مجلة الدراسات العُمانية

مجلة علمية محكمة

العـدد ٢١

The Journal of Oman Studies

مجلة الدراسات العُمانية

The Journal of Oman Studies

العـدد ٢١

Vol 21

The Journal of Oman Studies

Scholarly Refereed Journal

Volume 21

مجلة الدراسات العُمانية

The Journal of Oman Studies

مجلة الدراسات العُمانية

The Journal of Oman Studies

Volume 21

Published by the Ministry of Heritage and Tourism
Sultanate of Oman

Editor-in-Chief

Dr. Nasser Said Al-Jahwari
Associate Professor, Archaeology Department, Sultan Qaboos University.

Editorial Board

Prof. Abdullah Khamis Al-Kindi
Professor, Mass Communication Department, Sultan Qaboos University.

Dr. Abdullah Saif Al-Ghafri
Associate Professor, Al Aflaj Research Unit, Nizwa University.

Dr. Khaled Ahmed Douglas
Associate Professor, Archaeology Department, Sultan Qaboos University.

Dr. Abdul Gabbar Al Sharafi
Assistant Professor, English Department, Sultan Qaboos University.

Dr. Talal Khalifa Al-Hosni
Assistant Professor, Earth Sciences Department, Sultan Qaboos University.

Advisory Board

Prof. Janet Watson
Prof. Michael Jansen
Prof. Ian Clark
Prof. Ali Tijani Elmahi
Prof. Ricardo Eichmann
Prof. Amer Ali Al Rawas
Dr. Mohammed Ali Al Belushi
Dr. Rashid Abdullah Al Yahyai

Administration Manager

Ali Hamood Al Mahrooqi

Coordinator

Zahra Said Al Siyabi

© 2020 Ministry of Heritage and Tourism, Sultanate of Oman
ISSN 0378-8180
Printed by Mazoon

MAP OF THE SULTANATE OF OMAN

GUIDE TO AUTHORS

The Journal of Oman Studies was established in 1975. It is published by the Ministry of Heritage and Tourism in the Sultanate of Oman. It is a scholarly journal that publishes original and refereed research in both Arabic and English in areas relating to natural and cultural heritage relevant to the Sultanate of Oman. The journal publishes research in various areas of tangible and intangible cultural heritage. For example, the journal publishes research in various kinds of movable and non-movable archaeology, rock art, inscriptions and writings, sculpture, traditional architectures such as forts, castles and old neighborhoods. The journal also publishes research on modern buildings with unique architecture specific to Oman. It also publishes research on intangible cultural heritage such as research in the areas of Omani traditions and customs, different forms of expression including language and oral practices, various forms of performance arts, rituals, ceremonials, social practices, various forms of interaction with nature such as agriculture, falaj and irrigation system, traditional medicine, skills related to Oman's traditional handcrafts and others. The journal also publishes research dealing with topics related to Oman's natural heritage and these include studies of natural landscape, geological structure, natural sites like mountains, wadis, caves, flora and fauna of Oman. The journal also invites book reviews in relevant areas.

All submissions are subject to academic review. Submissions cannot be withdrawn after they have been sent to reviewers. Contributors must confirm in writing using the relevant form that their submissions are original and have not been previously published or are under consideration by other journals. All copyrights are reserved by the publisher and the journal has the right to republish or translate the submission upon consulting with the author. Materials published in the Journal reflect the opinions of their writers, not necessarily those of the journal's editorial board, nor do they reflect the official policy of the Ministry of Heritage and Tourism.

Guide to manuscript submission

Contributions are submitted in Microsoft Word format with a margin of 3cm in all sides. The number of words of the manuscript should not exceed 10,000 words for a full paper and 1200 for the book review including footnotes. Submissions should be double-spaced with Times New Roman size 12. Submissions should be written in good academic language.

Submissions should be sent electronically with the following details provided on the cover page: title of the paper, author(s) full name(s), academic titles, their affiliation(s) and the type of submission (paper, translation, book review... etc.) in both Arabic and English, full address of the author(s) including email, P. O. Box, phone and fax number.

The submission should include an abstract in both English and Arabic and it should not exceed 250 words in each language. The abstract should give a summary of the content, significance, methodology, contribution and the main findings of the study. The abstract should also provide 5 keywords.

In-text citation of sources should be documented in the main text not as footnotes or endnotes. The surname(s) of the author(s), date of publication and page number should be provided between brackets as follows:

- **Single author sources:**

  (Smith, 2005:22)

- **Two or three authors:**

  (Smith, Jakobson, and Gibbs, 2005:22)

- **More than three authors:**

  (Smith et al, 2005:22)

- **Work of an unknown author:**

  The title of the source is given in the citation sentence and when brackets are used then only a key word or two from the title is mentioned.

- **Book and report titles** are written in italics.
- **Titles of articles, book chapters and web pages** are written within quotation marks.
- When **quoting more than one source**, the sources should appear alphabetically ordered in the brackets with a semi colon separating them, for example, (Gibbs, 2007; Lyons, 2008; Smith, 2005).
- If an author has **more than one publication** in the same year, alphabets should be used after the date to show the sequence, for example, Gibbs (2011a), (2011b) …etc.
- If a **citation is paraphrased or quoted from a translated work**, the year of publication and the year of translation should appear in the citation, for example (Gibbs, 2005/2012, p. 22).
- If there is **no date of publication**, the phrase (no date) should be used.
- If a **source is cited more than once** consecutively the expression (ibid) should be used, and if the page number is different, then the new page number should appear next to the expression as follows: (ibid, p. 20).
- All **other notes** can be provided as endnotes.

All references must be alphabetically ordered following the 6th edition of APA, as follows:

- **Books in print version**

- **Single author**

  Family name, first name (initials), (year of publication), book title (italic), place of publication: publisher

  e.g. Pinker, S. (1999) Words and Rules, New York: Basic Book

- **Multiple authors**

  O'Grady, W., Archibald, J., and Katamba, F. (2011) Contemporary Linguistics: an introduction, London: Longman

- **Electronic books**

  Family name, first name (initials), (year of publication) book title (italic), date of retrieval and website link

  e.g. Smythe, K. (1983) Seashells of the Sultan Qaboos Nature Reserve at Qurm. Retrieved on April, 4th, 2015 from http://doc79.gangqinbooks.com/seashells-of-the-sultan-qaboos-nature-resereve-at-qurm-smythe-kathleen_P-less2.pdf.

- **Edited books**

  Family name, first name (initials) (ed(s)), (year of publication), book title (italic) place of publication: publisher

  e.g. Bailey K. and Damerow, R. (eds) (2014) Teaching and Learning English in the Arabic-Speaking World, London: Routledge

- **Chapters in edited books**

  Family name, first name (initials), title of chapter, in family name, first name (initials) of editor(s), title of edited book (italic) page numbers, place of publication: publisher

  e.g. Sharp, E. P. (2007) "Testimonies and the Expansion of Women's Roles in a Transnational Mexican Parish". In Jule, A. (ed.) Language and Religious Identity: Women in Discourse, pp. 7-28, New York: Palgrave Macmillan

- **Journal publication**

  Family name, first name (initials), title of article, name of journal (italic), vol., issue, page numbers.
  e.g. Nash, H., Al Musharifi, M., and Al Harthi, A. (2014) "Timing Falaj Water Shares in Al Hajar ash Sharqi", The Journal of Oman Studies, vol. 18, pp. 63 – 75.

- **Unpublished work**

  Family name, first name, (year), title of thesis/dissertation (italic), type of thesis, university or academic institution, country
  e.g. Garcia, L. (2012) The visual as a thinking tool: developing students' critical thinking skills through images (unpublished master's thesis), University of Auckland, Auckland, New Zealand

- **Translated work**

  Family name, first name (initials), (year of publication), title (italic), name of translator(s), place of publication, publisher

  e.g. Marquez, G. G. (1967) One hundred years of solitude, (G. Rabassa, trans.) (2006), New York: Harper Collins

- **Internet sources**

  Family name, first name (initials), last update or copyright date; if not known, put (no date), full title of work/ document, other information, vol., page number(s), date of retrieval, full URL address

  e.g. Ministry of Tourism (2011) Sultanate of Oman: A Special Issue. June 4th, 2017, http://www.omantourism.gov.om/wps/wcm/connect/a9b89d0048dd4e268443f6fde0ccbc90/FINAL+MAGAZINE. pdf?MOD=AJPERES&CONVERT_TO=url&CACHED=A9b89d0048dd4e268443f6fde0ccbc90.

- **Figures and Diagrams**

  No more than 30 illustrations such as figures, tables and diagrams are accepted, and should be sent electronically with a minimum of 300 dpi resolution. Every figure or diagram should have its sequence number. It is the responsibility of the author to sort out copyright issues by obtaining permission from copyright owners. All captions and numbers of figures, diagrams and tables are documented separately and accurately according to their appearance in the text. For example, (figure 2), (Table 2). Any comments explaining figures and diagrams should be put on a separate page at the end of the research paper.

- **System of measurement units**

  The metric system should be used and this should be reflected in the text by using the following abbreviations: m = meter, g = gram, s = second, l = liter … etc.

- **Dates**

  When the Hijri (Islamic) calendar dates are used they should be accompanied by their corresponding Gregorian calendar dates. Dates determined by radioactive carbon should be reported as they are (B.C.E.) or before present, using their exact lab numbers.

All correspondences are addressed to:

Editor-in-Chief
The Journal of Oman Studies
Ministry of Heritage and Tourism
P. O. Box 668, Muscat Postal Code 100, Sultanate of Oman
Tel: 0096824641572
Email: jos@mhc.gov.om or editor_chief@mhc.gov.om
Website: www.mhc.gov.om

Contents

Foreword

The Journal of Oman Studies, published by the Ministry of Heritage and Tourism in Oman, has been recognized over the last four decades by local, regional and international academics and researchers as a source of original research and scholarship on Oman's cultural and natural heritage. The Journal publishes solid research findings produced by many archaeological missions working in different parts of the Sultanate. These missions target the Journal as the main publishing venue for their research output. The Journal is thus a pioneer in publishing these archaeological discoveries and findings. The Journal also publishes research on various other topics related to Oman's cultural intangible heritage and on topics related to editing Oman's heritage manuscripts. It also publishes articles on Oman's natural heritage. These diverse areas of scholarship enrich the Arab and World academic libraries with significant academic studies on Oman and its cultural and natural heritage.

I am pleased to present to you issue 21 of this Journal, which includes 12 research articles in both Arabic and English addressing different historical and archaeological eras ranging from the Paleolithic through the Neolithic, Bronze Age, Iron Age, Pre-Islamic eras and Islamic eras. These research articles cover various topics related to palaeoclimatic and palaeoenvironmental in Al Hajar Mountains in northern Oman as well as early human dispersal in Oman. The articles also attempt to identify the nature and timing of human occupation and landscape change during the Stone Age period in the Western Hajar Mountains. The articles also shed light on prehistoric occupation of cave and rock shelters as well as ancient pastoral occupation. This issue of the Journal also includes articles on prehistoric settlements and cemeteries and the various archaeological artefacts such as pottery, metals, softstone, flint, stamp seals, coins and so on. In addition, the issue features some ethnographic and historical studies such as the one on the traditional banush boat and the one on aflaaj. The geographical framework of these studies is diverse and covers all regions of Oman from the north to the south.

On this occasion, I would like to extend my thanks to all the researchers who contributed to this issue and previous issues. The Journal will continue its mission of publishing rigorous, solid and original research, and I would like to invite researchers to submit their scholarly work whether in Arabic or in English to this Journal for publication in the upcoming issues.

