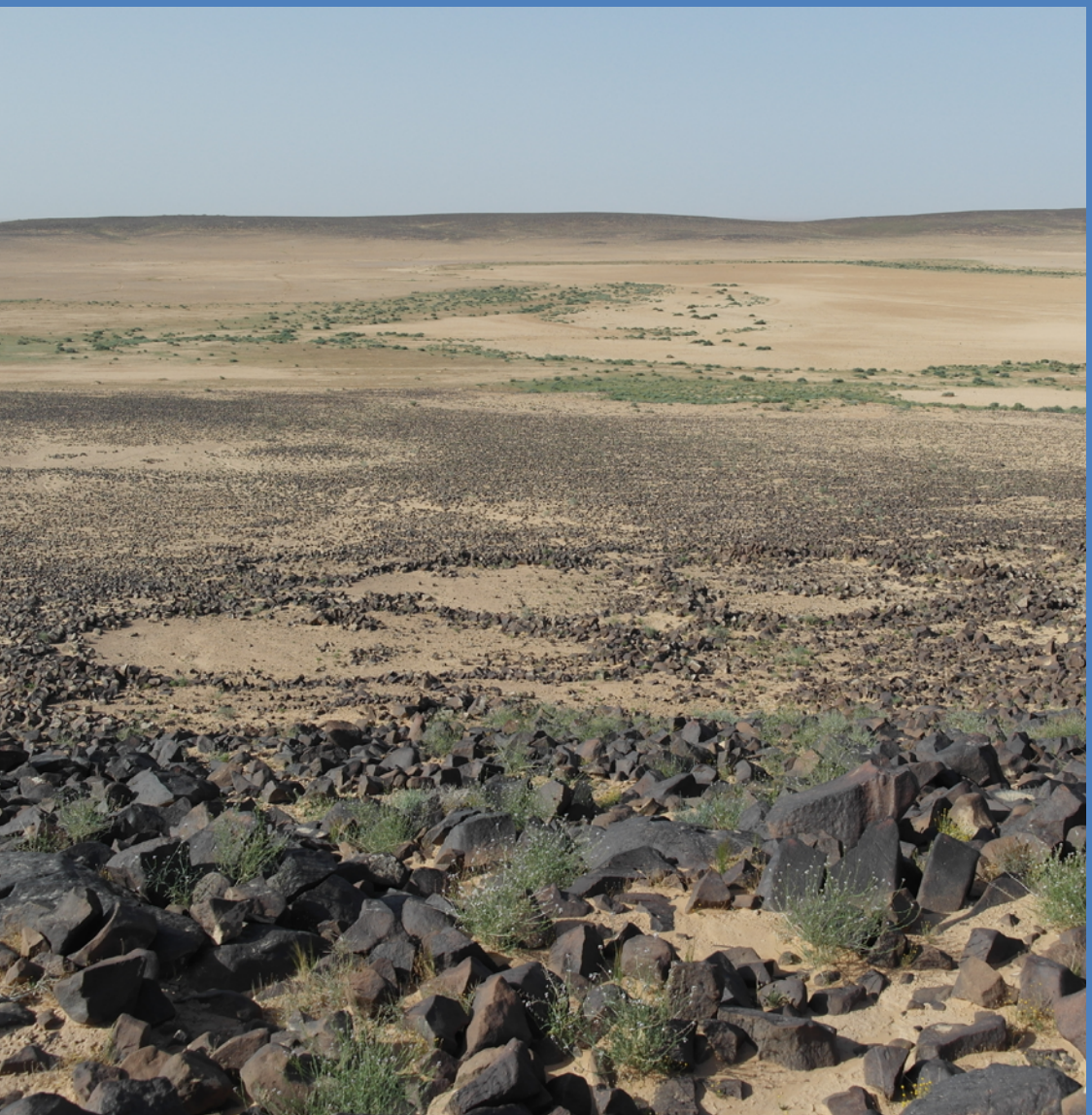
Mobile Peoples – Permanent Places

Nomadic landscapes and stone architecture from the Hellenistic to Early Islamic periods in north-eastern Jordan

Harmen O. Huigens



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APAAME	Aerial Photographic Archive for Archaeology in the Middle East
ASTER GDEM	Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Digital Elevation Model
DEM	Digital Elevation Model
(D)GPS	(Differential) Global Positioning System
GIS	Geographic Information System
HPC	Hillslope Position Classification
HydroSHEDs	Hydrological data and maps based on Shuttle Elevation Derivatives at multiple Scales
JOSCO	Jordan Oil Shale Company
ka	kilo-annum
m.a.s.l.	meters above sea level
mya	million years ago
OSL	Optically Stimulated Luminescence
SCC	Surface Cover Classification
SRTM	Shuttle Radar Topography Mission
USGS	United States Geological Survey
VPC	Visual Prominence Classification

Preface

This book is the principal output of my doctoral research, which I carried out between 2014 and 2018 at Leiden University. My PhD dissertation, which I completed and defended in 2018, has been the foundation of this book. It is intended as an archaeological perspective on a topic that, until recently, had largely been studied through textual sources: nomadic communities who inhabited the Black Desert of north-eastern Jordan some two thousand years ago. Although they were best known for the remarkable inscriptions they have left behind on the dark basalt rocks of the Black Desert, they also modified their living space in various other ways. The landscapes they have left behind consist of campsites, rock art, various kinds of artefacts, including ceramics, paths winding through the hills, and numerous stone-built structures such as burial cairns and enclosures, all of which had received little attention until recently. This book sheds more light on the constitution of these archaeological landscapes, driven by a fascination for the seeming contradiction between, on the one hand, the mobile character of its past inhabitants and, on the other hand, the long-lasting imprint of what they created in the landscape. It provides new information about these nomadic communities, their lifeways, and their position in the wider region and its dynamic history in Classical and Late Antiquity. This book may furthermore be consulted for its primary datasets on excavations and field surveys in the Jebel Qurma region of the Black Desert, which should be useful for scholars working in northern Arabia and other desert environments or nomadic landscapes. I am therefore grateful to Archaeopress for publishing this book, and for disseminating it as an 'open access' publication.

The research presented in this book is part of the *Landscapes of Survival* research project, based at the Faculty of Archaeology, Leiden University. The principal investigator of this project is Prof. Dr Peter Akkermans. I would like to thank him for supporting and supervising my doctoral research, and for the many years of fruitful collaboration and discussion. Financial support for this research, and the *Landscapes of Survival* project it is part of, was given by The Netherlands Organisation for Scientific Research (project number 360-63-100). I also thank the Leiden University Fund for a personal LISF-grant which made it possible to do additional fieldwork. I am grateful to the School of Geography and Environmental Sciences, Ulster University, for giving me the opportunity to publish my dissertation in the book at hand.

The *Landscapes of Survival* project was set out as a collaboration between various Leiden-based senior staff members, PhD students, and assistants. This collaboration has significantly added to the quality of my research through discussion, sharing information, and providing a professional and pleasant working environment. I am grateful in this respect to Nathalie Brusgaard, Chiara Della Puppa, Ahmad Al-Jallad, Koen Berghuijs, Monique Arntz, and Merel Brüning. I am also grateful to have been part of the Faculty of Archaeology, which has been a lively and stimulating place to work. Its Graduate School has provided the opportunity to engage with peers having different yet sometimes surprisingly related fields of expertise.

This research has benefited from collaboration with several researchers and research institutions at Leiden University and beyond, for which I am very grateful. Radiocarbon dates have been provided by the Groningen Institute for Isotope Studies, directed at the time by Prof. Dr Hans van der Plicht. The Netherlands Centre for Luminescence, based at Wageningen University & Research and directed by Prof. Dr Jakob Wallinga, helped with obtaining and dating OSL samples. Various people contributed to the documentation and study of ceramics: Dr Olivier Nieuwenhuyse, Dean Peeters, Akemi Kaneda, Thomas Vijgen, Giacomo Fontana (all Leiden University), and Pamela Koulianos (North Carolina State University).

I would also like to extend my gratitude to Dr Sarah Inskip (Leiden University/Cambridge University) for providing information on human skeletal remains; to Federica Fantone (Leiden University) for her study of botanical remains; and to Dr Canan Çakırlar, Francesca Slim and Francis Kootstra (Groningen Institute of Archaeology) for information on faunal remains. I would also like to thank Mikko Kriek for providing some of the drawings used in this book, Dr Mark Locicero for proofreading the manuscript, and Merel Brüning for providing some of the excavation documentation used in Chapters 4 and 5.

The research presented in this book is to a large degree based on results of the Jebel Qurma archaeological field project, carried out in Jordan. This fieldwork was supported by the Department of Antiquities of Jordan and its director general, Dr Monther Jamhawi. Other support was given by Shell B.V./Jordan Oil Shale company in Amman, who kindly provided pan-sharpened and georeferenced Ikonos satellite imagery for research purposes. Various types of satellite imagery were obtained through the United States Geological Survey. I also thank the APAAME project and its director, Prof. Dr David Kennedy (University of Western Australia) for providing valuable aerial photographs. Finally, I would like to thank the large number of students and volunteers who helped with carrying out surveys and excavations in the Jebel Qurma region, as much of their work has been essential for the study at hand.

Chapter 1 - Introduction

In terms of archaeological research, there are few regions in the world that remain as poorly known as the Arabian deserts. Recent discoveries made through the study of satellite imagery and aerial photographs have brought to light previously unthinkable numbers of ancient stone-built features in the Arabian deserts (Kennedy 2011; Kennedy and Bishop 2011). Such features were composed of the basalt rocks lying on the surfaces of the volcanic regions of Arabia, the so-called harra (Figure 1.1). The large majority of these features, whose quantity has been estimated to be over a million (Kennedy 2011), remain poorly documented and subsequently, are poorly understood. Considering this vast amount of virtually unexamined material, one immediately realizes how little is actually known about the societies that once lived in these desert regions and, consequently, how revealing this material might be if properly studied. This fascination with the material of the Arabian deserts lies at the foundation of this study, together with several other motivations which will be outlined in this introductory chapter. Obtaining a comprehensive understanding of the archaeological remains of the Arabian deserts extends far beyond the scope of a single study. Therefore, this book focuses on a region in north-eastern Jordan known as the Black Desert (Helms 1981), and is confined to the archaeological remains that date between the Hellenistic and Early Islamic periods. During these periods, the Black Desert was inhabited

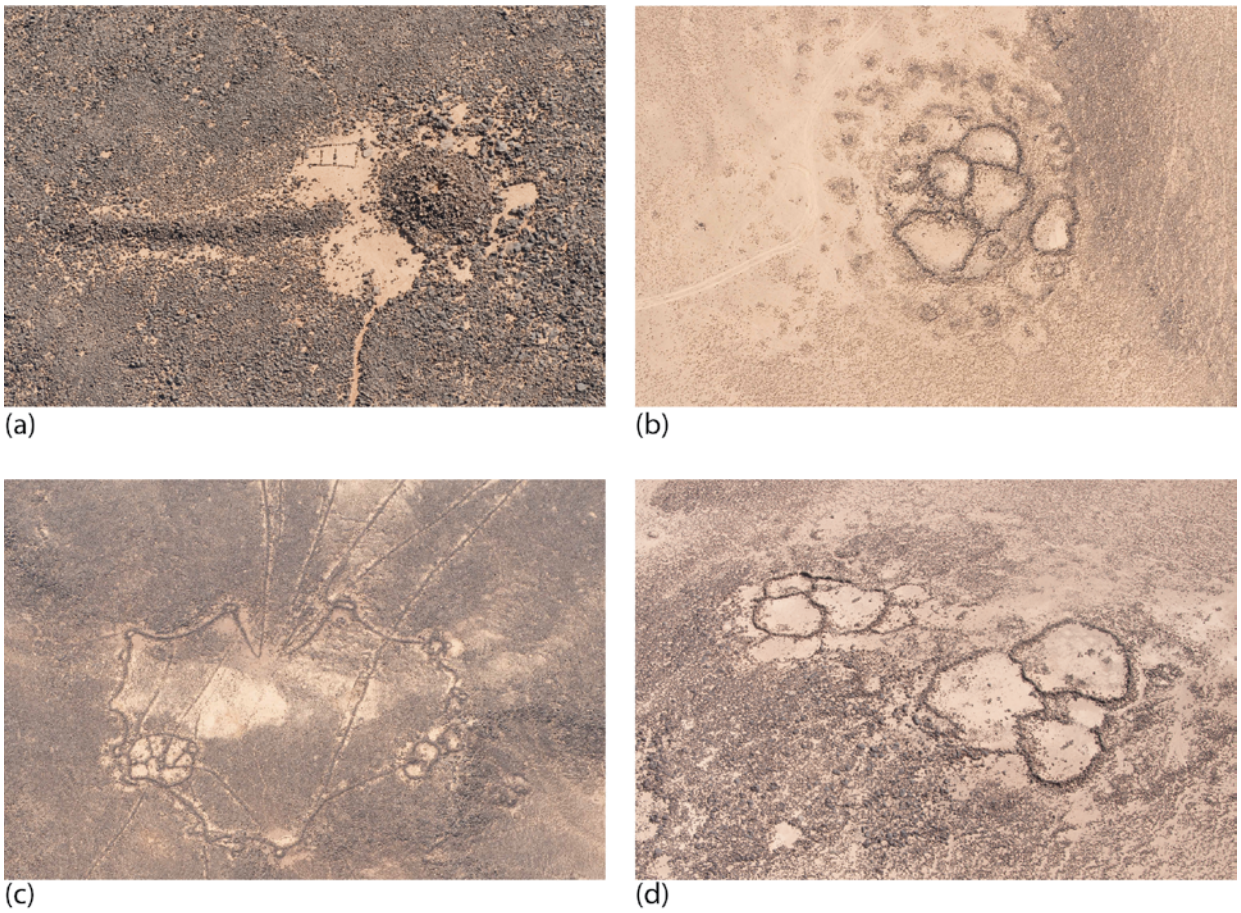


Figure 1.1 Examples of stone-built features from *harra* landscapes in north-eastern Jordan, including (a) a cairn with a pendant tail extending towards the left, (b) a wheel or jellyfish, (c) a desert kite, and (d) a series of enclosures. Aerial photos by D. Kennedy (a-c) and M. Dalton (d), courtesy of APAAME.

by communities of nomads. Arid conditions in parts of this region made fixed settlement untenable for certain times of the year and these communities had a migratory lifestyle: households moved in accordance with fluctuations in the availability of natural resources. Evidence for these nomadic communities has traditionally come from the inscriptions and pictorial carvings they left behind on the desert rocks. While these have provided important insights into the communities who created them, there is a serious scarcity of archaeological studies that have focused on nomadism in the Black Desert during historical times. As a result, there remains a poor understanding of how nomadic communities survived in an environment that appears bleak and uninviting to modern eyes. This book sheds light on some of the strategies employed by these nomadic communities by investigating the desert landscapes they inhabited and modified.

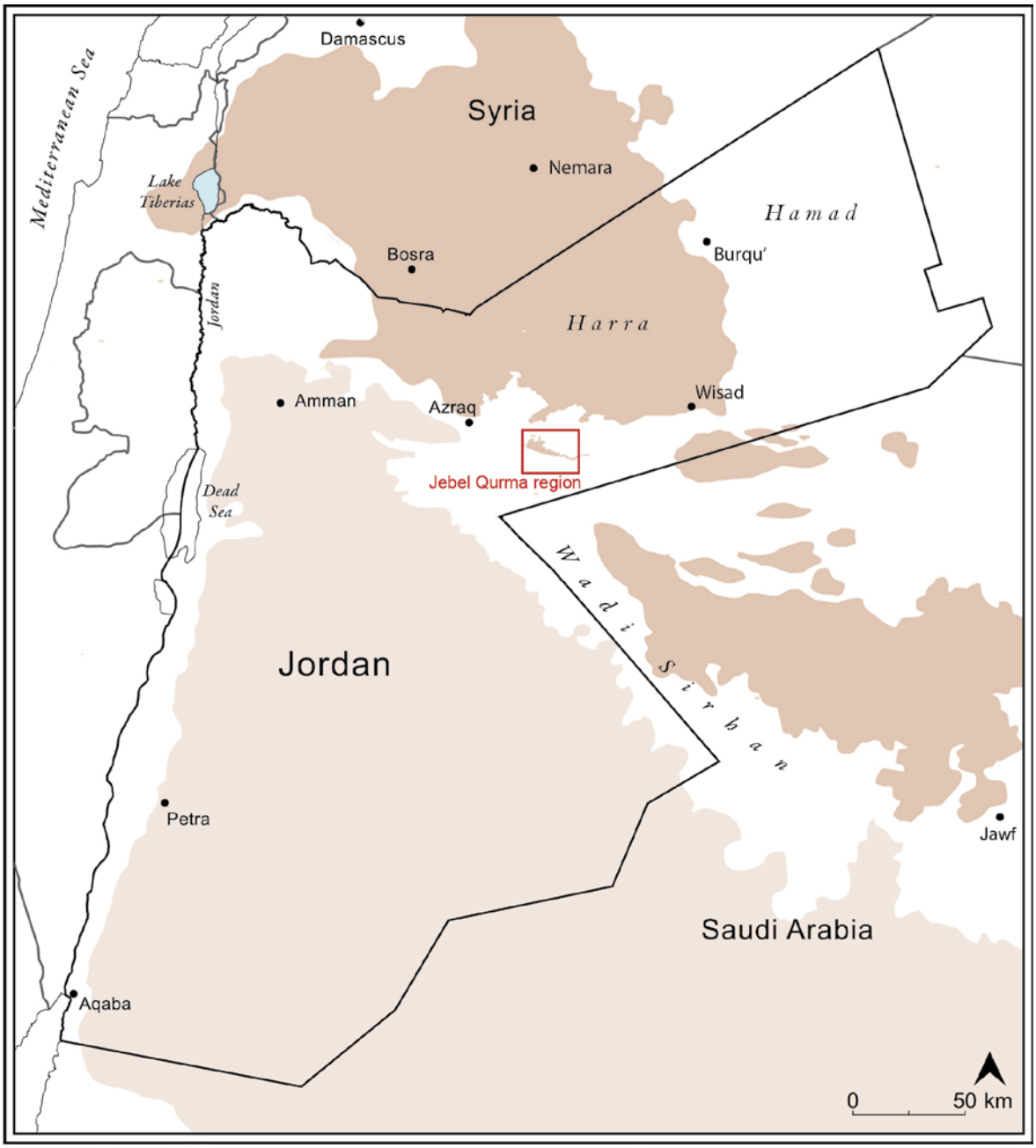


Figure 1.2 Map of modern Jordan indicating the extent of the Harrat al-Sham basalt field. Drawn by M. Kriek.

1.1 The Black Desert: a harsh and inhospitable environment?

1.1.1 Physical geography

The Black Desert of Jordan is a vast and seemingly inhospitable environment that today supports little permanent inhabitation. The name of the region derives from the dominant surface cover, comprising a blanket of sharp and darkly coloured basalt rocks, which originated from volcanic eruptions occurring more than a hundred-thousand year ago (Bender 1968). The area, known in Arabic as the Harrat al-Sham, stretches from the slopes of Jebel Druze in southern Syria (the Hauran region) towards the southeast into the desert regions of north-eastern Jordan and northern Saudi Arabia, where it terminates at the oasis of Jawf (Figure 1.2). These *harra* landscapes are surrounded by rolling plains and hillocks that are largely covered by gravels and desert pavements, and are often referred to as *hamad* landscapes. In Jordan, the *harra* and *hamad* landscapes are together known as the Black Desert (Figure 1.3). Today the Black Desert receives less than 200 mm of average annual precipitation, although there may be years when no rainfall occurs at all, leaving the region extremely arid and without substantial vegetation (Al-Homoud et al. 1995: 58). The Black Desert is largely treeless, and hosts only a few permanent sources of water, including at Azraq, Wisad, Burqu' and Nemara. Except for a few small towns, most of the Black Desert is uncultivated and only occasionally visited by Bedouin families with their herds of goat, sheep, and camel (Rowe 1999). It is perhaps not surprising, therefore, that many parts of the Black Desert remain uninhabited – unfrequented even – for large parts of the year, if not altogether.

1.1.2 Archaeological and epigraphic remains

In stark contrast to its seemingly harsh and uninviting environments, the Black Desert manifests an unusually rich archaeological and epigraphic record, which has been known since the middle of the 19th century, although the material was not widely disseminated. The first Safaitic inscriptions were discovered upon the basalt rocks of the Black Desert in this early period, and subsequently deciphered in 1901. Safaitic is conventionally dated between the 1st century BC and the 4th century AD, but this date is highly insecure, and a broader or more narrow date range is entirely possible (Al-Jallad 2015: 1-25; Macdonald 2010). Over 30,000 Safaitic inscriptions have been documented since, and there are likely an equal number of pictorial carvings (i.e. petroglyphs), which are often found in association with the inscriptions. Indeed, many of the inscriptions actually refer to these petroglyphs. The inscriptions and petroglyphs provide a unique testimony of the nomadic communities who carved them onto the basalt rocks of the Black Desert.

Equally spectacular is the large amount of ancient stone-built architecture that is preserved on the surface of the Black Desert. The presence of such features was first vividly illustrated by British pilots flying over the Black Desert during the British Mandate period in Jordan, who took photographs of the surface features from their planes (e.g. Maitland 1927; Rees 1929). Today, tens-of-thousands of stone-built features of various types have been documented through more advanced methods of aerial imagery, such as the study of high-resolution satellite imagery (e.g. Kempe and Al-Malabeh 2010; Kennedy 2011; Kennedy and Bishop 2011; Meister *et al.* 2019). These features are also known collectively as the "Works of the Old Men" (Maitland 1927). They have been given enigmatic names such as *kites*, *pendants*, *wheels* or *jellyfish* (Figure 1.1), which is illustrative of the fascination they evoked and, at the same time, the uncertainty about their exact purpose and date of construction.

Many of these fundamental questions remain largely unresolved today. In part, this is the result of the relatively short history of archaeological research in the Black Desert. The initial discovery of the "Works of the Old Men" in the early 20th century was not immediately followed by an increase of archaeological research in the Black Desert. With few exceptions (see Müller-Neuhof 2014a), the Black Desert remained almost completely unexplored until the 1980s, when a number of archaeological field projects were initiated (e.g. Betts *et al.* 1998, 2013; Garrard and Byrd 2013; Helms 1981). The most significant contribution in this respect was made by Betts, whose extensive survey and excavation

programme covered large parts of the *harra* and *hamad*. These pioneering studies were followed up in the 21st century by a number of field projects (Müller-Neuhof 2014a).

However, the archaeology of the Black Desert is still in its infancy in many ways. Most of the research carried out since the 1980s has focused on the region's prehistoric remains (e.g. Betts *et al.* 1998, 2013; Müller-Neuhof 2012, 2014b; Richter 2014; Rollefson *et al.* 2014; Rowan *et al.* 2015). Little focus has been directed towards the investigation of the inhabitation of the Black Desert in historic times or, more generally, developments over the *longue durée*. Exceptional in this respect is the *Jebel Qurma Archaeological Landscape Project*, as it studies the development of settlements from the Palaeolithic until the modern period (Akkermans and Huigens 2018; Huigens 2015). However, without comparable research in other parts of the Black Desert, the long-term cultural and ecological history of the Black Desert largely remains to be written.

The relatively short history of archaeological research in the Black Desert, and its strong focus on prehistoric remains, has resulted in a fragmentary understanding of the various types of stone-built architecture that are found in the *harra* and *hamad* landscapes. An apt example comes from the interpretation of the *desert kites*: some scholars suggest that these stone-built features were constructed already in prehistory for the purpose of hunting wild animals such as gazelle (Betts and Burke 2015); others argue that at least some of the kites may have been constructed more recently (Macdonald 2005; Maraqten 2015); other scholars state that some of them were used for penning herd animals rather than hunting (e.g. Echallier and Braemer 1995). Given the vast amount of desert kites of various different types, these issues remain to be further investigated (Crassard *et al.* 2015). Even more poorly understood is the chronology and function of *cairns*, which are thousands of stone heaps of varying configurations present in the Black Desert (Kennedy 2011). Some of these have proved to be prehistoric tombs (Akkermans and Brüning 2017); others appeared to contain graves associated with Safaitic inscriptions (Akkermans and Brüning 2017; Harding 1953, 1978; Rollefson 2013); and some cairns may have served an entirely different purpose (Kennedy 2012a: 493). It appears that there may be many different types of cairns used for different purposes in different periods. However, due to the scarcity of archaeological research conducted at this point, a clear understanding of the use and chronology of cairns is lacking. Equally enigmatic are *pendants*, which are often found in association with cairns (Kennedy 2011). The function and chronology of these features is completely unknown at this point. Although some of the pendants seem to contain small chamber-like features (Rowan *et al.* 2015), no evidence for their function as a tomb has been found so far.

These examples serve to illustrate that much remains unclear about the function and chronology of stone-built architecture in the *harra* and *hamad* landscapes of the Black Desert. This is important to acknowledge especially because of the remarkable context in which these landscapes developed, as is outlined below.

1.1.3 The Black Desert as a zone of nomadism

Much of the Black Desert's history of inhabitation is characterised by nomadism, which is defined here as a mode of existence in which communities engage in residential mobility on a regular basis (following Honeychurch and Makarewicz 2016: 347-348; Salzman 2002: 246). Others would reserve the term nomadism to define an economic system based primarily on pastoral production in marginal environments that is facilitated through the cyclical mobility of herds and households (e.g. Khazanov 1984; Spooner 1971: 199). This study primarily engages with the relationship between mobile communities and the organisation of space; this may have related to a multitude of social and economic dimensions, only one of which may have been pastoral production. Therefore, a broader definition of nomadism seems to be in order, namely one that highlights the mobile character of the communities classified as nomadic rather than defining them by a specific system of production.

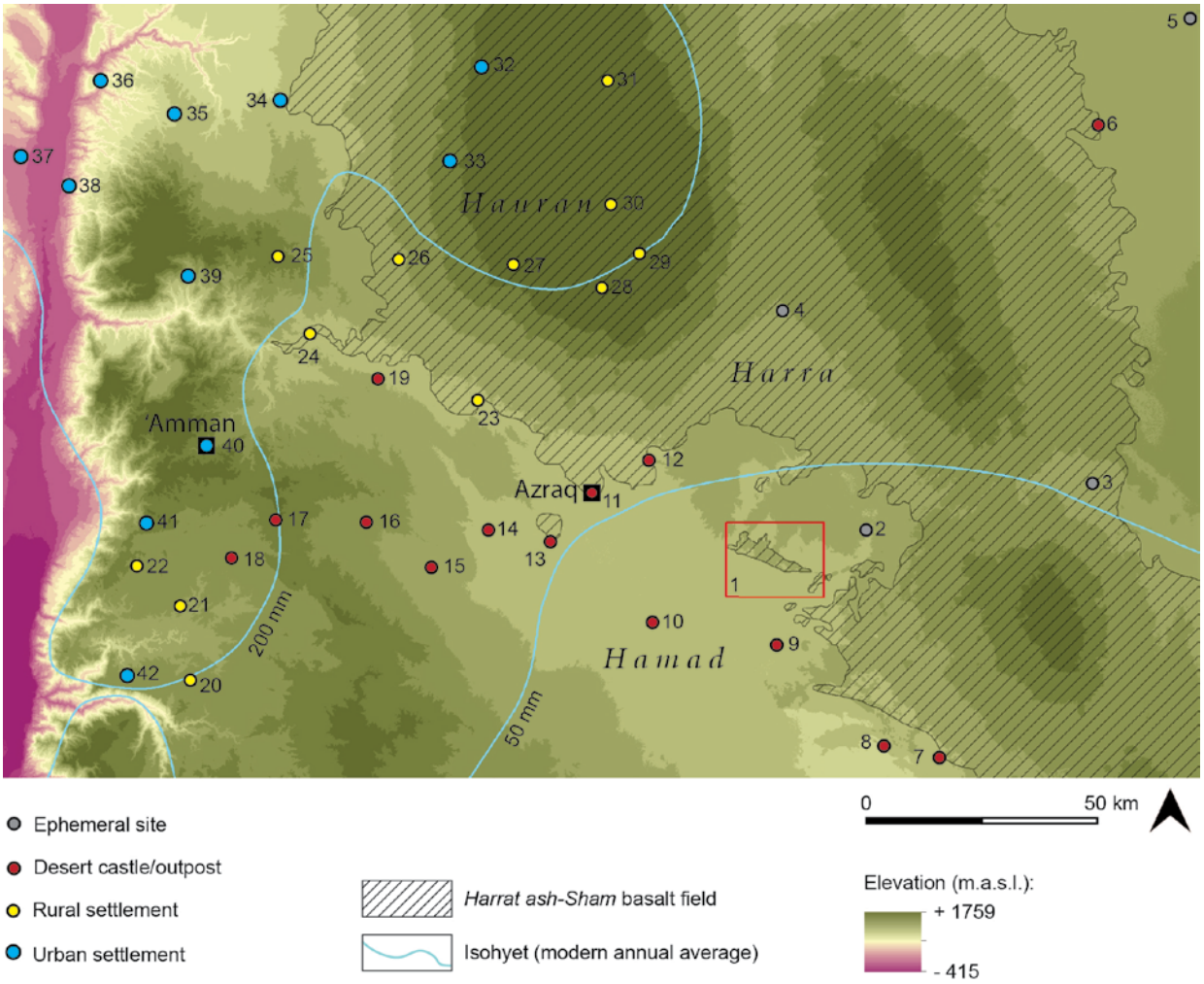


Figure 1.3 Map of the Black Desert and its surrounding, indicating the Jebel Qurma region (1) and sites referred to in this book: 2) Maitland's Mesa; 3) Wisad Pools; 4) Cairn of Hani'; 5) al-Risha; 6) Burqu'; 7) Ithra; 8) Kaf; 9) Hazim; 10) Khirbet 'Umari; 11) Arzaq; 12) Usaikhim; 13) Uweinid; 14) 'Amra; 15) Kharaneh; 16) Mshash; 17) Muwaqqar; 18) Mshatta; 19) Hallabat; 20) Umm al-Rasas; 21) Nitl; 22) Madaba; 23) Hibabiya; 24) Khirbet al-Samra; 25) Rihab; 26) Umm al-Jimal; 27) Umm al-Quttein; 28) Deir al-Kahf; 29) Deir al-Qinn; 30) Imtan; 31) Sa'neh; 32) Suweida; 33) Bostra; 34) Deraa; 35) Capitolas; 36) Umm Qais; 37) Beth She'an; 38) Pella; 39) Jerash; 40) 'Amman; 41) Hesban; 42) Dhiban. Based on Ababsa (2013) and HydroSHEDs elevation data.

Archaeological research has indicated that already in early prehistory (i.e. during the (Epi)Palaeolithic and Early Neolithic periods), the Black Desert was frequented by mobile hunter-gatherer communities. In fact, some of the stone structures visible on the *harra* surfaces today date back to this earliest period of inhabitation (Betts *et al.* 1998; Richter 2014, 2017). It was probably during the 7th millennium BC (i.e. the Late Neolithic), that the herding of sheep or goat was added to the subsistence activities of these nomadic communities, who continued to inhabit the Black Desert at least until the end of the Early Bronze Age, in the 3rd millennium BC (Müller-Neuhof 2014a; Rosen 2017). Permanent architecture that was constructed in this period includes the *wheels* or *jellyfish* (Rollefson *et al.* 2016), but probably also some of the other stone enclosures (Akkermans *et al.* 2014; Huigens 2015) ubiquitous in the Black Desert. Although more elaborate residential architecture has also been dated to this 'late prehistoric' phase of inhabitation – for example at Maitland's Mesa – these dwellings were probably inhabited on a seasonal base rather than year-round. While the environment was probably not as arid as today, there is no evidence that it supported year-round inhabitation (Rowan *et al.* 2015, 2017).

There is some uncertainty as to what happened to the environment of the Black Desert and its nomadic communities after the Early Bronze Age. Except for a few isolated finds there is hardly any archaeological evidence for significant inhabitation during the 2nd millennium BC until the Hellenistic period (Adams *et al.* 1977). This is remarkable as it is generally believed that the Arabian deserts opened up during the 1st millennium BC following the domestication of the (dromedary) camel and the development of both camel nomadism and camel-based caravan trade (Magee 2014: 259-274; Magee 2015). More specifically, a number of Assyrian sources of the early 1st millennium BC refer to violent conflict with both settled and nomadic populations of northern Arabia (Hoyland 2001). One of these settlements is Jawf (ancient *Adummatu*), but even here there is still no archaeological evidence for significant Iron Age occupation, despite serious attempts to locate them through excavations (Charloux and Loreto 2014, 2015). This strong discrepancy between textual sources and archaeological material calls for further investigation. With respect to the Black Desert, an important question is whether the absence of archaeological remains from the 2nd and much of the 1st millennium BC reflects a period of abandonment or methodological biases, such as poor visibility, or simply a lack of research attention.

What is certain is that by the end of the 1st millennium BC and the beginning of the 1st millennium AD (i.e. during the Late Hellenistic and Roman periods), the Black Desert was inhabited by nomadic communities. The clearest and most direct evidence for their presence comes from the Safaitic inscriptions and associated pictorial carvings, as mentioned above. Such rock art was carved out by communities migrating through the *harra* and *hamad* regions on a seasonal basis (Macdonald 1992a). Although some Safaitic texts have been recorded in Nabataean and Roman towns to the west of the Black Desert, the overwhelming majority of the inscriptions are situated in desert regions, and much of their content deals with nomadic activities rather than sedentary life. There are numerous references to people camping in different places and to pasturing livestock, such as camels, but also sheep and goat and, incidentally, cattle (Al-Jallad 2015: 1-25; Macdonald 1993). These nomads, however, did not solely rely on pastoralism, as there are also references to other economic activities such as hunting, raiding, military services, and possibly small-scale and opportunistic farming (Macdonald 1993).

The nomads who carved the Safaitic inscriptions sometimes identified themselves as belonging to a specific social group. To a certain degree, but probably not exclusively, these social groups were organised through kinship affiliations, which are sometimes listed in the inscriptions as long genealogies (Al-Jallad 2015: 56-60). These lineage groups sometimes competed with each other, such as through the raiding of livestock, although there is no evidence for large-scale warfare between different nomadic groups (Macdonald 1993: 314). The nature of relations with communities beyond the Black Desert has been heavily debated. From the Late Hellenistic period onwards, the western fringes of the Black Desert were increasingly populated by sedentary farming communities as well as military forces. Agricultural exploitation in the southern Hauran region developed rapidly under the Nabataeans, who greatly invested in the region in the 1st century BC and the 1st century AD. This practice was continued by the Romans, who annexed the Nabataean kingdom by AD 106; many towns, agricultural villages and *villae* emerged during this period in the Hauran (Villeneuve 1985), and the nature of the relations between these farming communities and nomads in the Black Desert has proved relevant. It has been suggested that in the wave of agricultural development, nomadic communities were slowly pushed out of the Hauran region, as former pasture grounds were transformed into agricultural plots (Villeneuve 1985: 116). Whether the nomads subsequently settled in the newly emerging towns and villages, or shifted their migratory routes into the Black Desert, remains unknown. It has also been suggested that pastoralism remained an important economic activity for the newly emerging towns in the Hauran (Rohmer 2011). Less clear is the nature of pastoralist production: was it based on nomadic pastoralism, in which herds and households resided in the Black Desert for certain times of the year, or was it restricted to the immediate outskirts of settlements?

During the same period, the Roman empire invested in the military infrastructure of this area. Perhaps building partly on earlier Nabataean military works (Bowersock 1983: 154-158), numerous fortifications and watchtowers were constructed on the western fringes of the Black Desert under Roman rule, and were connected by roads (Kennedy 1982, 1997). Various suggestions have been made as to the purpose of this roughly north-south line of defence. These include, firstly, the protection of trade routes between the empire and the Arabian Peninsula through the Wadi Sirhan, which connected the Hauran to the oases of Azraq and Jawf (Bowersock 1983: 154-158). Secondly, it has been proposed that they defended the agriculturally important Hauran region from enemy forces (Sartre 2005). While both suggestions seem plausible, different views on who 'the enemy' was in this respect have been advanced. While some have proposed the rival Sassanian empire as a likely candidate, others have suggested that Roman territories and activities needed to be defended against a 'nomadic menace' (Bowersock 1983; Millar 1993: 435-436; Parker 1986, 1987). The latter view seems to be based largely on ancient literary sources, in which nomads are portrayed not only as uncivilised and unreliable but, also, as characteristically hostile (Hoyland 2001: 96-97). Most scholars now acknowledge that such descriptions are most likely rhetorical rather than an accurate account of nomadic–sedentary relations in the Hellenistic and Roman periods. Although violent conflict may have occurred from time to time, these were probably exceptions to a much more harmonious relation, defined by mutual benefits or even a mutual dependency (Banning 1986; Fisher 2011: 108-109; Hoyland 2001; Macdonald 1993, 2014: 162).

The tradition of writing among nomads in the Black Desert seems to have come to an end sometime between the 4th century AD and the Late Antique period, as there are no clear indications that Safaitic or any other nomadic script was used afterwards. Given the equally scarce archaeological data, direct information on nomadism during the Byzantine and Early Islamic periods is largely absent. On this basis, it has been argued by some scholars that many of the nomads settled down in this post-Roman period, abandoning the Black Desert and their nomadic lifestyle for life in the villages and towns on the desert fringes (e.g. Kennedy 2014; Villeneuve 1985; Walmsley 2005, 2007a; Zerbini 2013). It is indeed the case that the encroachment of sedentary farming communities begun in the Hellenistic and Roman period continued well into Late Antiquity. Towns and villages in the Hauran region reached a peak in prosperity between the 6th and 8th centuries AD, with clear evidence for general demographic growth as well as an increase in the number of villages (Villeneuve 1985; Walmsley 2005).

However, others have suggested that this period of prosperity in village-life may not have come at the expense of nomads, and that they continued to roam the steppe and desert regions of eastern Jordan. In the Byzantine period, the defence of the eastern desert frontier increasingly depended on vassal rulers (*phylarchs*) and the local tribes they united. In Jordan, this role was fulfilled by the client kingdom of Ghassan, which was ruled by the Jafnids. Based in the Golan region, the hegemony of the Jafnid dynasty probably extended over southern Syria and northern Jordan (Fisher 2011: 95-102; Hoyland 2001: 78-79). It has been argued that nomadic tribes were also included in this kingdom (Fisher 2011: 110), and that some of the Roman forts in the desert adapted during the Byzantine period may have been used by local elites to meet with nomadic groups to secure their loyalty (Arce 2009, 2012). Furthermore, it has been suggested that this strategy was continued during the early caliphal period, when numerous old forts were refurbished and others were newly constructed (Arce 2009).

The archaeological evidence for the presence of nomads in the Black Desert is very scarce at this point. This may largely be the result of limited archaeological research rather than limited inhabitation in the past. The degree of nomadic continuation in the region after the disappearance of the Safaitic writing tradition thus requires further investigation. Only then will it be possible to further investigate possible processes of sedentarisation, or the role of nomadic communities in imperial border policies.

1.2 Landscapes of survival

What has so far become clear is that during the Hellenistic and Roman period, the Black Desert supported communities of nomads in an unprecedented way. After a period of seemingly very limited inhabitation, if not sheer abandonment, nomads were able to make a successful living in the desert once again. This trend can be observed in inscriptions and petroglyphs, historical references and, to a lesser extent, archaeological remains. It remains difficult to explain this story of relative success, as much remains unclear about the nature of these nomadic communities and how they developed through time. The mechanisms through which nomads were able to inhabit a region that appears to have seen very little activity during the preceding millennia remains poorly understood. To shed further light on nomadism in the Black Desert, new research is required that is more directly informed, and that combines the epigraphic remains and pictorial rock art carved out by nomads themselves together with archaeological material left behind by these communities.

