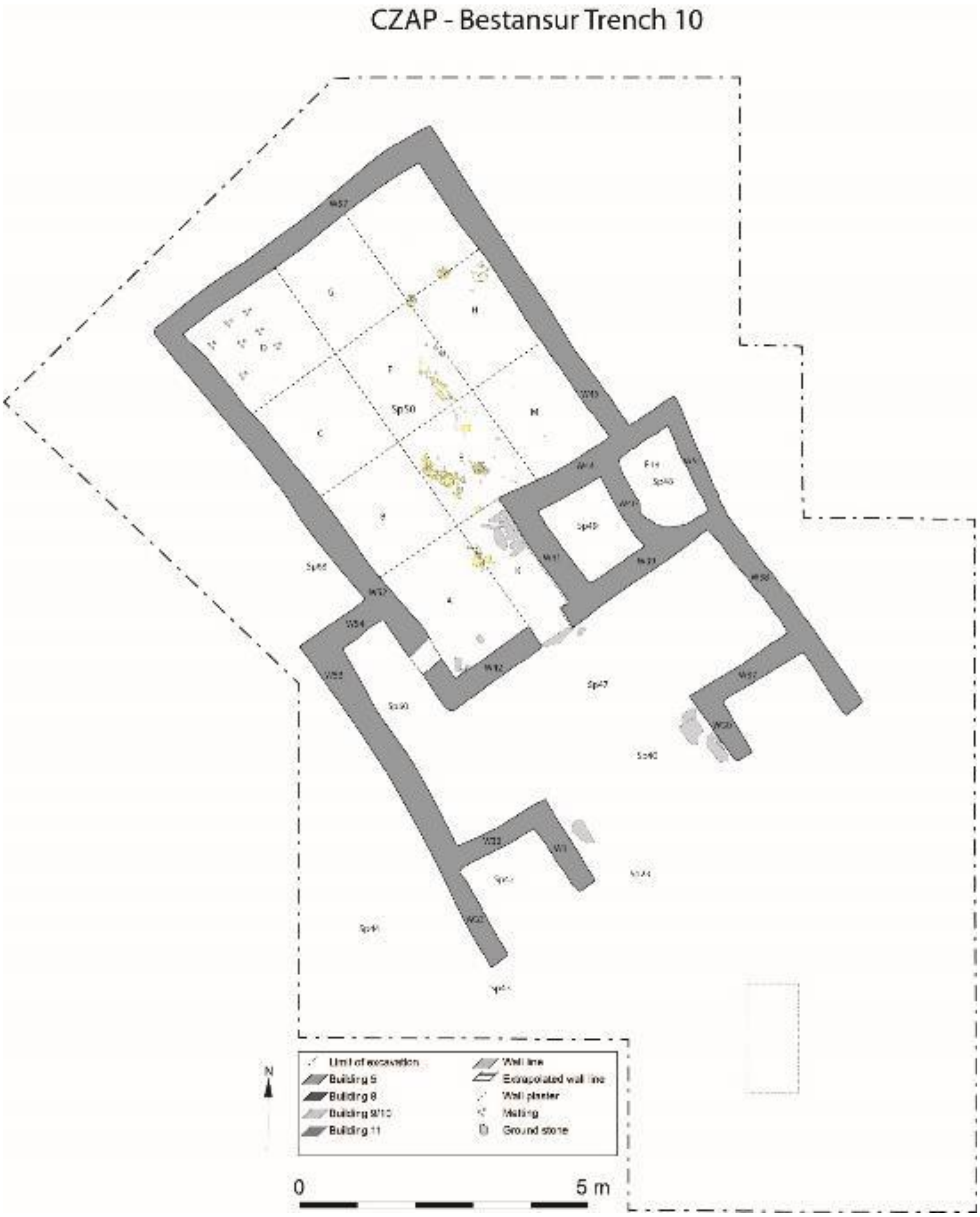


Figure 4.4. Plan of Building 5 showing Space 50 gridded squares

The presence or not of human bone does indicate the location of burials but variations in the density between samples is not necessarily a good indicator of any concentration of skeletons. Other factors such as the fragmentation of the bones and so the extent of recovery will influence how much is 'left' in the samples sent for flotation and sorting. In addition, the results shown in Fig. 4.5 for the density of human bone do not indicate any significant pattern.

The density of other material (mollusc and chipped stone) is similar across the whole of Space 50 with no discernible difference between samples that include human bone and those that do not. This suggests that the space was treated uniformly while the low densities of material indicate that any activities taking place were ones which left little trace. It is unlikely that the preparation and consumption of food (less than half of the samples had any animal bone and a number of those fragments are likely to be microfauna) or other daily activities were performed in this space as even with thorough cleaning some microartefacts would be left behind and thus recovered from heavy residue.

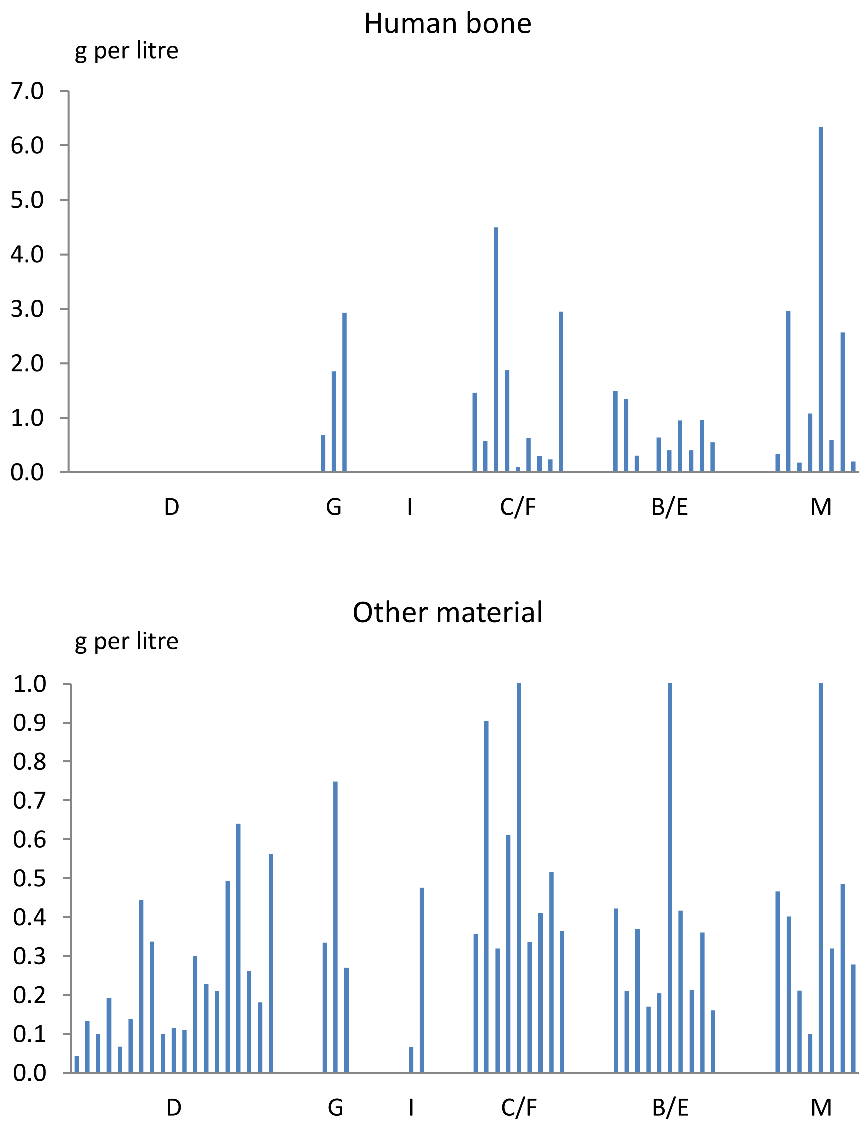


Figure 4.5. Density of human bone and other material recovered from heavy residue shown by grid square

Beads

The key objective in floating all the sediment is to ensure the recovery of all artefacts associated with the burials. During excavation beads and other artefacts are hand-picked and recorded as small finds but many, especially beads, are missed and only recovered once the sediment has been 'washed' and the heavy residue sieved by size and then sorted. Two-thirds of all the beads recovered were collected from heavy residue during sorting, the majority of which were found in the 2mm size.

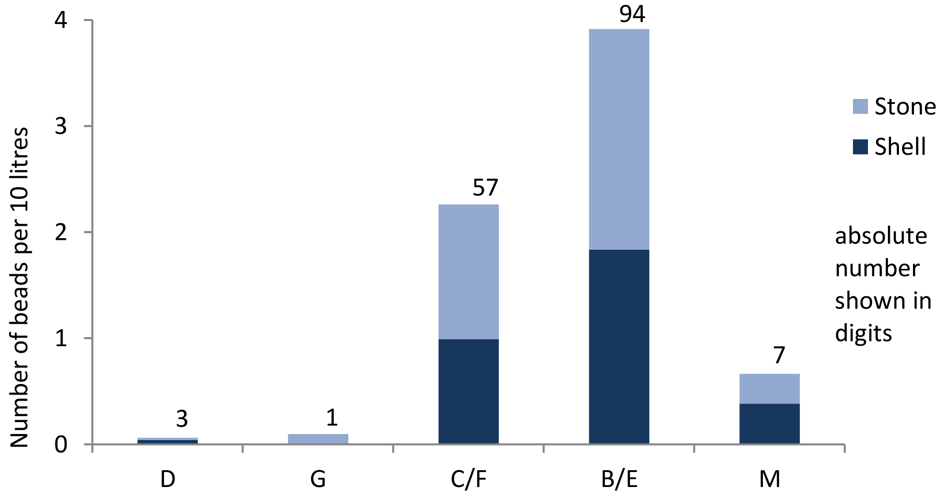


Figure 4.6. Beads recovered: shown by location and type; density and absolute quantity

The two methods of recovery (hand-picked and recovered in heavy residue) can be combined and the density of beads relative to excavated sediment measured, as shown in Fig. 4.6.

Most of the beads, in both absolute and relative terms, were recovered from the central area of Space 50 The highest density of beads at close to 4 beads per 10 litres of sediment was in the adjoining squares B/E; during the Spring 2016 season Square E produced five beads per ten litres (Iversen 2016, 22). The highest concentrations of beads were found in contexts characterised as being burials.