Salim bin Mohamed Al Mahrouqi
Minister of Heritage and Tourism

Ancient Pastoral Settlement in The Dhofar Mountains: Archaeological Excavations at Shakil and Halqoot

Joy McCorriston, Abigail Buffington, Kyle Olson, Louise Martin, Wael Abu-Azizeh, Timothy Everhart, Ali Al Maashani, Ali Ahmad Al Kathiri, and Ali Al Mehri

ABSTRACT:

For much of Dhofar's history and prehistory, most of its population has been mobile in search of wild game and with herded domesticated animals, which need new grass and browse. While few archaeological sites in the southern region of Oman suggest permanent or even semi-permanent occupations, there is now clear evidence of a distinct and perhaps unique episode of well-constructed, semi-permanent settlements in the Jebel Qāra, Dhofar. In 2012 and 2017, archaeological teams established a chronology, occupation history, and pastoralist-hunter lifestyle of these settlements' occupants, raising new questions about episodes of pastoralist settlement in long-term context. This paper documents the archaeological sites, their architectural details and layout, associated finds, and preliminary assessments of their faunal and vegetative components.

KEYWORDS: Dhofar, Iron Age, Pastoralists, Archaeological Settlement.

الاستيطان الرعوي القديم في جبال ظفار: التنقيبات الأثرية في شكيل وحلقوت

جوي ماكوريستون، وأبيجيل بوفينجتون، وكايل أولسون، ولويس مارتن، ووائل أبو عزيزة، وتيموثي إيفرهارت، وعلي المعشني، وعلي أحمد الكثيري، وعلي المهري

الملخص:

بالنسبة لمعظم تاريخ وعصور ما قبل التاريخ في ظفار فإن غالبية سكانها يتنقلون بحثًا عن الصيد البري، ورعي حيواناتهم المستأنسة التي تحتاج إلى عشب وكلأ جديد. في حين أن قلة من المواقع الأثرية في المنطقة الجنوبية من عمان تشير إلى استيطانات دائمة أو حتى شبه دائمة، هناك الآن دليل واضح على وجود حلقة مميزة وربما فريدة من المستوطنات شبه الدائمة جيدة البناء في جبل القرا بظفار. في عامي ٢٠١٢م و٢٠١٧م، أنشأت الفرق الأثرية تسلسلاً زمنياً وتاريخاً للاستيطان وأسلوب حياة الصياد الرعوي لساكني هذه المستوطنات مما أثار أسئلة جديدة حول فترات الاستيطان الرعوي في سياق طويل الأمد. توثق هذه الورقة المواقع الأثرية وتفاصيلها المعمارية وتخطيطها، والمعثورات المرتبطة بها، والتقييمات الأولية لمكوناتها الحيوانية والنباتية.

الكلمات المفتاحية: ظفار، العصر الحديدي، الرعاة، مستوطنة أثرية.

INTRODUCTION

In the southern region of Oman, the major indications of human passage are scatters of chipped stone on desert surfaces, small-scale stone monuments like platforms and tombs, hearths, and modifications to rock shelters. Occasionally one finds the stone outlines of windbreaks and insubstantial, small shelters. These rarely contain stratified archaeological deposits. The principal settlements that have yielded excavated remains of human life—Al Balīd (at Salālah) and Sumhuram (at Khawr Rawrī)—are atypical of the wider occupation of southern lands from 8000 years ago to the present day. In the absence of archaeological excavations of settlement sites, it has been difficult to explore the economic patterns in ancient Dhofari life. Recent excavations at well-constructed, permanent houses and corrals offer new perspectives on Dhofar's pastoral past.

Pastoralists used the different ecological zones in Dhofar, across five distinct topographical regions. The coastal plain, settled with port towns at Al-Balīd and Sumhuram, shows evidence of mobile people, whose graves and monuments adorn high promontories and ridges and whose chipped stone scatters ring the coastal lagoons (Zarins 2001: 72-75). Likewise, in the escarpment of Jibal Qāra, a hilly and sometimes steeply dissected zone densely covered in cloud forest (Hildebrandt and Eltahir 2006: 1-2; 2008: 2-3), there are painted caves and the remnants of camp sites (Cremaschi and Negrino 2002: 329-333; 2005; Charpentier 2008: 105-106). In the narrow grasslands of the upper plateau, there are few sites, with mostly windbreaks and hearths of indeterminate age and the occasional grave (e.g., Yule 1999: 91-96, McCorriston et al. 2014: 139). The high plateau drops sharply into the Najd, a stony desert in which the cloud-forest rapidly tapers into a scatter of frankincense trees, yielding northwards to acacias on stony plains where tombs and monuments mark the passage of ancient caprine and camel herders. The great dunes of the Rub al Khālī cover gravel and sabkha flats with little vegetation and few traces of human activity from the past 5000 years.

Given the rich vegetation of the mountains and their traditional use by Dhofari cattle herders (Janzen 1986: 93-144), it would seem likely that these lands were long home to some of Dhofar's ancient pastoralists. Archaeological research has largely focused on the rich coastal towns and on the Najd and desert, where there is better visibility of monuments and chipped stone surface accumulations (McCorriston et al. 2014: 122, Zarins 2001: 48) and better preservation of rockshelter stratigraphy in (Hilbert et al. 2015: 254-257). Here we present several settlement sites from the upper escarpment of eastern Jibal Qara, near the modern town of Jibjat. Although such sites have long been recognized (e.g., Zarins 2001: 72-75; Zarins and Newton 2013: 44-45), scant effort has sought to document the lifestyles and affinities of their occupants.

THE ARCHAEOLOGICAL SITES

Recognized as archaeological sites during a 2010 archaeological survey (McCorriston et al. 2014), at least four sites near the mountain village of Halqoot in the Eastern Jibal Qāra of Dhufar showed surface remains of curvilinear, dry-walled, stone architecture. (Figure 1) Three of these sites lie along the rims of headwater canyons forming minor branches of the south-draining Wadi Dharbat; one is the site D069 "Shakil" partially excavated in 2012. A fourth site with architectural remains includes circular rooms, either free-standing or appended to large oval enclosures, with adjacent graves, cairns, and stone platforms. This fourth site, D114 "Halqoot" is more extensive, more architecturally varied, and lies at the northern-most lip of the Dhufar escarpment, next to the narrow plateau grassland. The excavated sites at Shakil and Halqoot are a short 2.2 km distance apart.

Today the sites are located in an open landscape of degraded, heavily grazed, short-grassland with many herbaceous unpalatable species. There are few trees, mostly concentrated on steeper slopes adjacent to the actual sites. At both sites are solitary large specimens of *Ficus vasta*; otherwise the

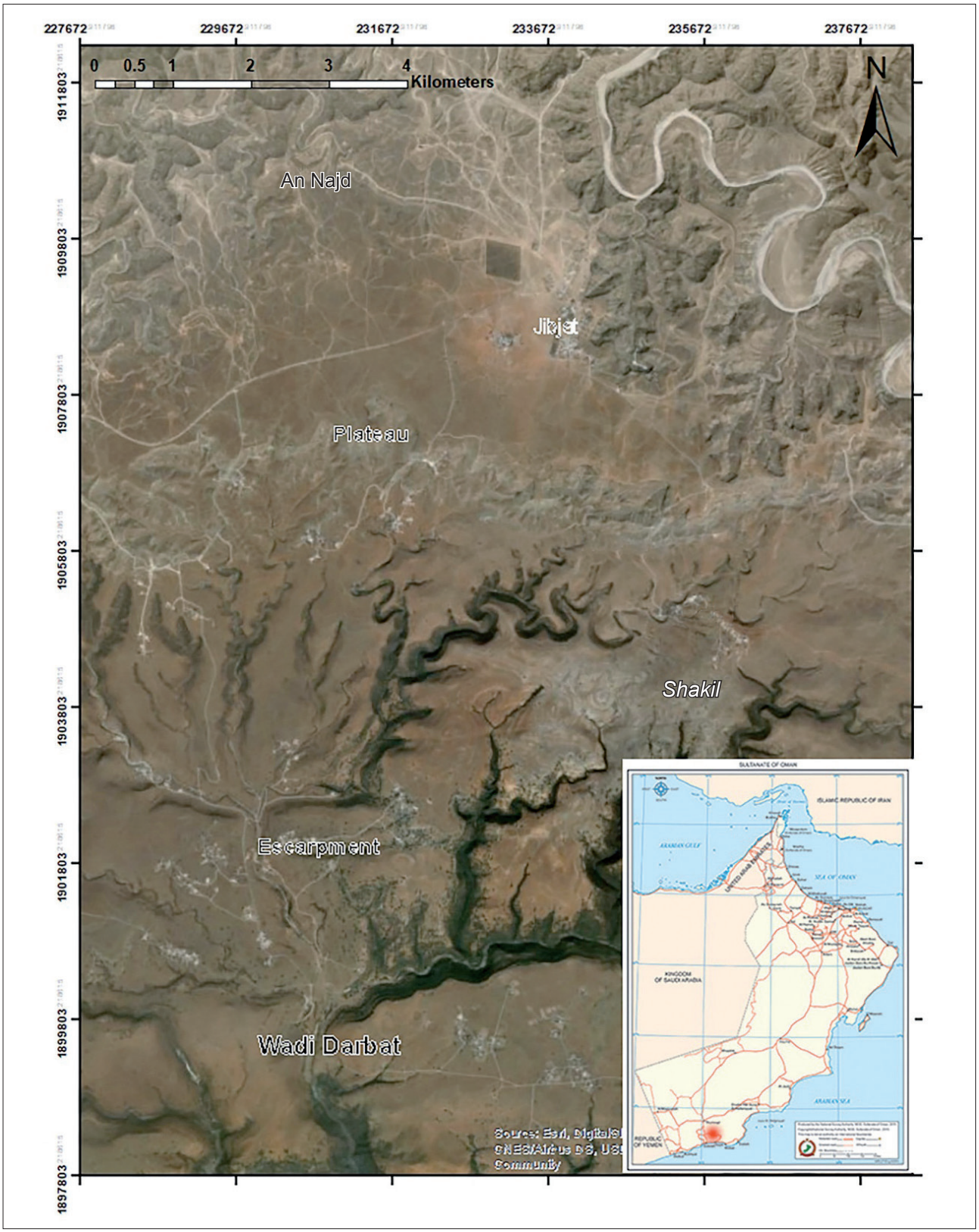

Figure 1: *Image map of eastern Jibal Qara with excavated site locations. Illustration by Abigail Buffington, Annalee Sekulic, and Lawrence Ball..*

surrounding area has a few *Acacia* trees. Downslope from D069 is *Anogeissus dhofarica* woodland hugging the wadi slopes. Seemingly abandoned termite mounds lie across the surface of both sites, attesting to former woodlands, which were present half a century ago, according to local memory.

The sites have a range of structure types, which we identified and classified into a typology. Our typology draws some elements from the broader regional archaeological literature (e.g., Zarins 2001, 2010, Boncassi 2010, McCorriston et al. 2014, Harrower, Senn & McCorriston 2014, Steimer-Herbet 2004), and our typology also comprehensively describes all the structures we encountered.

- *platforms* (composed of boulders as circumference, filled with cobbles, pebbles, and smaller boulders),
- *cairns* (mounded boulders, possibly with a collapsed central chamber),
- *graves* (boat-shaped and oval rings of boulders filled with cobbles and with upright markers, usually occurring in agglomerated groups), these are more widely known as "Boat-Shaped Graves" (Zarins 2010: 226)
- *windbreaks* (wall or alignment of stone without enclosure)
- *hearths* (small concentration of cobbles--often a ring--including thermally-altered rock)
- *cells* (circular, walled structures, often with entrances flanked by orthostats), may be arranged as
    - *aggregate cells,*
    - *isolate cells*, or
    - *cells attached to a compound*)
- *enclosures* (large, often oval, walled structures, too broad for complete roofing with local materials; enclosures may be
    - *freestanding enclosures or*
    - *enclosures appended to caves and cliffs)*
- *unknown*

Shakil D069

Surface documentation and excavations at Shakil revealed a northeast-southwest orientation of ten isolate cells (houses), about 4 m diameter with an interior diameter around 2.5 m. These straddle a gentle depression, across which lies the possible remnants of an oval enclosure. (Figure 2) A modern camel pen in seasonal use at the southwest probably incorporates and obscures earlier architectural elements of an eleventh isolate cell or perhaps oval enclosure, but thereafter, the site ends. The site is poor in surface artifacts; a comprehensive walking survey of the vicinity (about 500m x 500 m) documented fewer than ten chert flakes and one non-diagnostic limestone tool chipped to make an edge. None of these artifacts cluster spatially; they were widely interspersed with no apparent relationship to the partially-buried structures.

