Central Zagros Archaeological Project

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

22nd March – 27th April 2014

Archive Report

View of Bestansur from the south, Trench 10 visible centre right.

Preface

A fifth season of excavations at the site of Bestansur took place in Spring 2014 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 is 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'.

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. Our government representative, Kamal Rouf Aziz, gave support and advice in a great many ways as well as serving as a key team member. We also thank the villagers of Bestansur who worked with us on site and looked after us in the Expedition House.

The Spring 2014 team comprised:

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Nedal Haj Darwich	Independent	Excavation

The following report is a preliminary, provisional account of the results from the Spring 2014 season, produced for distribution to the Sulaimaniyah, Erbil and Baghdad Directorates of Antiquities and Heritage, and is not intended for publication.

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Chapter One: Research Issues, Strategy, Methods

Roger Matthews, Wendy Matthews, Kamal Rasheed Raheem

Aims, objectives, issues

The aims and objectives of the project are:

1. To investigate issues in the transition from hunter-forager to villager-farmer in the central Zagros region by the application of a full range 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 six seasons of excavation at the Neolithic site of Bestansur and two seasons at Shimshara, 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. Excavated deposits are quantified, sieved, floated, sampled, and processed for recovery of lithics, ground-stone, clay tokens, figurines, faunal and botanical remains (macro and micro), phytoliths, molluscs, 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 and Wendy Matthews with the CZAP excavation team

Introduction

For the Spring 2014 season, all our excavation efforts were concentrated in Trench 10. Our previous work in Trench 10 had exposed a large building, Building 5, constructed of red and white pisé and composed of a series of rooms, including a large oven (see CZAP Archive Report summer 2014). We had also articulated significant traces of an underlying building constructed of boat-shaped mud-bricks, Building 8. In the Spring 2014 season we extended Trench 10 to excavate a total area of 20 x 12m, thus recovering almost the entire plan of Building 5, except for its north-western extremity. We recovered partial plans of adjacent buildings, in particular Buildings 9 and 10 to the north-east and north of Building 5 (Fig. 2.1).

We continued to excavate disarticulated deposits of human remains under the floor of Space 50 in Building 5, which will require further excavation in summer 2014. As with previous archive reports, we begin this report with the earliest excavated levels of the trench.

Sounding in Trench 10 (Mathew Britten)

In the Spring 2014 season, excavations continued into a 2x2m sounding in the south east corner of Trench 10, east of the mound. Previous investigation into the sounding had already yielded a number of rich deposits and had suggested an open external area, but had not reached natural. Excavations were continued to investigate some of the earlier deposits below the wider excavation of Trench 10. This investigation into the sounding was aided by a number of cores and column samples taken by Dr Rob Batchelor, and micromorphology samples collected by Dr Wendy Matthews.

The earliest deposit excavated in the sounding this season was C1772, a rich ash layer and, characteristically of the sounding, the deposits were particularly wet, aiding good preservation of large animal bone many of which sent for sampling and further analysis with Dr Robin Bendrey. Above this ash was a plaster floor, which had survived poorly in parts, revealing C1772 in the South East corner of the sounding. A later phasing of this plaster C1768 survived more widely spread, covering almost two thirds of the 2x2m sounding. The south section (facing north) included large remains of plaster, suggesting that this later phase of plaster C1768 would have continued over C1772. The plaster layer C1768 followed the trend of other deposits in the sounding sloping from the North down to the South East corner. Within the plaster, clay shapes could be seen, although some were fragile and unliftable. Covering both the plaster layer C1768 and the rich ash C1772 was another layer of rich ash C1752. This context produced a large amount of chipped stone and debitage, identified in excavation and heavy residue sampling. Covering C1752 was a thick layer of clay packing C1751. The packing accounted for and modified the steep slope of the sounding, with deeper deposits in the South East and shallow packing in the North. Above this, the stratigraphy excavated became more complex, above C1751, was an ash layer C1749 containing a high volume of lithics and chipped stone, as well as larger stones that continued around the sections of the sounding, however the ash and associated finds were confined to the South East corner of the deep sounding. The first context excavated, and therefore the latest in the deep sounding investigations of Spring 2014, was C1738, another large layer of clay packing (similar to C1751), but also included a thin lens of ash C1740. This lens of ash is clearly traceable within the sections in the sounding.

A large amount of sampling took place within the deep sounding, including micromorphology by Dr Wendy Matthews, and core and column samples taken by Dr Rob Batchelor. Due to the rich characteristics of many of the deposits, and the high yields of lithics and chipped stone, many of the contexts were sent for flotation and heavy residue analysis. The sampling method varied due to the context requirements, but consisted of both whole-context sampling, and spatial sampling across the slope of the deep sounding.

One challenge presented by the deep sounding was the occurrence of clay shapes, particularly in contexts C1768 and C1751. Many were crudely shaped and of poor preservation, which challenged the methods of excavating them carefully.

Trench 10, Building 8

This season we did not excavate rooms and features of the underlying mud-brick building, Building 8. Removal of occupation deposits, floors and packing in several areas of Building 5 did, however, reveal further walls of Building 8, in particular in the western area of the trench, as illustrated in Fig. 2.1. It is notable that Walls 69 and 72, underlying the floors of Spaces 60 and 63, both have burnt plaster faces, suggesting *in situ* burning of the small room located between these two walls. We will investigate this and other spaces of Building 5 in future seasons.

We were also able to trace a northern extension of Wall 47 under the floors and packing of Space 50, and at the north end of Space 50 we traced one edge of a wall, Wall 73, which appears to delimit a large space of Building 8. We need to remove further packing from the rest of Space 50 before we can recover more of the plan of Building 8, a major aim for next season. The break in slope depicted in the plan (Fig. 2.1), running through the middle of Space 50, is aligned with the eastern edge of Wall 47, and may result from differential slumping of packing and floor deposits of Building 5 according to their position overlying walls of Building 8.

Trench 10, Building 5

Apart from the sounding, excavation in Trench 10 was focused on investigation of deposits in Building 5 and adjacent areas. Expansion of the excavated area of Trench 10 to the north and west exposed additional rooms, Spaces 60 and 63, and almost the complete plan of Space 50 (Fig. 2.1). Clean occupation deposits, floors and packing were excavated in Spaces 60 and 63, revealing underlying walls of Building 8. There also appears to be a doorway between Spaces 50 and 60 but the wall is disturbed by a pit at this point.

The bulk of our excavation effort during the Spring 2014 was invested in excavating collapse, occupation levels, floors, and packing deposits in Space 50 of Building 5 (Fig. 2.2). Space 50 is very large, covering *ca*. 8 x 4.5m in area. The packing deposits underlying the floors of Space 50 contain multiple deposits of disarticulated human remains, including many skulls (see Chapter Four), the excavation of which required painstaking attention (Fig. 2.3). The packing deposit itself may be interpreted as either a closure of the underlying structure, Building 8, or a foundation deposit for the overlying structure, Building 5, or both. No evidence for cuts through the floors of Building 5 have been observed to support the idea that the human remains were deposited episodically during the lifetime of Building 5 [n.b. evidence for cuts has been identified in subsequent excavations and analyses: see Archive Report 2017]. Rather, the human remains appear to have been deposited as discrete episodes of activity during the deposition of levelling and packing material between the two buildings. We also excavated a separate deposit of human remains, with associated clay beads, in the upper fill of Space 50, Context 1714, which may indicate a recurring association of Space 50 with human burial at the closure of Building 5.

Overlying the packing, we excavated the main floors of Space 50, consisting of a white/pale grey plaster in at least two phases. Beneath the floor a skirting of small angular pebbles was laid along all the inner wall faces of Space 50, to a width of *ca*. 10cm. Thick deposits of collapse, including fragments of wall with attached plaster, were excavated from above the floors of Space 50.

Taken together with last season's work, ongoing excavation of Building 5 is providing a detailed picture of Early Neolithic activity in and around a large building which appears to have a special character (Fig. 2.4). The association of multiple disarticulated human remains, many of children and infants and featuring multiple skulls, suggests a sacred nature to this building and arguably also to the underlying Building 8.

Trench 10, Building 9

We excavated occupation deposits and floors in Space 53 of Building 9 (Figs 2.1, 2.5), with much evidence for burning and ash. There were distinctive finds of ground stone and chipped stone from deposits within Space 53 (see Chapters Eight and Ten). A major pit, Context 1776, is the latest excavated feature in Building 9, at the north-eastern limit of the excavated area. A sizeable Fire Installation, F17, sits at the junction of Spaces 53 and 61 in Building 9.

Trench 10, external areas

We excavated some deposits in areas external to Building 5, in particular in Space 44 to the south-west (Fig. 2.1). A substantial Fire Installation (F16) and associated ash deposits and surfaces were partially excavated (Fig. 2.6). Sloping external deposits were also excavated in Spaces 27, 43 and 44.

Conclusions: a Neolithic neighbourhood

It is notable that each of the planned buildings in Trench 10 (Fig. 2.1) has its own external walls, without use of party walls, an attribute common to multiple Neolithic sites of the Near East. Each building is also built of consistently distinctive materials, with Building 5 made from red and white pisé, Building 9 from brown mud-bricks in yellowish mortar, and Building 10 from reddish-brown bricks. These traits are suggestive of a distinctive identity for each building within this part of the site, and perhaps also for the groups of people constructing and using each building. The recovered architectural plan from Trench 10 allows us for the first time to begin to envisage a Neolithic neighbourhood at Bestansur, dating to *ca*. 7700 BC at least. A major new phase of extensive excavations at the site will be required in order to articulate and address important issues such as the social constitution of Neolithic neighbourhoods at Bestansur and their role within the broad narrative of early village life.

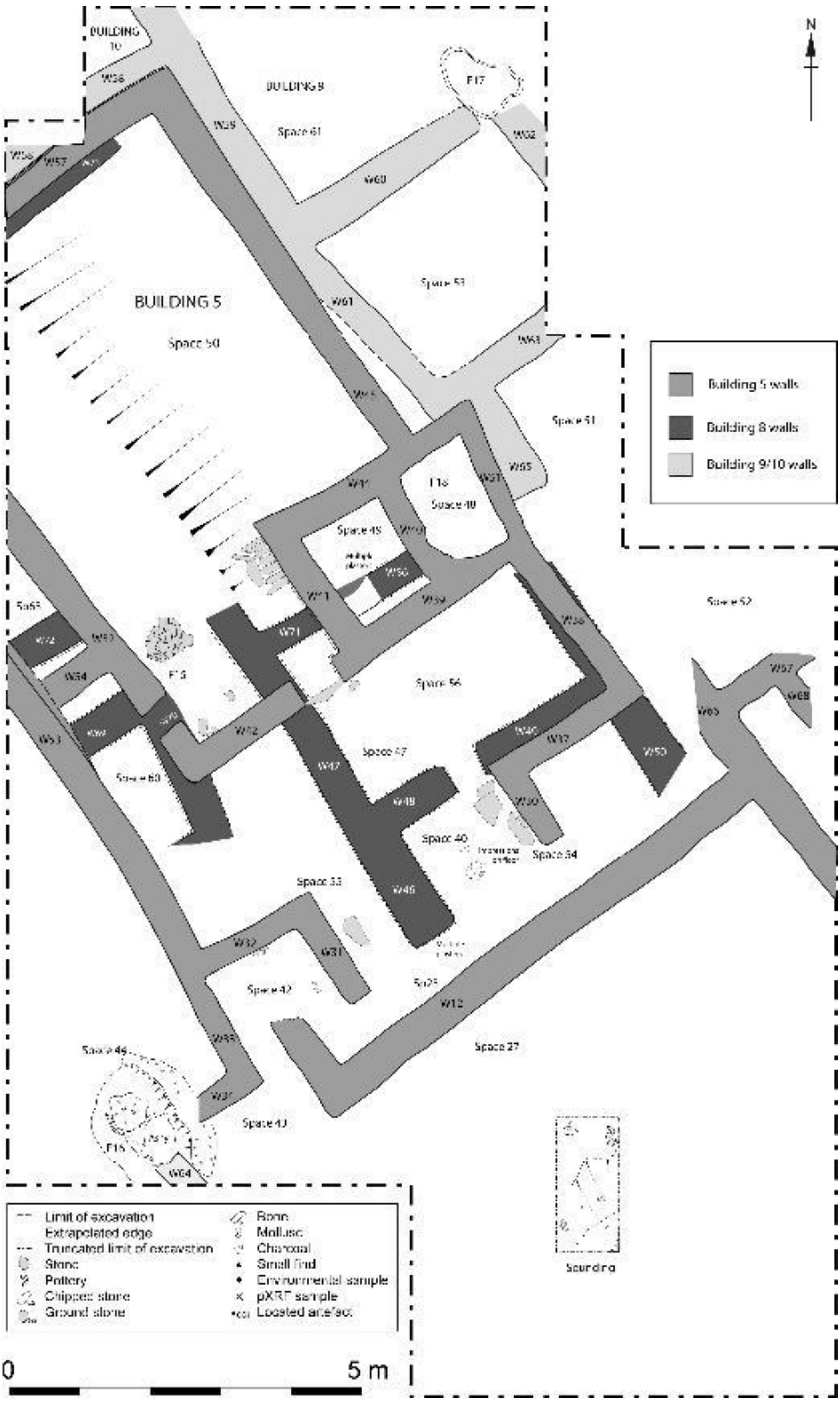


Figure 2.1. Composite plan of excavated walls, spaces, and features in Trench 10.

Figure 2.2. Excavations in Space 50, Building 5, looking south-west.

Figure 2.3. Excavation of human skull in Space 50, Building 5.

Figure 2.4. View of Building 5, from north end of Space 50, looking south-east.

Figure 2.5. Excavations in Space 53, Building 9, looking east.

Figure 2.6. Fire Installation F16, Space 44, looking south.

Chapter Three: Architecture, Traces of Activities and Site Formation Processes

Wendy Matthews

Research context and rationale

Current excavations at Bestansur are significantly revising our knowledge of the extent and complexity of architecture in the early eighth millennium BC in the eastern Fertile Crescent. Excavations in Trench 10, in particular, have revealed a cluster of multi-roomed buildings that abut each other (Chapter 2; Fig. 3.1).

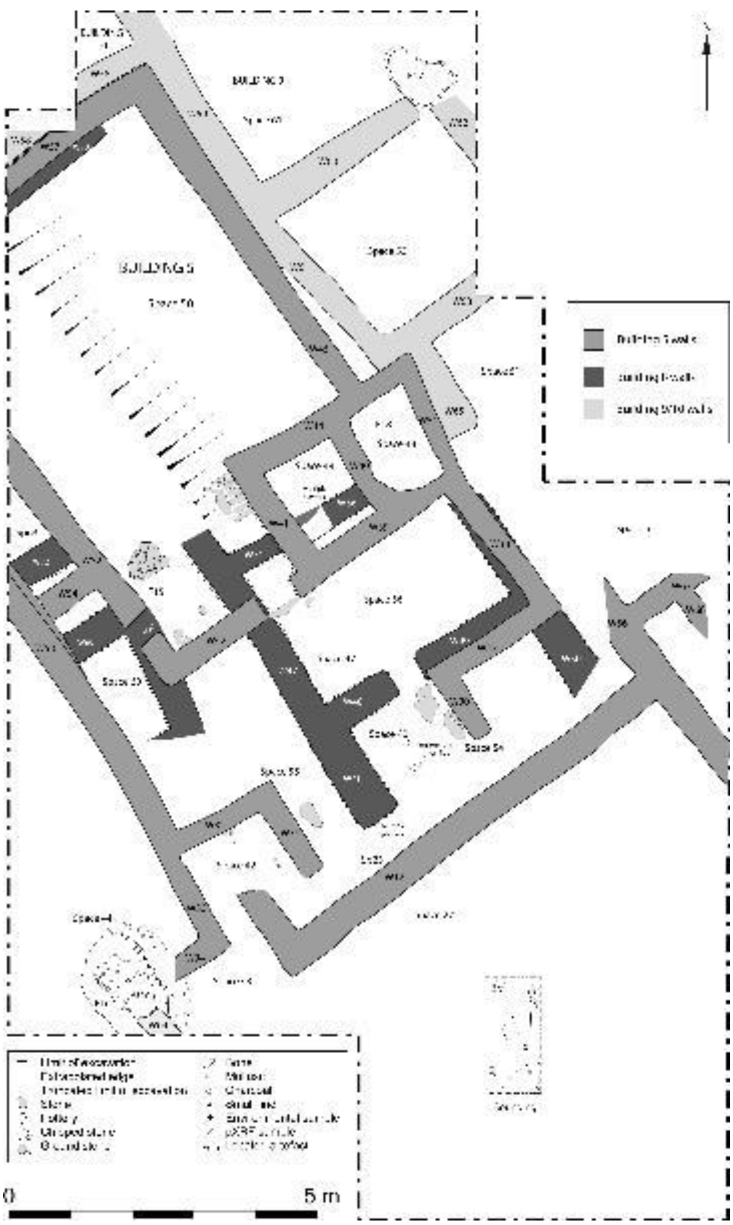


Figure 3.1. Composite plan of Buildings and features in Trench 10 at the end of Spring 2014.

Research aims and objectives

In Spring 2014 the aim was to excavate the upper red pisé building, Building 5 and to reveal more of the underlying painted mud-brick building, Building 8 in preparation for future excavation.

The aim in micromorphological sampling for microscopic analysis of deposits was to investigate:

- Early architectural technology
- History of activities, roles and relations within the built environment in this area of the site
- Site formation processes and earlier activities in the lower levels of the site in the sounding.

The data-set

Eleven blocks of deposit were collected and exported for microscopic analysis in large resin-impregnated thin-sections 14 x 7 cm (Table 3.1).

Table 3.1. Block samples for micromorphological analysis collected in Spring 2014.

Sample #	Context #	Trench #	Description
2297	1757	10	ashy deposits in Space 53
2298	1767	10	ashy deposits in oven F16
2300	1775	10	packing, surfaces and building fill in Space 50 (W Centre)
2301	1775	10	packing, surfaces and building fill in Space 50 (NE)
2302	1772	10 Sounding	ashy deposits (lowermost)
2303	Wall 64	10	green mud brick and pale brown mortar
2304	1740, 1749	10 Sounding	occupation deposits
2312	1755	10	deposits in external area Space 44
2313	1786	10	surfaces and occupation deposits in Space 60
2314	1773	10	surfaces and occupation deposits Space 53
2315	1785	10	surfaces and occupation deposits Space 63

Fifteen spot samples of deposits were also collected and exported for analysis of architectural materials, phytoliths and pigments.

Research methods and approaches

In the field laboratory, spot samples of materials and deposits were analysed in a temporary mounting medium, clove oil, to study plant fibres, phytoliths and traces of matting using a Leica DMEP at magnifications of x40-400. Surfaces of floors, traces of matting and charred plant remains were analysed *in-situ* in non-impregnated block samples using a stereo-binocular microscope at magnifications of up to x80.

The large resin-impregnated micromorphological thin-sections are currently being prepared and, although close to completion, are not ready for analysis for this archive report. All blocks were sub-sampled for spot phytolith and geoarchaeological analyses.

Phytolith samples are currently being prepared and analysed by Luna Gutierrez Castor as part of her undergraduate dissertation at the University of Reading.

Results to date

Microstratigraphic and architectural observations in the field are providing new insight into early architecture, the built environment and the range of activities, roles and relations at Bestansur. Pending forthcoming micromorphological analyses, we wish to highlight a number of observations.

Site formation processes and preservation

- Deposit and material preservation increases with depth from the surface of the mound, where there is less bioturbation and fluctuation in moisture and temperature. Deposits in the sounding in the south-east of Trench 10 appear to be better preserved and include a rich range of discarded materials including sequences of deposits with lightly burnt clay shapes, charred plant remains, bone, and molluscs below a stone layer (Fig. 3.2).

Architectural materials, technology and form

Our knowledge of the range of materials selected for buildings, walls and features continues to expand significantly with further excavation.

- In addition, increasing depth of excavation in Trench 10 has revealed some chronological variation in techniques:
    - The earliest phase excavated to date, Building 8, was constructed using boat-shaped thin-bricks of dark brown silty clay (CZAP Archive Report Summer 2013).
    - The latest phase predominantly comprises red silty clay-silty clay loam pisé walls with white calcareous inclusions across the site and for Building 5 in Trench 10. Contemporary buildings in Trench 10, however, were also constructed from green mud bricks (W64; Fig. 3.3) and pale brown mud bricks, Building 9.
- Increasing horizontal exposure in Trench 10, therefore, has revealed that some contemporary structures were built using specific materials and techniques that differ from those of adjacent buildings.
- Three constructed ovens were revealed across Trench 10, with at least one for each apparent building.
- A range of different materials were selected for rendering floors, walls and exterior surfaces. Of particular note this season was the hard very pale brown-whitish plaster used to cover sloping surfaces to the south east of Building 8, revealed in the deep sounding. The composition and technological production of these plasters will be investigated in collaboration with Prof Mathew Almond and an M4Chem student at the University of Reading. [Subsequently confirmed as fired-lime by IR Analyses (Godleman *et al.* 2016)]
- Mats were widely used across this area of the settlement. Traces of phytoliths from mats were uncovered and sampled this season from Spaces 50, 53 and 63, in collaboration with the conservation team and Kamal Raouf (Fig. 3.4).

Figure 3.2. Deposits with charred remains at the base of the sounding in Trench 10.

Figure 3.3. Mud brick wall (W64) with green mudbricks and slightly reddish brown mortar, Trench 10 (SW).

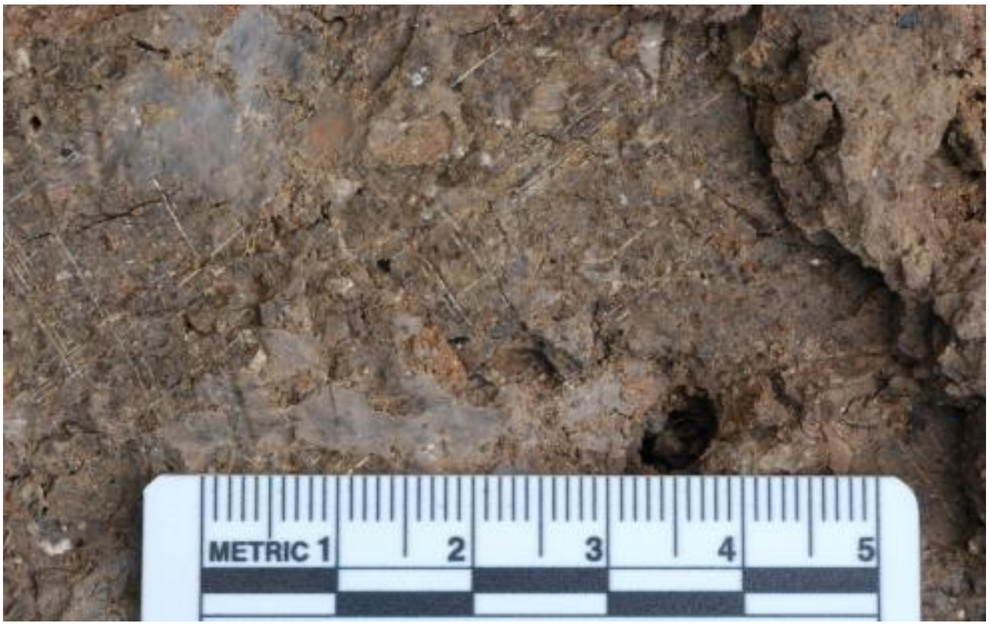


Figure 3.4. Traces of floor covering, C1746, Building 5, Space 50 (north), Trench 10.

Discussion

The diversity of materials and different mud brick and pisé types used in contemporary abutting buildings in Trench 10 suggests that construction was conducted by individual small-scale groups within the community who had access to different resource materials and arguably different technological knowledge and traditions.

The rectilinear architecture at Bestansur is contemporary with other rectilinear PPNB architecture across the Near East in the early eighth millennium BC. Preliminary analysis indicates resemblance of some aspects of the design and features to the later sites of Jarmo (Braidwood *et al.* 1983) and Yarim Tepe 1 (Merpert and Munchaev 1987).

Future directions

The micromorphological, phytolith and plaster samples will be analysed as soon as the samples are ready within the next month and fully published in the final report.

Chapter Four: Human Remains

Sam Walsh

Introduction

Previous seasons excavations revealed human remains in Trenches 7 and 10, which included a number of juvenile burials. The Spring 2014 season saw the continuation of the excavation of human remains in Trench 10, and the beginning of consistent analysis of the human remains from all seasons.

The aims for this season were to analyse 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.

Methods

The human remains were excavated following the standards of Brickley and McKinley (2004) and Baker *et al*. (2005). Human remains were found in various states of articulation and disarticulation. When the remains were scattered in fragments these were numbered and plotted in order to map bone elements that may relate to specific bone deposits. Some deposits appeared to be disarticulated 'bundles' of human remains; these were excavated and recorded in layers when possible.

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).

Spring 2014 burials: context and preliminary results

The burials from Trench 10 were almost all from Space 50. Both the adult and juvenile remains were highly fragmentary, were possible each bone was identified before being separately bagged and labelled to aid in later analysis.

Burial cuts were not visible, as the human remains seem to have been deposited in packing layers between floors, or on floor surfaces.

Fragments from C1708 and C1714 represent one adult individual; it was not possible to estimate sex as the remains were highly fragmented.These bones were still partially articulated (see plans) but had been disturbed by Iron Age pits (C1717 and C1723). The remains were associated with small shell beads.

SK1731-1 was discovered in the previous season near C1625. This was an extremely compact deposit of bone, which primarily contained the remains of a 5 to 8 year old. There were also small amounts of bone from an adult, an infant, and a neonate. Found in association with these remains was a dentalia bead, small shell beads and two cowrie shells (one of which was partial; see Chapter 9). The skull of the 5 to 8 year old was positioned in such a way as to indicate that it had rolled or fallen as the mandible was inverted. It seems possible that these remains were deposited in a bag or wrapping (Fig. 4.1).

Figure 4.1. Deposit of human remains from C1731.

The remains from C1731 give an MNI of four individuals.

SK1731-1,the remains of the 5 to 8 year old, were extremely compacted and fragmented. The upper central incisors and upper canines from this individual had repetitive LEH (Linear Enamel Hypoplasia, Fig. 4.2); this is likely to indicate that this child suffered a repeated sequence of malnutrition or illness, which interrupted the enamel growth (Hillson 1996, 165).

Figure 4.2. An upper incisor from individual 1731-1 with repetitive LEH.

SK1731-2, an infant, aged around 1 to 2 years. Some bones from this individual had concretions the same as on infant remains from C1623/6 and C1625.

SK1731-3 was a neonate represented by various fragments of vertebrae, pelvis and long bone. These remains potentially relate to disturbed material.

SK1731-4: there was an adult hand bone (capitate) from the area of the top of the skull of 1731-1, and also a rib fragment which was potentially also from an adult individual. This may also relate to disturbed material or to an adult skeleton, which was moved.

Directly below SK1731 was another skull of an infant SK1780. Excavation of the skull revealed other bones, this probably indicates that the rest of the skeleton is present but it was not possible to excavate this fully at this time. The dental development gives an age of 2 to 4 years.

A scatter of adult bones from C1754 (Fig. 4.3) and C1774 are likely to be from one individual, a possible female adult.These remains were spread over an area of four metres.

Near juveniles SK1731 and SK1780 was another juvenile, SK1783. This individual was potentially slightly disturbed by SK1731. This infant burial was articulated and can be said to be complete, the infant was aged around 7 to 12 months. SK1783 was positioned on the right side, facing the threshold and laid in a flexed position (Fig. 4.4). An area of different soil or material was visible around the right arm, this may relate to substance adhering to infant bones in C1623/6, C1625 and C1731.

After the removal of this individual another skull was just visible under the pelvis and femur of SK1783. This was covered in order for it to be excavated next season.

SK1784 was a cluster of adult bones to the west of SK1783; these at first appeared to be a random jumble of fragmented bones. Further excavation revealed a curving arrangement of ribs, upper limb bones, and pelvis bones. Later a skull and articulated leg was visible. SK1784 appears to be representative of at least one adult (possible female, Fig. 4.5). A humerus and ulna were placed as if articulated but with the appropriate joints at the wrong ends.

Towards the end of the season several deposits of adult remains started to become visible in the north and west edges of the extent of Space 50, two adult skulls which were in danger of damage from being exposed were excavated.

SK1788 is represented by one adult skull, the post-cranial skeleton is possibly intact but it was not possible to investigate this during the Spring 2014 season. This individual was a probable female of adult age. This individual was facing away from the threshold.

The second of the two excavated adult skulls was SK1789. This was an adult male with a very robust skull, due to fragmentation of the skull it was unclear where this individual was facing.

Outside of Space 50 only small amounts of human bone were discovered. SK1787 was one adult pelvis from the area of the deep sounding. Other fragments were found in C1700 and C1727.

The remains excavated from Space 50 during the Spring 2014 season give a preliminary MNI of 11.There were also scatters of individual teeth and small bones from C1775 which are yet to be analysed.

Figure 4.3. Bone scatter C1754.

Figure 4.4. Articulated infant burial C1783.

Figure 4.5. SK1784.

Osteological analysis of burials from previous seasons

Material from Trench 7

The 2014 analysis confirms the age and sex of the two individuals from Trench 7. SK1228-2 was an adult probable male, aged around 30-40 years. Fragments of the skull showed thickened cranial bone.This may have been caused by increased vascularisation from a metabolic problem such as anaemia (Waldron 2009, 136); this will be confirmed using X-radiography. SK1228-1 was an adolescent, probable female, aged 14-18 years. SK1228-1 had LEH (Linear Enamel Hypoplasia) on the anterior dentition (Fig. 4.6) this indicates an interruption in development between ages 2 to 4 years (Reid and Dean 2000). SK1228-1 was previously thought to have cut marks on the left parietal bone, this was found to be parietal striae, which are normal (White and Folkens 2005).

Figure 4.6. Incisor from SK1228-1 with LEH.

Figure 4.7. Vertebrae fragment from C1623 with concretion.

Material from Trench 10
Human remains from C1621 comprised a cluster of bones and teeth. The teeth represent a minimum of two juveniles, one aged around 4 to 5, the second aged 6 to 8 years, bones from the context are mostly from a young child but also include some adult skull fragments.

C1623 and C1626 are discussed together as these are adjacent contexts; most of the remains from these contexts were found through floatation. The remains represent an infant aged around 1 to 2 years, an infant aged from birth to 4 months, and a neonate aged from birth to 1.5 months. Some of the fragments from these contexts also had concretions, which are not made of bone (Fig. 4.7).

C1625 contained a number of individuals. Firstly was an adult skull and mandible (SK1625-1 and mandible 1) these were not articulated but are potentially from same individual. The skull is that of an adult, probable male. The adult teeth from this context are almost all aged around 16 to 25 years (Lovejoy 1985). Some adult phalanges were also found in this area and may relate to this individual.

Also from this context were juvenile teeth representing one 5 to 8 year old and one young child, aged around 1 to 2 years. Some fragments of juvenile skull and hand bones belong to an older child.

Lastly from C1625 were various elements from a neonate, this individual was represented by: vertebrae, ribs, and phalanges, with some larger elements of the pelvis and limbs also surviving. A number of these bones also had concretions consistent in appearance with those from C1623 and C1626.

Two juvenile skeletons were previously excavated from C1631, from the dental and osteological development SK1631-2 was aged at 6 to 8 years, SK1631-3 at 4 to 5 years.There was also a vertebra representing another child, a young infant.

The remains excavated from Trench 10 prior to the Spring 2014 season have an MNI of 12.

Discussion
The results of analysis and excavation of human remains throughout the project so far indicate a MNI of 23 individuals from Trench 10, with another two individuals from Trench 7. From the areas of Space 50 which have been excavated so far, there are a high number of juvenile individuals, numbering 16 between the ages of birth to around 8 years; the majority were in the infant age group (Fig. 4.8). Interestingly, there have been no adolescent individuals found so far. The number of juvenile burials in comparison to adults will likely alter as further excavation continues. However, similar high ratios of juveniles exist elsewhere, for example, at Tell'Ain el-Kerkh where 60% of the 40 burials were infants (Croucher 2012, 48).

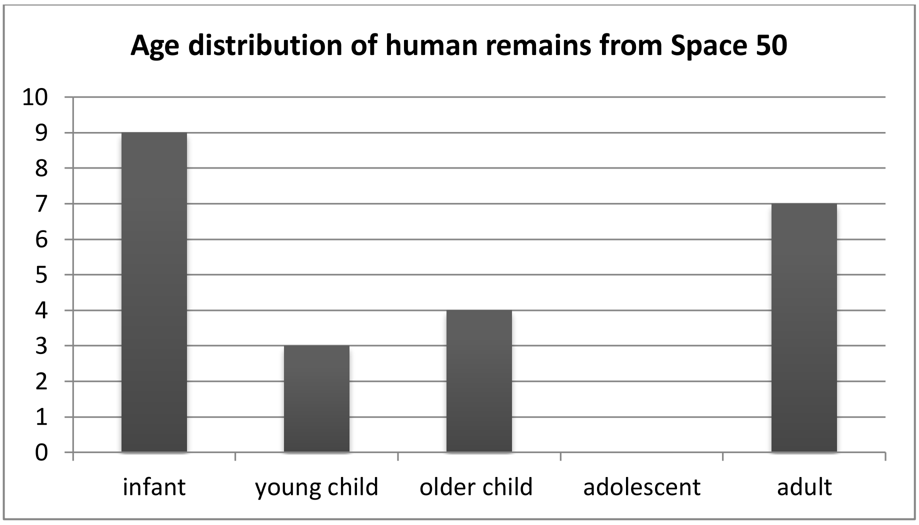


Figure 4.8. The age distribution of the human remains from Space 50.

The adult remains seem to have been predominantly located towards the north and western ends of the limits of Space 50. All of the juveniles so far were placed within view of the threshold of Space 50. A number of these burials seem to have been positioned so they are facing the threshold. The juveniles also appear to have been buried sequentially over each other in layers; examples can be seen in C1731 and C1780.

The burial deposits have been found in varied states, from fully articulated and partially articulated skeletons, to fully disarticulated bone clusters (where the bone is well packed) and to entirely scattered remains. There are spreads of bones such as C1754/C1774 and also scatters of loose material, predominantly made up of individual teeth and small bones from the hands, feet and spine. The discovery of basket remains in C1775 (on which there was a fragment of adult skull) may also indicate the storage of bones or body parts before deposition.

There were no cut-marks on the assemblage that would demonstrate defleshing using tools. Infant remains from C1623/C1626, C1625, and C1731 all had interesting concretions, which may have related to the burial practice. Chemical analysis of the substance has so far been inconclusive (Richardson pers comm).

At this stage, the process of how the burials at Bestansur reached their various states is unclear. At Köşk Höyük, Bonogofsky (2005, 124) demonstrated that bodies were left to decompose prior to ritual manipulation (in this case, skull plastering). Contrastingly, at Tell Qaramel, Northern Syria there was evidence that stone tools were used for post-mortem decapitation prior to burial (Kanjou *et al*. 2013).

It may be that the different levels of articulation at Bestansur demonstrate a complex burial practice where bodies were left to skeletonise prior to the bones being moved into different areas for final deposition. Alternatively, there may have been social differentiation in burial practice between different age groups; further analysis and excavation will enable more conclusive evidence of burial practice.

Future directions

Future work needs to focus on the completion of excavation and analysis of the burials in Space 50 and elsewhere in Trench 10. Analysis of the number of small bone elements may demonstrate the post-mortem taphonomic stages of disarticulation, enhancing our knowledge of the burial ritual. Also, consideration of spatial aspects of scatters of small bones and teeth may reveal more about possible movement of bodies.

Further work on the demography and health of the assemblage will enhance our knowledge of Early Neolithic populations from this region. Scientific methods including radiocarbon dating would clarify the chronology and use of this area; isotopic analysis would also enable us to interpret diet and movement and how these relate to the site overall. X-Radiography and SEM analysis should be carried out in order to clarify potential pathologies.