Other spaces

Three samples were collected from spaces outside Space 50; Space 60 lies within Building 5 and the sample was collected from deposits characterised as occupation residues and Space 63 is described as 'corridor space', lying outside the building with samples collected from deposits labelled as fill (Fig. 4.4). One further sample was collected from the cleaning of a section in the atrium of Building 8 (Space 54). The results are shown in Fig. 4.7:

- The density of all microartefacts in the one sample of 40 litres from Space 60 is in line with averages for internal spaces. There is a higher density of chipped stone at 0.13g per litre (41 pieces were recovered from the heavy residue) than the average of 0.4g per litre while mollusc and animal bone are lower in density than their averages.
- Two samples from Space 63 (31 litres in total) produced 0.4g per litre of animal bone, in line with the average for external areas while both mollusc and chipped stone densities were well below the average.
- The cleaning of the section in Space 54 produced a high density of chipped stone with 170 pieces collected (47 in 4mm and 123 in 2mm) with small amounts of other material.

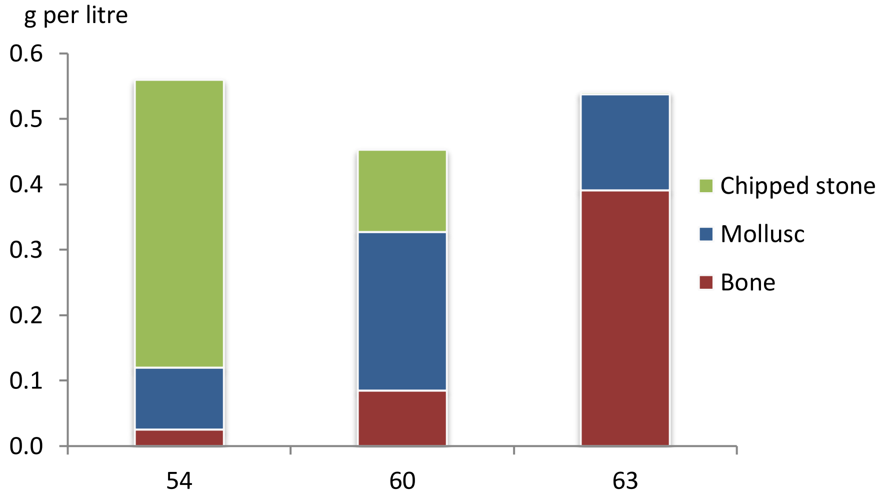


Figure 4.7. Density of microartefacts: Trench 10: Spaces 54, 60 and 63

Conclusions

The key objective of recovering material associated with the burials excavated in Trench 10 was achieved with a majority of the beads recovered during the season being found in the heavy residue and many of those being found in the smaller size fraction. In addition, a number of teeth and small human bones which were missed during excavation were recovered during the sorting of heavy residue.

The careful and accurate measurement and recording of the volume of sediment, which takes place during the process of flotation, allows for the analysis of the density of all material, whether hand-picked during excavation or recovered from sorted heavy residue. The continued use of grid squares to locate the samples enhances the possibility of discerning spatial patterns in the distribution of artefacts.

Future directions

The method of excavating and processing the sediment from the burial contexts allows a number of questions to be addressed. For example, as the skeletons from Space 50 are classified by age it will be interesting to examine whether there is any relationship to the concentrations of beads recovered. In addition, the analysis to date has by necessity concentrated on looking at the results 'horizontally' across the space but with further excavation, and the continued processing of whole contexts, it will be possible to examine 'vertical' patterns of material.

Chapter Five: The human remains

Sam Walsh

Introduction

Previous field seasons at Bestansur led to the discovery of numerous human burials, primarily in space 50, trench 10. The field season of Spring 2017 was planned with the intention of excavating the remaining burials in Space 50.

The aims of the field season were to complete analysis of the human remains excavated in previous seasons and to continue the excavation of human remains in Space 50. The overall objective was to gain an understanding of the burials in terms of: Minimum Number of Individuals (MNI), sex, age-at-death, health and trauma, taphonomy, and burial practices.

Due to more extensive human remains research and updated sampling strategies, all previous seasons remains were sampled where possible for aDNA, isotopes, as well as specimens for non-metrics, morphometrics, and non-destructive imaging analysis to assess age, palaeopathology, and taphonomy.

Methods

The human remains were excavated following the standards of Brickley and McKinley (2004) and Baker *et al*. (2005). Human remains at Bestansur have been found in various states of articulation and disarticulation. The various types of bone deposits are approached differently depending on if they are articulated, disarticulated, scattered, or clustered. For example, small bone fragment scatters are numbered and plotted in order to map bone elements that may relate to specific deposits or events. Some deposits are disarticulated 'bundles' of human remains; these are excavated and recorded in layers when possible.

Following previous seasons, it was decided to create a more extensive skeletal remains recording sheet designed especially for the complex remains.

For osteological analysis, the features examined to estimate age-at-death included, where possible: the pubic symphysis, auricular surface, cranial sutures, and dental attrition and wear (Lovejoy 1985; Brothwell 1989; Brooks and Suchey 1990; Buckberry and Chamberlain 2002). Age-at-death of juveniles was assessed by examination of morphological development and metrical analysis of the bones, and dental development and eruption (Schaefer *et al*. 2009; Scheuer and Black, 2000a; 2000b). Sex was assessed primarily using cranial features and pelvic bones, along with general morphology, robusticity and size (Buikstra and Ubelaker 1994).

Evidence of palaeopathology was recorded by location, description, photography, and X-radiography where export is possible. Differential diagnoses was carried out following Aufderheide and Rodríguez-Martin (1998), Ortner (2003) and Waldron (2009).

Taphonomic alterations were assessed to analyse pre and post-depositional modifications to the bones, these included: weathering (Behrensmeyer 1978), carnivore activity (Haglund 1996, 368-373), fracture patterns (Villa and Mahieu 1991, Knüsel 2005).

Single contexts and individuals were sampled for ^{14}C, and isotopic analysis using standard methods following McKinley (2004) and Mays et al. (2013). Sampling of individuals for aDNA followed Pinhasi et al. (2015). Dental sampling for aDNA analysis of dental calculus followed Fuente et al. (2013) and Weyrich et al. (2015). Sampling for non-metrics, morphometrics, and non-destructive imaging techniques was assessed on each individual context but focussed on dentition and juvenile remains due to the greater survival of these elements and the level of information which could be gained.

Spring 2017: context and preliminary results

The focus of excavation for human remains this season was continuing as in 2016, but primarily in places where cuts were visible against the wall of Building 8, and also in the area outside this wall (but within the boundaries of Building 5) to the western extent of the trench. This encompassed a long strip against the wall of B8, of which the largest amount of skeletal material was from Grid Squares B, E, and F, with smaller amounts retrieved from Grid Squares C and M (see Fig. 2.4).

Context 1861 is area of infant remains, this forms part of the same deposit as C1804 and C1812 excavated in 2016. These remains appear to spread from (and possibly under) the south east corner of Sp50 (Walls 44 and 45) to the edge of W47 B8, spreading approximately 1m north, within the southern half of Squares E and M.

Starting within the south-east corner of Square M, two infant skulls and a few scattered limb bones were found. Within the second and last spit of this area (currently excavated) were seven additional skulls at varying levels of completeness and preservation. Some of these were so young that the cranial bones were similar to tissue paper in their consistency. Further long bones and other elements such as vertebrae were also found. Some of these do not appear to be in any articulation, but a cluster between Skulls 5 and 8 may represent one individual. The remains of Skull 9 and a mandible or maxilla beneath skull 3 were left for future excavation. There were no finds associated with these infants. The in-situ age estimation of these individuals ranges from pre-natal to around two years old.

Where it was possible to carry out long bone measurements, these have resulted in the ages given in Table 5.1 below. These indicate a minimum of four individuals accounting for variation; two pre-natal infants, one perinatal infant, and one post-birth at around one month of age.

C1861	Long bone age
Humerus	33 weeks
Femur	35 weeks
Humerus x 2	39 weeks
Humerus	1 month

Table 5.1: Infant ages from long bone measurements

Most of the dentition from this context is still to be analysed. From Skull 9 five, teeth give an age around seven to ten months of age; one tooth from another individual is consistent with a neonate. Currently this context has a minimum of four individuals and a maximum of nine due to the fragmented and partial nature of the skulls. Future analysis of the dentition will clarify this.

Context 1862 SK1 was first visible as a skull, excavation revealed an associated cluster of long bones, ribs, and vertebrae. These were clearly cut into the surrounding larger deposit which may be an external area. These remains were excavated as far as possible up to the limit of excavation. This was an older adult female, disarticulated but in a layer or bundle in which the bones were not highly compacted. There was an area of red ochre around the skull and nearby mandible, this had become embedded in the worn pre-molars, this application seems very purposeful. There was also an amount of wall plaster underneath the skull, although this may have been there prior to bone placement. The bones were mostly complete in situ. Only three teeth were recovered from this deposit, all aged 40 to 50+ years. In situ measurements of long bones gives a height of around 150.43 cm (5’0).

Figure 5.1. Context 1862 SK1 in situ.

The skull has a lesion which may have been caused by blunt force trauma. The area affected is on the right parietal towards the sagittal line measures 8.14mm by 14.85mm and is irregular in shape forming an oval area with one angled edge. The lesion has not fully pierced the skull, going only through the outer table of bone to leave the diploe exposed, a ‘flap’ of bone was still in situ. The clearest edges of the lesion are smooth and bevelled. Whether the lesion was caused through a violent injury or a fall is still being investigated.

Figure 5.2. Possible traumatic lesion to the skull of C1862 SK1

The mandible from this context has resorption around the molars but the bone has not entirely healed; this demonstrates that tooth loss occurred not long prior to death.

Figure 5.3. a – left: mandible of 1862 showing beginnings of resorbtion around molar alveoli, and red pigment on worn premolar surface; b – right: mandible of 1862 showing signs of apical abscess/cyst around molar alveoli.

The same portion of mandible also has signs of infection around second premolar and first molar. The rounded edges of the alveolar margins indicate infection and subsequent healing. The lesion underneath to the middle of the mandible is where the infection has drained through the mandible resulting in a fistula (Hillson 1996, 287). Again the rounded edges indicate repeated infection and some healing prior to death.

Context 1863 SK1 was the burial of one individual placed against Wall 47. The body was in a highly flexed position on the right side. The limbs were drawn close up to the body with the hands towards the face. The bones suffered heavy taphonomic alterations through soil loading. This individual appears to have been placed in to a cut. This burial cut appears to cut a previous cut which contains four other skulls which were not excavated at this time. Underneath the pelvis of SK1 was a skull, a second was to the north east extent of the excavated area of this context, these both appear adult. One further skull which may be juvenile was directly under the skull of SK1, and another skull potentially adult was adjacent to this.

Figure 5.4. Context 1863 SK1 in situ.

The skull of SK1 appears to have been facing the entrance to Space 50 but may have fallen to the side as it is not in the correct position relative to the body. The completeness of this individual is difficult to ascertain due to fragmentation but appears relatively intact. The bones of the skeleton were predominantly very compact which may indicate that this individual was wrapped. There was darker sediment around the spine, ribs, and pelvis; some of this appeared to be pigment, some was humic material, organic in appearance.