The depositional environment varied at Shakil. Situated on a bedrock terrace, the site has large surface areas of bare rock. Soil formation elsewhere is shallow, with 10-30 cm depth. Abandoned termite mounds have covered an old land surface, including in one case a hearth and its adjacent ashy rake-out pile. Finally, the interiors of architectural features accumulated deposits up to a meter's depth. These contain the abandonment debris from prior occupants and probably also a significant component of loess that settled in the still interiors.

Excavations of architecture and exterior features and surfaces confirmed the artifact-poor nature of the archaeological deposits while exposing the unworked stone walls and a rare preservation environment for the charred plant and animal bone residues within. Excavations removed interior sediment from two quadrants and a partial doorway of D069-001 (Quad A and Quad C) as well as an exterior trench (Quad B) that cleared fallen wall rock, exposed an underlying exterior surface, then sectioned to bedrock. Excavations at D069-002 also excavated interior, exterior, and doorway contexts. At D069-003 a wall segment and exterior surface was excavated to bedrock; at D069-004, two interior adjacent quadrants were excavated to bedrock, sectioning across the interior deposits as a half-pie.

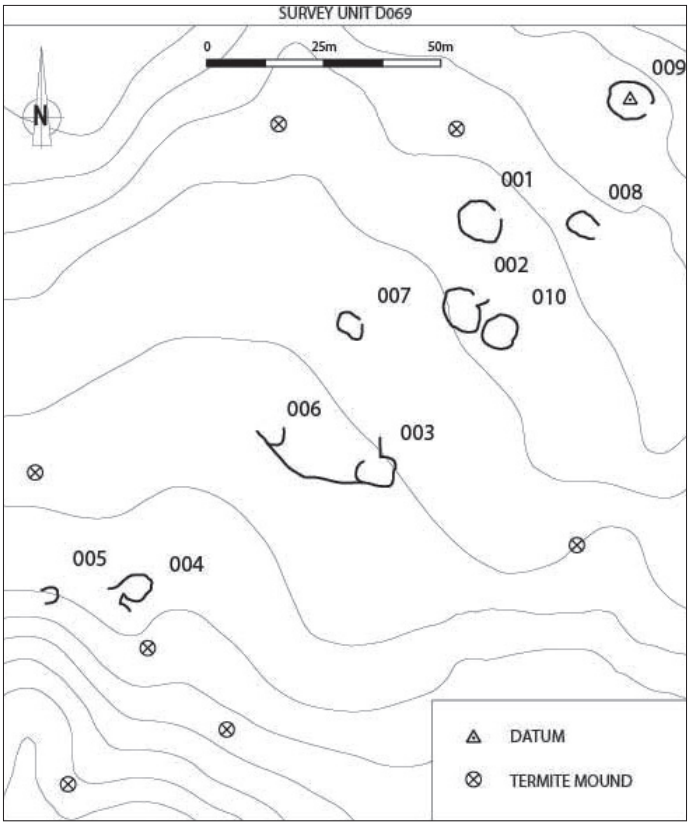

Figure 2: *Shakil D069; mapped structures (each a site numbered D069-xxx). Site surveyors registered one point on each protrusive surface stone; here the structures are represented by a line. Contour lines at 1 meter have been extrapolated from mapped transects. Excavations were within and adjacent to D069-001, -002, -003, -004 as well as 10 test pits and 2 termite mounds. Illustration by Matthew Senn and Benjamin Baaske.*

In addition, randomly-selected perpendicular offsets to a northeast-southwest transect (52 degrees- 238 degrees) along 50 m through the site provided a sampling strategy for ten 1 m x 1 m test pits (TP 1- TP10) seeking external middens, features, or sub-surface remains. TP 9 lay inside a possible oval enclosure, of which the down-slope wall was visible from the surface. TP 8 uncovered a hearth outside of D069-004. Other test pits recovered no diagnostic artifacts or anthropogenic features.

At Shakil, a preferential sieving method selected one in two or one in four buckets for 25-50 percent screening (0.4 cm mesh) of soil horizons A- and upper-B, which had developed on the sediments inside houses. We assumed that bone and other materials from these levels are re-worked from underlying deposits or deposited post abandonment. At lower levels and within occupation debris overlying floors, the excavators employed 100 percent screening to capture all animal bone and other materials closely related in time to the abandonment and immediate re-use of structures. Charcoal was recovered through hand selection and flotation described in greater detail elsewhere (Buffington and McCorriston 2019).

HALQOOT D114

In the 2017 mapping with a Leica Total Station 11, archaeologists recorded each stone's in-situ placement in architecture visible from the surface, with a total of 143 structures mapped across an area 597 x 305 m (173,908.89 m^2). These structures included oval enclosures (n=9), cells (n-55), and hearths like the remains at Shakil, with additional graves, cairns, platforms, windbreaks, and unknown structures). Cells occur in various spatial patterns—isolate cells, aggregate cells, and cells attached to

compounds with entrances from inside or outside the compound). Using kite aerial photography with photogrammetric processing, the team also overlay mapped structures on a topographical image map of the D114 site. We mapped additional structures (many of them probably mortuary and outside the core area) for a total of 187 structures (Figure 3). In ArcMap 10.2.1, we converted original point data to lines for an interpreted documentation of structures and monuments from both from Shakil and Halqoot. At Halqoot no formal surface survey for artifacts was conducted, but few flakes, no surface concentrations, and no tools were found in the month-long process of mapping the site.

There are site boundaries on the south, west and east sides, where the swale ends in crests that drop to steeper valleys free of visible structures. The southern edge is a small canyon headwater into which drains a gully that divides the site into two circuits, an east and a west side. Each of the structure types occurs in the main area of the site (105,186.23 $m^{2)}$, with cairns more common in the northern end and boat-shaped graves more common in the southern end. In addition to the structures defined above, at D114 there are larger sets of structures, which are compounds and aggregates. The mapping team defined nine compounds.

Excavations at Halqoot sampled across the interior and exterior of compounds with trenches (D114-004 B, D110). Using quadrats, excavations also sampled quarters and halves of the interiors and doorways of cells attached to them (D114-

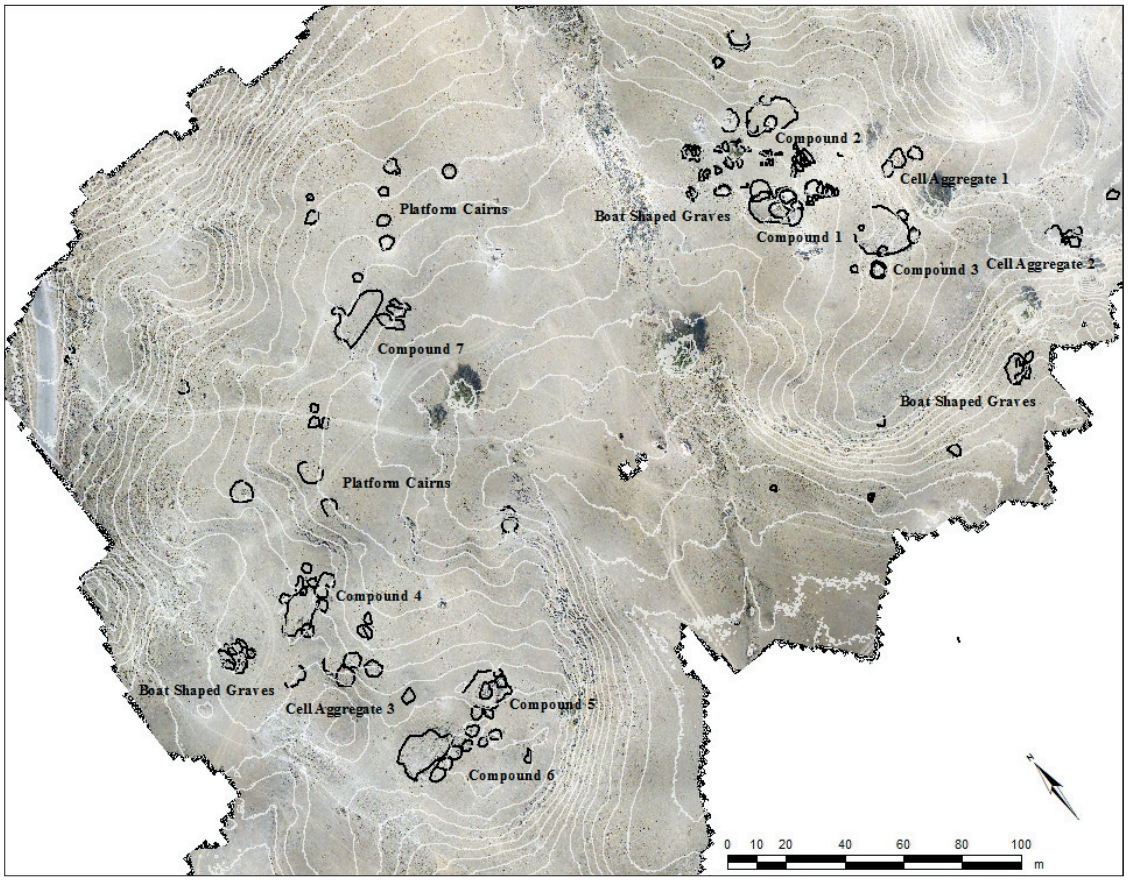

Figure 3: *Halqoot D114; mapped structures. (Site numbers D114-xxx suppressed for clarity.) Compounds 1 and 6 include sites D114-004 B, D114-110 respectively. Compound 4 has attached cells D114-097, D114-091, D114-092; isolated cells D114-006, D114-016, D114-031, D114-028 are on the eastern side of the site, and on the western side is D114-085, another isolated cell. Illustration by Abigail Buffington, Timothy Everhart, and Wael Abu-Azizeh.*

004 A, D114-111, D114-097, D114-091, D114-092). Quadrat excavations also sampled isolate cells (D114-006, D114-016, D114-031, D114-028, D114-085). In addition, the team excavated an external hearth (D114-099) to expose both half the hearth and its section.

From the excavated structures at Survey Unit D114 (004, 006, 016, 028, 031, 085, 096, 097, 110, 111) all deposit from stratigraphic contexts below topsoil was sieved through a 0.4mm mesh to ensure uniformity of recovery; the majority of animal bone was retrieved in this way, with some larger fragments hand-collected during excavation.

An appropriate methodology was developed to capture standard zooarchaeological data for diagnostic material (identification of elements, taxa, epiphyseal fusion, dental ageing, bone surface modifications); but also secondly to allow assessment of site formation processes, via quick recording of bone weathering, abrasion, burning, gnawing, root etching, and the general condition of both the diagnostic and undiagnostic fractions of the material. In-field recording focused on cell D114-004 only; study of other structures continues at the Zooarchaeology Laboratory, UCL Institute of Archaeology, London.

Likewise, some charcoal fragments were retrieved from sieves (and noted as such). Most charcoal was hand-picked in excavation; excavators selected 20 larger fragments for charcoal analysis, choosing discrete fragments not obviously broken from one piece and hand wrapping each fragment. For deposits rich in ash and charcoal, excavators collected and processed flotation samples ranging from 1 to 12 liters volume. We sorted heavy fractions in Oman and examined all light fractions under 6-40 x magnification using a Leica MZ-12 microscope.