This has been the aim of the *Landscapes of Survival* project, a four-year interdisciplinary research project (2014-2018) that investigated the archaeology, epigraphy, and pictorial rock art of the nomadic communities that inhabited the Black Desert in Classical and Late Antiquity. Its geographic research area is the Jebel Qurma region. This area is situated on the western fringe of the Black Desert, about 30 km east of the oasis and modern town of Azraq. The research area covers about 300 km^2, and comprises *harra* and *hamad* landscapes. Except for a few brief visits by earlier scholars (e.g. Abbadi 1986; Betts *et al.* 2013: 33-38; Knauf 1991), the region remained almost entirely unexplored until 2012. Since then, annual fieldwork has been carried out in the region by the *Jebel Qurma Archaeological Landscape Project*, out of which the *Landscapes of Survival* project developed. Over the course of five two-month field campaigns, part of the Jebel Qurma region was systematically and intensively surveyed, and excavations were carried out at a number of archaeological sites (Akkermans *et al.* 2014; Akkermans and Brüning 2017; Akkermans and Huigens 2018; Huigens 2015). While the history of the Jebel Qurma region extends from the Paleaolithic until the present day, a distinct peak in the occurrence of archaeological and epigraphic remains was observed between the late 1st millennium BC and the 1st millennium AD. These remains include about 5000 pre-Islamic inscriptions (mostly Safaitic) and an equal number of pictorial carvings. Additionally, there are hundreds of sites that can be dated to this phase of inhabitation and have archaeological remains, including ceramics and other artefacts, and stone-built features such as enclosures, clearings, and burial cairns. In the *Landscapes of Survival* programme these remains were further studied to shed light on the nomadic communities from which this material derived. A study of the epigraphic remains will be published in a separate book (Della Puppa forthcoming), as will the study of pictorial rock art (Brusgaard in press). The present book discusses and analyses the archaeological remains documented in the Jebel Qurma region.

1.3 Towards an archaeological perspective

Within the framework of the *Landscapes of Survival* project, the aim of the present study is to provide an archaeological perspective on nomadic communities who resided in the Jebel Qurma region between the Hellenistic and Early Islamic periods. In this section, the importance of such a perspective is further outlined. Several problems in text-based approaches to nomadism will be exposed, and a proposal is advanced concerning how archaeological research may contribute to solving these problems.

As was argued above, through much of antiquity the Black Desert was inhabited by nomadic communities whose importance in broader culture-historical developments should not be underestimated. Nomads of the Black Desert have sometimes featured prominently in discussions related to the development of settlement and the organisation of defence in the eastern parts of the empire in the Classical and Late Antique periods. For this reason, it is imperative to have a better understanding of the nature and development of nomadic peoples in the Black Desert. For some of the periods under discussion

there is hardly any direct evidence available about nomads. Other periods only have textual sources, which have their own set of limitations. As was highlighted above, external historical references to nomadic communities can give a biased and therefore distorted view of such communities. Moreover, they often lack detailed information on basic issues such as subsistence practices and cycles of migration. Furthermore, although the inscriptions and pictorial rock carvings created by nomads themselves provide an invaluable source of information, they are equally problematic in various ways. For example, these sources lack detailed chronological control and, as a result, tend to be studied as one contemporaneous corpus. Therefore, it remains highly problematic to study the way in which communities who carved the Safaitic inscriptions developed over time.

Additionally, to reconstruct nomadic communities on the basis of the Safaitic inscriptions alone comes with certain biases as well. For example, it has been suggested that the content of the Safaitic inscriptions does not fully represent the range of activities and phenomena that were considered to be a part of normal life. In some cases, there would have been little purpose to write about something unless it was considered exceptional (Macdonald 1993: 351). If this is indeed the case, cultural reconstructions based on the carvings alone risk interpreting the inscriptions on anomalous rather than common phenomena. Another bias is found in the fact that the inscriptions and petroglyphs seem to follow a set of informal rules and regulations. There were certain constraints on how to write and, more importantly, what to write about (Al-Jallad 2015: 6-7). In this respect, it is important to note that there are certain topics that people did *not* cover in their texts or depictions. Very little information is found in the texts or depictions about, for example, the nature of residential spaces, including: the types of tents or huts used and where they were pitched; the composition of herds and their variation across different regions; the nature of relations with nearby settlements and its populations. Lastly, the notion that literacy was widespread among nomadic communities and, in effect, that nearly everyone knew how to read and write (e.g. Macdonald 2010: 16) seems to be an unfounded assumption as there are no means to asses this. It is equally possible that there were nomadic peoples in the Black Desert whose lifeways are not reflected in the Safaitic inscriptions. These may include people that were living alongside literate nomads but, for one reason or another, did not engage in the creation of inscriptions, or people that resided in the Black Desert before or after the Safaitic writing tradition. If this is the case, archaeological remains rather than texts are a more suitable source of information.

In addition to the incomplete character of the textual sources, the way in which these texts have been interpreted can also be criticised. Greatly influential in this respect and, at the same time, highly problematic, are interpretive schemes based on descriptions of nomadic Bedouin communities published by European travellers who visited the Near East in the 19th and early 20th century (e.g. Bell [1907] 1919; Blunt 1879; Musil 1928; Raswan 1930). Models based on these ethnographic accounts have often been uncritically applied to the past. This is problematic as it assumes a kind of cultural rigidity or stasis that is completely untenable. Like any society, nomadic societies change over time as a result of social, political, technological, environmental, religious, and other developments. There is no reason to assume that nomadic communities two millennia ago were similar to Bedouin communities of the last 150 years or so, except perhaps for very generic characteristics like a certain degree of mobility and a reliance on herd animals (cf. Magee 2014; Rosen 2017). Instead, one of the key characteristics of nomadic societies is the enormous variability that exists *between* such societies, in terms of the degree of mobility, economic activities, and social organisation. Such societies have a high degree of fluidity, and can quickly adapt, either collectively or individually, to changing socio-political or environmental circumstances (e.g. Bacon 1954; Barfield 1993; Barth 1961; Biagetti and Howe 2017; Dyson-Hudson and Dyson-Hudson 1980; Finkelstein and Perevolotsky 1990; Khazanov 1984; LaBianca 1993; Salzman 1996a, 1996b, 2002).

The assumption that the modern Bedouin are 'timeless' has had a profound impact on how scholars have regarded the nomads of ancient Arabia in general (Magee 2014: 8-10), and the ancient inhabitants of the Black Desert in particular. For example, in an early study of nomad-sedentary interaction in the Hauran, Peters (1977) uncritically transposed Bedouin migration patterns recorded in the 19th century onto nomads residing in the Black Desert some 2000 years ago. Similarly, in his reconstruction of "The Role of Nomads in the Near East in Late Antiquity", Donner (1989) based his conclusions almost entirely on 19th and 20th-century ethnographies, and on hardly any ancient evidence. Donner's support of the 'timeless' nomad is further illuminated by his contention that *"nomadic groups, despite their almost constant movement and their periodic contact with "outsiders," tended to be socially and culturally isolated"* (Donner 1989: 78) and that this social and cultural isolation *"helped make nomads culturally conservative, that is, slow to change their ways"* (Donner 1989: 79).

Uncritical use of ethnographic analogies has also been influential in the reconstruction of nomadic societies based on the content of the Safaitic inscriptions. The term 'Safaitic Bedouin' has long been used by epigraphists to describe the nomads who carved out inscriptions and rock art in the Black Desert (e.g. Alzoubi *et al.* 2016; King 1990; Knauf 1991; Oxtoby 1968), as if these carvings were the only thing that set them apart from ethnographically known nomads. More specifically, Macdonald has argued on several occasions (Macdonald 2010: 15-16; Macdonald 2014: 146) that the Safaitic inscriptions and pictorial carvings represent a meaningless form of amusement, used to pass the time while watching over herds. This interpretation seems largely based on a single ethnographic case – the Tuareg of North Africa (see Macdonald 2010: 7). Although it may be true that the inscriptions seem to lack a direct communicative function, this does not imply that the inscriptions were meaningless. In fact, Al-Jallad argues that many of the inscriptions were created with the purpose of being read by others, and that their meaning would depend on the context in which they were read (Al-Jallad 2015: 7-9). Furthermore, he argues that "*writing in the Safaitic context was not a practice of unstructured self-expression, but a genre of rock art restricted by stylistic and thematic formulae.*" (Al-Jallad 2015: 7). The potential social significance of rock art in the context of mobile societies is well attested in anthropological literature and requires further scrutiny with regard to the Safaitic inscriptions and petroglyphs (cf. Brusgaard in press).

Regarding nomadic societies as 'timeless' is, as explained above, theoretically untenable. Moreover, it is also unsound from an empirical point of view. The desert regions of Arabia host an enormous amount of archaeological evidence, much of which was left behind by nomadic peoples. The archaeological landscapes they comprise are being revealed at an increasing rate, thanks to the increased use of satellite imagery in archaeological prospection, but also because of a general increase in archaeological interest in ancient nomadism (cf. Honeychurch and Makarewicz 2016). Many of these landscapes provide hints that the history of nomadic inhabitation of these desert regions is far more diverse and complex than has been previously assumed (Rosen 2017). In many cases, these remains are hardly consistent with models of nomadic land-use based on ethnographic accounts. In these traditional models, nomadic landscapes are largely regarded as wild, natural spaces that remain almost completely unmodified, except with the temporary pitching of camps. Related to such models is the enduring 'myth' (Rosen 2017) that archaeological remains of nomadic communities are very poorly tangible. Such views starkly contrast the tens-of-thousands, if not millions, of stone-built features that can be found across the diverse landscapes of the Arabian deserts. These features may suggest that nomads invested in their landscapes much more profoundly than previously assumed.

Archaeological research is therefore a necessity to better understand these features, the landscapes they are part of, and their role in ancient nomadic societies. Moreover, the study of these rich archaeological landscapes provides the means to overcome some of the problems inherent to the textual sources through which nomads have thus far been mostly studied.

1.4 Research aims and questions

As introduced above, the *Landscapes of Survival* project aims to come to a better understanding of some of the economic and social strategies that allowed nomadic communities to successfully inhabit the Black Desert. It does so by investigating the archaeology, epigraphy, and rock art of the Jebel Qurma region. The archaeological aspect to this objective, presented in this book, aims to shed light on how the organisation of space contributed to such strategies. As outlined above, the role of stone-built architecture in the use and organisation of space are not well understood, and this study aims to contribute to solving this problem. With this aim in mind, it intends to answer the following question:

To what degree and for which purposes did the nomadic communities who inhabited the Jebel Qurma region between the Hellenistic and Early Islamic periods physically modify their landscapes through the construction of stone-built features?

This question is essentially two-tiered, as it includes a descriptive element – *to what degree were landscapes physically modified?* – and an interpretive one – *why were these landscapes modified?* How these questions may be answered will be further outlined in the next section, which provides the justification for the research methods used in this study.

1.5 Investigating a nomadic landscape

1.5.1 Revealing the 'invisible nomad'

This study attempts to investigate the way in which nomads engaged with their environment, specifically through the construction and use of permanent architectural features that characterize the archaeological landscapes of the Black Desert. The way in which these landscapes can be studied is by no means self-evident, as the remains of nomadic communities have long been regarded as poorly tangible. Although prehistorians have long been able to locate a wide array of material traces of mobile peoples, archaeologists primarily interested in historical periods have not picked up on this for a long time (Rosen 2017: 3). The notion of the 'invisible nomad' has persisted through much of the 20th century, and has been fed by a number of assumptions. These include, firstly, the assumption that the material culture of nomads is in itself limited and comprised almost entirely of perishable materials (e.g. Finkelstein 1995; Macdonald 1993: 382; Villeneuve 1985: 116). The second assumption is that if such materials do enter the archaeological record they do not accumulate in dense enough clusters to form sites visible to archaeologists, given the highly mobile character of nomadic communities (e.g. Finkelstein and Perevolotsky 1990). The argumentation behind these assumptions, and the way in which they have negatively influenced the search for archaeological remains of nomads, is illustrated in the following quote from a book by Finkelstein (1995), related to the archaeological remains of nomads from the Negev and Sinai deserts:

'The nature of nomadism accounts for the dearth of material remains. Generally, nomadic societies do not establish permanent dwellings, and constant migration permits them to move only minimal belongings. Moreover, their limited resources do not facilitate the creation of a flourishing material culture that could leave rich archaeological finds. The limited resources also preclude development of complex social structures, in which part of the population would be free to engage in crafts that enrich material culture. The ability of pastoralists to obtain 'out-of-the-desert' goods through barter or trade may also be limited. Grain could be obtained from sedentary people in exchange for animal products, but they generally do not have sufficient surplus to serve as a basis for regular trade, and most of their resources are reinvested in the flocks.' (Finkelstein 1995: 25).

On the basis of these assumptions, Finkelstein argued for a text-based approach to ancient nomadism:

'We have to be aware of the limitations of our discipline: [...] *until more sophisticated methods are invented, more exhaustive fieldwork will not solve the problem of the invisible nomads, the comfortable library would.'* (Finkelstein 1995: 30).

What Finkelstein did not acknowledge, however, is that contemporary with the publication of his 1995 book, solutions had already been developed to many of the methodological problems he envisioned. Many of the assumptions that lie at the foundation of the 'invisible nomad' model are flawed to a considerable degree, as will be explored in the following discussion.

From about the 1980s onwards, much research has been done to provide a more positive view on the archaeological visibility of nomads. This was done firstly through ethno-archaeological research, followed by archaeological field projects specifically aimed at sites and landscapes of nomadic pastoralists. During the 1980s and 90s, following an increased interest in the anthropology of mobile peoples (e.g. Binford 1980, 1990; Kelly 1983, 1992; Khazanov 1984), numerous ethno-archaeological studies on pastoral nomads were carried out in the Near East (e.g. Avni 1992; Banning and Köhler-Rollefson 1992; Cribb 1991; Eldar *et al.* 1992; Simms 1988; Zarins 1992) and beyond (Bartosiewicz and Greenfeld 1999; Bradley 1992; Smith 1978). The general aim of these studies was to shed light on the potential archaeological footprint of nomadic peoples and to better understand these from an anthropological perspective. Cribb's *Nomads in Archaeology* (1991) is probably the most influential of these works. In this book, Cribb questions and successfully deconstructs the notion of the invisible nomad, by exploring the material culture and the nature of settlement among contemporary pastoral nomads, and the ways in which they may form archaeological sites. Thus, he developed an ethnographically informed methodological framework for comparable archaeological contexts.

While Cribb's study largely dealt with residential sites, other ethno-archaeological studies have highlighted the formation of an archaeological record of nomads on a landscape level. The ethno-archaeological study of nomadic pastoralists in northern Sudan by Bradley (1992) illustrated the nature of such landscapes. In addition to nomadic campsites she also studied the landscape beyond the site, recording material features such as wells and cemeteries. In her subsequent archaeological survey of the same region Bradley identified a number of residential and non-residential sites of ancient nomads, based on comparisons with her ethnographic data.

Such ethno-archaeological studies have greatly fostered a more positive attitude towards studying the archaeology of nomads. This is reflected in an upsurge in archaeological field projects with an explicit focus on nomads during the past decades, including in the Near East (cf. Honeychurch and Makarewicz 2016). The arid to hyper-arid environments of the Near East have proved to be beneficial for the preservation and visibility of nomadic sites, characterised by low artefact densities and limited stratigraphy. While such remains would quickly be obscured in more dynamic environments (e.g. buried by later sedimentation), the relatively stable nature of desert environments often leads to well-preserved archaeological landscapes (cf. Wilkinson 2003). This potential has been successfully exploited in several areas, including the Negev desert of Israel (Rosen 1987, 1993, 2007, 2017; Rosen and Avni 1993), the Transjordan region (e.g. Al-Salameen and Falahat 2009; Banning 1993; Macdonald *et al.* 2012), the Syrian Desert (e.g. Morandi Bonacossi and Iamoni 2012), and the Taurus hills of Turkey (e.g. Hammer 2012), where extensive nomadic landscapes were preserved largely above ground. Many of these landscapes consisted of a broad spectrum of features, including different kinds of residential sites, funerary monuments, rock art, sanctuaries, cisterns, and epigraphic remains.

Various field methods contributed to the successful identification of these ancient nomadic landscapes. What these studies consistently show is the importance of combining a number of different methods, including remote sensing, pedestrian surveys, excavations, and laboratory studies. Some of the

archaeological remains of nomads are poorly visible, such as short-lived campsites and rock art as these remains are scattered over various parts of the landscapes rather than accumulated in one place. In this respect, investigating the archaeological remains of nomads requires a focus not only on the large, visible sites, but also on the landscape beyond these sites (Wendrich and Barnard 2008) using relatively intensive survey methods (Hammer 2012). The use of high-resolution satellite imagery has proved a useful tool to obtain an initial insight into the nature of nomadic landscapes of the Black Desert (e.g. Kempe and Al-Malabeh 2010; Kennedy 2011). However, it lacks chronological control and, moreover, is likely to miss a vast amount of poorly visible archaeological features, inscriptions, and rock art that pervade these landscapes. Pedestrian surveys are therefore required to be able to come to a more complete reconstruction of the nature of the archaeological landscape and its past inhabitants.

Methodologically, these surveys need to be of an intensity high enough to document the archaeological remains, which may be poorly visible and highly scattered. While pedestrian surveys have been carried out on a large geographic scale by Betts, these surveys were highly extensive and selective in nature (Betts *et al.* 2013: 7), and often documented the most visible and, therefore, the largest archaeological sites. Telling in this respect is Betts' identification of only three sites in the Jebel Qurma area. This represents a fraction of the number of sites documented so far by the Jebel Qurma project, some of which comprise a few pieces of rock art or a handful of pottery sherds (Akkermans and Huigens 2018; Huigens 2015). What is required instead is a survey strategy that aims to document the diversity of archaeological remains in a broad sense, taking into account different environments and topographic locales that nomads may have visited in the region. Such intensive survey methods were effectively used to document nomadic landscapes in other desert regions of the Near East, such as the Negev (e.g. Rosen 1987) and the Transjordan area (e.g. Banning 1986; Barker *et al.* 2007).

Although nomadic landscapes may thus be documented through intensive survey methods, these datasets are not without problems either. Paradoxically, the relatively stable nature of arid environments that have often resulted in well-preserved nomadic landscapes pose, at the same time, a major methodological challenge: a palimpsest situation, in which features and artefacts with different temporal origins are found on the same level. Although this is arguably inherent to all archaeological surface remains (Wilkinson 2003: 7-8), in desert landscapes this situation becomes more problematic as a result of the limited availability of substantial and well-defined stratified remains on the site-level (e.g. Banning 1993; Davidovich *et al.* 2014; Rosen 1993). This difficulty is increased by the fact that stone features – both architecture and rock art – are often difficult to date. In some studies, this problem is evaded by simply assuming a chronological correlation between features within such landscapes on the basis of spatial association alone (e.g. Avner 1984; Avner *et al.* 2014). It is instead necessary to establish, rather than assume, chronological relationships between materials and features within such palimpsest contexts by using dating methods that can determine the actual construction date of such features. An important development in this respect is the use of Optically Stimulated Luminescence (OSL) dating, which has been successfully used to date stone-built features in the desert which were impossible to date on relative terms (e.g. Athanassas *et al.* 2015; Davidovich *et al.* 2014; Junge *et al.* 2016; Porat *et al.* 2006, 2013).

Another implication of these palimpsest situations is that features may persist in the landscape for hundreds if not thousands of years, and that such features can be reused or reworked multiple times. There are numerous examples of archaeological studies in desert landscapes of the Near East in which, for example, prehistoric features have been reused and altered in more recent periods (e.g. Crassard *et al.* 2010; McCorriston *et al.* 2011; Rosen *et al.* 2007). Therefore, it cannot be assumed that materials encountered in spatial association with such features are related to the original date of construction or use of that features. Again, reliable dating methods that provide a relatively fine chronological resolution need to be consulted.

In summary, important advances have been made in the archaeological study of nomadic communities of the ancient Near East over the past few decades. As a result, the notion of the 'invisible nomad' can no longer be substantiated (Cribb 1991; Rosen 2017; Wendrich and Barnard 2008). The archaeological record of arid environments of the Near East is rich in remains of ancient nomads, and this material can be retrieved by combining various archaeological methods that provide information on different geographic scales, and with different chronological resolutions. In this study, data from remote sensing and intensive pedestrian surveys will be integrated to document architectural features in the landscapes of the Jebel Qurma region. More detailed information on the chronology of such features will be obtained from excavations at a number of these features, in an attempt to reconstruct the degree to which nomads modified these landscapes in the Classical and Late Antique periods.

1.5.2 Understanding the constitution of the nomadic landscape

The second aim of this study is to understand the underlying motivations for the construction and use of stone-built architecture in the Jebel Qurma region, and the ways in which they may have been perceived by those who engaged with them. These issues relate to the intentions of the inhabitants of the region: Why did they create stone-built features in a certain way? What was their intended use? How were these features to be perceived, both by those who constructed them and by others? And how did they contribute to certain economic or social strategies? In this section I will present how such questions are approached in this study.

As described above, the discovery of archaeological landscapes of nomads in various desert environments of the Near East has led scholars to realise that the history of nomadic societies is far more complex than previously thought. It is unwarranted to assume that ancient nomads were in any way similar to the Bedouin communities described in the 19th and early 20th century. The same applies with regard to the stone-built architecture present across many of these landscapes: such features were hardly described in ethnographies of the Bedouin, and new explanations are required about why such features were created in the past and what their significance was to ancient nomadic communities.

It is important in this respect, firstly, to better understand some of the practical purposes these features were intended to fulfil. Archaeological research in the Black Desert has attempted to do so to some degree, but many issues remain unresolved. One relevant example pertains to the function of cairns, for which, as shown above, there is no typo-chronology or clear insight about their function. This is largely due to the extreme paucity of excavations targeted at these features. Recent excavations in the Jebel Qurma region (e.g. Akkermans and Brüning 2017), but also in other desert regions of the Near East (e.g. Abu-Azizeh *et al.* 2014; Crassard *et al.* 2010; McCorriston *et al.* 2011), have provided new insights into the diversity of cairns in terms of their function, morphology, and date of construction, use, and reuse. A similar example comes from the thousands of stone-built enclosures documented in the Black Desert (Meister *et al.* 2019). A variety of interpretations have been proposed for these features, including their use as animal pens (e.g. Rollefson *et al.* 2014) or, alternatively, that they had a residential or even a cultic function (Kennedy 2011: 3189; Kennedy 2012b): these interpretations remain assumed rather than substantiated. Again, excavations are required to establish the ways in which these features were used in the past. If, for example, these features were primarily used to confine animals one would expect limited artefactual remains and, instead, the presence of animal remains, such as in the form of macro- or microscopic dung remains (e.g. Rosen *et al.* 2005; Shahack-Gross and Finkelstein 2008; Shahack-Gross *et al.* 2014). If, on the other hand, they were used for residential purposes one may expect to find artefacts that were used in such contexts, like fire places, or perhaps the footings of tents or huts (Cribb 1991; Rosen 2003; Simms 1988).

In addition to establishing the way in which permanent architectural features may have been practically used, understanding the purpose of these features in nomadic landscapes also entails studying

them within their broader geographic context. Given the inherently mobile character of nomadic communities, the features they leave behind in the landscape cannot be adequately evaluated when studied in isolation. Instead, the structure of the landscape within which these features are present needs to be investigated. Nomadic landscapes consist of a variety of man-made features, artefacts, and natural elements that reflect the patterned engagement of nomadic communities with these landscapes (Frachetti 2008; Hammer 2012). This patterning may be identified by investigating relationships between various elements of the landscape, both natural and man-made. It is important, in this respect, to take into account various temporal and spatial scales on which these features may have functioned (cf. Cribb 1991: 19; Frachetti 2008; Honeychurch and Makarewicz 2016).

Temporality is of direct relevance, as stone-built features may have been used long after their initial construction. Moreover, this may be one of the very reasons why such architecture was created. There is a wide range of ethnographic examples in which nomads structure the landscape in ways that are related to anticipated future engagement with that landscape. Butler, who travelled through Northern Arabia in 1908, describes how piles of stone are used as territorial markers. His travelogue reports: '*A noticeable thing about all the country between Kabweisa and the hollow of Al Jauf is the presence of many "riġms," or piles of stones, which mark the boundaries of the authority of various Beduin sheikhs.*' (Butler 1909: 520). These features were thus purposefully created to communicate territorial claims, also when those who laid claim were not physically present themselves. In a recent study by Hammer (2012, 2014), many more examples are presented for the construction of permanent features in the landscape. She interprets these features as a kind of "landscape capital" in which investment in stone-built architecture served to facilitate certain social and economic strategies in the long term. Examples are features that improved the quality of pasture such as cairn fields and check dams, as well as stone-built enclosures used to provide shelter in winter long after their initial construction (Hammer 2012, 2014). To investigate these possibilities through archaeological remains, it is important to regard to what degree features may have been reused and modified over time. This entails establishing detailed chronological reconstructions of particular use phases of features through excavations and relative or absolute dating methods.

Equally relevant is the spatial scale on which a stone-built feature, or a collection thereof, may have functioned. Nomads typically operate over large geographic areas, and their migrations may extend over areas of dozens or even hundreds of kilometres. Even so, their daily activity radius may be confined to a much smaller geographic area (Hammer 2012). Similarly, the features that are created in the landscape may be related to the variety of geographic scales in which nomads operate. The spatial distribution of desert kites may serve as an example here. It has often been noted how the local topography of the landscape is employed in the functioning of these features. For the purpose of hunting wild animals, the traps of these features were purposefully created behind ridges, obscuring their presence from view of approaching game (Abu-Azizeh and Tarawneh 2015). In this sense, the functioning of a kite is understood through analysing its local landscape context. But desert kites were structured on a much larger scale as well, as they form strings of similar features extending for many dozens of kilometres across the *harra* landscapes (Betts and Burke 2015). The construction of these series of kites did not only require a large amount of time and energy, but possibly also considerable planning and cooperation between many people (Crassard *et al.* 2015: 1096). These multi-scalar analyses (cf. Frachetti 2008) thus provide complementary information on the function of desert kites. Understanding the construction and use of other types of permanent architectural features may benefit from similar multi-scalar analyses.

In summary, in order to better understand why stone-built architecture was created in the landscapes of the Black Desert by nomads, the following aspects should be investigated. Firstly, a better understanding of the function of various types of stone-built features should be obtained. How were features such as enclosures and cairns practically used? Secondly, it should be investigated whether these features were created to function over the long term, or for ephemeral use only. Were these features used on multiple

occasions and, if so, in what fashion? Thirdly, it should be explored how these features functioned in a wider landscape context. To what degree were specific areas in the landscape favoured over others for the creation of certain features, and what do these patterns tell about the function of such features?

1.5.3 Investigating nomadic landscapes of the Jebel Qurma region

The foregoing paragraphs explored how nomadic landscapes may be revealed through archaeological methods, and how the construction of permanent features in the landscape may be understood. Based on this, the methods and analyses that were employed in this research are outlined in this paragraph.

The first step in this research was to compile an inventory of the archaeological remains in the Jebel Qurma region, based on fieldwork carried out there by the *Jebel Qurma Archaeological Landscape Project* between 2012 and 2016. This research included a remote sensing study, in which an initial inventory of archaeological remains was compiled through the study of aerial photographs and satellite imagery. As discussed above, remote sensing in the Black Desert is an effective method of obtaining a broad overview of the types of archaeological features present in the *harra* landscapes of the Black Desert. At the same time, however, more detailed information on the nature and chronology of the archaeological remains can only be acquired through direct field work. Data from pedestrian surveys and excavations were therefore also employed in this research. Pedestrian surveys in the Jebel Qurma region were carried out using a highly intensive survey method, as discussed above, which is ideally used to obtain a more targeted overview of the diversity of ancient remains within the nomadic landscape. Various kinds of remains that could not be studied through remote sensing were documented through this intensive survey, including small stone-built features as well as rock art, inscriptions, and artefacts present on the surface. Even more detailed information on the nature and chronology of individual features was acquired through excavations at a number of sites.

These datasets were then used to reconstruct a broad chronology of inhabitation of the Jebel Qurma region in the Classical and Late Antique periods. Essential in this respect were different kinds of remains that could be dated with relative or absolute dating methods. Many ceramics were collected that could be relatively dated on typological grounds; absolute dating methods included radiocarbon dating of charred plant material and skeletal remains, as well as OSL dating of soil sediments. These absolute dating methods were specifically used to determine the construction date of several types of stone-built features.

In order to better understand why certain features were constructed in the landscapes of the Jebel Qurma region, the results of the pedestrian surveys and excavations were analysed together. The excavation results were used to qualify how individual features were used in the past, while the results from pedestrian surveys identified how these features may have functioned on various geographic scales. Other elements of the landscape, both natural and anthropogenic, also were taken into account for this purpose. The natural elements of the landscapes of the study area were reconstructed on the basis of various datasets, including cartographic information, satellite imagery, but also environmental proxies such as botanical remains.

1.6 Brief structure of this book

In the subsequent chapter, this book continues with a study of the natural elements of the landscapes of the Jebel Qurma region. This provides the wider context of the archaeological remains discussed in the remainder of this book. Chapter 3 presents an overview of the archaeological remains that were documented in the Jebel Qurma region through pedestrian and remote sensing surveys. It also includes a first chronological overview of the history of inhabitation in the Jebel Qurma region, based on the analyses of datable remains collected on the surface, including pottery sherds. It further provides an

initial assessment of the types of stone-built features that were potentially used during the period under investigation. Chapters 4 and 5 present the results of excavations carried out at a number of stone-built features to offer a more detailed view of these features. The spatial distribution of these features is analysed across the landscapes of the study area. A discussion of the results of the surveys, excavations, and analyses is presented in Chapter 6, which already aims to provide answers to some of the questions posed in this introductory chapter. Finally, an answer to the main research question of this study is formulated in Chapter 7, which also includes an evaluation of the methods employed in this study, as well as suggestions for future research.

Chapter 2 - The Natural Environment of the Jebel Qurma Region

2.1 Introduction

The Jebel Qurma region is highly diverse in terms of its natural environment and hosts a large number of archaeological remains from prehistoric until recent times, together comprising a diverse series of archaeological landscapes. While its archaeological remains are presented in Chapters 3 to 5, the aim of this chapter is to describe the natural aspects of the study area and the methods employed to study them. Although natural and cultural elements of archaeological landscapes are always entwined to some degree, archaeological remains are always fixed to an environment largely created by natural forces. This natural base of the archaeological landscape provides a good starting point in the study of nomadic landscapes.

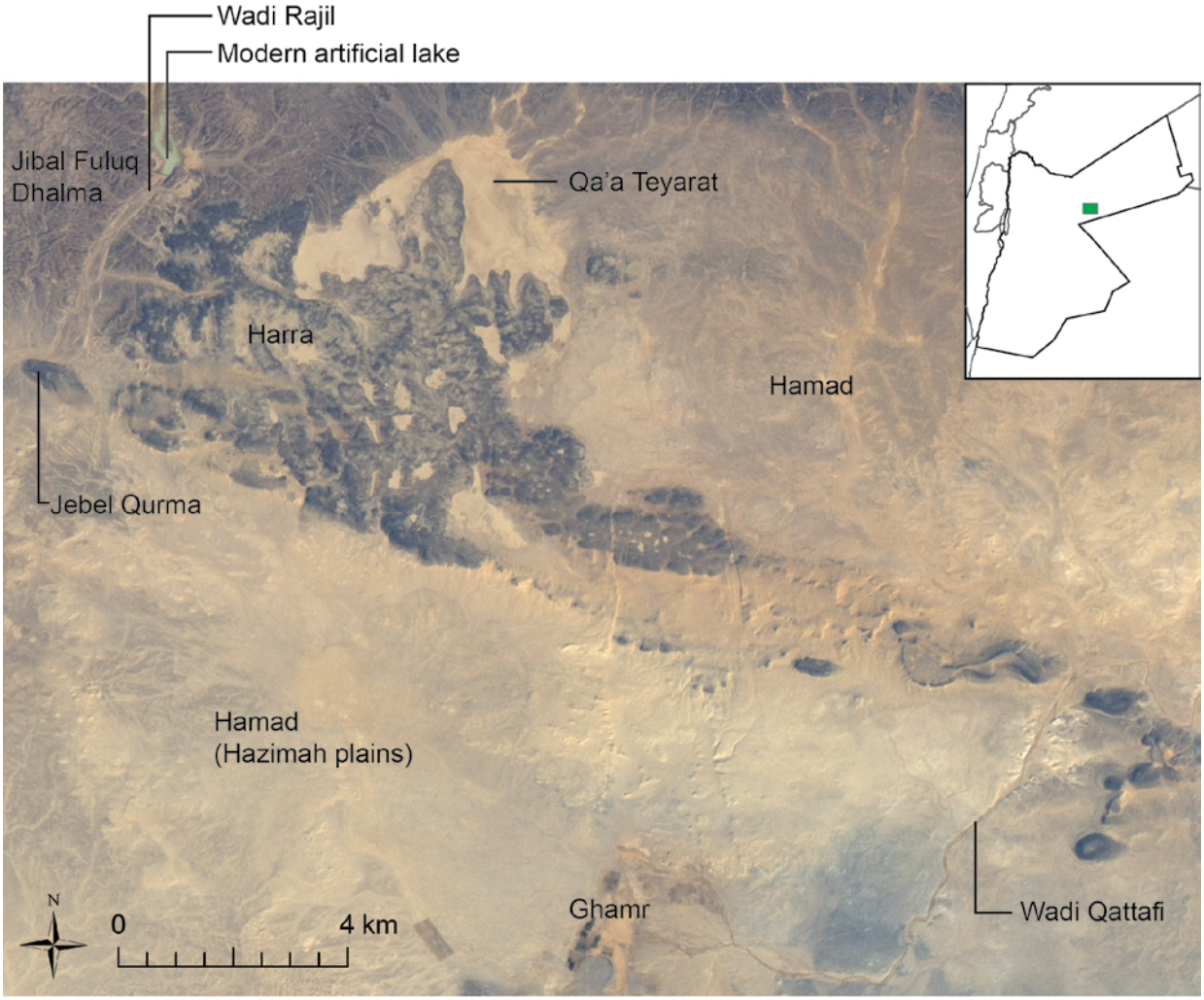


Figure 2.1 Satellite photo of the Jebel Qurma region, with relevant features indicated (insert: location of the study area (green) in Jordan). Base map: Landsat 7, true colours.

Yet, this chapter is more than simply a description of the types of natural landscapes encountered in the study area. It additionally presents the results of a number of digital modelling procedures. These results are crucial to understand the structure of the nomadic landscape, as discussed further in this book. Datasets containing information on the physical environment, such as geological maps,

topographic maps, and satellite imagery, needed to be transformed in such a way that they could be used for later quantitative and qualitative analyses. For example, although satellite photographs may provide a sense of what the physical environment looks like, it requires classification in order to make the image analytically useful. Therefore, a number of datasets on the natural environment (mostly remote-sensing data) were digitally processed for later analyses. Furthermore, published literature on the Black Desert in general and, to a lesser degree, on the Jebel Qurma region in particular were integrated.

The study area of the Jebel Qurma Archaeological Landscape Project was set out at the onset of the project in 2012. This was done on the basis of a number of major topographic boundaries such as wadi courses and hills. The study area is situated between coordinates[1] 323020 E, 3522870 N and 343985 E, 3506805 N – an area of 336 km^2. It is roughly bordered on the west side by Wadi Rajil, and on the east and south sides by Wadi Qattafi (Figure 2.1).

2.2 Regional setting

The Black Desert derives its name from the seemingly endless blanket of dark basalt boulders and cobbles that covers a low limestone plateau. This basalt surface cover was formed through the weathering and fragmentation of solidified lava flows (Figure 2.2), which erupted from the earth's crust mostly between 8.9 and 0.1 million years ago (Bender 1968: 106).

Figure 2.2 A harra surface in the Jebel Qurma region showing the densely packed fields of angular basalt rocks.

Jordan's Black Desert generally experiences hot summers with maximum temperatures of between 35 and 38 °C on average, with absolute maximum temperatures exceeding 46 °C. In winter the average minimum temperatures are between 2 and 9 °C, although occasionally it may freeze. Westerly winds

[1] All coordinates given in this book are UTM coordinates (Zone 37R).

predominate year-round (Al-Homoud *et al.* 1995: 58-9). The climate of the Jebel Qurma region can be characterised as a hot desert climate – or BWh in the Köppen climate classification system (Allison *et al.* 2000: 354).

Figure 2.3 Two seasonal conditions of Wadi Rajil: completely dry with steeply carved banks; and filled with fast flowing water after torrential rains. Photos by P. Akkermans.

Today, the Black Desert receives between 150 to 200 mm of average annual rainfall in the north and less than 50 mm in the south, which makes this an arid region unsuitable for large-scale rain-fed agriculture. The Jebel Qurma region is situated in an area that receives less than 50 mm of annual rainfall. Precipitation usually only occurs from November through May, although most of it falls from December through March, and often in the form of short but heavy storms (Al-Homoud *et al.* 1995: 58). It should be noted, however, that such precipitation trends are averages and can greatly vary between one year and the next. Rainfalls may be very localised in desert regions, and may thus result in the presence of surface water in one region, while a neighbouring area located only a few kilometres away may remain dry (Laity 2008: 56). Also, long periods of drought may occur. In fact, repeated seasonal dry spells lasting a few decades may occur in the Middle East (e.g. Cook *et al.* 2016; Enzel *et al.* 2003). This has severe repercussions for an environmentally marginal area such as the Black Desert, possibly resulting in rendering certain regions completely dry for several years on row. The availability of surface water and the degree of soil moisture are equally erratic. Runoff rates are usually high given the low permeability of soils in the Black Desert and the widespread presence of desert pavements. Water from rainfall is thus quickly carried off, either to major wadis (Figure 2.3) or, in many cases to mudflats. A mudflat (or *qa'a* in Arabic) occurs at the bottom of an endorheic or closed basin where runoff water is contained on the

Figure 2.4 A mudflat before and after heavy rainfall. Photos from the Jebel Qurma region by author (right) and P. Akkermans (left).

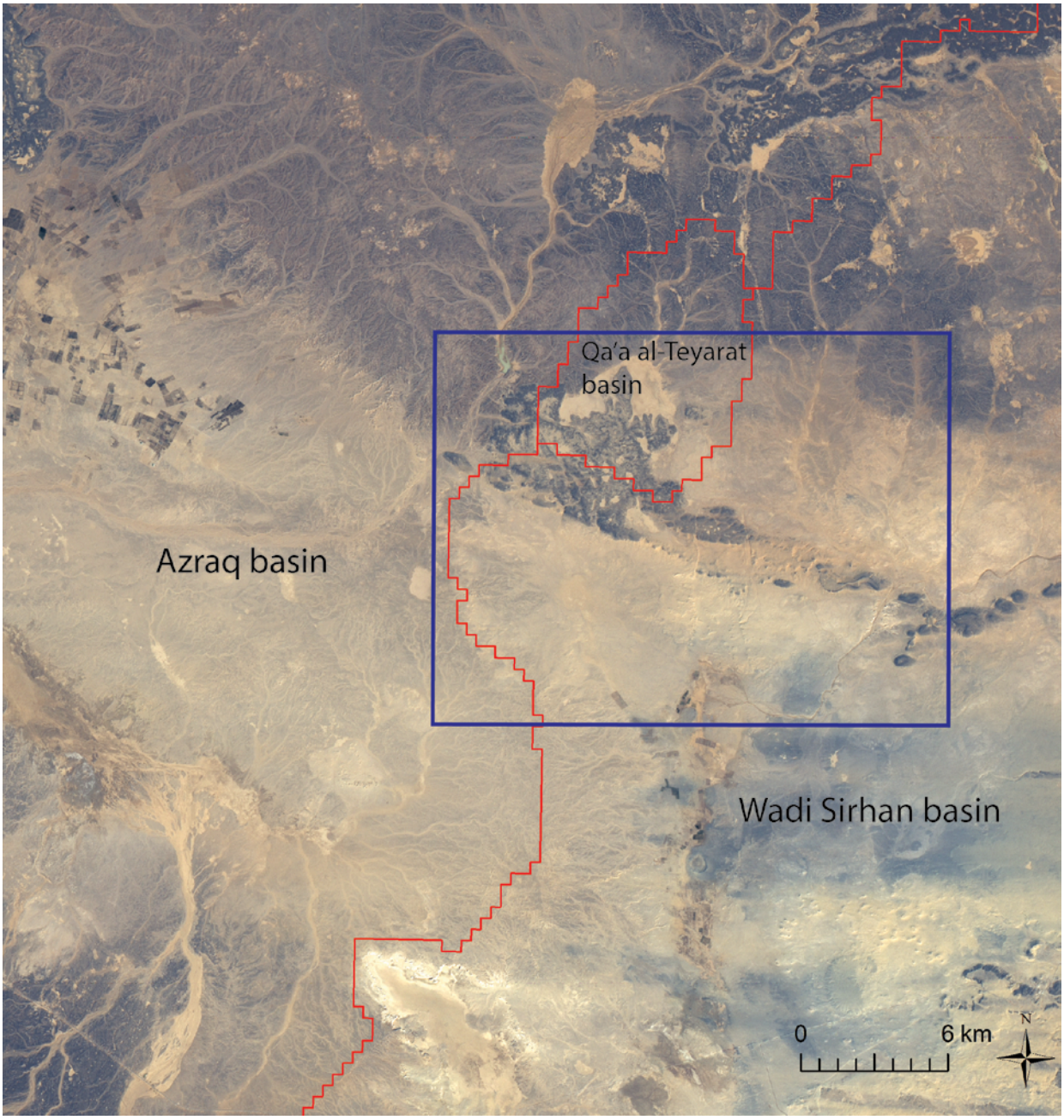


Figure 2.5 The Jebel Qurma region, outlined in blue, with the borders (i.e. watersheds) of its three drainage basins indicated in red. Base map: Landsat 7, true colours. Watershed boundaries are based on HydroSHEDs data.

surface as a shallow temporary lake until it evaporates (Figure 2.4). Silts carried within the water are deposited here and form a mudflat. Mudflats also occur in wadis if the wadi gradient is limited, in which case the mudflat is called a *marab* rather than a *qa'a* (Allison *et al.* 2000: 362).