This individual was adolescent in age, at around 12 to 15 years based on the dental development and wear, and possibly male. In situ measurements of a humerus and femur give an average stature of around 149cm or five feet.

The dentition had repeated linear enamel hypoplasia (LEH) on both upper first incisors which was repeated over the entire crowns and at times visible throughout the entire circumference of these teeth. All four canines and the lower second incisors were also affected. This indicates this individual had interruptions to growth throughout early childhood from around seven months to six years. This is one of the most severe cases of LEH within the Bestansur assemblage. The lower first incisors have calculus, this has multiple causes including high protein and high carbohydrate diets, as well as genetic, and mechanical factors (Radini *et al.* 2017).

This individual is also unusual in having the most non-metric dental traits from a single individual within the Bestansur assemblage, although these are not all strongly expressed. Out of 30 teeth, 13 presented non-metric traits, these include shovelling of the incisors, extra cusps on molars, tuberculum dentale on canines, and buccal creasing on roots. These traits need further analysis but could be caused by genetics or developmental stress (Hanihara 2008; Riga *et al.* 2014). The combination of LEH, and non-metric traits may indicate this individual suffered from a systemic disease throughout childhood (Ogden *et al.* 2007).

Context 1866 was an infant burial, mostly represented by a skull. This was within a cut adjacent to Building 8 wall, and cut into soil containing C1871. The skull was extremely flattened and had a high degree of root disturbance. Surviving dentition which has been analysed so far gives an age of seven to ten months. The dentition showed no pathology or non-metric traits. Some infant hand bones from this context showed pathology possibly indicating infection.

C1868/1871 was the largest area of human remains which was excavated. This context is the same as C1784 (excavated in 2014). Excavation of this area was started from the previous extent of C1784, where a number of limb bones had been left. Due to the nature of the shelter and the weather conditions it was easier to see cuts this season; it was apparent that this deposit was cut against and into the wall of Building 8. As the extent of the deposit grew, this became a large spread of bones made up of long bones and skulls in context C1871 (Square B) and skulls and two articulated juvenile skeletons in C1868 (Square E).

Within C1871 was at first an articulated, extremely flexed right leg and pelvis with the ankle up against the pelvic bone. Closely placed against the pelvis was a skull and ribs, to the south of this deposit were further long bones and a cluster of vertebrae. Further disarticulated bones and an infant skull were in a slightly separate bone cluster.

Within C1868 were eight skulls, two of which were associated with fully articulated skeletons. The majority of the visible deposit was skulls, SK6 and SK8 were articulated juvenile skeletons. Beneath these individuals were further long bones and other elements which have not yet been excavated.

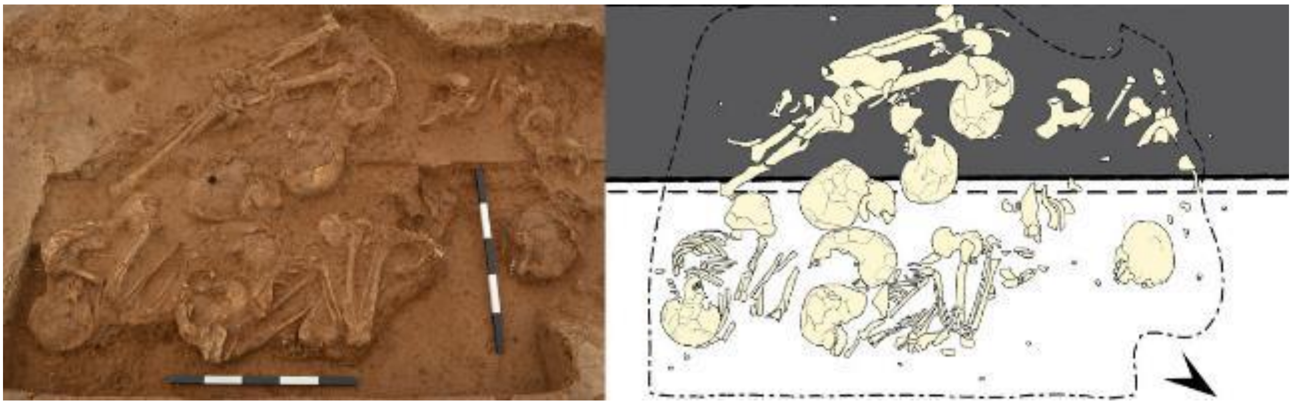


Figure 5.5. Context 1868 skulls in situ.

Within contexts C1871/C1868/C1784 was a minimum of 11 individuals from this one large deposit, the extent of which is not yet clear. This deposit is predominantly made up of partially disarticulated as well as disarticulated remains (except C1868 SK6 and 8). The other remains appear to have been pushed aside for the insertion of the two articulated individuals, this appears to indicate that this deposit was formed through the process of successive interment. This is where a body is placed whole and, as it becomes defleshed is moved aside for the interment of later bodies. This explains both the jumbled appearance of some bones, and the occasional remaining articulations of some others.

Context	SK	Age	Sex
1784	1	18 – 24	F?
1868	1	20 – 24	M?
1868	2	16 – 20	F
1868	3	Younger child (3-5)	NA
1868	4	40 – 50+ older adult	M
1868	5	30 – 40	F
1868	6	D = 7- 9 years, LB = 6 - 7 years	NA
1868	7	20 – 30	F?
1868	8	D = 6 -7, LB = 3 - 4 years	NA
1871	1	24 – 35	M?
1871	2	Neonate	NA

Table 5.2. Demographic overview of individuals from C1784/C1868/C1871 (D = Age from dentition, LB = Age from long bone length)

To summarise some other findings from this deposit, C1868 SK4 only had five surviving teeth, three of these were molars which are worn to an extreme angle which may indicate use wear. SK1 from the same context had some ante-mortem tooth loss around the maxillary premolars and a large carious lesion on one molar. Some teeth, a upper second pre-molar, and the upper left first and second molars from C1784 are highly worn to age 30-50, in contrast to the other teeth which give a younger age (18 to 25); this is also likely to have been caused by use wear to these specific teeth.

Context 1880 is an area which was excavated in square I, this revealed further adult bones which were disarticulated and co-mingled. These included long bones, ribs, vertebrae, pelvic bones and skulls. Only the post-crania were excavated during this season but in-situ assessment indicates at least three adult individuals.

In the laboratory, small amounts of material from previous seasons were analysed, contexts include: C1784, C1810, C1811, and C1812. This has improved age estimations for these contexts, in addition to increasing our data on pathology and dental non-metric traits.

Discussion

Age	MNI
Infants	6
3 – 5	1
6 – 12	2
Adolescent	2
18 – 30	2
30 – 40	2
40 – 50	1
50+	1
Total	17

Table 5.3. Minimum number of individuals excavated during the 2017 season

In summary a minimum of 17 individuals were excavated during the spring 2017 season. In contrast to the 2016 season these included individuals from all age groups.

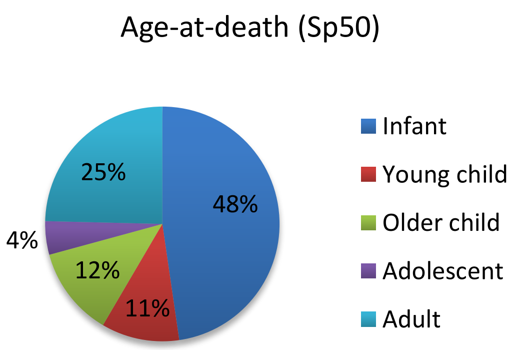
The overall MNI for Space 50 is now 65 individuals with more awaiting future excavation. The ratio of juveniles is still higher than that of adults, with 75% of the assemblage being younger than 18 years. The majority of juveniles are within the infant age group. Further adults excavated this season have increased the number of individuals for which sex could be assessed, the numbers of males and females are relatively even however (see Table 5.3).

Age	Number
Infant	31
Young child	7
Older child	8
Adolescent	3
Adult	16
MNI	65

Table 5.4. Number of individuals in age groups in space 50.

Sex	Number
Male	6
Female	7
NP	4

Table 5.5. Number of Male and Female individuals in Sp50 (sex estimation of adolescents is included where appropriate).



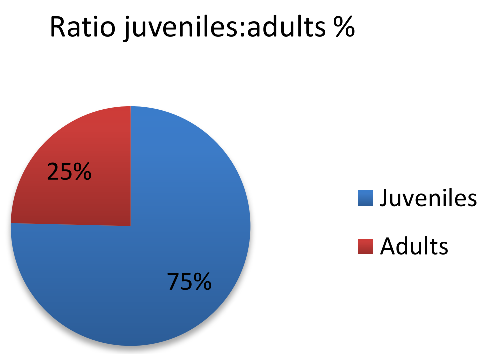


Figure 5.6. Percentage of individuals in different age groups in Sp50 & percentage of adults and juveniles in Sp50

Adult age ranges	Number
18 - 30	6
30 - 40	2
40 - 50	1
50+	2
NP	5

Table 5.6. Number of individuals in adult age ranges

The predominant burial practice in Sp50 is still secondary with most skeletal remains being disarticulated and co-mingled. Of particular interest are SK6 and SK8 from C1868, two primary juvenile burials which due to their position within an area of co-mingled remains indicate successive interment as a process of de-fleshing and breaking down the body. These two skeletons are the last two interments placed into this context as it currently stands, this deposit may have been closed or gone out of use after this point.

Burial type	Adult	Juvenile	Total
Primary	1	8	9
Skull only	1	9	10
Secondary	14	30	44
NP	0	2	2
Total	16	49	65

Table 5.7. Number of individuals (adults and juveniles) per burial type in Sp50

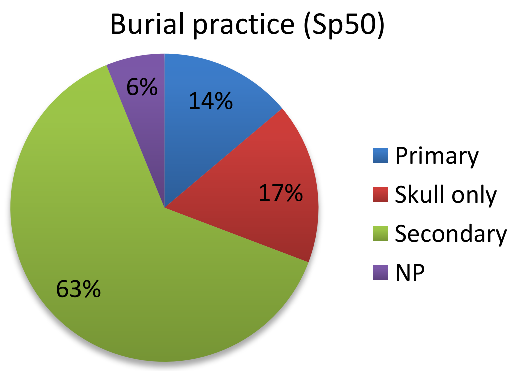


Figure 5.7. Percentage of burial types in Sp50

Conclusions and future directions

To conclude, this seasons excavations has been greatly informative to our understanding of the main area of burial deposits, and has added to the number of adults. Despite this, the juvenile remains still outnumber adults (see Fig. 5.6). It is clear that the majority of burials respect the plan outline of Building 8. It is likely that many more skeletons are yet to be discovered within this area, and perhaps within the wider area of Trench 10.