SITE ARCHITECTURE AND ITS TAPHONOMIC IMPLICATIONS

Shakil and Halqoot share a construction style, with curved walls constructed of local, unworked limestone slabs and boulders used to outline exterior and interior faces of walls ranging from 0.65-1.3 m thick. Many of the base stones were massive slabs and boulders requiring the labor of 5-7 adults to shift them, as we attest from the workmen's experience in excavation. Wall bases were completed with smaller stones fitted between boulders. Limestone uprights were set on a red, clayey-surface over bedrock, a detail we established through excavation of a wall section (Shakil D069-003). Large, blocky boulders on the interior of the two wall facings supported these uprights, and the core was a clastic limestone cobble fill. Dry-stone walls built atop the boulders used large, mostly flat-lying, stones for facing and smaller cobbles to fill a rubble core. Wall height reached 2 m in the best-preserved room (Haqoot D114-004 A), where a shallow, bedrock hollow had been exploited for an additional 20 cm of wall height and where a low (ca. 1.2 m) doorway with its intact stone lintel had been entirely buried by debris.

Doorways to cells and attached rooms are lined with orthostat limestone facings. Some occupation surfaces overlie smooth bedrock (e.g., D069-004, D114-028). Whether attached to enclosures or free-standing, many circular structures had paver floors. These floors consist of flat undressed limestone pavers (e.g., D069-002, D114-006), with up to five, successive re-occupations (e.g., D114-085 and D114-004 A). (Figure 4) Pavers and re-occupations provided excellent, sealed contexts from which to recover radiocarbon samples. At Shakil D069-002 a central posthole with choc stones and a visible post mold indicated central support for roofing. In the case of D069-004, an extraordinarily rich charcoal and ashy fill suggested the conflagration of a roof supported by *Ficus* and *Tamarix* wood (Buffington and McCorriston 2019: 289). Interior features of these rooms include hearths (D069-001, D069-002, D114-028, D114-006) and platforms (D069-001).

We observed also some differences in construction details between the sites. At D114, the rear walls of some cells were constructed as semi-subterranean linings against the side of a natural slope; at D069, all cell walls were free-standing. The inventory of structure types was much richer at

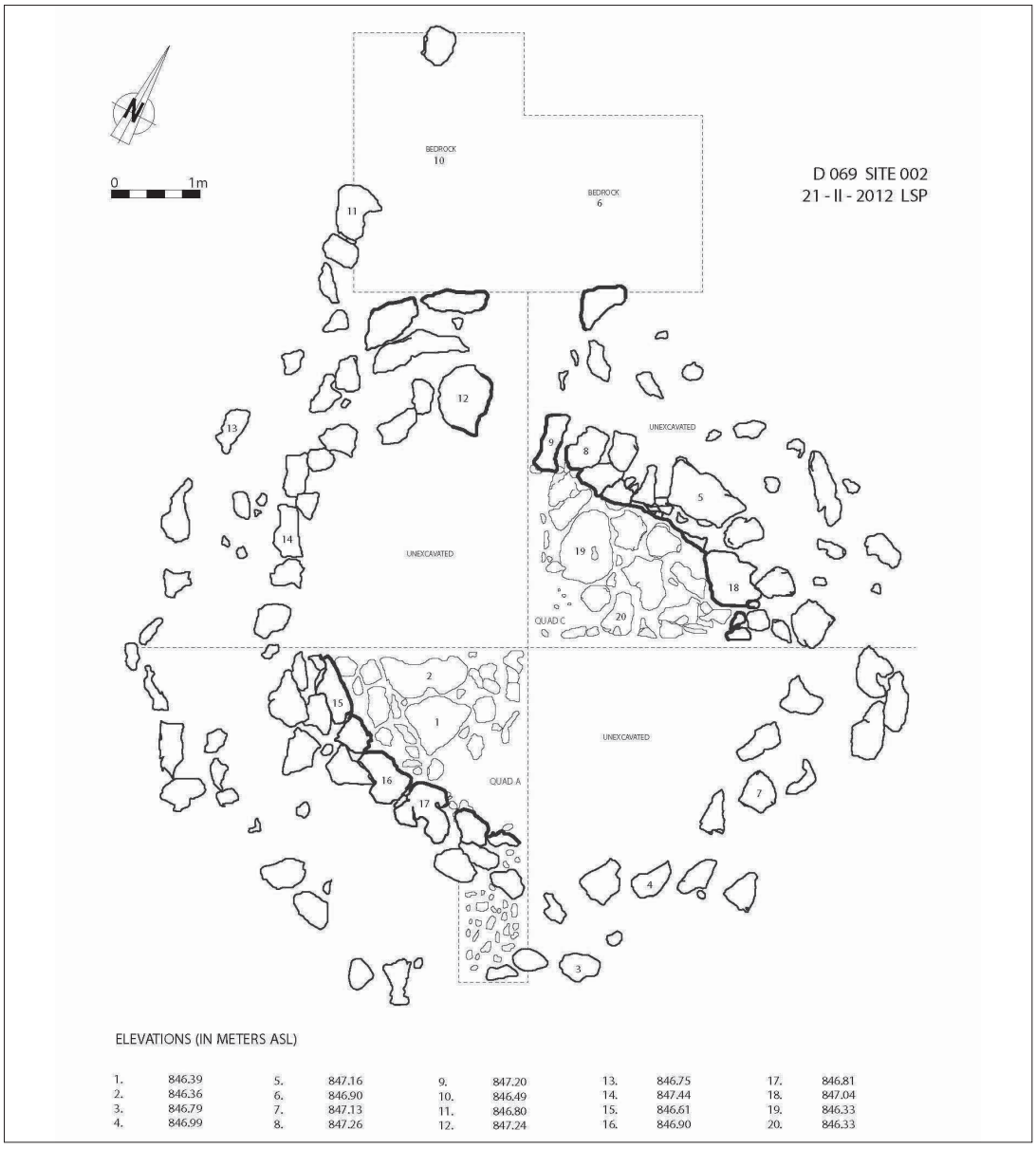

Figure 4: *Plan of House structure D069-002 at Shakil. Illustration by Lucas Proctor and Benjamin Baaske.*

D114, where we recorded a range of graves, cairns, platforms, and windbreaks not present at D069.

After abandonment, the interiors of cells and enclosures filled with windblown sediment. During fieldwork (January-March), we experienced several severe winter windstorms, which carried dense, fine sediment and greatly limited normal visibility. This same phenomenon carried sediment into abandoned structures, where the still space trapped aeolian silts and sand. Aeolian sediment subsequently became the parent material for soil formation during the relatively wet summer seasons of the Dhofar mountains. Despite the normal disturbances of active soil formation—insect and animal activity, root casts and disturbance, and chemical weathering—occupation debris remained relatively intact. Occupation consisted of rich ash, charcoal, and burnt daub concentrations in hearth areas (structured with thermally-altered limestone cobbles), concentrations of animal bone at lower depth near and on floors, and a very dense deposit of charcoal and ash where an organic

superstructure had probably burned (D069-004). Infilling with (probably) aeolian sediment offered a preservation environment that was probably relatively rapid after structure abandonment. Exterior surfaces do not trap sediment in this way, and they lack deep soils.

EXCAVATION AND ANALYTICAL RESULTS

From the interior of structures, the excavations recovered mostly charcoal, faunal bone, marine shell, ground and chipped stone. The sites were relatively poor in the latter categories, and in two seasons of excavations, we found but a single (non-diagnostic red body) ceramic sherd on the surface.

SITE CHRONOLOGIES

The accumulation of windblown sediment contributed to the preservation of charcoal and faunal bone inside structures. We recovered charcoal and bone through selective flotation of ash-rich layers, occupation surfaces, and hearths and systematic screening of all deposits (Buffington and McCorriston 2019: 287). To develop a radiocarbon chronology of the two sites, we generally hand-picked individual charcoal samples or bone directly from excavation. University of Georgia Center for Applied Isotope Studies (CAIS) did the radiocarbon analyses. In the case of animal bone, CAIS extracted both collagen and bioapatite for duplicate samples (e.g., UGAMS 11838 & 11838a; UGAMS 29216 & 29216a) to test the effects of diagenesis, which proved to be negligible in this environment. Table 1 presents the radiocarbon ages from both sites.

The radiocarbon ages overlap at the two sites. Most occupation documented from Shakil falls between 2100-1850 cal. yr. BP and most from Halqoot between 1900-1500 cal. yr. BP. The oldest samples from Shakil (UGAMS 11835, UGAMS 11836) come from one of the northernmost structures and overlap the older samples at Halqoot (UGAMS 29220) around 2300-2100 cal. yr. BP. House floors were re-paved multiple times. Therefore, the centuries-long ranges of occupation seen in radiocarbon ages likely reflect repeated uses of these sites rather than continuous, simultaneous occupation of all structures.

STRATIGRAPHY

Excavations revealed that different types of structures have different stratigraphic details. Two large enclosures (D114-004 B, D069 TP9) were tested. They contain very dark, loose greyish sediments unlike deposits elsewhere in the sites. D069-TP9 contained very dark brown, silty-clay deposits with much organic enrichment and black mottled inclusions throughout. (Figure 5) A layer of thermally-altered cobbles lay at the base of this enclosure, about 40 cm below modern surface. Inside the D114-004-B oval enclosure, the basal deposits were very fine, powdery ash mixed with darker ashy material that contained little actual charcoal. The underlying bedrock was soft and cracked, an appearance consistent with in-situ burning. A second deposit of black and grey deposit accumulated over an episode of abandonment, which included loose cobbles and a few artifacts. Finally, the upper part of the D114-004-B enclosure wall collapsed inward to cover and seal at least two thick layers that resemble burned accumulations of animal dung.

Cells contain well-developed soils, which nonetheless preserve accumulations of occupational debris and midden typical of houses. In some cells, the floors are bedrock (e.g., D114-110-111, D114-097, D114-031, D069-004); in other cells, the floors have successive layers of limestone pavers (e.g., D114-006, D114-085, D114-004 A, D069-002, D069-001) sealing occupation debris between them. (Figures 6, 7) There are a few flakes and core fragments of chipped chert, which is not local to either site. On the other hand, discarded animal bone and wood charcoal is abundant. Hearths occur on and between floor levels of bedrock or limestone pavers. There is one notable difference between the sites: at D069, cells contain pinkish flowstone