There are a few places situated at the fringes of the Black Desert where water is available permanently, such as at the larger oasis towns of Azraq in Jordan and Jawf in Saudi Arabia. Additionally, there are a number of small pools — sometimes artificially created in the past — such as at Wisad and Burqu' in Jordan, and at Nemara in Syria.

As a consequence of the hydrological conditions of the Black Desert at large, surface water may be transported from areas of high rainfall to comparatively dry regions. This has major consequences for the Jebel Qurma region as it receives surface water from rainfall occurring dozens of kilometres away. The Jebel Qurma region is located on the border of three water drainage systems (Figure 2.5), all of which are endorheic basins. The largest of these systems is the Azraq basin, covering an area of over 10,000 km^2. The Azraq oasis lies at the centre of this basin and contains water throughout the year, despite the fact that modern artificial maintenance of the springs is required to counter large-scale pumping activities. One of the major wadis of the Azraq basin is Wadi Rajil, which originates on the slopes of Jebel Druze in Syria. Wadi Rajil runs through the northwestern part of the Jebel Qurma region and, importantly, may carry large amounts of water through the region.

The second drainage basin partially situated in the research area is part of the Wadi Sirhan system, which is a low-lying area comprising multiple drainage basins and is distributed over a northwest-southeast axis. A major wadi of the Sirhan system is Wadi Qattafi, which runs through the Jebel Qurma region and culminates at the small oases of Ghamr, situated in the south of the research area, and further south at Hazim, which is known already from historical times because of the presence of wells. The drainage system of the Wadi Qattafi is mostly situated to the northeast of the Jebel Qurma region. The catchment area of this wadi is much smaller and situated in a more arid region in comparison with the Wadi Rajil catchment area, and thus carries smaller amounts of water through the Jebel Qurma region.

The third drainage basin is a relatively small, localized endorheic basin of about 65 km^2. At its centre lies the extensive qa'a that is locally known as the Qa'a al-Teyarat (or *Flat of the Airplanes* – derived from its use as an airstrip in the colonial past), where surface water from local rainfall may collect in wet seasons.

The dry, stony basalt that makes up the Black Desert is bordered to the northwest by the Hauran region. This is also a basalt-covered region but receives much more rainfall annually, making it a highly fertile region suitable for agriculture. However, to the north, east, and west of the Black Desert extends the vast and dry plains of the *hamad*, covered by limestone gravel and, in places, by a desert pavement of flint eroded from the limestone substrate. Together the *harra* and *hamad* make up a larger desert region known in Arabic as the *Badiyat as-Sham*, or in western terminology as the Syrian Desert. It is bordered to the north by the Euphrates river and in the south by the Nefud desert in central Arabia. The latter also forms the southern boundary of the *Harrat al-Sham*. It is also here, on the border between the *harra* and the Nefud, that the historically relevant oasis of Jawf is situated. The Jebel Qurma region is situated on a border zone between *harra* and *hamad*. To the north extend more *harra* landscapes that continue almost uninterrupted into southern Syria. To the west, south, and east, however, *hamad* landscapes stretch out comprising gravel plains and low, flint-covered hills.

In terms of vegetation, the Black Desert lies in the Saharo-Arabian desert vegetation zone, in which Al-Eisawi (1985) has defined four sub-zones based on soil types: *harra* soils, gravelly (*hamad*) soils, wadi soils and saline (mudflat) soils. Each of these sub-zones hosts a number of plant species. Large shrubs such as *Tamarix*, and *Retama raetam* mostly grow in wadis, whereas smaller shrubs, such as *Artemisia herba-alba*, *Atriplex*, *Astragalus* and others may also occur in gravelly soils beyond the wadis. Annual plants such as *Anthemis deserti* and *Asteriscus pygmaeus*, as well as grasses, are entirely restricted to the *harra* landscapes, where they may quickly grow in the event of rainfall. Mudflats host a number of salt-tolerant species such as *Nitraria retusa* but also large *Tamarix* shrubs (Al-Eisawi 1985; Cordova 2007: 104-6).

To what degree the climate and environmental conditions in the Black Desert in the past may have differed from the present situation is difficult to ascertain. There are hardly any published palaeoclimatological or environmental proxies in the Black Desert from the Late Holocene. Safaitic

inscriptions and petroglyphs indicating nomadic camel- and sheepherders suggest that environmental conditions may have resembled present-day conditions, although only to a very limited degree. This would suggest strong seasonal fluctuations in the availability of resources vital to a pastoralist economy (e.g. water and pastures), which is corroborated by epigraphic sources from the region (see Chapter 1). The region may also have been affected by changes in climatic conditions that occurred during the Late Holocene in the eastern Mediterranean region. Such oscillations can be observed in climatic proxies from regions further to the west, such as the Dead Sea, Soreq Cave near Jerusalem, and the eastern Mediterranean (Bar-Matthews and Ayalon 2004; Bookman *et al.* 2004; Migowski *et al.* 2006; Neumann *et al.* 2007; Orland *et al.* 2009; Schilman *et al.* 2001, 2002). Whereas much of the first millennium BC is generally associated with relatively arid conditions and precipitation rates much lower than today (Bar-Matthews *et al.* 1998; Roberts *et al.* 2011), a more humid phase seems to have started sometime towards the end of the millennium. Climatic data from Dead Sea lake sediments indicate that this humid phase started somewhere between *ca.* 500 and 200 BC (Bookman *et al.* 2004; Migowski *et al.* 2006; Neuman *et al.* 2007), whereas proxies from Soreq Cave and the eastern Mediterranean date the starting point to *ca.* 50 BC (Schilman *et al.* 2002). This humid period seems to have lasted until about AD 700, although the Dead Sea proxies indicate that it may have been interrupted by a period of aridity between *ca.* 50 and 400 AD (Migowski *et al.* 2006). Others have dated this intermediate dry spell in the Levant between *ca.* 300 and 470 AD (Izdebski *et al.* 2015). The onset of increased aridity around 700 AD is well attested at the Dead Sea, Soreq Cave, and the eastern Mediterranean cores, and seems to have continued until about 1100 AD (Bar-Matthews and Ayalon 2004; Izdebski *et al.* 2015; Migowksi *et al.* 2006; Schilman *et al.* 2001, 2002). Although the various proxies are not conclusive about the exact chronology and magnitude of these climatic oscillations they seem to represent fairly well-established trends for the Levantine region. However, it is much more difficult to ascertain to what degree and in what way climatic conditions affected more localized environmental conditions, as it is difficult to identify direct climatic effects on environmental conditions, and this may vary from region to region. More detailed information on environmental conditions and oscillations regarding the Black Desert during Classical and Late Antiquity therefore remain scarce. One notable exception in this respect is a recent study on pollen samples from the Azraq oasis, from which it was concluded that Azraq and its surroundings were dominated by a Saharo-Arabian vegetation type between *ca.* 600 and 1400 AD (Woolfenden and Ababneh 2011), which is comparable to today's vegetation type (see above).

Other major issues that remain unresolved concern the stability of environmental conditions in the Black Desert, and the degree of fertility of its soils. Nowadays, the timing and amount of rainfall in the region is highly unpredictable. In some years, no rain at all may fall, while in other years short but heavy storms may cause flooding of wadis. Furthermore, in times of rainfall the high rate of water runoff prevents moisture absorption by soils and the subsequent growth of vegetation. Although it is not unthinkable that soils of much higher fertility may have been present in the region in the past (Rollefson *et al.* 2014; Rowan *et al.* 2015), any evidence for this is presently unavailable.

2.3 Modelling the physical geography of the Jebel Qurma region

Having discussed the regional setting of the Jebel Qurma region, the physical geography of the study area itself will now be presented in greater detail. While several studies focus on the physical geography of the Black Desert in general, more detailed information on the Jebel Qurma region is much more scarce. Therefore, part of the data presented below represents new information acquired through satellite remote sensing, and landscape models that were created based on these data, especially in terms of topography, surface cover, and visibility.

2.3.1 Data acquisition and processing

This discussion of the physical characteristics of the study area is based on a variety of datasets. What follows is a brief description of these datasets and the way in which they were digitally processed to be incorporated and analysed in a Geographic Information System (GIS). The GIS software package used in this study is ArcGIS. Detailed descriptions of data processing and modelling procedures, including the steps followed and tools used in ArcGIS, can be found in Appendix A.

2.3.1.1 Hardcopy maps

Topographic maps of the study area that were obtained from the Jordanian Natural Resource Authorities included four 1:50,000 scale hardcopy maps (sheets 3453 I to IV) that were digitally scanned and mosaicked. Geological maps covering the Jebel Qurma region had the same sheet numbers, and were obtained and processed in a similar way. These geological maps were published together with short but insightful reports (Abdelhamid 1999; Rabba' 1998, 2005). The features from these maps, including geological and geomorphological units, were then digitally traced in ArcGIS. Comparisons with more recent satellite imagery, however, indicated that the accuracy of these maps is fairly limited, and additional datasets on local geological conditions were thus required.

2.3.1.2 Satellite imagery

Different types of satellite imagery were obtained that provided information on local geology, topography, and hydrology. The first type are Landsat images, which are low-resolution satellite images that are freely accessible online through the United States Geological Survey. Landsat is the name of a long-term satellite photography mission begun in 1972 with the launching of the Landsat 1 satellite, and has since launched seven more earth-observing satellites. Three of these satellites are still currently operational (Landsat 5, 7 and 8). The cameras on these satellites are multispectral, meaning that they record different wavelengths of light, including those that lie beyond the limits of human vision, such as infrared (IR), and near-infrared (NIR) wavelengths. The spatial resolution of the imagery varies between 15 m and 120 m, depending on the recorded wavelength. The imagery is thus not suitable to detect small-sized archaeological features. Rather, their advantage lies in combining different bandwidths to study specific phenomena, such as water bodies, vegetation, or other types of surface cover. Furthermore, as the images are freely available online and are frequently updated, Landsat images can be used to study relatively rapid developments on the earth's surface, including developments in surface water and vegetation (cf. Parcak 2009: 58-64).

Another type of optical satellite imagery used for this study is Ikonos imagery, which was originally a product of the commercial satellite company GeoEye. The Ikonos satellite produced optical imagery of the earth's surface between 1999 and 2015. The imagery has a high spatial resolution, of about 0.8 m. Also, the imagery has five bands: panchromatic, blue, green, red, and NIR. Ikonos imagery was acquired from the Jordan Oil Shale Company (JOSCO) as a derived product, meaning that all processing was done by JOSCO prior to acquisition. The imagery had been orthorectified using a 30 m ASTER GDEM and 12 ground control points, and pan-sharpened in 80 cm resolution. Ikonos imagery could be directly imported into ArcGIS.

Although hardcopy geological maps were available for the study area, these proved to be of limited spatial accuracy. Therefore, Landsat 8 imagery was used to model the surface cover in the Jebel Qurma region. A combination of bands 7 and 6 (shortwave infrared light), and 5 (near-infrared light) was used to classify the Landsat imagery based on surface cover. This combination of bands highlighted lithological differences on the imagery, as different rock or soil surfaces reflect different wavelengths of light, especially shortwave infrared and near-infrared light spectra (Leverington and Moon 2012). The resulting imagery (Figure 2.6) was classified following a Supervised Classification procedure in ArcGIS (see Appendix A). Signature polygons were created on the basis of high resolution Ikonos imagery and

geological maps, on which different land cover areas could be identified, while the actual signatures were derived from the Landsat composite raster that contained the near- and shortwave infrared bands. On the basis of these signatures, the Landsat raster that covered the complete study area was classified in terms of surface cover (see § 2.3.3.2).

Satellite imagery containing information on the topography of the entire study area included Shuttle Radar Topography Mission (SRTM) images, which consist of elevation data in a *ca.* 90 m resolution raster. More accurate elevation data includes WorldDEM radar data that was obtained from Airbus Defense and Space. WorldDEM data are of a much higher spatial resolution (0.4 arc-second or *ca.* 12 m per pixel), and is based on imagery from the TerraSAR-X and TanDEM-X satellites. Both SRTM and WorldDEM data could be used to produce Digital Elevation Models (DEMs) of the study area, which were used to create additional topographic models. WorldDEM data were only available for the western part of the study area (see Figure 2.7), and the subsequent use of these data in landscape modelling procedures is therefore confined by the limits of the data extent (see, e.g., Figures 2.14 and 2.20). Such modelling procedures included the calculation of slope degrees and profile curvatures in the study area (see Appendix A for digital modelling procedures), and the creation of a Hillslope Position Classification (HPC) raster in ArcGIS, based on WorldDEM data. In an HPC raster, topographic features are classified according to three

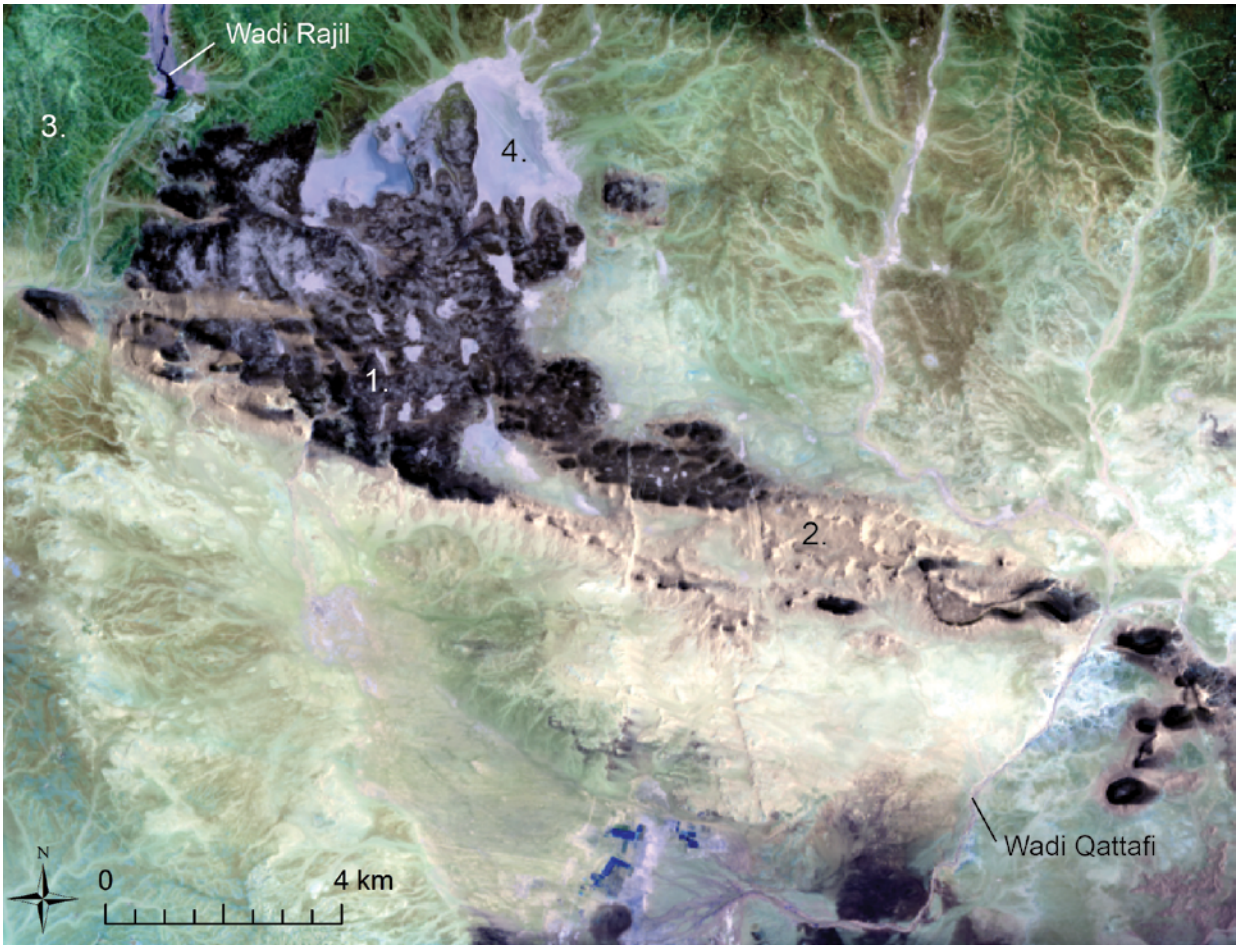


Figure 2.6 The Jebel Qurma region on false colour Landsat 8 imagery (bands 7-6-5), highlighting lithological differences on the surface, such as: (1) basalt; (2) sand covering basalts; (3) chert; and (4) mudflats.

different variables: slope degree, profile curvature, and relative elevation (following Miller 2014; Miller and Schaetzl 2015). On the basis of these variables, a differentiation was made between topographic lows, modest slopes, steep slopes, shoulders (or ridges), and topographic highs (see Figure 2.14).

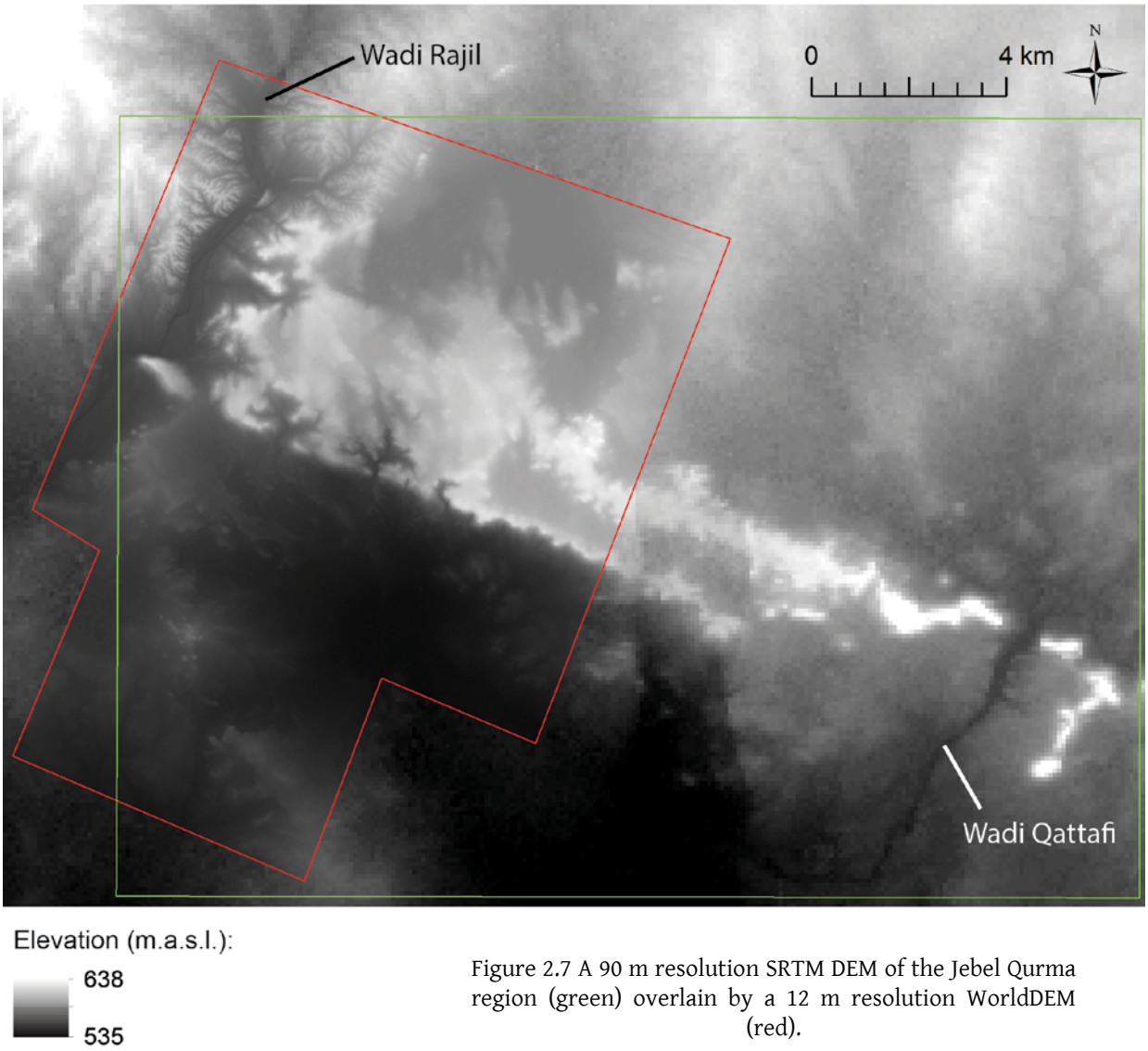


Figure 2.7 A 90 m resolution SRTM DEM of the Jebel Qurma region (green) overlain by a 12 m resolution WorldDEM (red).

The WorldDEM raster was further used to execute a number of analyses related to visibility. It defined areas in the landscape that can be observed from many points within that landscape, such as hilltops, extensive plains, and so on. Less prominent locations are secluded areas that are often hidden from view, such as deep valleys and depressions in the landscape. In order to differentiate between different degrees of visual prominence, a cumulative viewshed was created of the area covered by the WorldDEM dataset (see Appendix A). In a viewshed, the visibility of each cell of a DEM from one or multiple locations in the landscape – or 'observer points' – is calculated. The value of each cell of a viewshed raster indicates from how many observer points the cell is visible. In a cumulative viewshed, the values of multiple viewsheds are summed. In a cumulative viewshed, a differentiation is made between locations in the landscape that are generally more visible than others. It thus calculates the degree of visual prominence of each location in the landscape (see § 2.3.6).

The WorldDEM data were also used to define locations in the landscape that were visually dominant features along the horizon. Although what is visible along the horizon depends largely on the location of an observer, it is possible to differentiate between parts of the landscape that are more often visible along the horizon than others. These features represent the 'skyline' of a landscape which are visible on the horizon more often than other features although they are not visible from every location in the landscape. The 'Skyline' tool in ArcGIS was used to create such skylines, and was specifically calculated using observer points placed in areas representing topographic lows, based on the Hillslope Position Classification. By doing so, a map was created showing features that are most dominant along the horizon when looking around from low-lying areas in the landscape (see § 2.3.6).

Furthermore, the surface cover classification derived from Landsat 8 imagery and the slope degrees derived from WorldDEM data were combined to create a cost surface raster, in which the relative costs of movement through a particular area were calculated. In this model, the cost of movement is based on two parameters, namely the degree of slope and the surface cover of the terrain. This is based on the assumption that it costs more energy to pass over steep slopes than over flat areas, and passing through rough surfaces, such as basalt, is more costly than passing over smoother surfaces, such as limestone. Slope and surface cover classes were scaled from 1 to 10 and compared, resulting in a cost surface raster that represents relative costs of movement (see Appendix A).

Satellite data on the hydrology of the study area included HydroSHEDs data, which are a derivative of SRTM imagery that are compiled by the WWF Conservation Science Program. HydroSHEDs is an abbreviation of 'Hydrological data and maps based on Shuttle Elevation Derivatives at multiple scales' and contains hydrological information on, for example, drainage networks and watershed boundaries on a large geographic scale. WorldDEM data were used for hydrological modeling on the scale of the study area. On the basis of WorldDEM data, the Hydrology toolbox in ArcGIS was used to model wadi courses and drainage basins in the study area, as well as to model tributary valley systems and endorheic basins (see § 2.3.4).

2.3.2. Geology

The Jebel Qurma region hosts a variety of geological formations and fault lines that form the basis of its geomorphology, topography, and hydrology. These formations (Figure 2.8) will now be discussed in chronological order.

The oldest formation in the Jebel Qurma region is the Umm Rijam Chert-Limestone formation, which is a marine bottom formation dated to the Lower to Middle Eocene. It consists of whitish to beige limestone with beds of red-brown or grey to black chert. The formation is between 30 and 85 m thick (Abdelhamid 1999: 10-12; Rabba' 2005: 5). Geological maps indicate that it is mostly present at the surface in its north-western and north-eastern corners of the study area, as well as on some isolated hills within Wadi Rajil.

The Umm Rijam formation is covered in places by the Wadi Shallala Chalk formation, which dates to the Middle Eocene and is also a sedimentary marine bottom deposit. It is characterised by white-grey to yellow chalk, and thin beds of chert. This formation is up to 28 m thick (Abdelhamid 1999: 12; Rabba' 2005: 5-6). The geological maps indicate that it is mostly present in the eastern part of the Jebel Qurma region.

Covering parts of the Umm Rijam and Wadi Shallala formation are particular types of basalt that are part of the Wisad group. These basalts date between *ca.* 13 and 8 mya and are mostly grey to light grey in colour (Rabba' 2005: 11-12). They are mostly present in the central southern parts of the Jebel Qurma region. A particular basalt formation that is part of the Wisad group is the Wadi as-Subhi basalt, which

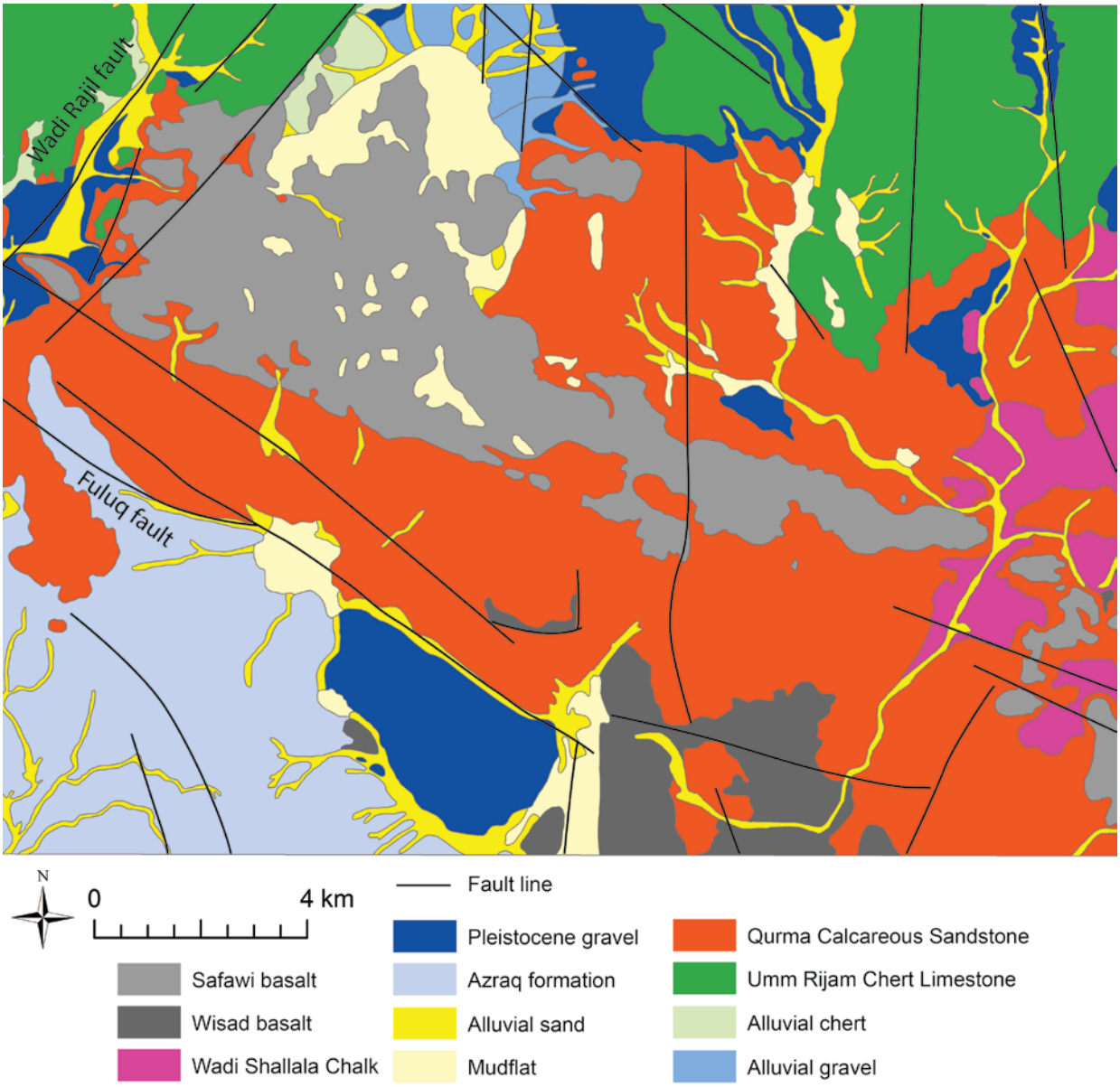


Figure 2.8 Geological map of the Jebel Qurma region. Adapted from Abdelhamid (1999) and Rabba' (1998, 2005).

is typically formed in large plates, and may have been an important building material. It is therefore important to note that the basalts of the Wisad group are not found in the study area, but only in regions further to the east. In the Jebel Qurma region, non-platy Wisad basalts are found in a relatively small area in the south-eastern part of the region.

Another sedimentary formation, this time slightly younger than the Wisad basalts, is the Qurma Calcareous Sandstone formation, dated to the Late Miocene. It overlies the Wadi Shallala and Wisad formations. The Qurma formation consists of sandstones of various colours – from white to pink to reddish brown – and is often covered by light grey to beige quartzites. This formation is up to 29 m thick (Abdelhamid 1999: 12-14; Rabba' 2005: 5-6). In the Jebel Qurma region it is found mostly in the central and south-eastern areas.

The main body of basalts in the study area are part of the Safawi group, which dates to *ca.* 8.9-8.7 mya, and is slightly younger than the Wisad basalts and the Qurma Calcareous Sandstone formation. These basalts also overlie the Wadi Shallala formation in places. The Safawi basalt flows are between 10 and 50 m thick, although they are usually heavily weathered into irregularly shaped angular blocks of a dark blueish grey to brownish or black colour. Their texture is usually relatively dense, although more vesicular basalts may occur in places (Abdelhamid 1999: 5; Rabba' 1998: 7; Rabba' 2005: 14). Safawi basalts are centrally located in the Jebel Qurma region, almost like an island of basalt, surrounded by sedimentary formations.

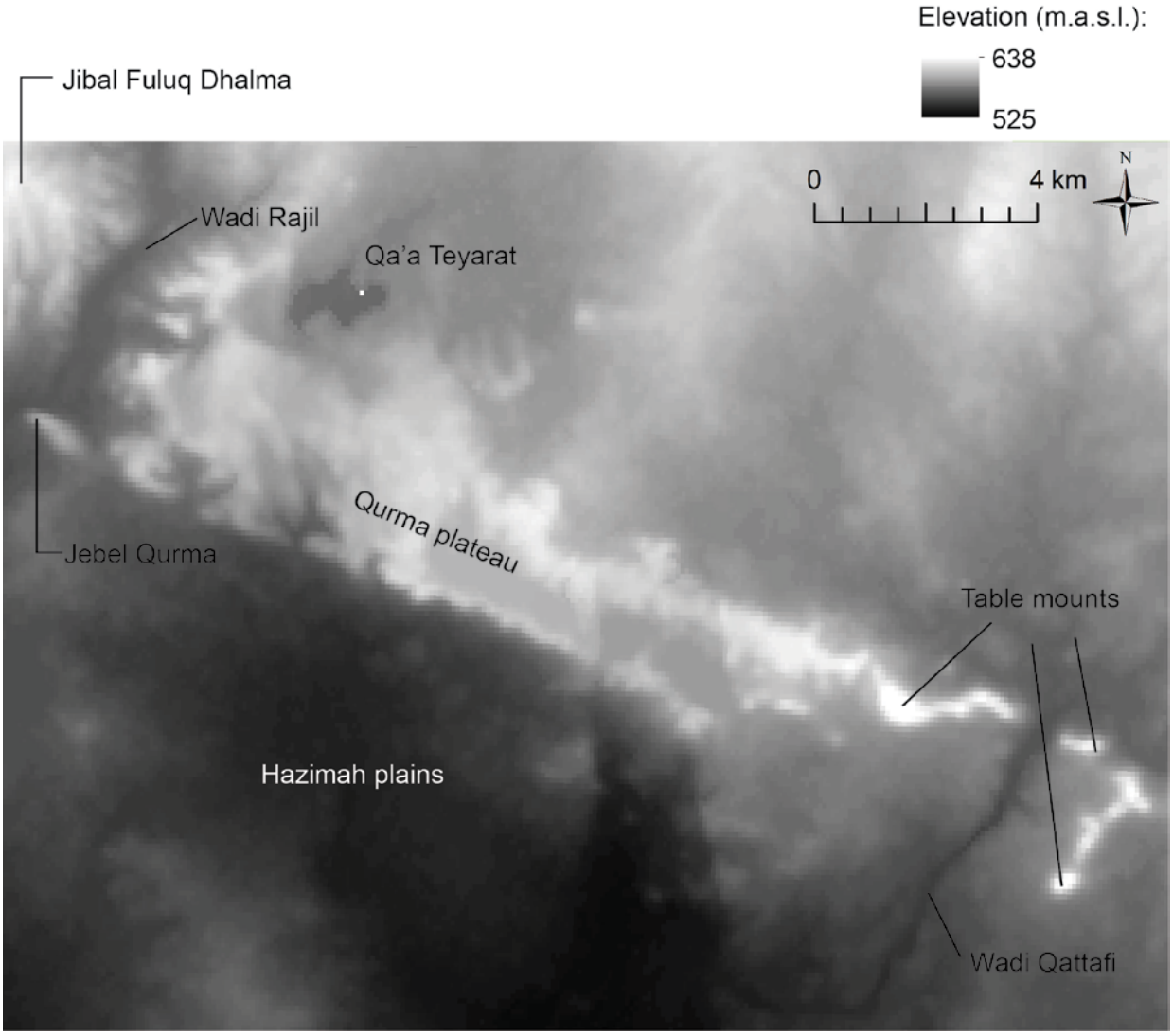


Figure 2.9 Elevation map of the Jebel Qurma region with relevant topographic features indicated. Base map: SRTM DEM.

A relatively young sedimentary formation, dated to the Plio- and Pleistocene, and thus post-dating the Safawi basalts, is the Azraq formation. It is a lacustrine formation and consists of a mixture of sedimentary rock types, including sandstone, limestone, gypsum. While it may also comprise loose sands, silts and gravels, the upper, exposed parts mainly consist of limestone and sandstone (Abdelhamid 1999: 14-15; Rabba' 1998: 12). The Azraq formation mostly occurs in the southwestern corner of the study area.

Covering large parts of the Jebel Qurma region is a series of what are described as superficial Quaternary deposits, which may cover the older formations to a large extent. These deposits consist of two main components, Pleistocene gravels and Holocene alluvial deposits. The Pleistocene gravels consist of a combination of chert, limestone and basalt clasts. These gravels often form a desert pavement with a distinctive dark colour. The Holocene alluvial deposits comprise sandy deposits in wadis, where the sands also contain cobbles and pebbles of chert and limestone, and mudflat deposits made up of silt, silty clay, and fine sand. Additionally, Holocene deposits include alluvial fans that run down eroded hill slopes (Abdelhamid 1999: 15; Rabba' 1998: 12; Rabba' 2005: 9). In different parts of the Jebel Qurma region, Pleistocene desert pavements mostly occur around a number of major wadis, whereas Holocene

Figure 2.10 The Jibal Fuluq Dhalma in the Jebel Qurma region, featuring low flint-covered hills intersected by deep, narrow wadis. Photos by P. Akkermans.

Figure 2.11 The Qurma plateau has steep slopes leading up to an extensive upland; broad valleys run down from this upland. Photos by P. Akkermans.

alluvial deposits are found within wadis and mudflats. Mudflats are mainly situated in endorheic basins but also within a number of wadis.

In addition to rock formations, a number of major fault lines are also depicted on the geological maps of the Jebel Qurma region. These have influenced the topography of the study area to a large degree. The first of these is the Fuluq fault, which runs in a roughly NW-SE trajectory through the Jebel Qurma region, and has resulted in the formation of a steep escarpment, dividing the region into a relatively high region to the north, and a low region to the south (see below). Another major fault line is the Wadi Rajil fault, which runs in a NE-SW trajectory through the region and has contributed, as its name suggest, to the formation of Wadi Rajil.

Figure 2.12 Table mounts in the Jebel Qurma region, including Jebel Qurma (top) and an aerial view of the table mount near Wadi Qattafi (bottom). Photos by P. Akkermans (top and middle) and D. Boyer (bottom; courtesy of APAAME).

Figure 2.13 Extensive gravel plains and low isolated hillocks in the Hazimah area of the Jebel Qurma region.

2.3.3 Geomorphology

In this paragraph the geomorphology of the Jebel Qurma region is presented, including its topography and surface cover. This is partially based on the description of the geology of the study area presented above, but also on additional datasets including satellite data.

2.3.3.1 Topography

The Jebel Qurma region is characterised by a variety of topographic features, including table mounts, valleys, ridges and plains (Figure 2.9). A chain of topographic highs, comprising hills, plateaus and table mounts, runs is a roughly NW-SE direction through the centre of the study area. These hills were formed through tectonic uplift associated with the Fuluq fault that runs parallel to this chain (see above). In the eastern and western part of the study area this chain is dissected by two major wadis – Wadi Rajil in the west (associated with the Wadi Rajil fault), and Wadi Qattafi in the east. The central chain of hills reaches a maximum absolute elevation of 648 m above sea level. Relative to the plains surrounding this upland, these hills are up to about 75 m high. The upland can be roughly divided into three elements. The first of these is the range of hills known locally as the *Jibal Fuluq Dhalma* (Figure 2.10). These hills are dissected by numerous smaller wadis that result in a large number of ridges, slopes and small valleys.

This type of topography also occurs on the east bank of Wadi Rajil, albeit only in the northern part of the study area. The second upland terrain is the Qurma plateau (Figure 2.11), which comprises an elevated plateau bounded by steep slopes on its south and west side. On the north side, most of the plateau's slopes are much gentler. A limited number of broad, deep valleys are situated at the edges of the plateau, especially on the south and west side. These valleys are not very long – typically between 0.5 and 1.5km. The top of the plateau is not flat but undulates, featuring low rolling hillocks, smaller valleys, as well as a number of endorheic basins. The third type of topographic high consists of table mounts, which are individual hills with steep slopes and relatively flat, wide tops (Figure 2.12). A concentration of such table mounts occurs in the eastern part of the study area where the Qurma plateau seems to break up into individual mounts, known locally as *Jibal Qattafi*. More table mounts are situated along Wadi Rajil in the western part of the study area. The most prominent of these is *Jebel Qurma* from which the toponym of the study area was derived.

To the south of the central upland extends a low-lying area known as the Hazimah plains. This is a largely flat area with scattered undulations such as hillocks, low plateaus and table mounts with a relative height between 5 and 25 m (Figure 2.13). Similar plains extend to the north of the central hilly chain, although the absolute elevation of these northern plains is higher than the Hazimah plains. These plains also feature terrains of varying elevations.

In addition to the rather undulating terrains described thus far there are a number of areas in the study area that are almost completely flat. These areas are present at the bottom of endorheic basins, where silts brought in by runoff water have accumulated to form mudflats. Several small flats are present on the Qurma plateau, with the much larger Qa'a al-Teyarat situated on the northern edge of the plateau (see Figure 2.4 above).