Chapter Five: Microarchaeology

Ingrid Iversen

Introduction: research aims and objectives

The aim of this research is to understand the social and economic relationships of an early Neolithic settlement. It examines the 'role' of early households ('domestic' groups) and is based on the premise that the household represents a 'great intensity of social relations, practices, choices and decisions' making it the ideal place to address questions relating to economic and social networks at a range of scales (Souvatzi 2008, 2). In the Neolithic, the house became central to the organisation of economic and social life as the location of production shifted to the household with implications for greater specialisation and a division of labour. This would have shaped social relationships, within the house and the community as a whole.

A number of methods will be employed in examining, measuring and analysing social space using artefacts and architecture. Analysis of artefacts, their variability and distribution can assist in determining activities and the use of different spaces((Allison, 1999). Understanding how activities were distributed is a key line of enquiry and can be used to answer questions about practices and social relationships as well as about the economic functions of households. The spatial data will be analysed at a range of scales, from small areas within an excavated context to the variation seen across the whole site. The sampling and results from the Spring 2014 season reported here focussed on a number of discrete areas within Trench 10, including spaces within and outside buildings.

Research context and rationale: microarchaeological techniques

The examination of micro-artefacts promises to produce the most reliable picture of past activities as they are more likely to represent 'primary' deposits, having been trampled into floor surfaces or swept into corners during cleaning. Larger artefacts will often have been subject to different site formation processes (e.g. discarded, scavenged or curated) and thus are frequently found away from the area of primary use; at best they can only reflect the immediate pre-abandonment situation (LaMotta and Schiffer 1999; Rainville 2005). The artefacts to be collected and analysed will be those less than 1cm but larger than 1mm in size and will include pottery, animal bone, molluscs, chipped stone and beads. Some of these are rarely picked up by traditional excavation methods and the 'abundance' of material and the patterns of distribution can also vary from those shown by macroartefacts.

For a more detailed discussion of the theoretical context and approach being adopted see Summer 2012 and Spring 2013 reports (Iversen 2013a; Iversen 2013b).

Methodology: microarchaeological techniques

Sampling strategy

Sampling is based on a scheme of systematic *standard* sampling and *strategic* sampling. At least one whole-earth **standard sample** is collected from each context. In addition any number of **strategic**

samples chosen by the excavator and/or other involved persons (archaeobotanist, microarchaeologist) based on archaeological criteria and with a clear purpose in mind are collected.

The strategic sampling falls into three categories:

- for the purpose of distinguishing **spatial** variation in microdebris (and thus potentially the use of space)
- to examine microdebris in and around **features**
- samples taken for **archaeobotanical** analysis**.**

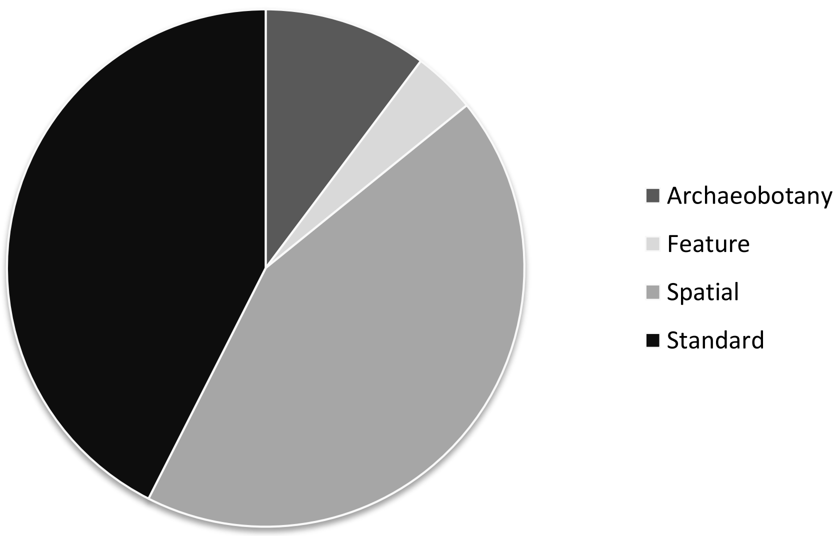


Figure 5.1. Sampling rationale.

The reasons for sampling are not mutually exclusive and may at times be of relevance to a number of criteria. It is a collaborative process with discussions between excavators and other specialists determining the outcome, and is fully integrated with the flotation procedures. This season the excavators were asked to indicate the reason for taking the samples on the sample form. The data presented here are based on using the primary reason for sampling as indicated by the excavators.

Spatial sampling has been used at Bestansur where multiple samples have been taken over a whole context and the results are compared to look for any variation across the space in question. The purpose of sampling of **features** is to examine the use to which the feature may have been put (e.g. small samples have been collected around and under groundstones) or an understanding of possible activities in the vicinity (e.g. thresholds). The microartefactual results of samples taken from features such as walls and fire installations are important in understanding background noise as well as building practices. Burials are sampled in order to ensure the collection of all related artefacts (e.g. beads).

The capacity constraints encountered in previous seasons encouraged the decision to reduce the size of standard samples from the target 50 litres to a new target of 25 litres. The change was made after a thorough discussion with the project directors and other members of the team. The key issue is whether the reduction in the size of the samples compromises the quality of the data collected and the conclusion was reached that this is not a significant risk and that there is a benefit in being able to process more samples. (see 'heavy residue processing capacity' in Iversen 2014). In the cases where there was a concern that artefacts might be missed, samples were collected and a fraction was floated (25 litres per sample) and the remaining fraction was either dry-sieved on site or in a few cases the remaining fraction was also floated if the artefacts in the initial fraction suggested that this was worthwhile. For example, the discovery of beads in the first 25 litres of some samples resulted in the flotation and sorting of the rest of the sample.

Processing: sorting and recording
The sample to be analysed is first floated, which removes loose soil and allows the collection of plants and other light material – the *light fraction.* The samples are then dried and the unsorted *heavy residue* is weighed before being sieved through a 1cm sieve. This removes all the large items, including stones. At this stage any artefacts are picked out by hand and recorded as artefacts larger than 1cm but remain associated with the sample.

The remaining residue is put through a nest of sieves which sorts it by size: 1cm-4mm, 4mm-2mm and 2mm-1mm. The size fractions are weighed and the decision on the proportion to be sorted is made. The size fractions are divided using a riffle box to ensure accuracy and are then are sorted by type of material, such as pottery, animal bone, mollusc and chipped stone. The sorted material is weighed and counted and these data recorded. For a further description of the process and illustrations see Iversen (2012).

Spring 2014 activity

The 128 new samples which were processed during the season totalled 2690 litres of sediment (see Table 5.1 and **Error! Reference source not found.**). The average sample size was 21 litres, ranging rom 69 litres to 0.25 litres; the size of strategic samples varied according to context, reason for sampling and deposit thickness while random samples were typically around 25 litres. Small areas obviously produce smaller sample sizes. The samples were taken from 53 different contexts.

Number of samples		128
From Neolithic contexts		123
Volume (litres)		2690
Average sample size (litres)		21
Number of contexts		53
% sorted	**4mm**	94
	2mm	80

Table 5.1. Summary of activity.

Heavy residue sorting

The majority (106 samples) were sorted by size and then by material. The 4mm fraction was sorted in its entirety in almost every sample but with the smaller size fractions a proportion was left unsorted in some cases. Overall, 87% of all heavy residue was sorted; 4 mm 94% and 2mm 80%. The results from the sorting of the smallest size fraction (1-2mm) in previous seasons have suggested that little is gained from sorting this size of residue and, as it takes longer than the larger size fractions, it was left unsorted (Iversen 2013a).

A few samples, 22 in total, were left unsorted or unrecorded because of the lack of time. A number of the unsorted samples (nine samples) were collected to investigate archaeobotanical remains and were very small (<0.5 litres) and so are not of interest in terms of heavy residue. The remaining 13 samples have been stored and will be sorted and recorded during a future season. The eight samples left unrecorded at the end of the Summer 2013 season were processed at the beginning of the Spring 2014 season.

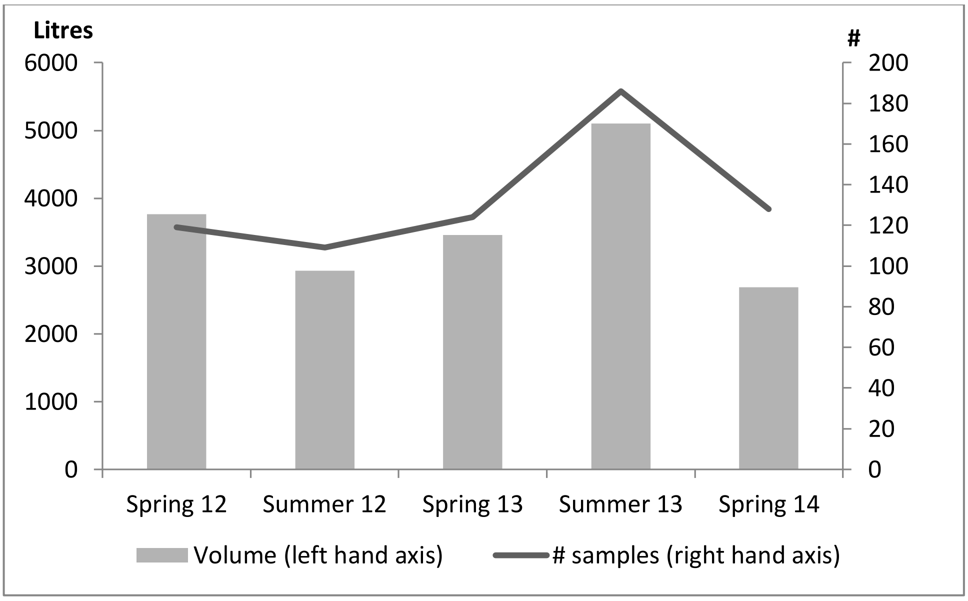


Figure 5.2. Samples processed by number and volume.

The results

Density of material

The density of material is measured relative to the volume of sediment but can also be looked at relative to the total weight of the sample. The microartefacts are counted (except for molluscs) and these data can also be analysed relative to the sample volume.

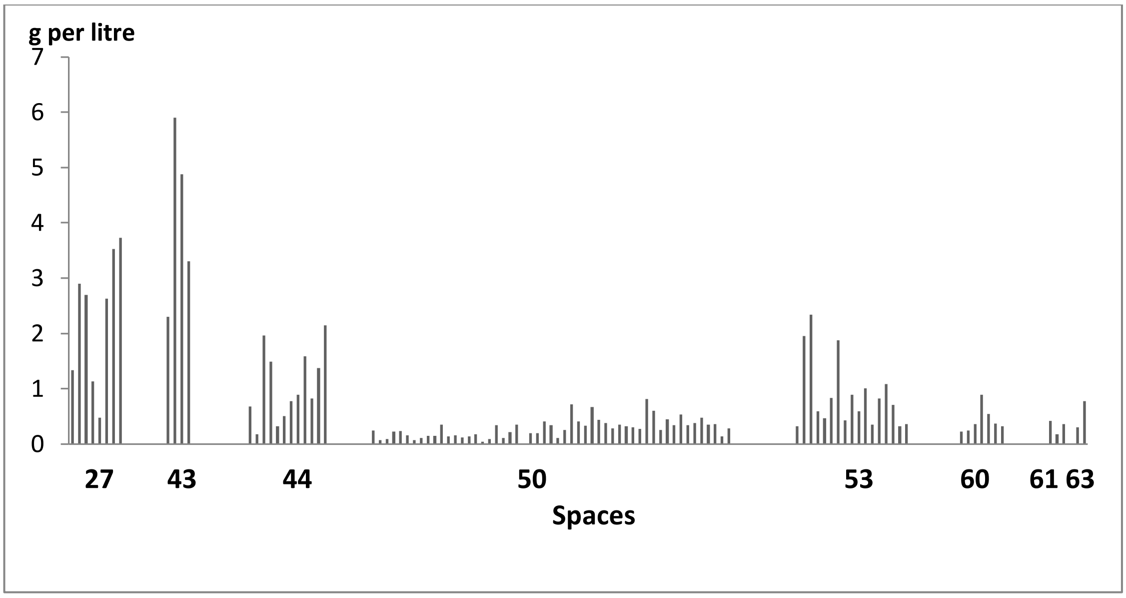


Figure 5.3. Density of all microartefacts by space.

The data presented in the charts and tables exclude the results from samples taken from post-Neolithic levels. The overall density of material, as shown in Fig. 5.3, could indicate the intensity of activities in different areas (both spatially and chronologically). It is also useful in giving an initial indication for the relative cleanliness of the different samples (Cessford and Mitrovic 2005).

The density of all microartefacts organised by space show a clear difference as seen in Fig. 5.3. The detail, as outlined in

g per litre **Spatial category** **# samples**	**Space 27** External area 8	**Space 43** External area 3	**Space 44** External area 12	**Space 50** Building 53	**Space 53** External area 18	**Space 60** Building 7
Animal bone	0.78	0.44	0.16	0.01	0.07	0.06
Mollusc	0.75	4.16	0.86	0.22	0.7	0.22
Chipped stone	0.73	0.09	0.03	0.04	0.05	0.1
Fired clay	0.05	0	0.02	0.0	0.06	0
Human bone	0	0	0	0.5	0	0
All material	**2.31**	**4.7**	**1.06**	**0.75** **(0.3 excluding human bone)**	**0.9**	**0.4**

Table , shows that in external areas that the density of all types of microartefacts which could be related to activities is much higher (the exception being human bone which only occur within Building 5, Space 50). Spaces 44 and 53 which are categorised as external areas have lower than average density of microdebris; a number of contexts in Space 53 are designated as spaces within an external area (as opposed to open areas).

The aggregate data from 5 seasons of excavation highlight the differences in the material found in the different kinds of context; external open areas have a greater density of all material especially mollusc suggesting that most activities took place in these areas. Spaces within buildings are very ‘clean’ but there are also external spaces where there is limited evidence of activity (see Fig. 5.4).

g per litre Spatial category # samples	Space 27 External area 8	Space 43 External area 3	Space 44 External area 12	Space 50 Building 53	Space 53 External area 18	Space 60 Building 7
Animal bone	0.78	0.44	0.16	0.01	0.07	0.06
Mollusc	0.75	4.16	0.86	0.22	0.7	0.22
Chipped stone	0.73	0.09	0.03	0.04	0.05	0.1
Fired clay	0.05	0	0.02	0.0	0.06	0
Human bone	0	0	0	0.5	0	0
All material	**2.31**	**4.7**	**1.06**	**0.75 (0.3 excluding human bone)**	**0.9**	**0.4**

Table 5.2. Density by type of material.

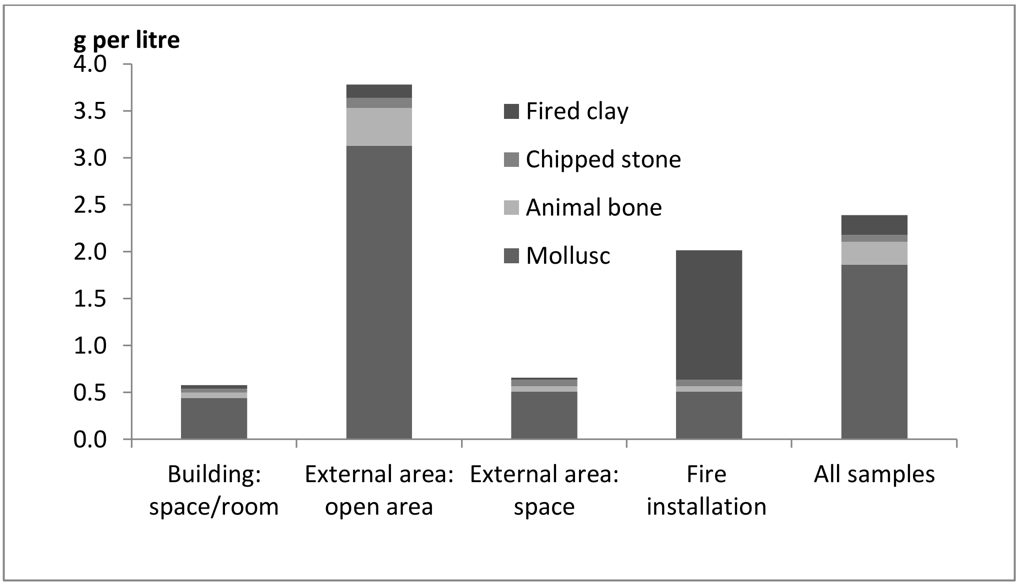


Figure 5.4. Density of material by context type (all trenches).

Spatial and chronological

Two spaces, Sp50 and Sp53, were extensively sampled with a large number of samples collected in order to examine spatial variation. In each the results have been analysed both chronologically and spatially.

Space 50

Space 50 was divided into 12 'squares' and 33 samples were taken from three different contexts (Figure 5.5 and Figure 5.7).

Figure 5.5. Space 50: gridded for sampling.

The summary results by context are shown in Fig. 5.6 and illustrate the greater density of material in the lower levels and especially the packing below the floors. In all cases the density is well below the site average, with no suggestion that activities which would leave a trace took place.

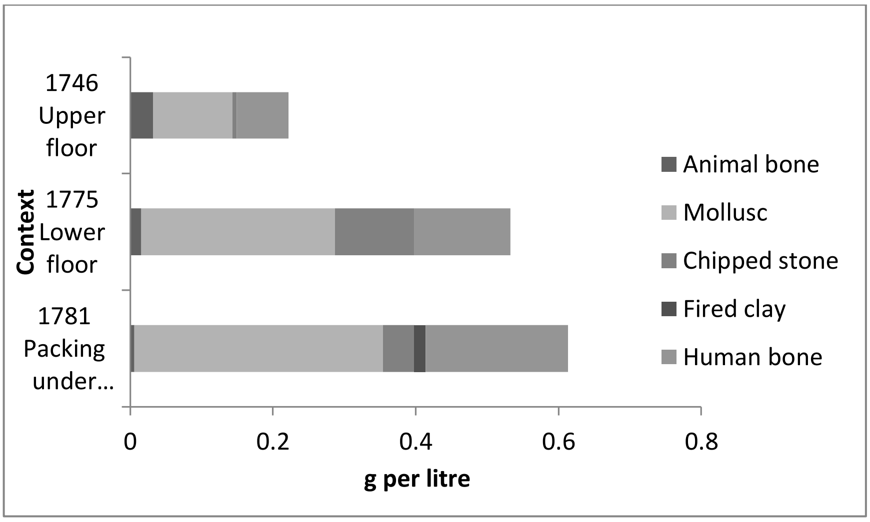


Figure 5.6. Space 50: density of material by context.

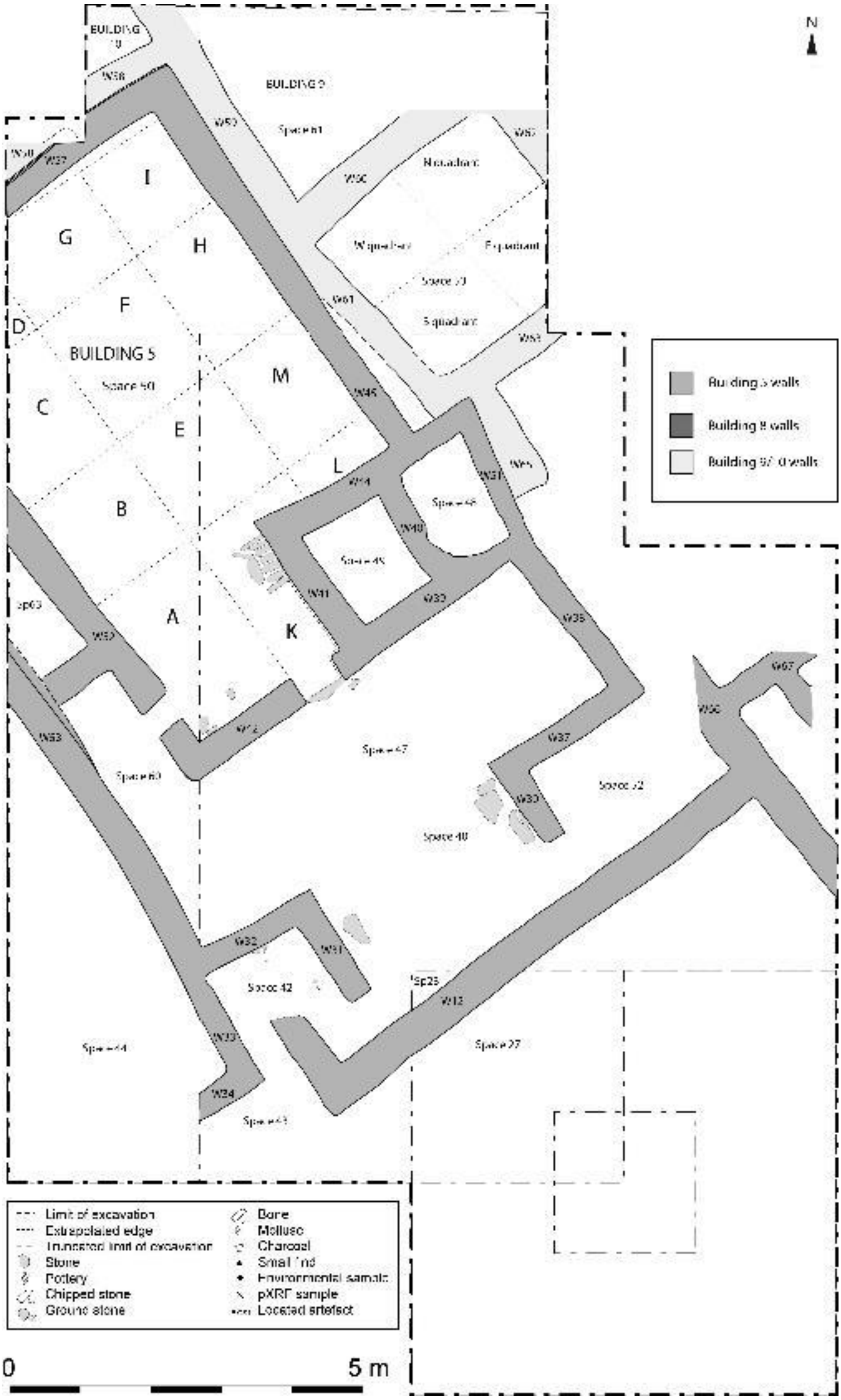


Figure 5.7. Spaces 50 and 53 with sampling grids marked.

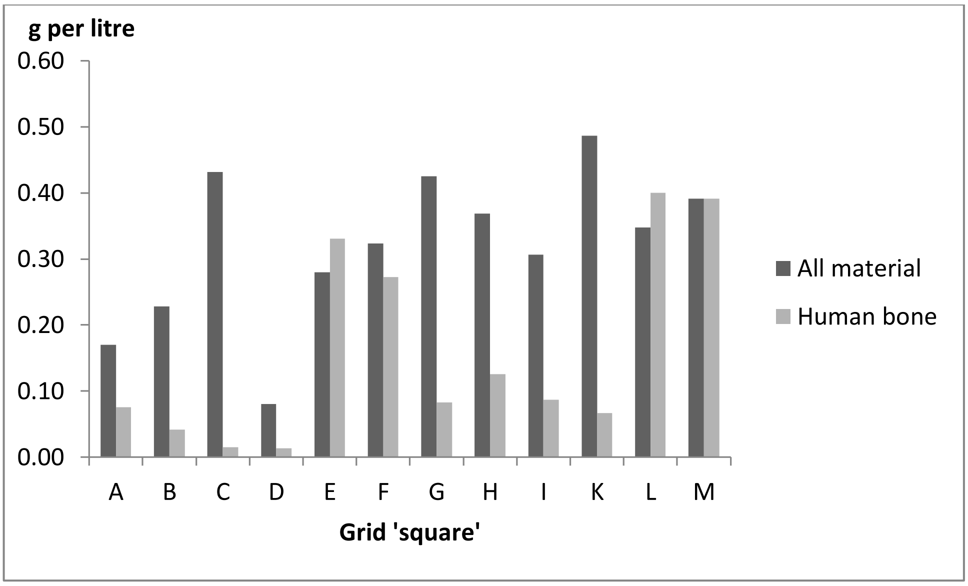


Figure 5.8. Space 50: density of material across gridded area.

The density of material by sampling 'square' is shown in Figure 5.8. The density of all material excluding human bone varies only slightly across the space with the four 'squares' with the highest density (C, G and K) lying next to the walls of the room. The samples with the highest density of human bone came from E, F, L and M and are associated with the burials in that area of Space 50 (see Chapter 4) .

Space 53

Space 53 lies within Building 9 in the northeast of Trench 10 and two contexts (C1763 and C1773) were sampled spatially. The space was divided into four (Fig. 5.7 and Fig. 5.9) and in each quadrant one 25 litre sample was collected and processed.

Figure 5.9. Space 53 gridded for sampling.

The samples from the two contexts show similar results, although the lower layer has some fired clay not found in the level above. The excavator (R. Everett) noted homogeneity in the deposit, with few finds suggesting that this was not an area of discard in either level. In contrast the context above (C1756) which was also extensively sampled, included in Fig. 5.10 for comparison, was more mixed with ash, possibly re-deposited. The microdebris results support this interpretation, although the total density is not indicative of an area of general discard.

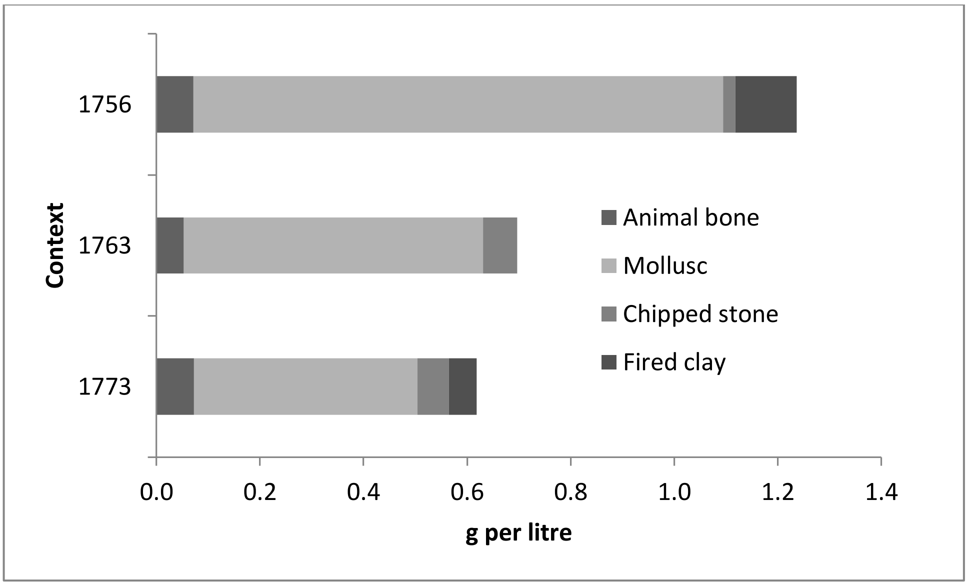


Figure 5.10. Space 53: density of material by context.

The results from the samples organised spatially show some variation in the density of material, with the north and east quadrants producing twice as much microdebris as the other half of this space (Fig. 5.11).

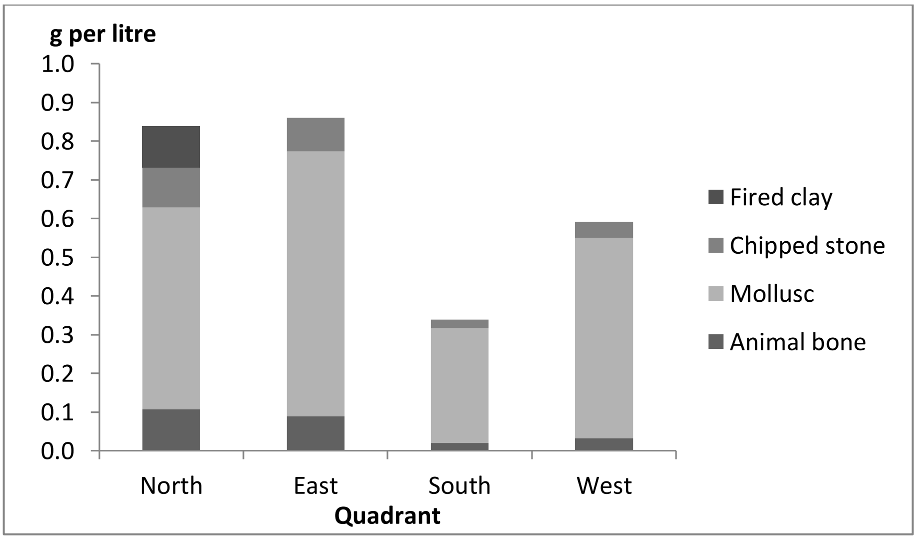


Figure 5.11. Space 53: density of material by quadrant.

Other spaces

A number of other external areas were intensively sampled, showing a significant variation in the density of material (Fig. 5.12).

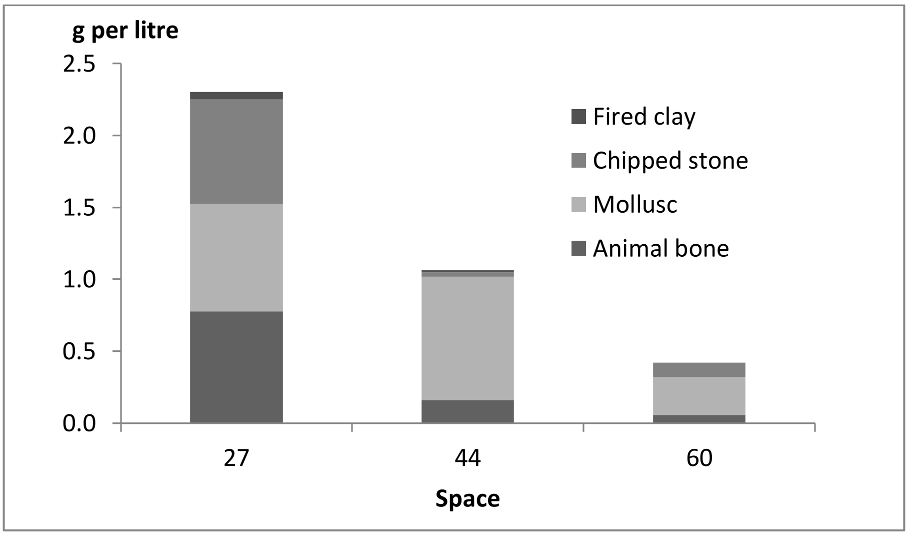


Figure 5.12 Density of material by space.

Space 27, at the south-east edge of the trench produced the greatest density of animal bone and chipped stone this season. The density of animal bone from samples from this area was on average three times the site average and chipped stone ten times the average. In particular the density of chipped stone was noteworthy with one sample registering the highest density of any over 5 seasons and comprising of a wide range of cherts (Figure 5.13). In one sample alone there were over 1,000 chipped stone pieces, split evenly between the 4mm and 2mm size fractions.

Figure 5.13. Space 27: chipped stone from 4mm heavy residue.

Conclusions

The results

There is clear evidence for significant variation in the density of microartefacts at different spatial scales at Bestansur. The spaces inside Building 5 were very clean and showed little variation across the 'room' suggesting few activities which leave a residue having taken place (and/or very thorough cleaning). The slight increase in density next to the edges of the room may be the result of microdebris being swept to the edge during cleaning.

Most of the external areas excavated this season produced a low density of artefacts, micro and macro suggesting limited activities took place in these areas and they were not used for the dumping of 'rubbish'. The exception is Space 27 in the sounding where large amounts of bone and chipped stone were recovered in heavy residue. The range of types of chipped stone suggests an area of lithic working or where debris was discarded.

Methodology

The methodology for the processing, sorting and recording of heavy residue continues to be improved as each season presents new challenges. The large volume processed in Summer 2013 highlighted some resource constraints which were successfully addressed by making an adjustment to the target sample size during the Spring 2014 season. Discussions within the team were key to achieving this without compromising the project's research goals.

Analysis

The work on applying a standard and detailed labelling of all contexts has allowed comparisons to be made across the whole site, enabling analysis of the microdebris densities to be made against a matrix of criteria.

Future work

The analysis of five seasons of samples from across the site is now the priority. The data can now be organised by a number of criteria: material, spatial category, specific space, building and so forth. The analysis will include the examination of the relationship between micro and macro artefacts (e.g. see Chapter11 Molluscs) and will be conducted at different spatial scales.

Chapter Six: Preliminary Assessment of the Zooarchaeological Assemblage

Robin Bendrey

Introduction

Excavation at Bestansur during Season 5 (Spring 2014) focussed on Trench 10 (see Chapter 2). This work recovered an animal bone assemblage consisting of some 2000 Neolithic bone fragments (weighing 1.7kg), of which ~4% by number were identified to species. Continued work in Trench 10 over several seasons has resulted in the exposure of a large open-area excavation. To consider the Season 5 material in its fuller context, this chapter briefly assesses all recovered Neolithic animal bones from Trench 10 (from all seasons of excavation), focussing on spatial variation. The report provides basic quantifications of recorded Neolithic bones (fragment counts and bone weight).

CZAP zooarchaeological research aims and objectives

Zooarchaeological analyses on the assemblages excavated within the CZAP research programme have the potential to contribute data and interpretations to a range of overlapping research themes that fall within the project aims (Matthews *et al*. 2013a). It is aimed that studies of the animal bones and teeth will be able to advancing knowledge in the following subject areas:

- processes of animal domestication
- human diet, economy and society
- wild animal resources
- ecology and environments
- sedentism and territorial use
- animal husbandry

The zooarchaeological analyses will be fully integrated with the full range of research methods being applied by the CZAP team to investigate animal diet and management from GC/MS, micromorphological, phytoliths and archaeobotanical analyses (see other chapters). See previous archive reports for fuller discussion of academic context and ongoing zooarchaeological results (Bendrey 2012; 2013a; 2013b; 2014). As stated, this chapter presents a preliminary assessment of spatial variation in Neolithic animal bones from Trench 10 excavated to date.

Methodology

Recovery methods

Animal bones were collected by three different methods: hand-picking during excavation; dry sieving of the excavated sediments using a 4mm mesh; and wet sieving using a 1mm mesh (Table 6.1). Material recovered from the integrated wet sieving and flotation programme typically consisted of 50 litres of deposit per context processed by machine assisted water flotation.

Identification and recording

The recording system for the Bestansur zooarchaeological assemblage was based on the protocols used at Çatalhöyük by Russell and Martin (2005, 34-38). The bones were identified with the aid of standard published protocols (e.g. Boessneck 1969; Halstead and Collins 2002; Lister 1996; Prummel and Frisch 1986; Schmidt 1972; Zeder and Lapham 2010; Zeder and Pilaar 2010). Bones not identified to species have been awarded an animal-size category, or labelled indeterminate. Material that could not be identified in the field has been exported to England for checking against modern osteological reference collections. Identifications reported in this assessment are provisional – some of these will change as further work is undertaken and specimens are compared to more comprehensive osteological reference collections (including the Natural History Museum collections in London and Tring).

Neolithic animal bones from Trench 10 Bestansur

Preservation and taphonomy

The assemblage was scored for general conditions of preservation (excellent, good, fair, and poor) and broad taphonomic characteristics (battered, rounded, spikey, and variable) (O'Connor 1991, 234-235). The latter was assessed in order to distinguish between those contexts where bone fragments retained sharply angular margins to old breaks, those that exhibited a rolled/abraded appearance, and those that exhibited impact pitting/battering. As in previous seasons, the Season 5 assemblage is generally well preserved, with most of the material exhibiting a good quality of preservation and a 'spikey' appearance.