Table 1: *Radiocarbon ages from Shakil and Halqoot.*

LAB #	SITE	SITE CONTEXT	MATERIAL	uncal. bp	1 σ +/-	cal. yr. BP (median)	2 σ range cal. yr. BP	DESCRIPTION
UGAMS 11840	Shakeel D069	TP8-002-5	wood charcoal	2000	25	1949	1998-1891	Individual fragment from base of hearth; dates last use of open-air hearth, but wood could be older
UGAMS 11839	Shakeel D069	004-B-003-7	wood charcoal	2070	25	2038	2122-1951	Individual fragment from burned collapse layer (roof? Superstructure) overlying bedrock floor and under a layer of cobbles (wall collapse?); the context dates abandonment/destruction of house but wood could be older
UGAMS 11834	Shakeel D069	002-A-005x	wood charcoal	2070	25	2038	2122-1951	In situ burning in a pit cut into the debris and fill overlying the secondary floor pavers; hearth use provides a terminus post quem for the secondary flooring/occupation of structure; wood could be older
UGAMS 11837	Shakeel D069	002-A-011-31	wood charcoal	2030	25	1978	2060-1900	Sample sealed into pinkish flowstone developed after placement of limestone boulders. Deposit provides terminus ante quem for first house occupation under secondary pavement; wood could be older.
UGAMS 11838	Shakeel D069	002-A-012-32	charred collagen	1950	25	1899	1970-1825	Burnt bone from bone-rich abandonment debris overlying earliest structure floor (bedrock) and under secondary slab flooring. Death of animal is terminus post quem for secondary occupation of house.
UGAMS 11838a	Shakeel D069	002-A-012-32	bioapatite	1960	25	1910	1987-1835	Same bone as above; same significance; tested for calibration of bioapatite and collagen dating
UGAMS 11835	Shakeel D069	001-A-007-36	wood charcoal	2180	25	2245	2308-2121	Ash and thermally-altered rock (TAR) concentration in occupation debris underlying secondary pavement; hearth use dates hearth dump in earlier use of structure; wood could be older
UGAMS 11836	Shakeel D069	001-A-008-37	wood charcoal	2110	25	2081	2146-2003	Earliest available sample for dating earliest abandonment of structure; a large piece of charcoal from deposit rich in bone and charcoal in midden and cobble collapse (probably from wall fill) over structure floor. Underlies later limestone slab pavement; wood could be older
UGAMS 29215	Halqoot D114	006-A-007.Lot 1.Bag 3	collagen-like	1570	25	not calibrated		caprine mandible (domesticated) recovered beneath a limestone paver of paver floor and overlying bedrock surface; death of animal occurred before (re-) paving of interior and provides terminus post quem for occupation on paver floor.
UGAMS 29215a	Halqoot D114	006-A-007.Lot 1.Bag 3	bioapatite	2520	20	2592	2738-2498	Same bone as above; same significance; tested for calibration of bioapatite and collagen dating; THIS RESULT REPLACES UGAMS 29215 (above)
UGAMS 29218	Halqoot D114	004-A-005.Bag 2	wood charcoal	1760	25	1662	1735-1571	single piece hand-picked from hearth area rich in charcoal directly above pavers of upper (last) paver floor; hearth dates last use of house cell (younger than UGAMS 29216, UGAMS 29219); wood could be older
UGAMS 29216	Halqoot D114	004-A-006.Bag 10	collagen	1690	20	1588	1690-1544	caprine rib recovered from occupation/abandonment debris under the upper floor. Death of animal occurred before use of last hearth (UGAMS 29218)
UGAMS 29216a	Halqoot D114	004-A-006.Bag 10	bioapatite	1660	20	1559	1609-1529	Same bone as above; same significance; tested for calibration of bioapatite and collagen dating
UGAMS 29219	Halqoot D114	004-A-009.Bag 1	wood charcoal	1900	25	1849	1919-1741	single piece hand-picked below lowest (first of four) paver floor in house cell; directly under a paver and overlying bedrock, deposition during first occupation phase of house before re-paving bedrock (older than UGAMS 29218, UGAMS 29216); wood could be older
UGAMS 29221	Halqoot D114	004-B-013.Lot 3.Bag 6	wood charcoal	1860	20	1795	1865-1729	single piece hand-picked from lowermost ashy deposit overlying bedrock and inside enclosure wall; first accumulation of ash inside enclosure dating last time enclosure was cleared to bedrock: presumably end of first use after enclosure construction; wood could be older
UGAMS 29217	Halqoot D114	028-A-005.Lot 7.Bag 1	wood charcoal	1910	20	1856	1896-1820	Same as 028-A-005.Lot 1.Bag 1 in excavation notes (error in radiocarbon submission form); hand-picked single piece from hearth deposit underlying dung mat and directly over bedrock floor of structure; earliest available date on cell use; wood could be older
UGAMS 29220	Halqoot D114	085-A-004.Lot 2.Bag 1	wood charcoal	2180	20	2253	2307-2123	hand-picked single piece under the uppermost of four successive limestone slab and cobble pavements; debris from later but not latest activites; wood could be older
UGAMS 42261	Halqoot D114	085.001.Lot 4.Bag 3	wood charcoal	2160	20	2160	2305-2068	hand-picked charcoal, last occupation over first (uppermost) floor of pavers in the interior of the house.
UGAMS 42262	Halqoot D114	085.004.Lot 1.Bag 5	wood charcoal	2320	20	2344	2356-2324	hand-picked charcoal, re-occupation of house interior, from debris between the second and first (uppermost) levels of pavers in the interior of the house
UGAMS 29220	Halqoot D114	085.004.Lot 2.Bag 1	wood charcoal	2180	20	2254	2380-2124	hand-picked charcoal, re-occupation of house interior, from debris between the second and first (uppermost) levels of pavers in the interior of the house
UGAMS 42263	Halqoot D114	085.007.Lot 1.Bag 8	wood charcoal	2180	20	2254	2380-2124	hand-picked charcoal, from occupational debris between the fourth (lowermost) paving stones of the house.
UGAMS 42264	Halqoot D114	091.003.Lot 1.Bag 5	wood charcoal	1710	20	1609	1694-1557	hand-picked charcoal, from uppermost and latest occupation before rubble fill of structure interior
UGAMS 42265	Halqoot D114	091-004.Lot 1.Bag 1	wood charcoal	modern		not calibrated		fractionation is high; was this a root from a grass?

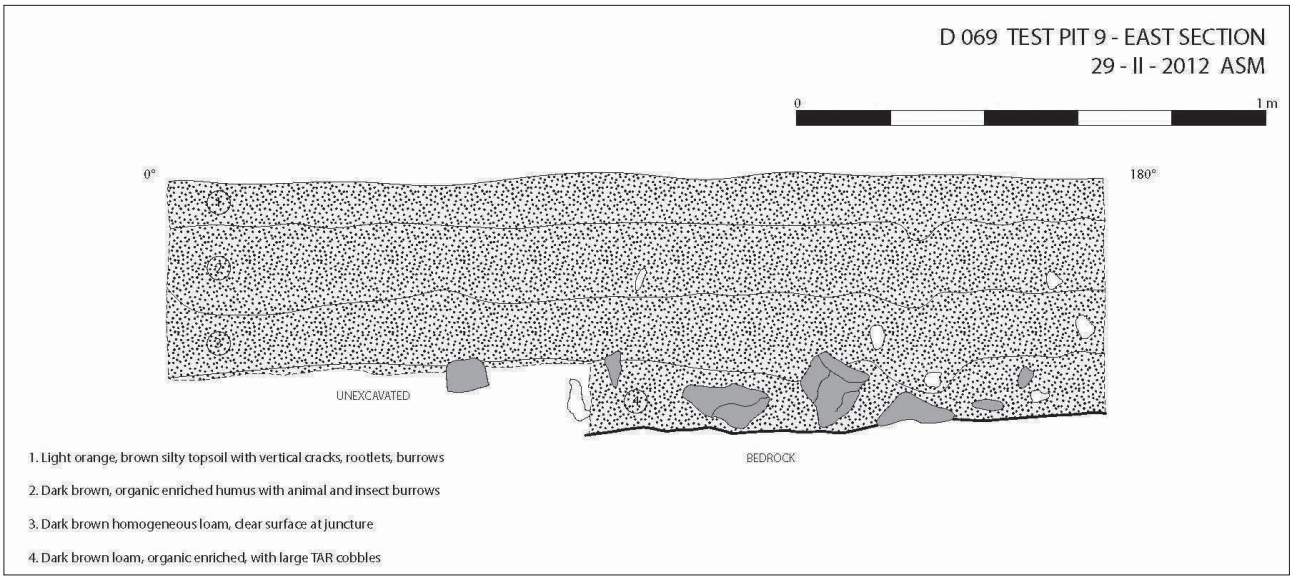

Figure 5: *East section of D069 Shakil Test Pit 9, showing dark, organic-enriched loam with thermally-altered limestone cobbles at base of deposit; perhaps burned dung in a cattle byre. Illustration by 'Ali al-Maashani and Benjamin Baaske.*

adhering to the lower inner walls and flecked throughout the lower deposits, but at D114 there was no trace of this substance. Local herders today say that this material develops on walls during the *kharīf*, with its heavy summer fog.

Exteriors surfaces generally lacked the depth of soil and preservation of the interiors. Some area is bare rock. Where excavations did recover stratified exterior features, these were buried under termite mounds (e.g., D069-TP 8 and a hearth in D114 TM-1). Outside cells at D069-001 and D069-002, karstic pockets in the bedrock had trapped a few chert flakes about 8 cm below today's surface. On a terrace in front of the entrance to D114-085, a few artifacts—bone, charcoal, chert flakes and a broken serpentine pendant—had fallen between the cobbles of terrace fill.

Some animal bone and charcoal derived from structure 'infill' contexts, rather than primary occupation deposits, raising questions of whether this material reflected post-abandonment phases in the life of the structures, rather than being closely associated with the use of them. From excavations, it appeared that the abandoned structures filled in relatively rapidly because in several cases, many courses of their walls stood supported by fill and had not collapsed inwards. Radiocarbon ages from D114-004 A support this observation. With rapid accumulation, animal bone from infill contexts provide an indication of herding activities in the vicinity of a structure, even when it has gone out of direct use. Another possibility is that infill deposits represent post-abandonment re-use of structures, either for temporary encampment or animal penning. Louise Martin therefore studied and recorded animal bone excavated from infill deposits, alongside the far smaller samples retrieved from basal occupation floors clearly associated with the original structure use.

FINDS

Stone artifacts. Chert flakes were rare; cores even more rare, and formal tools all but absent. At both sites, excavators found a few pieces of discarded ground stone. At D069, we found one hammerstone inside a cell, one worked limestone tool from the modern surface, a fragment of a mortar from the bedrock floor of cell D069-004, and a hand stone grinder from TP 8. There were thermally-altered

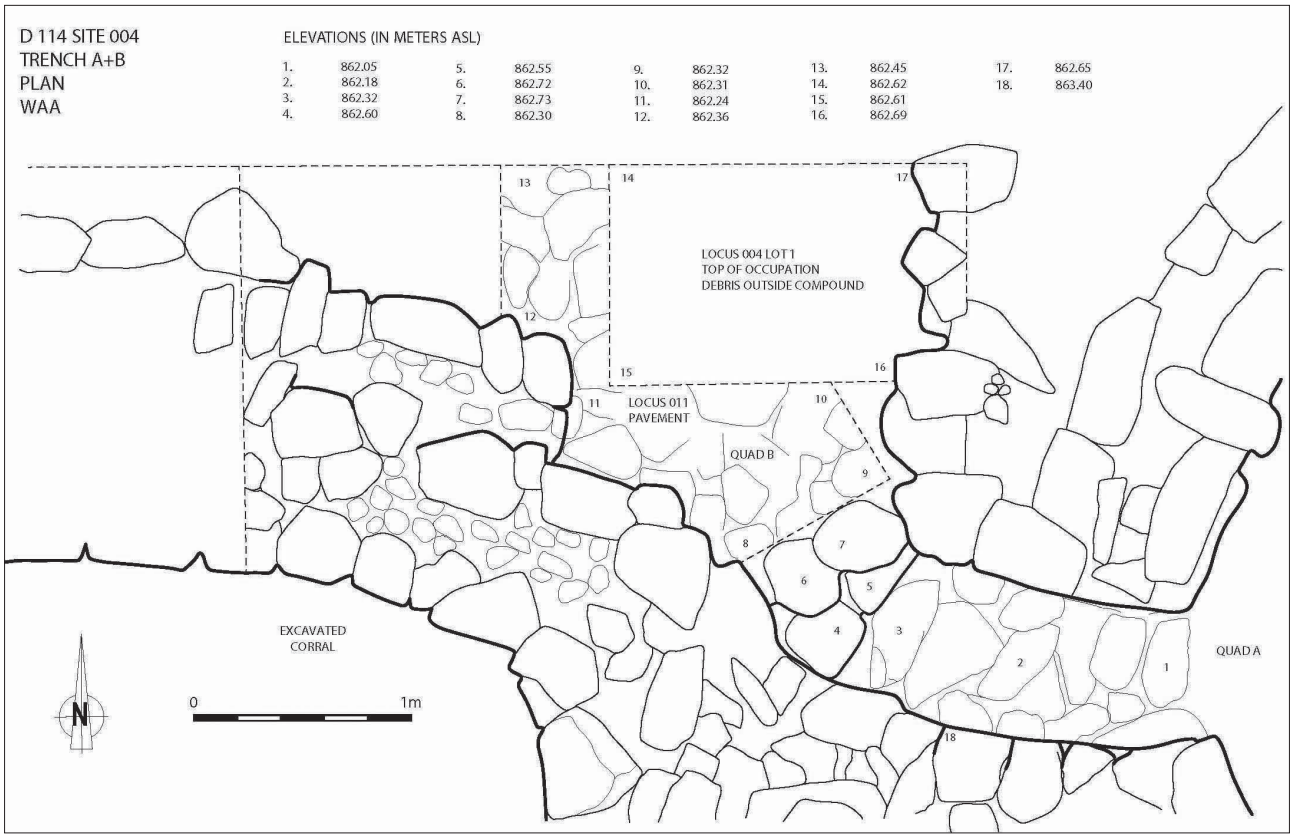

Figure 6: *Plan of D114 A&B Illustration by Wael Abu-Azizeh, Abigail Buffington, and Benjamin Baaske*.