Analysis of aDNA is currently being started at UCD, hopefully this will be successful and revealing. Studies on C-14 and Isotopes will be carried out, the method of which depends on the success of the aDNA methodology.

As part of Wainwright research, more in-depth studies on dental non-metrics and morphometrics are being carried out for relatedness, this could tie in well with aDNA studies. Pilot studies are also being arranged using Micro Computed Tomography (MCT) to image and analyse aspects of health, taphonomy, and infant development. A more in depth study of bone taphonomy is required in the future.

Chapter Six: Small Finds

Amy Richardson

Research context

Previous seasons at Bestansur and Shimshara, along with research conducted into the finds from Sheikh-e Abad, have highlighted a series of key questions:

- To what extent is it possible to map patterns of material usage across the local and regional landscapes?
- How are these patterns of movement/exchange integrated with the spread of the Neolithic package around the Fertile Crescent?
- Are all material elements of the 'Neolithic package' visible at Bestansur?
- Is it possible to establish spatial and chronological patterns of activity and material engagement at Bestansur?

Excavations conducted in 2017 have highlighted the intricate relationship between treatment of the dead and adornment.

Research aims and objectives

This summary of the small finds recorded during the Spring 2017 field season at Bestansur aims to provide a brief overview of those special finds which merit attention beyond the scope of the bulk finds summaries. Material resource usage is considered where appropriate. The relationships between these artefacts are provisionally examined across the site, setting them into a broader geographical context and elucidating their implications in terms of dating, where possible. This research aims to assess the potential of answering the key research questions through the artefactual evidence recovered from these archaeological investigations.

The data-set

Over the course of the 2017 Spring season excavations in Trench 10, a total of 104 objects, or groups of objects, were assigned SF numbers, 102 of which may be classified as belonging to Neolithic activities. These artefacts were catalogued; key examples were photographed and drawn, and packed ready for storage at the Sulaimaniyah Museum, and future integration into their collections.

From Bestansur, the small finds were selected as having specific cultural significance and recorded separately from the bulk finds, the latter comprising a total of 2kg of post-Neolithic pottery, 161g of ground stone, 83g of animal bone, and 32g of chipped stone. The small finds are treated in this summary by their material groups, rather than by context, in order to examine their significance in relation to the site and its relationship with the other Neolithic sites across the region. Chronologically, they have been simply divided into Neolithic and post-Neolithic, for the purposes of this report.

Research methods and approaches

In the field, SF numbers were assigned to artefacts during excavation and through heavy residue processing conducted by I. Iversen. Each find has been catalogued, described, illustrated, photographed and is now held at the Sulaimaniyah Museum, along with copies of the catalogues. Material analysis was conducted on the basis of comparanda from previous seasons, which have been chemically characterised using portable x-ray fluorescence.

Results to date

Worked bone

Animal bone was not processed during the field season, due to very low quantities present in the interior spaces of Buildings 5 and 8. This process has been most fruitful in identifying worked bone during excavations. Consequently, no worked bone was identified during the course of the 2017 season, although fragments may be present in the animal bone assemblage from multi-period contexts excavated above the secure Neolithic levels to the northwest of Trench 10. However, the presence of a complete horn in the western extension of Trench 10 is notable (SF685, Fig. 6.1). Preliminary morphometrics by R. Bendrey (*pers. comm.*) indicate this may belong to a female sheep. The in situ deposit occurred in the upper fill of Space 63, to the west of Building 5.

Figure 6.1. Possible sheep horn core (SF685), 3D modelled by S.Z. Pak.

Stone

Excavations in Space 50 revealed two flat stones in the northwest corner, in the collapse and fill of Square D (C1884). SF746, a small, smoothed stone was located lying flat on the surface with dark residues beneath, close to the larger SF764 which was found upright against Wall 52 (Fig. 6.2). The latter is composed of a very soft limestone; the outward face is etched with a network of fine scratches, possibly from working materials such as leather, across the smooth but irregular surface, which bore patches of dark staining. The reverse, pressed against the wall surface, is also irregular but does not feature the scratch marks, and had a single *Unio tigridis* river clam shell in the adhering mixture of mortar and plaster. Directly below the stone, a cut has been identified, which is yet to be excavated, but would seem likely to contain burials.

Figure 6.2. SF764 with fine scratch detail, dark residues, and *Unio tigridis* on reverse.

Two small marble fragments were recovered inside Building 5, including a small off-cut of grey marble in the floors of Sp50, SqD (SF710), and a body fragment of a polished white marble bowl in Sp60, in the southwestern corner. Little evidence of craft activity has been located inside Building 5, but these fine details demonstrate the highly skilled working of materials transported from sources in the Zagros in proximity to this significant place. Three further stone fragments demonstrate evidence of anthropogenic activity, one used for grinding (SF716), one with a possible attempt at a perforation (SF768), and one heat-treated stone with a soft, ferrous interior (SF676).

Adornment

A total of 162 beads were recorded over the course of the season, made from stone and shell, plotted across the burial deposits in Building 5 and recovered in groups through heavy residue analysis. These were significantly concentrated in the deposits at the centre of Sp50. Forty-eight percent of the beads recovered over the course of the season were made from perforated river molluscs (*Theodoxus jordani*). Forty-eight percent of the beads are small (3mm diameter) red cylinder or red and white disc beads, which are made from calcium carbonate, possibly in the form of fossilised crinoids recovered from the abundant limestone deposits in the region. The remaining six beads include a pair of shell beads (SF687 & SF688) made from shells otherwise unseen across the site. The uneven surface indicates that these belong to a spiny marine gastropod, likely the fresh/brackish water mollusc *Melanopsis praemorsum*, or possibly heralding from marine sources further afield and belonging to the Muricidae family (cf. *Corallophilidae Meyendorffi*). A small green chalk bead (SF765) and a crab-claw bead (SF668) find parallels in the material from previous seasons. One small, beautifully worked translucent carnelian flat-bead (SF660) and one large, partially worked, red-brown chalcedony flat-bead (SF722) complete the assemblage and highlight the extensive distances from which materials travelled to Bestansur.

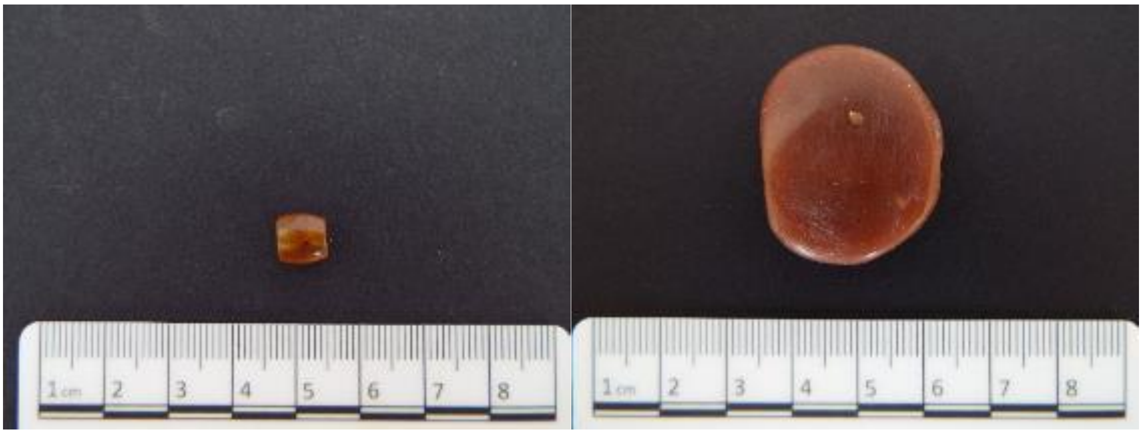


Figure 6.3. SF660 and SF722, carnelian and chalcedony flat-beads.

A single fragment of obsidian (SF769) raises questions whether this material was reserved exclusively for the chipped stone repertoire, or possibly was worked to form adornments, as became common in the late Neolithic. The small chip of obsidian has a rounded edge, which appears deliberately smoothed. The profile is similar to that of bracelets, and striations across the surface more akin to polish than use-wear, although the form could be a product of hinge-fracture. Flanged obsidian bracelets, similar to the flanged forms seen in earlier seasons at Bestansur in marble, are known from Asikli Hoyuk, and an obsidian bracelet industry at Bestansur would suggest further long-distance connections to Central Anatolia.

Clay

Fourteen clay objects and fragments have been recorded over the course of the season, including six which correspond with the most commonly occurring shapes of ball, teardrop, and squashed/nullified tokens (see Fig. 6.4). The remainder are of largely indeterminable shape, due to their fragmentary condition, and indeed some of which could not be extracted from the surrounding sediment, and were recorded and preserved as cross-sections through the clay shape, following conservation approaches advised by J. Unruh. These include two lightly baked clay shapes with parallel, linear edges identified in the west section of Sp63 with walls approximately the thickness of pottery (SF680 & SF681), and a small shaped object in Sp50 with bilateral bulges and extrusions similar in cross-section to the simple figurines common to this region (SF665). The complete objects demonstrate the deliberate working practices prior to baking in fires, which blackened the surfaces. SF663 bears a clear thumbprint pushed into the clay, in a nullifying action. SF672 is clearly deliberately shaped to form an ellipsoid, flattened at one end and bulbous at the other, similar in shape to the red deer canine pendants found at Shimshara, imitated in black stone at Jarmo, recorded as far away as El Wad, and known across European Neolithic sites.

Eleven of the clay small finds were excavated from Space 50, in the fill and packing around the burials, although never in direct association with the human bone, with the remainder from Sp63. The clay objects and fragments were found exclusively in the central and western areas of Sp50, with no clay recovered from the eastern edge, although this may be due to excavation bias over the course of the season.

SF708

SF665

SF663

SF672

Figure 6.4. Clay objects.

Post-Neolithic

Half a crudely cut cowrie shell was recovered from an unstratified context close to the eastern edge of Trench 10. The shell has a fresher surface than the Neolithic examples previously recovered from Sp50, and the apex is crudely cut with jagged edge, distinct from the smooth dorsal cuts present on SF468, SF470, SF590, and SF600. Cowries have continued to be worn as amulets in modern jewellery into modern times in Kurdistan, and it may be that unstratified finds belong to post-Neolithic occupation or modern visitors to site (Fig. 6.5). Furthermore, in cleaning around Trench 10, a fragment of the clay bulb of an Ottoman pipe was recovered, decorated with a deep maroon slip (SF666).