Quantification and distribution of zooarchaeological remains

The distribution of the Trench 10 Neolithic zooarchaeological assemblage (collected by all recovery methods) is presented in Tables 6.2 by number of fragments and Table 6.3 by bone weight. This provides an overview of the spatial distribution of this material, by space (see composite plan of Trench 10) and by spatial category and type. External open areas can be seen to have produced the largest quantity of material, with significantly small quantities coming from within the buildings.

Table 6.4 presents the distribution of identified taxa by assigned space number (this may introduce some bias due to the different proportions of each assemblage collected by each recovery technique (Table 6.1), but will allow preliminary assessment of patterning). As can be seen, although sample sizes are generally small, they do vary between the defined spaces. The number of different species, or taxa, recovered from each space assemblage is in part related to the size of the assemblage, and it is the case that rarer animals are likely to appear in larger samples and not in smaller ones, whereas commoner animals will appear in relatively small samples (Grayson 1984; Lyman, 1995). This relationship can be demonstrated by plotting the number of taxa (here the number of positively identified small- medium-, and large-sized mammalian species) against the logarithms of the fragment count (the total number of small-, medium-, and large-sized mammal fragments; Fig. 6.1). This allows an assessment of those space assemblages that are more diverse in terms of numbers of number of taxa (those furthest above the line of best fit), and those that are less diverse (those furthest below the line of best fit). This could potentially contribute to understanding of activities going on within each space, when integrated with the other categories of finds. Notable from this analysis is that the assemblage from Space 40 plots as the least diverse mammalian assemblage (Fig. 6.1).

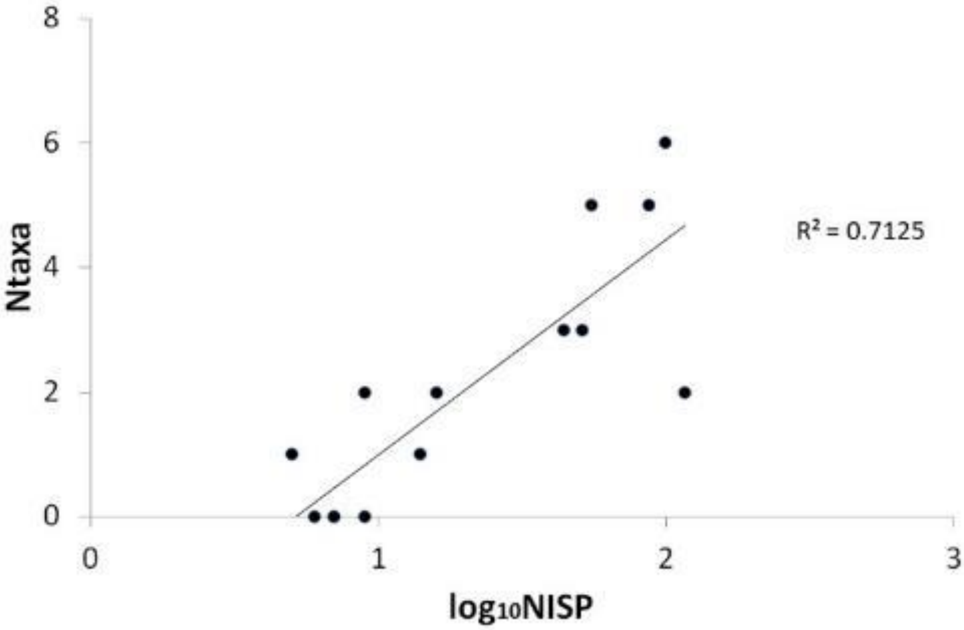


Figure 6.1. Graph showing the number of taxa (Ntaxa - the number of positively identified small-, medium-, and large-sized mammalian taxa) against the logarithm of the number of identified specimens (the total number of medium- and large-sized mammal fragments – log_{10}NISP) for each space in Trench 10 (data from Table 6.3).

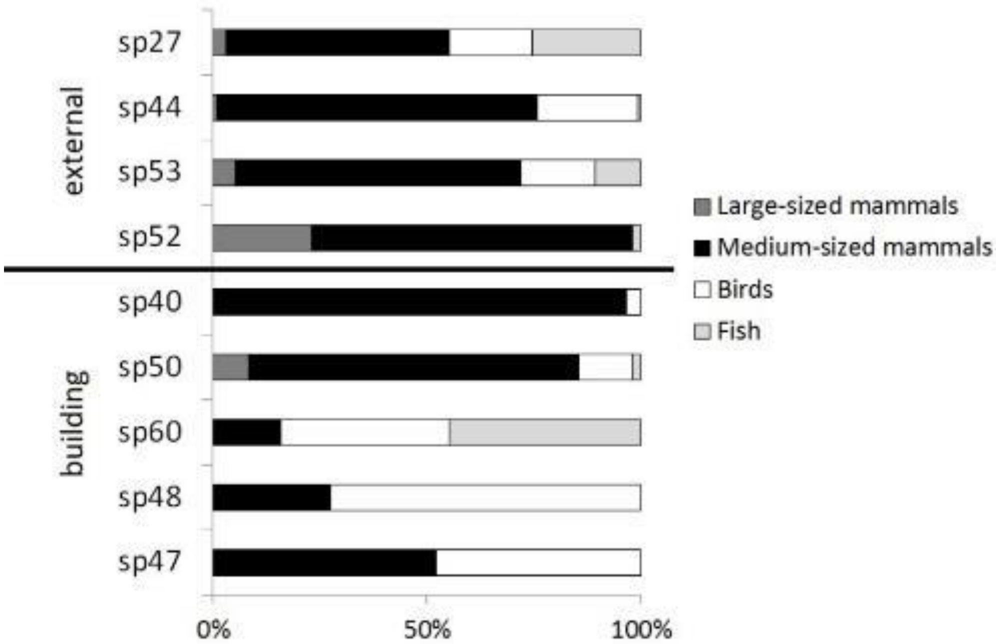


Figure 6.2. Graph showing the relative proportions of all large-sized mammals, medium-sized mammals, birds, and fish for space assemblages for which the number of all large-sized mammals, medium-sized mammals, birds, and fish remains is greater than 25 (data in Table 6.3).

Spatial patterning of animal bones at archaeological sites can be used to assess spatial variations in activities (Wilson 1996). Previous analysis of overall site-level patterning in recovered fauna from Bestansur indicated differences between areas characterised by higher proportions of large- and medium-sized mammal remains suggestive of more 'peripheral' processing and butchery areas and areas with higher proportions of fish and and/or micro-mammal remains suggestive of a more 'domestic' character areas where we have evidence for food preparation/consumption (fish remains) and small mammal commensalism (Bendrey 2013b).

A similar methodology to assess the character of assemblages from within the spaces defined in Trench 10 is applied here. Figure 6.2 compares the relative proportions of all large-sized mammals, medium-sized mammals, birds, and fish. Micro-mammals have been excluded from this analysis due to the presence of intrusive burrowers potentially biasing results (Bendrey 2014). Due to the frequently small sample sizes conclusions must be drawn with caution. Figure 6.2 presents those space assemblages for which the number of all large-sized mammals, medium-sized mammals, birds, and fish remains is greater than 25 (data in Table 6.4). Spaces characterised as internal building and external areas are presented separately. It can be seen that external areas (Spaces 27, 44, 53 and 52) are dominated by medium-sized mammal fragments (Fig. 6.2). Space 27 produced a relatively large and well preserved assemblage (although absolute numbers of bones are still small). This assemblage is characterised by a heavily fragmented bone group with frequent pieces of cancellous bone and only one or two pieces of cortical bones (no evidence for fresh breaks). The material appears suggestive of bone processing, perhaps for grease. The high number of small fragments indicates this processing may have been undertaken *in situ* or nearby.

Three of the five internal building spaces (Sp47, Sp48 and Sp60) have assemblages with higher proportions of birds and fish, perhaps interpretable as being more 'domestic' in character (e.g. food processing/consumption waste). Birds can also be employed in symbolic associations (Peters and Schmidt 2004; Russell and McGowan 2003). Future work should consider such associations for the Bestansur assemblage, for example Space 48, the fire installation, produced a small and enigmatic assemblage, with a small number of fragmented burnt bird bones (over-representing them by number), including a burnt probable crane tarsometatarsus (Moore 2014). In contrast to Spaces 47, 48 and 60, two internal building spaces (Sp40 and Sp50) have assemblages dominated by medium-sized mammalian fragments. We may thus be seeing evidence for different uses of these areas in terms of activities undertaken in the spaces, whether day-to-day uses of the spaces or particular acts of deposition, for example deliberate deposition of animal parts in Space 50 could be associated with the human remains buried here.

Conclusions and future prospects

This brief assessment of spatial variation in the animal bones from Trench 10 allows an initial characterisation of the space assemblages. Assemblage sizes are very small and this preliminary work is presented with the significant caveats associated with such small sample sizes. In general, differences visible in the proportions of large-/medium-sized mammals to birds/fish suggest differences in use interpretable within a simple framework of 'inside' activity (food preparation/consumption) and 'outside' activity (butchery/processing waste). Some areas (e.g. Spaces 40 and 50) seem to deviate from this pattern. Ritual or symbolic structuring within the animal bone assemblage, for example in terms of deliberate associations with the mortuary depositions (Space 50) or fire installation (Space 48), will be the focus of further work. Future detailed work will explore details of element representation and bone taphonomy between the areas, and fully integrate with the other categories of finds to explore possible associations and interpretations (especially the microarchaeological analyses).

Acknowledgements

Thanks to Dr Louise Martin (UCL) for kind support and digital resources/databases.

Space	hand-picked	dry-sieved	wet-sieved	Total
27	33	24	583	640
40	177	19	38	234
42	10	7	55	72
43	6	-	85	91
44	70	106	150	326
47	17	15	20	52
48	3	4	105	112
49	3	12	28	43
50	38	46	110	194
51	13	-	9	22
52	78	9	10	97
53	63	32	205	300
54	-	-	9	9
55	10	2	30	42
60	4	1	61	66
61	-	-	14	14
63	40	3	5	48
other	1680	397	1990	4067
Total	**2245**	**677**	**3507**	**6429**

Table 6.1. Distribution of animal bone by recovery method (number of fragments).

		Space																		
spatial category	**spatial type**	**27**	**40**	**42**	**43**	**44**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**60**	**61**	**63**	**other**	**Total**
Building	Entrance	-	215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**215**
	Fire installation	-	-	-	-	-	-	112	-	-	-	-	-	-	-	-	-	-	-	**112**
	Space	-	19	-	-	-	52	-	43	173	-	-	-	9	-	63	14	48	464	**885**
	Uncertain, Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	**3**
	Wall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	**45**
Building, External Area	Open area, Space	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	**16**
Building, Feature	Space	-	-	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**72**
	Space, Burial	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	**5**
External Area	Open area	640	-	-	91	325	-	-	-	-	22	97	230	-	42	-	-	-	3549	**4996**
	Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	**9**
	Space	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	-	**70**
External Area, Feature	Fire installation	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
	Total	**640**	**234**	**72**	**91**	**326**	**52**	**112**	**43**	**194**	**22**	**97**	**300**	**9**	**42**	**66**	**14**	**48**	**4067**	**6429**

Table 6.2. Spatial distribution of Neolithic animal bone (collected by all recovery methods) from Trench 10 (all seasons) (number of fragments - NISP).

spatial category	spatial type	27	40	42	43	44	47	48	49	50	51	52	53	54	55	60	61	63	other	Total
		Space																		
Building	Entrance	-	303.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**303.9**
	Fire installation	-	-	-	-	-	-	25.2	-	-	-	-	-	-	-	-	-	-	-	**25.2**
	Space	-	3.6	-	-	-	41.6	-	21.2	172.1	-	-	-	0.4	-	4.7	0.3	20.6	641.2	**905.7**
	Uncertain, Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	**2.3**
	Wall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.5	**22.5**
Building, External Area	Open area, Space	-	-	-	-	-	-	-	-	21.0	-	-	-	-	-	-	-	-	-	**21.0**
Building, Feature	Space	-	-	47.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**47.0**
	Space, Burial	-	-	-	-	-	-	-	-	0.8	-	-	-	-	-	-	-	-	-	**0.8**
External Area	Open area	499.8	-	-	45.6	389.6	-	-	-	-	18.8	320.4	222.8	-	23.0	-	-	-	5635.8	**7155.8**
	Pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.5	**42.5**
	Space	-	-	-	-	-	-	-	-	-	-	-	71.4	-	-	-	-	-	-	**71.4**
External Area, Feature	Fire installation	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.1**
	Total	**499.8**	**307.5**	**47.0**	**45.6**	**389.7**	**41.6**	**25.2**	**21.2**	**193.9**	**18.8**	**320.4**	**294.2**	**0.4**	**23.0**	**7.0**	**0.3**	**20.6**	**6342.0**	**8598.2**

Table 6.3. Spatial distribution of Neolithic animal bone (collected by all recovery methods) from Trench 10 (all seasons) (bone weight - grams).

		Space																	
		27	**40**	**42**	**43**	**44**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**60**	**61**	**63**	**other**	**Total**
Large-sized mammals	Cervus elaphus	-		-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	17	**19**
	Large cervid	1	-	-	-	-	-	-	-	1	-	2	1	-	-	-	-	-	3	**8**
	Large-sized indet.	3	-	-	3	1	-	-	-	3	1	10	1	-	-	-	-	-	85	**107**
Medium-sized mammals	Capra	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	7	**9**
	Ovis	3	4	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	22	**33**
	Ovis/Capra	10	5	2	-	5	-	-	-	6	-	1	4	-	-	-	-	1	57	**91**
	Sus scrofa	3	1	-	-	2	-	-	-	-	-	3	2	-	-	-	-	-	91	**102**
	Gazelle	-	-	-	-	3	1	-	-	1	-	-	1	-	-	-	-	-	14	**20**
	Capreolus capreolus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	**3**
	Ovis/Capra/Capreo./Gaz.	4	10	-	-	8	2	-	1	2	1	3	1	-	-	-	-	1	64	**97**
	Medium-sized indet.	50	95	11	3	70	10	8	3	27	5	32	39	-	6	6	-	5	927	**1297**
Small-sized mammals	Vulpes vulpes	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	**4**
	Medium canid	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	**3**
	Medium carnivore	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	**3**
	Lepus	2	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	1	**5**
	Small-sized indet.	10	1	1	1	6	1	1	-	3	-	-	-	-	-	1	-	1	14	**40**
Micro-mammals	Mus sp	-	1	1	-	-	1	6	1	1	-	-	4	-	1	-	-	-	-	**16**
	Microfauna indet.	42	7	2	3	13	4	13	2	20	-	-	35	6	3	10	12	1	28	**201**
Mammal indet.	Indeterminate	394	104	44	77	175	20	59	28	108	13	43	180	-	29	16	-	35	2642	**3967**
Birds	Birds	26	4	4	1	28	12	21	3	6	-	-	13	3	1	15	-	3	12	**152**
Reptiles	Tortoise	19	1	1	-	4	-	-	4	6	-	2	3	-	-	-	-	-	53	**93**
	Snake	33	-	-	1	4	-	1	-	2	-	-	2	-	1	-	-	-	13	**57**
Amphibians	Amphibian	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	**5**
Fish	Fish	34	-	3	2	1	-	-	-	1	2	1	8	-	1	17	-	-	8	**78**
Crustacea	Land crab	3	1	1	-	1	1	3	-	6	-	-	-	-	-	1	-	-	2	**19**
	Total	**640**	**234**	**72**	**91**	**326**	**52**	**112**	**43**	**194**	**22**	**97**	**300**	**9**	**42**	**66**	**14**	**48**	**4067**	**6429**

Table 6.4. Spatial distribution of Neolithic animal bone (collected by all recovery methods) by taxonomic groups from Trench 10 (all seasons) (number of fragments - NISP).

Chapter Seven: Archaeobotany

Alice Williams

Introduction

This chapter describes the methods and initial results from the flotation of samples collected during the 2014 Spring season at Bestansur. All the samples were taken from Trench 10 and processed using flotation tanks and bucket flotation. Two local women, Gurdah and Chernu, were employed to float the samples and were essential to the success and efficiency of the flotation system.

Methods

The flotation machine consisted of 3 tanks, one flotation tank and two sediment settling tanks for the recycling of water (see Whitlam 2012, fig. 7.1, for photographs and a description of the flotation layout). Bucket flotation was used for samples which were particularly small (under 3L). A 1mm mesh was used to collect the heavy residue, and chiffons (c.µ300 mesh) were used to collect the light fraction for archaeobotanical analysis.

The standard sample size was reduced this season, from 50L to 25L, to help ensure the efficiency of the flotation process and reduce backlog at the end of the season. Larger samples or whole context samples were taken and floated from potentially important contexts. In addition to the standard and whole context samples, bulk samples were also taken when lentil concentrations were visible at site. The bulk samples included three samples from C1775, two from C1741, and other bulk or handpicked samples from C1758, C1772, C1751 and C1781. If a bulk sample was not taken then the lentil-rich context was either sampled as a smaller 10L sample or taken as part of the standard sample with the rest of the context. The bulk and 10L samples were taken as a precaution against potentially intrusive material.

The light fraction from each sample was air dried in the shade before further processing. Endicott sieves were used to split the larger samples (usually above 5g) into 4mm, 2mm, 1mm, 0.3mm and <0.3mm fractions, but many samples were too small to be sieved. The light flot of the samples were also weighed (to the nearest 0.1g) and the volume was estimated. Samples were then put into plastic sample bags and stored for export. A total of 49 samples were scanned before being stored for export.

Samples were scanned for the presence of grain, chaff, legume, nut shell, weed seeds and indeterminate charred material. The presence or absence of charred wood, uncharred seeds, modern roots, shell and bone were recorded using the DAFOR scale (Dominant, Abundant, Frequent, Occasional and Rare). The entirety of the 4mm, 2mm and 1mm fractions were scanned, as well as a subsample (c. 5ml) of the 0.3mm fraction for each sample. None of the <0.3 fraction was scanned. Archaeobotanical material was counted by rough type, so that any fragments which were pulse or grain were counted as such, whether or not embryos or apical ends were identified. Other fragments were recorded as indeterminate. This means that the count presented in the scanning results will be higher than the estimated minimum number of individual seeds or chaff, but gives an indication of the archaeobotanical density of the sample (many samples were so sparse that only minimal fragments were recovered, so these were recorded by plant type where possible). Sorted fragments have been separated from the rest of the sample by glass tubes or gelatin capsules, and placed back in the sample bag for future analysis in the UK.

Results

Samples floated

The tables below (Tables 7.1 and 7.2) provide information on the flotation samples taken during the five week Spring season. Samples taken were often larger than the sample floated and the remaining bags were dry-sieved on site. The total number of samples exported to the UK does not correlate with the total number of samples floated because two floated samples came from the same original sample and so were combined for export. These samples do however remain in separate bags with separate flotation numbers under the same sample number.

Table 7.1. Total of flotation samples excavated in Spring 2014.

Total volume floated (L)	Total number of samples floated	Average flotation sample size (L)	Range of flotation sample sizes (L)	Total number of contexts
2690	129	20.85	0.25-69	53

Table 7.2. Total of flotation samples scanned and exported in Spring 2014.

Total number of samples scanned	Total number of samples exported to the UK	Total number of samples not floated but stored in sugar sacks for next season
49	127	2

Samples scanned

The initial scanning results are summarised in Table 7.3. This table shows the frequency of charred plant material in each sample, both including and excluding weeds seeds. The results have been separated because weed seeds often formed the majority of the plant material counted in each sample, many of which may have been modern inclusions. As can be seen in the table, the majority of samples contained no charred plant material when weed seeds are excluded. Only some samples (between 8.2 and 10.2 per cent) containing more than 25 charred plant fragments, whether including or excluding weed seeds. These results confirm the pattern described in the archive reports of previous seasons which show low frequencies of charred plant material recovered from excavations at Bestansur.

Table 7.3. Overview of the charred material counted in scanned samples.

Number of charred plant remains	Count of samples, excluding weed seeds	Percentage of samples (%)	Count of samples, including weed seeds	Percentage of samples (%)
0	27	55.1	11	23.4
1-10	17	34.7	27	55.1
11-25	1	2.0	5	10.2
>25	4	8.2	5	10.2

Figure 7.1. Photographs of well-preserved charred grain: (a) (likely *T. monococcum*) (left) and (b) lentil (*L. culinaris*) (right) in the 2mm fraction of SA2055, C1741, BF5045.

Figure 7.2. Photographs of reasonably well preserved (a) grain (left) and (b) lentil (right) in the 2mm fraction of SA2064, C1741, BF5051.

Figure 7.3. Photograph of SA2074 (C1741, BF5062) showing intrusive ants, molluscs and roots in the 2mm fraction.

Figure 7.4. Photograph of SA2186 (C1775, BF 5109) showing an abundance of modern roots and no charred material.

A total of 49 samples were scanned, and in every case the sample was dominated by modern roots, followed by mollusc shell fragments and with varying proportions of bone, modern seeds and charred wood. Where charred plant material was recovered these tended to be pulse (likely lentil, *Lens culinaris*) and a variety of weed seeds which have not been identified. Charred grain (mostly einkorn wheat, *Triticum monococcum*) occurred less frequently, but tended to be more prevalent in samples which had a high number of pulse fragments. Figures 7.1 and 7.2 show well preserved lentil and wheat grains from C1741. Charred chaff and nut shell were rare. Some samples contained no charred botanical material and consisted entirely of modern root material (see Fig. 7.4). Samples also frequently included insects, both from excavation at site and from accidental collection during flotation. These were not specifically noted while scanning, although the presence of burrowing insects, such as the high number of ants identified in SA2074 (C1741; see Fig. 7.3) may be useful in taphonomic assessments of the samples and the botanical material present.

Archaeological block sample and modern reed work

Archaeological block samples excavated during previous seasons were briefly looked at. Sample number SA1582 from C1485 consisted of several blocks, each wrapped in foil. Small samples were taken from five of these blocks for phytolith analysis. The blocks were numbered one to five, with their corresponding slides. The blocks were sampled by scraping a small amount of sediment onto a microscope slide and using two-to-three drops of clove oil to keep the cover slip in place. Using clove oil will not create permanent slides, but is much quicker and safer to use than other mounting fluids such as Entellan. Black lenses within the blocks were sampled, as were potentially preserved woody/reedy sections. Phytoliths were visible in the slides, but were very sparse and often obscured by other elements of the sediment.

In an attempt to identify some of the phytoliths material, a modern reed sample was taken from the stream close to the Bestansur site (see Fig. 7.5). A small sample of modern, uncharred reed material was taken for phytolith analysis using the same process as described above. The rest of the modern reed sample was charred in a make-shift foil oven. The material burned for roughly ten minutes, reaching 500°C, and the material produced ranged from lightly charred stem to white ash. Four phytolith slides were made from this material, again using the process described above. The charred reed slides produced much more visible phytolith material than the uncharred reed slide, and numerous phytolith skeletons (articulated phytoliths) were observed in the reed ash.

The modern samples have not yet been used to identify the phytolith remains in the archaeological block samples, and a full reference collection would ideally be present to safely identify the different forms. The charred reed material has been kept in storage at Bestansur. Future work may investigate this further and potentially use wider reference material to identify phytolith remains in the archive samples taken. This could include a repetition of the charring of modern reeds, but by burning the leaves, stem, inflorescence and roots separately as this would potentially allow phytoliths from the different parts of the reed to be identified and used in interpretations of reed use in the archaeological record.

Figure 7.5. Modern reeds collected from the stream next to the site of Bestansur.

Conclusions

The flotation of samples from Trench 10 at Bestansur during this Spring season produced relatively little archaeobotanical material, with the richest samples coming from Iron Age deposits. All the samples contained modern root material, and most had either the remains of burrowing snails or insects. The prevalence of this modern organic intrusive material suggests that the sediments will have been subject to a degree of mixing between deposits, and so the charred material from Neolithic contexts may have moved down from later periods (as confirmed with previous dating of supposed Neolithic lentils to the Iron Age). The mixing of some sediments was confirmed when briefly compared to the presence of burrowing rodent bones in a few of the samples taken this year (in discussion with Robin Bendrey, see Chapter 6). However, the relative lack of charred macrobotanical material from the site may in part be due to activities at the site in Neolithic times: animal dung rather than wood may have been the primary fuel, which would help explain why few charcoal fragments have been recovered. In addition, food remains would be rare if the seeds and grains have been stored and processed elsewhere in the settlement. Future excavations may uncover deeper contexts which are less disturbed so that questions of taphonomy and activity in the archaeological record can be investigated further.

Chapter Eight: Chipped Stone Tools and Debitage

Roger Matthews and Amy Richardson

Introduction

The Spring 2014 season saw excellent progress in processing of chipped stone tools and debitage from Bestansur as well as coverage of some of the backlog from previous seasons' work at Bestansur and Shimshara. In this report we focus on variation in tool representation from the excavated spaces of Trench 10. The research conducted during the course of the Spring 2014 field season continued investigations into the identification of obsidian and chert raw materials from Bestansur and Shimshara, and the study of hafting residues and sickle sheen, through portable X-ray fluorescence analysis.

Trench 10: spatial analysis of tool use

We here examine the variability in the representation of different tool types across the different spaces of Trench 10, above all those of Building 5, but also external areas and Building 9. Basic details are included in Table 8.1, and all Building and Space numbers are shown on Figure 8.1. Table 8.2 shows the distribution of chert and obsidian tool types across the Spaces and Space types of Buildings 5 and 9.

There are several interesting features of the tool distribution. Firstly, it is notable that external areas (Spaces 27, 43, 44, 51 and 52) generally have much higher quantities of tools than internal areas (Spaces 50, 60, 63, 53 and 61). But the low numbers of tools from Spaces 51 and 52 suggest a need to allocate these Spaces to the internal rather than external category, as the architectural plan perhaps also indicates (Fig. 8.1). Secondly, most tool types occur in both internal and external areas, but blades with sickle sheen, diagonal-ended blades/bladelets and points/awls/drills are more commonly found in external areas, while shouldered drills are more common in internal spaces. High concentrations of scrapers in Spaces 50 and 44 are likely to relate to specific activities undertaken in those spaces, such as preparing animal hides or working with wood. Thirdly, the relative representations of chert and obsidian tools are roughly equivalent across the various spaces, with chert always dominant. Obsidian is used almost exclusively for blade production, exploiting its sharp cutting properties. A single obsidian core from Space 27 indicates on site knapping of this material.

Finally, it is striking that cores, almost always of chert, are found across a range of spaces, both internal and external, suggesting flexibility in the production of chipped stone tools on a need-to-use basis. Especially notable is the occurrence of nine chert cores in Space 53 of Building 9. The blade cores from Space 53 are unusually large (Fig. 8.2), and most of them have scars from removal of flakes and short blades rather than the far more common narrow blade/bladelet cores found across the site. One possibility is that the Space 53 cores result from training or experimentation in knapping techniques rather than in genuine tool production.

Much further study and analysis remains to be conducted on the enormously rich chipped stone evidence from Bestansur, and this will be the aim for further reports and publications.

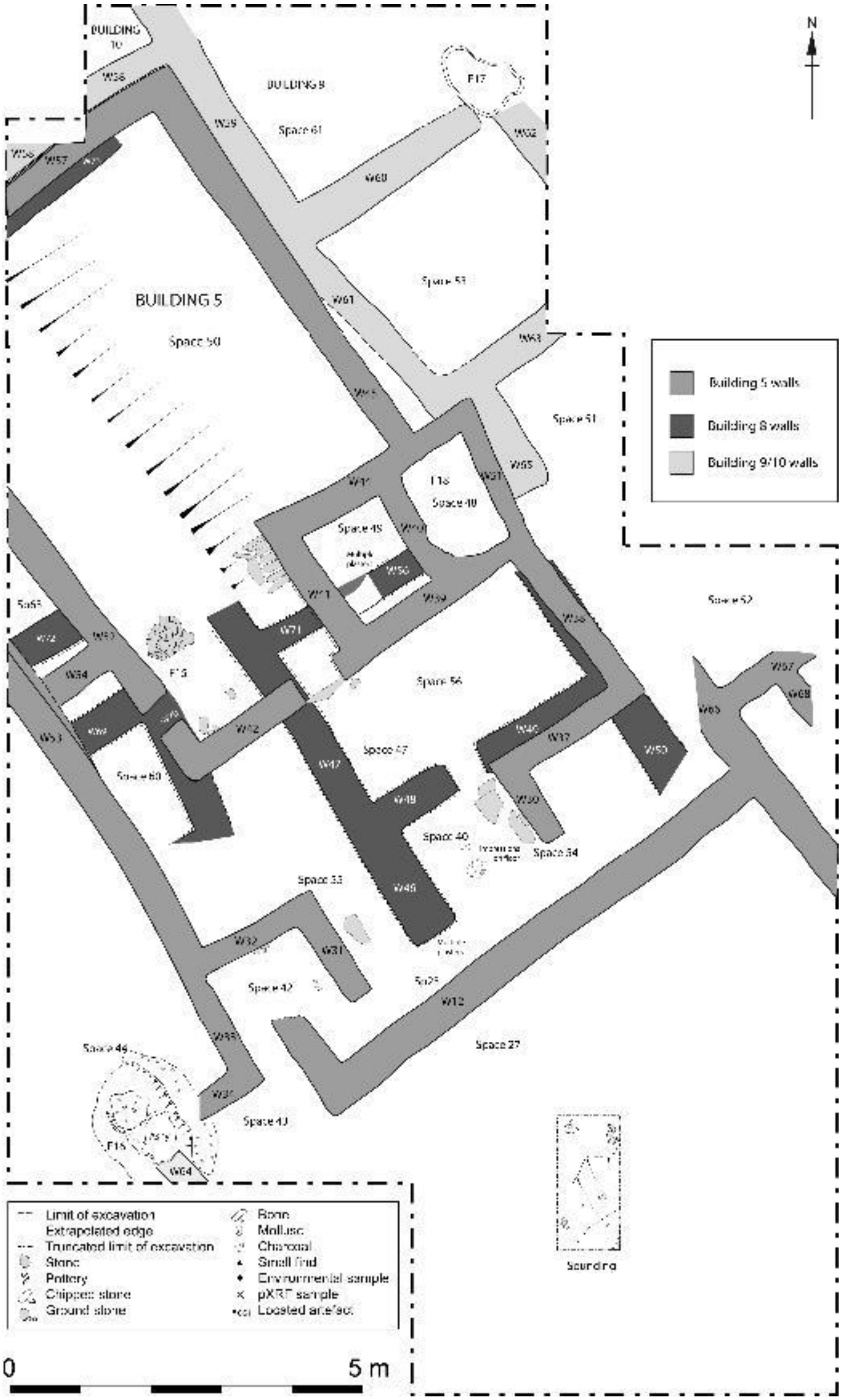


Figure 8.1. Composite plan of Trench 10.

Figure 8.2. Chert cores from C1758, Space 53.

Building	Space	Space type	Neolithic context numbers
5	50	Internal	1714, 1728, 1729, 1731, 1733, 1741, 1744, 1745, 1746, 1754, 1771, 1774, 1775, 1780, 1781, 1782, 1783, 1784, 1788, 1789
5	60	Internal	1734, 1736, 1737, 1742, 1753, 1785
5	63	Internal	1748, 1786
9	53	Internal	1735, 1756, 1757, 1758, 1763, 1773
9	61	Internal	1764
-	27	External	1738, 1740, 1749, 1751, 1752, 1768, 1772, 1777, 1787
-	43	External	1724, 1725, 1730, 1732
-	44	External	1739, 1743, 1750, 1755, 1767, 1769, 1778
-	51	External	1706
-	52	External	1721, 1761

Table 8.1. Buildings, Spaces. Space types and Neolithic context numbers for chipped stone spatial analysis.

Building	Space	Space type	Chert/ Obsidian	Blade unretouched	Bladereto uched	Blade notched	Blade sickle	Blade serrated	Blade beaked	Diagonal-ended blade (-let)	Point/ awl/ drill	Shouldered drill	Scraper (blade/ flake)	Core (whole or fragment)	Microlith?	TOTAL
5	50	Internal	Chert	21	14	7		2		3	2	1	9	2	2	63
			Obsidian	7	9											16
5	60	Internal	Chert	8	13	5	2					3	3			34
			Obsidian	3	1											4
5	63	Internal	Chert		2					1			1			4
			Obsidian													0
9	53	Internal	Chert	6	11	3	1			2	1		1	9	1	35
			Obsidian	2	4						1		1			8
9	61	Internal	Chert	2	2											4
			Obsidian													0
-	27	External	Chert	61	10	15	4		1	11	4		5	7		118
			Obsidian	10	3	3								1		17
-	43	External	Chert				1			1						2
			Obsidian													0
-	44	External	Chert	22	32	14	3			5	7	1	7	2		93
			Obsidian	11	3	1				1						16
-	51	External	Chert													0
			Obsidian													0
-	52	External	Chert	3	3	2	2			1	1			1		13
			Obsidian	3	2											5
			TOTAL	159	109	50	13	2	1	25	16	5	27	22	3	432

Table 8.2. Distribution of tool types across Buildings, Spaces, and space types.

pXRF of obsidian and chert: research context and rationale

The consistent principal chemical composition of obsidians, in conjunction with the unique combination of trace elements at each source, renders them ideal for source identification. Cherts are represented by far more variation in their composition, occurring throughout the local geology including rich and diverse deposits at Penjwin, and with chert nodules littering the landscape, as observed during the course of the Zarzi Survey in January 2013. Substantial chert sources are known to exist in the high peaks of the Central Zagros, but travel restrictions to the Iraq-Iran border prevent further source analysis at this time. Analysis of cherts is therefore restricted to the characterisation of groups of material and identification of significant patterns of variation. A further analysis has been integrated into this framework, examining the residues on sickle blades, including the sickle sheen along the serrated blade edge and the dark residues along the length of the blade from hafting.

Research aims and objectives

Following research conducted over the course of the previous seasons, a series of key questions remain regarding the composition of the chipped stone assemblage. This phase of the study aims to answer key research questions:

- Are the non-Nemrut obsidians featured in the earlier levels at Bestansur and Shimshara?
- Do the traces of sickle sheen correspond with the preliminary findings for identification?
- Are hafting residues on chert comparable with residues on other artefacts (i.e. can the consistent use of bitumen adhesives be identified across the site)?

The data set

During the course of the season, a total of 63 chert and obsidian tools were analysed (Table 8.2). These include 13 obsidian tools and 50 chert tools. Tools for pXRF analysis were selected during the processing of lithics by R. Matthews. No clear obsidians were identified. Obsidians were selected on the basis of tool form: Çayonu tools, two knives from Shimshara and a core trimming element from the earlier levels in the deep sounding in Trench 10 at Bestansur. Cherts were selected on the basis of colours infrequently occurring in the assemblage. Chert blades with sickle sheen or residues and stains from fixatives, such as bitumen, were also selected for analysis.

Methods and approaches

Analysis of all artefacts was conducted in accordance with the protocols established in Spring and Summer 2012 (Matthews and Richardson 2012; Richardson 2013a), to ensure consistency of results. The Niton XL3t GOLDD+ was run in 'Mining mode', with high, low and main filters operating for 20 seconds each, and the light elements analysed for 60 seconds for all samples. The analyser was given time to stabilise to high temperature conditions at the beginning of each period of analysis and a full system check run. All readings were recorded in parts per million (ppm). NIST standard samples were run at the beginning and end of each period of analysis to check for drift. All samples were analysed in the tungsten-lined stand. All samples analysed using the 3mm spot are recalibrated where necessary, following the methodologies established in Spring 2013 (Richardson 2013b).

Table 8.3. Chert and obsidian tools analysed by pXRF.