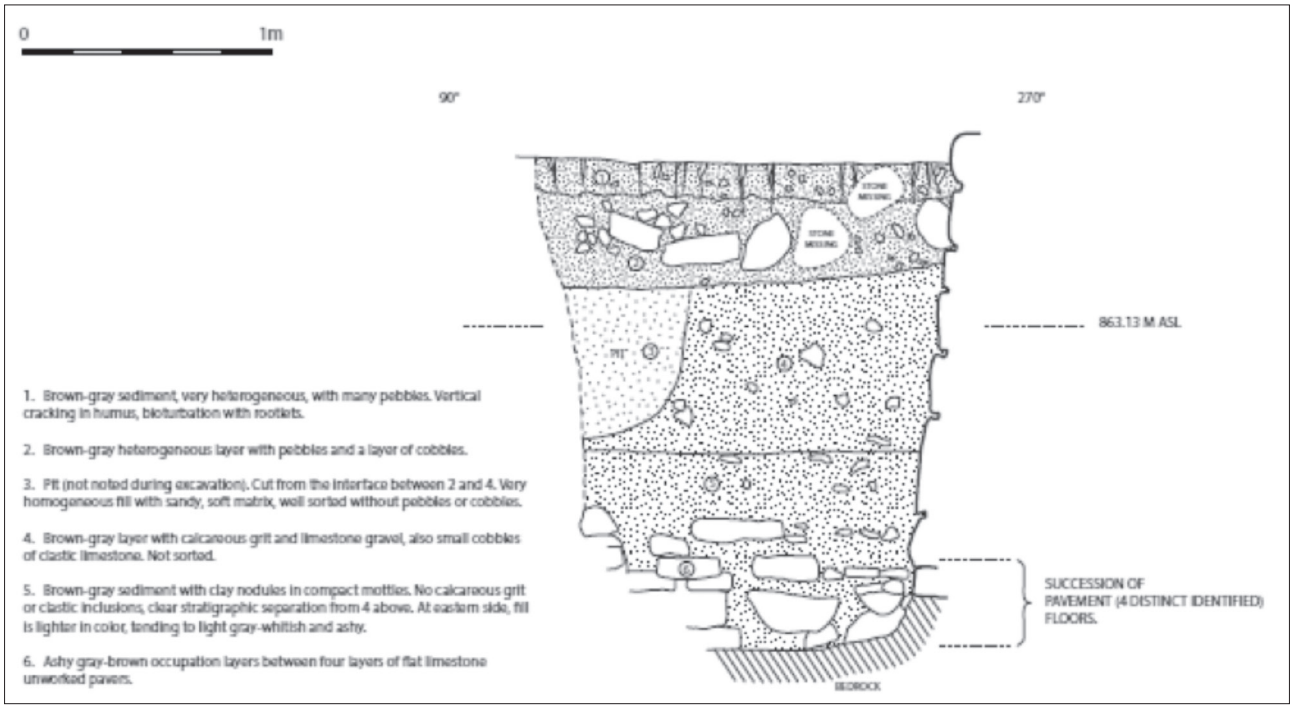

Figure 7: *Excavation Profile from D114-004 A Southern Section. Illustration by Wael Abu-Azizeh, Anna Berlekamp and Benjamin Baaske*.

cobbles in a layer in TP 9.

At D114, we found two chert scrapers, both in topsoil deposits. Otherwise, there were few primary flakes, mostly secondary flakes, and utilized flakes, with only six retouched flakes. Several artifacts did show signs of curation. Of particular interest was a greenstone, probably serpentine, ground adze (D114-004 B). (Figure 8) It was very worn and chipped and yet retained the size and tapered form of adzes typical for the Yemen highland Bronze Age (about 2000 years earlier). Was it curated for so long?

Excavators found a basin-shaped limestone mortar measuring 17.5 cm long at floor level in cell D114-028. This object was heavy and its owner probably cached it against a future use instead of carried it across campsites. Another smaller mortar also in limestone came from inside D114-085 A. This latter example was broken in half and therefore had exhausted its use-life. On the other hand, at D114-031 someone had cached the broken worked stone in gneiss where recovery was easy, tucked in the interior dry-stone walling of the structure. The object had clearly broken in two. One surface was artificially smoothed, whether through use as a hand-grinder or manufactured as a palette to apply dyes to leather, skin, or wooden surfaces.

Ornaments. There were rare finds of ornaments, mostly beads discarded or lost among occupational debris within or just outside cells. (Figure 9) From D114-004 came a 2 cm circular mother-of-pearl disc-shaped bead, probably of abalone. One *Dentalium* shell bead appeared inside the cell D114-004-A and another in D114-006. From D114-004 B excavators also recovered a 2 cm circular disc bead of light pink branch coral. From the terrace before cell D114-085, excavators also recovered a 2 cm tear-shaped pendant of smoothed serpentine stone, highly polished, chipped on one side, and clearly re-drilled after a first loop hole had worn through.

A hammered copper fragment was recovered from D091, the only metal found at the site.

Shell. There were a few shells, including an oyster and a shell of *Euchelus asper* from D069-TP5 that is striking in appearance, with black and nacre patterning. This last item was a buried, near-

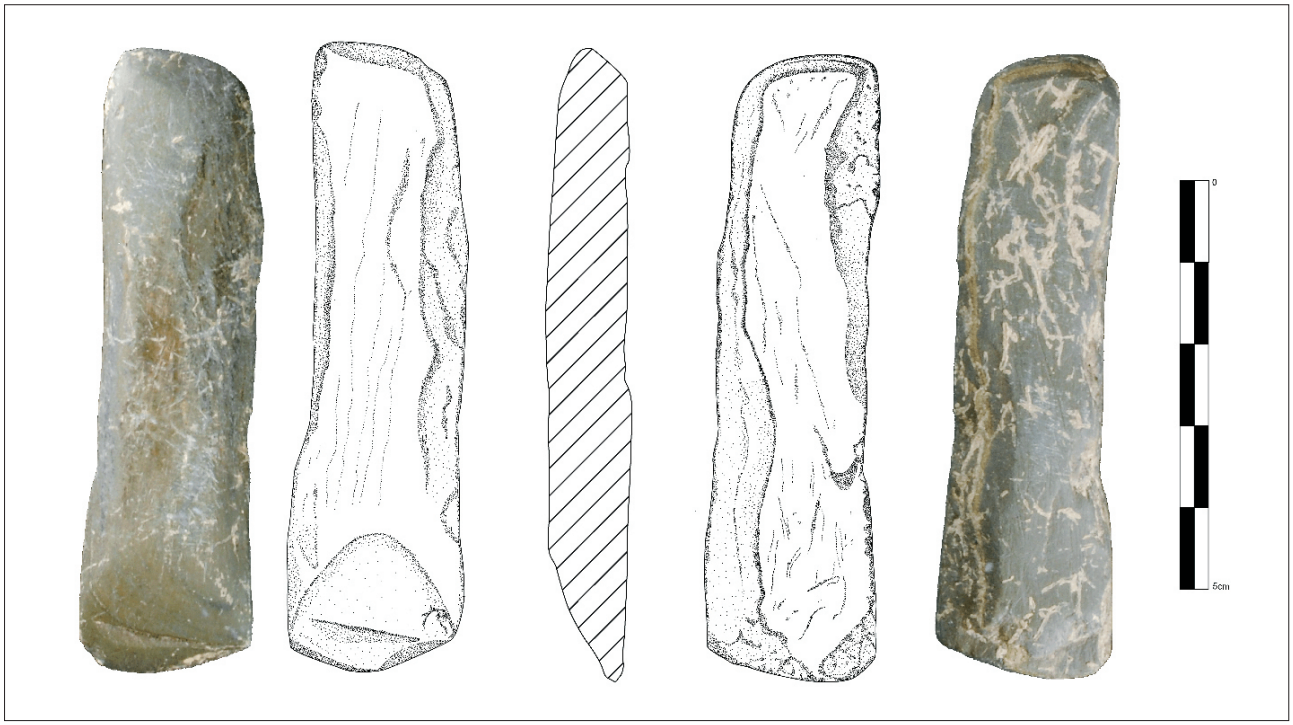

Figure 8: *Greenstone adze from D114-004 B. Illustration by Joy McCorriston and Emma Lagan. Photograph by Anna Berlekamp.*

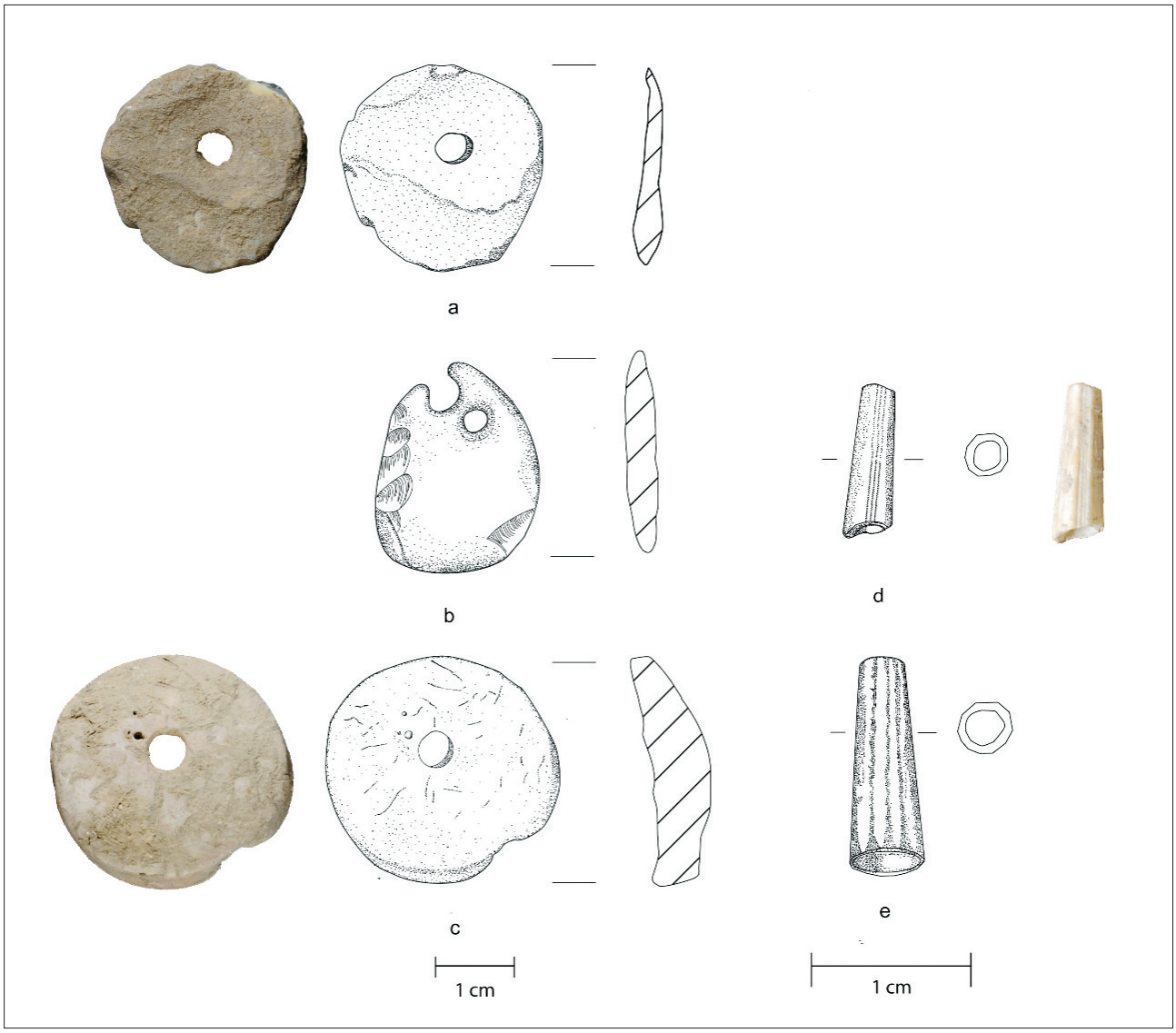

Figure 9: *Ornaments from D114. a) Mother-of-pearl bead, likely abalone, D114-004-B Loc 012 Lot 2, Bag 4 DA46818; b) Greenstone pendant, likely serpentine, re-drilled, D114-085-A Loc 002 Lot 3 Bag 5 DA46819; c) Coral bead, pink-white with calcite incrustations and natural growth rings, D114-004-B Loc 005 Lot 1 Bag 5 DA46816 d) Dentalium shell bead, naturally faceted, not drilled, D114-006-A Loc 004 Lot 1 Bag 2, DA46814; e) Dentalium shell bead, naturally faceted, not drilled, D114-004-A Loc 001 Lot 1 Bag 4 DA46815. Illustrations by Joy McCorriston and Emma Lagan. Photographs by Anna Berlekamp.*

surface find and may have been unrelated to original occupation of the structures at D069. On the surface near the modern camel pen at the south of D069, excavators noticed a concentration of micro-chips of marine shell and sand. The deposit almost certainly came from sacks of beach-cured sardines, hauled up the mountain on camel back to force-feed cattle in decades past. As a surface observation, this deposit provides no indication that this practice dates to the original occupants of D069.