A classification of the topographic features of the western part of the Jebel Qurma region was created following a Hillslope Position Classification procedure (see section 2.3.1 above), the result of which is depicted in Figure 2.14. This model shows a relative classification of the topography rather than an absolute one, which has a number of advantages. First of all, it allows for the identification of topographic high places not only in absolute terms, but also in relative terms (i.e. relative to an area's direct surrounding). The HPC model thus shows the presence of local topographic highs in the Hazimah plains, consisting of low plateaus and table mounts: a low-lying area in absolute terms. The model furthermore highlights topographic lows, consisting of shallow basins and valley floors within the Qurma plateau:

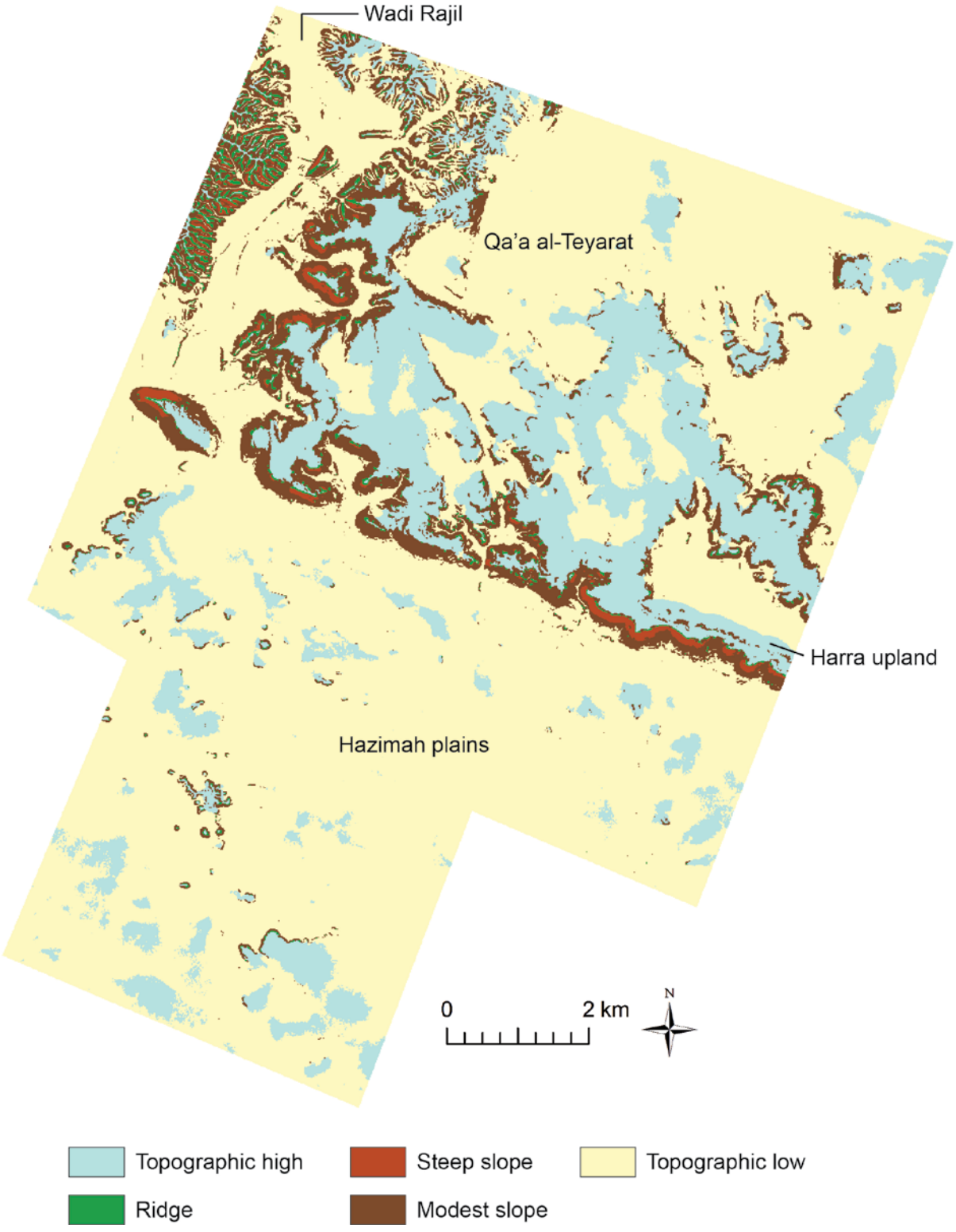


Figure 2.14 Result of a Hillslope Position Classification, which differentiates between various topographic features based on slope degree, elevation, and surface curvature.

an upland area in absolute terms. The model furthermore highlights different slope classes (modest and steep ones), which are largely situated on the southern and western side of the Qurma plateau but also in the Fuluq hills and Hazimah plains. Finally, well pronounced ridges are present on many of the border zones between slopes and topographic highs. Within the limits of the WorldDEM data, most of the area for which the HPC was produced was classified as a topographic low (Figure 2.15). This covered large parts of the Hazimah plains but also part of the Qurma plateau. Topographic highs comprise the second largest class. In many cases high and low areas are not separated by substantial slopes. Modest and steep slopes cover about 12% of the area, while well pronounced ridges are even more scarce as they cover less than 2% of the area – mostly on the southern and western sides of the Qurma plateau.

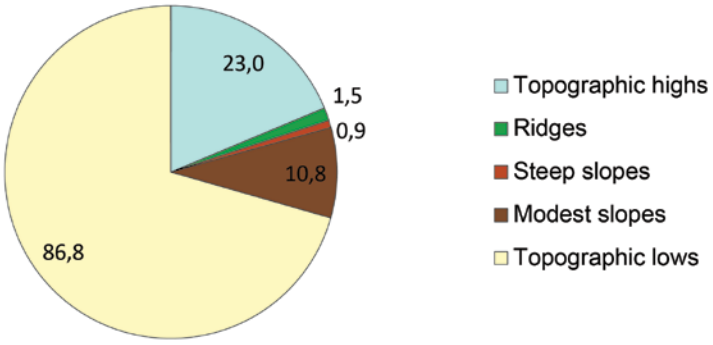


Figure 2.15 Proportion of topographic features in the western part of the Jebel Qurma region, based on the Hillslope Position Classification.

2.3.3.2 Surface cover

Given the scarce amount of vegetation, surface water, buildings, and infrastructure in the area surface cover in the Jebel Qurma region is largely governed by the geological formations described above. However, the distribution of lithological formations as depicted on the geological maps is not very accurate, and sometimes even incomplete. For a more accurate representation, the Surface Cover Classification (SCC) based on Landsat imagery was created, as described above (see § 2.3.1.2).

For the SCC, 13 different classes were defined based on geological formations and observations on high resolution Ikonos satellite imagery (Figure 2.16). In addition to the geological formations described above, three more classes were defined, including: surface water, which was only present in small quantities behind the Wadi Rajil dam; agriculture, as observed in a small part of the Ghamr oasis in the south; and basalts partially covered by sands. These sands, which are probably of aeolian nature (cf. Kempe and Al-Malabeh 2010: 49; Rosser 2002: 17), were not depicted on geological maps but were clearly visible as mottled brownish areas on Landsat imagery (see Figure 2.6). Observations on the ground further corroborated the existence of such surfaces (see also Figure 2.20). For the sake of clarity, these 13 classes can be divided into three general categories, namely *harra* surfaces (basalts), mudflats, and *hamad* surfaces (other non-basalts). The *hamad* surfaces cover the largest area by far, and surround the *harra* landscapes on most sides (Table 2.1). Numerous small mudflats can be found within the *harra* landscapes as well, although the largest one by far – the Qa'a al-Teyarat – actually lies on a border zone between the *harra* and *hamad*, in the northern part of the study area.

Surface type	Area size (km²)
Harra	64
Hamad	259
Mudflats	13

Table 2.1 Area size per surface type in the Jebel Qurma region, based on Surface Cover Classification.

The area sizes per surface cover are given in Figure 2.17, which indicates that Holocene alluvial gravels form one of the largest classes, covering more than 100 km², or almost a third of the study area. Since these deposits are broadly dated to the Pleistocene and Holocene (see § 2.3.2), it cannot be excluded that archaeological remains are buried underneath them. The same may hold for mudflats. Although detailed information about when and at what rate the mudflats developed is not available, aerial photographs

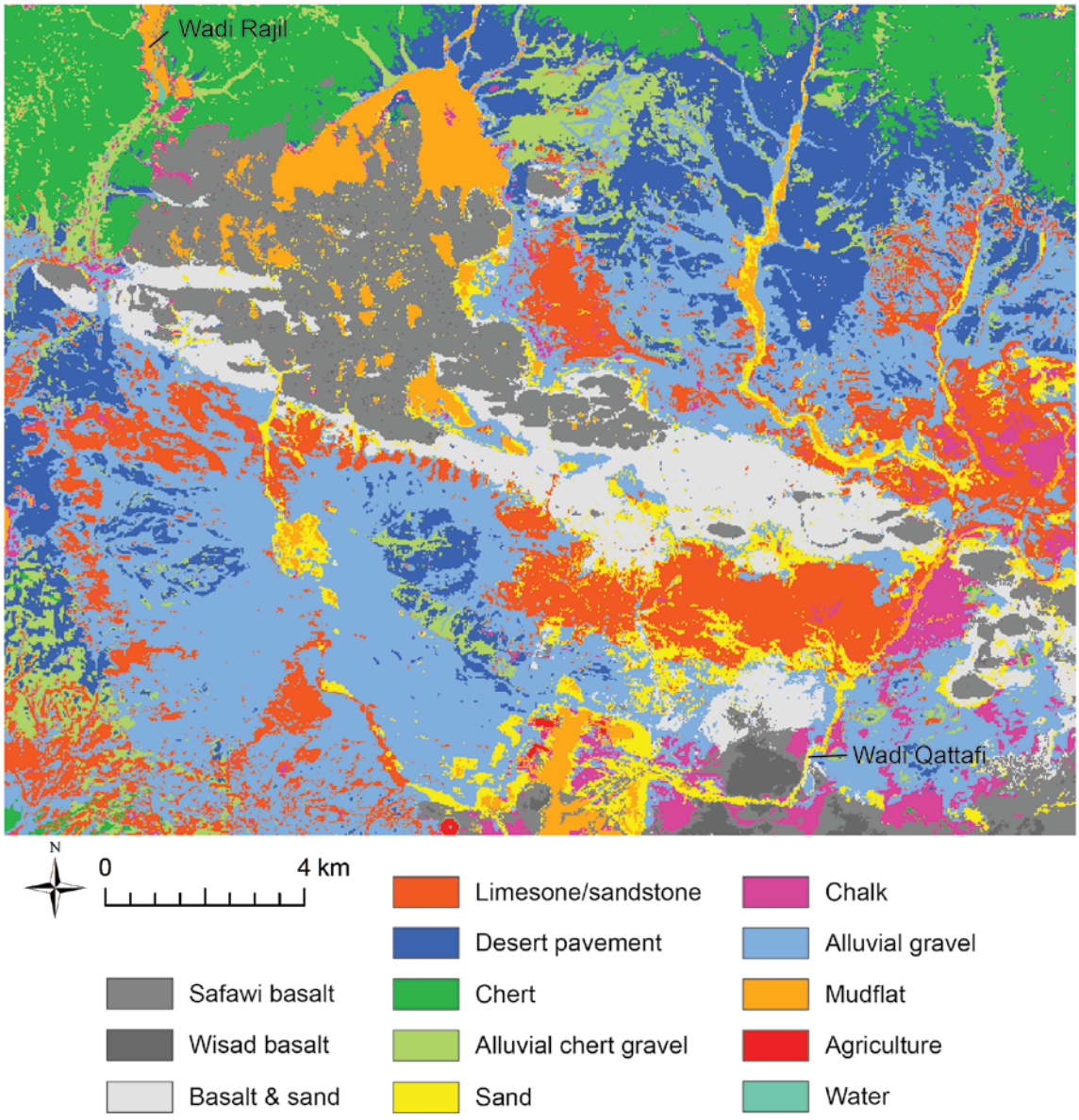


Figure 2.16 Surface Cover Classification of the Jebel Qurma region based on Landsat 8 imagery (see Figure 2.6).

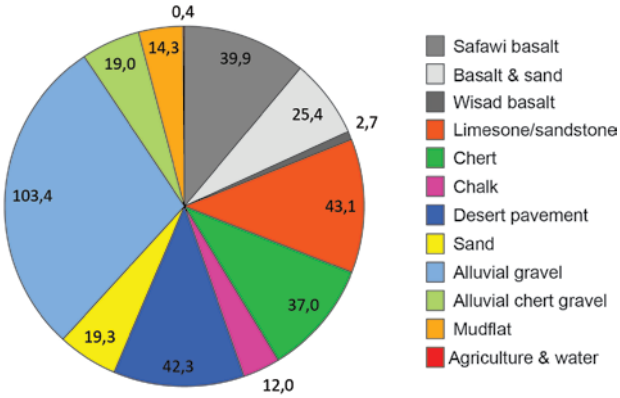


Figure 2.17 Proportion of different types of surface covers in the Jebel Qurma region, based on the Surface Cover Classification. Absolute area sizes (in km²) are indicated.

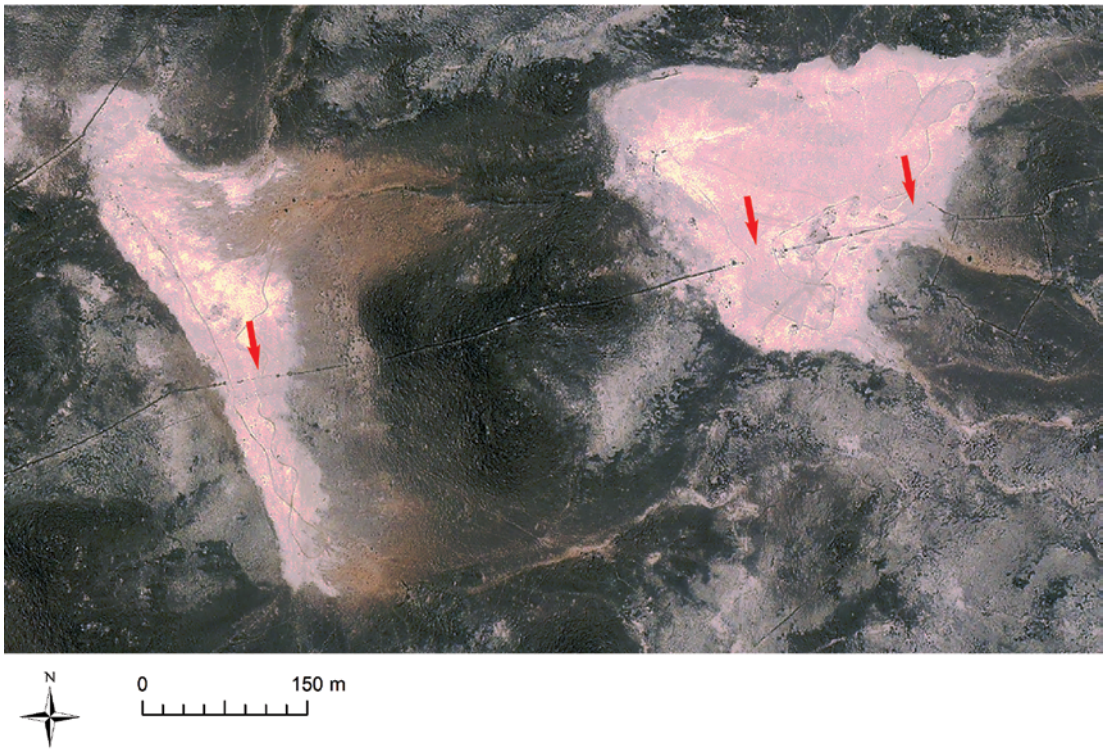


Figure 2.18 Mudflat sediments (pink) in the Jebel Qurma region that appear to have partially buried a wall feature (indicated by arrows). Base image: Ikonos satellite photo.

show that archaeological features are sometimes partially buried by mudflat sediments (Figure 2.18). Sands may also cover archaeological remains (Figure 2.19), although it is again not known exactly when they were deposited. In general terms, it may be surmised that only about half of the surfaces in the study area predate the Holocene, whereas the other half, consisting of alluvial and aeolian deposits, may have been deposited during that period, although when exactly is unknown. This has implications for the visibility of archaeological remains – something that needs to be tested or at least acknowledged when studying the archaeological data.

The distribution of different surface covers can now also be compared to local topography. Basalts mostly occur on the hills and plateaus in the centre of the study area, although they are concentrated on the Qurma plateau and the adjacent table mounts, rather than on the Fuluq hills. Many sands have accumulated between the basalts particularly in the eastern part of the *harra* landscape, as well as in the western part to some extent.

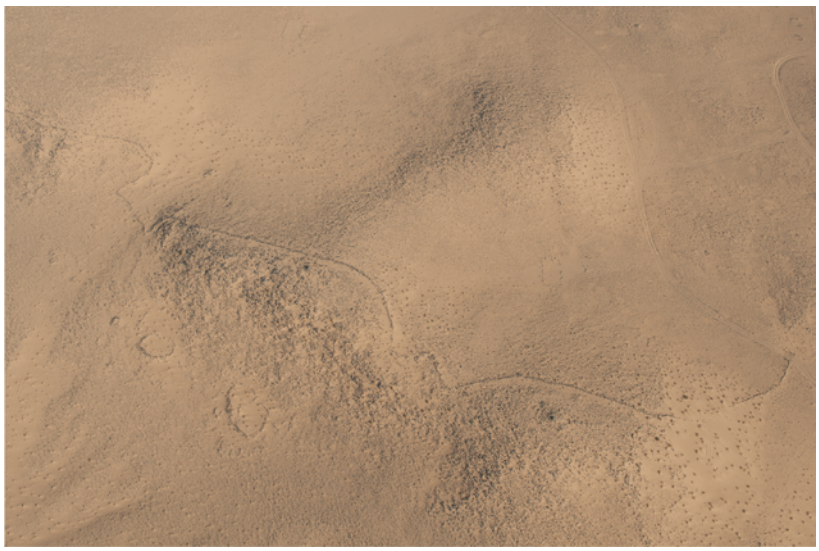


Figure 2.19 Windblown sand deposits in the Jebel Qurma region partially covering a number of archaeological features. Photo by D. Kennedy, courtesy of APAAME.

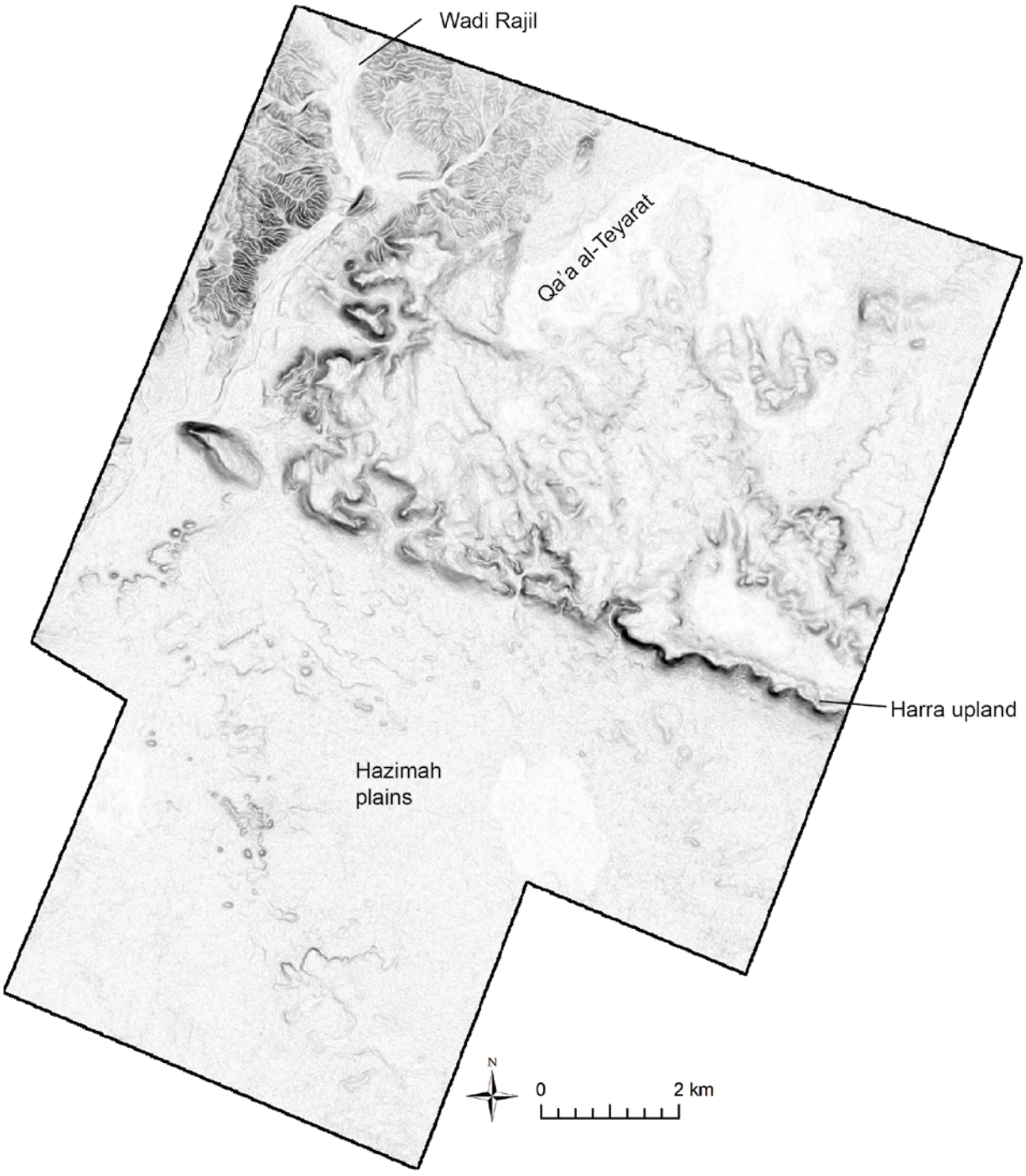


Figure 2.20 Relative degree of surface slope in the western part of the Jebel Qurma region. Darker shades indicate steep slopes while lighter shades indicate gentler slopes. Based on WorldDEM.

Wisad basalt is present in the central part of the southern area, as was indicated on geological maps. As for *hamad* surfaces, it appears that chert gravel surfaces are mostly present in the northern part of the study area, including on the Fuluq hills, and that more varied desert pavements and alluvial deposits mostly occur in the plains. The limestone/sandstone and chalk outcroppings that also occur in these plains largely represent the local topographic highs, such as the hillocks, plateaus, and low table

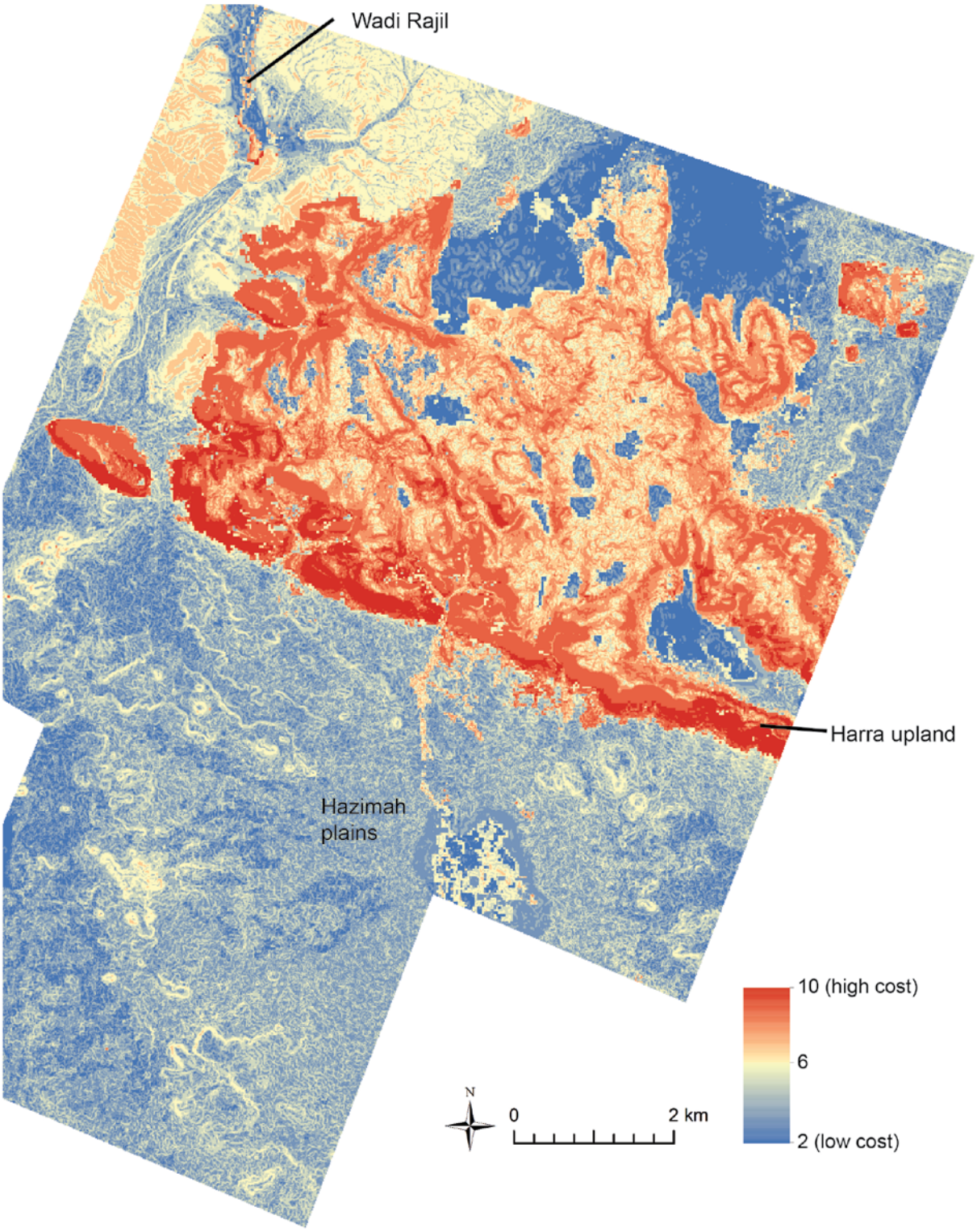


Figure 2.21 Cost Surface Raster showing the relative cost of movement on a scale of 2 (low cost) to 10 (high cost) through the western part of the Jebel Qurma region based on slope degree and surface cover.

mounts. Mudflat deposits occur in topographic lows like basins, but also in wadi courses where still standing surface water may be present in wet periods.

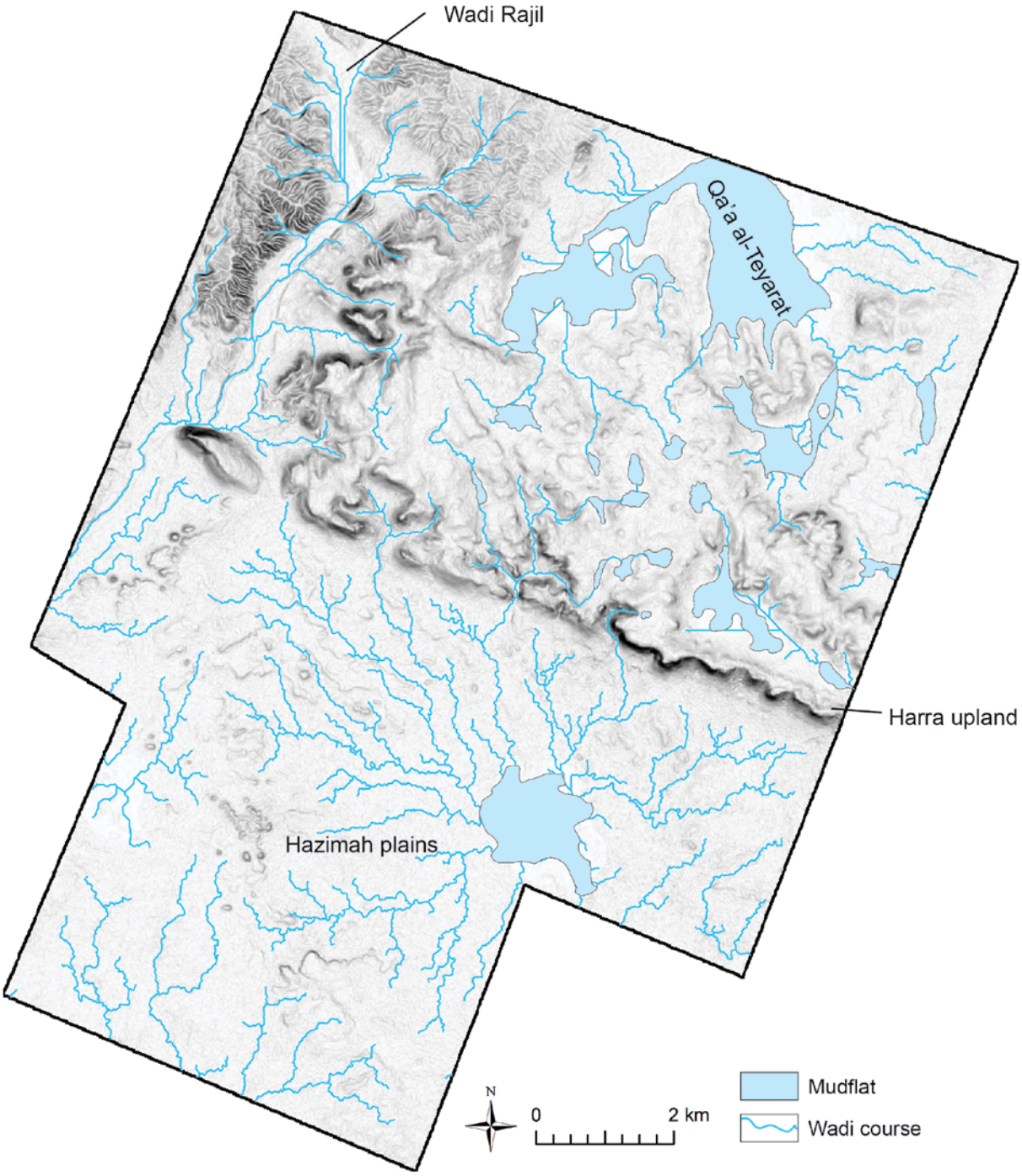


Figure 2.22 Drainage patterns in the western part of the Jebel Qurma region, showing wadi courses as modelled based on WorldDEM data, and mudflats indicated on topographic maps. Base image: WorldDEM slope map.

2.3.3.3 Natural boundaries and corridors

Another issue of importance in terms of geomorphology is the presence of natural boundaries and corridors, as these impact the relative cost of movement through the landscape to potential visitors. In terms of movement, boundaries may be impassable cliffs or water bodies, while corridors may be relatively flat areas or areas with an even, compact surface. Thus, two principle parameters of cost of movement in the landscape are slope degrees (Figure 2.20) and surface cover (see above). As shown above, these aspects were calculated and a combination of the two parameters results in a model that

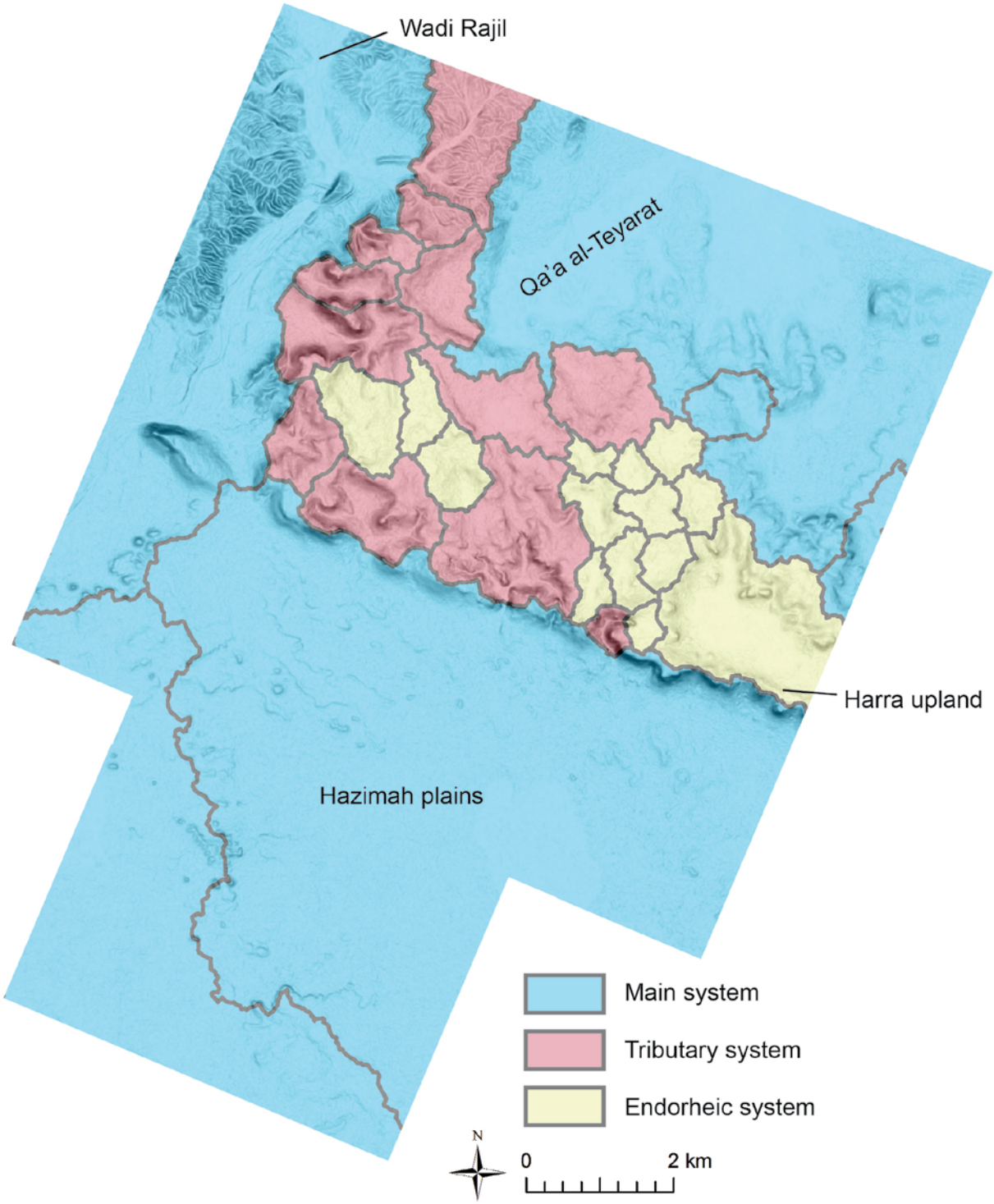


Figure 2.23 Classification of different drainage systems in the western part of the Jebel Qurma region. Base image: WorldDEM slope map.

gives insight into relative costs of movement (Figure 2.21). This model shows, perhaps not surprisingly, that movement is most restricted in the basalt covered upland and is least restricted in the low-lying plains. Steep slopes covered by basalt form the most severe boundaries to movement, although these

boundaries are not absolute. At the same time, corridors are formed by valleys in which non-basaltic surface covers and more gentle slope gradients occur.

2.3.4 Drainage systems

As was noted above (§ 2.2), the Jebel Qurma region sits on the border between the Azraq and Sirhan drainage systems, as well as a third more localized system that culminates in the Qa'a al-Teyarat. Numerous wadis are present throughout the Jebel Qurma region that form the local surface drainage system. The courses of these wadis were modelled (Figure 2.22) on the basis of WorldDEM data (seeabove). These wadis are dry for large parts of the year but may contain water during rainfall. Some of the smaller wadi systems are tributaries of larger wadis, such as Wadi Rajil, which eventually debouches into the Azraq oasis. However, a number of small wadis also run into local mudflats.

The major watershed boundaries in the Jebel Qurma region, related to the three drainage basins described above, were modelled on the basis of WorldDEM data. The smaller, tributary drainage basins are composed of valley systems that run down from the Qurma plateau; together with the small endorheic basins on the plateau these drainage features form an important part of the region's drainage and are depicted in Figure 2.23. This figure shows the presence of eleven tributary systems that run down from the central plateau, covering a total area of *ca.* 17 km^2. Based on the valleys whose extent is fully known, the area covered by these valleys can range between *ca.* 0.3 and 3.3 km^2. In addition to these tributary systems, a number of small endorheic systems were defined. These cover a total area of 7.7 km^2, again taking into account only the systems whose complete extent is known. The individual sizes of these basins ranges between 0.25 and 1.25 km^2, and are characterised by the presence of a small mudflat on the bottom of the basin. All of these endorheic systems are situated in the Qurma plateau, and are completely surrounded by *harra* surfaces. These basins are therefore the most poorly accessible areas in the region as they are surrounded by basalt surfaces and bounded by slopes on all sides.

2.3.5 Vegetation

Specific information on the type and distribution of vegetation in the Jebel Qurma region is currently not available. While there are ways of studying vegetation systematically through remote sensing, their application remains problematic for sparsely vegetated areas such as the Jebel Qurma region. Multispectral satellite imagery, such as Landsat imagery, has been used to gain information on healthy vegetation, especially by studying the amount of red and near-infrared light that is reflected by green leaves. These reflectance values have been used to calculate a Vegetation Index (VI), which is the outcome of an equation based on reflectance values based on different spectra of light (Rouse *et al.* 1974). The most commonly used VI is the Normalized Difference Vegetation Index (NDVI). Hammer (2012), for example, used NDVI to locate pasture zones and compared these to distributions of nomadic campsites and other features. A drawback of VI is that in sparsely vegetated areas the reflectance of soil rather than healthy vegetation can greatly disturb its outcome. While a number of equations have been proposed to compensate for soil reflectance (e.g. Huete 1988; Qi *et al.* 1994), their success has proved to be limited, especially in areas where vegetation cover is less than 30% (Ren and Feng 2015). The use of VI is therefore unsuitable for studying vegetation in a sparsely vegetated area such as the Jebel Qurma region.

Although direct and systematic ways of studying vegetation patterns in the Jebel Qurma region remain problematic, some remarks of a more general nature can be made. Aerial photographs and observations on the ground have indicated that there are numerous areas in the Jebel Qurma region where vegetation occurs, either seasonally or year-round. Large, permanent shrubs are often present in major wadis such as Wadi Rajil and Wadi al-Qataffi, but also in smaller wadis that run down from the basalt plateau (Figure 2.24). Smaller shrubs are also present in the *harra* and *hamad* landscapes. Furthermore, seasonal plants such as grasses and weeds may start to grow soon after the occurrence of heavy rainfall, as was

Figure 2.24 Perennial vegetation in various wadis of the Jebel Qurma region. Photos by P. Akkermans.

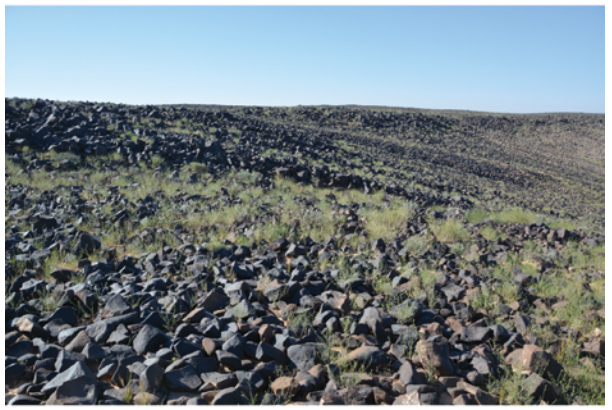


Figure 2.25 Annual/biennial vegetation in various landscapes of the Jebel Qurma region. Photos by P. Akkermans.

observed in the field during the 2016 campaign. Relatively lush vegetation was present in the *harra* landscape in April 2016, not only in the wadi valleys but also on the slopes and top of the Qurma plateau (Figure 2.25). Here, the basalt boulders offered seedlings some protection against the wind and sun (cf. Rowe 1999: 358). By ways of inference, then, it may be suggested that wadi systems are areas that are generally most densely vegetated, likely because part of the runoff water seeps into the wadi beds and can be retained there for prolonged periods of time. Other parts of the landscape may become green as well, but only after the occurrence of heavy rainfall.