Sample type	Site	Trench	Context	Tool #	Description
Chert	BEST	10	1538	5837	Grey chert borer/awl
Chert	BEST	10	1547	5846	Beige chert flake
Chert	BEST	10	1720	5643	Speckled grey chert shouldered blade
Chert	BEST	10	1725	5723	Beige chert diagonal-ended bladelet
Chert	BEST	10	1733	5754	Grey chert blade
Chert	BEST	10	1733	5764	Green-grey chert core
Chert	BEST	10	1733	5765	Speckled grey chert core
Chert	BEST	10	1736	5725	Grey chert shouldered blade
Chert	BEST	10	1736	5733	Grey chert blade
Chert	BEST	10	1736	5753	Grey chert blade
Chert	BEST	10	1738	5850	Burgundy chert core
Chert	BEST	10	1739	5718	Tan chert blade
Chert	BEST	10	1739	5721	Grey chert blade
Chert	BEST	10	1739	5768	Maroon chert core
Chert	BEST	10	1742	5869	Pink chery blade
Chert	BEST	10	1743	5803	Grey chert blade
Chert	BEST	10	1748	5783	Grey chert diagonal-ended bladelet
Chert	BEST	10	1750	5812	White chert translucent bladelet
Chert	BEST	10	1750	5813	Grey chert awl
Chert	BEST	10	1750	5814	Red chert blade
Chert	BEST	10	1751	5896	Dark grey chert core
Chert	BEST	10	1751	5897	Pink chert core
Chert	BEST	10	1751	5898	Grey and white striped chert flake
Chert	BEST	10	1751	5903	Red chert bladelet
Chert	BEST	10	1752	5929	Grey chert core
Chert	BEST	10	1752	5933	Pink-grey chert core
Chert	BEST	10	1752	5937	Grey chert flake
Chert	BEST	10	1755	5951	Orange chert blade
Chert	BEST	10	1756	5790	Black chert diagonal-ended bladelet
Chert	BEST	10	1758	5883	Black chert core
Chert	BEST	10	1758	5884	Tan chert core
Chert	BEST	10	1758	5885	Dark grey chert core
Chert	BEST	10	1758	5886	Red chert core
Chert	BEST	10	1758	5887	Dark grey chert core
Chert	BEST	10	1758	5948	Dark grey chert flake core
Chert	BEST	10	1758	5949	Brown chert blade core
Chert	BEST	10	1758	5950	Black chert core
Chert	SHIM	1	1632	334	Brown chert blade
Chert	SHIM	1	1653	312	Brown striped chert blade
Chert	SHIM	2	1633	282	Hooked grey chert blade

Sample type	Site	Trench	Context	Tool #	Description
Obsidian	BEST	10	1727	5777	Obsidian Cayonu tool
Obsidian	BEST	10	1752	5935	Obsidian core trimming element
Obsidian	SHIM	1	1632	349	Obsidian knife
Obsidian	SHIM	1	1632	350	Thick obsidian blade
Obsidian	SHIM	1	1632	351	Obsidian Cayonu tool
Obsidian	SHIM	1	1632	352	Obsidian Cayonu tool
Obsidian	SHIM	1	1634	385	Obsidian blade
Obsidian	SHIM	1	1634	389	Obsidian knife
Obsidian	SHIM	1	1634	390	Obsidian Cayonu tool
Obsidian	SHIM	1	1649	397	Obsidian blade
Obsidian	SHIM	1	1649	398	Obsidian Cayonu tool
Obsidian	SHIM	1	1653	253	Complete obsidian Cayonu tool
Obsidian	SHIM	1	1660	260	Obsidian blade
Sickle	BEST	10	1721	BF5261	Grey chert sickle blade
Sickle	BEST	10	1724	5722	Grey chert sickle blade
Sickle	BEST	10	1736	5741	Tan chert sickle blade
Sickle	BEST	10	1738	5832	Grey chert sickle blade
Sickle	BEST	10	1738	5849	Dark grey chert sickle blade
Sickle	BEST	10	1739	5720	Grey chert sickle blade
Sickle	BEST	10	1752	5936	Brown chert sickle blade
Sickle	BEST	10	1755	5992	Grey chert point with sickle sheen and hafting residue
Sickle	BEST	10	1758	5888	Mottled chert sickle blade
Sickle	SHIM	2	1652	308	Brown chert blade with sickle sheen

Obsidian

Analysis of the obsidian revealed a set of results consistent with the Nemrut-sourced material that dominates the Bestansur and Shimshara assemblages. This is the case for the majority of blades from both sites, including those from the deepest levels of the Trench 10 sounding at Bestansur, where a core trimming element (Tool 5935) testifies the earliest working of Nemrut obsidian on-site thus far recorded.

However, a single anomaly occurs in the assemblage of analysed blades from Shimshara. SHIM Tool 389 (Fig. 8.4) demonstrates significantly lower zirconium (Zr) proportions than are commonly observed in the Nemrut obsidians (Fig. 8.3). The thick, broad blade demonstrates considerable wear in the form of striations across the dorsal, with thick concretions adhering to the ventral surface. The latter are responsible elevated calcium readings on the ventral surface, but do not account for depleted zirconium readings on both ventral and dorsal surfaces. Preliminary indications suggest an alternative source for this black obsidian blade (Fig. 8.5). Possible sources include the Meydan Dag deposits at Lake Van, close to the major Nemrut source which supplied most of the obsidian to the Neolithic sites in the Central Zagros, but a marginally stronger compositional correlation is found with the north-eastern Anatolian Pasinler source at Tizgi. The blade was recovered from C1634, a mixed context of loose material and hill wash, extracted to access the intact archaeological deposits beneath. Nonetheless, the range of Cayonu tools and comparable large obsidian blades recovered from the topsoil and earlier deposits in Trench 1 strongly support a

Neolithic date for Tool 389 and provide the first indications of a second obsidian source supplying the chipped stone repertoire at Shimshara.

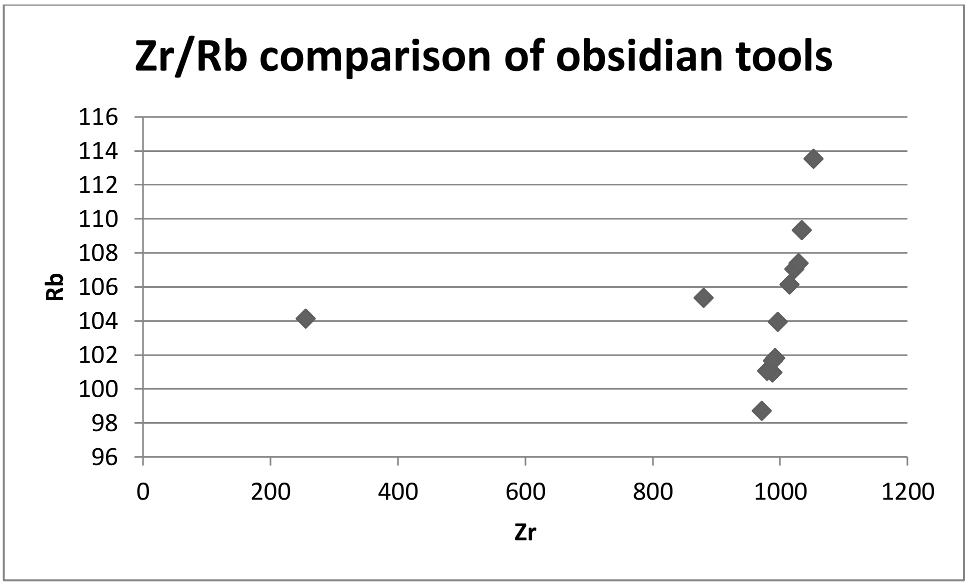


Figure 8.3. Comparison of the pXRF results from the Bestansur and Shimshara obsidian tools.

Figure 8.4. Obsidian Tool 389 from Trench 1 at Shimshara, C1634.

Chert

Cherts have been analysed according to major, minor and trace elements in order to compile a corpus of cherts used at the sites. However, at this stage the analysis of cherts is not anticipated to lead to the identification of sources. Geologists at the University of Sulaimaniyah have confirmed the presence of rich and varied chert deposits in the ophiolite complex at Penjwin (25-30km from Bestansur). The location in the foothills of the Zagros Mountains, less than 10km from the Iraq-Iran border, has thus far hindered chert source investigation due to travel restrictions.

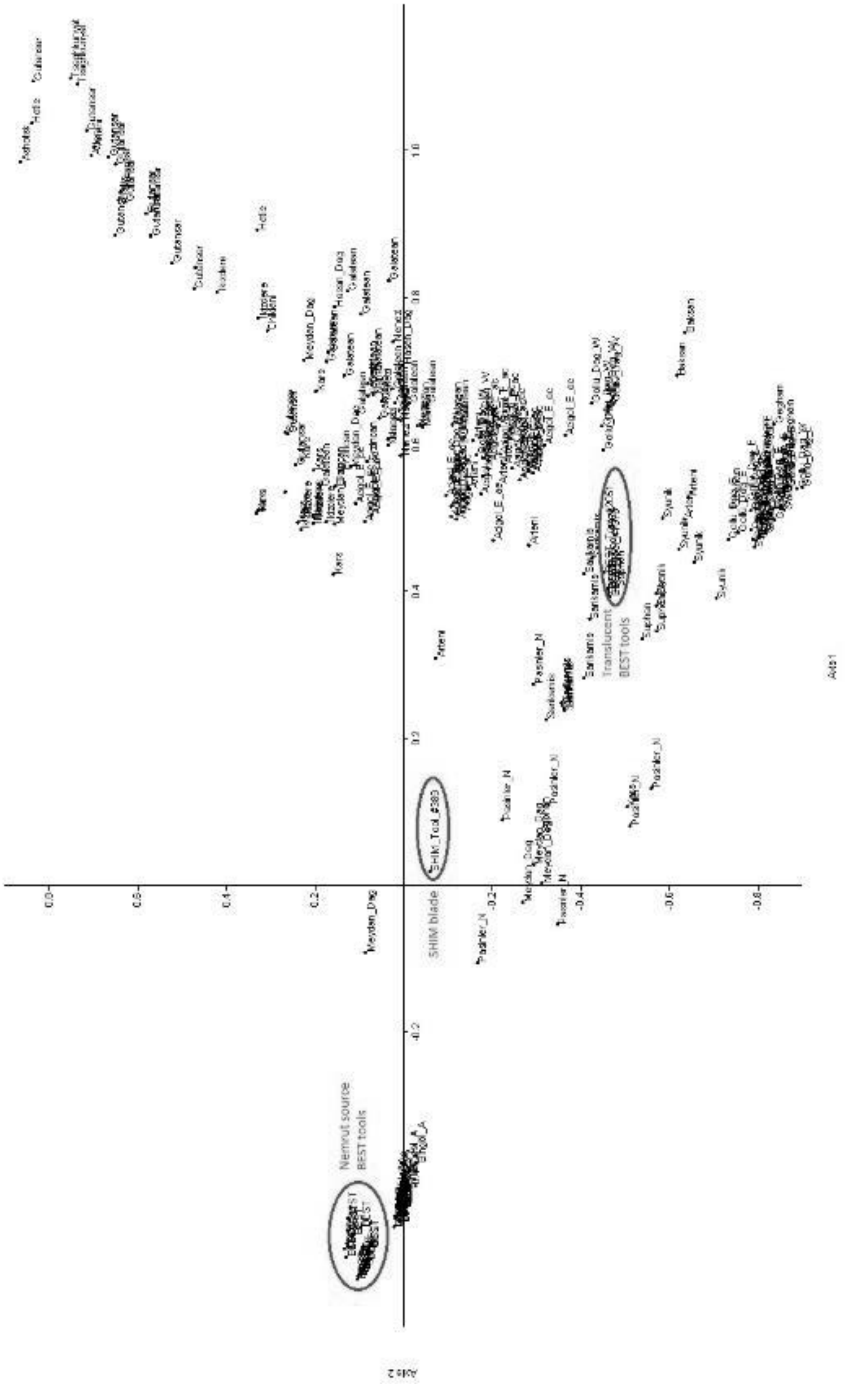


Figure 8.5. Correspondence analysis scatter diagram of Rb, Sr, Zr and Zn values for obsidian sources. With comparative data from Bestansur and Shimshara.

Sickle sheen results

To support the data collected in previous seasons, further analysis of blades with sickle sheen and hafting residues/stains were conducted (Table 8.3), in order to corroborate the correlation of elemental traces detectable by pXRF analysis.

The results compare the chert composition based on the average values from the analysis of the dorsal and ventral sides of the blades, with focussed readings from the areas affected by sheen or staining (Figs 8.6 and 8.7). The results support the preliminary observations made in 2013 (Richardson 2013b; Matthews *et al.* 2014b), that where sheen occurs, silicon and strontium values will be elevated by the plant residues, and calcium values depleted.

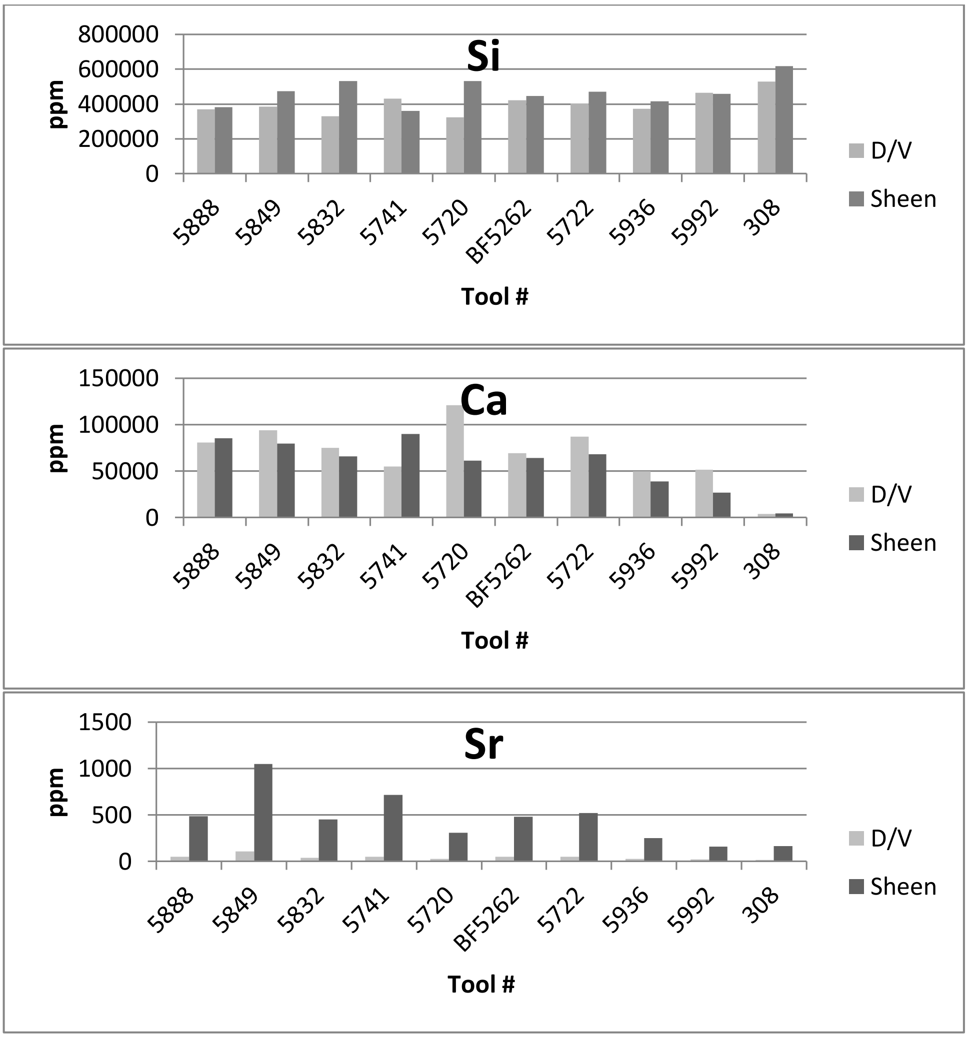


Figure 8.6. Comparison of pXRF chert results with sheen spot analysis.

Elevated strontium values may also be observed in the staining residues visible on the blade shafts, indicating a hafting of the blades with bitumen fixative. Sulphur traces largely mirror this pattern, but the chlorine values, whilst raised, are not so prominent. One blade demonstrates exceptionally high sulphur and chlorine values (Tool 5936, Fig. 8.8); this brown chert blade has thick black residue adhering to the surface. The blade was recovered from the deep sounding in Trench 10, indicating hafting from the early levels at Bestansur and the continuous presence of sickle blades in contexts across the southern portion of Trench 10 in over two metres worth of deposits. Further evidence for hafting is discussed in Chapter 9: Small Finds (this volume).

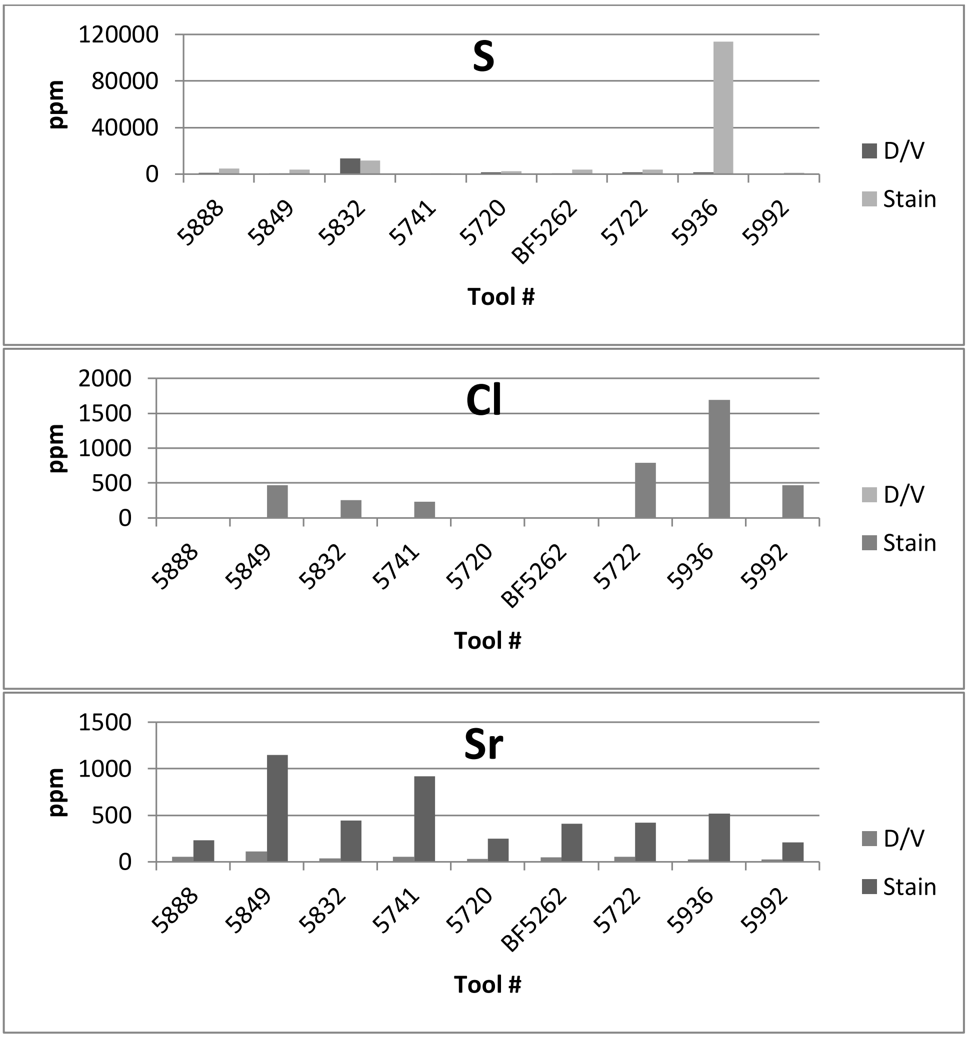


Figure 8.7. Comparison of pXRF chert results with hafting residue spot analysis.

Figure 8.8. Tool 5936, C1752, with thick black hafting residues on ventral (and dorsal) surface.

Chapter Nine: Small Finds

Amy Richardson

Research context and rationale

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?

Research aims and objectives

This summary of the small finds recorded during the Spring 2014 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 highlighted and preliminary portable XRF analysis conducted, where appropriate. The relationships between these artefacts are provisionally examined across the sites, 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 2014 Spring season, a total of 84 artefacts were assigned small find numbers. These artefacts were catalogued, photographed and drawn, ready for storage at the Sulaimaniyah Museum, and future integration into their collections.

From Bestansur, the artefacts were selected from a total of 15kg of bone, 28kg of pottery, 3kg of fired clay, 4.5kg of chipped stone and 130kg of ground stone, as having specific cultural significance. They are treated in this summary as 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.

Methods and approaches

In the field, SF numbers were assigned to artefacts during excavation, through heavy residue processing and by specialists conducting analysis (e.g. worked bone was highlighted by R Bendry during the zooarchaeological analysis). Each find has been catalogued, described, illustrated, photographed and is now held at the Sulaimaniyah Museum, along with copies of the catalogues. Where appropriate, pXRF analysis has been conducted to identify and compare materials used for the manufacture of portable material culture. The pXRF analysis methods applied to the chipped stone tools have been applied here (see Chapter 8).

Results to date

Worked bone

From Bestansur, 21 items of worked bone were identified, 18 of which pertain to the processing of the Spring 2014 finds (Trench 10) and three recovered during the Summer 2013 field season (from Trench 13).

Fourteen of the 18 worked bone fragments from Trench 10 were excavated from external spaces to the south and east of Building 5. The fragments occur in general occupation residue deposits.Only two fragments of worked bone were retrieved from well-stratified internal spaces, one from the corridor space to the west of Building 5 (SF501, Sp60, Fig. 9.1), and the other next to a skull (Sk1) in Space 50 (SF504, Fig. 9.1). Rather than the bone-working discard more frequently seen in external deposits, these two fragments appear to be deliberately shaped, possibly indicating specific tool-types in use within the building.

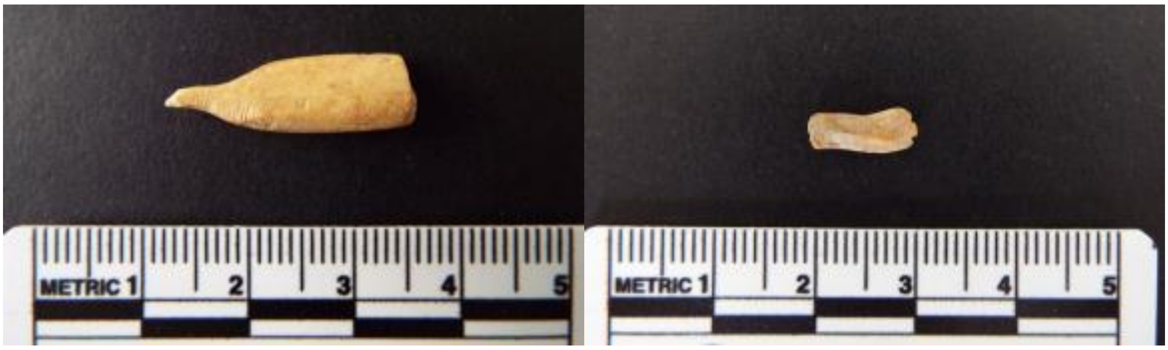


Figure 9.1. SF501 and SF504 worked bone fragments from internal deposits in Building 5.

Five fragments of bone needles were identified from external deposits, including three fragments of a complete needle (SF483 and SF484, Fig. 9.2) from Sp53 above Building 9. Two further small fragments of a fine bone needle were deposited in Sp44, the external area to the southwest of Trench 10 (SF505 and SF508). The final shaft fragment (SF506) occurred in the deep sounding (Sp27), illustrating the continuity of activity and deposition practices.

Figure 9.2. SF483 and SF484 bone needle fragments from Sp53.

From Sp44, protruding from the south section, a fragment of worked bone was identified and excavated (SF514). Investigations indicate further fragments still present in the section. The fragment, with its smooth external surfaces and grooved interior with black residues, is likely a portion of bone sickle haft that would have secured chert sickle blades (Fig. 9.3). Chemical analysis of the black residue lining the central groove has revealed that this possible bitumen residue corresponds with residues analysed on sickle blades (Fig. 9.3). In particular, the very high sulphur content on the bone haft is similar in signature to that of Tool 3916, one of a set of four sickle blades from C1422. Although excavated in different seasons, contexts C1422 and C1730 are proximate and may refer to the same context.

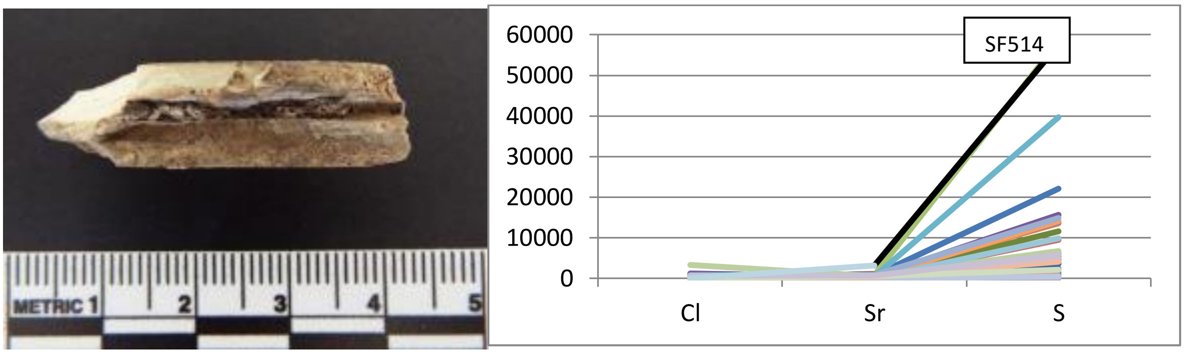


Figure 9.3. SF514 bone haft with residues and pXRF analysis of sickle blades residues and haft residue.

Cowrie shells

Two cowries were excavated from Space 50 (Fig. 9.4). The cowries are type *Cypraea monetaria moneta* or *monetaria annulus* (likely the former). These are both common to the Red Sea/Persian Gulf rather than the Mediterranean. As is commonly seen, the rear is cut away and embedded in the shell is a combination of both packing sediment and dark bituminous residue.

The 'bitumen' residues observed inside the cowrie shells and on the bone haft are characterised by elevated readings in the balance, reflective of the bitumen C6H6 compound. Depleted aluminium values distinguish the residues from the common soil compositions and sulphuric values are elevated to between 30k and 100k ppm (3-10%). This is keeping with the Mesopotamian bitumens, which vary between 3-8% sulphur. Numerous surface deposits and outcrops lie between Tigris and the Zagros mountains (Forbes 1936, 20).

Figure 9.4. SF468 with embedded residues, and in situ with SF470 next to SK1731-1.

Stone

A variety of stone artefacts were recovered over the course of the season. The ground stone material is covered in further detail in Chapter 10. Nine artefacts from Bestansur were assigned SF numbers, including two polished stone spheroid tokens identified in the ground stone assemblage from Spring 2013 (SF499 possibly hematite, SF500 possibly alabaster). Two further hematite tokens were recorded from Trench 10, SF478 and SF485, a mineral commonly used as the ferrous component in red ochre pigments. Worked and unworked ferrous stones occur in several instances in spaces to the south and west of Trench 10 (see also SF377), though are not commonly seen occurring naturally at Bestansur, suggesting deliberate selection and sourcing of this dense material for the production of small tokens and shapes. Two small tokens of polished limestone were also retrieved from the southwest of Trench 10, an ‘egg-shaped’ object (SF474) and an ‘almond-shaped’ token (SF475). SF481 and SF482 were unusual, unworked stones identified in Sp53, deliberately deposited in that space, the former green sandstone and the latter fire-cracked stone. In Sp50, C1781 the packing below the floors that contain human remains, two adjoining fragments of alabaster bowl were buried (SF537, Fig. 9.5). Closer to the thin-walled marble bowls at Shimshara in style than the Bestansur limestone bowls, these fragments demonstrate the deliberate deposition of prestige artefacts in this space, alongside the remains of the dead.

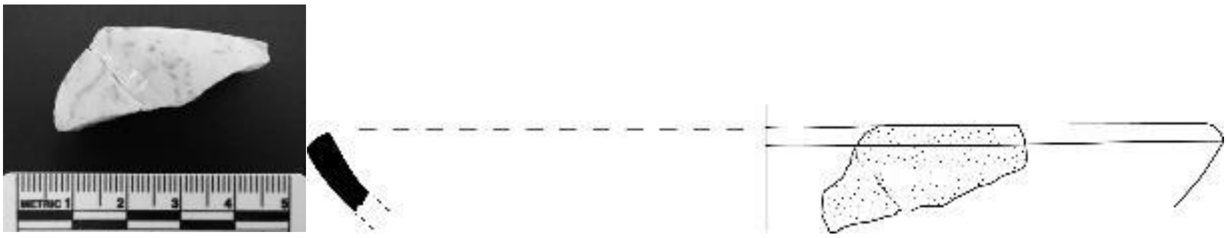


Figure 9.5. SF537 alabaster bowl fragments from Sp50.

Adornment

From Bestansur, 22 Neolithic bead small finds were recorded, 18 of which pertain to secure Neolithic contexts. Beads have, for the most part, been recorded individually, but a number of bead groups possibly belonging to necklace strings have been assigned a single SF number. A total of 87 individual beads were recovered during the course of the field season. All 18 of the Neolithic bead SFs (85 individual beads) were recovered from Sp50, amongst and in relation to the multiple burials. The majority are either dentalium or small river mollusc (*neritidae*), although there are three exceptions: SF469 a lozenge-shaped clay bead with narrow terminals, SF539 a green stone (variscite) flat-bead, and SF552 a short cylinder bead made from crab claw. SF539 displays the seams of crandallite that variscite commonly contains. Only a limited number of sources are known, although these include the Kushk Mine in Bafq, Yazd Province, Central Iran and possibly in the turquoise mines at Nishapur, east of the Elburz mountains.

Adding these to the 117 beads previously recorded from Sp50, there are thus far 204 individual beads recovered from the floors and packing surrounding the deposits of human remains, strongly supporting the adornment of the dead. Although individual beads have been recorded from many trenches across the site and from domestic contexts in Trench 13 particularly, the concentration of beads in Sp50 and the variety of materials used in their manufacture indicate elaborate mortuary activity as a particular focus for conspicuous display.

Figure 9.6. SF546 a group of 30 dentalium and shell beads from Sp50.

Clay

From the fired clay assemblage, a total of 28 Neolithic clay objects or groups of objects were recorded as small finds, where form or deliberate shaping was evident.Only six of these were recovered from internal spaces, all from Sp50. The finds from the clay packing beneath the floors included the clay bead discussed above (SF469), two teardrop shaped tokens (SF493 and SF510) and a clay figurine, comparable with the Jarmo early levels: Jarmo Early Simple Type (Morales 1983, 377, fig. 156:1). The figurine was recovered in five separate pieces and appears to have been broken in antiquity. Fracture is evident at the top of the neck, indicating the possibility of an absent head, removed prior to deposition. Located in the Sp50 packing with disarticulated human remains, this seated figurine represents the best example of human representation found thus far at Bestansur.

Figure 9.7. Clay objects from Space 50.

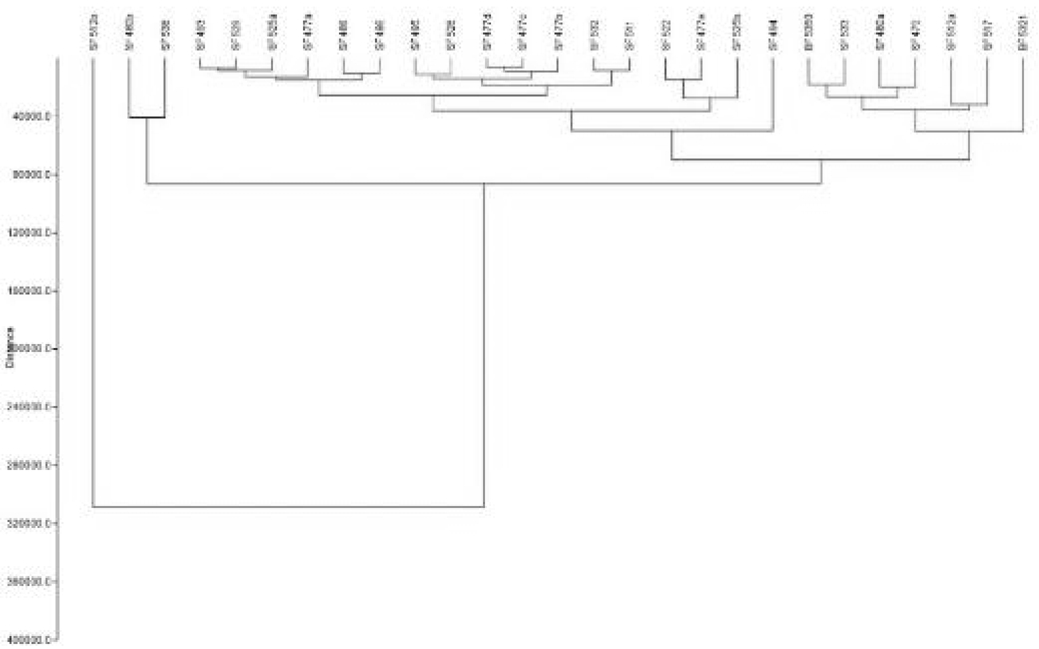


Figure 9.8. Correspondence analysis of clay artefact elemental compositions from pXRF.

Portable XRF analysis of the clay objects illustrates variations in the clay matrix used for objects across the site (Fig. 9.8). Most unusual is SF512b, a piece of shaped clay with obsidian temper and red ochre on one surface (Fig. 9.9). The deliberate addition of crushed obsidian temper has not thus far been observed in any other materials on site and its coincidence with ochre indicates specific activities and agency involved in its preparation. The presence of eight clay SFs in Space 44, an ash rich external deposit and fire installation, provides evidence for deliberate deposition of clay objects within this area to the southwest of Building 5. In the ash-rich deposit C1755 was a second clay object, with more deliberate shaping (SF512a); this object takes a form similar to an object recovered from the packing in the lower levels of the sounding (C1751, Sp27). SF522 is a very deliberately shaped and scored piece of clay, with fingernails marks forming radials and a possible knot impression on one side. Both SF512a and SF522 have smoothed flattened bases and may resemble the reclining female figurines from Jarmo and Sarab (Fig. 9.10; Morales 1983, fig. 157.3; 1990, plate 13:k).

A further figurative object was recovered from Sp27, the sounding, in a context with three tiny, shaped clay balls (SF495). The small cone-shaped token (SF498, Fig. 9.11) was revealed to have short incisions to the front and rear, with a dot impression above the incision on one side. Similar markings were observed on SF329, though less pronounced.

Throughout the clay assemblage, it is abundantly clear that a repertoire is emerging in the form of peaked spheroidal or 'teardrop' shaped objects (Fig. 9.12). Appearing in Spaces 27, 44 and 50, these small, smooth objects are present in both internal and external deposits. These tokens have not appeared in any other trench at Bestansur and appear to be particular to the set of buildings uncovered in Trench 10, perhaps serving a symbolic or abstract purpose within and around the area of the settlement. Whilst the clay token forms ubiquitous across the Fertile Crescent find representation here (balls, cones, etc), a set of non-standard shapes appear with frequency across this space, including the teardrops and squashed/nullified/ button tokens, with rounded uppers and flat bottoms. If these do represent early numerical recording systems, then Building 5 (and Building 8 below it) is a focus for the enumeration of objects.

Figure 9.9. SF512 with obsidian temper and red ochre on surface.

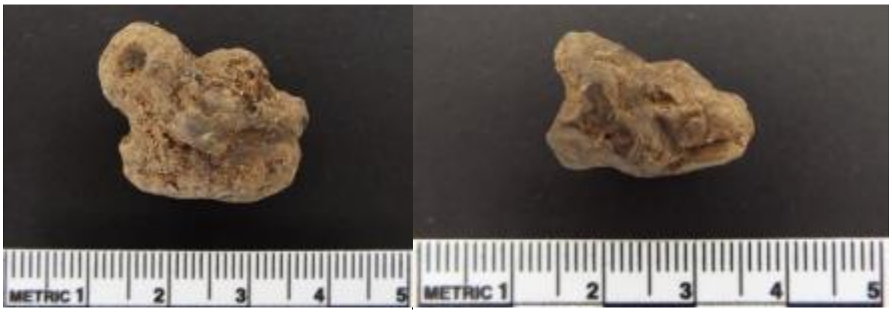


Figure 9.10. SF512a and SF522, possible reclining female figurines, to be compared with SF525.