Figure 6.5. Unstratified cowrie SF762 with crudely cut apex, and Kurdish jewellery with cowrie amulets inset

Future directions

This brief summary of the finds demonstrates the degree of continuity in the material practices of the inhabitants of Space 50 at Bestansur. Key features, however, have been highlighted in the area-specific concentrations of beads around Grid Squares E and F. This data will be merged with that from previous seasons, to better outline the extent of the bead clusters and the variations in bead type. In future seasons of excavation in this space, the likely presence of beads in these areas should be considered, and material from the southern portion of Space 50 should be wet-sieved, although beads no longer require individual plotting. The range of bead materials from this space is remarkable and points to wide-reaching networks of exchange operating across the region. The provenance of the materials is not easy to establish in many cases, but further investigation of carnelian sources should be undertaken when possible. The occurrence of fragmentary clay artefacts and stone-working fragments amongst the burials demonstrates the extent to which these deposition events took place in a living space, where people were undertaking diverse activities with wide-ranging materials.

Table 6.1. Small finds recorded during the Spring 2017 field season.

SF	C#	Item	Material	Description	L (mm)	W (mm)
				Bone objects		
685	1873	Animal horn	Horn	Animal horn, appears to be complete, although very fragile (fragments in bag). Lifted on sheet. 3D modelling by S. Pak.	380	42
				Stone objects		
676	1875	Red stone	Stone	Stone with burned, blackened exterior, and soft red interior, possibly heat-treated for pigment or fire-cracked.	30	20
700	1878	Bowl fragment	Stone	Small, highly polished fragment of a white marble bowl with smoothing striations on the internal surface and highly polished exterior	7	11
710	1887	Marble fragment	Stone	Small, rough, working fragment of grey mottled marble, possibly an off-cut with traces of cortex	6	7
716	1870	Ground stone	Limestone	Fragment of flat grinding stone with two broken edges - possibly from sub-rectangular shape. Base is flat (sediment still adhering) and slightly concave upper. Linear striations on upper surface indicate overlying organic material (i.e. reed matting phytoliths).	18	13
746	1884	Flat stone	Limestone	Flat stone with smooth surfaces and rounded edges. Irregularly shaped. Charred flecks on one surface.	75	55
764	1884	Large stone	Stone	Large stone set against W52 marking cut and fill below - likely a burial. Repeated striations and deep linear scars on obverse indicate possibly used for (leather?) working or even deliberately marked surface. River clam shell (Unio Tigridis) adhering to reverse.	340	380
768	1873	Pebble	Stone	Small, red-brown stone with possible attempt at piercing/drilling. Sheen on surface indicates much-handled, suggesting it may have been kept as a curio or amulet.	17	19
				Adornments		
660	1853	Carnelian flat bead	Carnelian	Small, translucent flat bead, with lenticular section drilled from both sides. Colour is pale orange with red-orange streaks and dark brown impurities	7	7
661	1853	Mollusc bead	Shell	Small, abraded mollusc bead with one perforation	8	6
667	1853	Red stone bead	Stone	Small red stone cylinder bead (possible fossilised crinoid) with narrow central perforation. One rounded and one irregular terminal.	6	2
668	1857	Crab claw bead	Crab claw	Short, crab claw, cylinder bead, tapering similarly to scaphopod tusk shells. Terminals are uneven and worn.	5	7
670	1853	Mollusc bead	Shell	Mollusc bead	7	6
671	1863	Disc bead	Stone	Tiny, red, stone disc bead with central perforation	1	2
673	1876	Mollusc bead	Shell	Mollusc bead found with SF674 and SF675. Single perforation with slight traces of wear.	6	5
674	1876	Mollusc bead	Shell	Mollusc bead found with SF673 and SF675. Single perforation near apex worn flat from stringing abrasion.	7	4
675	1876	Mollusc bead	Shell	Squat mollusc bead found with SF673 and SF674. Single perforation and slight flattening at aperture.	6	5
677	1876	Mollusc bead	Shell	Mollusc bead with single perforation	6	4
678	1876	Disc bead	Stone	Small, white stone disc bead with central perforation	1	4
679	1876	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
682	1876	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
683	1876	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
684	1876	Mollusc bead	Shell	Mollusc bead with single perforation	6	5

SF	C#	Item	Material	Description	L (mm)	W (mm)
687	1857	Bead	Shell	Cream shell bead with uneven surface, likely from spiny marine gastropod. Possibly fresh/brackish water Melanopsis praemorsum, or saltwater Muricidae family, cf. Corallophilidae Meyendorffi and Mediterranean types. One large perforation for stringing through aperture.	10	8
688	1857	Bead	Shell	Cream shell bead with uneven surface, likely from spiny marine gastropod. Possibly fresh/brackish water Melanopsis praemorsum, or saltwater Muricidae family, cf. Corallophilidae Meyendorffi and Mediterranean types. One large perforation for stringing through aperture.	12	7
689	1853	Mollusc bead	Shell	Mollusc bead - small with one perforation	5	4
690	1866	Mollusc beads (3)	Shell	Three mollusc beads, each with single perforation		
691	1866	Red stone beads x3	Stone	Two barrel beads and one disc bead in red stone		
692	1863	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
693	1863	Disc beads (15)	Stone	Ten red and five white small disc beads	3	1
695	1853	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
696	1853	Red cylinder bead	Stone	Small, red cylinder bead, possibly made from crinoid fossil	4	2
697	1866	Beads (9)	Shell & stone	Five mollusc, one red cylindrical, one white disc and one red disc bead		
698	1866	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
699	1868	Red cylinder bead	Stone	Small, red cylinder bead, possibly made from crinoid fossil	3	7
701	1863	Red disc bead	Stone	Small, red disc bead, possibly made from crinoid fossil	1	3
703	1863	Mollusc bead	Shell	Mollusc bead with single perforation	5	7
704	1863	Black mollusc bead	Shell	Mollusc bead with two deliberate perforations, burned to glossy black	4	5
705	1868	Disc beads	Stone	17 red disc beads and 1 white disc bead	1	3
706	1868	Cylinder, disc, and mollusc beads	Stone and shell	19 mollusc beads, 3 red cylinder beads, and 5 red disc beads		
709	1882	Disc and mollusc beads	Stone and shell	16 beads: 8 mollusc, 6 red disc and 2 white disc beads		
715	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
718	1868	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
719	1868	Disc bead	Stone	Red disc bead - possible crinoid	3	1
721	1868	Mollusc bead	Shell	Mollusc bead with single perforation	5	5
722	1868	Flat bead	Chalcedony	Large flat bead, sub-circular with abrupt edges. Material is almost completely opaque, red-brown chalcedony, very fine-grained and very hard. Conchoidal fracture where reduction blows have been struck. Striations and reduction scars suggest finishing and polish were not attempted. Perforation is drilled from both sides with a smooth tool (chipping at one perforation); perforation is wider and longer at one terminal. Soil from perforation has been retained for testing. Fine crack running between perforations indicates material stress - possibly left incomplete to prevent further destruction.	24	30
723	1868	Cylinder bead	Stone	Red stone cylinder bead found in scatter. Possibly crinoid fossil	5	3
724	1868	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
725	1868	Mollusc bead	Shell	Mollusc bead with single perforation	5	5
726	1868	Cylinder bead	Stone	Red stone cylinder bead found in scatter. Possibly crinoid fossil	6	4

SF	C#	Item	Material	Description	L (mm)	W (mm)
727	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
728	1882	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
729	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	5
730	1882	Disc bead	Stone	Small, white, stone disc bead - possibly fossilised crinoid	3	1
731	1882	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
732	1868	Disc bead	Stone	Small, red, stone disc bead - possibly fossilised crinoid	3	2
733	1882	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
734	1882	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
735	1882	Mollusc bead	Shell	Mollusc bead with single perforation	7	5
736	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
737	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	5
738	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
739	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
740	1868	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
741	1863	Disc bead	Stone	Small, red, stone disc bead - possibly fossilised crinoid	3	1
742	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	4	3
743	1876	Disc bead	Stone	Small, white, stone disc bead - possibly fossilised crinoid	4	1
744	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	5
745	1868	Disc bead	Stone	Small, red, stone disc bead - possibly fossilised crinoid	3	1
748	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	6	3
749	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	7	3
750	1868	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
751	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	4
752	1868	Mollusc bead	Shell	Mollusc bead with single perforation	7	6
753	1868	Mollusc bead	Shell	Mollusc bead with single perforation	6	5
754	1868	Mollusc bead	Shell	Mollusc bead with single perforation and protruding apex	8	6
755	1882	Mollusc bead	Shell	Mollusc bead with single perforation and protruding apex	6	4
756	1868	Mollusc bead	Shell	Mollusc bead with single perforation and protruding apex	7	5
757	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	7	3
758	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	5	3
759	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	7	3
760	1868	Mollusc bead	Shell	Mollusc bead with single perforation and protruding apex	6	4
761	1868	Mollusc bead	Shell	Mollusc bead with single perforation and protruding apex	7	5
763	1863	Disc bead	Stone	Small, red, stone disc bead - possibly fossilised crinoid		3
765	1884	Barrel bead	Stone	Small barrel bead with narrow central perforation (<1mm). Shaped from a very pale green, soft stone, likely chalk.		
766	1868	Cylinder bead	Stone	Small, red, stone cylinder bead - possibly fossilised crinoid	4	6
767	1880	Disc bead	Stone	Small, red, stone disc bead - possibly fossilised crinoid	1	4
769	1873	Obsidian fragment	Obsidian	Small chip of obsidian with rounded edge, which appears deliberately smoothed. Profile is similar to that of bracelets, and striations more akin to polish than use-wear, although could be product of hinge-fracture.	8	12