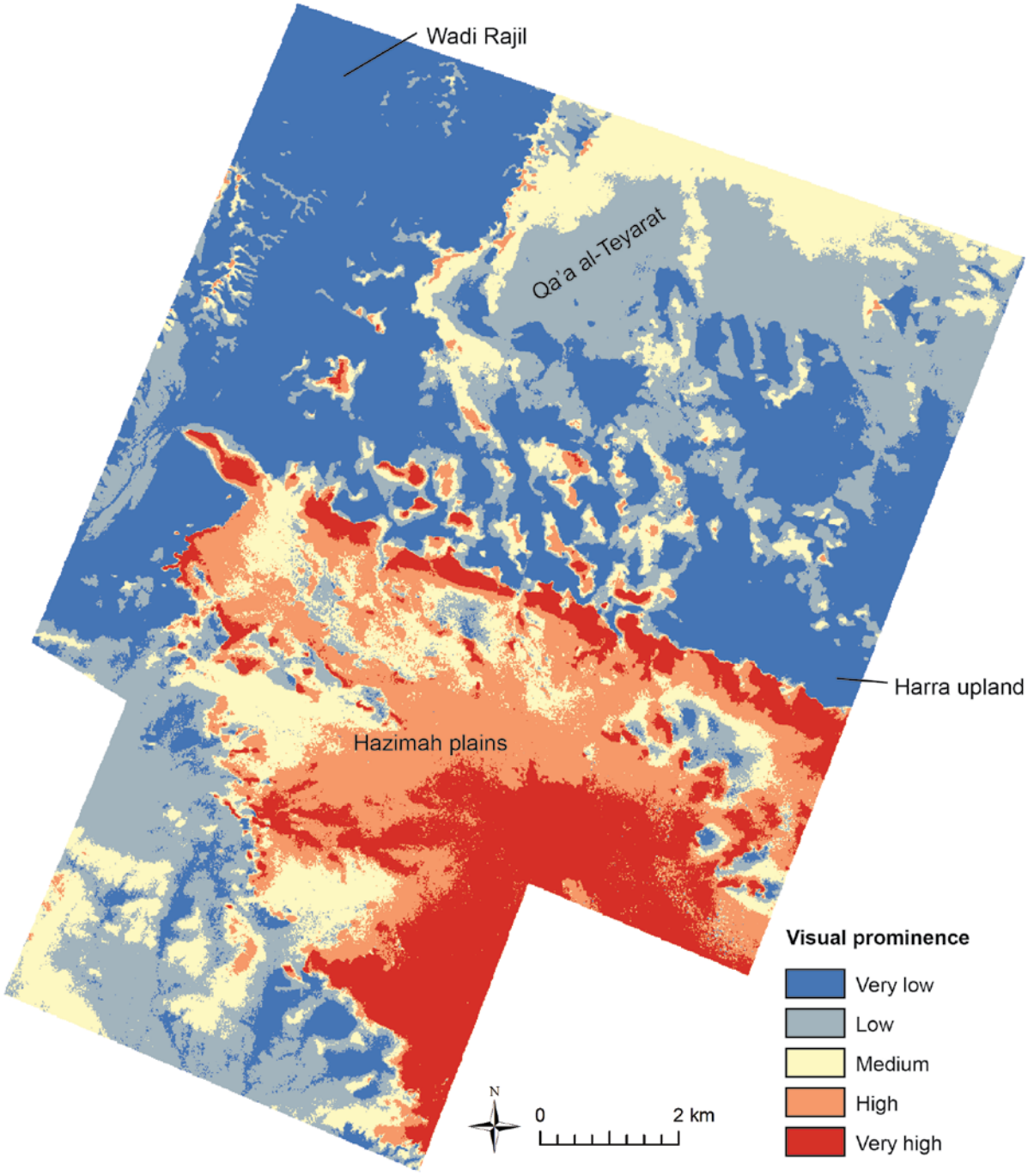


Figure 2.26 Visual Prominence Classification of the western part of the Jebel Qurma region.

2.3.6 Visibility

Much of the Jebel Qurma region is dominated by undulating terrain, which creates high variability in terms of visibility, across the landscape. Visibility in the Jebel Qurma region is largely restricted by the topography of the landscape. Vegetation, at least nowadays, is too minimal to significantly influence what is visible and what is not. The topography, on the other hand, is highly variable and includes high locations in the landscape offering extensive views, as well as ranges of hills that shield extensive areas from view. Indeed, some locations in the study area can be observed from relatively many locations,

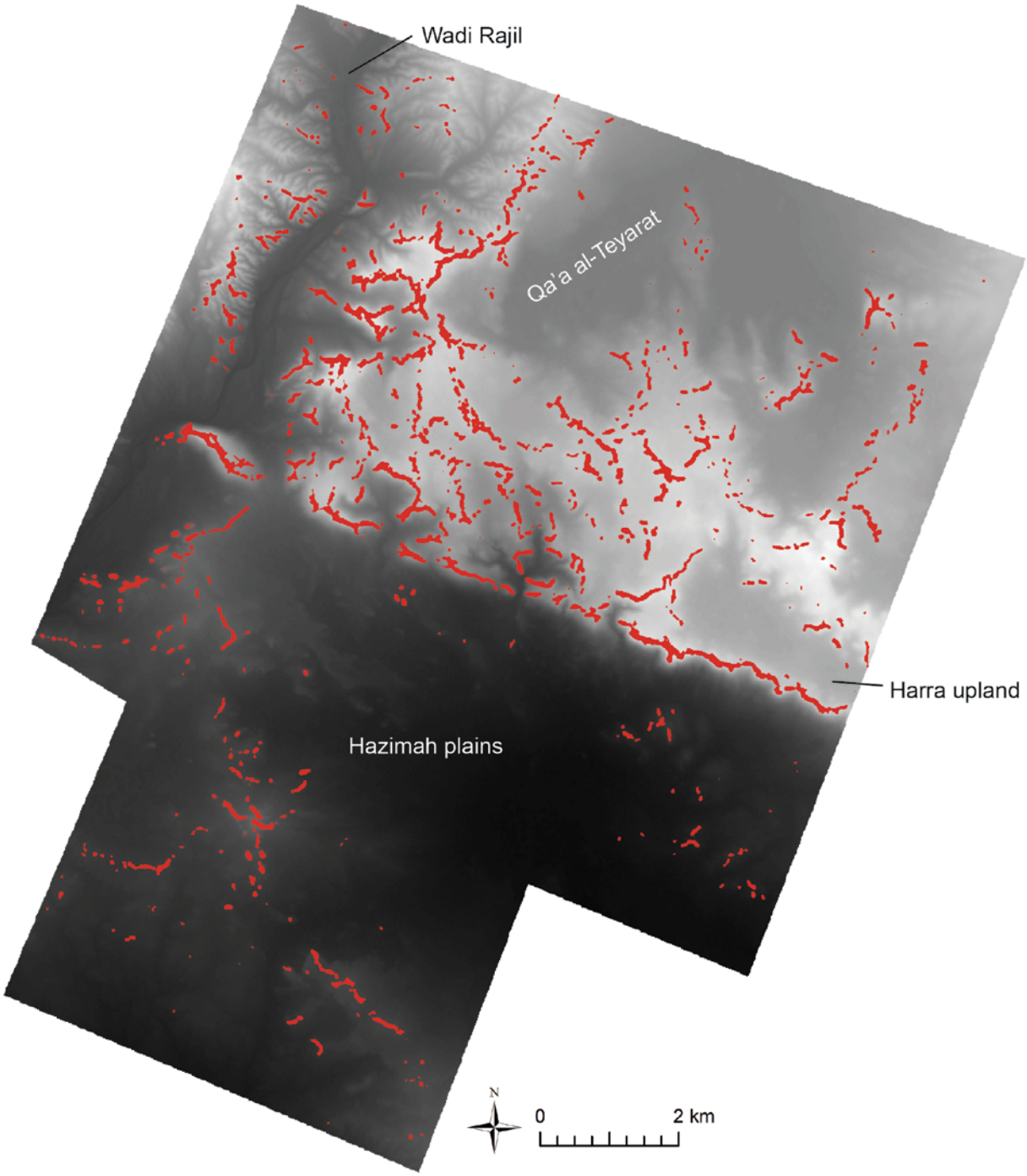


Figure 2.27 Result of a Skyline analysis of the western part of the Jebel Qurma region. Landscape features that are most dominant on the horizon are indicated in red. Base map: WorldDEM.

while other areas, such as valleys, are much more secluded and are only visible from a few locations situated nearby.

This is illustrated in the Visual Prominence Classification, which shows that the central southern part of the study area contains mostly locations that are highly exposed, like the southern ridge of the basalt plateau and the Hazimah plains at its base (Figure 2.26). Also prominent are some major hills on top of the basalt plateau and along Wadi Rajil. These are high places that can be seen from many locations in

Figure 2.28 Examples of dominant skylines in the landscapes of the Jebel Qurma region. Photos by P. Akkermans.

the landscape. Dominant features on the horizon of the Jebel Qurma region, as indicated through the Skyline analysis map (Figure 2.27), include most of the ridges and hilltops of the area's characteristic undulating terrain. These ridges and hilltops often define the boundaries of visibility in the study area. The horizons visible from low lying areas, such as the Hazimah plains or the floor of Wadi Rajil, were dominated by high places (Figure 2.28).

Much more secluded locations include many low-lying areas confined by high slopes, such as Wadi Rajil itself and its tributary valleys, as well as the bottoms of valleys descending from the southern side of the plateau.

2.4 Concluding remarks

In this chapter I have discussed the physical geography of the Black Desert and presented several landscape models of the Jebel Qurma region. On the basis of these models the physical environment of the study area was classified into different environmental zones on different scales, based on several different parameters. These classifications will be compared to the archaeological remains in the landscape in Chapters 4 and 5.

The Jebel Qurma region hosts a wide diversity of natural environments that offer various affordances for nomadic communities. Sources of water and vegetation are unequally distributed across the region, as are locations of varying visibility and seclusion. Similarly, some areas are easily accessible to potential visitors while other places are much more difficult to reach, related to the nature of the terrain. These issues will be taken into account when trying to understand the structure of the nomadic landscape in the course of this study.

Another important issue that has emerged from this chapter is the presence of Holocene deposits in the study area, such as alluvial and windblown deposits, that have potentially obscured archaeological remains. To what degree this may have been the case will be further studied in the next chapters as well, as this is relevant in the reconstruction of nomadic activities in various parts of the landscape.

Chapter 3 - Surface Surveys in the Jebel Qurma Region: Methods and Results

3.1 Introduction

Having presented the natural environment of the Jebel Qurma region in the previous chapter, this chapter presents its archaeological remains as documented through surface surveys carried out since 2012. The *Jebel Qurma Archaeological Landscape Project* is a multi-period project and thus focuses on all periods of inhabitation. The occupational history of the region has proved to be very extensive, with material represented from the Palaeolithic until the modern period (Akkermans and Huigens 2018). This chapter presents, firstly, the methods that have been employed to document the surface remains of the region (pedestrian and remote sensing surveys). Secondly, the results of the surface surveys are presented, including the types of archaeological and epigraphic remains that were documented, and the criteria used to date this material. More detailed information regarding the excavations is presented in Chapters 4 and 5.

An intensive prospection methodology was used to investigate the full diversity of the archaeological landscapes of the study area in detail. As outlined in Chapter 1, intensive landscape studies were not previously carried out in the Black Desert. Field methods had to be developed largely from scratch, although to some degree these were built on experiences from comparable regions elsewhere. Initial predictions on the nature of archaeological remains could be made to some extent based on publications of previous research in the Black Desert (e.g. Betts *et al.* 2013; Kennedy 2011). These studies had already shown the existence of several feature types, including desert kites, cairns, enclosures, wheels, as well as inscriptions and rock art. However, since an intensive survey strategy had not been adopted before, new and unexpected features were encountered each survey season, which in part led to the adjustment of field strategies. Admittedly, this has led to some inconsistencies in the dataset. This is of course only natural in field projects that begin basically from scratch, and it is necessary here to make these data inconsistencies explicit.

This study incorporates the result of fieldwork carried out between 2012 and 2016. Although fieldwork has been carried out in subsequent years as well, the results from these campaigns were not used in this study due to time constraints. The work that was carried out during the field campaigns was not done solely by the author. A large team of staff and students worked on documenting these remains.

3.2 Pedestrian surveys: objectives and methods

3.2.1 Survey objectives

To study the Jebel Qurma region, an intensive pedestrian survey methodology was used, which aimed to document the full diversity of archaeological and epigraphic remains in a systematic and comprehensive way. Previous survey studies carried out in the Black Desert often have relied heavily – if not entirely – on aerial photographs and satellite imagery (see Chapter 1). Although such imagery provides a useful initial source of information, many – if not most – of the surface remains, such as small stone structures, artefacts, inscriptions, and rock art are too small to be visible from above (Huigens 2013). Therefore, the surface survey carried out in the Jebel Qurma region relied mostly on data acquired through pedestrian surveys. Remote sensing data provided additional information, especially when observed features were so extensive that a view from above assisted in determining their spatial extent and configuration. Desert kites are a good example in which the study of satellite imagery helped to establish the configuration of such features.

Pedestrian survey may be defined as the study of archaeological surface remains that usually involves field walking. This also includes the systematic prospection of a given area, collecting artefacts from the surface, and cleaning archaeological features. Excavations are usually not part of survey methodology, as this entails a different archaeological method and a focus on a particular site rather than a broader landscape. Systematic pedestrian survey has been a major tool to study archaeological landscapes of the Near East since the 1960s (Wilkinson 2000: 220-2; Wilkinson 2003: 37-9). Although surveys have sometimes been used to locate sites suitable for excavation, survey methods can in themselves be used to answer particular research questions. Archaeological surveys may be used to acquire detailed datasets of archaeological landscapes, in terms of the nature and variability of archaeological remains, as well as the wider history of inhabitation in a given area.

It is also, however, a rather labour-intensive method, as it requires archaeologists to be physically present in the field, together with a team of colleagues, and numerous logistical and financial requirements. Sampling strategy is therefore an important issue in pedestrian survey projects, and particular choices always need to be made in such projects. These choices can relate to the geographic extent of the survey area, to the degree of coverage within that area (i.e. survey intensity), and to the exclusion of particular datasets, such as materials from a particular period.

Another important issue in pedestrian surveys, both methodologically and interpretatively, is the way in which archaeological remains are classified and documented. Particularly problematic in this respect is the way in which archaeological sites are defined. The archaeological site is a concept that particularly evolved from traditional settlement-based archaeology, in which the term indicates a well-defined cluster of archaeological remains (Binford 1964: 431). Traditional site categories include, for example, villages, sanctuaries, cemeteries, forts. One of the aims of a landscape approach is to contextualise such sites in broader geographic contexts (see Chapter 1), which immediately creates problems in terms of site definition. For example, it becomes difficult to say where a village ends and where its hinterland begins. Also, archaeological landscapes may comprise many features that are wholly different from traditional site categories. These remains can include small artefact clusters or even individual, isolated artefacts, but also extensive features such as roads, walls, and field systems. Even though all of these features can essentially be called sites, the enormous variability that may occur between them (ranging from a single artefact to a city), means that the term quickly runs the risk of losing its traditional qualitative character. Several alternatives have been proposed to classify archaeological survey data, including making a distinction between site- and off-site remains (Bintliff 1999), as well as omitting the site concept altogether (Caraher *et al.* 2006; Dunnell 1992). The way in which sites were defined for the Jebel Qurma survey is discussed below.

3.2.2 Survey methods

The pedestrian survey is a widely used and accepted archaeological field method, but the way in which surveys are carried out is highly variable because of differences in the nature of archaeological landscapes and the particular research questions asked. Therefore, a detailed discussion of the survey methods applied in the Jebel Qurma project is warranted.

3.2.2.1 Sampling strategy

From 2012 to 2016 five field campaigns were carried out in the Jebel Qurma region by the *Jebel Qurma Archaeological Landscape Project*. All of these field campaigns included a period of field surveying. These periods varied in length between two to eight weeks, and were carried out with a team of varying composition, comprising professional archaeologists and students.

The areas surveyed comprised a wide variety of landscapes of the Jebel Qurma region, including two of its major geomorphological units: the *harra* landscapes of the Qurma plateau and the *hamad* landscapes of

the Hazimah plains to the south (Figure 3.1). On the Qurma plateau, the survey aimed to cover different topographic areas such as its ridges, slopes, and the low-lying areas at the foot of these slopes on the south and west side. The valley systems running into the plateau and the upland areas on top of the plateau also were surveyed. Areas around mudflats, including an area on the banks of the large Qa'a al-Teyarat, were surveyed as well. A similar strategy was employed in the diverse topographic zones of the Hazimah plains, as well as areas with different surface covers, such as plateaus and hillocks consisting of lime- and sandstone, low lying areas covered by desert pavements, and alluvial sediments.

The Fuluq hills west of Wadi Rajil were not included in the sample. Nevertheless, a number of similar chert-covered hills situated closer to the Qurma plateau were surveyed, and may eventually be used to make inferences about the archaeology in this type of landscape. The entire eastern half of the study area was not included in the survey either. At this point, only information from remote sensing studies is available for this part of the region, although, in the same way as the Fuluq hills, it may be possible later to make inferences about this region based on the survey results of other *harra* landscapes. An area currently used for agriculture, the small oasis of Ghamr, was also not surveyed.

Figure 3.1 Area surveyed between 2012 and 2016 in white, with the survey transects in the Hazimah plains indicated in blue. Base image: Landsat 7.

3.2.2.2 Field walking methods

Following one of the main aims of the Jebel Qurma project, namely to study the full diversity of the archaeological and epigraphic remains of its study area, an intensive survey strategy was adopted. An important distinction, in term of field walking methods, was made between the *harra* and *hamad*

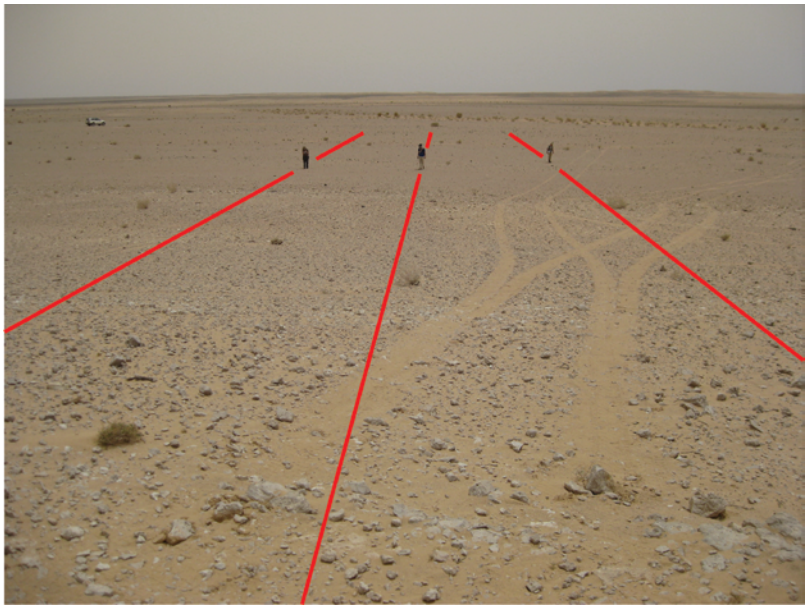


Figure 3.2 Systematic transect surveying in the Hazimah plains.

landscapes of the study area, largely as a result of pragmatic choices. These differences merit a separate discussion of survey strategies in the *hamad* and *harra* landscapes.

The largely flat, open terrain of the *hamad* landscapes allowed for a highly systematic transect survey strategy. Four survey transects of 120 m wide, between 1.3 and 6.3 km long, and spaced between 700 and 850 m apart were established and studied through intensive field walking. All transects were subdivided into 30 m wide and 100 m long parcels, and three field walkers were spaced 10 m apart within these parcels (Figure 3.2). They were instructed to walk in a straight line to the far end of the parcel (i.e. over a length of 100 m), and to collect artefacts and locate potential archaeological features, which could be later documented in more detail. In addition to this intensive transect method a more extensive survey was also carried out in the areas surrounding the transects. This was done to gain a better insight into site location and variability, although this extensive survey method was only able to locate the bigger, more visible sites (Huigens 2015).

Figure 3.3 Team members documenting features in a harra landscape. Photo by P. Akkermans.

In the more rugged and undulating *harra* landscapes an equally intensive yet less rigid strategy was adopted, in which field walkers were allowed to search for artefacts and features in a free-roaming fashion (Figure 3.3). Topographic features, such as valleys, ridges, hilltops, and plateaus were successively visited by survey teams comprising three or four individuals, who were instructed to search for artefacts and features within their predefined area. They were to some extent guided by the location of features that were already pinpointed on satellite imagery and aerial photographs, but were explicitly instructed to also search in areas where no features had yet been documented.

3.2.2.3 Site definition

The Jebel Qurma project used a methodology in which a number of structures and artefacts were grouped to form sites. Sites were defined as an assemblage of archaeological and/or epigraphic remains,

including artefacts, structures, inscriptions, and petroglyphs that were spatially clustered within an area bounded either by prominent topographic features or by arbitrary boundaries. These parameters are fluid to some degree as, for example, spatial clustering is not easily established objectively in the field. Furthermore, this kind of site definition does not make a distinction between periodization or features types, such as between domestic structures and funerary structures. Also, since every artefact or feature becomes part of a site even when such remains are found in isolation, great variability exists between site size and composition. Some of the sites, for example, cover multiple hectares and comprise dozens of stone-built features, hundreds of pieces of rock art, and countless artefacts, whereas other sites consist of a single inscription or only a few stray artefacts (Figure 3.4). It is thus important to realise that, in the Jebel Qurma project, the term 'site' does not equate to 'settlement', but more accurately defines a collection of spatially clustered finds.

Figure 3.4 Sites of varying sizes. The very large site of QUR-162 comprising several large enclosures and other features (left). The small site of QUR-250 comprising a single isolated stone feature (right).

3.2.2.4 Documentation structure and methods

Documentation of sites, structures, artefact distributions and rock art during the survey activities of the Jebel Qurma project were documented in the field using paper forms, sketch drawings and photographs. Here, the documentation structure is outlined. Sites were defined on the parameters outlined above and designated a site number (1, 2, 3...) after a prefix – QUR-... for sites in the *harra* landscape and HAZ-... for sites in the Hazimah plains. For each site a sketch drawing was made. When available, these drawings were based on aerial photographs, high resolution satellite imagery, or footage made with an Unmanned Aerial Vehicle (UAV or drone). The drone used by the Jebel Qurma project was a Phantom 2 Vision+ mounted with a 14-megapixel camera. When such imagery was not available, hand-sketched drawings of inevitably less detail were produced. These sketches recorded the local topography as well as anthropogenic remains. General photographs were made of the site and its location, and the location and nature of the site was described in detail on paper forms.

Each site could contain a number of structures, each of which was assigned a structure number (1, 2, 3...). These structures, which included cairns, enclosures, shelters, were described by means of a standardized paper form, photographed, and their location was recorded using handheld GPS devices. A sketch drawing was also made of each structure, which could sometimes be based on aerial photographs. Some of these structures were also documented through photographs that were later combined using photogrammetric software (in this case Agisoft Photoscan Professional), which resulted in a much more detailed rendering of a structure compared to hand-made sketches (Figure 3.5).

Apart from structures, sites were assigned loci, or areas, in which artefacts were counted and collected. The borders of these loci were defined architecturally, topographically, or arbitrarily. For each locus

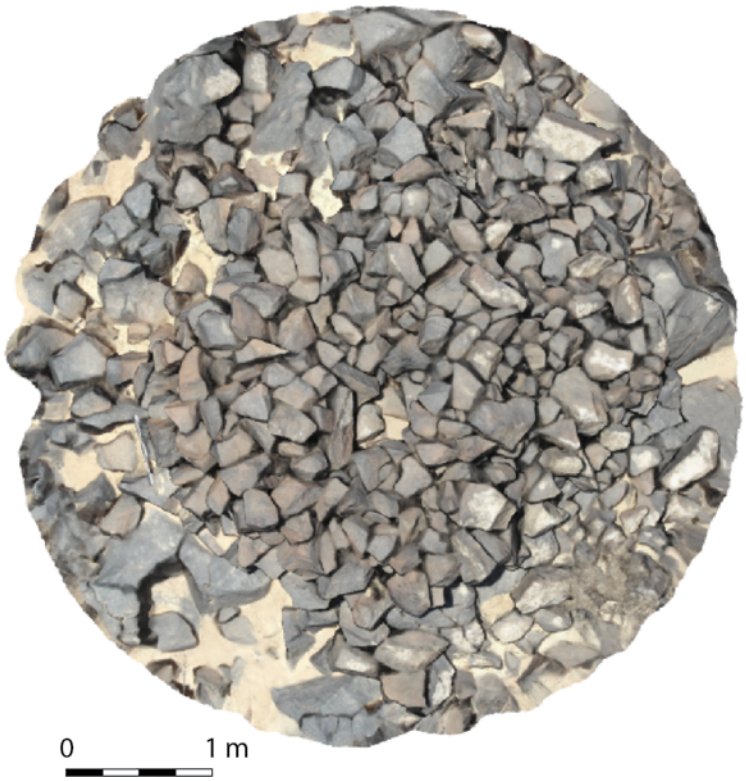


Figure 3.5 Photogrammetrically reconstructed top view of a cairn (QUR-943, Structure 13).

a form was filled out to document information such as slope, surface cover, and the number of artefacts counted and collected. Given the general scarcity of pottery sherds, all pottery sherds usually were collected from a site, whereas chipped-stone artefact scatters were usually sampled. Other small finds, such as beads and coins, were documented and collected when the material needed further study.

Inscriptions and petroglyphs also were recorded in detail on standardized paper forms. Their locations were recorded in different ways, either by indicating them on the site plan or by using devices such as handheld GPS or – especially with particularly large clusters of rock art – more precise equipment such as a Total Station or a Differential GPS.[2]

The processing of finds and data resulting from survey activities was done at the project's base camp. Such processing included: inputting paper forms into a digital database; washing, drawing and registering artefacts such as pottery, chipped-stone artefacts and other small finds; storing spatial data in a GIS; and photogrammetric processing. At the end of each field campaign artefacts were stored in storage facilities of the Department of Antiquities of Jordan.

3.2.2.5 Survey challenges

Data inconsistencies

Although the aim of the Jebel Qurma project was to systematically document archaeological and epigraphic remains within its survey area some problems in data consistency have occurred, which are here made explicit. In the earlier survey seasons, mostly during the 2012 season but also to some degree during the 2013 season, not every structure or piece of rock art was spatially recorded using a GPS device. Rather, during these seasons only site locations were pinpointed with a GPS, while its component features only were indicated on site plans. Therefore, the spatial data from these earlier seasons is somewhat less detailed, and this issue has implications for subsequent spatial analyses (Chapters 4 and 5). Another issue is that over the years the visual documentation of structures has changed to some degree. Hand-made sketches were done of structures during the earlier survey seasons (i.e. the 2012, 2013 and 2014 survey campaigns), but in the 2015 and 2016 campaigns photogrammetric documentation took over hand-made sketches to some degree. Thus, a number of structures were documented in a much higher level of detail: these differences were to be taken into account when comparing different structures.

[2] For more detailed information on documenting inscriptions and petroglyphs, see Brusgaard (in press) and Della Puppa (forthcoming).

Buried sites

As was noted above on the basis of satellite imagery and aerial photography (Chapter 2), some of the archaeological features in the Jebel Qurma region have been partially buried by aeolian sand deposits. About 13.5% of the sites documented through pedestrian surveys were present in areas characterised in Chapter 2 as being covered, either partially or completely, by such deposits (see Figure 2.16 above). Although the presence of such deposits does not necessarily imply that architectural features are completely buried (see above Figure 2.19), smaller remains such as rock art and individual objects may become completely buried and thus invisible to pedestrian surveys. This has implications for the amount of datable remains, and therefore sites, in these parts of the study area. This issue was taken into account when studying the distribution of archaeological remains on a landscape scale (see Chapter 4).

The same may hold for areas where fluvial deposits are present, which most significantly affects the Hazimah plains (see Chapter 2). Find-numbers in terms of sites, architectural features, artefacts, and rock art are all considerably lower in the *hamad* landscape in comparison with the *harra*. Whether this can be attributed to fluvial deposits covering archaeological remains is at this point impossible to say. Whatever the case, there are additional factors that possibly contributed to this situation as well. The limited availability of stone building material, for example, may also have contributed to the scarcity of architectural features encountered in the *hamad* landscapes, while the soft lime- and sandstone present in the *hamad* may have been unfavourable for the preservation of pre-Islamic carvings.

Palimpsest situations

A variety of palimpsest situations occur in the Jebel Qurma region, and these were encountered on numerous occasions. Remains documented on the surface were often found from a wide range of time periods (e.g. from prehistoric until relatively recent times). A relevant example in this respect is the temporal variation observed in artefacts found at residential sites. It often proved difficult to make associations between datable remains, such as ceramics, and non-datable remains such as enclosures. Such problems are not easily overcome. For example, it was difficult to establish a direct relationship between architectural remains and the Safaitic inscriptions often encountered on- or around them. This was only possible when a stratigraphic relation could be made between the structure and the inscription, which was not the case in the majority of situations.

The palimpsest situations encountered over the course of this study are the result of the limited accumulation of deposits in distinct stratigraphic sequences. Through excavations carried out within enclosures, deposits with limited depth and stratigraphy were often encountered. Various processes may have contributed to such situations, including limited anthropogenic deposition of materials, limited deposition of natural and clearly distinguishable sediments, and perhaps even erosion processes such as deflation, although the latter is difficult to establish with certainty.

Looted sites

The remote sensing study and fieldwork carried out in the Jebel Qurma region has widely documented evidence for recent looting of archaeological features. Burial cairns appear to be the prime target of looting activities, as these are believed to contain precious objects. But other types of features have become subjected to looting as well, such as enclosures (see Chapter 4). All of these looting activities are detrimental for the preservation of archaeological features, the cultural landscape they are part of, and the archaeological research that pursues a greater understanding the development of these landscapes and of their past inhabitants.

While it is by no means the aim here to justify such looting activities, it should be noted that they can have a limited positive side-effect for research purposes. In a number of cases looting exposed archaeological remains within features that would not have been visible on the surface otherwise.

These included human skeletal remains, fire pits, and architectural features, all of which could be used to further direct future fieldwork strategies.

3.3 Remote sensing: objectives and methods[3]

3.3.1 Remote sensing objectives

Prior to actual field campaigns in the Jebel Qurma region, a detailed assessment of the archaeological remains in the area was made through a remote sensing study, using aerial photographs, and optical satellite imagery. The advantages of using such imagery in archaeological studies of the Black Desert has long been acknowledged. In fact, the earliest interest in the Black Desert was fostered by the publication of aerial photographs of stone structures on the surface in the early 20th century (see Chapter 1). The extraordinary high degree of preservation and visibility of stone features make them ideal to be studied from the air and from space. Recent advances in the availability of aerial photographs and high-resolution satellite imagery have further added to the potential of remote sensing studies in the Black Desert (Kennedy 2011).

The aims of the remote sensing study of the Jebel Qurma region were twofold: (a) to study the distribution of archaeological features in regions not covered by pedestrian surveys and (b) to better study large linear features that are difficult to document on the ground given their size.

3.3.2 Remote sensing methods

3.3.2.1 Imagery selection, acquisition, and processing[4]

The first type of imagery that was acquired for the detection of archaeological features in the Jebel Qurma region was CORONA satellite imagery. These images were initially produced by a USA espionage programme in which a number of CORONA satellites were launched to observe the earth's surface. These satellites produced photographs between 1959 and 1972, were declassified by the American government in 1995, and since then available for archaeological research (Beck 2004: 134-5). Digital copies of the imagery are now freely available online through the website of the United States Geological Survey (USGS). The imagery is panchromatic (black-and-white) and has different spatial resolutions (varying between 1.8 and 12.2 m per pixel) depending on the camera used on a specific satellite (Galiatsatos 2004, Table 2-2).

For the purpose of this study, two CORONA satellite images were acquired from the USGS, together covering the extent of the study area (Figure 3.6). These photographs were taken in 1968, and have a spatial resolution of *ca.* 2.3 m. This resolution is high enough to document large archaeological features such as walls and large cairns (Figure 3.7). These images came in digital TIFF format but did not have spatial reference data. They were first mosaicked in Photoshop. Following Casana and Cothren (2008: 4-6), who used geocoded imagery to georefence ungeocoded imagery, the mosaicked image was imported into ArcGIS and manually georeferenced using the software's Georeferencing tool, using 15 m spatial resolution Landsat imagery as a reference. The final step in processing the imagery was to orthorectify the imagery to remove image distortions using ArcGIS orthorectification tool. The SRTM DEM was used as a reference to correct these distortions.

The second imagery type used for documenting archaeological features in the Jebel Qurma region was Ikonos imagery (see Chapter 2). The spatial resolution of this imagery is considerably higher than

[3] The remote sensing study presented here was carried out between 2011 and 2013 (Huigens 2013). High resolution imagery of the study area became available on open source web mapping services only after this was completed. As a result, virtual globes such as Bing Maps and Google Earth are not included in this study.
[4] See Appendix A for more detailed information of imagery processing in ArcGIS.

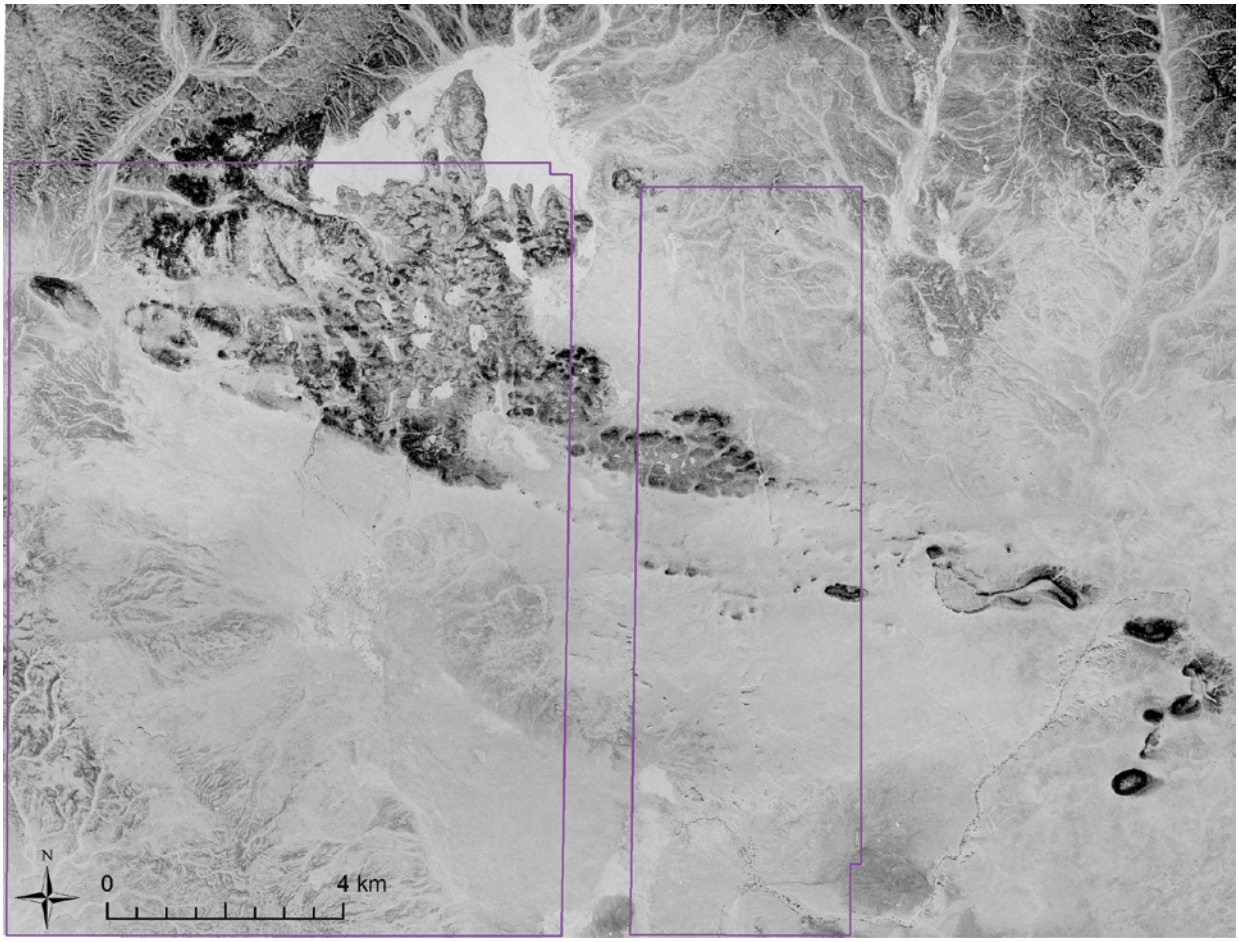


Figure 3.6 Corona imagery of the Jebel Qurma region (courtesy of the USGS) with the extent of available Ikonos imagery indicated in purple.

CORONA imagery (*ca.* 80 cm), and it is therefore more useful to detect small features (Figure 3.7). This imagery, however, is expensive and could only be acquired for part of the study area. The imagery covered about 50 % of the study area (172.1 km^2), including the majority of the basalt landscapes of the Jebel Qurma region and most of the Hazimah plains to the south, as well as most of the WorldDEM data extent (Figure 3.6). Many of the basalt-covered table mounts in the eastern part of the study area fell outside the imagery extent.

In addition to satellite imagery, aerial photographs were obtained of a large number of archaeological sites in the Jebel Qurma region. These photographs were made by the Aerial Photographic Archive for Archaeology in the Middle East (APAAME) project. The APAAME project is a programme in which aerial photographs of archaeological sites in Jordan are made and archived online. Although the flying programme includes Jordan as a whole, one of the major foci of the project is the archaeology of the Black Desert, of which tens-of-thousands of photographs are available. The advantage of these photographs is that they were shot at low altitude with high-resolution handheld cameras, and are thus of much higher resolution than satellite imagery (Figure 3.7). The geographic locations of the photos are contained in the photographs' metadata, and can be imported into ArcGIS. A drawback of these photographs is that many of them were taken from an oblique angle and proper orthorectification is often very time-consuming and sometimes impossible through a lack of adequate ground control points. Given these constraints, this process was only done for a few photographs. A total of 541 APAAME aerial photographs

were obtained for remote sensing purposes at reproduction cost. Their geographic location was imported from their metadata into ArcGIS.

3.3.2.2 Feature detection and documentation

A strategy of systematic manual detection was chosen to detect archaeological features on the satellite imagery and aerial photographs. For the satellite imagery, this entailed the visual detection and marking of potential archaeological features in ArcGIS. To ensure a systematic workflow, a 1x1 km grid was created overlying the imagery, thus dividing the imagery into smaller areas that could be studied consecutively. The imagery was studied for anomalous features, such as linear and circular features that were subsequently marked with points in ArcGIS. Particular attention during the detection of features was paid to what can be called 'negatives'. As noted above, in the basalt landscapes windblown sediments have accumulated between basalt clasts. This means that when clasts are removed to create features such as walls and cairns a layer of lightly coloured soil is exposed that strongly contrasts with the built feature. Contrasts between the feature and its negative are very easily detectable from both aerial photographs and satellite images (Figure 3.8). This is not the case, however, in other landscapes consisting mainly of sedimentary rocks. For example, in the Hazimah plains to the south of the Qurma plateau, archaeological features made of local limestone stand out much less clearly against the surrounding surface, as both are lightly coloured. This greatly hampers the detection of stone-built features in the *hamad* landscapes.

Each detected potential feature was given a unique number, and a number of variables were recorded for each of them, including type, shape, size, and the type of imagery on which the feature was recognised. Type of features included relatively straightforward categories, largely based on previous remote sensing studies of stone features in the Black Desert (e.g. Kennedy 2011; Kennedy and Bishop 2011). Feature sizes were measured with the ArcGIS measure functionality, for which a margin of error was taken into account related to the spatial resolution of the imagery.

A somewhat different method was used for the detection and documentation of archaeological features on the APAAME aerial photographs. These photographs were studied separately without being incorporated in the GIS. A photograph was selected for each unique archaeological feature and then added to the GIS to visualise its geographic location as a point. These points were then added to the general shapefile that also contained the points of the features recognised on satellite imagery. Information was then added to the shapefile's table for each variable except size, since most of the images could not be orthorectified properly and therefore measurements could not be taken.

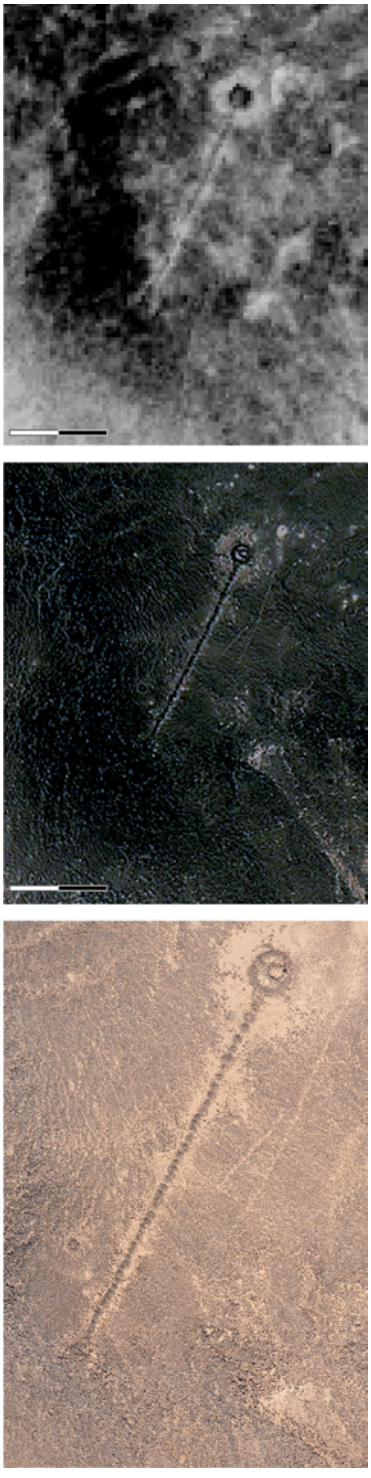


Figure 3.7 An archaeological feature observed on various imagery types. Scale is 100 m. Top: Corona satellite image (courtesy of the USGS). Middle: Ikonos image (courtesy of Jordan Oil Shale Company). Bottom: APAAME image (photo by D. Kennedy, courtesy of APAAME).