Animal bone. Although analysis is still preliminary and includes only a sample from each site, nearly all the bone from both Shakil D069 and Halqoot D114 appears to be mammalian, from both domesticates and wild fauna represented. One entire stratified sequence from D069-002-A

yielded identifiable goat, cattle, and gazelle bone and several equid teeth. (The latter may be *Equus hemionus*, wild ass still roaming the Najd, or donkey, *Equus africanus*). The deposit contains mostly undiagnostic fragments, with long bones from both cattle/camel sized animals and goat/sheep/gazelle sized. High fragmentation is evident, with many skeletal elements displaying longitudinal chopmarks and the spiral fracturing of 'green' bone, indicating intensive processing of carcasses for marrow. Even goat/sheep sized astragali were smashed for marrow extraction. Where caprine (goat/sheep) bones can be identified, their diminutive size is notable. The finding of a complete caprine scapula and four foot elements still in articulation shows the bone assemblage inside D069-002-A to have had minimal disturbance after its deposition.

The animal bone from D114 also awaits final analysis, but a preliminary sequence is available. Over 1000 bone fragments were recorded, primarily from D114 004 A, with fewer from D114-004 B. The majority of the material consisted of small fragments of undiagnostic bone, generally < 5cm in size and mostly < 3cm, deriving from both cattle/camel-sized and goat/sheep/gazelle-sized mammals. The high fragmentation likely relates to both human processing of the material, but also depositional/taphonomic factors. Bone material from Locus 002 and beneath (including Loci 003, 004) is not highly weathered, as might be expected if it had lain on exposed ground surfaces for extended periods; nor is this bone abraded, which would indicate aeolian or fluvial deposition, being blown on washed into abandoned structures. Rather, bone is generally well preserved and lacks any signs of carnivore gnawing, all suggesting fairlyrapid burial conditions, and might indicate that material was actually deposited in the infill, rather than becoming incorporated into it from elsewhere. The exception to this pattern is Locus 001, close to the surface, in which bone surfaces exhibited far more weathering, providing a useful contrast to the better preserved, more deeply buried material, and suggesting a different formation process. The only fragment found of an equid (a small sized tooth, possibly from a donkey) comes from Locus 001.

Caprine (unseparable goat/sheep bones) and cattle bones are most common from Locus 002 down (preliminary NISP – Number of Identified Specimens – of 21 and 14 respectively). Of caprine elements, four are identifiable to goat, and none to sheep. Locus 002 contained what appeared to be a whole cattle skull with full dentition, albeit highly fragmented. Locus 003 includes two deciduous cattle incisors, which need further examination to determine if they were shed, and what the implications of shedding might be in this context. Locus 003 also contains a cluster of goat-sized long bones that have longitudinal breakage patterns clearly reminiscent of processing for marrow extraction, as was noted at Shakil D069-002 A. The relative integrity of Locus 003 bones raises questions as to whether marrow/grease processing was being undertaken in this location, or whether the material was dumped into this abandoned structure from elsewhere. Finally, bone material from D114-004 A (inside the structure) is relatively un-weathered, indicating more rapid burial, whereas bone from D114-004 B is more highly weathered and fragmented, which fits with this being an external (corral?) area. This is a further sign that material from the infill within the structure is less disturbed or reworked, and thus could provide insight into herding and consumption activities once temporal sequences for structures are laid down.

Plant remains. Apart from wood charcoal, targeted sampling, flotation of likely deposits, and microscope analysis found no seeds or identifiable macro-fossil plant remains. Wood charcoals were abundant in highly variable densities at both Shakil and Halqoot, with greatest concentration in D069-004 A and D069-004 B. A detailed study of wood charcoal from Shakil found six main taxa: *Acacia* sp., *Anogeissus* sp., *Commiphora* sp., *Ficus* sp., *Tamarix* sp., and *Ziziphus* sp., with *Anogeissus* the most common (ubiquitous) and *Commiphora* the least. Analysts established that the taxa were used in different contexts and likely served different purposes. *Anogeissus* was used widely and most likely preferred as firewood, as it is today. It is

and surely was locally available. The taxa also derive from several ecological zones. *Ficus*, *Anogeissus*, *Commiphora*, and *Acacia* grow in the upper escarpment and plateau near the site, but the *Tamarix* and *Ziziphus* grow in the wetter parts of the (southern) An Najd, especially near water sources and high water table. The inhabitants of Shakil may have made the effort to acquire the *Tamarix*; it is reputedly termite resistant, as is *Anogeissus*, dried over several months. The Najd also is relatively rich in *Acacia* and *Commiphora*, suggesting that a significant effort in wood acquisition targeted the dry north-flowing wadis (Buffington and McCorriston 2019: 290-291).

Like Shakil, the charred plant remains at Halqoot contained no seeds, husks, or evidence of plant food processing, storage, or preparation. The same woody taxa were present, albeit with some variation in their distribution across contexts and the site. To the inventory from Shakil, the assemblage at Halqoot adds *Euclea* sp., *Moringa* sp., and *Euphorbia* sp. Most of these taxa were locally available, with a few exceptions collected in the near An Najd to the north of the sites. With its insect-repellant properties, *Euclea* is useful for burning and fencing, and *Moringa* is also a termite-resistant wood. A comparison of woody taxa and other environmental indicators from both sites remains the subject of ongoing analyses.

DISCUSSION

Excavations and preliminary analysis at Shakil and Halqoot have revealed a well-dated sequence of occupation. Radiocarbon ages mostly fall within the calibrated range of 360 BCE -180 CE. The larger site, Halqoot has a wider spread of radiocarbon ages, including a caprine mandible under the basal pavers of house D114-006 (ca. 600 BCE) that establishes a terminus post quem for house construction. The latest radiocarbon age (ca. 300 CE) was from a hearth marking the latest occupation within house D114-004 A.

While it would be premature to claim that all undated, comparable house sites and corral complexes fall within this occupation range, the evidence from these two sites does challenge prior assumptions about prehistoric settlement in Dhofar. Based on parallels with construction techniques and site layout in northern Yemen, Juris Zarins (2001: 72-75) has assigned double-faced rubble core wall construction in Dhofar to the Bronze Age around 2500-1800 BCE. Multiple coastal sites exhibit this construction technique for houses, and surveys in the Jibal Qāra have identified others (Cremaschi and Negrino 2002: 343). At Taqah, Zarins' (2001: 48, Fig 30) excavations produced a radiocarbon age only from the upper, stratigraphically-late structure. This determination is in the Late Iron Age, contemporary with Halqoot and Shakil. By inference, the excavator then assigned the lower, undated structure at Taqah to the Bronze Age and consigned all others like it (double-faced wall construction) to a similar timeframe. It may be that there is not widespread Bronze Age settlement in Dhofar. The evidence from Halqoot and Shakil suggests Late Iron Age settlements in Jibal Qāra and fails to yield radiocarbon ages of prior Bronze Age settlement activity.

If Shakil and Halqoot substantially overlap with each other chronologically, then one may wonder about the relationships of site occupants. Were they occupied simultaneously? One cannot address this alone through radiocarbon ages, with their long confidence intervals insufficiently refined to show short gaps in occupation even at a single house. Were these the same group or closely related groups? Was there a pattern of mobility that allowed one site to be occupied as another was deserted? Ethnography and ethnoarchaeology of Dhofari pastoralism in the early modern era documents a pattern of movement between seasonal camps of aggregation (winter, summer) and the spring-fall dispersals of people and cattle in search of pasture and evading hematophageous flies (Janzen 1986: 114, ElMahi 2010: 22, 28). Historically, cattle herders found smaller, temporary locations still in the escarpment and plateau zones (Janzen, ibid). This historical pattern offers a descriptive model against which to assess the archaeological record.

During the winter months and again in the summer, cattle-breeding mountain pastoralists congregated in permanent camps near water. In the modern Jibal Qāra, water is assured through mechanically drilled wells, but in the Late Iron Age (300 BCE-300 CE), surface water from fog drip or springs was the only source for cattle, which need to drink daily. During monsoon months July-September, surface water could flow across bedrock to the headwater gullies of the Wadi Darbat system; indeed a depression that carried seasonal flow existed at both sites. Only a few hundred meters from Shakil are twin sinkholes—now filled—that once provided access to subterranean water. But water availability is highly seasonal in the Jibal Qāra, which would be a desert were it not for seasonal fog (Hildebrandt and Eltahir 2006: 2-3). Shakil is dry in winter. Halqoot, also dry, lies closer to the steep descent to the Najd where geological disconformities and porous limestone offer seeps and springs. In other words, both sites probably offered critical water access for seasonal long-term encampment.

However long people remained at these sites, their lives did not revolve around agricultural production. There are no crops, no processing waste debris from agricultural production, no facilities for storage, and no tools for cultivating plants. Charred plant remains produced no waste from processing wild plant foods, despite the likelihood that people used them (ElMahi 2001: 136). The few ground stone mortars and hand stones could have been for other purposes—pounding fat and meat, processing pastes and ointments for tanning leather, dyes, and medicinal treatment, processing pulp or farinaceous wild plants (Miller and Morris 1988). The few chipped stone finds fit comfortably into a non-investment industry of opportunistic knapping.

Excavations have clarified that occupants of these sites were pastoralists. They repeatedly abandoned and renewed their living surfaces, as evident in the multiple episodes of re-paved floors at both sites. They certainly kept domesticated animals, including cattle and small-sized goats, and the ashy deposits within D114-004-B and D069 TP9 conform to the expectations of cattle byres with dung burned to repel hematophageous flies (ElMahi 2010: 22-23). Yet the occupants also depended on wild game like gazelle and possibly wild equids obtained not from the forested escarpment but from the Najd and grassland plateau to the north. The lure of wild game and fly-free pasture for goats (ElMahi 2010: 28, ElMahi 2001: 136) would explain the opportunities for collecting exotic woods like *Tamarix* and *Ziziphus* in flotsam from seasonal flooding in the Najd. Pastoralists would have prized wild game to eat, conserving domestic stock for milk and reproduction. And when people were obliged to eat their stock, they processed each scrap for marrow. Although we do not see the archaeological proof, these pastoralists probably also maintained a rich tool kit in leather, basketry, wooden tools, horn, and worked bone. Certainly their material culture was poor in durables like metal, stone, and ceramics.