SF	C#	Item	Material	Description	L (mm)	W (mm)
				Clay objects		
662	1863	Clay shape	Clay	Amorphous baked clay fragment with small area of burned surface remaining (3.5x2mm)	24	17
663	1857	Clay shape	Clay	Two lightly baked clay fragments: a) has curving concave/convex shape pressed between thumb and forefinger (23x18x7mm); b) is a fragment of thin surface with one curving edge and otherwise indeterminate shape (19x11x4mm).	23	18
664	1864	Clay shape	Clay	Fragmentary clay object found in W47 of B8. Orange-brown to dark grey in colour.	4	3
665	1864	Clay shape	Clay	Outline of clay shape (red-orange) in cut block of sediment (flecked brown). Shape has bilateral bulges and extrusions at one end.	16	10
669	1870	Clay object	Clay	Clay object with fire-blackened surface, lightly baked throughout. Sub-rectangular section visible in plan during excavation, but too friable to extract from dense surrounding clay-earth.	30	20
672	1872	Clay object	Clay	Black-brown, lightly burned, complete clay object with slight fracture at upper edge. Small, kidney-shaped, very similar in form to red deer canines used for pendants across the region, including narrow upper tapering to bulb, with flattened reverse.	16	9
680	1875	Clay shape	Clay	Very dark brown clay shape, with linear, parallel edges. Identified in W section of Sp63, but too shallow to extract.		
681	1875	Clay shape	Clay	Very dark brown clay shape, with linear, parallel edges. Identified in W section of Sp63, but too shallow to extract.		
707	1868	Clay token	Clay	Ovoid clay token, possibly deliberately squashed or 'nullified'. Made from buff/pale brown clay with fine mineral and vegetal inclusions.	13	16
708	1868	Clay token	Clay	Spherical/ball token with slight peaking on one side (as seen elsewhere across site). Shaped from buff/pale brown clay with coarse, hackly inclusions	14	14
711	1879	3 clay shapes	Clay	Three small clay objects, one of which is in two fragments (a) that form tetrahedral shape - possibly a token	16	19
712	1879	Clay object	Clay	Clay object, ovoid in shape, with flattened base. Likely a squashed token.	14	19
713	1880	2 clay shapes	Clay	Two clay shapes, one possible ball token and on squashed/nullified fragment		
714	1868	Clay shape	Clay	Linear frag of clay, with linear colour-changes throughout. Form has surfaces running parallel with approx. triangular section	11	7
				Post-Neolithic objects		
666	1865	Clay pipe frag	Clay	Bowl fragment (50%) from clay pipe with bulbous surface detail. Deep maroon slip/gloss across surface. Likely Ottoman. Internal contents preserved for further analysis.	35	30
762	1865	Cowrie	Shell	Half a small cowrie shell, fresher than Neolithic examples from Sp50, found in unstratified surface deposits next to B5. Apex is crudely cut with jagged edge. Possibly from modern dress/adornment.	8	18

Chapter Seven: Excavations in Trench 14

Lisa Cooper, Lynn Welton and Sheri Pak

Excavations in Trench 14 at Bestansur were carried out April 9-27, 2017 by an archaeological team – Lisa Cooper, Lynn Welton and Sheri Pak – from the University of British Columbia, Vancouver (Canada). The initiative was supported financially by a two-year Insight Development Grant from the Social Sciences and Humanities Research Council of Canada. Excavations benefitted greatly from the assistance of a work force from the village of Bestansur. The team was also grateful for the support it received from Kamal Rouf Aziz, one of the project's government representatives.

Initial work in Trench 14, located approximately 30 metres southeast of the central mounded tell on gently sloping ground, aimed to locate parts of the 10m x 10m trench which was first opened and investigated during the spring season of 2013, and which had been thoroughly back-filled. Once the excavated areas of the trench were located and cleared, further digging exposed additional architectural features, allowing a greater understanding of what appears to be a domestic sector dating to the late Assyrian period (circa late 7th century BCE) (Fig. 7.1).

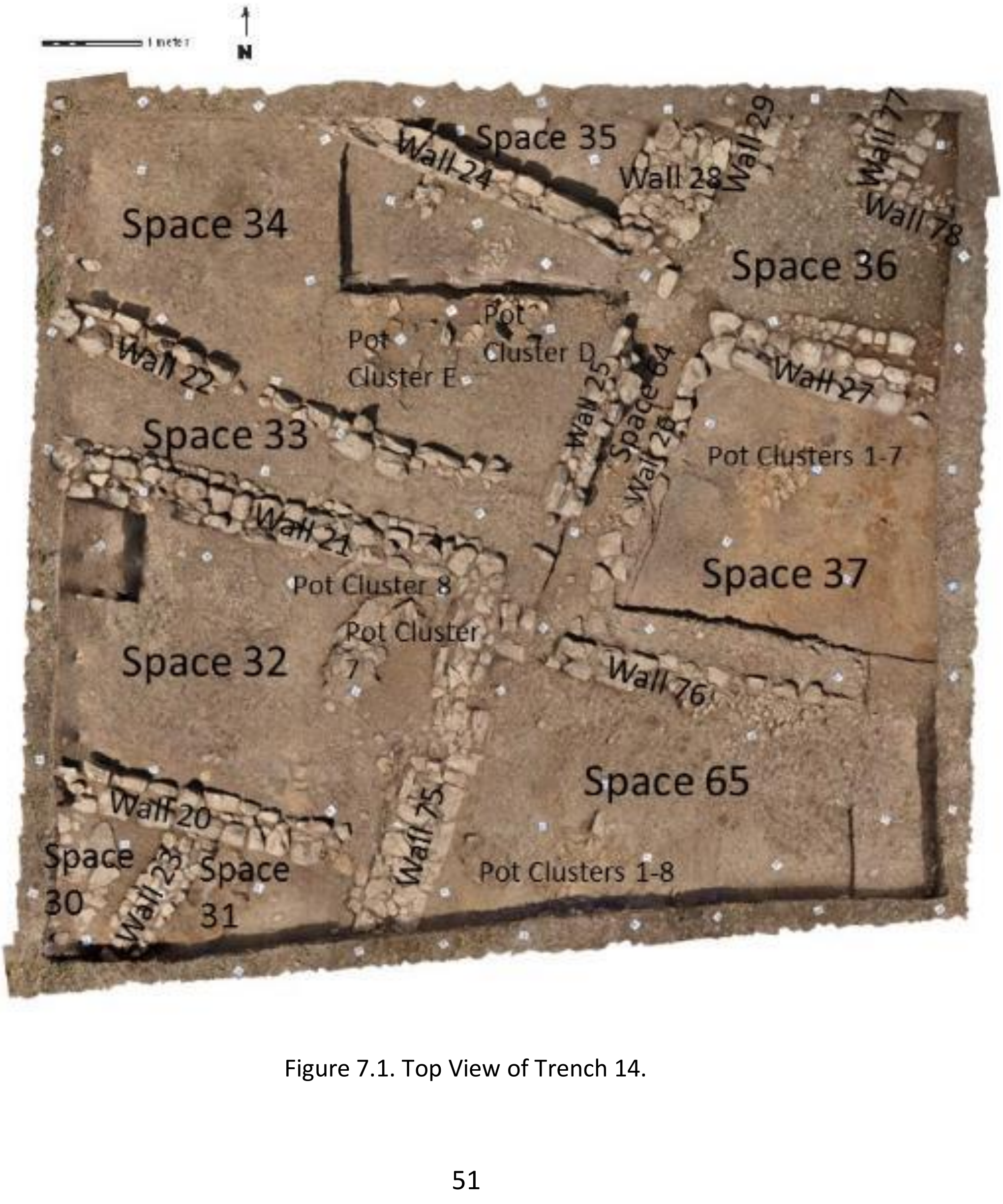


Figure 7.1. Top View of Trench 14.

Although the original premise in 2013 was that all of the architectural spaces defined in Trench 14 were rooms of a large rectilinear household, it is apparent now that several separate and distinct domestic units exist (Spaces 34, 30-32 and 37). These are separated from one another by, or adjacent to, narrow alleyways (Spaces 33 and 64) and outdoor spaces (Spaces 36 and 65). The domestic units are enclosed by walls comprising one or more courses of small to medium-sized stones that were probably originally topped by superstructures of mudbrick. These brick superstructures have not been well preserved due to the trench's proximity to the surface, and the probability that agricultural activities and erosion have destroyed much of them. Some proof of the existence of mudbrick superstructures comes from the abundant burned chunks of mudbrick debris found in the fill above the floors of Spaces 34, 30-32 and 37, these possibly the remnants of brick walls destroyed by fire. Additionally, in the case of at least one of the units, that of Space 37, one or more of the stone walls appear to have been additionally shored up or strengthened by a combination of small stones, mudbricks or clay packing (see for e.g. the southern stretch of Wall 26 for a remnant of a type of clay packing or mudbrick).

Figure 7.2. Stone with circular depression in centre of both sides (Small Find #809, Context #2008).

The abrupt nature of the abandonment of the units, probably caused by their destruction by fire, is well attested by the number of pottery vessels that were found in their entirety on the floors of the houses, albeit smashed. Such clusters of smashed vessels were first uncovered during the 2013 season, with further pot clusters uncovered this past season. In total, Space 34 was found to contain at least eight clusters of large jars positioned across its floor from west to east (from 2013, Pot Clusters #4 to #6 in Context #1403, and Pot Clusters A-C in Context #1416; from 2017, Pot Clusters D-E in Context #2008, seen in Figure 1 above). These were found in conjunction with an unusual object that was found sunk into the floor near the pots: a stone with a central circular depression on both its upper and basal sides (Small Find #809, Context #2008; see Fig. 7.2). Its precise function remains undetermined. Space 32 contained the remnants of at least three large storage vessels (Pot Clusters #1 and #3, found in Context #1404 in 2013, and Pot Cluster #7 found in Context #2002 in 2017, the latter seen in Fig. 7.1 above), a globular jar with restricted neck (Pot #2 found in 2013) and a large casserole bowl (Pot Cluster #8 found in Context #2002D and E in 2017, seen in Fig. 7.1 above). In Space 37, a somewhat different group of pottery vessels was found smashed in situ in the centre of the room, these amid of dark ashy debris combined with burned mudbrick (Pot Cluster #7 in Context #1418 in 2013, and Pot Clusters #1-#7 in Context #2007G, the latter seen in Fig. 7.1 above).

The nature of the pottery vessels from each of these different spaces appears to provide clues as to the functions of the areas. In Space 32 for example, the appearance of large storage jars in connection with thick pebbled surfaces, especially in the areas under the jars, may indicate that the jars contained liquids and that the surfaces provided an impermeable base for these liquid storage containers. A thick course of broken pottery fragments, placed directly against the base of Wall 75 in Space 32 may have prevented further water damage to the lower sections of the wall, perhaps further confirming the ample presence and use of water in this context. Space 31 immediately to the south, and possibly connected to Space 32 via a small doorway, may have been an area of cooking and food processing, this suggested by the discovery of a curving burned brick fire installation on the floor of Space 32, found in conjunction with cooking pot sherds. In contrast, the smashed cluster of smaller serving bowls and cups uncovered in Space 37 to the east points to a place of possible food consumption.

Space 36 in the northeast corner comprised a thick layer of cobbles set into a kind of clay matrix, forming what was probably an outdoor surface. Interestingly, it was in this sector of the trench that some suggestion of an earlier phase could be discerned. The cobbles of the pavement run under nearby Walls 25 and 26, indicating that these walls, and the rooms they enclose, were constructed at a later date. Nevertheless the cobbled pavement in Space 36 runs up and against the walls 28 and 29, suggesting that these walls are contemporaneous with the first use of the pavement and belong to an earlier phase.

Spaces 34, 32, and 37 are thought to be contemporaneous, and they may have been destroyed in the same conflagration event. The fact that Space 37 exists at a lower elevation than Spaces 34 and 30-32 is probably best explained by the downward slope noticeable in the area, and the fact that Space 37 was constructed on a lower terrace than the other spaces.

Figure 7.3. Iron Blade (Small Find #817, Context #2011).