3.4 The Hellenistic to Early Islamic-period landscape: datable surface remains and associated features

A wide variety of archaeological and epigraphic remains were documented in the Jebel Qurma region by means of surface surveys. Some of these remains could be attributed with relative certainty to particular periods while for others the date was tentative or completely unknown. Relatively well-datable remains included ceramics and other artefacts as well as inscriptions and petroglyphs. These remains are discussed first as they provide, to a considerable degree, the basis on which the stone-built features were dated – at least in a tentative fashion. The nature and chronology of these stone-built features will therefore be discussed in the subsequent.

3.4.1 Ceramics

The ceramics collected during pedestrian surveys in the Jebel Qurma region present a unique corpus from the Black Desert. During the five survey seasons a total of 8597 ceramic sherds were encountered and collected. Of these sherds, 829 (9.6%) included rims, bases, handles and decorated body sherds, and were potentially diagnostic. The high number of sherds far exceeds other regional projects in the Black Desert, in which ceramics are hardly reported. It is doubtful, however, that the Jebel Qurma region is unique in the widespread occurrence of ceramics. Given that many other projects have focused on the prehistoric periods, it seems rather more likely that there simply has been little interest in the collection, or at least publication, of pottery sherds.

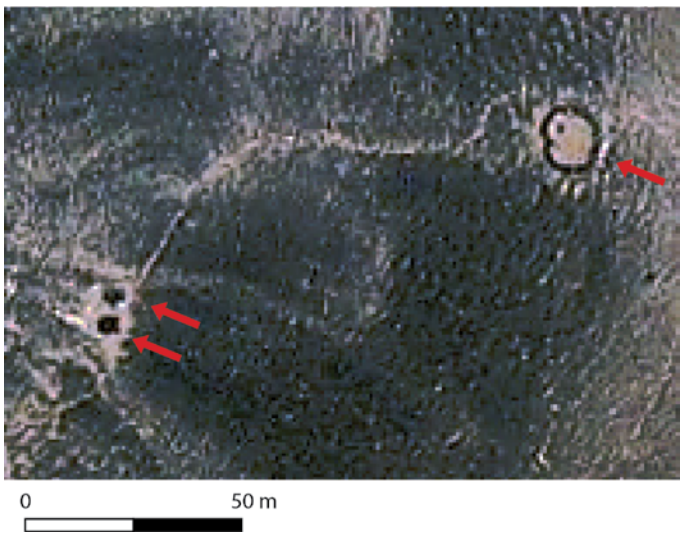


Figure 3.8 Example of Ikonos imagery showing two cairns, a small enclosure, and a path running between them.

For the purpose of this study the ceramic corpus from the Jebel Qurma region is important for a number of reasons. Firstly, they serve as general chronological markers for human occupation of the Jebel Qurma region and particularly of individual sites during the Classical and Late Antique periods. While chipped-stone artefacts have been used to identify prehistoric sites in the Black Desert (e.g. Betts *et al.* 1998, 2013), ceramics may serve a similar purpose when studying the historical periods. Secondly, ceramics may be helpful in the identification of ancient activity areas. This is especially relevant when attempting to identify nomadic campsites, where domestic waste, including pottery sherds, may be encountered. Thirdly, ceramics may provide information on regional exchange relations, which is visible when at least some of the ceramics are not locally produced but imported from elsewhere. This can perhaps identify the relationships between mobile peoples with sedentary communities from which ceramics may have derived.

3.4.1.1 Challenges

Dating and classifying the ceramics from the Jebel Qurma region posed a number of challenges. Firstly, there was a lack of an established local ceramic sequences from which a chronology could be derived. Well-stratified ceramics were hardly encountered during excavations within the region (see Chapters 4 and 5), which rendered it unfeasible to create a local ceramic typology. Dating the diagnostic pottery sherds was therefore only possible through comparisons with published ceramic corpora from other excavated and well-dated contexts. Unfortunately, corpora that could have been useful in this respect, including the potentially well-stratified remains from the Roman military structures in the Azraq

Code	Name	Description
B	Buff Ware gritty	Wheel-made; hard fired; completely oxidizing; abundant mineral inclusions; medium coarse in general; buff to light buff calcareous clay
C	Red Ware gritty	Wheel-made; hard fired; variable firing: from completely oxidizing to incompletely oxidized dark core; iron-rich clays; reddish to reddish brown colours; mineral inclusions very variable in sizes, sorting, quantities, and kind.
D	Red Ware compact	Wheel-made; hard fired to very hard; clinky sound; iron-rich clays; reddish to reddish brown colour; variable firing: completely oxidizing to incompletely oxidized dark core; mineral inclusions of low densities and small size.
E	Buff Ware compact	Wheel-made; hard fired; completely oxidized; calcareous clays; light, buff colour; mineral inclusions of low densities and small size.
F	Basalt Ware gritty	Hand-made; low/short firing; incomplete reduction; emphasis on very strong mineral temper of a predominantly basalt kind; large amounts of mostly large to very large inclusions and low density of small-medium size plant inclusions; iron rich clay; reddish to reddish brown surface colour but quite dark.
G	Pink Ware gritty	Hand-made; mostly oxidized firing but may also be incompletely oxidized with grey core; strong mineral temper; medium size to large inclusions of various kinds and small densities of small/ medium size plant inclusions
H	Grey Ware gritty	Wheel-made; iron-rich clay, but fired in such a way as to induce grey, dark grey to black surface colour; no plant inclusions; mineral inclusions; small/medium-sized and variable densities.
I	Grey Ware compact	Similar to H, but with compact fabric with few to no macroscopically visible inclusions

Table 3.1 Descriptions of fabrics attested in the Classical/Late Antique ceramic material from the Jebel Qurma region. Defined by O. Nieuwenhuyse and D. Peeters.

region, have not yet been published in detail. Instead, the closest comparative material comes from urban and rural settlements situated much further to the west (see below).

Secondly, even when present, the chronological resolution of the datable ceramics is usually limited. The number of ceramics from the Jebel Qurma region that can be closely dated is very low, including high-quality fine wares and amphorae. Coarse wares dominate the ceramic corpus, while there is a total absence of *terra sigillata* wares and Nabataean Painted Fine Wares. Both coarse wares and ceramics from the Classical and Late Antique period are usually difficult to date within a century or less.

Thirdly, possibilities of dating the ceramics is further reduced by their high fragmentation rates: the average weight per diagnostic sherd is only 15.7 grams. Two factors that may have contributed to this high fragmentation degree are the scarcity of high-quality ceramics, and the fact that the surface ceramics were probably exposed for relatively long periods of time to weathering and trampling.

Finally, there are differences in the amount of knowledge about pottery traditions from different time periods in the Levant. This may be because during some periods less distinctive pottery types were produced, or simply because some periods have been better studied that others. Ceramics from the Roman period are relatively well studied, but, except perhaps for fine Nabataean wares, Hellenistic-period pottery are relatively poorly known. There are also problems with Late Antique pottery, as differentiating between Byzantine and Umayyad-period pottery is often difficult, and Abbasid period pottery is poorly known. These issues may create certain dating biases that need to be taken into account.

3.4.1.2 Documentation method

During field surveys in the Jebel Qurma region, ceramics were collected according to the loci that were defined in the field. Each lot of materials from these loci was first sorted out into batches according to fabric and form (e.g. base, rim, body). A total of twelve broad fabric groups were defined based on initial studies of the ceramic corpus by ceramic specialists affiliated with the field project. These fabric groups were defined on the basis of the composition of the ceramic corpus rather than on comparative grounds, since no comparative material from the region or its vicinity were available. Of the defined fabric groups, those relevant to this study are presented in Table 3.1. Batches were then counted, weighed, and coded. The diagnostic ceramic sherds were subsequently documented in more detailed, as they were coded, drawn, and photographed.

3.4.1.3 Comparative analysis

The dating of the ceramics collected during the field surveys was entirely based on comparisons with published ceramics from excavated contexts. Mostly primary excavation data that contained information on the stratigraphy and dating methods were used for this purpose, to be able to ensure the accuracy of the parallels. Most parallels were found in excavation reports from a number of sites in the southern Levant. Other sources included typo-chronological studies based on datasets from various excavated contexts. Descriptions of the find contexts from these parallels and the way in which they were dated can be found in Appendix B.

3.4.1.4 A note on periodization

Historical periods in the ancient Near East are named and dated in different ways, largely following differences in research tradition, the issues under investigation, and differences in local historical developments. It is therefore necessary to describe briefly the way in which this research various historical periods. There is no local tradition of periodization of phases of inhabitation in the Black Desert, especially not for the historical periods. Thus, common terminology and associated dates were adopted from neighbouring regions, in such a way that they broadly reflect the local socio-political history. These periods are sometimes arbitrarily broken down here into an 'early' and 'late' period. The periodization used in this research is shown in Table 3.2.

Period (broad)	Period (narrow)	Date range
Iron Age II		1000 - 332 BC
Hellenistic	Early	332 - 100 BC
	Late	100 BC - AD 106
Roman	Early	AD 106 - 200
	Late	AD 200 - 324
Byzantine	Early	AD 324 - 500
	Late	AD 500 - 634
Early Islamic	Umayyad	AD 634 - 750
	Abbasid	AD 750 - 969
Fatimid		AD 969 - 1171

Table 3.2 Periodization used in this research.

Much of the terminology is derived from the socio-political situation in the settled parts of

the southern Levant, and one wonders whether such terminology has any direct relevance to nomadic communities of the Jebel Qurma region. After all, these communities would not have identified themselves as 'Roman' in the early 1st millennium AD. The term 'Byzantine' may be regarded as a misnomer in similar ways, but also for the fact that what we now call the Byzantine Empire was in antiquity still regarded as 'Roman' (Treadgold 1997). What this terminology does relate to are conventions of the archaeological discipline that derived from broad culture-historical developments, as well as from events used to provide some historical frames of reference.

The end of the Iron Age II period and the beginning of the Early Hellenistic period, then, is set here at 332 BC, marked by the conquest of Alexander the Great of the southern Levant (Berlin 2003; Magness 2012: 6). The Late Hellenistic period is more or less contemporaneous with the Nabataean kingdom, which was annexed by the Roman Empire in AD 106 (cf. Schmid 2008: 360-378). The transition from Roman to Byzantine is placed at AD 324, following Parker (1986) and Watson (2008). The latter takes the end of the Roman tetrarchy and the succeeding reign of emperor Constantine – who moved the capital from Rome to Constantinople – as a starting point. The Early Islamic period starts with the Islamic conquest of the Syrian desert and the Hauran under Abu Bakr, the first Rashidun caliph in AD 634. Between AD 661 and 750 the caliphate was ruled by the Umayyad dynasty (Donner 1981; Kennedy 1986). As it would be pointless to subdivide the beginning of the Early Islamic period into a Rashidun and Umayyad period, the period between AD 634 and 750 is here simply referred to as the Umayyad period. The Abbasid period coincides with the rule of the Abbasid dynasty from AD 750 up to AD 969, when the Fatimid caliphate established its capital in Egypt and subsequently advanced into the southern Levant (cf. Gil 1992; Kennedy 1986: 318-320).

3.4.1.5 Results

On the basis of the comparative analysis, a total of 98 diagnostic pottery sherds could be dated to Classical and Late Antiquity. A catalogue of these sherds can be found at the end of this chapter (§ 3.7.: Table 3.6 and Figure 3.46). Table 3.3 shows the number of sherds per attested period. There is a rather large variability in the chronological range of individual ceramics: some of the sherds could be dated quite closely while others show a much wider date range. It is subdivided into three sections, showing the number of sherds that could be dated according to a fine, medium, and coarse chronological resolution. This is simply the result of differences in the 'life-span' of pottery styles and differences in the chronological resolution of excavated contexts. Importantly, there are no ceramics that could be securely attributed to the Iron Age or Early Hellenistic period, and generally, the number of ceramics that are securely dated to the Hellenistic and Roman periods seems to be low (13 out of 98 sherds (13.3%)). The majority of the dated ceramics were attributed to the Byzantine and Early Islamic periods (65.3%). Additionally, there are many sherds (16.3%), that could be either Hellenistic/Roman or Byzantine/Early Islamic. Given the fact that the majority of sherds are from the Byzantine/Early Islamic period, it is likely that the sherds with a coarse chronological resolution date to Late Antiquity as well. Also important is the scarcity of Fatimid-period pottery (1%) and the absence of ceramics from the Ayyubid/Crusader period.

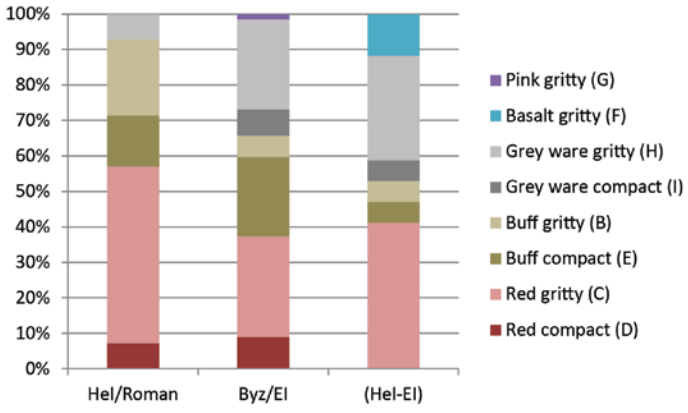


Figure 3.9 Occurrences of fabrics in the Hellenistic/Roman period (Hel/Roman) and the Byzantine/Early Islamic period (Byz/EI). The final column shows fabrics that could only be broadly assigned between the Hellenistic to Early Islamic periods.

Period	Number of sherds	% (of sub-totals)
Fine chronological resolution		
Iron Age II	0	0.0%
Early Hellenistic	0	0.0%
Late Hellenistic	1	3.2%
Early Roman	0	0.0%
Late Roman	2	6.5%
Early Byzantine	2	6.5%
Late Byzantine	7	22.6%
Umayyad	11	35.5%
Abbasid	7	22.6%
Fatimid	1	3.2%
Medium chronological resolution		
Iron Age II/ Hellenistic	1	1.8%
Hellenistic	3	5.4%
Hellenistic-Early Roman	1	1.8%
Late Hellenistic-Early Roman	2	3.6%
Roman	4	7.1%
Roman-Early Byzantine	1	1.8%
Roman-Byzantine	2	3.6%
Late Roman-Byzantine	4	7.1%
Byzantine	5	8.9%
Byzantine-Early Islamic	6	10.7%
Byzantine-Umayyad	1	1.8%
Late Byzantine-Early Islamic	18	32.1%
Late Byzantine-Umayyad	3	5.4%
Early Islamic	4	7.1%
Abbasid-Fatimid	1	1.8%
Coarse chronological resolution		
Iron Age II/Umayyad	1	9.1%
Hellenistic-Early Islamic	1	9.1%
Late Hellenistic-Byzantine	1	9.1%
Late Hellenistic-Early Islamic	1	9.1%
Roman-Early Islamic	1	9.1%
Late Roman-Umayyad	4	36.4%
Late Byzantine-Middle Islamic	1	9.1%
Early-Late Islamic	1	9.1%
Total	98	

Table 3.3 Number of dated ceramics per period collected during pedestrian surveys (see § 3.7 for a catalogue of dated ceramics).

Little chronological diversity is observed within the fabrics of the dated ceramics. Figure 3.9 shows the occurrences of different fabrics divided over two broad periods – the Hellenistic/ Roman period and the Byzantine/Early Islamic period. Although Hellenistic/ Roman sherds are mostly made of red fabrics and Byzantine/Early Islamic sherds are mostly of buff and grey fabrics, all of these fabric types occur in both broad chronological periods. It therefore seems unlikely at this point to ascribe any of the fabric groups to a particular period.

3.4.2 Other artefacts

Few prehistoric ceramics have been identified in the Jebel Qurma region (see Akkermans and Brüning 2017), and pottery sherds from the 2nd and early 1st millennium are so far completely absent. Instead, the remainder of the currently dated ceramics seem to date to more recent periods – mostly the Mamluk and (early) modern periods (Akkermans and Huigens 2018).

Other than ceramics, very few other artefacts could be securely attributed to the Hellenistic to Early Islamic occupation phase. An exception is a single silver coin that was found on the slopes of a looted burial cairn; this was identified as a Seleucid tetradrachm minted in Tyre under the reign of Antioch VII (Figure 3.10). Fragments of artefacts made of materials such as bronze, iron, and glass were found as well. Although such material may also originate from the period of study, these fragmentary remains mostly remain largely undated.

Material that was datable to prehistoric phases of inhabitation was present in the form of many thousands of chipped-stone artefacts (Akkermans *et al.* 2014). At this point, there is no reason to believe that flint implements were used

by inhabitants of the Jebel Qurma region in post-prehistoric periods. Modern artefacts were found in the form of trash such as plastics, bullet casings, paper, and metal and glass containers. These were left behind by Bedouin and other occasional visitors to the region such as hunters, truckers, and grave looters.

Figure 3.10 Silver tetradrachm minted in 130/129 BC under Antiochos VII in Tyre, discovered at a looted cairn at QUR-238 (inventory number QUR238/A1). The grey-brown colour represents tarnish. Photos by P. Akkermans.

3.4.3 Inscriptions and petroglyphs

A large amount of rock art was documented in the Jebel Qurma region, which can be broken down broadly into inscriptions and petroglyphs (Figure 3.11). Inscriptions are carvings of texts in various scripts while petroglyphs are defined as all non-textual carvings, which include zoomorphic and anthropomorphic figures as well as geometric shapes. Various scripts have been attested in the Jebel Qurma region. Over 5000 pre-Islamic inscriptions were recorded, most of which were in Safaitic. Although these are conventionally dated between the 1st century BC and the 4th century AD (Macdonald 2004), this date is highly uncertain. References in the inscriptions to certain political events show that at least some of the inscriptions can be dated between the Late Hellenistic or Roman periods, but the time frame of the writing tradition may nonetheless be broader (Al-Jallad 2015: 17). Although a more reliable dating framework is desirable, this study adheres to the Late Hellenistic-Roman date for the inscriptions.

A handful of pre-Islamic inscriptions were written in other scripts, including Hismaic, which is dated between *ca.* 100 BC and 100 AD, and Thamudic, which is very poorly dated but may range between the 6th century BC and the 3rd century AD (Della Puppa forthcoming; Macdonald 2004). Two Greek inscriptions were encountered as well (at QUR-2 and QUR-610), which may date anywhere between the Hellenistic and the Byzantine periods. Associated with the Safaitic and other pre-Islamic inscriptions are thousands of petroglyphs (Brusgaard in press). Although some pre-Islamic carvings have been documented in relative isolation, they are mostly found in clusters that may consist of over 800 individual inscriptions and petroglyphs.

Figure 3.11 Safaitic inscription and associated petroglyphs (QUR-64, RA-152). Scale is 20 cm. Photo by P. Akkermans.

Rock art that can be safely attributed to the Byzantine and Early Islamic periods is absent thus far. Although it is possible that the two Greek inscriptions are from the Byzantine period, they could equally be from older periods. Furthermore, although Arabic inscriptions abound, none of them are in Kufic – a script from the Early Islamic period.[5] Rather, the earliest Arabic inscriptions in the study area are a few dozen texts from the 13th and 14th centuries AD, during the Mamluk period (Abbadi 1986). The remaining Arabic inscriptions and associated pictorial carvings are modern.

[5] This interpretation is based on preliminary readings of the Arabic inscriptions by Prof. Dr Petra Sijpesteijn (Leiden University) and Dr Ilkka Lindstedt (University of Helsinki).

Feature type	Pedestrian survey area		Beyond pedestrian survey area
	harra	*hamad*	
Enclosures (grouped)	141	7	45
Enclosures (single)	277	3	72
Clearings	365	1	65
Cairns	633	38	53
Pendants	30	1	20
Desert kites	11	0	5
Walls	99	6	5
Dwelling clusters	6	0	0
Wheels	21	0	8
Tent places	525	23	70
Graves	99	34	0
Desert mosques	21	0	0
Markers	333	9	0
Others/undefined	844	24	31
Total	3405	146	374

Table 3.4 Number of features per type as documented through pedestrian and remote sensing surveys in the Jebel Qurma region.

3.4.4 Stone-built features

In addition to the artefacts and rock art described above, the Jebel Qurma region hosts a large number of stone-built features of various types (Table 3.4). Although many of these represent fairly familiar feature types of the Black Desert, many of these have thus far remained virtually undated. Through association with better datable surface remains (mainly ceramics and pre-Islamic carvings), the date of construction and/or use of these features is here proposed. This tentative chronology is further investigated in Chapters 4 and 5. What follows is a description of the different recognised feature types, including their proposed date of construction and use.

3.4.4.1 Enclosures

Enclosures are defined as walled structures enclosing a space that may or may not be cleared of basalt boulders (Figure 3.12). Enclosures are very numerous in the Black Desert, but their date of construction and use is largely unknown, and even their function remains unclear. A number of enclosures were targeted by Betts' survey and excavation programme as they were often associated with prehistoric remains – the main focus of her research. While in a limited number of cases her excavations seemed to suggest a prehistoric origin of enclosures, Betts generally remained cautious about assigning enclosures to a specific period. She often recognised multiple phases of use of the enclosures, demonstrated either by multiple phases of construction of the walls, or through find material within and around the enclosures. Yet, a lack of stratigraphy in the deposits made it difficult to securely correlate artefact assemblages with phases of construction (see Betts *et al.* 2013). In terms of function, Betts seems to support the idea that they were used in the past as animal pens (e.g. Betts and Cropper 2013: 184). On the other hand, the large number of artefacts sometimes found in and around enclosures also may suggest that they were used as residential areas (cf. Abu-Azizeh 2013). It is of course possible that either or both

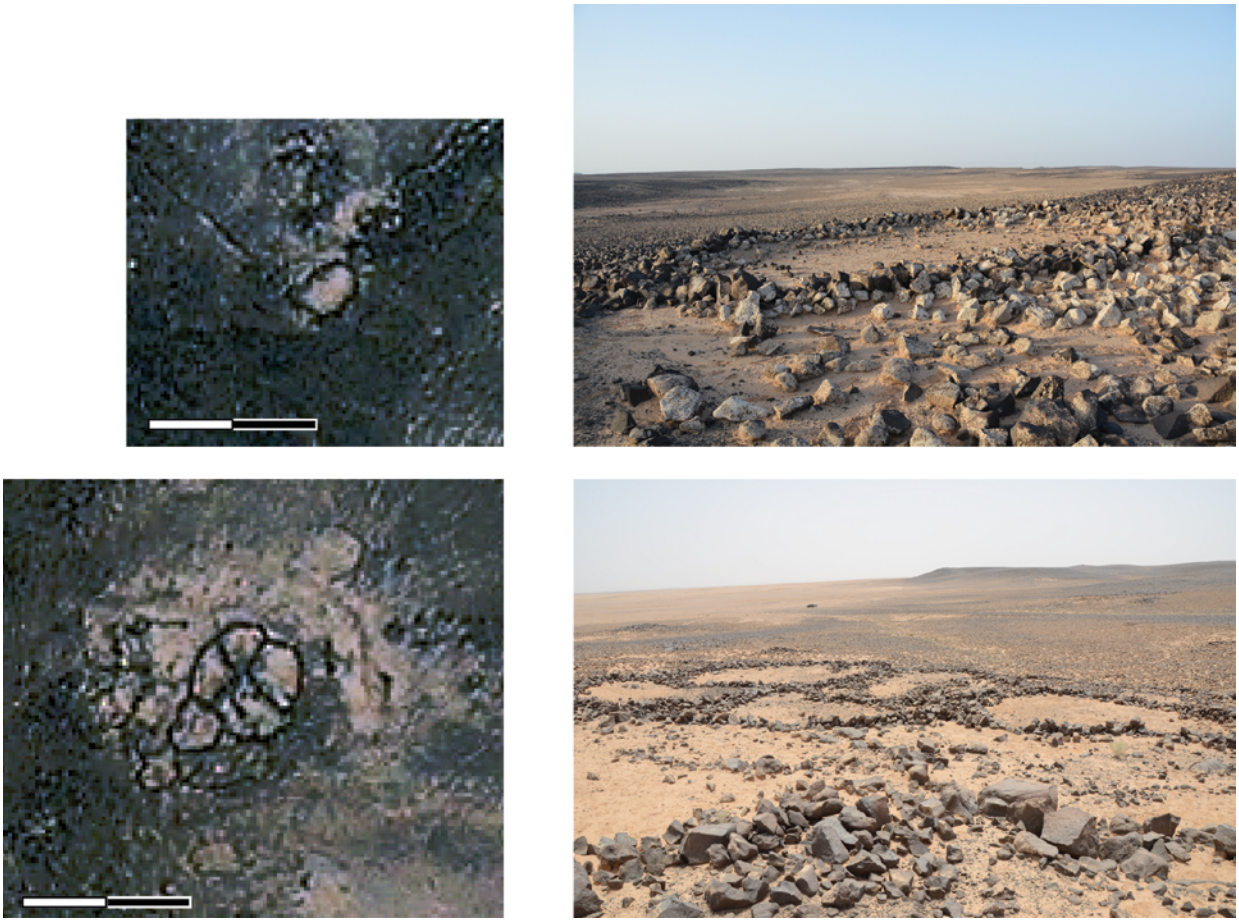


Figure 3.12 Enclosures in the Jebel Qurma region as seen from the air and on the ground. Top row: single enclosure at QUR-379. Bottom row: grouped enclosure at QUR-123. Scale is 40 m.

of these interpretations may be true, especially if enclosures were reused between prehistory and the present day.

In the Jebel Qurma region a total of 428 enclosures were documented during surface surveys. These were subdivided into two types: *single enclosures* and *grouped enclosures*. Single enclosures are most numerous and represent walls that enclose a single space. Grouped enclosures are spaces that are subdivided into a number of compartments.

Evidence for the use of a number of enclosures between the Hellenistic to Early Islamic periods comes from ceramics identified from these periods within and directly around enclosures, which was the case at ten enclosures. Hellenistic to Early Islamic ceramics were attested at another eleven sites where enclosures were present, although the ceramics were not found in direct association with enclosures. Further evidence for the frequentation of sites with enclosures during the period of study is provided by pre-Islamic inscriptions and petroglyphs that are sometimes found at these sites. In the case of eight sites, some of these inscriptions actually mention the presence or construction of an enclosure.[6]

While many of the enclosures were visited and possibly used during the period of study, many of them were possibly constructed much earlier, perhaps as early as prehistory. Relatively large amounts of

[6] Enclosures are identified by the Old Arabic word zrt (Della Puppa forthcoming). The enclosures to which the inscriptions most likely refer are found at the sites of QUR-20, QUR-1016, QUR-175, QUR-185, QUR-206, QUR-210, QUR-734, and QUR-974 (see Table 3.5).

chipped-stone artefacts have been encountered within a number of the enclosures (Akkermans *et al.* 2014; Huigens 2015). In fact, at 17 of the 25 sites for which there is evidence that one or more of the enclosures were occupied between Hellenistic and Early Islamic times, large amounts of chipped-stone artefacts also were encountered. It is therefore possible that the enclosures at these sites were reused rather than newly constructed.

3.4.4.2 Clearings

Clearings are defined as surfaces that were cleared of their naturally occurring stone cover, yet not surrounded – or only to a limited extent – by stone walling (Figure 3.13). Clearings are among one of the most understudied feature types of the Black Desert. Although they are not unique to the Jebel Qurma region, clearings have been rarely described in most of the remote sensing or field studies previously carried out in the Black Desert. A notable exception is the study by Kempe and Al-Malabeh (2010), in which these clearings were documented through remote sensing. However, it has remained completely unknown when these clearings were made and used, and for what purpose. Tentatively, a number of possibilities in terms of their function can be posed. They may represent areas that were used for residential purposes, i.e. to pitch small tents or huts, or to pen animals, although in the latter case the actual pens must have been made of perishable materials. An alternative hypothesis is that these areas were cleared of basalt to stimulate the growth of pasture, as is known from ethnographic accounts and archaeological contexts (e.g. Chang and Koster 1986; Hammer 2014). These hypotheses remain to be tested.

A large number of clearings were documented through pedestrian surveys (Table 3.4). They seem to be confined entirely to the *harra* landscapes, where the rock cover is usually much denser than in the *hamad*. The variability in the size of the clearings is rather large. The smallest clearings may only be a few meters across, while the largest can cover an area up to about 1 ha.

Evidence for the use of a small number of clearings during the Classical and Late Antique period comes from ceramics, which were encountered on or directly around 14 clearings. Evidence for earlier (prehistoric) use of these clearings is limited, but they were extensively reused in relatively recent times. In many cases the remains of recent Bedouin campsites, including modern trash, rectangular tent outlines, and animal pens (see below), are found on

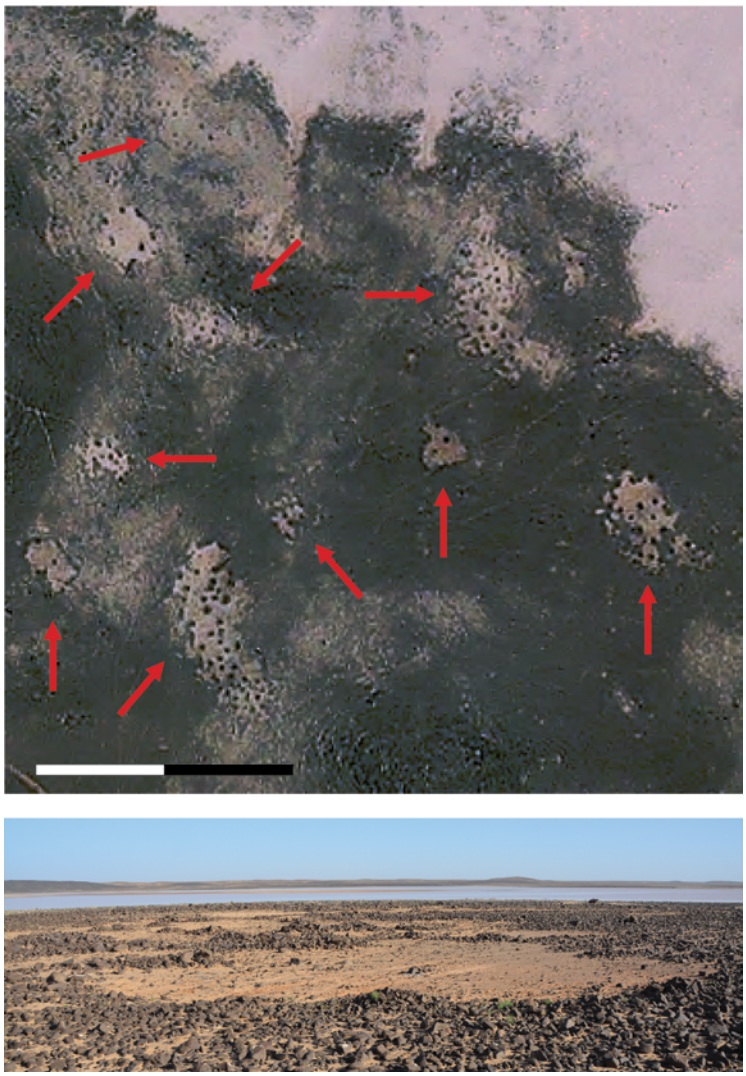


Figure 3.13 Clearings on the edge of a mudflat. Top: clearings indicated by red arrows on Ikonos satellite imagery (scale is 100 m). Bottom: a clearing at QUR-882. Photo by P. Akkermans.

the clearings. As a result of these recent reconfigurations, it is difficult to identify ancient features at these clearings, such as the remains of residential units or other installations. It should also be noted that many of the clearings identified in the Jebel Qurma remain undated at the moment due to a lack of datable surface remains associated with them.

3.4.4.3 Cairns

Cairns are mounds of stone that are widely known from the Black Desert and other basalt landscapes of Arabia, where many thousands of cairns have been documented through remote sensing studies (Kennedy 2011; Kennedy and Bishop 2011). Although they are usually interpreted as funerary monuments, very few of them have thus far been studied on the ground. Their interpretation as burial cairns is based partly on Safaitic inscriptions mentioning funerary practices, which have sometimes been found in association with cairns. Excavations have shown that at least some of cairns associated with funerary inscriptions were indeed tombs (e.g. Clark 1981; Harding 1953, 1978: 245-9). At the same time, however, it has proved dangerous to categorically ascribe a funerary function to all cairns. For example, cairns at Maitland's Mesa were originally thought to be funerary monuments because of their similarity in appearance to tombs in the Negev; they were later identified as prehistoric dwellings (Rowan *et al.* 2015). Other excavated cairns yielded no human bone material or potential grave gifts (e.g. Harding 1978: 243), and there was therefore no clear evidence that these were funerary structures. A classification of different cairns in terms of form, chronology and, indeed, function is necessary to better understand these features (see Chapter 5). It is furthermore important to realise that cairns, similar to other surface features, may have been reused in different periods and for different purposes, as has been shown in other parts of Arabia (e.g. Crassard *et al.* 2010; Döpper 2015; McCorriston *et al.* 2011).

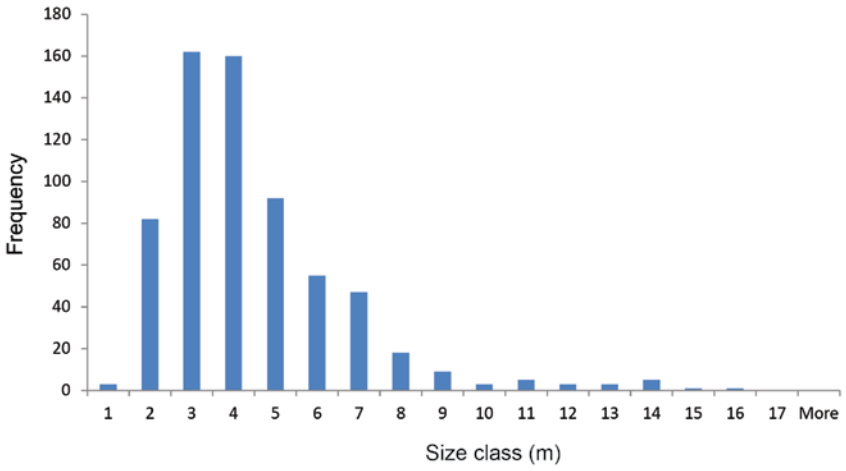


Figure 3.14 Histogram showing the number of cairns documented through pedestrian surveys per size class according to diameter (in meters).

In the Jebel Qurma region, 671 cairns were documented through pedestrian surveys between 2012 and 2016. Of these, 38 were situated in the *hamad* landscapes, with the others situated in the *harra*. Variation in the size of all cairns ranges between 0.8 and 15.6 m. When the variability of the diameter of cairns is plotted in a histogram (Figure 3.14), any clear differentiation between cairn types based on size does not become apparent, as the variation is distributed more or less normally. To further differentiate between cairn types, we may instead turn to their general morphology. While over 95% of the cairns can be characterised simply as crudely piled rock heaps, a limited number of them (31, or 4.6%), showed a more neatly stacked external façade. Most of these façades are fairly low (less than 1.25 m high), although a few seemed to be much higher and were created of much larger stones that were neatly aligned (Figure 3.15). These cairns were also more formidable in diameter (i.e. between 7 and 13 m) than the cairns with lower façades, which were mostly between *ca.* 2 and 6 m across.[7] Any further subdivision

[7] These measurements do not necessarily reflect the original size of the cairn but may include a 'cover', composed of later additions to the cairn or debris (see Chapter 5).

Figure 3.15 Two types of cairns with façades. Left: a small cairn with a relatively low façade (QUR-943). Right: a large Tower Tomb featuring a high, neatly stacked façade (QUR-64). Scale is 50 cm. Photos by P. Akkermans.

within the large group of cairns that lack a façade and simply consist of a dome of rocks is at this point not possible. These require further study through excavation (see Chapter 5).

Some evidence was collected in terms of the function of cairns. From the 671 documented cairns, a possible central chamber was observed at 163 cairns. There were several potential indicators for the presence of such a chamber. A circular or oval outline was sometimes visible on top of cairns. These outlines were made of blocks that were often somewhat larger than the stones used for the general cairn construction (Figure 3.16). In other cases, a shallow depression was observed, also on the top of the cairn, which presumably had formed due to the collapse or looting of an internal chamber (Figure 3.17). Preserved chambers, including the walls (Figure 3.18), and sometimes even parts of the roof construction were observed as well (Figure 3.19). Skeletal remains were observed within 31 of the 163 cairns with chambers. The presence of human bones suggests that these chambers indeed represent tombs (Figure 3.20). Recent illicit looting of such tombs has occurred widely, as 152 (22.7%) of the cairns showed signs of recent looting. In addition to human skeletal remains, whole or fragmented artefacts such as beads and metal objects – presumably grave gifts – were sometimes exposed by such activities. It is important to note that skeletal remains were mostly found at cairns with a rather large size: 78% of the cairns with skeletal remains had a maximum width larger than 4 m. There were only four looted cairns that were smaller than 4 m across at which skeletal remains were observed. Therefore, although 60% of the total amount of cairns in the Jebel Qurma region measured less than 4 m in width, it is possible that very few of these actually represent burial structures. Alternatively, it may be that larger cairns have been more frequently targeted by looters because of better visibility. Whatever the case, on the basis of survey evidence alone it is difficult to state that the smaller cairns were also used for funerary purposes, and excavations were necessary

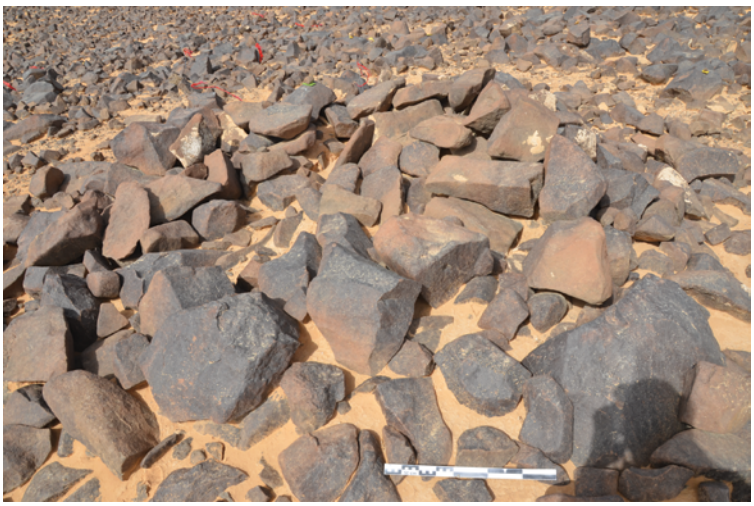


Figure 3.16 Low cairn featuring a circular outline of larger stones in the centre (QUR-529). Scale is 50 cm. Photo by P. Akkermans.

Figure 3.17 The top of two cairns featuring a depression in the centre, at QUR-207 (left) and QUR-943 (right). Scale is 50 cm. Photos by P. Akkermans.

to further explore their function (see Chapter 5).

Finally, at 56 (8.3%) of the documented cairns a small structure was created against the side of the cairn. This consisted either of a small crescent-shaped or circular enclosure, or simply a few protruding walls (Figure 3.21). These additions usually occurred on the leeward side of the cairns. Whether these were original features of the cairns or later additions could not be determined on the basis of survey data alone, and were investigated further through excavations (see Chapter 5).

Figure 3.18 Centre of a cairn at QUR-207 featuring a looted chamber with part of its corbelled wall pre-served.

Pre-Islamic rock art was regularly present on or directly around cairns. In one case, an inscription directly referred to

Figure 3.19 Cairn at QUR-27 featuring a partially collapsed/looted roof construction on the top. Scale is 50 cm. Photos by P. Akkermans.

Figure 3.20 Central part of a burial cairn at QUR-148 disturbed by recent looting activities. Photos by P. Akkermans.

constructing or visiting a burial cairn (QUR-215: Della Puppa forthcoming). In this case there is a likely link between the inscription and the cairn situated nearby. In other cases, however, there was evidence that a cairn post-dated at least some of the inscriptions associated with it. In these cases, stones carrying pre-Islamic carvings were reused for the construction of the cairn. This is evident, for example, where inscriptions were situated within the seams of a façade wall on the cairn's exterior. In these cases, the carvings must predate the construction of the cairn, although others might still have been added later.