Finally the evidence from these sites offers a perspective on cross-cultural dynamics, or perhaps the lack of them. The occupations occurred contemporaneous with the colonization of Dhofar's coastline and establishment of inland trading posts by people from Hadramawt, integrated in a more complex social confederation than existed among native Dhofaris of the period (Avanzini 2008, Albright 1982, Breton 1999: 29-51). The Hadrami port at the mouth of Wadi Darbat, Sumhuram lies only a few dozen kilometers from the sites at Halqoot and Shakil. The Hadramawt Kingdom and its Sumhuram colonists sustained interest in Dhofar for its frankincense. But there is little from the contemporary pastoralist camps to suggest that Dhofaris—at least cattle herders of the mountains and near An Najd—engaged in its collection. There are no remains that suggest contact with Sumhuram—no ceramics, no cereals, no camel bone, an inconsequential scrap of hammered copper, no agate or carnelian beads, no alabaster, no iron, no whetstones, no basalt, no spindle whorls, no millstones. The knapped stone suggests an industry different from the microlith industries known in Yemen at this period. While the absence of evidence can never be evidence of absence, the list of lack

is nonetheless impressive when compared with the array of materials recovered at Sumhuram's excavations. Even as the cattle pastoralists of Late Iron Age Jibal Qāra turned inland for the precious game of the Najd, they do not show material signs of exchange with the coastal traders.

CONCLUSIONS

This very An Najd wild game sustained an apparent independence. Pastoralists cannot live by herds alone, and they supplement their stock and its products. Three basic patterns of pastoralism are **subsistence pastoralists** (supplementing their stock with wild game and gathered plants), **agropastoralists** (relying on part-time farming), and **specialized pastoralists** (who raid or exchange surplus animals for agricultural and other material surplus from farming communities) (Johnson 2002: 166). Dhofar's cattle herders of the Late Iron Age left no tools or plant remains from farming, processing, or even acquiring crops. These herders moreover left no signs of other material exchanges with coastal town-dwellers. Instead, Late Iron Age herdsmen apparently practiced subsistence pastoralism, and although their mobility must have taken them into the Najd, they appear to have remained largely aloof from frankincense production, at least that destined for trans-regional shipment.

Excavations at Shakil and Halqoot contribute extensive archaeological studies and the first coherent suite of radiocarbon ages of these sites, tying settlement construction to some 500 years of the Late Iron Age, a relatively narrow range within Dhofar's long prehistory and one concurrent with the incursions of foreign settlers from the Hadramawt Kingdom. Excavated plant remains, artifacts, and animal bone moreover returned new information about the sites' occupants and their livelihoods. With this new information, archaeologists are now poised to address settlement history, its episodic and regional expressions, and the interactions of different peoples—settled, mobile, and urban--across the Dhofar landscape under changing conditions of the Holocene.

ACKNOWLEDGEMENTS

The team members thank foremost the administration of the Sultanate of Oman Ministry of Heritage & Culture, under His Highness Haitham Bin Tariq Al Said. We are indebted to the management of His Excellency Undersecretary Salim Al Mahrooqi, Mrs. Biubwa Al Sabri, Mr. Sultan Al Bakri, Mr. Khamis Al Asmi, and Mrs. Sumaya Al Busaidi. In Salālah we received persistent kindness and assistance from the Ministry of Heritage & Culture employees, especially Salim Al Amary, Masūd Al Hādhari, and Masūd Al Kāthīri. Without the field participation and innumerable logistical and cultural interventions of Salālah Ministry staff, we could not have done this research. Anna Berlekamp, Abdalazīz Bin Aqīl, Ian Hamilton, Kevin Johnston, Keoki Johnston, Mark Moritz, Lucas Proctor, and Matthew Senn contributed to excavations; Craig Stevens and Anna Berlekamp helped with plant remains. Thanks also to Thuwaiba Al Riyami in Muscat. Finally but not least, we acknowledge the generous hospitality of the people of modern Halqoot, most especially Mohammad Shahri and family.

BIBLIOGRAPHY

Albright, Frank P. (1982) *The American Archaeological Expedition in Dhofar, Oman, 1952-1953*, Publications of the American Foundation for the Study of Man. Vol. 6. Washington, DC: AFSM.

Avanzini, Alessandra. (2008) *A Port in Arabia between Rome and the Indian Ocean (3Rd C. BC-5Th C. AD)*, Khor Rohri Report 2. Rome: Erma di Bretschneider.

Bonacossi, D.M. (2002) "Excavations at Khor Rohri: the 1997and 1998 campaigns." In Avanzini, A. (ed.), *Khor Rohri Report 1*, pp. 29-69, University of Pisa: Edizione Plus.

Breton, Jean-François. (1999) *Arabia Felix from the Time of the Queen of Sheba: Eighth Century B.C. to First Century A.D.* [*Arabie heureuse au temps de la reine de Saba'*], English language edition, Notre Dame, Indiana: University of Notre Dame Press.

Buffington, Abigail F. & Joy McCorriston. (2019) "Wood exploitation patterns and pastoralist–environment relationships: charcoal remains from Iron Age Ṡhakal, Dhufar, Sultanate of Oman." *Vegetation History and Archaeobotany* 28: 283-294. doi.org/10.1007/s00334-018-0682-y

Charpentier, Vincent. (2008) "Hunter-Gatherers of the 'Empty Quarter of the Early Holocene' to the Last Neolithic Societies: Chronology of the Late Prehistory of South-Eastern Arabia (8000-3100 BC)." *Proceedings of the Seminar for Arabian Studies* 38: 93-115.

Cremaschi, Mario & Fabio Negrino. (2002) "The Frankincense Road of Sumhuram: Paleoenvironmental and Prehistorical Background." In Alessandra Avanzini, (ed.), *Khor Rori Report 1*, pp. 325-363, University of Pisa: Edizione Plus.

Cremaschi, Mauro & Fabio Negrino. (2005) "Evidence for an Abrupt Climatic Change at 8700 14C Yr B.P. in Rockshelters and Caves of Gebel Qara (Dhofar-Oman): Palaeoenvironmental Implications." *Geoarchaeology* 20: 559-579.

Cremaschi, M. & A. Perego. (2008) "Patterns of land use and settlements in the surroundings of Sumhuram. An intensive geo-archaeological survey at Khor Rori: report of field season February 2006." In Alessandra Avanzini, (ed.), *A Port in Arabia between Rome and the Indian Ocean (3rd c. BC–5th c. AD) Khor Rori Report 2*, pp. 563-573, Rome: Erma di Bretschneider.

ElMahi, Ali Tigani. (2010) "Pastoralists' adjustments to hematophageous flies in Dhofar: an analogy of an ancient adaptation." *Adumatu* 21: 15-32.

(2001) "The traditional groups of Dhofar, Oman: a parallel for ancient cultural ecology. *Proceedings of the Seminar for Arabian Studies* 31: 131-143.

Harrower, Michael J., Matthew J. Senn, & Joy McCorriston. (2014) "Tombs, Triliths and Oases: Spatial Analysis of the Arabian Human Social Dynamics (AHSD) Project, Archaeological Survey 2009-2010." *Journal of Oman Studies* 18: 145-151.

Hilbert, Y.H., A. Parton, M.W. Morley, L.P. Linnenlucke, Z. Jacobs,L. Clark-Balzan, R.G. Roberts, C.S. Galletti, J.-L. Schwenninger, & J.I. Rose. (2015) "Terminal Pleistocene and Early Holocene archaeology and stratigraphy of the southern An Najd, Oman." *Quaternary International* 382:250-263.

Hildebrandt, Anke & Elfatih A. B. Eltahir. (2006) "Forest on the Edge: Seasonal Cloud Forest in Oman Creates its Own Ecological Niche." *Geophysical Research Letters* 33 (11): L11401.

Hildebrandt, Anke & Elfatih A. B. Eltahir. (2008) "Using a Horizontal Precipitation Model to Investigate the Role of Turbulent Cloud Deposition in Survival of a Seasonal Cloud Forest in Dhofar." *Journal of Geophysical Research-Biogeosciences* 113 (G4): G04028.

Johnson, Amber. (2002) "Cross-Cultural Analysis of Pastoral Adaptations and Organizational States: a Preliminary Study." *Cross-Cultural Research* 36:151-180.

McCorriston, Joy, Michael Harrower, Tara Steimer, Kimberly D. Williams, Matthew Senn, Mas'ud Al Hadhari, Mas'ud Al Kathiri, Ali 'Ahmad Al Kathiri, Jean-François Saliège, & Jennifer Everhart. (2014) "Monuments and Landscape of Mobile Pastoralists in Dhufar: The Arabian Human Social Dynamics (AHSD) Project 2009-2011." *Journal of Oman Studies* 19: 117-143.

Miller, Anthony G. & Miranda Morris. (1998) *Plants of Dhofar, the Southern Region of Oman: Traditional Economic and Medicinal, Uses*, Muscat: Office of the Adviser for Conservation of the Environment, Diwan of Royal Court, Sultanate of Oman

Steimer-Herbet, Tara. (2004) *Classification Des Sepultures à Superstructures Lithiques Dans Le Levant Et l›Arabie Meridionale (IVe et IIIe Millénaires Avant J.-C.)*, British Archaeological Reports International Series, Vol. 1246, Oxford: Archaeopress.

Yule, Paul. (1999) "A prehistoric grave inventory from Aztaḥ, Ẓufār." In Paul Yule, ed., *Studies in the Archaeology of the Sultanate of Oman*, pp. 91-96, Deutches Archäologisches Institut Orient-Abteilung Orient –Archäologie Band 2. Rahden/Westfal. : Verlag Marie Leidorf GmbH.

Zarins, Juris. (2010) "Funerary Monuments of Southern Arabia: The Iron Age-Early Islamic Traditions." In Lloyd Weeks, (ed.), *Death and Burial in Arabia and Beyond*, British Archaeological Reports

International Series, Vol. 2107, pp. 225-236, Oxford: Archaeopress.

(2001) *The Land of Incense. Archaeological Work in the Governate of Dhofar, Sultanate of Oman 1990-1995*, Sultan Qaboos University Publications in Archaeology and Cultural Heritage Series Vol. 1, Sultanate of Oman: the Project of the National Committee for the Supervision of Archaeological Survey in the Sultanate, Ministry of Information.

Zarins, Juris & Lynne Newton. (2013) *Atlas of Archaeological Survey in Governorate of Dhofar Sultanate of Oman*, Mina al Fahel, Oman: Office of the Advisor to His Majesty the Sultan for Cultural Affairs.

CONTRIBUTORS ADDRESS:

Joy McCorriston

Professor, Department of Anthropology, The Ohio State University, 4034 Smith Laboratory, 174 W. 18th Ave. Columbus, OH 43210, USA (Corresponding author: +1 614 292-0230 mccorriston.1@osu.edu)

Abigail Buffington

Mellon Postdoctoral Scholar, College of William and Mary, P.O. Box 8795, Williamsburg, VA 23187-8795 USA

Kyle Olson

Doctoral Candidate, Department of Anthropology, University of Pennsylvania, Penn Museum, 3260 South Street, Philadelphia, PA 19104, USA

Louise Martin

Reader, Institute of Archaeology, University College London, 31-34 Gordon Square, London, WC1H-0PY, UK

Wael Abu-Azizeh

Researcher and Branch Director, Institut Français du Proche-Orient (Ifpo), 15 Mount of Olives Road, Jerusalem, PALESTINE

Timothy Everhart

Doctoral Candidate, Department of Anthropology, University of Michigan, 101 West Hall, 1085 South University Ave., Ann Arbor, MI 48109-1107, USA

Ali Ahmad Al Kathīrī

Research Associate, Ministry of Heritage and Culture, P.O. Box 643, Postal Code 211, Salālah, Sultanate of Oman.

Ali Al Mehri

Research Associate, Ministry of Heritage and Culture, P.O. Box 643, Postal Code 211, Salālah, Sultanate of Oman.