Figure 9.11. SF498 clay cone token/figurine, with navel and incision to divide legs.

Figure 9.12. ‘Teardrop’ shaped tokens, SF509 (Sp27), SF526 (Sp44) and SF493 (Sp50).

Conclusions and future directions

The small finds demonstrate the participation of the Bestansur inhabitants in the complex networks of exchange that operated across the Neolithic Fertile Crescent. The deposition of materials from up to 1000km away, in conjunction with the cultural repertoires recorded, testifies to consistent and maintained interactions with people and landscapes that facilitated the spread of these things and ideas. Investigations of Space 50 have revealed this to be an area of concentrated activity and deliberate deposition regarding mortuary remains. It is in this context that the richest variety of exotic and travelled materials were displayed and removed from circulation. Future investigation of these networks and the range of interactions that transmitted both materials and innovations will provide further insight of the nature of the interactions operating between the Bestansur inhabitants and their contemporaries in the landscape.

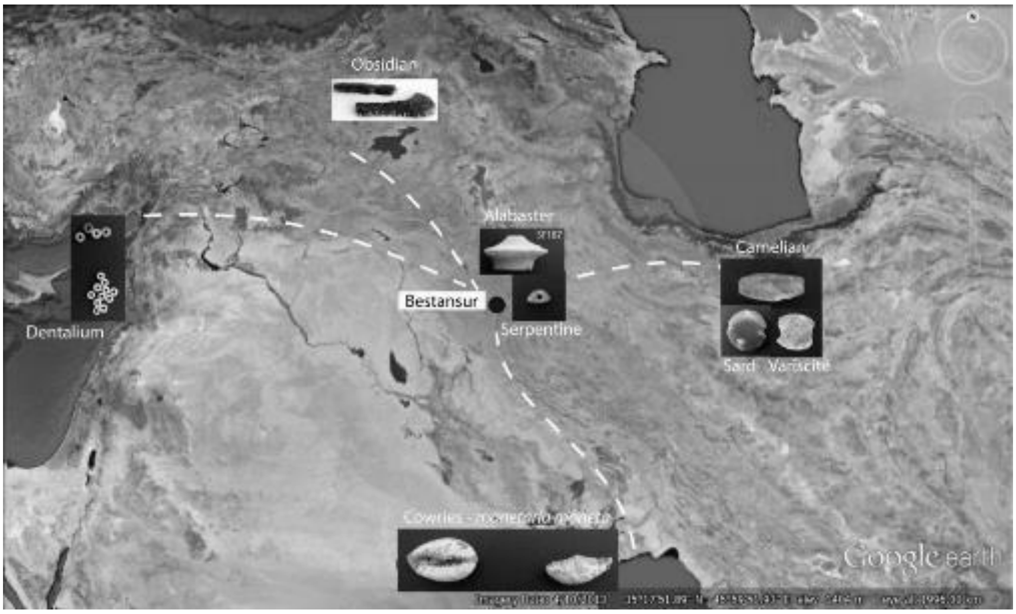


Figure 9.13. Exotic materials from source to deposition at Bestansur.

Table 9.1. All small finds catalogued at Bestansur Spring 2014.

C#	SF	Material	Item	L (mm)	W (g)	Description
1700	**460**	Stone	Bead		0	Small white stone disc bead, with irregular shaping and off-centre perforation. Located in topsoil - period unknown.
1700	**461**	Clay	Clay object	128	605	Possible clay cooking stand. Triangular in shape, with four circular impressions decorating the front face. Broken on rear.
1708	**462**	Clay	Bead	6		Small, clay barrel bead, slightly asymmetrical in form with central perforation and concave terminals. Buff to pink in colour. Lustre on surface due to use.
1714	**463**	Shell	Beads	6	2	19 shell beads and fragments in a group, associated with human remains in C1714. Soil around taken as SA1905.
1720	**464**	Glass	Bead		0	Small, blue glass, disc bead with central perforation. Colour, translucency and pitting suggestive of glass, but colour is imitative of lapis lazuli.
1719	**465**	Bone	Tool	41	1	Worked bone tool with high polish. Well-worn and broken at both ends. Working edge appears to be serrated, with a lustre from use.
1727	**466**	Bronze	Ring		3	Copper alloy spiral ring with plain serpent's head terminal (one terminal absent). Five fragments recovered indicate coiled at least twice.
1731	**467**	Shell	Beads	6	0	2 small mollusc beads, white - cream in colour, with 1 natural and 1 artificial perforation. Found in skull area of C1731 SK1.
1731	**468**	Shell	Cowrie	24		White cowrie shell found in proximity to SK1 (1731), c. 10cm south of skull. Likely used for eyes. Shell is hollow in rear with some adhering sediments and a dark, rich organic substance.
1729	**469**	Clay	Bead	17		Lozenge-shaped bead shaped from clay (burnt black). Asymmetrical with one pinched and one flattened terminal. Circular in section with narrow (<1mm) perforation. Complete.
1731	**470**	Shell	Cowrie	24		White cowrie shell found in proximity to SK1 (1731), c. 5cm north of skull. Likely used for eyes. Shell is hollow in rear with a dark, rich organic substance.
1731	**471**	Dentalium	Bead	6	0	Small, red and white, cylindrical dentalium bead, with natural curvature. Section is ovoid with upper pronounced ridge. Perforation running through length.
1733	**472**	Bone	Rib fragment	36	3	Rib fragment. Not polished or worked.
1738	**473**	Clay	Rod	17	1	Small, fired clay rod, with fracture at both terminals and slightly expanded, circular mid-section. One terminal is broken flat, the other tapering and chipped from edge. Clay is pink to black, from uneven firing.
1739	**474**	Stone	Polished stone	37	49	Small, 'egg-shaped' stone with smoothed and polished surfaces.
1742	**475**	Stone	Token	20	3	Stone 'token' with polished, uneven surface. Almond-shaped with curved ventral and ridged dorsal.
1725	**476**	Clay	Objects	13	3	Two irregularly-shaped sub-oval pieces of clay with finished surfaces. Potentially part of a larger object/s, or crude tokens. Clay is brown to black.
1751	**477**	Clay	Shapes		29	Pieces of shaped clay (one in 3 frags, one in 2 frags). Two shapes are elongated, tapering to a point. Two shapes resemble squashed or nullified tokens/seals. One piece has two finished surfaces either side of a curving wall, similar to pottery. A further 6 fragments may relate to the others, but refit and shape identification is not possible. The clays used are coarse and lightly fired, with limestone inclusions. Variable firing conditions, resulting in varying surface, margins and core: black/red/orange/buff-pink.
1748	**478**	Stone	Object	33	14	Object of sub-ovoid ferrous stone. Possibly partially shaped. Similar in size and shape to helix salamonica.
1751	**479**	Clay	Shape	51	30	Two adjoining fragments of a piece of shaped clay, with partial smoothed surface; otherwise all surfaces are fractured. Original form indistinguishable. Clay is very coarse, indicating object is much larger or clay is architectural.
1756	**480**	Clay	Objects	40	34	Two large fragments of shaped clay, forming thick-walled shapes (20mm deep). One fragment is convex-walled with rounded edges and large grog inclusion that may have caused the fracture point. Other frag is similar in form, although the lip is concave rather than convex. Possibly from same object, althought refit is not possible. May be discarded after misfire.
1756	**481**	Stone	Green stone	60	65	Piece of very fragile green sandstone. No evidence of working. Found in close proximity to SF480 (clay objects).
1756	**482**	Stone	Fire-cracked stone		31	>7 fragments of fire-cracked stone. High quartz content. Charring and fracture indicate direct heat. Possibly used in hearth.
1756	**483**	Bone	Needle	37	0	Two adjoining fragments of fine, polished, bone needle. Mid-shaft, tapering towards (absent) point.
1756	**484**	Bone	Needle	18	0	Upper shaft fragment of fine, polished, bone needle.
1755	**485**	Stone	Ball	18		Ferrous metal, possibly pyrite, worked into the shape of a ball. Impact scars suggest use as a ballistic.
1751	**486**	Clay	Ball	9	1	Small, spherical clay ball with pitted surface and traces of red ochre.
1755	**487**	Uncertain	Bead	10	0	Possible bead from light/fragile material (similar to glass slag). Blue/green in

C#	SF	Material	Item	L (mm)	W (g)	Description
						colour (staining?). May be intrusive.
1521	**488**	Bone	Worked bone	40	6	Fragment of worked bone. Material probably antler from either red or fallow deer. Fragment is flat on one surface, rounded on the reverse, tapering to a curved tip. Possibly a polisher/burnisher.
1625	**489**	Shell	Bead	6	1	Small, off-white bead- likely broken bead.
1521	**490**	Bone	Worked bone	21	1	Small piece of worked antler. Highly polished and flat on one side.
1521	**491**	Bone	Worked bone	28	2	Fragment of worked antler. Highly polished and partly carbonised.
1521	**492**	Crab	Worked crab claw	5	1	Worked fragment of crab claw. Possible bead blank or off-cut. Saw and snap/polish evident, but fractured along length.
1741	**493**	Clay	Object	19	2	Small, spheroid piece of clay, with slight peak to create squat teardrop shape. Clay is crude and coarse; pink to grey. Possible token/proto-token.
1755	**494**	Clay	Objects	20	6	Two squashed clay shapes, possibly nullified tokens. One is squat, flat, teardrop shaped (18x8mm). The other is similar in form, but larger, flatter, with smoothed surfaces (20x6mm). Coarse clay; brown to black.
1738	**495**	Clay	Objects	7	4	Three small clay balls (5mm, 7mm, 7mm) and a lozenge shaped piece of clay (diamond section). All are hard-fired, with one ball lighter (grey-beige) than the others (brown-black). Gaming pieces?
1721	**496**	Bone	Worked bone	53	5	Worked fragment of sheep-sized long bone
1721	**497**	Bone	Worked bone	50	6	Worked fragment of sheep-sized long bone
1738	**498**	Clay	Token/figurine	31	1	Cone-shaped clay token with short incision running from base to 1/3 up body, above which is an impressed dot. Possibly front face of figurine, representing bifurcation of legs and belly button. Rear shows second incision from base.
1310	**499**	Stone	Token	18	8	Peaked ellipsoid shaped stone, possibly pyrite. Similar to clay tokens in form.
1312	**500**	Stone	Token	13	4	Small, spherical, cream stone token with slight facets from shaping.
1742	**501**	Bone	Worked bone	24	1	Fragment of worked bone with saw marks on wide end, narrowing to fine cylinder (broken) with circular section (needle?).
1743	**502**	Bone	Worked bone	8	1	Fragment of worked bone - broken needle. Bone is burnt/carbonised.
1720	**503**	Bone	Worked bone	55	3	Fragment of worked metatarsal with saw marks, likely working discard. Illustrates stages of bone-working.
1731	**504**	Bone	Worked bone	11	1	Small, rounded fragment of worked bone, flaring to flattened edge with two notches.
1739	**505**	Bone	Worked bone	8	1	Mid-section of very fine needle, circular in section (1.6mm). Calcined bone
1752	**506**	Bone	Worked bone	6	1	Mid-section of a fine bone needle, circular in cross-section. Calcined bone.
1772	**507**	Clay	Shape	24	6	Oblong of clay with fracture along surface and two blobs.
1743	**508**	Bone	Worked bone	84	1	Mid-section of a tiny needle. Circular in cross section. C. 11m in diameter.
1752	**509**	Clay	Shape	10	1	Small fragment of clay shape, sectioned during excavation. Teardrop section with slightly rounded profile.
1741	**510**	Clay	Shape	12	3	Small peaked speroid clay shape.
1750	**511**	Clay	Shape	21	6	Fragment of dense, hard-fired shaped clay with smooth and rounded surfaces. Potential animal figurine.
1755	**512**	Clay	Shape	26	12	Deliberately shaped piece of clay, possibly figurative. Completely smoothed flattened base with undulating upper.
1752	**513**	Clay	Three balls	8	1	Three small (<10mm) shaped and fired clay balls. One is in 2 fragments.
1730	**514**	Bone	Worked bone	41	5	Probable bonehaft. Outer polished surface; groove in bone contains black residue (possibly bitumen). Potentially for a sickle.
1743	**515**	Bone	Worked bone	26	2	Small fragment of worked bone (carbonised and burnt)
1752	**517**	Clay	Object	16	1	Squashed clay object with smoothed faces. Fingernail impressions in shoulder and on base.
1751	**522**	Clay	Object	24	5	Clay object with finished/smoothed reverse, with nail impressions in centre. Possible scoring decoration on underside (3 radials) and knot impression on upper, with fibrous impressions.
1768	**525**	Clay	Objects	28	7	Two clay 'shapes' recovered from fine 'plaster' layer in T10 sounding. One is complete, crescent shaped with rounded surfaces (potentially reclining figure). The other is triangular in section (surface removed during excavation with slightly rounded posterior, suggestive of a squashed cone shape.
1772	**526**	Clay	Object	16	2	Teardrop-shaped clay object, with most surfaces surviving intact. Slight facetting to create shape, biconical.
1769	**527**	Clay	Shape	16	2	Blackened, rounded clay object, possibly deliberately shaped. One surface absent and fracture evident.
1769	**528**	Clay	Object	20	3	Fragment of a clay object. Trapezoid in shape. Upper surface is absent, but possibly flat, expanding toward base (absent). May be part of a much larger object. Clay is very coarse and poorly sortedm with grit and limestone inclusions, including 5mm stone at fracture point.
1778	**529**	Clay	Object	14	2	Hemispheroid clay object (complete) with pinched edge leaving possible nail impression on upper surface. Possibly a squashed/nullified ball.
1767	**530**	Clay	Shape	19	2	Fragment of clay excavated from F16 ash, with partial smoothed surface and remaining rough surfaces. Possibly discard.
1780	**531**	Shell	Bead	6	1	Small cream mollusc bead (pierced), some fracture and damage.

C#	SF	Material	Item	L (mm)	W (g)	Description
1781	**532**	Clay	Figurine	40	12	Clay figurine found in packing Sp50. Similar to Jarmo early levels: simple seated schematic figurines. Body is rounded with elongated neck. May have lost head in antiquity (flattened and smoothed on top of neck). Legs are extruded from body, tapering. Figurine is in 5 parts: head/neck, neck fragment, body, legs. Possibly formed from separate pieces of clay, leading to natural fracture points.
1775	**533**	Clay	Object	25	9	Piece of very lightly fired, dense clay. Shaping appears intentional. Fragment of shell ahering to/embedde in surface. Object has flattened base, leadingto rounded upper, with slight extrusion.
1775	**536**	Shell	Bead	6	1	Small, cream, perforated mollusc bead.
1781	**537**	Alabaster	Bowl fragment	47	8	Body sherd of an alabaster stone bowl (modern break to make two fragments). Non-diagnostic. Wall is c. 6mm thick in cream stone.
1781	**538**	Clay	Object	43	11	Fragment of larger clay object with curved finished surface. On broken face, buff-coloured core is visible, surrounded by dark and coarse clay exterior.
1781	**539**	Stone	Bead	10	1	Bright green flat bead, ellipsoid and flat with perforation running along length. Some damage at both terminals, possibly from drilling of hole with too wide a tool. Fabric is soft, with concretions and weathering across surfaces. Likely serpentine or jadeite.
1775	**540**	Dentalium	Bead	1	1	Small cream dentalium disc bead with central perforation.
1746	**541**	Dentalium	Bead	1	1	Small red dentalium disc bead with central perforation.
1781	**542**	Dentalium	Bead	1	1	Two red and two cream small dentalium disc beads with central perforation.
1781	**543**	Dentalium	Four beads	1	1	Small red dentalium disc bead with central perforation.
1763	**544**	Bone	Worked bone	47	2	Worked bone point. Lenticular tapering to a circular section.
1781	**545**	Dentalium	Two beads	1	1	One red and one cream small dentalium disc beads with central perforation.
1775	**546**	Shell and dentalium	Thirty beads		3	Nine dentalium red disc beads, one red dentalium cylinder bead, two white dentalium disc beads and eighteen shell beads, possibly from a single necklace.
1755	**547**	Bone	Worked bone	23	2	Worked bone (probable gazelle), sawn across shaft (below proximal epiphysis); also down length of bone (in two axes).
1758	**548**	Bone	Worked bone	55	1	Shaft of worked bone, lightly polished, in 3 pieces (modern break).
1775	**549**	Shell	Four beads	6	1	Four cream mollusc beads with two perforations at either side of the apex.
1781	**550**	Shell and dentalium	Ten beads	9	1	Nine shell beads and one dentalium cylinder bead. Shell sizes vary between 9mm and 6mm in length. Dentalium is red, measuring 6 x 3mm.
1780	**551**	Shell	Bead	6	1	Small, cream, shell bead, heavily weathered on surface but complete. Single, large perforation adjacent to apex, for threading through aperture.
1775	**552**	Crab claw	Crab claw bead	9	1	Short cylinder bead made from crab claw with one smoothed end and one coarser end.

Chapter Ten: Ground Stone

David Mudd

Research context and rationale

The ground stone assemblage from Bestansur has the potential to help illuminate a wide range of archaeological issues concerning the Aceramic Neolithic of the eastern Fertile Crescent. Stone artefacts had a central role in the daily life of Neolithic sites. They were used for activities such as processing food and animal products, grinding minerals, burnishing plaster walls and surfaces, and in the manufacture of other tools. These functions were central to economic, social and ritual life in the Zagros Neolithic. Traces of their manufacture, use, curation and discard are visible as modifications to the shape of the stone, wear on its surfaces, and, possibly, surface residues. Stone is one of the most durable materials: stone artefacts may have had a use-life of decades or centuries before entering the archaeological record, and suffer little post-depositional degradation. The long use-life of ground stone artefacts means that their value in establishing the dating and chronology of a site is limited. Nevertheless, their stylistic traits of ground stone artefacts and assemblages can be used in making comparisons between sites with known dates. Morphological, spatial and statistical analysis of ground stone artefacts, and their association with other categories of material culture, can help to explain many aspects of daily life in the Neolithic.

Research aims and objectives

My research aims to throw light on several themes:

- to place individuals, households and social units in the context of the development of sedentism, agriculture, craft specialisation and social differentiation in the Neolithic of South West Asia. The traditional paradigm of climatic and/or demographic imperatives driving social change does not take sufficient account of human agency - the significance of individual people making choices and decisions (for example Tringham 1991; Dobres and Robb 2000; Robb 2010). One way to resolve these challenges is to drill down within the archaeological evidence to find narratives of daily life in order to better understand the ‘small picture’. Ground stone artefacts are a key piece of evidence for these narratives.
- social relations in Neolithic lifeways - the identity, roles and relationships of different population segments. Ground stone artefacts, particularly those related to architecture, to food processing and to the symbolic and ritual practices of communal life, are important evidence (Atalay and Hastorf 2006; Wright 2008).
- the use and number of ground stone artefacts. Most Pre-Pottery Neolithic sites were occupied over several centuries by populations numbering high tens or low hundreds, and over time, settlement size increased. Yet the number of ground stone tools recovered by excavation is low – usually tens or low hundreds – and the numbers of specific artefact types can be very low. Why is this? Do individual tools have a long life-span (decades or centuries)? Could this account for their apparent scarcity?
- the chronological sequence of neolithisation processes. To what extent can we see cultural change and evolution at early Neolithic sites, which were often occupied over several centuries? Did processes of neolithisation happen *within* individual sites, or, as Robb (2010) argues, did sites have

an inherent conservatism and stability, so that neolithisation proceeded by the fissioning and nucleation of settlements? The role of ground stone artefacts in answering these questions is less clear, but it has been argued that as agricultural villages developed, the development of the individual household and the growth of social inequality are reflected in changes in the size, typologies and spatial location of ground stone tools (Bogaard *et al*. 2009; Wright *et al*. 2013; Wright pers. comm.).

My specific objectives are to examine and catalogue the ground stone assemblage from the Neolithic site of Bestansur, in order to answer these research questions:

1. What are the life histories of the ground stone artefacts?
2. Can we identify the roles of individuals and groups who were engaged with the manufacture and use of the ground stone artefacts?
3. What role(s) did ground stone have in the development of social processes and social relations during the early Neolithic period in the eastern wing of the Fertile Crescent?In particular, what role(s) did ground stone have in quotidian and ritual processes such as daily meals and feasting?

Scope of this report

Neolithic assemblages of non-chipped stone are customarily referred to as 'ground stone', implying that abrasion had a significant role in the lithic production sequence. The Bestansur assemblage is broader than this. Not all the items were reduced by grinding or pecking: as this chapter will show, many items were flaked (knapped), similar to the production of chipped stone. A number are 'utilised cobbles' – stones of a convenient shape and weight which were used expediently with no or minimal prior modification (Moholy-Nagy 1983, 291). Some stones do not show any signs of use. They may have been tool blanks, or have had an architectural purpose such as floor surfaces or hearth linings. Some are fragments which may have been debris from stone tool manufacture or curation. For the sake of simplicity, however, the report uses the term 'ground stone' (abbreviated to GS).

The data-set

This chapter reports on stone items from:

- the Summer 2013 Bestansur season – all items are from Trenches 10 and 12/13, together with a small number of surface finds from a survey of the field to the west of the mound. A few items were included in the previous Archive Report on that season.
- the Spring 2014 Bestansur field season, all from Trench 10.

The analysis includes items from post-Neolithic contexts, but excludes beads and other personal ornamentation, and GS small finds.

Research methods and approaches

Excavation and handling

Following removal of topsoil, all pieces of stone with any dimension >10mm were collected. The majority were hand-picked, and the remainder were recovered by dry sieving or from flotation samples. Noteworthy items were recorded as Small Finds (SF), with their spatial co-ordinates noted. Others were recorded as Bulk Finds (BF). Their context was recorded, and the location of the context was planned. Some BFs included groups of stones from the same context. Stones were placed in polythene bags, labelled and taken to the dig House for examination by the author. Where a BF contained several stones, each has been given an individual identifying number (e.g. BF3324.06).

Examination

All the stone items were examined individually. Stones were not washed before examination, although a small number had to be washed first to remove surface soil so that their surface could be seen, and in order to identify the stone raw material. Items selected for surface residue analysis were only washed after samples had been taken. Dimensions, weight and physical characteristics were recorded. Items were examined by eye or with a hand lens. Items with possible usewear were examined with a digital microscope (Dino-Lite AM4113T, magnification up to 300x). After examination Items were washed (if necessary) and allowed to dry naturally. Leached carbonate concretions which obscured working surfaces were dissolved with vinegar and gentle brushing with a soft brush. All items except natural unmodified stones were photographed.

Raw material and a probable source, has been identified in most cases. The advice and assistance of Professor Kamal Haji Karim, Department of Geology, University of Sulaimaniyah, is gratefully acknowledged.

Usewear and surface residues

In the Spring 2013 season, I took elastomer surface peels from seven artefacts to examine possible usewear under SEM in the UK. It has become clear, however, that to pursue this avenue of research will require an extensive programme of experimental replication and identification of usewear, which is beyond the scope of my research. I have therefore not taken further surface peels.

Surface residue samples to look for pollen, phytoliths and starch grains were taken in 2013 from several artefacts which might have been used for food-processing. Laboratory analysis found pollen and phytoliths, but the quantities were insufficient to draw conclusions. A revised collection technique (Piperno 2006, 98-9) was therefore used in 2014; results are awaited.

Cataloguing and storage

Items broken in excavation were counted as one item. Clusters of debitage were weighed but not counted. All other items were counted and recorded individually. Cataloguing was recorded on paper in Bestansur and transcribed to an Excel spreadsheet. Details will in due course be recorded onto the CZAP database. All the GS items are in bags and crates, stored at the Bestansur dig house, in readiness for integration into the archive storage of the Sulaimaniyah Directorate of Antiquities.

Classification

Classification of GS artefacts in the Neolithic Near East is generally based on morphology: inferring the function of an artefact from its shape, particularly the shape of the (assumed) working surface(s). I have used a hierarchical classification:

- Artefact Class – based on mode of action (Wright *et al*. 2013)
    - Artefact Type – based on Baysal and Wright's taxonomy for Çatalhöyük (2006)
        - Artefact Sub-type – based on Baysal and Wright's taxonomy for Çatalhöyük (2006), and Wright's classification system for the Neolithic Levant (1992).

These taxonomies list physical criteria (size, shape, raw material) for each type, and use explicit terminology to describe the shape of the items. The 'Artefact Class' category is simpler than the system used in previous Bestansur Archive Reports.

Classifying the chaîne opératoire for 'ground stone'

'Ground stone' is a misnomer. Although reduction by abrasion may play a minor part in the final stage of manufacture, most of the reduction is achieved by percussion – pounding, flaking and pecking. Some may be made from flakes; others are equivalent to core tools (Wright 1992, 53-4; Wilke and Quintero 1996, 243-4). Wright's taxonomy includes Class Y 'Cores and debitage'. It is not easy to distinguish between pieces of stone which have been broken by human action and those which have been broken naturally. My criteria for debitage are derived from personal observation and Wilke and Quintero (1996):

- Fragments with any of:
    - a striking platform
    - a bulb of percussion
    - a bulbar scar
    - percussion ripples
    - hinge or step terminations
    - radial lines or striations on the ventral surface, emanating from a point of percussion
- Groups of stones (numbering >100; within a radius of ca. 1m), falling into a continuum of shapes and sizes:
    - Large: 50-120mm, sub-rectangular or triangular, fairly flat (thickness 10-30mm), often with one or more arrises on the dorsal surface, weight ca 50-250g. Recognisably worked; approximately 50% with percussion bulbs.
    - Medium: 25-50mm, angular, flattish (thickness 3-10mm), weight ca. 25-50g, sometimes with an arris on the dorsal surface, sometimes with a percussion bulb. Difficult to recognise individual pieces as worked.
    - Gravel: 10-25mm, angular, weight ca. 10-25g. Not recognisable individually as worked. Unlikely to be identified in excavation – more likely to be found in heavy residue.
    - Grit: <10mm, 10g. Not recognisable as worked; very unlikely to be identified in excavation – almost certainly only found in heavy residue.

The volumes of the Large, Medium, Gravel and Grit categories are approximately equal if recovered from flotation. If they have been hand-picked, the amount of Gravel and Grit tends to be smaller.

A further characteristic of debitage is that it may contain fragments of a harder stone, which has been used as the hammerstone. These may be fragments which fly off during knapping, or the debris from resharpening. Debitage from experimental knapping is shown at Figure 10.1. Archaeological debitage from Bestansur is shown at Figure 10.2.

I have included blanks and preforms under the relevant class. Blanks are recognised by their regular geometric shape, usually rectangular, with sides which are perpendicular to the upper and lower surfaces. Wilke and Quintero suggest, on the basis of experimental GS reduction, that the finished product is likely to be about 75- 85% of the mass of the blank (Wilke and Quintero 1996, 256).A blank undergoes further reduction to make a preform, and the shape of the finished product is usually recognisable at this stage.Figure 10.3 shows blanks for a mortar and a quernstone from Bestansur.

Finally, a note on manufacturing complexity, where I follow Adams' definition (2002, 21). An *expedient* tool has had its shape modified only by use, not by manufacture. I have included them in the relevant Class.

Results to date

This section begins with a summary of the items found, and then analyses the GS items by Trench and Space. Whilst a description based on artefact classification is traditional (and will be included in the Project's final publication), a spatial analysis will be more helpful at this stage in considering prehistoric activity at the site because it will show the associations between different kinds of GS artefacts.

Summary - Individual GS items

Number

217 individual GS items were catalogued, weighing a total of 307.5 kg. Table 10.1 below shows the number of GS items examined, by trench and period. 'Field' refers to a field survey of the northern edge of the field to the west of the mound carried out in Summer 2013.

	Field	**Trench 10**	**Trench 12**	**Trench 13**	**Total**
Post-Neolithic contexts		33	1		34
Mixed contexts		7			7
Neolithic contexts		115	45	5	165
Unstratified	11				11
Total	**11**	**155**	**46**	**5**	**217**

Table 10.1 Number of individual finds, by trench.

The presence of an artefact in a post-Neolithic context does not necessarily mean that the artefact came from a later period. First, the artefact may have remained in use or circulation for a long period and entered the archaeological record much later. Second, experimental evidence has shown that stone artefacts may be displaced laterally or vertically by human activity such as trampling, ploughing and earth-moving (Schiffer 1977; 1987, 121-9) and biological processes such as faunal burrowing, disturbance by tree roots, and alternate wetting and drying (Villa and Courtin 1983). All the 34 artefacts from Post-Neolithic and Mixed contexts are stylistically and functionally similar to other artefacts from Neolithic contexts on this and other PPNB sites (for example Wright 1992; Kozlowski and Aurenche 2005), and for the purposes of this report will be considered as of Neolithic date.

Classification

	Field	**Trench 10**	**Trench 12**	**Trench 13**	**Total**
A Pounding tools		23		3	26
B Coarse grinding tools	1	22			23
C Fine abrading tools	7	10			17
D Polishing tools		2			2
F Cutting tools		2			2
G Perforated tools		3	46		49
X Miscellaneous		4			4
Y Cores and debitage	3	28			31
Z Unworked		55		2	57
ZZ Unidentified		6			6
Total	**11**	**155**	**46**	**5**	**217**

Table 10.2. Number of individual finds, by trench and class.

The table shows that relatively few GS items were found in Trenches 12 and 13, apart from two groups of perforated tools, probably net sinkers. Trench 10 is of course much larger than Trenches 12 and 13.

Summary – debitage

Reports on chipped flint and chert routinely consider manufacturing debitage. Ground stone reports mostly do not, although manufacturing techniques are very similar. This section makes the case for considering several assemblages of debitage as finds in their own right.

Eight contexts, all Neolithic, contained quantities of small angular pieces of stone, weighing 20.16 kg in total. These pieces were all limestone or sandstone, the same raw material as nearly all the GS items found on the site. They are considered to be evidence of the manufacture, rather than curation, of GS tools, though not necessarily *in situ*.

BF4050 (C1547, Trench 10 Building 5 Space 42), limestone, weight 3.711 kg

This location is a narrow space between on one side Walls 31, 32 and 33, and on the other side Wall 12. It is possibly an entrance into the first room of Building 5. The debitage was a spread of stones in the corner of Walls 31 and 32.Other GS finds in this context are five pieces of unworked stone, a small sandstone anvil (BF4052.02) and a pestle blank (BF4052.01). The amount of debitage residue is too large to relate to just these items, and the Space, at about 1.50 by 1m, seems too small an area for knapping. The range of sizes indicates the full sequence of manufacture, not just curation by re-pecking. The spread is fairly even across the area, extending right up against the walls. It seems likely, therefore, that the debitage was not *in situ*, but was a secondary deposit, to make a floor surface.

SA2232 (BF number not issued; C1782, Trench 10 Building 5 Space 50) limestone, weight 3.239 kg
This group included some large fragments, 60-120mm, which represent the early stages of reduction from a large block of raw material. Successive reduction stages are shown by the presence of stones of decreasing size. Most of the stones were small, 0.5-3cm, and all were found along the sides of Walls 52 and 45. It is clear from the location of these stones (Fig. 10.4) that this is not the result of *in situ* knapping: the stones have been placed neatly along the walls.

BF5363.01 (C1757, Trench 10 Building 9/10 Space 53), limestone and sandstone, weight 1.516 kg)
This was a group of nine large irregular fragments of mixed stone, in an ash deposit in an external area. There were no accompanying smaller gravel or grit fragments, so these items do not represent a full reduction sequence. Some of the stones were orange from heating, so this group may represent rake-out from a fire or cooking installation.

BF5361.02 (C1738, Trench 10 Space 27), limestone, weight 849g
Stratigraphically above

BF5283.04 (C1749; Trench 10 Space 27), limestone and sandstone, weight 2.995 kg
and

BF5448 (C1740, Trench 10 Space 27), limestone and sandstone, weight 1.507 kg
and

BF5509 (C1751; Trench 10 Space 27), limestone and sandstone, weight 279g
which are above

BF5460 (C1752; Trench 10 Space 27), siliceous stone not found elsewhere on site, weight 6 g
and

BF5483 (C1752; Trench 10 Space 27), limestone and sandstone, weight 4.907 kg
These latter five contexts are in the deep sounding in Space 27, whose stratigraphy is complex. The material in each of these groups of debitage suggests that they represent different knapping events. The sounding is relatively small in area (approximately 1m square) so it is not clear whether they represent *in situ* knapping. Several were found in ashy deposits. The deposits may represent discard from other areas, possibly to create a slope leading to the wall and entrances of Building 5.

Was the debitage from single or multiple events? The largest stone blanks found on the site, almost certainly for mortars, weigh 35-45 kg, and blanks for smaller artefacts such as quernstones might have been half this. Assuming that Wilke and Quintero are correct in calculating that manufacture removes 15-25% of this mass, then we could expect to see up to 2.5-5 kg of debitage from one manufacturing event. Four of the nine debitage groups are within this range, and none are larger. My conclusion is therefore that each represents a single manufacturing sequence.

Having made the case for these groups as debitage, I move on to consider the GS items by location. For each space, the number and weight of stones in each class is given, and interesting items are discussed in the text.

Trench 10

Space 27 (external)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	3		1288
Y Cores and debitage	3		217
Z Unworked	1		1133
ZZ Unidentified	1		811
Total	**8**		**3449**

Table 10.3. Classification of stones from Space 27.

BF5448.03 (C1740, limestone, 751g) is a hammerstone, flaked to produce a bevelled edge. It has percussion damage from stone-on-stone pounding, and polish from handling. A second, expedient, hammerstone (BF5483.03 (C1752, sandstone, 466g) has also been used for pounding stone. C1749 contained three individual pieces of sandstone and limestone debitage (217g), as well as the groups of debitage previously described.

Space 43 (external)

Class	Count of BF	Count of SF	Weight (g)
Y Cores and debitage	9		921
Total	**9**		**921**

Table 10.4. Classification of stones from Space 43.

These nine irregular fragments (BF5331, C1627, limestone, 50-80mm) all show thermal fracture, and do not refit. They may have been used in cooking.

Space 44 (external)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	1		719
C Fine abrading tools	1		25
Y Cores and debitage	1		30
Total	**3**		**774**

Table 10.5. Classification of stones from Space 44.

BF5292.01 (C1739, sandstone, 719g) is a roughly shaped sub-cuboid block. It has some percussion scars, and mollusc fragments adhering.

Space 42 (internal)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	2	1	1051
Z Unworked	5		3504
Total	**7**	**1**	**4555**

Table 10.6. Classification of stones from Space 42.

BF4052.02 (C1550, sandstone, 366g) is an anvil with a flattish upper surface and mollusc fragments adhering. BF4052.01 (C1550, limestone, 685g) is a pestle blank without usewear. A stone tool (SF326), made from alabaster, was also found in Space 42 and has been described in the previous Archive Report (Richardson 2014, 101).The small hand-tool tapers to a blunt point, possibly for retouching chipped stone (see gypsum alabaster tools SF16 and SF25, for similar technology, and also black marble tool, SF188).

Space 54 (internal)

Class	Count of BF	Count of SF	Weight (g)
B Coarse grinding tools	1		124
Total	**1**		**124**

Table 10.7. Classification of stones from Space 54.

C1630 contained a fragment of a grinding stone, BF5335.01, limestone, with evidence of heating.

Space 40 (internal)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	1	1	45100
B Coarse grinding tools	3		70329
C Fine abrading tools	1		179
Total	**5**	**1**	**115608**

Table 10.7. Classification of stones from Space 40.