Figure 3.21 Low cairn at QUR-249 with a small annex in front of it. Scale is 50 cm. Photo by P. Akkermans.

In summary, this section has shown that cairns of highly variable size and configuration were documented by pedestrian surveys. The survey evidence shows that at least some of them indeed represented tombs, mainly based on materials found in looting debris. Some of them may be relatively young (i.e., postdating Safaitic carvings), but some of them may date much older, to the prehistoric period. Excavations were required to further investigate morphological, chronological, and functional differences between the cairns in the study area (see Chapter 5).

3.4.4.4 Pendants

Pendants are linear features comprising either a string, or 'tail', of small cairns or simply a broad wall of stones, which often, but not exclusively, can diverge from a larger cairn (Figure 3.22). The name 'pendant' originates from earlier studies of structures in *harra* landscapes (e.g. Kennedy 2011), but have also been termed *tombes à traîne* (e.g. Steimer-Herbet 2001, 2011), or *tailed cairns* (e.g. Rollefson 2013). Pendants are a rather distinctive type of feature from the basalt landscapes of Arabia. They occur, in various different forms, from the Syrian part of the Black Desert as far south as Yemen, and are present across many of the basalt regions of the western Arabian peninsula (De Maigret 1999: 329-35; Kennedy 2011). Despite their high numbers and wide occurrence, their function and date of construction are at this point still largely uncertain. In Yemen, radiocarbon dates were obtained from skeletal remains discovered at the main cairns associated with pendants. These gave a broad date range, between the early 3rd and early 2nd millennium BC (Steimer-Herbet 2001), and the 1st millennium BC (De Maigret 1999: 331). For the pendants in southern Syria, Steimer-Herbet also argued for a correlation between

Figure 3.22 Examples of a pendant as viewed from the air and from the ground. Photos by D. Kennedy (left, courtesy of APAAME) and P. Akkermans (right; QUR-32).

funerary cairns and pendants, although this association seems to be largely inferred rather than established, as direct dating evidence from this region is currently lacking.

In the Black Desert of Jordan pendants have been even less well studied. Even though their occurrence has long been established through aerial reconnaissance (Kennedy 2011: 3189-90; Rees 1929: 391), investigations on the ground were very rare. Until recently (but see Chapter 5) a pendant had been investigated in detail only at Maitland's Mesa. Here, the individual heaps of the pendant appeared to have been small oval to rectangular chambers that did not appear to contain any human bone or other remains. This perhaps suggests that they were not tombs by themselves but may have served a commemorative function in relation to the main cairn at the head of the pendant (Rowan *et al.* 2015: 180, following Kennedy 2011: 3190). This conclusion, however, needs to be further substantiated (see Chapter 5) as it is based on a single case only and, again, lacks dating evidence.

A total of 31 pendants were documented in the Jebel Qurma region through pedestrian surveys between 2012 and 2016. A large degree of variability exists among the pendants in terms of their size and configuration. The shortest pendant tail is only about 3 m long and consists of 2 cairns, while the longest pendant tail is 134 m in length and consists of 58 individual cairns (Figure 3.23). Nearly all of the pendants feature a larger cairn at one of its extremities and there does not seem to be a preferred orientation of their tails (Figure 3.24).

The pendants are difficult to date on the basis of survey data alone. They are usually not associated with pre-Islamic rock art or artefacts. Some of the pendants appear to be overlying

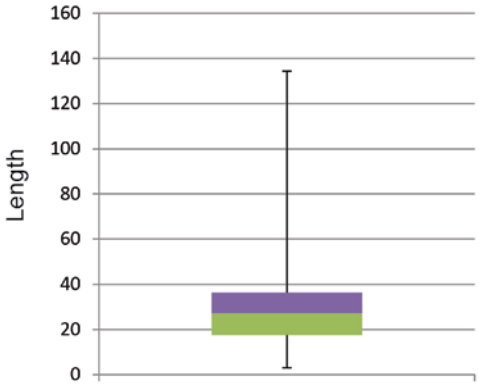


Figure 3.23 Box-and-whisker plot of the length of pendants documented though pedestrian surveys in the Jebel Qurma region.

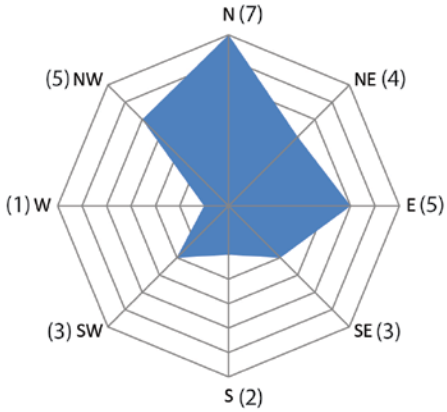


Figure 3.24 Radar chart showing the orientation from which pendants diverge from the main cairn. Absolute amounts are indicated between parentheses (for one of the pendants the orientation is unknown). The p-value of the variation is 0.45, indicating that there is statistically no preferred orientation.

prehistoric structures, such as the prehistoric 'wheel' (see below) at QUR-148 (Figure 3.25). Some of the pendants, however, are connected to cairns that are associated with many pre-Islamic carvings, which may suggest a similar date for the pendants. However, this remains to be further scrutinized (see Chapter 5).

Figure 3.25 A pendant overlying a prehistoric wheel and enclosure at QUR-147. Aerial photograph by K. Henderson/N. Qaili, courtesy of APAAME.

3.4.4.5 Desert kites

Desert kites, or simply kites, are among the better-studied feature types of the Black Desert. They typically feature a large star-shaped enclosure with walls diverging from its apex. Although their function has been the topic of some dispute over the last decades, recent excavations at a number of kites all seem to suggest that these installations were constructed for hunting large amounts of game, including gazelle, although secondary use as animal corrals cannot be ruled out (Betts and Burke 2015). Animals would be driven towards the star-shaped enclosure using the diverging arms, where hunters would wait for the animals to trap or kill them. The actual trapping and killing was probably done through the use of pits, situated at the points of the star, into which animals would fall (Abu-Azizeh and Tarawneh 2015). The origin and period of use of the kites is less clear than their function. While there is evidence that the original construction date of at least some kites in the Black Desert is prehistoric (Betts and Burke 2015), their use may have continued for much longer. Safaitic rock art is known to depict hunting activities using kites (Macdonald 2005), and there are even ethnographic accounts from the 20th century of similar hunting practices (cf. Fowden 1999). Therefore, while some kites may have a prehistoric origin, it may well be that they were often reused or sometimes newly constructed in more recent times.

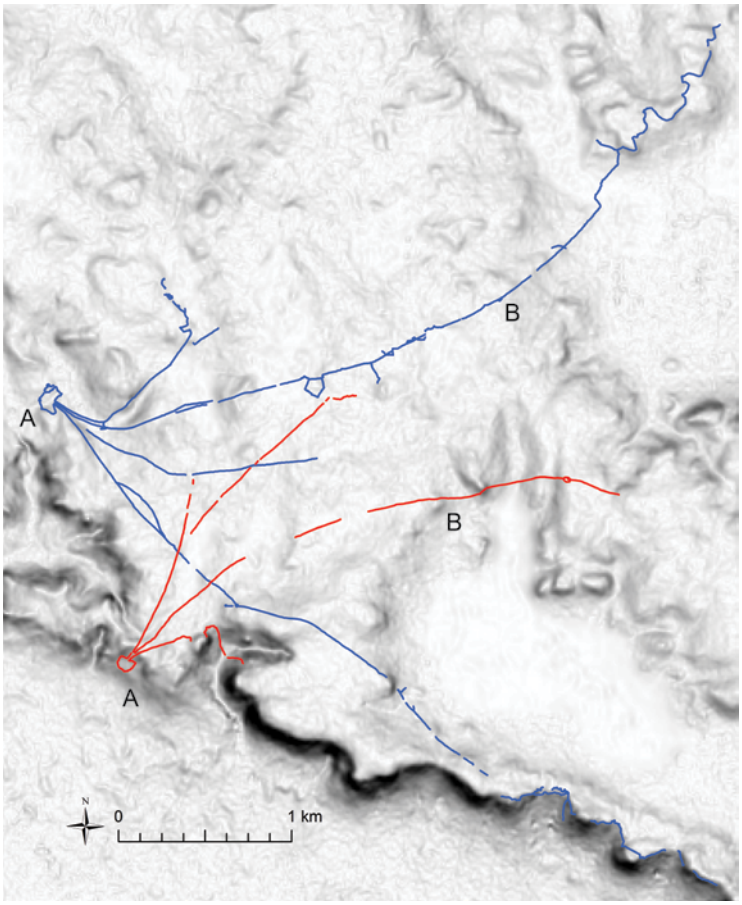


Figure 3.26 Two desert kites in the Jebel Qurma region, featuring an apex (A) and guiding walls (B). Traced from Ikonos satellite imagery. Base image: WorldDEM slope map.

All desert kites that were recognised in the Jebel Qurma region (Table 3.4) were situated in the *harra* landscape. These are very large constructions, featuring traps of hundreds of meters across, and guiding walls diverging from them of up to 5 km long (Figure 3.26). The trajectory of these walls could be observed and documented with the help of Ikonos satellite imagery. Most of these features, if not all of them, were most likely constructed already in prehistoric times (Akkermans *et al.* 2014), and there are no clear indications that they were used in younger periods. However, it must be stressed that any evidence for the use of these structures, be it as installations for hunting or herding, would be difficult to find on the surface, as such activities would leave very little material traces.

3.4.4.6 Walls

In addition to the linear features described above (enclosures, pendants, kites) a number of walls were recognised that do not seem to fall in these other categories. These were long walls winding through the landscape for many kilometres that did not seem to have a connection to, for example, kites. Ikonos satellite imagery again proved useful in documenting these extensive features, which can be as long as 2 km (Figure 3.27).

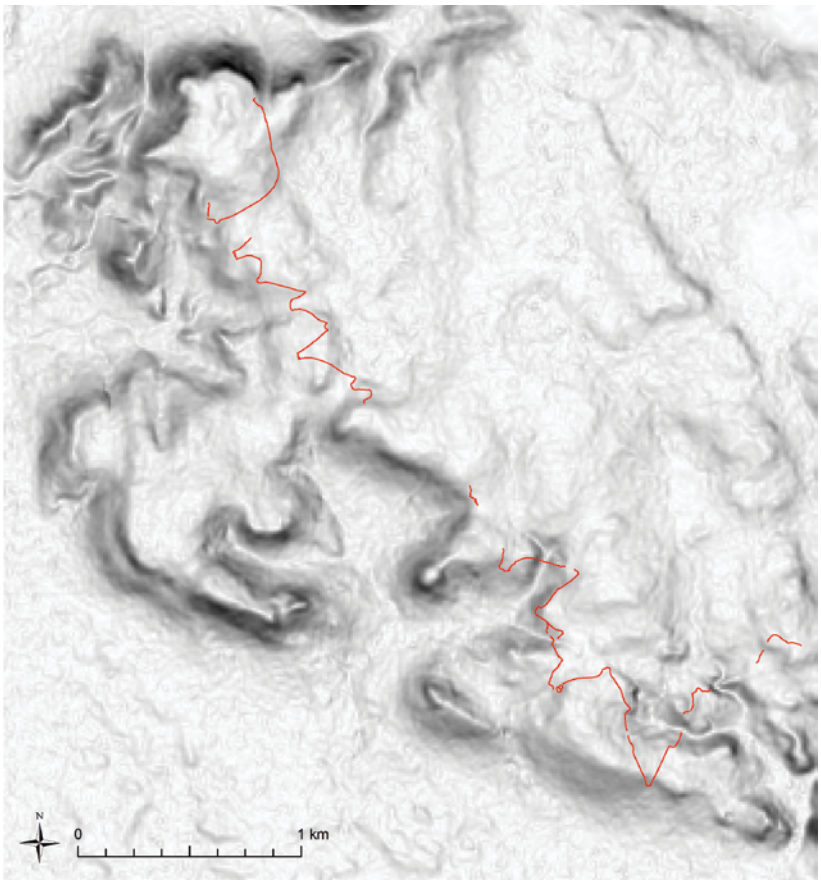


Figure 3.27 Selection of Walls in the Jebel Qurma region traced from Ikonos satellite imagery. Base image: WorldDEM slope map.

Such walls were recognised earlier by Kennedy (2011: 3190), who described these features as a form of 'landscape art' in the absence of substantial evidence in terms of function.

Although a number of the long walls in the Jebel Qurma region have been investigated through surface surveys there is at this point no evidence for their date of construction or the ways in which they were used in the past.

3.4.4.7 Dwelling clusters

In a number of places, clusters of small circular, oval, or figure-eight shaped features were recognised. While these features had an open interior and can look like very small enclosures, they are distinctive given their small size and their tendency to form clusters (Figure 3.28). These were characterised as dwelling clusters because of their close resemblance to other sites in the Black Desert, where excavations identified these features as small prehistoric dwellings or hut foundations (Müller-Neuhof 2013: 135; Rollefson *et al.* 2014; Rowan 2013).

Six dwelling clusters were identified in the Jebel Qurma region and studied through pedestrian surveys. The artefacts recovered from these sites represent mostly prehistoric material (e.g. chipped stone

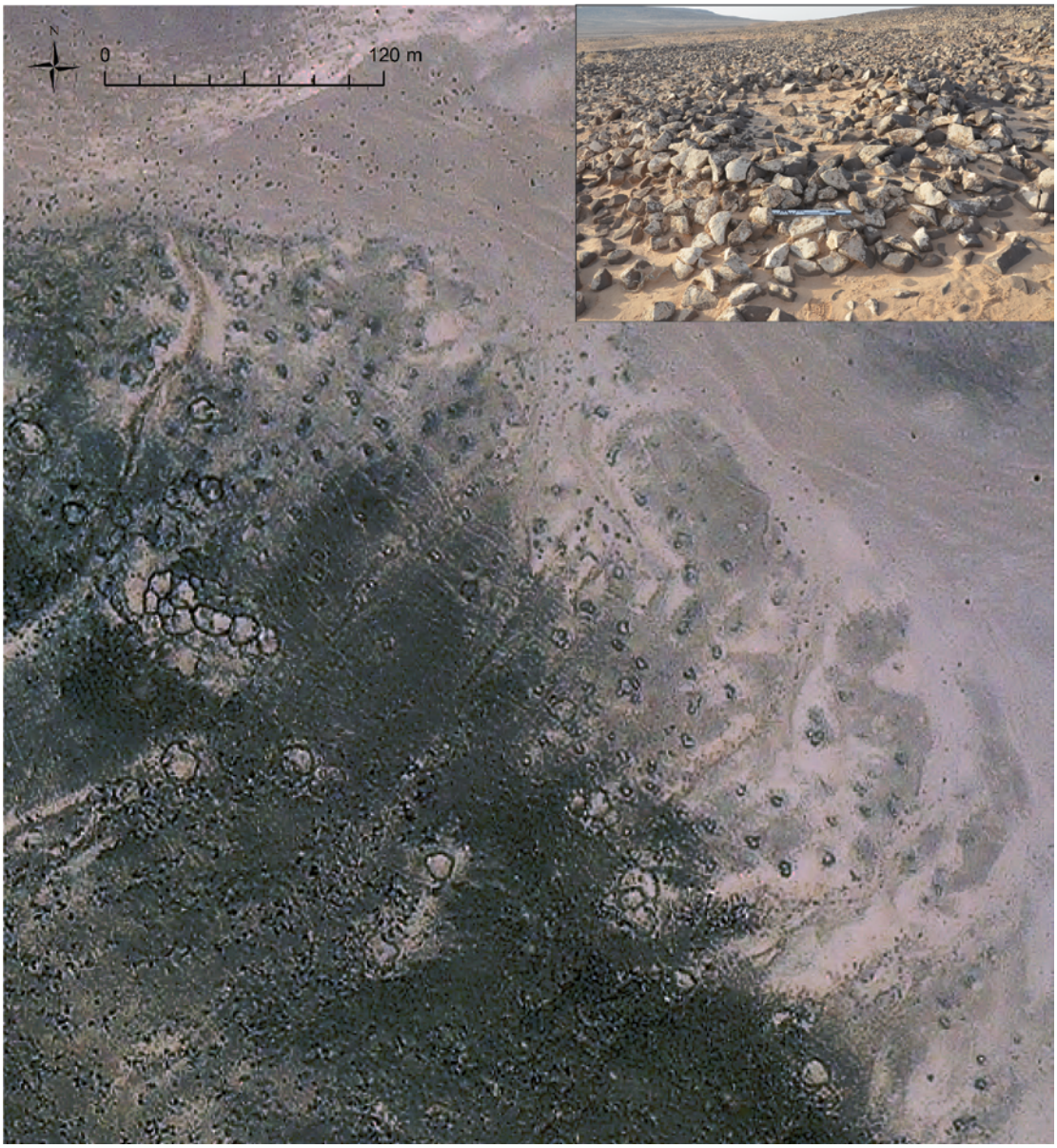


Figure 3.28 Ikonos satellite image of a cluster of dwellings at the site of QUR-6 at the bottom of Jebel Qurma. Insert: a dwelling or hut foundation at QUR-6. Scale is 50 cm. Photo by P. Akkermans.

artefacts), which was tentatively dated to a late prehistoric phase of occupation in the Jebel Qurma region (Akkermans *et al.* 2014). There is no evidence that these structures were reused in more recent times.

3.4.4.8 Wheels

Wheels are yet another highly distinctive, perhaps unique feature type of the Black Desert. Wheels are defined as roughly circular grouped enclosures surrounded by a ring of hut-like structures (Figure 3.29).

Little is known about the function and chronology of wheels. They were first described on the basis of field data by Betts (1982), who used the term 'jellyfish' for them, and she tentatively suggested a domestic function and prehistoric date of origin. Kennedy has challenged this interpretation, stressing that the circle of small structures around the main enclosure may actually be cairns rather than huts,

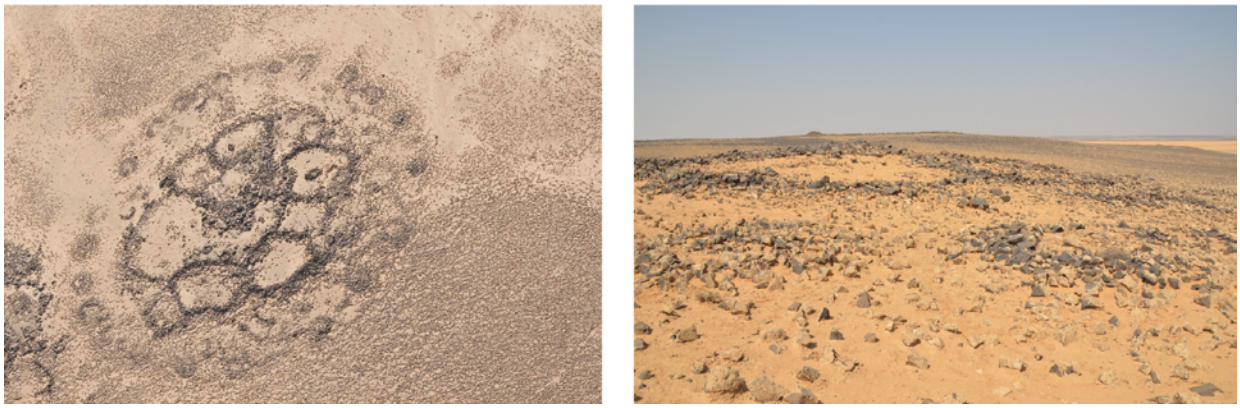


Figure 3.29 A Wheel in the Jebel Qurma region (QUR-146) as viewed from the air and on the ground. Photos by M. Neville (left, courtesy of APAAME) and P. Akkermans (right).

perhaps suggesting a funerary function rather than a domestic one (Kennedy 2012b). However, with the absence of excavation data their function remains uncertain as of yet. Recent research in the Black Desert, however, has provided more information about their possible initial date of construction. OSL dates from a number of wheels suggest that they were constructed over a very long time period, namely between the early 7th and late 4th millennium BC (Rollefson *et al.* 2016).

In the Jebel Qurma region, numerous wheels have been documented through remote sensing and pedestrian surveys (Table 3.4). Evidence for a prehistoric date of these features was found at many of these features, in the form of chipped-stone artefacts and, possibly, ceramics (Akkermans *et al.* 2014). Nevertheless, a number of wheels appear to have been reused and altered during more recent times, visible through changes to the original configuration of the wheel. Moreover, ceramics from the Classical/Late Antique period were encountered within some of the enclosures of the wheel, which may be indicative of domestic use of the wheels (see above). In other cases, cairns surrounded by large amount of pre-Islamic rock art were constructed in the centre of these wheels.

3.4.4.9 Tent places

A large number of features were interpreted as abandoned tent places (Table 3.4). These are rectilinear clearings often outlined by small heaps of stone or gravel, which probably served to keep down tent cloth

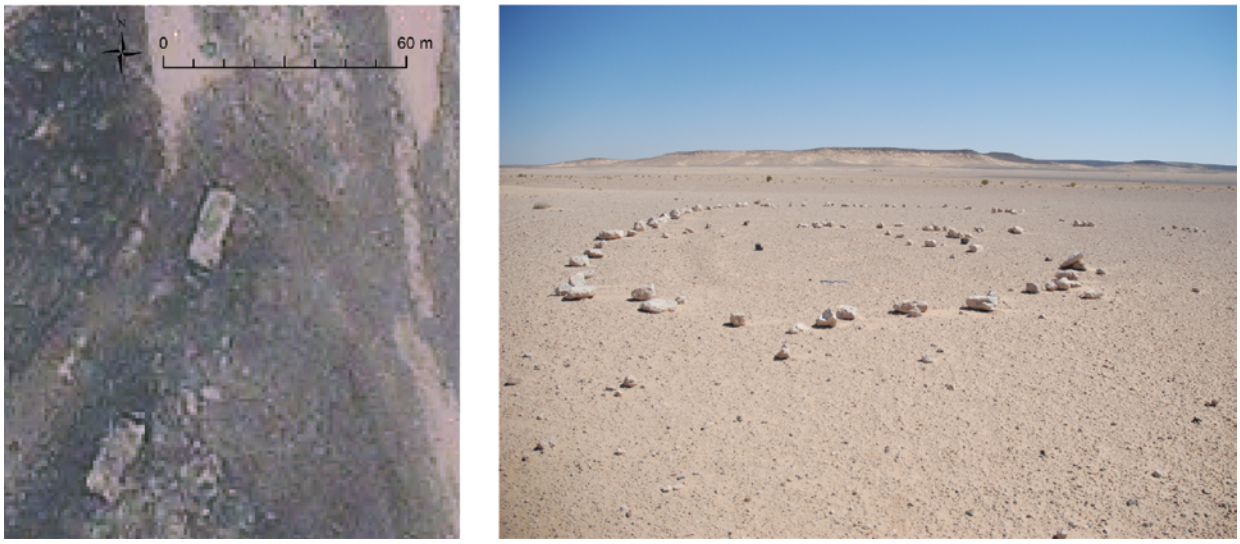


Figure 3.30 Examples of tent outlines. Left: rectangular tent outlines in Wadi Rajil as visible on Ikonos satellite imagery. Right: a tent outline at HAZ-9 in the Hazimah plains.

(Figure 3.30). Their rectangular shape is similar to the traditional black tent of the Bedouin (cf. Cribb 1991: 140), and their use as residential areas is further substantiated by the occurrence of fireplaces within some of these features and modern trash within and around them.

The interpretation of these outlines as tent places is further substantiated by similarities to other remote sensing and field studies of abandoned Bedouin campsites (e.g. Banning 1993; Saidel and Erickson-Gini 2014; Tucker 2009). These studies further indicate that such tent places probably date mostly between the 17th and 20th centuries AD, although there is limited archaeological evidence that suggests the black tent was used already from the 6th to 8th centuries AD and afterwards (Saidel 2008: 473).

The field surveys in the Jebel Qurma region do not provide any evidence for the use of such tent places during the Classical or Late Antique period. Although in eleven cases ceramics from this period were found on such tent places or directly around them, it is possible that these artefacts are chronologically associated to the clearings on which these tent places were situated rather than with the tent places, which may have been added much later. Excavations are required to further establish whether the rectangular tent places may represent remains from antiquity (see Chapter 4).

3.4.4.10 Graves

In addition to burial cairns there were a total of 133 features that were tentatively identified during the pedestrian surveys as simple graves. Some of these potential graves were found in isolation while others were found in clusters of up to 10 graves (Figure 3.31). In some cases these were elongated stone heaps with an east-west orientation, reminiscent of the covers of Islamic inhumation graves. Some of these had a 'headstone', for example in the form of an upright slab at one end, which strengthens their identification as a grave.

Figure 3.31 Example of an Islamic grave from the site of QUR-1028. Scale is 50 cm. Photo by P. Akkermans.

A different type of potential graves was recognized in the Hazimah plains, at site HAZ-27, where the graves consisted of

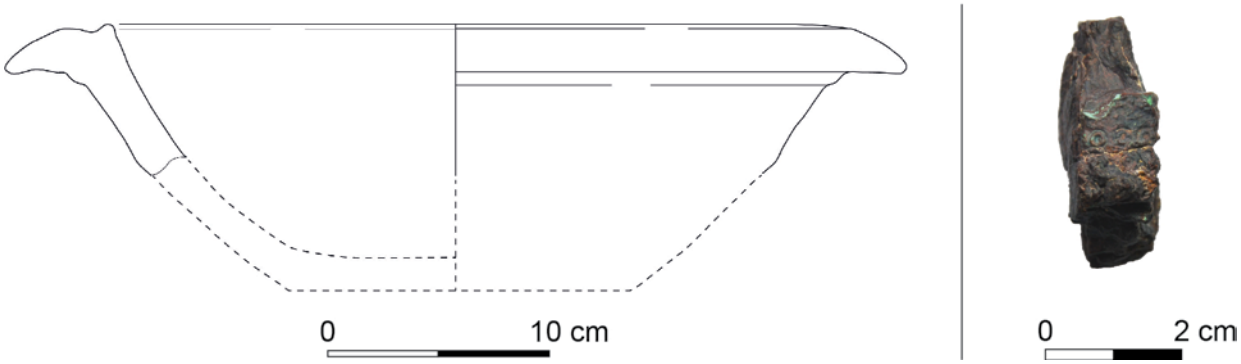


Figure 3.32 Selected artefacts from the cemetery at HAZ-27: a 3rd/4th century AD mortarium (left; see § 3.7 for details), and a fragment of an iron object with decorated bronze cladding (right).

circular outlines of limestone or sandstone blocks. These graves were found in a line, reminiscent of a pendant (cf. Huigens 2015), but in this case they were associated with a number of artefacts that were exposed through looting. From one of the disturbed features came large amounts of bronze and iron fragments, as well as the remains of a large ceramic vessel dating to the early 4th century AD (Figure 3.32). This would suggest that at least some of the inhumation graves may be of pre-Islamic origin. To further investigate this possibility, a similar kind of small 'cemetery' recognized during surveys (at the site of QUR-829) was further investigated through excavations (see Chapter 5).

3.4.4.11 Desert mosques

Desert mosques are small religious structures featuring, at the very least, a small prayer niche or *mihrab* orientated towards Mec*ca.* Additionally, a wall or even a chamber may be attached to the *mihrab* enclosing the area in which people gathered for prayer (Figure 3.33). In the Jebel Qurma region, 21 desert mosques were recognized.

Desert mosques, also called 'open-air mosques' (Avni 2007), are well known from ethnographic and archaeological studies, including in the Black Desert. They may be associated with nomadic campsites, small agricultural settlements (Avni 1994; Betts *et al.* 2013; Carvajal Lopez *et al.* 2015), or burial grounds (Lancaster and Lancaster 1999: 252). For some of the desert mosques recorded in the Negev it was suggested that they may date already to the Early Islamic period (Avni 1994), although this is based on survey evidence alone and not corroborated by absolute dating methods.

Figure 3.33 Example of a desert mosque at QUR-999, with the mihrab indicated. Scale is 50 cm. Photo by P. Akkermans.

Whether desert mosques occur this early in the Jebel Qurma region is difficult to say, as they are not usually directly associated with datable materials. In some cases, Mamluk-period inscriptions were found carved onto the walls of these mosques (Akkermans and Huigens 2018). Although desert mosques are attested at a number of sites where Early Islamic ceramics were found, in most cases these sites were also frequented in more recent times, which makes it difficult to date the mosques through spatial association. More direct evidence for the Early Islamic use of these features in the Jebel Qurma region is not available at this point.

3.4.4.12 Markers

Markers are conical stone pilings characterised by some visual prominence (Figure 3.34). This is usually achieved by their shape but sometimes also by their location. Some markers, for example, are constructed on top of cairns, or at other prominent locations in the landscape. A few markers received a white coating, probably in relatively recent times. The Jebel Qurma region hosts a large number of these markers, and 342 were documented through pedestrian surveys. They are usually rather limited in width and therefore poorly identifiable through remote sensing. A large degree of variation exists in their morphology and size. Although most of the markers are not taller than about 65 cm and crudely

Figure 3.34 Examples of markers in the Jebel Qurma region. Scales are 40 cm (left) and 50 cm (right). Photos by author (left), and P. Akkermans (right).

constructed, some of them can be up to 1.65 m tall and more neatly built. Their visual prominence suggests that they may have been raised to mark a particular place or trajectory.

In this respect, various authors have suggested that such features may have functioned as route markers (Polkowski 2015; Riemer 2013; Rossi and Ikram 2013), given their association with archaeologically or historically known routes. Other possibilities would be that they were used to mark territories or simply to mark points of interest, such as favourable campsites or lookout spots.

The lack of associated datable remains greatly hampers the dating of the construction of markers. There is little evidence that markers in the Jebel Qurma region were constructed already in antiquity. Although some of the markers are spatially associated with pre-Islamic rock art, this association hardly provides evidence that the rock art and features are contemporaneous.

3.4.4.13 Other/undefined

In addition to the better-defined features types described above, a large variety of small and rather enigmatic features also were documented during the pedestrian survey. These include small circular hut-like features and crescent-shaped walls, mostly between about 2.3 and 4.2 m wide, and up to 1.35 m high. These perhaps represent small temporary shelters or wind shields (Figure 3.35), although this interpretation remains tentative. In some cases, these features are spatially associated with pre-Islamic rock carvings. It is difficult, however, to establish a clear chronological relation between the carvings and these features (see § 3.5.3 for a more elaborate discussion). An example is provided at the site of QUR-741, which features only a small shelter-like feature (Figure 3.35),

Figure 3.35 Examples of small hut-like shelters, at QUR-737 (top) and QUR-741 (bottom). Scales are 50 cm. Photos by P. Akkermans.

and is associated with two Safaitic inscriptions as well as a recent Arabic inscription. Whether the structure is contemporaneous with the inscriptions and, if so, whether it is related to the Safaitic texts or the modern Arabic inscription cannot be determined.

Also included here are features which, although clearly anthropogenic, were even less substantial, including small rock pilings, bin-like installations, and small platforms. All of these features are difficult to date given the lack of datable remains that could be unequivocally associated with these features.

3.4.4.14 Paths

The final feature type identified in the Jebel Qurma region are paths (Figure 3.36). Numerous paths appear to run through the region, especially in the *harra* landscapes. These features were first identified on satellite imagery, and subsequently investigated on the ground through field surveys (Huigens 2018). The occurrence of paths in the basalt regions of the Black Desert was described already by European travellers of the late 19th and early 20th century, such as Von Oppenheim (1899: 219) and Bell ([1907]1919: 115-6).

Figure 3.36 Example of a path winding through the harra landscape. Photo by P. Akkermans.

On the Ikonos imagery, paths appear as lightly coloured linear traces that run through the dark basalt surface cover. These features appear on the imagery as narrow lines, often diverging from and converging towards each other (Figure 3.37). They are normally not wider than *ca.* 1.5 m, and may run parallel to the contour lines of the terrain or perpendicular to it. They are

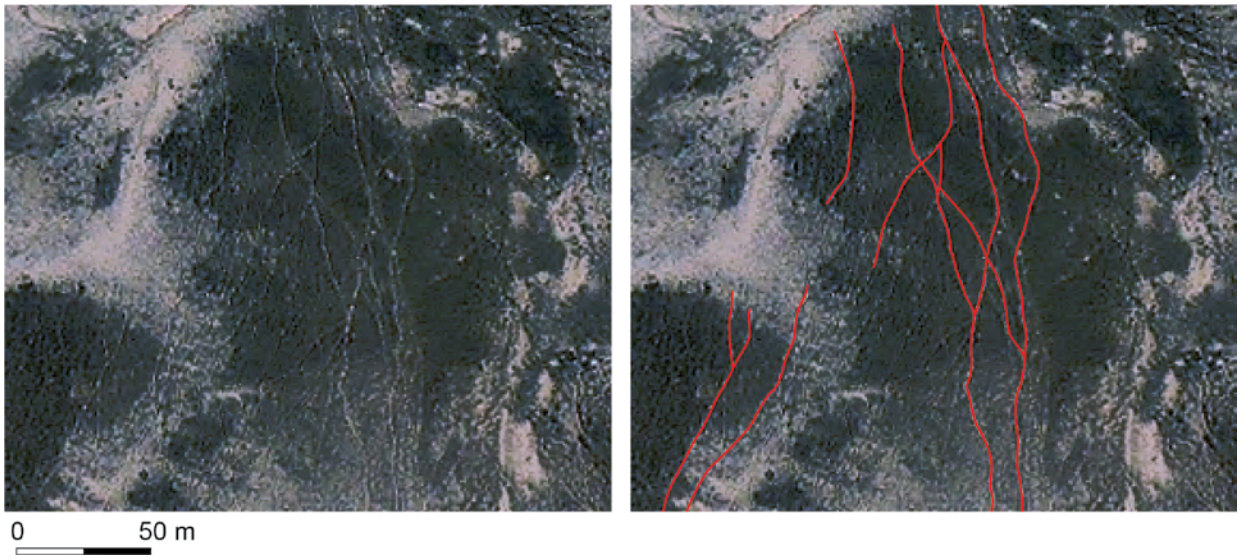


Figure 3.37 Left: Unmodified Ikonos imagery showing paths running through the harra landscape. Right: Paths traced on the imagery.

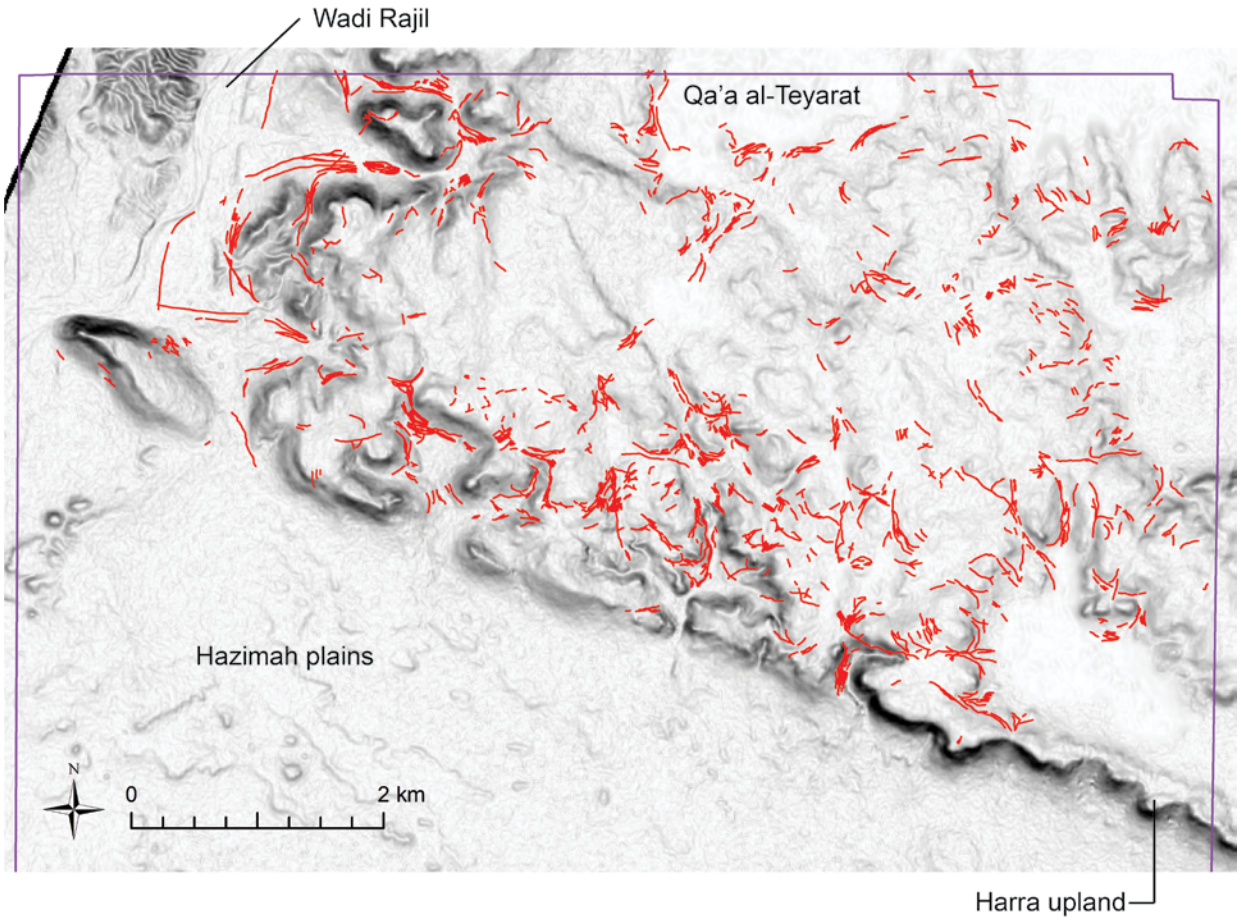


Figure 3.38 Distribution of paths in the harra landscape of the Jebel Qurma region. Purple lines indicate the limits of the Ikonos imagery. Base image: WorldDEM slope map.

mostly somewhat curved and, in a few cases, especially when running up a steep slope, they follow a zigzag pattern — thereby forming a switchback path. Hundreds of such paths were traced by the present study from Ikonos satellite imagery (Figure 3.38).

The paths recognised on satellite imagery and during pedestrian surveys in the Jebel Qurma region were never paved or had additional steps to lead up steep slopes. Rather than being built intentionally, it seems more likely that most of the paths are the result of prolonged traffic through the landscape by both animals and people, who occasionally kicked aside stones in their way. In time, this process resulted in the formation of paths, by which the accessibility of the landscape was greatly improved. There is little direct evidence for the deliberate creation of paths, although it is not implausible that people sometimes intentionally made efforts to increase their accessibility by removing stray rocks.

Evidently, the paths themselves are difficult to date. Nevertheless, datable remains such as ceramics and rock art were found in direct association with a few of the paths. An example from pre-Islamic times is the occurrence of a Safaitic inscription that mentions pastoral activities, and was carved on a stone directly next to a path in an otherwise isolated area (Figure 3.39). It may thus be inferred that at least some of the paths in the Jebel Qurma region were probably traversed already in antiquity, and that they can be further analysed to investigate patterns of movement through the *harra* landscapes (see Chapter 4).

3.4.5 Discussion

Figure 3.39 Path in the harra landscape with an isolated Safaitic inscription found directly along it. The inscription mentions pastoral activities (QUR 749.1.1; see Della Puppa forthcoming).

Numerous types of stone-built features have been documented through surface surveys in the Jebel Qurma region. On the basis of datable surface remains (e.g. mainly artefacts and rock art), as well as through comparison with the results of other archaeological field projects, it has become clear that many of these features were constructed, used, and reused during different time periods, from prehistory up to relatively recent times. Features that were used or frequented between the Hellenistic and Early Islamic periods were identified mainly on the basis of ceramics and pre-Islamic inscriptions and petroglyphs, and include the following feature types. Ceramics from the Classical and Late Antique periods were often encountered in close association with clearings and enclosures, including some of the wheels; in a few cases Safaitic inscriptions explicitly mentioning an enclosure were found on or near such a structure. The occurrence of ceramics at these features may indicate that enclosures and clearings were partly residential areas, in which the ceramics represent waste associated with domestic activities. This is further investigated in Chapter 4. Furthermore, pre-Islamic inscriptions and petroglyphs were often found in association with non-domestic structures, most notably cairns. The exact nature of this association remains to be investigated as well. An important question in this respect is to what degree the inscriptions are related to any potential burial practices at these locations. This is further investigated in Chapter 5. Less elaborate funerary monuments, such as simple inhumation graves, could sometimes be dated to pre-Islamic times through the occasional association with Roman-period ceramics, although the extent of this practice remains unclear. Pendants have often been found in association with potential funerary cairns, but the lack of datable surface remains associated with pendants makes it impossible to say when they were constructed without excavating them (but see Chapter 5). Other structure types that were also possibly used, or perhaps even constructed, during the period of study are desert mosques and small, simple structures such as stone-built shelters and markers, but this remains a tentative suggestion. Finally, there is limited evidence that the numerous paths running through the *harra* landscapes were traversed already during Classical Antiquity, based on their association with Safaitic carvings.