The southeastern corner of Trench 14, labelled as Space 65, proved to be the most interesting yet most enigmatic of areas in the trench. A thick layer of stony rubble was found strewn over this area, together with amounts of rich ashy soil, animal bones and pottery sherds. It is conjectured that some or all of this material could have been rubbish thrown from the room spaces to the west and north. Also found within this rubble were significant small finds, including a bronze ring, and an iron blade with long tang (Fig. 7.3; SF#817, Context #2011). Along the southern side of Space 65, where excavations probed somewhat more deeply, a cluster of pots were found in situ amid a great deal of dark, rich organic soil (Pot Clusters #1-#8 in Context #2011J). As the base of Wall 75 is at a higher elevation, it is conceivable that these pottery vessels pre-date the lifetime of that wall and the spaces it encloses (Spaces 30-32) although future investigations will be needed to confirm this phasing. Finally, the extreme south-eastern side of Space 65 has been intruded upon by a pit or overlay of Sasanian period debris consisting of stony rubble, Sasanian pottery fragments, and other later artefactual remains (e.g. fragments of clay tobacco pipes).

Besides the excavations in Trench 14, another goal for the 2017 field season was the implementation of photogrammetric recording of architectural features and archaeological deposits. At its essence, photogrammetry is the ability to derive metrological and descriptive data from multiple analogue and digital images. In Trench 14, this was accomplished by capturing a series of photographs of the subject area with a digital single-lens reflex (DSLR) camera and by using computer software to edit and process them. Images were georeferenced using a system of coded markers in the photographic field of view. These markers were then assigned spatial information by our total station (Nikon Nivo 5M+). Off site, Adobe Photoshop CC 2017.0.1 and Agisoft PhotoScan Professional 1.3.1 were used to edit the images, render geo-referenced 3D models, and generate orthophotos (photogrammetric images that are geo-rectified, that is, geometrically corrected, so that the scale is uniform) that can be imported into ArcGIS for use with other geographic data. As a result, this work produced a comprehensive suite of accurate visual documentation of this year's archaeological findings - primarily, architectural features, such as walls, and pottery deposits. Furthermore, stone-by-stone tracing of photogrammetric orthophotos produce architectural plans and sections that are more accurate than scale drawings generated by traditional, non-digital methods like tape-and-offset. In addition to its relative ease and accuracy, photogrammetric plans can be produced in the post-season, and, thus, allow more efficient use of time in the field – time that can be spent excavating instead of drawing. Preliminary results of our photogrammetric data look promising as we continue with our post-season processing and analyses.

Chapter Eight: Conservation at Bestansur, 22-27 April 2017

Julie Unruh

Introduction

It was truly a pleasure to participate in excavations at the archaeological site of Bestansur from April 22 through April 27, 2017. I am grateful to the co-directors for giving me that opportunity: Professor Roger Matthews and Dr. Wendy Matthews of the University of Reading, and Kamal Rasheed Raheem, Director, Sulaimaniyah Directorate of Antiquities and Heritage. Additional thanks go to the government representatives and to all members of the Bestansur team. All were welcoming and helpful.

The Bestansur excavations are part of the larger Central Zagros Archaeological Project, a multi-site project investigating Early Neolithic societies of the eastern Fertile Crescent. Bestansur excavations focus on the Pre-Pottery Neolithic B levels (a separate team is excavating Neo-Assyrian levels nearby). While I was on-site, work concentrated primarily on Building 5, a mudbrick and plaster construction believed to be a public and ritual space, dated to approximately 7760 BCE. As is PPNB convention, the structure contains burials cut through the floors; however, this building - the largest known for the date - contains an unusually high number of burials and infants.

The conservation objectives for the week were to:

- Gain an understanding of the site conditions and site conservation needs in order to provide assistance with long-term preservation
- Assist with excavation of fragile material
- Assess the storage conditions for excavated objects
- Treat unstable objects.

My time at the site was split between working in the field with the excavation team, and working at the excavation house to examine excavated objects and revisit previously excavated objects. In the field, significant time was spent consulting with Wendy Matthews and osteologist Dr. Samantha Walsh regarding safe retrieval and preservation of the architecture and human remains. Observations resulting from those discussions are reported in the *Site conservation and the excavation of fragile objects* section below. Other projects included lifting an intact animal horn with the help of Sam Walsh and Kaycee Herrick (see *Bone and horn material*), taking preliminary measurements to characterize the matting on the floor in context 1877 (see *Matting remains/evidence for matting*), and lifting or assisting with lifting approximately half a dozen unidentified clay objects and experimenting with a revised technique for doing so (see *Clay objects*). In the excavation house, 19 objects were treated or examined over the course of the week, including two objects from the Neo-Assyrian team. The most major treatments were the mould remediation discussed in the *Preventive Conservation and Storage* section. Other projects included testing consolidants for stabilizing lifted sections of plaster containing matting impressions, and testing the removability of the facings applied to three block lifts in 2014 (see *Matting remains/evidence for matting*).

A highlight of the week was a visit to the Slemani Museum kindly arranged by the co-directors. It was a great pleasure to see Slemani Museum conservator Nyan Nassar again, to unexpectedly reconnect with visiting conservator Carmen Gütschow, and to meet their conservator colleague Akam. Slemani Museum Director Hashem Hama subsequently facilitated a visit to the site for Nyan, Carmen, and Akam. Since Nyan had participated in the Bestansur excavations in 2014, it was particularly gratifying that she was able to visit. Carmen will be at the Slemani Museum until the end of the excavation season, and may be a useful contact.

Dr. Amy Richardson, Project Manager, has a copy of Carmen's business card should her contact information be needed.

Site conservation and the excavation of fragile objects

Conditions at the site April 22-27 were damp to muddy. No soluble salts activity was identified on-site; however, in wet conditions, salts will be solubulized and mobile rather than crystallized and efflorescing. Low salt levels may be indicated by the fact that no efflorescence was observed on dried artifacts or block lifts. A conductivity meter can be brought on-site site in future seasons to quantify the soluble salt content of the soil.

In previous seasons the pH of the soil was determined to be slightly above 8, or alkaline. Additional measurements at new, deeper levels could provide updated information and may help to predict the condition of excavated bone in particular. PH testing could be done in the field with a pH meter or pH test strips.

Mudbrick and plaster

Mudbrick and plaster present considerable conservation challenges with no satisfactory solutions. Decades of research have identified materials and methods that are ineffective or harmful, but few materials or methods that are conclusively effective, other than backfilling. Very broadly, current knowledge could be summarized as:

- If features are damp when excavated, keeping the features damp will prolong their preservation in the short term. In particular, plaster can crack and spall within minutes of excavation if it dries quickly.
    - As was noted by Jessica Johnson in her 2014 conservation report, the shelter over the site is extremely beneficial in preventing rapid drying.
    - On site, the excavation uses plastic and aluminium foil covers over fragile features to prevent sensitive materials from drying rapidly during excavation, an appropriate and recommended approach. However, it was observed that liquid water pools underneath the plastic and aluminium foil, at times creating actual puddles. Caution should be exercised with covers as some features can be damaged by standing water. Some excavations use Gore-tex® fabric temporary covers: Gore-tex® is breathable but will still slow evaporation of moisture. It is somewhat more expensive than plastic or aluminium foil, but can be reused indefinitely.
- Backfilling prolongs preservation of mudbrick and plaster by preventing drying and providing support. The backfill must be correctly constructed to provide support and maintain capillarity. In other words, there must be good contact between the feature and the soil or sandbags used to support and cover the feature, and ideally, the construction would allow ground water to migrate away from architecture surfaces rather than being trapped at the feature/backfill interface.
    - Temporary, partial backfilling prolongs preservation of features that are exposed but not actively being excavated. The team already employs appropriate temporary "backfilling" in the form of sandbagging. See below for a discussion of capillarity.
    - The large plastic bags that are used as sandbags may allow some moisture movement (as is preferred). If they are actually woven, the small gaps between elements will allow the movement of moisture, but be cautious: bags are sometimes printed with a "woven"

pattern rather than being actually woven. One bag examined in the field did appear to be woven – this should be double-checked. A material specifically engineered to allow moisture movement, such as geotextile, would be preferable to plastic in backfills.

  - At the end of the excavation season, trenches are lined with plastic sheeting and then backfilled. Water accumulation is manageable during active excavation, but it would be best to prevent the accumulation of liquid water in direct contact with fragile features in a year-long backfill. A system was proposed whereby certain fragile areas would be locally covered with geotextile, a small 3 - 5 cm layer of soil would be laid on top of the geotextile, and then the plastic sheeting would be laid over the soil. The idea is that the permeable geotextile would promote capillarity away from the artefacts; while water would still likely pool on the underside of the plastic sheeting, it would do so 3 -5 cm away from the feature. This system is experimental.

  - Good contact is necessary between features and the backfill to provide physical support. Air pockets between the feature and the backfill cover should be avoided: within air pockets, water may accumulate and/or salts may efflorescence on the surface of the feature, both harmful.

- Consolidation of in-situ mudbrick and plaster with polymer consolidants or resins has proved more destructive than beneficial. Research continues, but until a method conclusively demonstrates benefits and long-term stability, it is recommended to avoid the application of polymers or resins to in-situ features.

  - There may be exceptional situations in which it would be desirable to apply a consolidant to promote short-term preservation. If in-situ features are consolidated, recognize that the benefits are likely to be temporary and that ultimately damage may result. Wendy Matthews alerted me to the fact that Ashley Lingle at Çatalhöyük is researching a polymer consolidant, Paraloid B-44. Caution is advised as Paraloid consolidants have not performed well in previous studies, but it will be useful to follow her work.

- There are obvious drawbacks to removing architectural elements from their contexts; however, lifting can be a way to promote long-term preservation of small sections of important features. It is easier to preserve a detached section of mudbrick and plaster than it is to preserve it in situ. Once disconnected from the architecture, the section can be dried in a controlled manner, and will no longer be susceptible to rapid wet/dry cycles, groundwater, and salts.

  - Wendy Matthews' method for cutting block samples for micromorphological analysis worked great to remove one section of floor. For small lifts, that method is useful and recommended. However, that method utilizes non-archival kitchen roll and packing tape wrappings, on the theory that they are temporary wrappings. Over time, the paper will embrittle, weaken and disintegrate; the paper may encourage pest infestation, including mice; and the tape will lose adhesion and may cause staining. At worst, the paper and tape adhesive may cause damage to the block or to nearby objects in storage. If this method becomes protocol for block lifts that will be kept in storage long-term, it will be worthwhile to substitute materials that are more stable and less attractive to pests. A number of options exist and can be tested for workability in the future.

- If larger sections need to be lifted, the excavation would benefit from keeping a large, thin support on hand. Additional block lift supplies can likely be sourced locally, but plan for a time delay while supplies are sourced and purchased.