This Space has further evidence of GS manufacture. C1541 contained three massive pieces of raw material (BF5334.03, limestone, 10.1 kg; BF5334.04, limestone, 41.1kg; BF5334.05, limestone, 28.8 kg). They have been taken from a natural bedding plane, and truncated roughly to form blanks for large artefacts such as mortars or quernstones. These stones were placed adjacent to Wall 30, as if stored.

Space 40 also contained a large worktable (SF357, C1539 limestone, *c*. 35 kg). This is a large sub-triangular boulder with some truncation of its sides. Its lower surface contains a sub-circular depression, 94mm diameter 12mm deep, suggesting that its initial function was as a boulder mortar (Fig. 10.5).The stone has been reused, with the upper surface as a worktable (Figure 10.6). The surface has longitudinal and transverse cutmarks, and a surface sheen from repeated contact with soft material such as animal hide or textiles.

Space 60 (internal)

Class	Count of BF	Count of SF	Weight (g)
B Coarse grinding tools	1		1276
Z Unworked	1		65
Total	**2**		**1341**

Table 10.9. Classification of stones from Space 60.

Quernstone fragment BF5295.01 (C1736, conglomerate, 1276g) is an unusual and somewhat perplexing stone. It is the only artefact found at the site to be made from conglomerate. The likely source of the stone is Chuwartah, 50km north in the High Zagros (K.H. Karim, pers. comm.). Both the upper and lower surfaces and a curved side appear to have been ground (from manufacture and usewear).The use of both surfaces for grinding suggests that it was an efficient tool – the raw material has a naturally rough texture, and its hardness (compared with the limestone used for other querns on the site) means that it would require only infrequent re-sharpening. The sharpness of the truncated edges and sides show that the stone was truncated at the end of its use-life, not as part of its manufacture. No other fragments have been found. The stone is thick (75-80mm), and it is very unlikely that its fragmentation was accidental: pounding or pecking to resharpen the surfaces might have cause one fractured side, but not three. The size of the resulting working surface, 114mm x 106mm, is small for a grinding stone to process cereals. Space 60 is an out-of-the-way corner of Building 5, between Walls 52 and 53. The context is a deliberate packing deposit, and stratigraphically secure, with few other finds. Further work is needed to find comparanda.

Space 63

Class	Count of BF	Count of SF	Weight (g)
Y Cores and debitage	1		28
Z Unworked	3		168
Total	**4**		**196**

Table 10.10. Classification of stones from Space 63.

These pieces are part of a packing deposit in Space 63, a corridor not yet fully excavated.

Space 48 (internal)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools		1	4500
B Coarse grinding tools	1		11200
G Perforated tools		1	542
Y Cores and debitage	1		3
Z Unworked	2		2547
Total	**4**	**2**	**18792**

Table 10.11. Classification of stones from Space 48.

Space 48 is an enclosed area in Building 5, *c*. 1.5 x 1m. It was used as an oven, and its lowest level, C1676 was a very hard constructed clay base for the oven. Set inverted on the base was a chert grinding stone, (BF4177.02, 11.2 kg), and a small fragment of the same material (BF4914.01, 3g). This is the only grinding stone made from chert discovered on the site. The working surface of the grinding stone is large (350 x 240mm) and almost completely flat, suggesting that it was unused. The special raw material, the lack of use, and the inverted deposition on the oven floor, suggest strongly that this stone was a symbolic deposit at the time the oven was constructed.

The other GS finds came from contexts C1666 and C1668, the top two layers of the upper fill of the oven after it had gone out of use. SF450 (542g) is a very finely crafted macehead made of an unusual brown marble with a narrow yellow band. It shows no sign of usewear. SF449 (limestone, 4.5 kg) is another finely crafted artefact. This mortar is perfectly circular, with a perpendicular wall which is the same height ±2mm all round. The working surface is more dished than others found at the site, and it is unusual in having no shoulder, or rim, between the working surface and the wall. This artefact is better crafted than other tools from the site, and the possibility exists that it is of later date (though still PPNB). Both these items are 'special' in their raw material and manufacture. Their deposition in the final fill of the oven is clearly of symbolic significance, and points to the importance of the installation in the life of Building 5.

Space 50 (internal)

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	2	1	33942
B Coarse grinding tools	2		14900
F Cutting tools	1		1403
Y Cores and debitage	4		2155
Z Unworked	14		36621
Total	**23**	**1**	**89021**

Table 10.12. Classification of stones from Space 50.

Space 50 is the largest area in Building 5. The lowest excavated context is C1781, a packing layer below the floor of this Space. It contained four pieces of debitage and natural fragments, probably related to the large debitage item SA2232 in C1782, skirting the walls. Above this, the floor C1775 included a further piece of debitage. A mixed deposit, probably wall collapse (C1746) covered the floor, and contained two GS items. BF5776.01 (limestone, 5.6 kg) is a long flat sub-rectangular block. It is unmodified, and is probably raw material for manufacture. The second, BF5773.01 (limestone, 7.1 kg) is an unfinished quernstone. Its sides have been flaked to shape, but its very smooth upper surface is natural from water wear, so the final stage of manufacture, pecking the surface to give a rough texture, was not completed. Further debitage fragments were found in the fills above this (C1745, C1733). The obvious interpretation of these items is that GS manufacture took place in this phase of the building, and this helps to understand a group of stones found in C1604.BF5333 consists of:

- a group of eight long, narrow stones, each weighing 2-5 kg, unmodified apart from a few small percussion marks on the tip of one. These were laid neatly next to Wall 41, near the doorway to Space 47 (Fig. 10.7). I interpret these as raw material for GS manufacture, stored neatly against the wall. Their elongated shape would make them suitable for use as pestles, with little modification necessary other than breaking them transversely.
- a green stone axe, BF5333.09 (green gabbro, 1.4 kg; Fig. 10.8). The raw material is thought to have come from Chuwartah or Penjween, some 40km north/northwest. This has been shaped, ground and polished, but shows no signs of usewear. The stone is probably too brittle to have been used as a tool, and it has no bevel or cutting edge. It seems to be a finished artefact, though its intended use and significance are unclear.
- a large hammerstone (BF5333.12, limestone, 1.0 kg) with percussion scars at one end.
- an irregular limestone fragment (BF5333.11, 791g), probably debitage but large enough to be a blank for a small tool.

This assemblage thus contains raw material, a stoneworking hammer and a finished product: all further evidence of GS manufacture. The raw materials, tools, and use of space for storing material is similar to those in the nearby Spaces 42 and 40, and it seems reasonable to conclude that GS manufacture was a function undertaken in Building 5.

Space 52 (external)

Class	Count of BF	Count of SF	Weight (g)
Z Unworked	2		203
Total	**2**		**203**

Table 10.13. Classification of stones from Space 52.

These two pieces of unmodified stone are of no significance.

Space 53

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	1	2	40900
B Coarse grinding tools	4		26853
C Fine abrading tools	3	1	457
F Cutting tools	1		122
X Miscellaneous	1		96
Y Cores and debitage	3		118
Z Unworked	9		9930
ZZ Unidentified	5	1	430
Total	**27**	**4**	**78906**

Table 10.14. Classification of stones from Space 53.

Space 53 is an enclosed area in Building 9. Although a small area (about 3m x 3m) it contained relatively large quantities of GS. Most of the layers in this Space are occupation residues redeposited from elsewhere. Some of the GS artefacts are significant, however. The lowest excavated level was a surface C1773 with occupation residues. This contained:

- a quernstone (BF5775.01, limestone, 7.8 kg). This artefact was well-made, with a virtually flat surface showing some usewear, but by no means worn out.
- a sub-oval grinding slab (BF5774.01, limestone, 3.0 kg), also showing usewear.
- an unmodified river cobble (BF5777.01, limestone, 7.0 kg).

The context above this, C1763, contained a massive boulder mortar (SF0521, limestone, 31.2 kg) (Figure 10.9). This is unlike other mortars from the site in a number of respects. The boulder was not reduced to produce a smaller artefact which would have been portable. The base is irregular and unstable. The working surface (bowl) is relatively deep for its diameter (42mm and 140mm respectively), and the bowl has relatively large striations from usewear. The mortar seems well-used, and thus perhaps quite old. In style, it is closer to a Natufian cup-hole mortar than to the usual PPNB design. The stone was resting on a thin layer of dark brown humic material, and soil and residue samples were taken to investigate whether this could have been a textile mat. Results are not yet available. The context also contained a large flat anvil with percussion marks on its upper surface (SF0520, limestone, 9.7 kg).

Above this was a packing layer, thought by the excavator to be deliberately deposited, containing a handstone (BF5492.01, limestone, 953g) and an abrader similar to the many others found at the site (BF5492.02, sandstone, 236g).Redeposited occupation residues (C1656) held several small pebbles and stone fragments, as well as a river cobble flaked to produce a bevelled cutting edge (BF5517.03, limestone, 122g).

In the top layer was C1727, a pit fill of redeposited material, which contained a boulder quern similar to other examples from the site (BF5279.01, limestone, 15.1 kg). This had an even and stable base, with vertical flaked walls. The relatively shallow working surface covered the whole of the stone's upper surface, sloped downwards to allow ground material to fall off. Although the function of this stone was probably the same as the mortar SF521 described above, its design is very different, and to the modern eye, much more efficient.

Trench 10 – other

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	11	2	52013
B Coarse grinding tools	15		35076
C Fine abrading tools	8	1	1109
D Polishing tools	2		274
F Cutting tools	1		122
G Perforated tools	2		1560
X Miscellaneous	4		468
Y Cores and debitage	9		1040
Z Unworked	27		15749
ZZ Unidentified	5	1	430
Total	**84**	**4**	**107841**

Table 10.15. Classification of stones from other Trench 10 contexts

A further 13 contexts in Trench 10 contained GS items. Most of these were in topsoil, ploughsoil or cleaning layers, or in Post-Neolithic levels. Notable items were:

- BF4177.01 (C1577 topsoil, limestone, 5.2 kg) – a boulder mortar, not preformed, but stable. The bowl occupies most of the upper surface, and is relatively deep. A large flake is missing from the rim, probably post-depositional damage.
- BF4070 (C1553 Post-Neolithic) – a mixed group of 11 artefacts including a sub-spherical cuboid grinder (green granite, 110 g); three palettes with evidence of heating – probably cooking stones; a hemispherical piece of unfired clay, reduced by rubbing – perhaps to be used as abrasive powder to grind stone or bone
- BF5245.01 (C1708 topsoil, vesicular basalt, 1116g) – unstratified and made of a material not found elsewhere on site, this grinding slab may not be Neolithic, but is similar to examples from PPNB Çatalhöyük (Wright *et al*. 2013, figs 20.23a, 20.26d, table 20.4).
- BF4063.04 (C1552 topsoil, green basalt, 247g) - polishing pebble with two flat facets, possibly used to process soft material such as hide (Fig. 10.10)

Trenches 12 and 13

Class	Count of BF	Count of SF	Weight (g)
A Pounding tools	2	1	3019
G Perforated tools	1	45	1372
Z Unworked	2		419
Total	**5**	**46**	**4810**

Table 10.16. Classification of stones from Trench 12 and 13.

SF317 and SF321, small perforated stones used as net sinkers, were discussed in the previous Archive Report (Richardson 2014, 101).

Field survey

Class	Count of BF	Count of SF	Weight (g)
B Coarse grinding tools	1		38
C Fine abrading tools	7		674
Y Cores and debitage	3		261
Total	**11**		**973**

Table 10.17. Classification of stones from surface collection.

These 11 items recovered as surface finds have lost their spatial integrity. The abraders have undergone no, or minimal, preparation. Only one shows signs of use.

Discussion and future directions

The ground stone finds from these two seasons are typical of PPNB sites in the Zagros foothills and Anatolia, such as Jarmo, Çatalhöyük, Çayönü and the Deh Luran plain. The typologies and stylistic are not significantly different from the stones found in previous seasons. To this extent, the nature of the GS assemblage has not changed dramatically, but our understanding of it, and of its significance for the project's research questions, has made considerable advances.

This season has brought some significant progress in cataloguing the assemblage. With the valuable advice of Professor Kamal Haji Karim, it has been possible to identify nearly all the raw material used, and probable sources. The overall increase in the number of GS artefacts recovered, and the publication of comparanda from Çatalhöyük (Wright *et al*. 2013), has enabled the number of Unidentified artefacts to be reduced. The heavy residue output from flotation, and comparison with experimental replication of stone manufacture, have enabled the identification of debitage from GS manufacture. The help of Ingrid Iversen and Dr Sam Smith (Oxford Brookes University) have been very valuable in this respect. Debitage is the missing link absent from too many Ground Stone reports. At Bestansur there is clear evidence of manufacturing, and the finds are very well contextualised. Further spatial and statistical analysis is required, but the evidence from GS manufacture will undoubtedly enhance our understanding of Bestansur, and of stoneworking in the Neolithic Near East.

GS evidence from the further excavation of Trench 10, particularly Building 5, has shown clearly that GS manufacture took place in this location, probably at the end of the building's occupation. The special nature of the GS items in the fill of Space 48 throw an interesting light on the social and symbolic importance of this cooking installation. There is a contrast with the items discarded informally in Space 52. In due course, the results of surface residue analysis may show to what extent the artefacts were used in foodways.

It can also be argued that we can now see chronological changes in the styles and use-life of some GS artefacts. It would be wrong to place too much emphasis on 'culture-historical' analyses of artefact typology per se, and there is further work to be done on integrating the results of GS analysis with the evidence from other archaeological material. However, changes in ground stone typology and use reflect changes in the environment, lifestyle and social organisation of a prehistoric community. In context, therefore, further study of this aspect of the GS assemblage should help to answer aspects of the project's objectives.

The final excavation season may or may not add to the GS assemblage. Specific future work on the GS catalogue will include:

- reviewing the classification and interpretation of items from previous seasons: I know that these contain errors
- integrating the interpretation of the GS assemblage with other material
- more comprehensive spatial and statistical analysis
- comparison with assemblages from other relevant sites.

Figure 10.1. Debitage from experimental knapping (courtesy of Dr Sam Smith, Oxford Brookes University). Note hammerstone resharpening fragments (darker colour) at right.

Figure 10.2. Knapping debitage (BF4050 SA2118 C1547 Trench 10).Heavy residue from flotation.

Figure 10.3. Blanks for (L) mortar (BF5334.04) and (R) quernstone (BF5334.05), both C1541 Trench 10.

Figure 10.4. Debitage lining the walls of Space 50 (SA2232) adjacent to doorway to Space 47.

Figure 10.5. SF357, lower surface, scale bar above mortar depression.

Figure 10.6. SF357, upper surface. Stone reused as a worktable, with surface sheen, cutmarks and drill-holes from working hide or textiles.

Figure 10.7. BF5333 Flat stones in situ on floor of Space 50 against west face of Wall 41.

Figure 10.8. BF 5333.09 Green gabbro axe.

Figure 10.9. SF521 Boulder mortar in situ.

Figure 10.10. Green basalt polishing pebble BF4063.04.

Chapter Eleven: Molluscs

Ingrid Iversen

Introduction

Molluscs have been found across the site in all Neolithic contexts. Fragments of shell occur in the vast majority of flotation samples in the heavy residue while varying numbers of complete shells have been recovered through hand-picking, dry-sieving and from heavy residue following flotation. Molluscs have been found in high concentrations in some areas, i.e. in 'middens', and in association with features and other artefacts. The ubiquity and quantity of shell recovered points to their anthropogenic use and so should be considered as 'cultural' artefacts rather than naturally occurring. Of course, there may be elements of the shell recovered which are not 'cultural' and certainly a very small portion of the total is made of up modern burrowing snails. These amounts are insignificant and do not affect the overall numbers nor the analysis which follows.

The quantitative data are outlined with a description of the methods by which the molluscs under study have been recovered, including a discussion of the problems and potential differences in the results from the different methods. The recovered molluscs have been quantified by counting and measuring the individual shells from the larger assemblages, in order to try to answer a number of questions relating to their exploitation. Finally, the data collected from both archaeological contexts and modern observations are employed in suggesting how and where the molluscs were gathered, prepared and eaten.

A number of shell beads have also been found, manufactured from marine, freshwater and land molluscs but are not included in this analysis.

Zagros molluscs: other studies

Helix salomonica (and *levantina*) molluscs have been found at a number of sites in the Zagros Mountains, both in north Iraq and across the modern border in western Iran. Lubell (2004), in a survey of edible land snails, lists a number of sites 'dating before the appearance of an agricultural economy' with deposits of molluscs which can be considered as 'food debris' (84). They include Jarmo and Karim Shahir, a number of cave sites (e.g. Palegawra, Shanidar) and edible land snails have also been identified at Sheikh-e Abad (Solecki 1963; Braidwood and Howe 1960; Shillito 2013). Stone hearths found in proto-Neolithic levels at Shanidar cave in association with large numbers of land snails have been interpreted as being used to cook the molluscs. The evidence of *helix salomonica* found throughout the layers for the same period at Zawi Chemi Shanidar encouraged the conclusion that they were eaten (Solecki 1963; Lubell 2004, 85). In addition, as caves are not the natural habitat for this species, there is clear evidence that they were collected elsewhere.

Molluscs were found in significant quantities at Nemrik 9; the *helix salomonica* found are interpreted as being for food having been selected while the other type found, the river clam *unio tigridis* were used for making 'the rare ornament'(Kozłowski and Zych 2002, 92). *Helix salomonica* have also been found further afield at Jericho, where 75 of the 82 individuals studied came from pre-pottery Neolithic contexts and have been interpreted as being brought to the site as a food source. There was also a large number of *levantina* (Biggs 1960).

Helix salomonica are found at archaeological sites from around twelve thousand years ago, are visible for 4-5000 years and then disappear from the archaeological record (Reed 1962, 4). While there is a wide acceptance that human tastes and thus food habits change and so affect the archaeological record, it is also argued that 'cultural selection of fauna … is obviously dependent upon the existing faunal inventory, which must have first passed through the screen of natural environment' (Solecki 1963, 186-187). The disappearance from the archaeological record could therefore have been because of a change in the choice of food or reflect a change in the availability of molluscs, or a combination of the two.

In most of reports molluscs are only given a mention in passing with a disappointing lack of data on the quantities and density of their occurrence. At Jarmo, the molluscs were found in such great numbers that the decisions was made to measure them in 'number of cubic-foot boxes' (Braidwood and Howe 1960, 48) and it was subsequently reported that over three seasons at Jarmo 2$m^3$of molluscs were collected (Braidwood *et al*. 1983, 542). However the lack of quantification and analysis of the molluscs is not indicative of a lack of interest and the potential use of molluscs as food is discussed in the reports and elsewhere. Reference is made to modern populations of molluscs, the environmental conditions and their consumption (Reed 1962). The sense given is that it falls under 'future work'.

Bestansur: the mollusc 'typology'

Four different types of land snail have been identified in the recovered material, two of which are variations of the same species, *Helix salomonica,*and the others tentatively identified as *cernuella* and *cecilioides jani* (Harper 2013, 129). In addition a small number of freshwater molluscs have been recovered, *Unio tigridis*. A number of shell beads have been found, some of which are likely to have been made from the apex of the *Helix salomonica* shell, but as adornments rather than food they are not the subject of this study (Richardson 2013c).

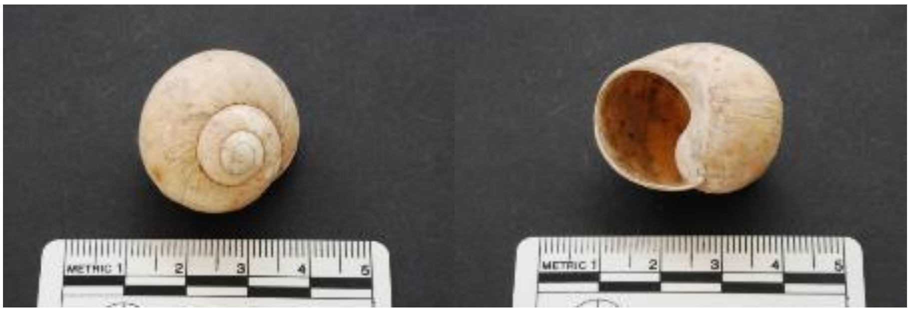


Figure 11.1. Helix salomonica 1

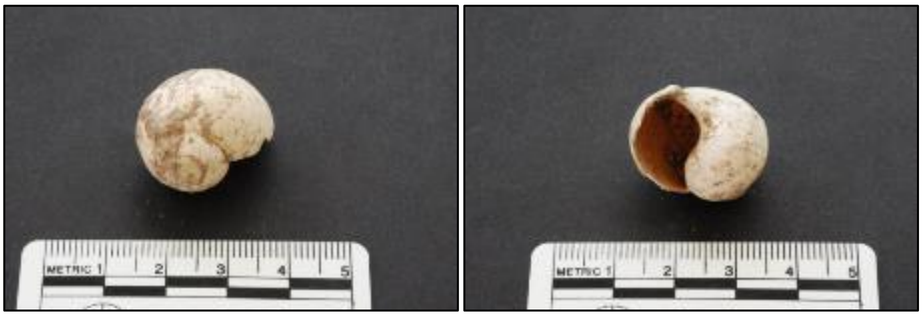


Figure 11.2. *Helix salomonica* 2.

One type of *Helix salomonica* is generally larger than the other, is more 'squat' (the height-width ratio is around 1.5 rather than 1.35 for the smaller 'taller' variant) and occurs in larger numbers within most assemblages. On average 4/5ths of each sample was made up of the larger type, henceforth labelled as Helix 1; the other smaller variant is labelled as Helix 2 (see Fig. 11.1 and Fig. 11.2).

A comparison of the size of the two types of *helix salomonica* from the largest sample is shown in Fig. 11.3. The other mollusc types are too small to be edible, one of which is likely to be intrusive. It has been found in significant numbers close to the excavations as seen in Fig. 11.22.

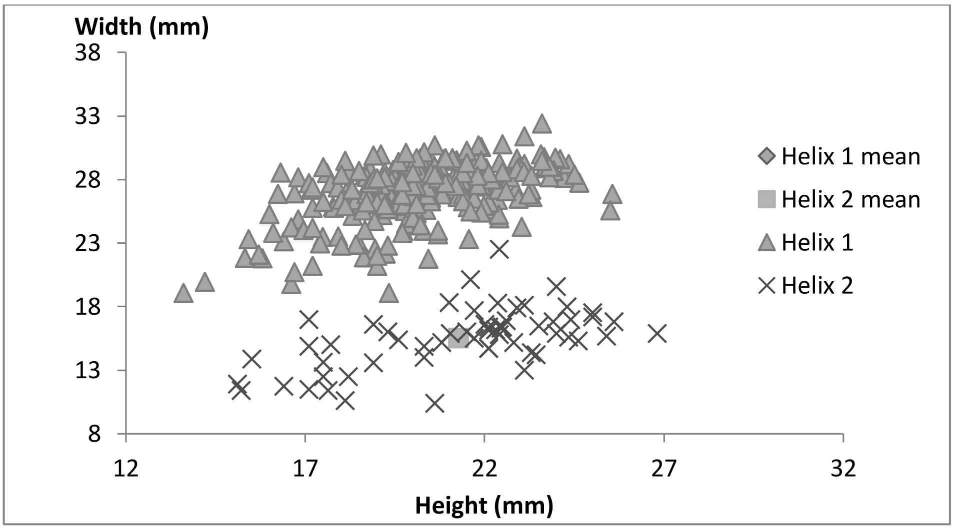


Figure 11.3. Helix 1 and Helix 2 C1078: size.

Methods of recovery

Molluscs were collected from excavated contexts in three different ways: hand-picked, picked from dry sieving and collected from heavy residue after flotation (wet-sieving). For a description of the processing of flotation samples please see Iversen (2013a). The total weight by method is outlined in Table 11.2 and in Fig. 11.4 which shows the data by excavation season and trench. The total amount of molluscs recovered is of little analytical value as they are not comparable across the areas of the site or by the method of collection.

In order to use the data to answer questions relating to the density of molluscs across the site, the aggregate numbers need to be assessed relative to the volume of sediment excavated or sampled. In addition, the densities of hand-picked and dry-sieved molluscs are not directly comparable to the wet-sieved molluscs where the soil in and around the molluscs is washed away and in the process the weight is reduced. A measurement of the volume of molluscs would address this difficulty but this is currently not part of the protocol for recording.

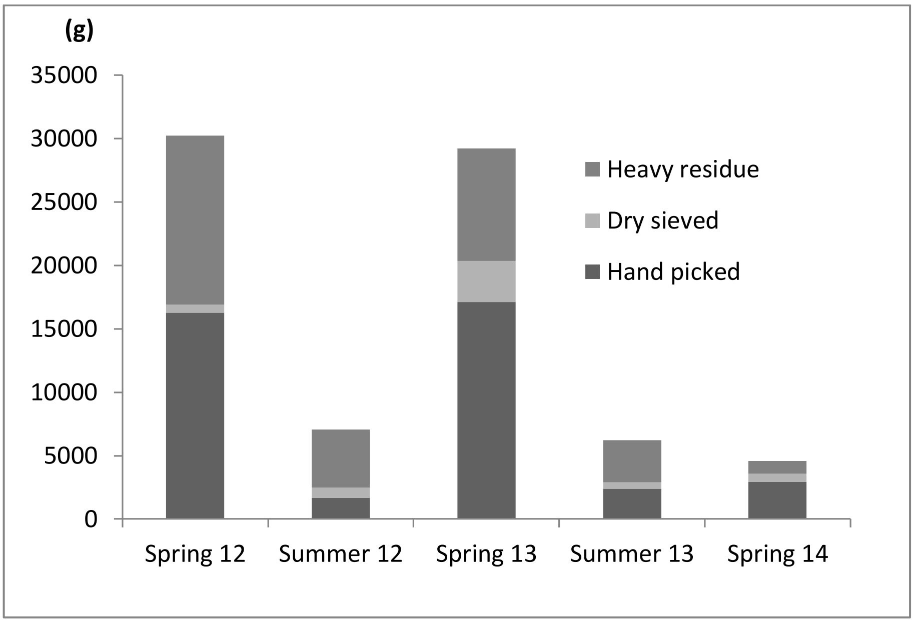


Figure 11.4. Molluscs recovered by season.

It was also noticeable that collections of molluscs which had been left for a season or two and then revisited reduced in weight as the sediment had dried out. The data used to determine the relative density of molluscs will therefore be the original weights for all recovery methods but molluscs from heavy residue will be analysed separately.

Analysis will be undertaken on Neolithic contexts only which reduces the available data significantly. A further reduction has to be made in the density of molluscs recovered by hand-picking and dry-sieving where there is no available information of the volumes from which the molluscs were recovered. There are seven trenches with at least a few data points although only three trenches (Trench 7, 9 and 10) have enough to allow any kind of statistical comparison. The data for heavy residue are more comprehensive as the volume of every sample is recorded so here the only limitation is the number of samples. Table 11.1 shows the matrix of 'useable' data.

Trench	**Contexts**	**Dry-sieve volumes**	**Hand-picked volumes**	**Heavy residue samples**
1	5	1	1	6
2	3	-	3	2
4	11	-	-	10
5	3		1	3*
7	44	17	12	128
8	5	-	-	7
9	42	9	8	56
10	60	30	26	242
11	1	-	-	1
12	8	3	-	46
13	3	-	1	42

*Additional samples analysed for midden

Table 11.1. 'Assemblages' with Neolithic molluscs.

Spatial distribution

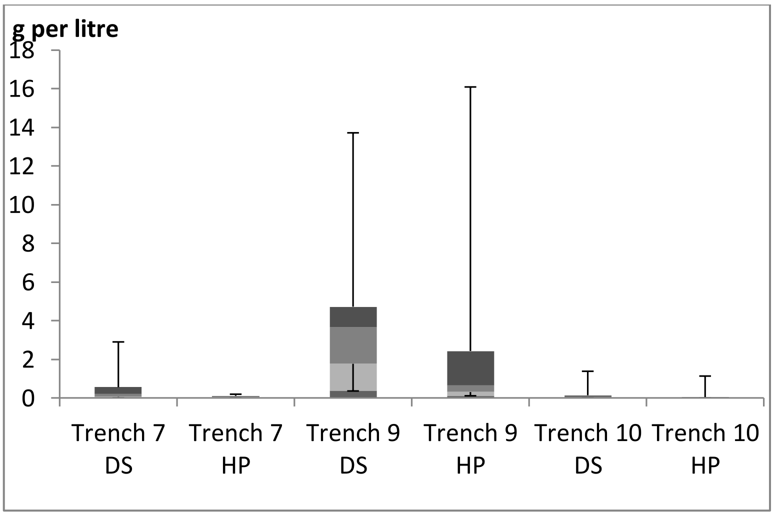
The density of molluscs across the site can be compared by calculating the weight of the molluscs recovered relative to the volume of sediment excavated.

Dry-sieve and hand-picked

The results for dry-sieved and hand-picked molluscs, where data are available, are summarised in Fig. 11.5. The chart shows the average (median) and the 1st and 3rd quartile levels as well as the range indicated by the whiskers. The data show that Trench 9 has the greatest density of molluscs on average as well as providing the samples with the greatest density but the chart also illustrates the difficulty in comparing across trenches as a few data points skew the picture. However some preliminary conclusions can be drawn.

- In Trench 7 and Trench 10 the density of molluscs is similar, if slightly higher in the dry-sieved assemblage in Trench 7.
- The outliers are worthy of further investigation, especially in Trench 9.
- The number of data points for Trench 9 is much lower and questions of sampling bias need to be addressed.

In sum, it is not possible to draw firm conclusions on the site-wide distribution of molluscs based on data for hand-picked and dry-sieved recovered shells.



Data points	**17**	**12**	**9**	**8**	**30**	**26**

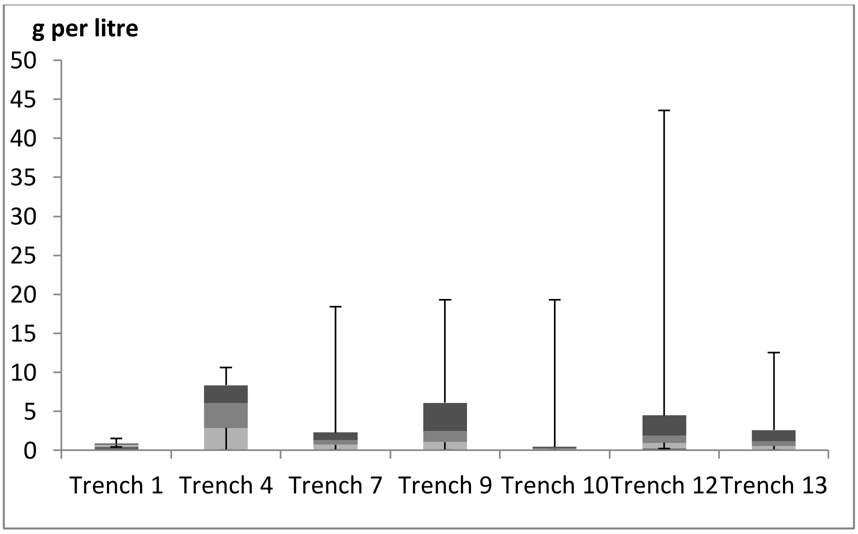
Figure 11.5. Density of molluscs by method.

weight (g) Trench	Hand picked	Dry sieved	Heavy residue	Total
1	1179	106	383	**1668**
2	2420	11	53	**2484**
3	2498	0	481	**2979**
4	3568	230	1890	**5688**
5	3999	0	10035	**14034**
6	151	0	0	**151**
7	1506	776	4592	**6874**
8	576	192	164	**932**
9	8298	2104	4549	**14951**
10	10882	1679	2473	**15034**
11	720	54	110	**884**
12	3867	350	3772	**7989**
13	696	299	2609	**3604**
14	29	0	0	**29**
	40389	**5801**	**31111**	**77301**

Table 11.2. Molluscs by trench and method of recovery.

Heavy residue

The data provided by samples floated and wet-sieved allow for a more complete picture. There are 485 samples processed from Neolithic contexts across 10 trenches, of which 398 will be analysed; samples of less than two litres are excluded from this analysis as the small volume can result in very high density of material which is not representative. Fig. 11.6 below shows the aggregate results for the trenches with more than five samples.



Data points	6	10	78	50	241	46	41

Figure 11.6. Mollusc density in heavy residue.

The validity of using trench averages is again questionable as even with a much larger dataset the need to investigate individual contexts and samples is clear. While Trench 4 has the highest average (median) density, the other trenches have samples showing the higher concentrations of molluscs. The samples from Trench 9 also have the greatest number of outliers at 20 of the 50 samples included. In contrast most trench data does not have any outliers although seven of the 241 samples from Trench 10 lie in the top quartile (see Fig. 11.6.

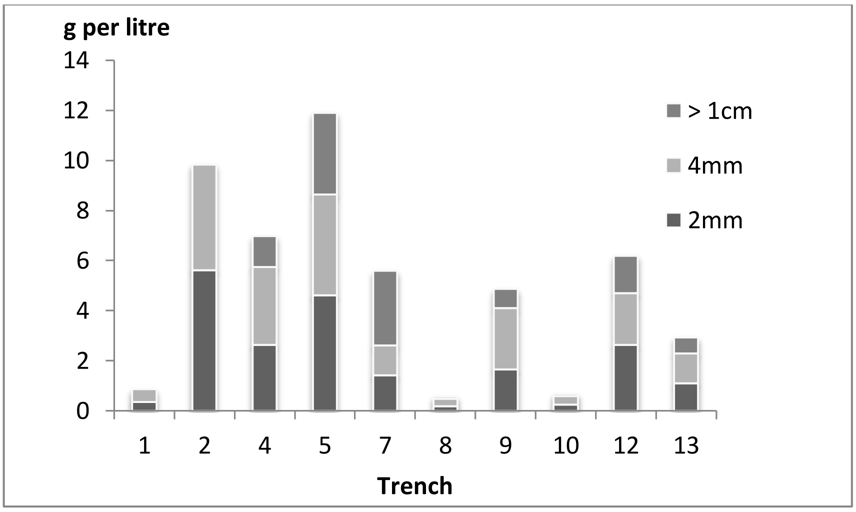


Figure 11.7. Density of molluscs recovered in heavy residue by size fraction.

The molluscs hand-picked from heavy residue samples have also been weighed and recorded and this is yet another source of data, although the proportion of samples with molluscs in the >1cm size fraction varies between trenches (on average around 70%of samples with 60% of the Trench 9, 12 and 13 samples and only 10% of Trench 10) (see Fig. 11.7).

Contexts of interest
A number of contexts (45) have been identified for further analysis based on the molluscs recovered by the different methods. The average (mean) density of heavy residue samples was calculated and formed the basis for selection of the contexts. Any assemblage with a density of greater than one standard deviation over the average is included and the results are shown in Fig. 11.8.

Over a half of the assemblages recovered through flotation come from Trench 12 and 13 while the contexts from Trench 9 where all methods produced greater than average densities were selected. A number of clusters and/or middens of molluscs have been identified from the excavation records (context sheets, photographs and the archive reports) and these provide important additional information and are included in the trench by trench discussions.

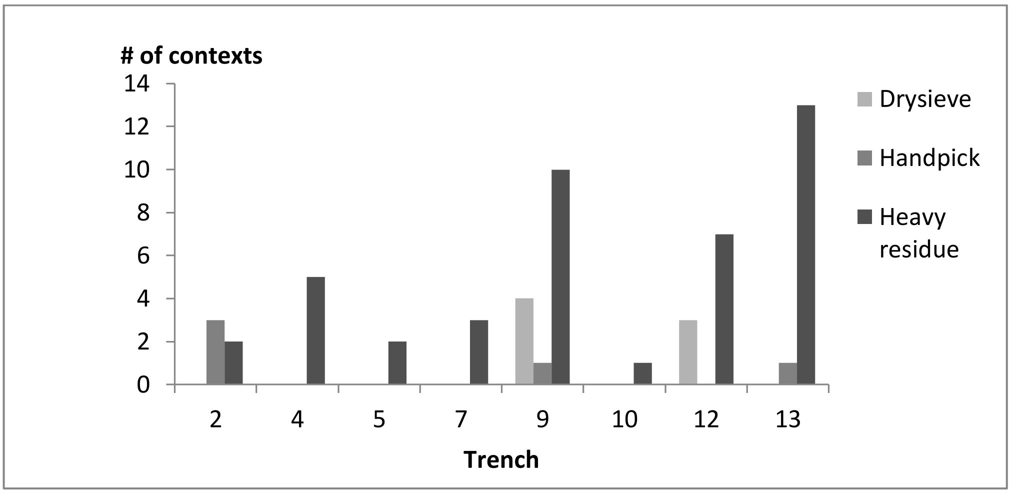


Figure 11.8. Assemblages for analysis.

Analysis by trench

Trench 4

Trench 4 is to the southwest of the mound in the surrounding field; the 2m x 2m sounding was excavated in the first season producing eight heavy residue samples with well above average mollusc density. Unfortunately the volume of sediment excavated was not recorded so the density of molluscs recovered by other methods is not available. The total weight of mollusc recovered is among the highest for a 2m x 2m trench (see

Table 11.) and this combined with the report by the excavator suggests an area of overall high mollusc density (Matthews and Ahmed 2012). Mollusc lenses of 1-2cm thick and measuring 0.3-2m in extent were found in a series of Neolithic contexts and have been interpreted as being deposits related to their processing. One of the samples, from C1067, which was counted, weighed and measured produced shells that were significantly smaller than the average (see Fig. 11.19).

Trench 5

Trench 5 is located to the west of the mound in the field, north of Trench 4, and the 2m x 2m sounding was excavated in the first season. Areas dense with molluscs were discovered and interpreted as a mollusc midden. The mollusc deposit was column-sampled at its maximum depth with a 50cm sample taken, comprising two 4cm spits (see Fig. 11.10) (Richardson and Aziz 2012).

Two flotation samples were taken from the context, one 70 litre sample from the area south of the column sample and one 21 litre sample from the east. The large amount of shell visible in the samples resulted in the decision to dry-sieve the smaller of the samples through a 10mm mesh before flotation as experience had shown that floating such samples are time-consuming, hard on the equipment (and personnel) and not effective. The other sample was sorted at a later stage without flotation. The sample which was floated after the larger pieces of shell were removed was measured and showed a density of over 100 g per litre. The second 70 litre sample was made up of at least 600 molluscs (based on counting the apex) and forms the basis for the analysis of the size of individual molluscs (see below and Fig. 11.9).

Figure 11.9. Molluscs from Context 1078- sample not floated (left) and sample floated after dry-sieving (right) (photograph: I. Iversen).

Lithics have been found in a number of mollusc deposits/samples, often the tool is a blade with a curve which would have been ideal for extracting the snail from the shell. An obsidian blade was found between the two spits of the column-sample (Fig. 11.11) and combined with other such tools suggests the consumption of the land snails in this location. The visible layering of the shells is indicative of multiple events, possibly a season of consumption (Richardson and Aziz 2012).

Figure 11.10. Trench 5 after removal of 50cm column sample.

Figure 11.11. Obsidian blade found in C1078.

Trench 7

Trench 7 was excavated during two seasons, in the first a 2m x 2m sounding was explored and in the following season the area was extended to a 6m x 6m trench. It lies to the west of the mound between Trench 4 and Trench 5. The density of molluscs in all samples from the first season was low although the excavation report recorded a mollusc cluster in Context 1098. The deposit measured 30cm x35cm x10cm and is shown in Fig. 11.12.

Figure 11.12. Mollusc deposit: C1098.

The molluscs recovered in the second season once again showed a lower than average density although breaking down the results allows for a more detailed picture of the spatial distribution within a small area. The western half of the 6mx6m trench was an extensive open area and the deposits in the northern part were made up of sequences of finely stratified, fugitive surfaces with discrete clusters of shells, stones, and lithic items, with possible packing between surfaces (Matthews 2012). Samples were collected systematically for flotation across the context and all artefacts were 3D recorded and planned (see Fig. 11.14).

Figure 11.13. Fired-clay pit with molluscs.

Unsurprisingly, the samples collected from the area of the mollusc clusters had a density well above the average but it is also interesting that in the surrounding spaces the density was much lower. It appears the consumption and discard of molluscs was contained within a small areas. In contrast, a room or internal space which was also intensively sampled produced a very low density of molluscs in heavy residue across the whole space at less than one gram per litre.

Trench 7 also produced some tantalising indication of how the molluscs may have been cooked as a cut into underlying deposits had been made in order to situate a small pit, *ca*. 50 x 40 cm, which was lined on the base and sides with clay. The clay was fire-hardened from cooking within the pit. Fill within the pit comprised a dense cluster of land snail shells, presumably cooked within the pit through heating by fired stones, as well as broken chert tools, including a serrated blade (Fig. 11.13; Matthews 2012, 13).

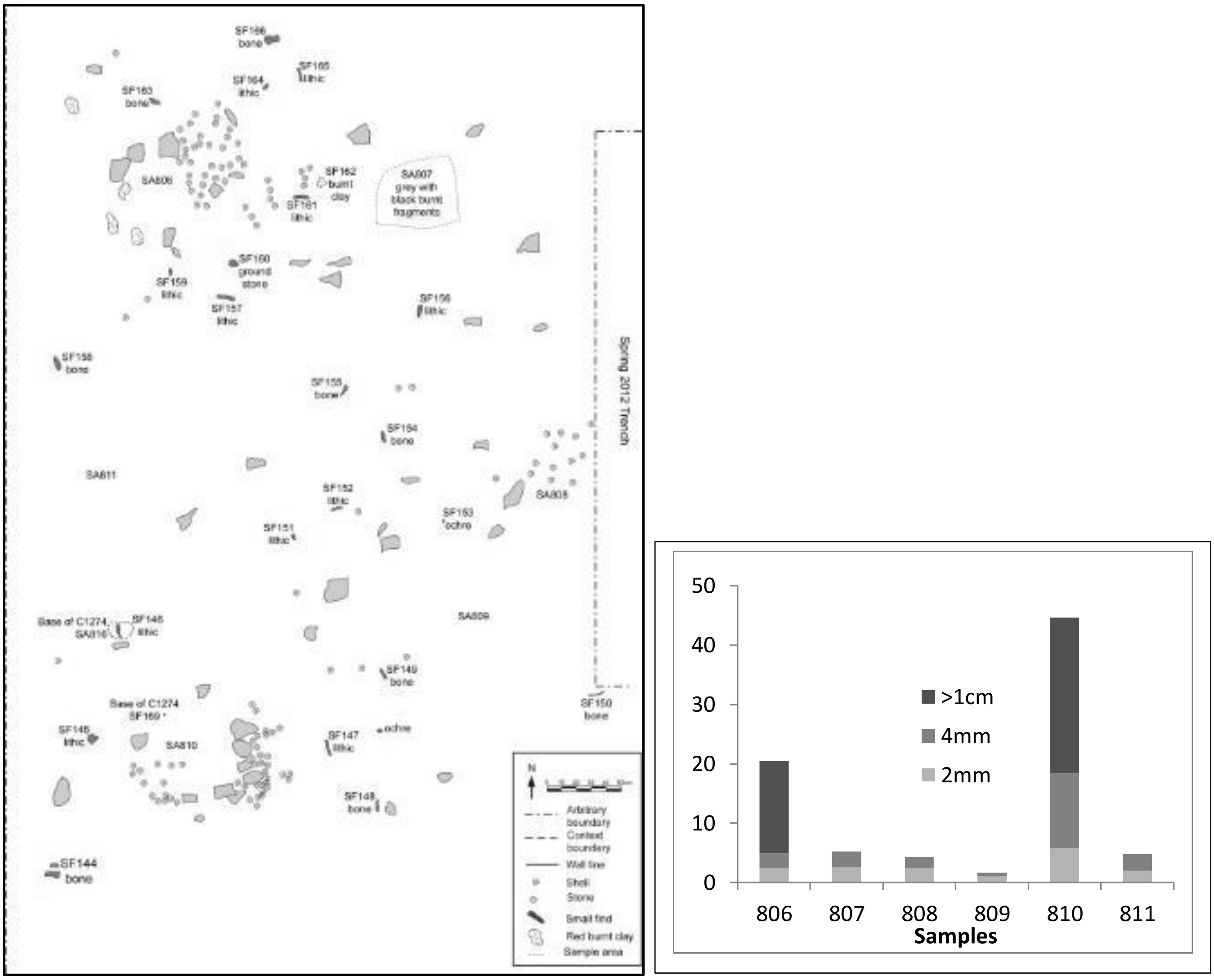


Figure 11.14. Trench 7: systematic sampling and recording of external area with density of molluscs in heavy residue.

Trench 9

Trench 9 lies at the base of the mound in a field south of the mound and was excavated in the first season (2m x 2m) and then again in Spring 2013 when the trench was extended to 6m x 6m. The area excavated in was primarily external areas with evidence of activities with deposits of ash and areas of burning. The relatively large amounts of bone and a high density of molluscs suggests that the activities included the processing and preparation of food (Bendrey 2013b).

The total quantity of molluscs recovered from Trench 9 accounts for around 20% of the total, most of which were collected in the second season of excavation. While the volumes of sediment from which the molluscs were collected is not available, and so a definite comparison to other trenches is thus not possible, the absolute amounts compare with the amounts collected from Trench 10 which was excavated over 3 seasons and now covers a much greater area and is significantly deeper, suggesting a high density of mollusc. The data that is available shows that the density of molluscs picked from dry-sieve and from hand-picked is significantly higher in this trench than others, with some samples returning the maximum values found across the site.

A few flotation samples produced a high density of molluscs although the trench average lies close to the site average. The pattern is one of the presence of molluscs in all samples around the site average with a couple of samples with greater density. There were no 'clusters' reported by the excavators nor any evidence of a midden but molluscs were very visible and found across all the contexts.

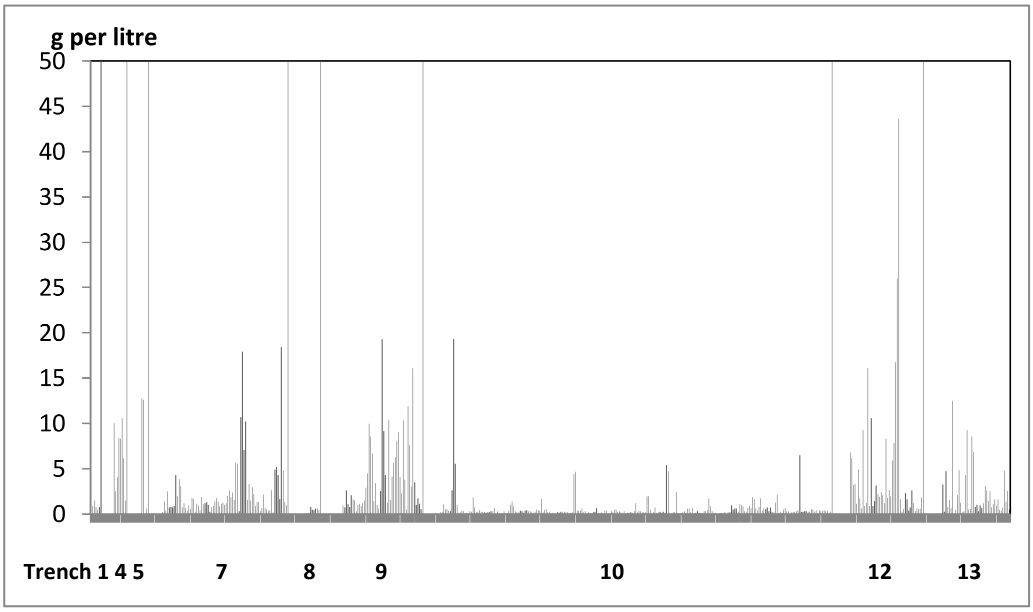


Figure 11.15. Density of molluscs in heavy residue by sample.

Trench 10

Trench 10 on the east side of the mound has produced the greatest amount of molluscs of any area but also is by far the largest trench in terms of area and volume excavated having been excavated over four seasons (Matthews *et al*. 2013b, Matthews *et al*. 2014a).

The density of molluscs recovered by dry-sieving and hand-picking is low (see Fig. 11.5) as is the overall average for the density in heavy residue (see Fig. 11.6 and Fig. 11.15. The range of the data for heavy residue is wide with some of the external areas excavated primarily in Spring 13 in a 6m x 6m trench contrasting with the internal areas excavated in the subsequent two seasons. It is notable that the internal areas of buildings are very 'clean' with very low density of any material including mollusc fragments. Given the difficulty in removing all evidence of molluscs as the shells break during consumption it is very unlikely that they were prepared or eaten within the buildings in Trench 10. The contrasting density in areas categorised as 'external' reinforces the interpretation that activities relating to molluscs took place in specific parts of the site.

Trenches 12 and 13

Trenches 12 and 13 were excavated during the Spring and Summer 2013 season. Trenches 12-13 lie at the north of the mound and includes a 13 metre section and a series of stepped terraces which extend north into the field (Matthews 2014). There are a number of contexts with evidence of occupation activities and some which have been described as 'midden-like'.

The data from heavy residue supports the interpretation that the area was used for discard as well as possible *in situ* activities with the highest consistent density of material of several types. There is no volume data against which to measure the amounts of molluscs hand-picked and dry-sieved although the absolute amounts, especially from Trench 12, are high (see Table 11.2). The results from flotation provide a more secure picture as 87 samples were processed from these trenches during the two seasons of excavation.

The most molluscs were found in Trench 12 in contexts closest to the centre of the mound with C1254, which is described as 'midden-like' (by P. Flohr , excavator) producing three flotation samples, two of which have the greatest density of molluscs anywhere on the site (excluding the column sample from Trench 5 which was all mollusc). The deposition is observed as being in layers with a possible interpretation that there were a series of discard events. While there are traces of other microartefacts, their density is not remarkable in these samples. Other contexts in this area have also produced high density of molluscs (e.g. C1388) with the most likely interpretation being that they have been discarded here rather than consumed (Matthews *et al*. 2013c, 29).

Mollusc measurement

Method

A total of 23 samples from six trenches were examined closely; the samples cover all forms of recovery with four from dry-sieve, six from flotation and a majority of 13 from hand-picked. The samples were selected from Neolithic contexts and weighed 250g or more when first recorded. The minimum size was arbitrary but is designed to produce assemblages of large enough size to produce a sufficient number of molluscs to ensure a representative sample. It also kept the molluscs for study to a number which could be counted and measured within the time available. A total of 1,430 molluscs were counted, of which 663 were measured. *Helix 1* dominate the samples and are also the focus of the analysis of size, with over 50% measured (548) compared with 30% of the *Helix 2* (115). Fig. 11.16 shows the number of molluscs included by trench and is dominated by the almost 600 shells recovered, of which more than half were measured, as part of the flotation sample taken from C1078. Excluding this sample, the average number of shells measured was 22 per sample.

The results for the very large sample shows a wide range of sizes and provides an average, maximum and minimum size against which other smaller samples can be analysed (see Fig. 11.19 and Fig. 11.20).

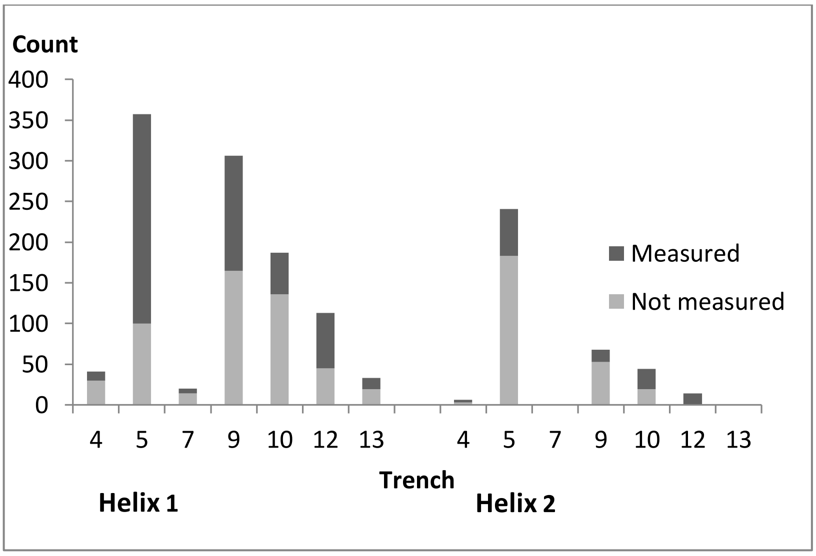


Figure 11.16. Molluscs counted and measured.

Counting and measuring
Each sample was weighed and the total volume recorded after which the molluscs were separated into *Helix 1* and *Helix 2*. Shells were counted if they still had the apex to avoid double-counting shells. Where it was not possible to distinguish the difference between the *Helix* types, i.e. if the shell was very fragmented, apexes from fragmented shells were not included in the count although with a single type this would normally be the practice. The degree of fragmentation was recorded which allows estimates of molluscs per litre to be compared across different samples.

The two types of mollusc were then measured using electronic callipers with a reading taken from the height and width of each as shown in Fig. 11.17. Not all the shells were measured, as shown in Fig. 11.16, either because they were damaged and it was not possible to take the appropriate measurement or in the case of the very large samples a fraction was measured because of time constraints.

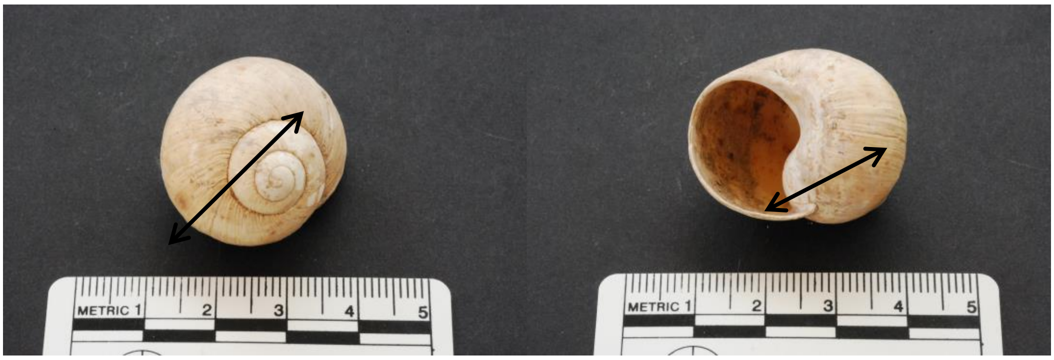


Figure 11.17. Mollusc measurement: width and height.

The results
The data for the measurement of the width of molluscs show relatively consistent results (see Fig. 11.18). The majority of samples have an average similar to the overall average width at 27mm shown in the horizontal line. The range of mollusc size does vary between the samples but those with the widest range have a very few outliers on the smaller end of the size range; C1078 has three out of 257 measured molluscs while there is one outlier in the dry sieve sample from C1344. In both cases the median is in line with the overall average.

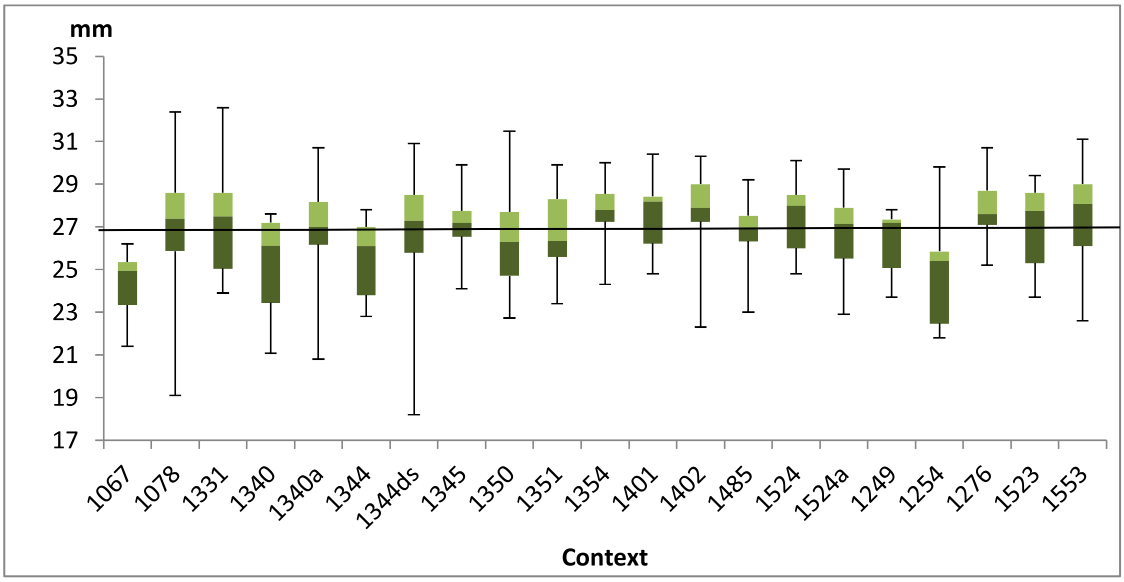


Figure 11.18. Helix 1 measurement; range and average.

Of potentially greater interest are the two samples where the measurement shows the whole assemblage being made up of smaller molluscs, i.e. C1067 and C1254. This can also be seen in Fig. 11.19 which plots both the width and height of individual molluscs.

The large sample from C1078 provides a useful comparison, as discussed above, and the two samples with lower averages are made up almost completely of molluscs which fall in the lower end of the 'typical' range, with the exception of one shell in C1254, rather than being skewed by a few outliers.

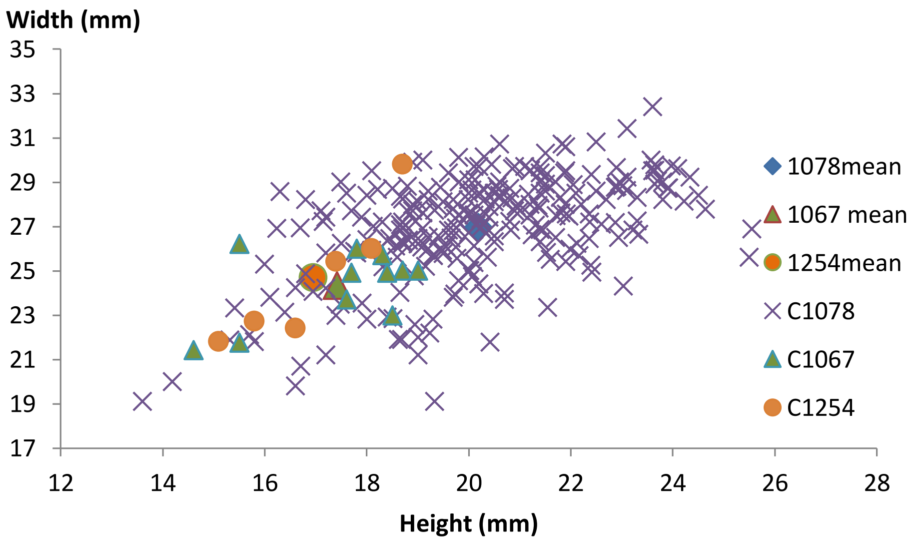


Figure 11.19. Mollusc size: samples < average.

The equivalent chart for samples with larger than average molluscs is less conclusive, as the range remains wide albeit with a greater number of shells either around the average or falling in the top of the 'typical' range, with fewer small molluscs (see Fig. 11.20).

Overall, the results show uniformity in the size of molluscs within each sample, suggesting deliberate selection. If all snails were collected a much greater range in sizes would be expected reflecting the age distribution of the population. The samples with smaller snails could be due to environmental factors, either temporal or spatial, resulting in a reduction in snail size across the whole population.

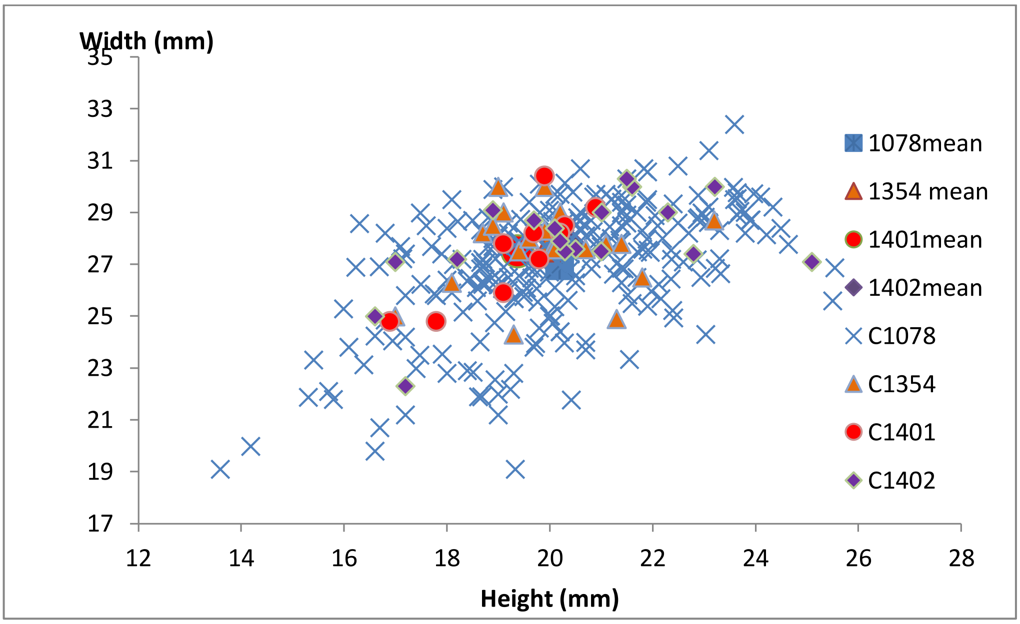


Figure 11.20. Mollusc size: samples > average.

Modern molluscs

In order to understand the human exploitation of molluscs better we attempted to answer the question of where and how they were collected. There was no visible evidence for modern molluscs in the areas adjacent to the site but, based on local 'intelligence' we were encouraged to look for *helix salomonica* under stones, close to the outlet of the spring, and a little way away from the site. The search involved checking under stones alongside the stream, paying special attention to areas with lush vegetation but not in running water. The edges of the fields had areas with a number of stones and wild thistle leaves and these were checked as well. On the first attempt no mollusc shells of any type were found, although it proved to be an enjoyable walk.

Figure 11.21. Typical terrain involved in search for molluscs (Left hand photograph courtesy R. Bendrey, right hand I. Iversen).

The local workers were still insistent that there were molluscs to be found and so another attempt was made. This time the search began first thing in the morning in the hope that the molluscs would not yet have moved to their daytime spots and so would be easier to find. Again no *helix salomonica* were found although large numbers of a much smaller mollusc were found, mainly on the leaves of the thistle plant (see Fig. 11.22). It also transpired that there had been some possible misunderstanding as the locals were in fact talking about these smaller molluscs, further supported by being handed some of this type that had been 'found'. The conclusion is that if there are modern *helix salomonica* in the vicinity of the site they survive in very small numbers with the most likely being that there are now none. The whole exercise was met with some bemusement by the locals over our interest in what they call 'devils' eggs'.

Figure 11.22. Small snails found on nettle leaves (Photograph I. Iversen)

At Jarmo, in the 1950s, similar questions were being asked with the conclusion that while *helix salomonica* was 'obviously abundant when the village was occupied, but is extremely rare in the area today'(Braidwood and Howe 1960, 172). The few *helix salomonica* which were found were under rocks and in crevices in the soil and much more common were *levantina kurdistana* which are found feeding in the same terrain as *helix salomonica* during the day but retire to 'rocky ledges' at night. *Levantina* has not been identified among the shells recovered at Bestansur although one was found in the spoil heap (dead) which could be archaeological but is most likely modern. Another *levantina* was picked up alive from a rocky ledge while on a walk and identified using the illustration in Reed (1962; Fig. 11.23).

Figure 11.23. Modern *levantina*, photographed against Reed (1962)

In 1959-1960, members of the Iranian Prehistoric Project led by Charles Reed, explored the area of Kermanshah in West-Central Iran for modern molluscs as a way to answer some of the questions arising from molluscs found at a number of archaeological sites. The decision was made to concentrate on *helix* and *levantina* as those were the types of molluscs found at archaeological sites. *Helix salomonica* was found at an altitude of around 1,700m in open fields and associated with 'ground-hugging perennial' plants believed to be resistant to local ploughing (Reed 1962, 9).

Two sessions of live snail gathering were undertaken in April 1960 on a rocky slope below a cliff face, close to the site of Warsawi. The vegetation was low 'thorn-bushes' on a bare hillside. *Helix salomonica* were collected from below the bushes and were on the move, some of which were copulating. The amounts thinned out further up the slope although the vegetation was the same. *Levantina diulfensis* were found in the same habitat conditions although increased further up the slope and were found on the cliff itself. In November 1961, Kent Flannery collected a number of *Helix salomonica* during a survey of the Qaleh Paswah valley after a few days of rain. They were found 'in great numbers' on the valley floor at a similar altitude to the earlier samples but well away from 'nearest hill'(Biggs 1962, 65). A survey of the molluscs found in the Zagros was able to link the different kinds of molluscs to distinct altitudinal ranges which coincide with rainfall; *helix salomonica* and *levantina* are found in the same zones. While molluscs can be a good indicator of climatic change, in the Zagros the numbers are skewed by the changes to the environment through the clearing and farming of the land in modern times and the collection of molluscs for food in the distant past making it difficult (Harris 1978).

The team then went on to eat the snails they had collected. One puzzle, they hoped to solve through 'pleasurable gastronomic experiments' , is why the *levantina* molluscs were not eaten and yet were of similar (often larger) size and would have been found in the same areas as *helix.* Both types were boiled, 'with no seasoning' and were deemed to be 'acceptable' with no significant difference between the two types. Questions of how they were prepared in the past were not answered; they will have been dead before they were extracted based on the completeness of the shells and the assumption is that they were cooked. Without pottery it is difficult to boil water and as there is no evidence of burnt parts of the shells, at the Zagros sites including Bestansur, it is unlikely they were placed directly onto fire (Reed 1962). The molluscs found in pre-pottery levels at Jericho also showed no signs of burning, again raising the question of how they were cooked (Biggs 1960, 380).

Discussion and conclusions

The detailed quantification of molluscs recovered over four seasons of excavation at Bestansur allows a number of conclusions to be drawn although a number of questions remain.

The data collected by the various methods do not allow for an easy comparison of the different deposits with molluscs. However, in order to analyse the results an attempt will be made to characterise the deposits using the different stages in the process of the exploitation of molluscs as food.

Gathering

Molluscs, and specifically *Helix salomonica*, were consumed at the site in significant numbers. The uniform size of the shells in each sample suggest that they were selected as food rather than occurring naturally which would result in a greater range of sizes reflecting the range of ages likely in the population. It is difficult to determine where the molluscs were collected as no evidence of a modern population was found in the vicinity of the site. The cultivation of the fields surrounding the mound may render the environment inhospitable to molluscs although Reed and his team did find molluscs on ploughed land during their search in Iran (Reed 1962). They also found molluscs on hillsides with scrubby bushes and it is possible that the hills close to Bestansur, which are now bare, provided this environment in the Neolithic.

Cooking

The snails were cooked before eating as any attempt to extract the meat before cooking would be very difficult and would break the shell. How they were cooked is not clear; with few signs of burning on the recovered shells it is unlikely they were cooked directly on the fire and there are no pottery vessels. The best indication comes from the fire-hardened clay-lined pit in Trench 7 with intact molluscs suggesting that they may have been cooked using hot stones. This would risk burning and it is also possible that some material (of plant or animal origin) was used between the stones and the molluscs allowing them to be ‘steamed’.

Eating

The molluscs were eaten after cooking by prising the snail from its shell with the appropriate tools. A number of lithic blades have been recovered, some in association with mollusc clusters, which would have been ideal for the task. In their ‘gastronomic experiments’ in Iran the team used microliths from Sarab as ‘snail-picks’ to show how the snails may have been consumed (Reed 1962, 16). The smaller *Helix 2* were all broken around the aperture while many of the *Helix 1* remained intact suggesting that either the size of the shell or its shape made the former harder to extract.

Discard

Once eaten the shells were discarded, in large accumulations in middens and in smaller amounts mixed with other ‘rubbish’.

Summary of results

In trying to identify areas where the different mollusc-related activities took place the quantitative data as well as site reports, photographs and the records of all recovered molluscs (regardless of whether their density can be measured) have been included to show three different types of deposit:

- **clusters**, to indicating areas where mollusc were cooked and/or eaten,
- **middens**, with a significant accumulation of molluscs and
- **areas of general discard,** with a high density of molluscs suggesting their deposition after the clear-up and cleaning of other areas.

Middens do not include other material in any quantity while it is expected that areas of general discard contain a mixture of 'rubbish'. Clusters have been identified where more than 250g of molluscs have been recovered by dry-sieving or through hand-picking in a context, based on the observation that most of these assemblages are made up of molluscs with low fragmentation. Context reports by the excavator have been referred to support the raw data and in some cases this has altered the initial interpretation.

Trench	Deposit type			Heavy residue
	Clusters	Discard	Midden	
2	1 context External area			High density in all samples (2); 1 sample from cluster
4	2 contexts External area	Indicated by heavy residue in 6 of 10 contexts		High density in 6 of 10 samples;
5			Large accumulation of molluscs	
7	3 contexts Several clusters in 1254 Clay lined pit	Possibly debris related to clusters	Possible based on photo (see Figure 11)	High density in 2 contexts of 74 (multiple samples) Associated with clusters
9	8 contexts External areas Excavator reports visible clusters but mixed with other material; activities			High density in 9 of 56 contexts
10	3 contexts External areas and Building			High density in 3 samples from 1 context coinciding with cluster
12		Midden-like deposit from section cleaning; not defined and mixed with other material General area of discard		High density in 4 of 8 contexts
13				High density in 3 of 36 contexts

Table 11.3. Summary of results

Table 11.3 summarises the results of this exercise but also illustrates that the data and observations do not always fit neatly into just one of the categories.

There is at least one mollusc 'midden', in Trench 5, while the mollusc 'deposit' in Trench 7 (albeit much smaller) could also be a midden. The description of the molluscs in Trench 12 is similar to the midden in Trench 5 with clear 'layering' of shells, although here the deposit is mixed with other material. It appears that after eating, the shells were collected and deposited in one area and that these areas were used repeatedly for some time, hence the build-up. It is unlikely, given the layering reported and the quantity of shells, that the middens were the result of just one session. Trenches 5 and 7 lie in the field west of the mound.

Mollusc clusters are found in external areas, typically associated with other activities. There are clusters in Trenches 2, 4, 7, 9 and 10 suggesting that the consumption of molluscs took place across the site. Other material found associated with the clusters suggest that there may be some variation in the eating event as in Trench 7 molluscs were found in distinct clusters but with little animal bone while in Trench 9 the mollusc clusters were associated with a high absolute number (and density) of animal bone, with evidence that this area of the site was used for butchery (Bendrey 2013b).

Molluscs also appear in high densities across the site in a less visible way, i.e. in the smaller artefacts collected from heavy residue. This could be as the result of clearing up the remains of the mollusc cooking and eating. Some of the areas of high density of mollusc in heavy residue coincide with higher than average density of other 'rubbish', notably in Trenches 4, 9 and 12. Trenches 7, 10 and 13 have far fewer contexts with above average density of molluscs in heavy residue except where the samples are associated with the mollusc clusters.

In conclusion, the preparation, eating and discard of molluscs took place in distinct areas and it is possible to discern where from the archaeological record. The spatial pattern of the activities can be mapped across the site with the consumption of molluscs spread most widely, although taking place in external areas only. Molluscs were discarded in a more limited number of areas with only one (possibly two) significant accumulations found to the west of the mound. Areas of high density of molluscs in heavy residue were found at the south and the north of the mound with the Trench 9 samples part of debris from general processing of food while the sample from Trench 12 reflecting a midden-like deposit with domestic 'rubbish'.