Bone and horn material

As osteologist Sam Walsh is aware, a major preservation concern with bone material is to prevent rapid changes in moisture content so as to prevent fragmentation and warping. Keeping bone material damp during excavation will prolong preservation, and also may aid in lifting, as water tension can hold lightweight pieces together. Post-excavation, slow drying will assist preservation.

Many of the observations about the excavation of mudbrick and plaster apply to the bone material as well.

- The shelter over the site is extremely beneficial in preventing rapid drying, and the team uses additional local covers during active excavation, generally plastic or aluminium foil. Care should be exercised to prevent pooling water at the surface of bones. Consider Gore-tex® covers as a possibility for the future.

- The proposed backfilling system utilizing local geotextile cover, a small 3 - 5 cm layer of soil, and then the plastic sheeting, would be expected to move standing water away from bone material. It is recommended over what may be a plastered skull. Establish good contact to prevent air pockets at the surface of the bone material, in order to discourage water accumulation and/or salts efflorescence on the surfaces of the bone.

- Sam Walsh is testing 5% Paraloid B-72, an acrylic polymer, as a possible bone consolidant in a situation in which the preservation of the morphology is critical. (In one study B-72 was found to not impede stable isotopic analysis.[1]) Depending on her experience, that system can be refined as needed for the future.

- During my week on-site an animal horn was lifted. The horn had been completely exposed prior to lifting so that it lacked supportive soil on the sides. A better lift might have been possible had the object been left fully supported within a block of soil; alternatively, the lift might have been postponed until supplies were obtained to cast an expandable foam support or a plaster casing. It will not always be clear that an object will need lifting until it is largely exposed. However, if fragile bone or horn material will be lifted, it will be helpful to think through the lifting method in advance of complete exposure. This observation is particularly directed towards what may be a plastered skull.

Pigment

Red pigment has been discovered both in association with artifacts and loose in soil. Blackened bone has also been uncovered; in the examples observed in 2017, it was unclear whether the black was deliberate pigment or darkening of the bone due to burning or microbial activity, and that material deserves further investigation.

One example of red pigment adhered to bone was examined in at the excavation house. In that instance, the pigment was well adhered to the bone, and it seemed unlikely further action would be needed to keep the pigment in position provided the object received careful handling.

Because loose pigment was anticipated, Klucel G, a hydroxypropylcellulose commonly used in conservation to consolidate powdery pigment, was brought to the site and added to the conservation supplies. Should it be needed, it can be made into either an aqueous or alcohol solution, and should be compatible with wet soil and bone.

Matting remains/evidence for matting

Both in 2014 and in 2017, sections of floor plaster were excavated preserving evidence of reed matting. The evidence takes the form of organic material, phytoliths, dark humic or microbial staining, carbonized material, and impressions. One instance, from context 1877, appeared to be pigmented red.

- The approach to preserving matting evidence varies with the situation. Organic material contains molecular data that would ideally be kept uncontaminated, and organic reeds and phytoliths ideally would be kept uncoated by consolidant so as to not impede microscopic examination and possible species identification. If possible, those remains should not be treated with any consolidants. Plaster impressions, however, may need consolidation in order to remain coherent for lifting. In one test conducted on an excavated chunk of plaster, Primal WS-24, an aqueous acrylic dispersion, worked well (by contrast, Klucel G did not, and Paraloid B-72 was reported by Jessica Johnson to be problematic due to the wet conditions on-site). While Primal WS-24 is NOT recommended for large scale consolidation of features, if isolated local consolidation is necessary, this polymer will be compatible with the wet soil conditions and could be used. Dilute the WS-24 to about 25% with distilled water or a water/ethanol mix. It will dry slowly; allow the polymer to dry completely before handling. Again, it is best to avoid consolidation unless absolutely necessary.
- A number of floor sections with evidence of matting have been lifted to date. Several block lifting methods have been employed (and others could be employed). In addition to the block lifting observations above, note that Paraloid B-72 and tissue paper facings were used in 2014. Preliminary testing in 2017 indicated that those facings will be time consuming to remove. For that reason it is recommended to avoid adhering facings directly to matting surfaces unless necessary (to retain positions of fragmented plaster, for example).
- It would be informative to track the matting measurements to determine whether matting construction is similar site-wide.
    - As one example, the matting in context 1877 was tracked over approximately 50 cm2 of surface. Preliminary measurements taken in five locations indicate one or possibly two mats, with a balanced weave structure that may be a plain weave but was not clearly seen in the field. In four locations the average width of the reeds in one system of elements was approximately 2.80 mm wide; in the second system, 2.56 mm wide. A reliable count per centimeter was not obtained for the first system, but in the second system averaged 3.62 reeds per centimeter, indicating a moderately tight weave. To the west of those locations, a fifth location exhibited similar but slightly different measurements, which may or may not indicate a separate mat. At that location, the average width of reeds in one system averaged 3.31 mm wide, and in the other, 3.17 mm wide. The first system exhibited 2.80 reeds per centimeter; the second, 2.68 reeds per centimeter, indicating a more open structure. If the measurements signify two mats, the weave structures of the two were more or less in alignment on the floor. It is emphasized that these measurements are preliminary and were calculated from very few measurements. Further study and more data are needed to confirm these observations.

Clay objects

Fragmentary unbaked or low-fired clay forms are common. Forms range from thin, almost two- dimensional shapes that are most clearly seen as outlines in the soil, to broken fragments, to larger lumps. The more solid three-dimensional shapes can be carefully lifted without special techniques, but they are fragile, and care should be taken in packaging them for transport, for example, by securing them within tissue wrappings before placing within a Ziploc bag.

The flat forms and the fragmentary pieces present more of a challenge. In 2014, Jessica Johnson recommended lifting these objects using an applied facing, a good recommendation. In 2017, tests were performed with using a 25% solution of Primal WS-24 in ethanol and water as a consolidant, applied without a facing. For the clay objects lifted during the week, consolidation (without a facing) was adequate to hold the objects together for lifting. If lifted with a small amount of supportive soil, a form-fit aluminium foil wrapping provided enough support to prevent fragmentation. Take care with aluminium foil: it can be abrasive.

The excavators were given a quick training session in how to use WS-24 and a small vial of solution plus droppers and a syringe were left with Amy Richardson for their use.

- Practice is needed to lift these objects safely. The more the excavators can lift, the better they will become at gauging the level of consolidation/facing and support needed, and the more comfortable they will become with the techniques.
- The outlines of some of the objects can be very clearly observed in situ but less clearly mapped after excavation. For that reason, photographs may be the best way to document the form of the most two-dimensional objects, rather than relying on the lifted objects themselves.

Preventive conservation and storage

Preventive conservation strategies

Preventive conservation is the preferred first line of defence for all heritage preservation. Simply put, preventive conservation manages conditions so that deterioration does not occur in the first place.

Preservation of an entire site or collection is improved, and the necessity for time-consuming individual conservation treatments is reduced.

The Canadian Conservation Institute has identified ten agents of deterioration (see http://canada.pch.gc.ca/eng/1444330943476). While all pertain to the excavation house storage, priority was given to identifying whether relative humidity requires remediation in the form of microclimates. Monitoring the stored samples for pest activity and taking care to insure that breakage is not promoted by incorrect samples or crates stacking would be particular concerns in future work.

Storage at the excavation house

During the week of April 22 – 27, the relative humidity in the excavation house storage area measured between 36% and 67% (measured at times of the day during which hot showers were not thought to be a factor). Mould becomes active at approximately 70% RH, so the measurements indicate that active mould growth in storage could be expected. Wendy Matthews reports that aside from the mould inside plastic enclosures noted below, mould has rarely been observed on objects in storage. Precautions are recommended nonetheless.

In April, the site and excavated materials are damp. It is strongly recommended that all materials be dried as well as possible prior to packaging for storage, in order to prevent local pockets of high humidity.

Unfortunately, it is also strongly recommended that most objects are dried slowly to prevent cracking. With limited time during the season, those two goals may not be compatible. However, mould growth can be discouraged by promoting air circulation: for example, by putting holes into plastic Ziploc bags and other containers, or by not wrapping objects in airtight or waterproof materials. The storage area is not climate controlled, so if needed, low RH microclimates could be built to house specific objects to control mould activity.

Four block lifts and plaster samples lifted in 2014 were thought to be growing mould. They were examined under magnification. Sample #2257 and SF #524 exhibited copious white mould on visible surfaces; the white spots on Samples #2209 and #2241 appeared to be bloom associated with the consolidant rather than mould. The two block lifts exhibiting mould had been stored inside closed plastic containers and had possibly been put into storage while damp. The mould was temporarily mitigated with 70% ethanol. However, mould spores remain in the objects and in high humidity, the mould is likely to return. These two objects should be re-evaluated next season to determine whether microclimates may be helpful.

Conservation treatment and recording

All conservation treatment or object examination by the conservator was recorded in a 2017 Conservation Treatment Records Excel spreadsheet which was given to Project Manager Amy Richardson prior to leaving the site. Through an oversight, the 2014 and 2017 conservation records were entered into separate Excel spreadsheets. In future seasons, an effort should be made to combine all records from all seasons into one digital file. Ideally, conservation information will eventually be linked to the excavation small finds and inventory records, so that conservation treatment information is immediately apparent to researchers without the need to access a separate file.

The conservation supplies were inventoried on a separate Excel spreadsheet, also given to Amy Richardson.

Recommendations for future work

Suggestions for conservation work next season include:

- determine the pH and soluble salt content of the soil at several levels to inform site preservation efforts
- assess the effectiveness of the local geotextile backfill system, if used
- lift what may be a plastered skull
- assess storage conditions for materials stored at the Slemani Museum
- assess stored crates for evidence of pest infestation or breakage due to stacking and remediate as necessary
- re-visit the mould-infested matting blocks to determine whether they require microclimate storage to control mould growth, and construct enclosures as necessary
- remove the facings from the 2014 block-lifted matting
- if needed, work with Sam Walsh to refine a Paraloid B-72 bone consolidation solution. With experimentation, it is believed that the proportions of the solvents can be adjusted to work more optimally with the damp site conditions.

In 2014, Jessica Johnson mentioned partnering Western-trained conservation students with Iraqi students to allow both to benefit from the fieldwork opportunity. This option could be pursued; however, I would caution against unsupervised student work.

A Bestansur exhibition at the Slemani Museum has been proposed. Depending on the anticipated timeframe for installation, it may not be too early to begin curating the objects for display, designing the exhibition, and stabilizing objects for exhibition.

A large challenge facing the excavation is the preservation of the mudbrick architecture, particularly if long-term goals include tourism. To state the obvious, determining the best way to both preserve and interpret the site and mounting any large-scale site preservation efforts will require careful forethought, planning, and fundraising.

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