The social dimension

It is likely that many individuals were involved in the gathering, preparing and eating of molluscs. The collection of molluscs would be an 'easy' task and especially if it was close to the site could have included children as well as adults. Ethnographic studies and observations have reported that children are often included in this activity (V. Taylor *pers. comm.*). If they were gathered further afield, the activity may have been combined with other objectives, e.g. gathering of other food only available at a distance from the site, but given that the snails would be picked alive probably within less than a day's walk.

The cooking and eating of the snails took place in external areas which were communal and so was a shared social activity. In some parts of the site, the areas where the molluscs were eaten also show evidence of other activities, further supporting the view that this was a communal event. The empty shells were collected and discarded away from where they were eaten. The density of waste, either in the mollusc middens, or mixed with other rubbish points to the practice of using distinct areas for the final stage of mollusc related activities.

Acknowledgements

This paper draws heavily on the excavation, recording, reporting and photographs of a large number of colleagues who have worked as members of the CZAP team over five seasons at Bestansur. All photographs, unless otherwise indicated, courtesy of CZAP.

Chapter Twelve: Geoarchaeological investigations

Rob Batchelor

Introduction

This report forms an interim summary of the geoarchaeological investigations carried out at Bestansur during the Spring 2014 excavations as part of the Central Zagros Archaeological Project (CZAP), University of Reading. The eventual aims of the investigation are: (1) to enhance knowledge and understanding of the nature of the sub-surface stratigraphy of the site, and (2) to evaluate the potential of the sedimentary sequences for providing a preliminary reconstruction of the environmental history of the site and its environs. As a first step towards achieving these aims, eight geoarchaeological sequences were collected along a transect orientated approximately west-east across the site, from the west of the mound, through the ongoing excavations in Trench 10, to the present position of the spring (Fig. 12.1). Targeted boreholes were also put down near to/through previous excavations in Trenches 9 and 12/13, and at two locations along the existing spring.

Methods

A total of ten boreholes were put down during the excavations. Nine of these boreholes (BH1 to BH9) were down within the vicinity of the archaeological excavations using a combination of an Eijelkamp soil auger gouge and screw auger. Samples were removed in a maximum of 20cm lengths down to a maximum of 2.6m BGL (below ground level); longer lengths/deeper depths were not possible due to the stiffness of the sediment. In addition, a sequence of column samples were taken through the deposits within the deep sounding of Trench 10 (SA1946 to SA1948 and SA2269), replacing the BH1 sequence originally put down in the same location. The co-ordinates of each borehole and column sample were taken using a Leica Total Station (Table 1; Figure 1). Finally, a further two boreholes were put down through the alluvial deposits adjacent to the nearby spring using a Dutch gouge (BH10) and Russian corer (BH11). The locations of these boreholes were taken using a handheld Garmin GPS (Table 12.1). Each core/column sample was labelled with the depth and orientation, sample and context number and returned to the University of Reading for cold storage to prevent sample deterioration.

Further work

The over-riding aims of the geoarchaeological investigation are to be achieved during the course of a six-week Undergraduate Research Opportunity (UROP) Project taking place during the summer of 2014. These investigations will consist of the following:

1. Recording the lithostratigraphy of each sequence to clarify the nature of the sub-surface stratigraphy across the site, and to provide a preliminary reconstruction of the sedimentary history.
2. Detailed sedimentary analyses including organic matter determinations, calcium carbonate content and particle size to quantify the changes in sedimentology.
3. Assessing the microfossil content (pollen, phytoliths and diatoms) of the samples to establish the potential for providing a detailed reconstruction of the botanical and hydrological history of the site and its environs.

Figure 12.1. Locations of the boreholes and column samples.

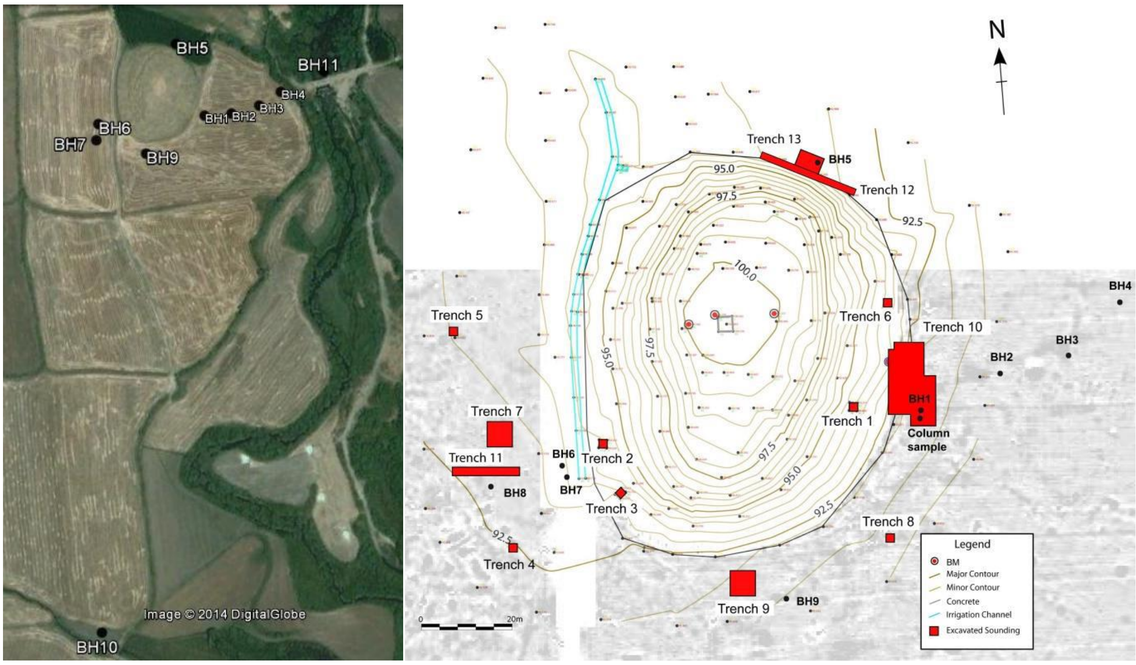


Table 12.1. Borehole/column sample locations, Bestansur.

Sequence	Sample #	Context #	Trench (if applicable)	Easting	Northing	Relative height
BH1	<1936>	(1766)	Trench 10, sounding	4538458.006	3522361.856	89.352
BH2	<1937>	(1766)	-	4538454.407	3522366.796	90.306
BH3	<1938>	(1766)	-	4538505.518	3522370.701	89.566
BH4	<1939>	(1766)	-	4538520.392	3522383.943	88.741
BH5	<1940>	(1766)	Space 40, Trench 12/13	4538452.328	3522417.973	92.557
BH6	<1941>	(1766)	Near Trench 7	4538372.996	3522337.253	92.466
BH7	<1942>	(1766)	-	4538358.789	3522342.168	92.477
BH8	<1943>	(1766)	-	4538335.465	3522339.656	92.097
BH9	<1944>	(1766)	Trench 9	4538421.707	3522312.728	91.009
BH10	<1945>	(1766)	-	?	?	?
BH11	<1949>	(1766)	-	?	?	?
Column 1948	<1948>	(1777)	Trench 10, sounding	4538457.620	3522360.244	90.22
Column 1947	<1947>	(1777)	Trench 10, sounding	4538457.914	3522360.264	89.895
Column 1946	<1946>	(1777)	Trench 10, sounding	4538457.999	3522360.230	89.533
Column 2269	<2269>	(1777)	Trench 10, sounding	?	?	89.38

Chapter Thirteen: Conservation

Jessica S. Johnson

Academic Director, University of Delaware and Iraqi Institute for the Conservation of Antiquities and Heritage

This report documents activities carried out with the Central Zagros Archaeological Project at Bestansur, Sulaimaniyah, Iraq from April 14 through April 21, 2014 (six working days).I participated in the excavations at the invitation of co-directors Dr Wendy Matthews and Prof Roger Matthews, University of Reading. This report documents observations, work undertaken on-site and ideas for the future.

I am very grateful to the directors for the opportunity to participate in the excavations. I learned much more about the particular issues and difficulties of archaeological excavation in this region of Iraq. The visit was also a chance investigate internship opportunities for students and alumni from the Iraqi Institute for the Conservation of Antiquities and Heritage (Iraqi Institute).Both of opportunities will help strengthen the educational programs at the Institute in the future.

I am also extremely thankful to the project's co-director Kamal Rasheed Rahim, Director-General of Antiquities for the Sulaimaniyah Province and to Slemani Museum Director Hashem Hama for allowing Iraqi Institute alumna Nyan Nasser (Advanced Conservation 2013) to participate as an intern with me on the excavations. Particular thanks also go to another Institute alumnus, Kamal Rouf Aziz (Historic Preservation 2010) who was of great assistance during excavation of several very fragile woven artifacts (see below).

Background

Current excavations at Bestansur are underway to recover and define Neolithic occupation of the site. There have already been four field seasons at the site, and during the last field season (Summer 2013) two well-preserved buildings were recovered. The good preservation and intense interest in the site have generated a desire to develop the site as a tourism venue for Sulaimanyah province. These plans are in the early stages, but are guiding some of the excavation and conservation decisions.

Conservation and preservation of the site and the finds are have already been given great consideration at the site.Numerous simple, but thoughtful practices are part of the day-to-day work and help to ensure that the site and the finds are kept as stable as possible during on-going excavations. These include shade cover over the entire site, covering the site with plastic each evening, making numerous plastic boxes, acid-free tissue and aluminum foil available for storage of fragile finds immediately upon excavation. At the end of the season, walls are given physical support with plastic woven bags filled with soil and the site is backfilled.

Upon arrival at the site, Dr Wendy Matthews, Dr Amy Richardson (Project Manager) and I discussed a number of conservation topics with which they were concerned. These included a number of issues related to:

- Site conservation
- Preservation during excavation
- Post-excavation storage and treatment
- Display and presentation of artifacts
- Impact and outreach
- Development of protocols

Figure 13.1. Early morning view showing shade cover and plastic covers on-site.

Throughout my visit I discussed and addressed these topics while participating in excavation on-site and working in the laboratory (details below).Several documents were also provided to Richardson on packing materials, storage equipment and a method for labelling finds

An Excel spreadsheet was designed in coordination with Richardson who maintains the excavation database. Conservation records were entered into the spreadsheet and will be transferred into the larger database. A digital copy of the spreadsheet was submitted along with this report.

On-site excavation

The majority of my time was spent working on site lifting a number of very fragile artifacts. These included woven material at first thought to be textile (later identified as degraded matting), small clay balls and shapes that may be figurines, a large fragment of burnt or bitumen lined matting, and a few other materials. Two basic methodologies were used – facing with acid-free tissue and block-lifting, or careful excavation of soil away from the edges of artifacts and then removing. Because of the damp soil conditions (maintained during excavation by the shade cover and daily covering of the site with plastic) fragile artifacts are kept physically supported by the clayey soil until it dries.

Woven materials

Three large block lifts were undertaken. *In situ* macro shots of the organic material were taken with the dig camera by Chris Beckman before block lifting in case the block failed. Viewing these images after excavation at the laboratory, it became clear that though at first glance the first two blocks lifts had a woven structure of fine threads, in fact there was no place where a finely divided weave pattern could be discerned. The fibers were not twisted which would have indicated that they were spun. Instead, the woven structure seems to be made of fine fibers that are the remains of wider grasses or reeds.

Figure 13.2. Overlapping fibres *in situ*. These were originally thought to be remains of textile but later understood to likely be partial remains of wider grasses or reeds used as matting.

Figure 13.3. Jessica S. Johnson and Nyan Nasser applying facing to black matting material *in situ*.

A third, separate area of woven material was a better preserved black area where complete elements of the woven material are visible – either as carbonized material or bitumen lining.

In each case the organic material was faced with acid-free tissue and then block lifted. Kamal Rouf Aziz did much of the physical removal of soil for all of the blocks. The blocks were taken back to the laboratory. They were given physical support around the base using several layers of aluminum foil strapped tight with locally purchased tape (which will not be stable long term).Each was then inserted into a hole cut into polyethylene foam inside a plastic box for storage. There was not time to remove the facings, but they can be removed in future seasons if desired. The black matting (the third block-lift) in particular, could make a nice example for display if treated in the future.

Small unfired and low-fired clay objects

A number of small clay artifacts were uncovered in several places during my time at the site. It is unclear if these are figurines, or parts of figurines, or small pieces of discarded clay or some other item. They are often partially burnt, but rarely fired (though one unmistakable fired clay figurine was recovered from the site during the week).Because of their fragility, a methodology of facing the artifacts with acid-free tissue and Paraloid-B72 after applying ethanol to the surface was devised and shared with several excavators. Application of the ethanol was an attempt to push some of the water out of the surface of the clay so the Paraloid B-72 would not emulsify. This technique gave some support to the objects allowing them to be excavated in some cases. The facing can be removed with acetone – and several objects were treated back in the laboratory to remove the facing.

Humic material

One morning was spent excavating an area of dark 'humic' material found under a stone mortar. This black material had no identifiable structure that could be seen in the field. The material was curved in the shape of the stone, but discontinuous. The edges found under the stone were clarified – but the material continues into the profile so the total extent could not be defined. It was photographed in situ by Chris Beckman. Four samples (SA2239-SA2242) were taken. Sample 2239 was a soil sample taken as a control for analytical work being done on the ground stone. The other samples were placed in plastic boxes. One of these samples (SA2242) had a small area of red pigment. Wendy Matthews also planned to take a block sample for micromorphological analysis.

Human remains

I also assisted Samantha Walsh uncovering human remains as so many partial skeletons were found during the week I was on-site. One skull was thought to have a black material on the temple and forehead area. It was cleaned it in the field using mini cotton swabs to clarify this hypothesis. However, with removal of overlying dirt, it appeared more likely to be some sort of staining and no further treatment was applied.

Intern Projects

Thanks to the support of excavation co-director Kemal Rasheed Rahim, Director-General of Antiquities for the Sulaimaniyah Province, Ms Nyan Nasser, a graduate of the Institute's Advanced Conservation programme in 2013 participated as an intern on-site during the week. Since graduation from the Institute, Nyan has been working in the small conservation laboratory at the Slemani Museum. Examples of her work there include upgrading mounts for display and restoration of ceramics.

Though Nyan has a degree in archaeology from Salahaddin University, this was her first opportunity to actively participate in an on-going excavation. This is typical of many archaeology students in Iraq. Mock-up excavation and survey experiences take place as part of Iraqi Institute educational programs, but only real on-site experience gives people a nuanced understanding of preservation issues, limitations of recovery from the field, and new excavation methodologies being used now. Nyan assisted with several different projects in the field to remove very fragile materials from the soil including assisting with block lifting and facing and lifting fragile unfired clay objects. In the laboratory, Nyan learned how to consolidate fine cracks in ceramics, removal of facings applied in the field, and practiced repair of low fired ceramics.

Figure 13.4. Nyan Nasser working with University of Reading student archaeologist to excavate fragile unfired clay objects.

Figure 13.5. Nyan Nasser removing paper facing from fragile unfired clay artifact.

Laboratory Treatments

A house in the village is used for a small field laboratory.C yclododecane (used to consolidate fragile materials) and white spirit was purchased by the excavation and a number of tools and supplies were brought from the Institute and donated to the project. See Table 13.1 for a list of supplies left with the excavation.

A number of small artifacts (clay disk, low-fired figurine, small clay artifacts) were given treatment in the laboratory. These treatments were recorded in an Excel spreadsheet and provided in digital form along with this report (Table 13.2).

Ideas for the Future

After one week on site with the Central Zagros Archaeological Project it is my hope that there will be future opportunities for collaboration. A number of projects were initiated or discussed that could continue in future seasons. These are listed below:

1. Consider having a US or European educated conservation intern on-site – and pair them with Iraqi Institute graduates. The deeper knowledge of the western educated students will help to show Iraqi students how much more they could learn with continued education and through the literature. The opportunity to teach and to partner with an Iraqi student would help develop many skills for the western educated students. This will also be a way of having a conservator on-site for more of the season.
2. Excavate and prepare for exhibit or long-term storage the block lifted woven materials recovered this year. In particular, the black woven matting was left with the facing in place and in the block. The block was supported with layers of aluminum foil and strapped tight with locally purchased plastic tape. This piece could be consolidated and excavated from the block and mounted for display. This work could be done on-site, or a project could be developed to do the work in the Slemani conservation lab or at the Iraqi Institute.
3. Investigate excavation methodologies for plastered walls to develop excavation strategy for 2015. I will pursue this information and share it with the co-directors during the year.

Table 13.1. List of conservation chemicals and supplies

Item	Quantity
Ethanol	1 litre
Acetone	1 litre
Distilled water	1 litre
White spirit	2 litres
Primal WS-24	Small amount decanted in plastic container
Paraloid B-72	4 bags @ 10gm + 250gm
Paraloid B-48N	5 bags @ 10gm + 250gm
Cyclododecane	2 x 1kg tin
Set of plastic beakers	Very small to large
Plastic graduated cylinder	1
Scalpel handle	1
Disposable plastic pipettes	c. 20
Plastic bottles with long nozzles	2
Small glass and ceramic trays	Assorted
Cotton	Small amount
Mini cotton swabs	c. 50

Table 13.2 Artefacts and sample conservation record Spring 2014

C	SA	SF	Material	Description	Problem	Treatment	Conservator	Date Completed
1771	2175			4 dirt clumps with possible remains of pigmented fibres	Fragile	Wrapped with aluminium foil to support. Made storage mount by cutting spaces into polyethylene foam sheet to create support.	Jessica S. Johnson	19-Apr-14
1771	2163		textile fibre		Fragile	Wrapped with aluminium foil to support. Made storage mount by cutting spaces into polyethylene foam sheet to create support.	Jessica S. Johnson	19-Apr-14
1550		333	clay object	Large clay disk, dark grey colour.	Broken into multiple pieces, small crushed fragments also included in the box. Surface unevenly covered with dirt and linear concretions.	Dry brushed, then swabbed surface with distilled water to remove soil and slightly soluble concretions on the surface. Used toothpick to remove more soil. Concretions are somewhat soluble/removable with water. Used approximately3% Paraloid B-72 in acetone and ethanol to coat join edges. Glued with approximately 20% Paraloid B-72 in acetone and ethanol. Created storage mount.	Nyan Nasser	19-Apr-14
1554		359	clay lump	Low fired clay object found in flotation	Broken into five pieces, probably adjoining			
1548		329	clay token	Conical clay token, low-fired, grey colour	Broken into two larger and more than seven smaller fragments.	Re-adhere some of the pieces with approximately 15% Paraloid B-72 in acetone and ethanol.	Jessica S. Johnson	19-Apr-14
1564		370	clay object	Reduction fired clay object with a bulbous slightly pointed end narrowing towards a rectangular cross-section where it is broken off. Dark grey colour.	There are a number of cracks visible on the surface however, none appear to be moving. One runs from the top of one side, past one side of the point, down the other side, across the bottom and back up the other side. Another crack runs around the "neck" area from the longer crack on one side to the other. The surface is slightly dirty.	Cleaned surface with distilled water on cotton swabs. Consolidated cracks with approximately 3% Paraloid B-72 in acetone and ethanol by applying it with a very small brush and allowing capillary action to pull the consolidant into the crack. Removed excess consolidant on surface with acetone.	Nyan Nasser	19-Apr-14

C	SA	SF	Material	Description	Problem	Treatment	Conservator	Date Completed
1731		470	cowrie	Partial worked cowrie shell with black material filling about half of the interior.	Surface is dirty. Two fragments of the black material have broken away from the fill material and are housed separately in a small bag.	Used distilled water on small cotton swabs and a toothpick to remove dirt from shell.	Jessica S. Johnson	17-Apr-14
1731		468	cowrie shell	Cowrie shell with reverse cut away. Two sides of interior filled with black material.	Surface is dirty. Black very visible on one side, on second side, dirt covers black but some is visible in loss in the dirt. There is some loss of black material on the dirt filled side.	Used distilled water on small cotton swabs and a toothpick to remove dirt from exterior shell and in some areas of the black material on one side. On side filled with more dirt it was removed by softening it with distilled water and using a scalpel and toothpick. One area that was loose was consolidated with approximately. Removed soil from 3% Paraloid B-72 in acetone and ethanol to secure it to the shell.	Jessica S. Johnson	19-Apr-14
		532	clay figurine	fragmented, low fired, black smoothed exterior figured	Broken into about eight pieces - body, two legs, and fragmented neck.	Used B-72 to glue.Neck break was an old break.Small fragments on neck are new chips that came off.There are still losses at the neck.Used scalpel to remove loose dirt.More cleaning could be done to remove concretions.	Jessica S. Johnson	21-Apr-14
	2257		matting	Fragment of black woven matting in situ. Material is either burnt or was lined with bitumen.	Want to lift complete	Faced with acid-free tissue adhered with Paraloid B-72 in acetone and ethanol. Block lifted by cutting away soil several inches beyond the edges of the matting and then undercutting until complete block could be lifted out. Wrapped in aluminium soil to bring to laboratory. In laboratory uncovered top of block (with matting) and tightly wrapped soil block with aluminium foil and strapped with locally purchased tape. Cut out hole in one inch polyethylene foam to fit the base of the block and support block in plastic storage box.	Jessica S. Johnson	21-Apr-14
	2317		'textile'	Fragments of woven fibres	Want to lift complete	Faced with acid-free tissue adhered with about 20% Primal WS-24. Block lifted by cutting away soil several inches beyond the edges of the matting and then undercutting until complete block could be lifted out. Wrapped in aluminium soil to bring to laboratory. In laboratory uncovered top of block (with matting) and tightly wrapped soil block with aluminium foil and strapped with locally purchased tape. Cut out hole in one inch polyethylene foam to fit the base of the block and support block in plastic storage box.	Jessica S. Johnson	21-Apr-14
	2318		'textile'	Fragments of woven fibres	Want to lift complete	Faced with acid-free tissue adhered with Paraloid B-72 in acetone and ethanol. Block lifted by cutting away soil several inches beyond the edges of the matting and then undercutting until complete block could be lifted out. Wrapped in aluminium soil to bring to laboratory. In laboratory uncovered top of block (with matting) and tightly wrapped soil block with aluminium foil and strapped with locally purchased tape. Cut out hole in one inch polyethylene foam to fit the base of the block and support block in plastic storage box.	Jessica S. Johnson	21-Apr-14

Chapter Fourteen: Public Archaeology Pilot Study

Dr Rhi Smith in collaboration with Othman Fattah, Hero Salih, Hawar Hawas and Mathew Britten

Research Context and Rationale

As the excavations in Bestansur enter their final year the team are keen to explore the legacy of the CZAP project for the region and for the local community. In light of this Dr Rhi Smith attended the excavation for 10 days in order to conduct a short pilot project and identify possible opportunities for future research and community initiatives. The pilot project combined a number of research techniques in part to establish which would be most useful for a further project.

Public Archaeology is a growing field with strong roots in the UK. It covers a broad range of research activities but is defined by the journal of the same name as research and debate "surrounding archaeological and heritage issues as they relate to the wider world of politics, ethics, government, social questions, education, management, economics and philosophy". Archaeological ethnography represents one strand of this research and is attracting increasing attention as a specific methodology (Hamilakis and Anagnostopoulos 2009). It involves the use of anthropological fieldwork techniques such as semi-structured interviews and participant observation to understand the relationship between different communities and archaeological projects and resources. Such techniques may be used alongside or as part of action research, that is research which seeks to explore solutions to or reflect upon real world problems. Meskell (2012) has used the term 'hybrid fieldwork' to refer to growth in practice which combines a range of methodologies in order to complicate the relationship between archaeology and its public(s).

This type of research is well established in the archaeological study of this period and region through the Çatalhöyük Excavation Project which employed an overtly 'multi-vocal' approach to research (Hodder 2005, 2000). Several projects at the site have used a mixture of methodologies from museum studies, public understanding of science, anthropology, education, and the study of contemporary spirituality (Bartu 2005; Shankland 2000, 1999; Rountree 2007, 2006). They demonstrate that the excavation and its products are intextricably linked into a much wider network of significances as different stakeholders seek to understand and use the site in their own term. These studies also explore some of the challenges of producing public interpretation at a contested site in this region of the world. While the specific context of Çatalhöyük is very different from Bestansur some important lessons can be learned from this ongoing research.

Research aims and objectives

Given the short time frame of the project the key activities involved establishing connections, gathering data, and piloting some modest projects. It is hoped that this can be used to inform a more substantial project at a later date in collaboration with local heritage and educational professionals.

- To pilot and evaluate different methodologies for recording local interactions with the site
- To pilot an outreach project with local schools
- To explore the potential for a strategic collaboration with Sulaimaniyah Museum
- To begin to investigate the regional and local significances of the excavation project and the site of Bestansur.

Data set

The data set for this project is largely qualitative and consists of:

- 'Scratch notes' and a fieldwork diary written by Dr Rhi Smith
- Photographs of public interactions on site
- Field notes taken during interviews with local stakeholders
- Clippings on local and international news coverage of the excavation

A member of the team in Kurdistan, Hero Salih, was responsible for keeping a log of visitors to the site (invited and informal). She took the decision to note the number of women in each group.

Numbers	Status	Affiliation (if any)	Number of women
22	Students	Department of Archaeology, University of Sulmanaiyah	5
15	Teachers	Karagol School	2
12	Picnickers	Local	Not known
3	TV Crew	TV Sharaea "ahl almadeena" (Al Jazeera)	1
33	Teachers	Local School District (History teachers + 4 supervisors)	12
4	Students	Local	3
2	Teacher/Reporter	Local	0
40	Teacher/ Students	Galawezh School, Sulaimaniyah City (9 teachers, 31 students)	24
3	Local	Children from dig house	3
3	Visitors	2 from England. Came to visit site	0
12	Local	Bestansur	5
16	Teachers	Chemistry Teachers from Zarayan (1 female and 1 male supervisor)	7
165			

Table 14.1. Details from visitor log book for Spring 2014 field season

Key findings (for future development) from this data and from participant observation were:

- There were only two formerly booked visits (33+16). This demonstrates that word of mouth was an effective method of attracting visitors. However, the lack of formal warning made this difficult to manage and ate into excavation priorities.
- Visitors tended to live locally or were teachers/students who had come in via group transportation.
- Participant observation showed that while there were relatively high numbers of women visiting the site, they were often physically marginalised from discussions on site i.e. standing to one side while men surrounded the main speaker. However, they seemed to negotiate around this by seeking out interactions with other female members of staff or people standing working away from the central trench.
- Visitors took lots of photographs and were extremely keen to follow people on social media.
- There was a great deal of local pride in the excavations and energy to support the site amongst heritage professionals and local politicians and elected officials.

- Excavation workers brought a great deal of local knowledge to the project. They also brought more general skills such as construction or transportation. Some have a wealth of excavation experience in the region.

Pilot site visit with teachers

We were also able to pilot collaboration with local heritage professionals with assistance from Othman Fattah (Slemani Museum staff member). Working with the help of the Department of Antiquities Othman was able to negotiate a meeting with the local head of education in New Halabja for himself, Hero Salih and Dr Rhi Smith. Two days later 33 history teachers visited the site and the dig house (4 of them supervisors for the region). Dr Rhi Smith wrote a short guide to the site which Othman translated into Kurdish. A University of Reading student was also able to produce a series of digital reconstructions in Google Sketchup which were used to help visualise the building which was being excavated (Fig. 14.1). The team decided that it was important that teachers understood the scientific procedures taking place in the dig house, as well as the on-site work. The trip consisted of a simple structure which included a tour of the facilities with each specialist giving a demonstration of their work (Fig. 14.2).

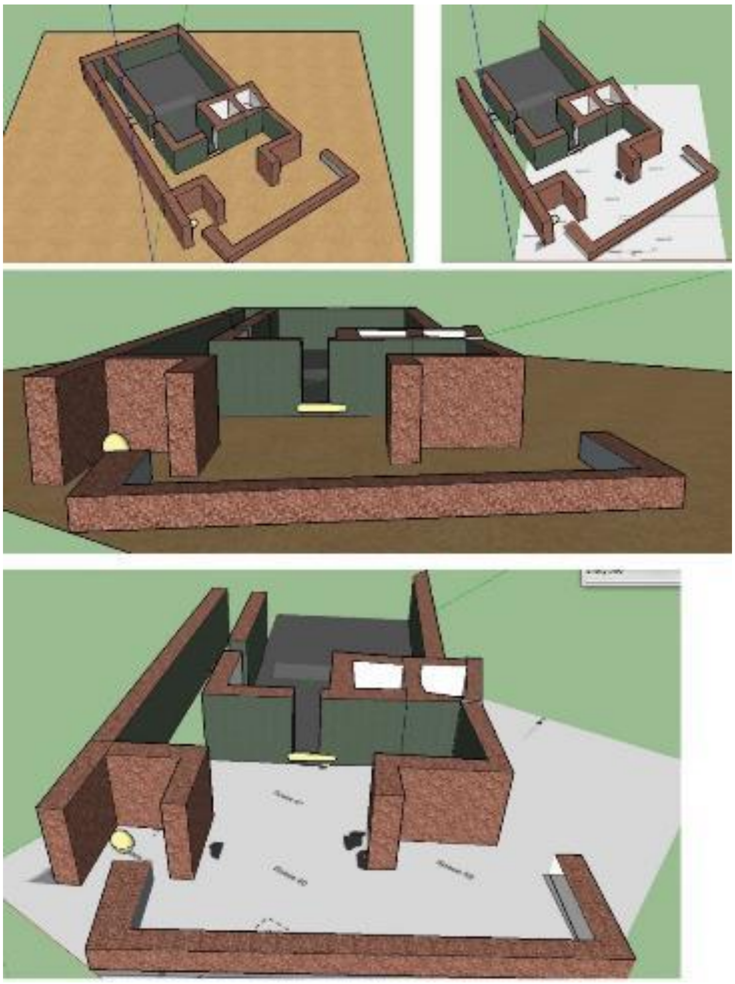


Figure 14.1. Digital reconstruction of Building 5 at Bestansur (produced in Google SketchUp by Zoe Richardson).

Figure 14.2. Local history and science teachers visit the Bestansur dig house to tour the facilities.

Evaluation of research methods and approaches

Interviews

Due to language problems and restrictions on time we were only able to undertake two interviews with local workers. Pilot interview questions asked workers about their previous experience of excavation work, their experiences of excavating, and their views on the future of the site. One interviewee was a guard and the other a student so they represented the range of experiences of the local staff.

Discussions with the guard demonstrated the range of occupations simultaneously undertaken by local men who worked on the site. Working at the site was only one of a range of different activities undertaken. He also brought many years of excavation experience on similar sites to the dig. When trying to understand the relationship between local workers and the site, the complex relationship between the project and local economy needs to be understood. The wide skill set and knowledge of local workers also has to be appreciated and previous studies as part of this project have demonstrated the potential of archaeological ethnography to enhance our understanding of the local mixed economy and landscape.

Both interviewees reported that there was a great deal of local pride in the site and that they would like to see a museum and possibly a picnic site nearby. This would also have a knock-on effect for the local economy and infrastructure (most notably roads, refuse collection) which both workers appreciated.

From observing responses to questions it seemed clear that while the workers were open to being asked questions they seemed more comfortable being asked about their opinions on the site. As they were employees of the project there may also have been some hesitancy about responding to questions about their experiences of working on site. This desire to talk about specific interpretation products was also supported by their response to digital models of the site and a piloted site guide. Hence, in the future it might be more useful to focus on seeking their response to interpretation materials (see Moser and Perry

2011) and using participant observation techniques and informal discussions to understand more about their own experiences of working at the site.

Participant Observation and Action Research

It was generally found that a less formal approach to investigation yielded richer results and was better suited to the local context. For example, while qualitative data demonstrated high numbers of women attending the site, participant observation illustrated that they were often physically marginalised. The history of the region also means that there is some reluctance to talk freely in official contexts about personal information. Hence an ethnographic approach utilising participant observation and reflexive action research may be more effective in the long term, than an approach based on formal techniques such as interviews and focus groups.

The development of these resources also shows that partners with a mixture of strong English and Kurdish and specialist knowledge are needed in order for interpretation to be effective. It also highlighted the different skill sets that individual team members could bring to interpretation. While the resources created by team members may not be of professional design quality, the content and images were very strong and generally extremely well received by visitors and workers. This approach also allowed for updates to take place as excavations continued. This suggests that a collaborative and sustainable approach to interpreting the site can have a significant impact (see Moser and Perry 2011) and that outsourcing to professional companies may not always be the most sustainable or collaborative means of interpreting a site.

Discussion and future developments

This is only a small pilot project but there are a number of ways in which it could inform the future interpretation of the site and legacy of the project.

Collaboration with Slemani Museum

As part of this pilot project the team talked with local heritage professionals about the objectives of Sulaimaniyah Museum and the potential for future collaboration. The Museum was founded in 1961 and moved to its current premises in 1980. In co-operation with UNESCO and the EU the Museum undertook a modernization project 2011-2013. This resulted in a new strategy and a piloted exhibition space relying mainly on materials and expertise from outside of the region. Language and museological training for staff also enhanced local skills in the region.

There is a general feeling that the current premises are not fit for purpose in the long term and that a new building is needed. A mock-up of a proposed building was developed as part of the UNESCO plan and is displayed in the new gallery. However, there is great potential to provide flexible materials which would work within the current galleries and a new space. For example, the museum has a large central video screen which it uses to contextualise objects but is unable to find suitable videos in Kurdish. It also has several smaller currently underutilised spaces in which temporary exhibitions could be held.

In terms of outreach and education, school visit days are extremely restricted and staff already have outreach activities in place which could be enhanced through a collaboration with the project. Member of museum staff Othman Fattah has completed an MA in Museum Studies at the University of Leicester and wrote his dissertation on the educational potential of the museum, which is yet another useful resource for future projects. It should be noted that the Museum's remit and the national curriculum goes beyond Bestansur and that any interpretation of the site needs to connect into wider chronologies and themes. Several people have also suggested a small site museum at Bestansur but this has serious implications for local infrastructure, security, and local staffing and expertise which need to be addressed. Above all any interpretation must be collaborative, flexible, and sustainable. Moser and Perry's (2011) visualisation project at Çatalhöyük may offer a useful model for future development with its focus on ethnographically informed design and local sourcing of materials and expertise.

Work with teachers and piloted resources

Feedback was extremely positive and one of the supervisors organised a second visit for local Chemistry teachers. The visit of Chemistry teachers illustrates the potential for the site's inter-disciplinary methodology to inform cross-curricular educational outputs. For the second visit University of Reading student Mat Britten and Hawar Hawas also repurposed the original guide to create and translate a small booklet. Staff at the Museum are now keen to use this as the basis for a site guide. The digital models were also extremely well received and there is potential to build on this in collaboration with the student's digital modelling supervisor Dr Matthew Nicholls in the future.

The impact of the excavation on local and regional identity

Media interest and local feedback demonstrated that the site is growing in importance and is being hailed as 'the earliest village in Kurdistan'. At the time of writing this report the future of Iraq looks uncertain, and while Kurdistan is currently stable it is unclear what the future holds for the region. The town of Bestansur is also relatively small and it is unclear what the impact of tourist interest would be on the local economy and cultural life. Research at Çatalhöyük (Bartu 2005; Shankland 2000, 1999; Rountree 2007, 2006) demonstrates the potential role of a high profile excavation site in local social dynamics and regional and national identity building. It also demonstrates the complexity of spiritual significance for a pre-Islamic site to local people and the wider world (ibid.). In conclusion, while the dig at Bestansur represents a much smaller project, there is a great deal more which can be done from an ethnographic perspective to explore the multiple meanings of this site in its local, regional, national and global contexts.

Future Directions

Any future work in the region would need to bring with it funding resources which could help to 'make things happen' on the ground. This kind of co-designed research would ensure that the excavation and any public archaeology research addressed local priorities as well as wider research agendas. Potential sources of funding are currently being explored and communication with local partners is ongoing.

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