3.5 Site types of the Classical and Late Antique periods

In the above sections the archaeological and epigraphic remains that have been documented through pedestrian surveys in the Jebel Qurma region were presented, in terms of the available dating evidence and the types of features possibly associated with this material. The sites that have been documented in the study area, however, are not equally constituted. Rather, there appear to be different types of sites comprising different combinations of features, artefacts, and rock art. In this section an attempt is made to classify the types of sites based on their common characteristics.

Site	Dating criteria	Period	With enclo-sure(s)?	Prehisto-ric remains?	Modern reuse?	Potential camping area (m2)	Coordinates (UTM, Zone 37R)
HAZ-1	Ceramics	Byzantine/Early Islamic			x	?	325542 E 3515845 N
HAZ-15	Ceramics	Roman			x	?	326394 E 3515362 N
HAZ-21	Ceramics	Byzantine/Umayyad			x	?	325913 E 3514600 N
HAZ-23	Ceramics	Late Byzantine/Early Islamic			x	?	326219 E 3513981 N
HAZ-44	Ceramics	Hellenistic/Roman or Byzantine/Early Islamic	x	x	x	?	324819 E 3509834 N
HAZ-TA88	Ceramics	Late Byzantine				?	325846 E 3513981 N
HAZ-TB70	Ceramics	Abassid				?	325172 E 3514689 N
HAZ-TD2	Ceramics	Roman/Byznantine/Early Islamic				?	324422 E 3508542 N
HAZ-TD72	Ceramics	Late Hellenistic		x	x	?	325084 E 3510109 N
QUR-1	Ceramics	Abassid	x	x	x	17000	323308 E 3517861 N
QUR-6	Ceramics	Abassid, possibly also Hellenistic/Roman	x	x	x	34400	324451 E 3517369 N
QUR-11	Ceramics; C14	Early Islamic	x	x		800	326122 E 3516838 N
QUR-20	Inscriptions	Hellenistic/Roman	x	x	x	1600	328472 E 3516371 N
QUR-22	Ceramics	Late Byzantine/Early Islamic			x	8200	328775 E 3516873 N
QUR-23	Ceramics	Umayyad	x	x		600	329161 E 3516721 N
QUR-123	Ceramics	Late Byzantine/Umayyad	x	x		3050	331613 E 3517104 N
QUR-140	Ceramics	Byzantine/Early Islamic	x	x	x	360	334109 E 3519110 N
QUR-146	Ceramics	Late Byzantine/Early Islamic	x	x		4600	333633 E 3519799 N
QUR-162	Ceramics	Early Roman & Late Byzantine/Early Islamic	x	x	x	4000	329238 E 3521671 N
QUR-175	Ceramics	Hellenistic/Roman, possibly also Byzantine/Early Islamic	x	x	x	1750	328366 E 3520857 N
QUR-185	Ceramics	Umayyad	x	x		3300	326195 E 3520372 N
QUR-206	Inscription	Hellenistic/Roman	x	x	x	2900	326403 E 3519566 N
QUR-210	Inscription; ceramics	Hellenistic/Roman & Umayyad	x	x	x	1600	326377 E 3519001 N
QUR-257	Ceramics	Hellenistic	x		x	5700	331407 E 3515918 N
QUR-295	Ceramics	Hellenistic/Early Roman			x	850	329962 E 3515770 N
QUR-337	Ceramics	Early/Late Islamic	x		x	2600	334040 E 3519171 N
QUR-347	Ceramics	Byzantine/Early Islamic			x	27000	333185 E 3519667 N
QUR-360	Ceramics	Byzantine	x		x	21000	328034 E 3515512 N
QUR-370	Ceramics	Early Byzantine & Umayyad	x		x	1100	325516 E 3517841 N

Site	Dating criteria	Period	With enclo-sure(s)?	Prehisto-ric remains?	Modern reuse	Potential camping area (m2)	Coordinates (UTM, Zone 37R)
QUR-373	Ceramics; C14	Roman, Byzantine & Early Islamic	x	x	x	2400	325407 E 3518209 N
QUR-389	Ceramics	Late Byzantine/Early Islamic			x	1700	326405 E 3516881 N
QUR-393	Ceramics	Late Byzantine			x	3500	323628 E 3517462 N
QUR-396	Ceramics	Byzantine/Early Islamic			x	1000	326602 E 3519182 N
QUR-446	Ceramics	Byzantine				1000	328666 E 3515806 N
QUR-490	Ceramics	Roman			x	2350	326397 E 3516759 N
QUR-595	Ceramics; C14	Hellenistic, Roman and Byzantine/Early Islamic	x	x	x	3400	323992 E 3517891 N
QUR-615	Ceramics	Late Byzantine			x	4600	325667 E 3517864 N
QUR-619	Ceramics	Byzantine/Early Islamic	x		x	7000	325448 E 3517922 N
QUR-632	Ceramics	Iron Age II/Hellenistic			x	2050	328855 E 3516730 N
QUR-637	Ceramics	Late Roman/Byzantine			x	2100	325042 E 3517669 N
QUR-645	Ceramics	Late Byzantine/Early Islamic			x	3200	324773 E 3517838 N
QUR-651	Ceramics	Fatimid			x	2000	325014 E 3518049 N
QUR-653	Ceramics	Roman			x	3900	325531 E 3517737 N
QUR-661	Ceramics	Late Byzantine/Early Islamic	x			750	325177 E 3518335 N
QUR-734	Inscription	Hellenistic/Roman	x	x	x	600	326351 E 3518875 N
QUR-735	Ceramics	Late Byzantine		x	x	6700	326640 E 3519245 N
QUR-759	Ceramics	Roman			x	2500	325669 E 3519294 N
QUR-768	Ceramics	Late Roman/Byzantine				160	325574 E 3519323 N
QUR-773	Ceramics	Late Roman/Byzantine				1200	326060 E 3519135 N
QUR-785	Ceramics	Abassid			x	1750	325719 E 3519406 N
QUR-787	Ceramics	Late Roman			x	3800	326500 E 3519678 N
QUR-833	Ceramics	Byzantine				5400	325632 E 3519965 N
QUR-851	Ceramics	Roman/Early Byzantine				300	327668 E 3519606 N
QUR-974	Inscription	Hellenistic/Roman	x	x		1100	327270 E 3520463 N
QUR-1016	Inscription; ceramics	Hellenistic/Roman, possibly also Byzantine/Early Islamic	x		x	4100	327795 E 3519350 N
QUR-1022	Ceramics	Umayyad	x		x	6400	329054 E 3521551 N

Table 3.5 Classical/Late Antique campsites documented in the Jebel Qurma region.

3.5.1 Residential sites

Residential sites can be defined as locations in the landscape where inhabitants of the region resided, be it for a short or prolonged period of time. At such locations, different kinds of domestic activities could be carried out, including housing in residential units such as tents, huts, or other kinds of architecture, and the preparation of food. As outlined in Chapter 1, the material traces of such activities may include the remains or outlines of dwellings, waste material from domestic activities such as ceramics, animal bones, or plant remains, as well as fire places used for cooking or craft activities.

The first and most accurately datable surface remains that can indicate residential sites in the Jebel Qurma region are ceramic scatters found in association with specific types of architectural features. Most of the ceramics that could be dated between the Hellenistic and Early Islamic periods were found in association with sites featuring enclosures and clearings. These were extensive areas cleared of their original surface cover to create a smooth area suitable for the erection of tents or huts. The ceramics present at these sites are probably best interpreted as domestic waste associated with domestic activities.

Some of the Safaitic inscriptions are further indicative of the presence of residential sites in the study area. A limited number of the inscriptions from the Jebel Qurma region refer to enclosures, and most of these were indeed found at sites where one or more of such structures were present.

The presence of ceramics or inscriptions referring to the use of an enclosure were used as criteria to define a number of residential sites in the Jebel Qurma region. The same materials were used to provide a chronological indication for the period(s) of habitation. In cases where inscriptions were used to identify these sites, they were dated to the Hellenistic/Roman period, based on the conventional date range of the Safaitic script. In cases where ceramics were encountered at residential sites the dating evidence as presented above was consulted. The dating evidence obtained from the three residential sites that were excavated (Chapter 4) are included here as well. Based on these criteria, 56 residential sites dating between the Hellenistic and Early Islamic periods could be identified (Table 3.5). This may seem like a low number and it probably is: a large number of clearings documented through pedestrian surveys in the Jebel Qurma region are difficult to date given the scarcity of find materials on them (see § 3.4.4). It should therefore be kept in mind that the number of residential sites with which Classical/Late Antique remains could be associated represents the minimum number of residential sites that were inhabited during this period.

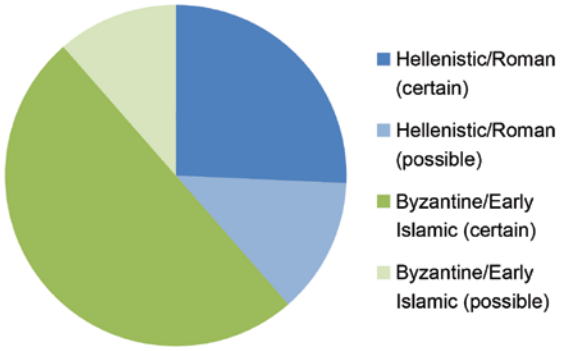


Figure 3.40 Proportion of campsites per period attested in the Jebel Qurma region.

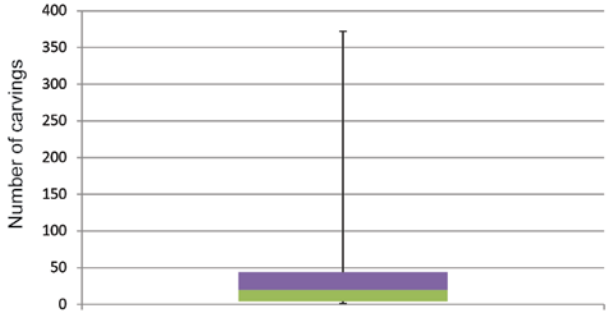


Figure 3.41 Box-and-whisker plot of the number of individual inscriptions and petroglyphs per Classical/ Late Antique residential site.

Some of the residential sites have dating evidence from a restricted time period, while others seem to have been used during multiple occasions over a prolonged period of time. For example, there are many sites at which prehistoric chipped-stone

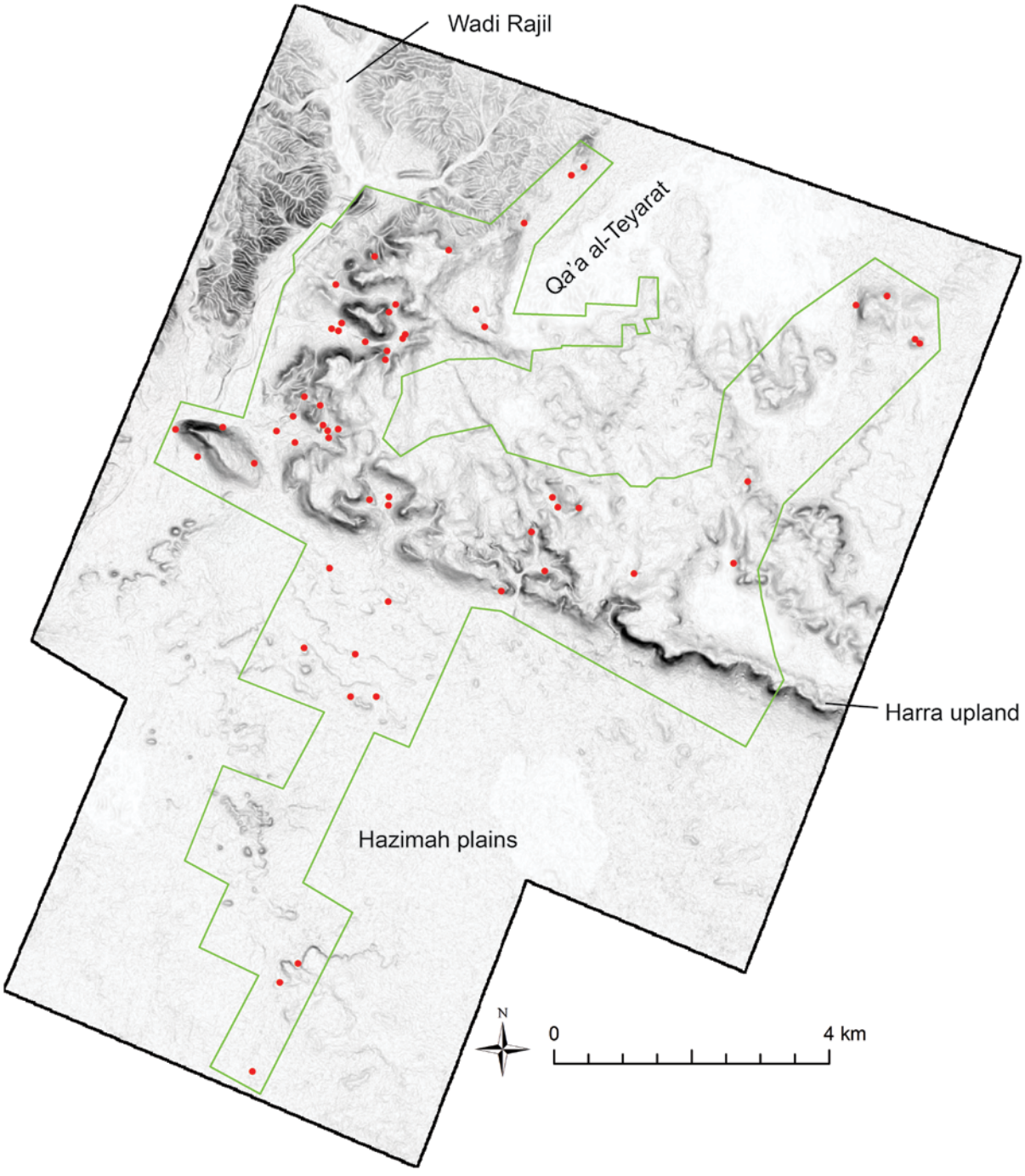


Figure 3.42 Distribution of Classical/Late Antique residential sites (red) in the Jebel Qurma region based on pedestrian surveys. The survey area is indicated in green. Base image: WorldDEM slope map.

artefacts were found together with Classical/Late Antique ceramics. At other sites there is evidence of modern reuse of the site indicated by the presence of modern trash, tent remains, and associated material.

For analytical purposes the sites can be categorised into two broad periods of inhabitation. These are the Hellenistic/Roman period and the Byzantine/Early Islamic period (Figure 3.40). Ceramics and inscriptions from the Hellenistic/Roman period were attested at 18 residential sites (Table 3.5), and

another 9 sites may have had ceramics from this period as well, although this is less certain. A total of 35 residential sites could be ascribed with certainty to the subsequent Byzantine/Early Islamic period on the basis of ceramics, while the material was less clear for an additional 8 sites.

These residential sites are constituted of man-made open spaces, such as clearings and enclosures. These may have been used for a number of purposes, including to erect tents or huts, or to pen herd animals. Some of these surfaces were more extensively cleared than others, and in some cases small features were present including platforms, fire places, and even tent places. However, a word of caution is required here, as many of these features, and parts of the clearings and enclosures themselves, need not always be related to the ancient artefacts and inscriptions present at these sites. The majority of the residential sites (73%) had evidence for recent reuse by Bedouin families, who may have considerably altered the configuration of the ancient sites, for example by modifying or expanding the enclosures and clearings, or by adding features. It is therefore difficult to assess the initial configuration of the residential sites.

The number of pre-Islamic inscriptions and petroglyphs at residential sites is usually limited. Less than 40% of the residential sites contained such carvings, and when rock art is present, there were often less than 50 examples per site, with only a few exceptions (Figure 3.41). These are much lower numbers than the amount of carvings found at, for example, funerary sites (see below).

Residential sites usually occur on low-lying areas, such as on the floors of valleys that run down from the central plateau of the Jebel Qurma range, and in the open plains beyond (Figure 3.42). These areas are fairly easily accessible, and the basalt surface cover is often relatively sparse or even non-existent. These areas require limited clearing activities to create areas suitable for residential purposes.

Residential sites represent a small yet distinctive category of the sites that were tentatively ascribed a Classical/Late Antique date. A more detailed description and analysis of these sites is presented in Chapter 4 as this will also be based on the results of excavations discussed in that chapter.

3.5.2 Funerary sites

In addition to residential features and sites, the Jebel Qurma region is home to a large number of features that were tentatively designated as funerary monuments. This feature category firstly includes cairns, for which the survey evidence indicates that at least some of them were constructed or reused during the Classical and Late Antique period on the basis of materials retrieved from looter's debris and Safaitic inscriptions referring to burial cairns. Secondly, pendants often seem to be associated with burial cairns and may therefore also have served a function in funerary customs. Finally, a large number of graves were also identified during the pedestrian survey, and there is evidence that at least some of them date back to 1st millennium AD.

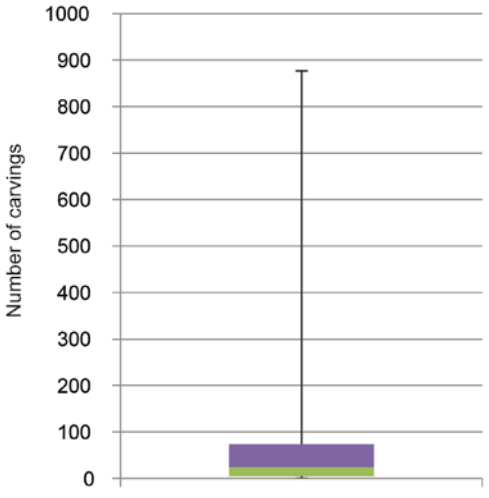


Figure 3.43 Box-and-whisker plot of the number of individual inscriptions and petroglyphs per Classical/Late Antique funerary site.

Dating these funerary monuments on the basis of surface evidence alone offers many challenges. In contrast to residential sites, these features are not usually clearly associated with datable surface remains. This was only the case when materials could be retrieved from recent

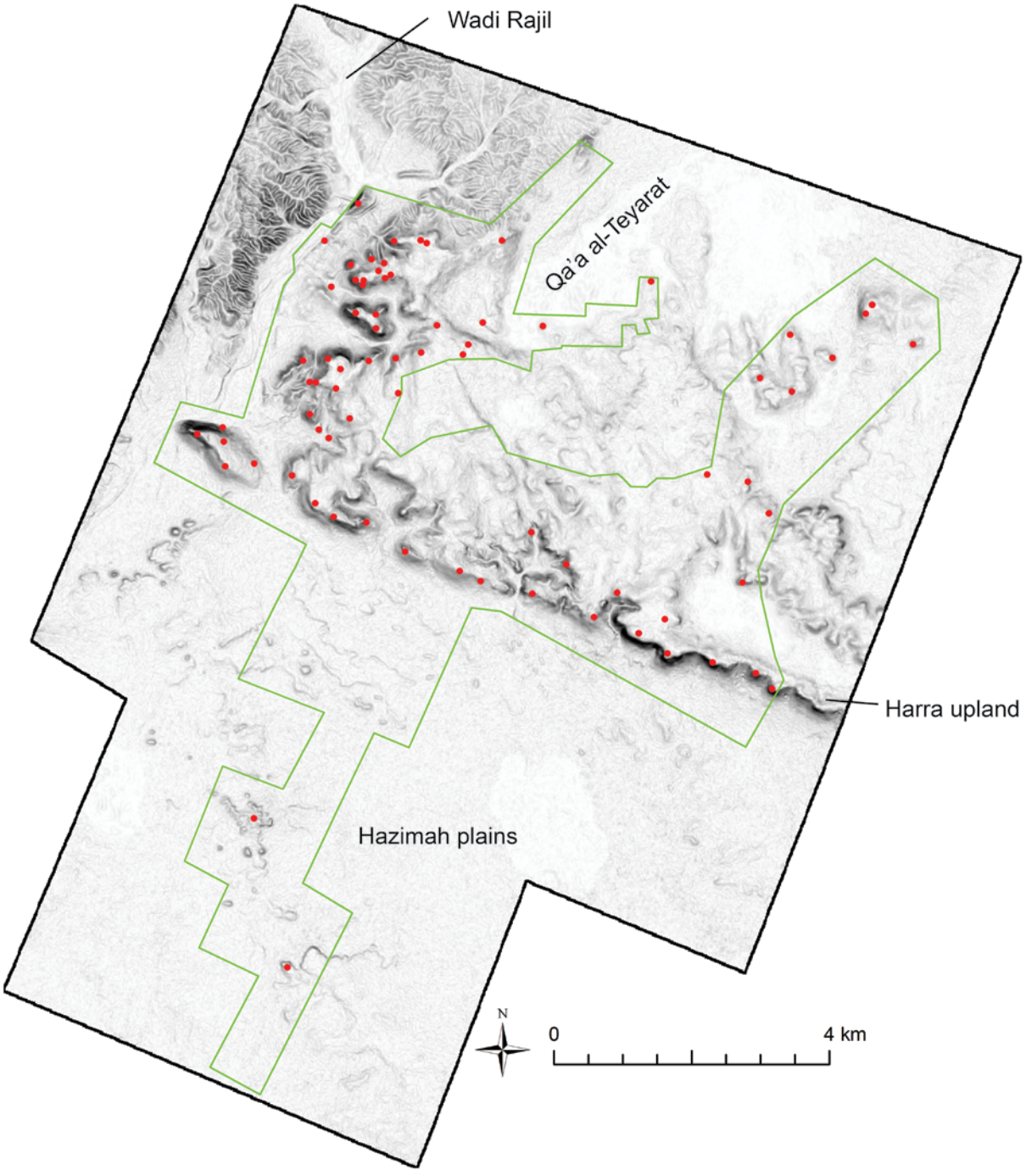


Figure 3.44 Distribution of Classical/Late Antique funerary sites (red) in the Jebel Qurma region based on pedestrian surveys. The survey area is indicated in green. Base image: WorldDEM slope map.

disturbances such as looting, or when Safaitic inscriptions and rock art were incorporated in the structure. It was necessary, therefore, to obtain further dating evidence through excavations (see Chapter 5).

On the other hand, we may propose a number of sites for which there is substantial evidence for the presence of funerary monuments as well as datable surface remains that are potentially associated with these tombs. The following criteria were used to define a number of Classical/Late Antique funerary

sites in the Jebel Qurma region. This was done firstly on the basis of datable surface remains present at these sites, mostly pre-Islamic inscriptions and petroglyphs, as well as materials retrieved from looter's debris such as ceramics. The second criterion was the presence of potential funerary structures. As noted above, most evidence for the use of cairns as tombs came from cairns with a diameter exceeding 4 m. It is at this point questionable whether cairns smaller than this size represent burial cairns. Pendants were also included in the selection as there is limited evidence from other regions that they date to the 1st millennium BC.

Following these criteria, a total of 75 funerary sites were defined that contained one or more Classical/ Late Antique funerary monuments. Only 5 of these were also defined as residential sites as they also consisted of enclosures and associated ceramics, but the remaining 70 sites primarily consisted of funerary monuments. Funerary sites thus mostly represent a site category that is largely separate from residential sites. They further differ from residential sites in the number of pre-Islamic inscriptions and petroglyphs, which are much higher at funerary sites (Figure 3.43). Furthermore, funerary sites occur at relatively high places in the landscapes, such as along hilltops and ridges. They follow a distribution that is distinct from the distribution of residential sites, as described above (Figure 3.44).

It is important to note that many of these funerary sites were probably frequented from prehistory to recent times. Some of the funerary monuments may in fact be of prehistoric date and only reused in more recent periods – even in modern times. Medieval and modern Arabic inscriptions are also often found at these sites. It therefore remains important to further study the exact nature and chronology of the funerary monuments at these sites through excavations. This will be done in Chapter 5.

3.5.3 Other sites

No funerary monuments or residential features were encountered at the remainder of sites documented in the Jebel Qurma region that had datable remains from the Classical/Late Antique period. Instead, these sites often consisted mainly of pre-Islamic carvings or small ceramic scatters that were spatially associated with minor features such as markers, paths, or small temporary shelter-like features. It is difficult to say with certainty whether these features are chronologically, let alone functionally, related to the inscriptions or ceramics situated nearby. These sites are merely suggestive of the frequentation of these locations, probably over a relatively short period of time.

3.5.3.1 Rock art clusters

Clusters of pre-Islamic carvings, sometimes associated with minor features as described above, were found at a total of 217 sites in the Jebel Qurma region. Many of these rock art clusters (96 sites, 44.2%) were associated with one or several small shelter-like features, but whether these features are contemporaneous with the rock art was impossible to establish (as described in § 3.4.4). Similar to funerary sites, rock art clusters mostly occur on elevated locations in the *harra* landscape (Figure 3.45). They are found most often in areas that were identified as topographic highs (see Chapter 2). However, rock art sites seem to penetrate the interior of the central plateau much more than funerary and residential sites.[8] This distribution is probably indicative of daily movements and associated activities, such as watching over animals, within the broader landscape.

3.5.3.2 Ceramic scatters

Two sites were defined merely on the occurrence of small quantities of Late Byzantine to Early Islamic ceramics, and were not associated with a clearing or other potential residential sites (QUR-15 and QUR-656). The origin of these ceramics is therefore unclear, and although the sites seem to represent some kind of brief activity in these areas, the nature of these activities remains unknown.

[8] For a more detailed overview of the distribution of carvings, see Brusgaard (in press).

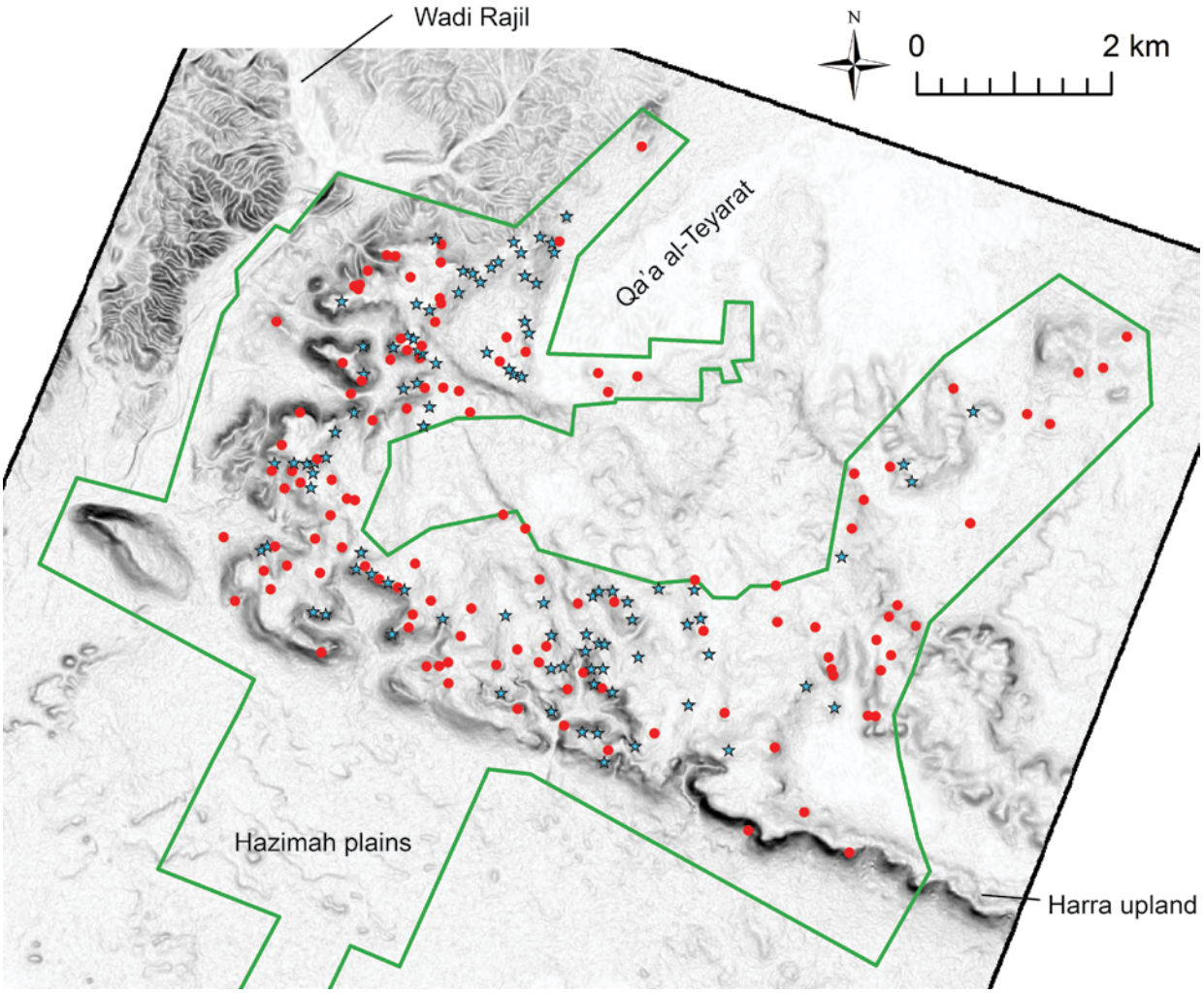


Figure 3.45 Distribution of sites containing pre-Islamic carvings that were not associated with residential or funerary features (red). Blue stars indicate rock art clusters associated with shelters. The survey area is indicated in green. No rock art clusters were encountered in the Hazimah plains. Base image: WorldDEM slope map.

3.5.3.3 Desert kites

Pre-Islamic inscriptions and petroglyphs were encountered in locations with desert kites, showing that these locations were at least frequented during the Hellenistic and Roman periods. Two depictions of kites were found close to an actual desert kite (QUR-21), and although they were earlier believed to be prehistoric (Akkermans *et al.* 2014), they likely are associated with the Safaitic inscriptions as well (Brusgaard in press). Whether those who created these carvings actually made use of the kites for hunting or for different purposes remains unknown. Although the use of kites has been depicted in pre-Islamic carvings from other regions (see above), there are no indications from the Jebel Qurma region that suggest the kites from this area were used in historical times in a similar way.

3.5.3.4 Unrelated features and sites

While there are many sites and features in the Jebel Qurma region that could be associated with datable remains from the Classical and Late Antique periods, others were dated to prehistoric, medieval or modern times, or could not be dated with certainty. Features that seem to have been used exclusively in prehistory in the Jebel Qurma region include Wheels, whose dating is based on the direct association with chipped-stone artefacts and comparable material from studies in other areas (see § 3.4.4). There

were no Classical/Late Antique ceramics associated with these features. For some unknown reason, the enclosures within the wheels were not deemed suitable for reuse in subsequent periods, in contrast to other types of enclosures (see above). Wheels were only reused as foundations for later burial cairns and pendants, which was the case, for example, at QUR-147 (Figure 3.25), and QUR-148 (see Chapter 5). Another site type that appears to have been used exclusively in prehistory are the dwelling clusters. In the Jebel Qurma region, ceramics from the Classical/Late Antique period were collected only at one cluster (QUR-6), but in this case they are probably related to the enclosures and clearings located at the same site rather than to the dwellings.

Features that probably relate mostly to medieval and modern phases of inhabitation in the Jebel Qurma region include tent places and desert mosques. Many tent places were associated with modern trash rather than with Classical/Late Antique ceramics; in cases where such ceramics were encountered it is more likely that the tent places are overlying more ancient campsites. Regarding the desert mosques, although it has sometimes been suggested that desert mosques appear as early as the Early Islamic period, there is no evidence from the survey results that this chronology exists in the Jebel Qurma region. The earliest remains associated with desert mosques are inscriptions from the Mamluk period.

3.6 Concluding remarks

In this chapter an overview of archaeological and epigraphic remains from the Classical and Late Antique period has been presented, based on surface surveys. While this period of inhabitation in the Black Desert has long been understood mainly on the basis of textual sources, this chapter has shown that valuable information can be obtained from the archaeological record. The archaeological 'visibility' of this period is reflected in a variety of ways. A notable example comes from the ceramic corpus collected during pedestrian surveys in the Jebel Qurma region, which broadly spans the late 1st millennium BC and the 1st millennium AD. These ceramics have the potential to define activity areas in the landscape, and may thus provide the means for understanding settlement patterns beyond the information contained in rock art. This potential is further explored in the next chapter.

At the same time, however, one may wonder what the observed ceramic trends actually reflect. At this point, no ceramics that can be safely assigned to the Iron Age. Hellenistic and Roman-period sherds are fairly restricted in number, while the number of sherds becomes much higher during the Byzantine and Early Islamic period. Fatimid-period sherds, finally, are again extremely rare. Caution is required when using these trends to reconstruct differences in occupational intensity. There are indications that the ceramic trends reflect something different than the amount of people that frequented the Jebel Qurma region. If we assume for the moment that the thousands of Safaitic inscriptions and associated petroglyphs from the study area pre-date the Byzantine period, then the occupational intensity during the Hellenistic/Roman period must have been more considerable than is reflected by the ceramic evidence. Another possibility, then, would be that the limited number or total absence of ceramics from the preceding Iron Age does not imply limited occupation, but merely a limited use of pottery. This possibility and others are further explored in the next chapters.

In addition to ceramics and rock art, different types of stone-built features have been defined that were potentially constructed and/or used during the Classical and Late Antique period. On the basis of survey evidence alone, it has proven difficult to be conclusive about the date of these features and their relation to artefacts and other features found nearby. For example, a number of potential burial cairns demonstrate strong spatial associations with pre-Islamic rock art. But while many hundreds of inscriptions and petroglyphs are sometimes found on top of or directly around burial cairns, this does not necessarily mean that there is a chronological, let alone functional or meaningful relationship between the two (cf. Macdonald 1992b: 304). These uncertainties are largely the result of restrictions imposed by

the study of surface remains. The next chapters present an investigation into the relationship between such surface features based on evidence obtained from excavations.

3.7 Catalogue of dated pottery sherds

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
1.	HAZ-1	3	1	Cooking pot	Byzantine/ Early Islamic	Avissar 1996. Figure XII.7:5; Parker 1998, Figure 155:29	I
2.	HAZ-1	4	1	Closed vessel	Umayyad	Acconci and Gabrieli 1994, Figure 46:14; Tushingham 1972, Figure 6:7	C
3.	HAZ-15	2	1	Bowl	Roman	Gerber 2012, Figure 3.13:3; Figure 3.38:2-8	D
4.	HAZ-21	2	1	Unknown	Byzantine/Umayyad	Vokaer 2010-2011, Figure 47:52	C
5.	HAZ-23	4	1	Cooking pot	Late Byzantine/Early Islamic	Ball *et al.* 1986, Figure 3.3; El-Khouri 2014, Figure 9.3; McNicoll *et al.* 1982, Plate140:1	H
6.	HAZ-27	2	1	Mortarium	Late Roman	Parker 2006, Figure 16.37:191	E
7.	HAZ-44	3	1	Unknown	Hellenistic/Roman/ Byzantine/Early Islamic	Khalil and Kareem 2002, Figure 11; Renel 2010, Figure 3:2, 4	B
8.	HAZ-TA88		1	Closed vessel	Late Byzantine	Tushingham 1972, Figure 12:33	I
9.	HAZ-TB70		1	Unknown	Abbasid	Khalil and Kareem 2002, Figure 8:18	D
10.	HAZ-TD2		1	Closed vessel	Roman/Byzantine/Early Islamic	Berlin 2005, Figure 9:7, 8; Walker 2012, Figure 4.8:3	C
11.	HAZ-TD72		1	Closed vessel	Late Hellenistic	Schmid 2000, Figure 292	C

Table 3.6 Hellenistic to Early Islamic ceramics collected during pedestrian surveys in the Jebel Qurma region.

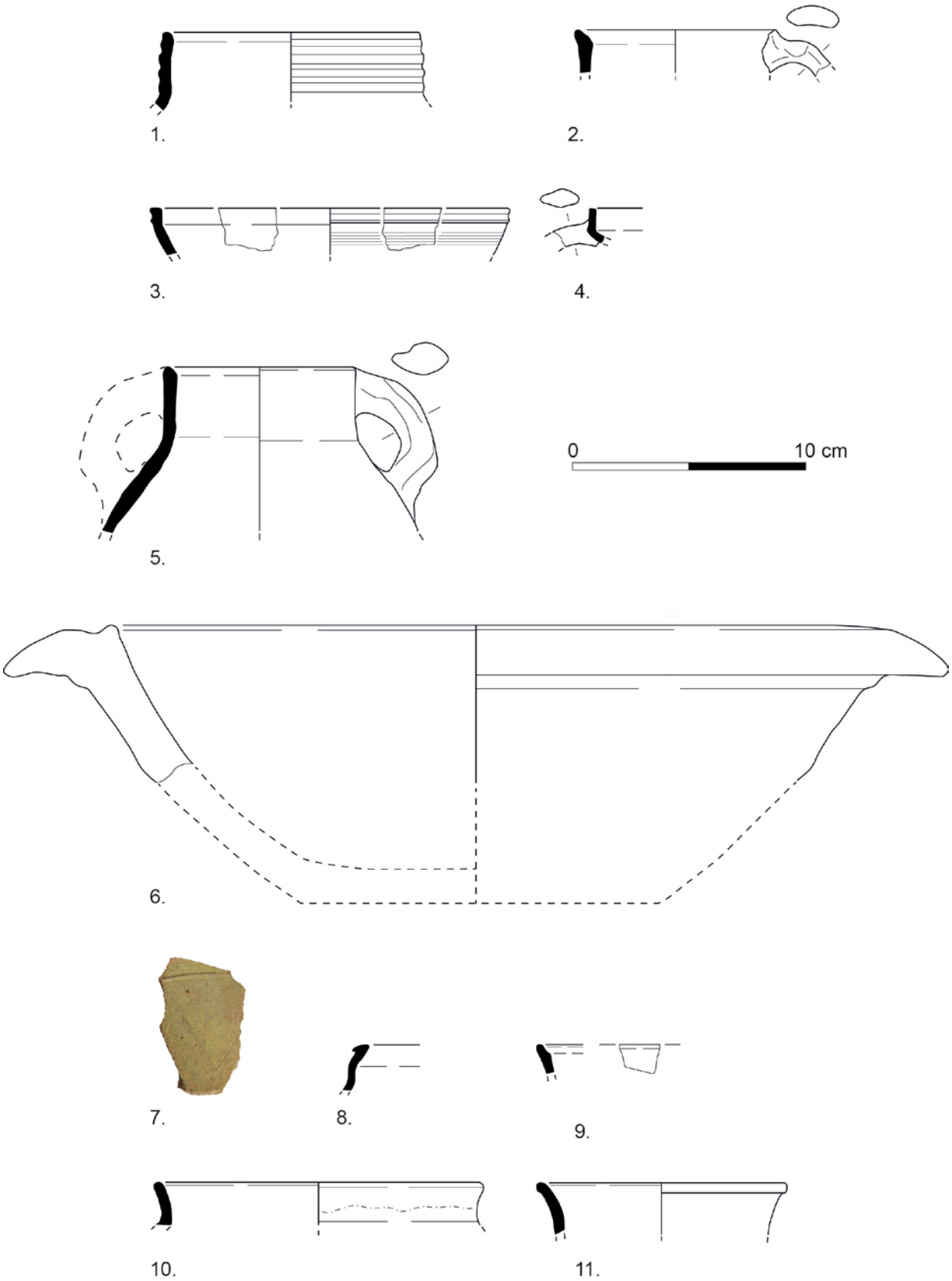


Figure 3.46 Hellenistic to Early Islamic ceramics collected during pedestrian surveys in Jebel Qurma region (see Table 3.6 for details). Drawings by A. Kaneda

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
12.	QUR-1	1	8	Open vessel	Abbasid	Khalil and Kareem 2002: Figure 8:2	C
13.	QUR-2	11	1	Unknown	Late Hellenistic/ Early Roman	Berlin 1997: Plate 68:PW536	B
14.	QUR-6	20	1	Bowl	Abbasid	Khalil and Kareem 2002: Figure 9:16	H
15.	QUR-6	20	2	Closed vessel	Roman/Byzantine	Johnson 2006: Figure 15.6:122; Reynolds and Waksman 2007: Figure 17	H
16.	QUR-6	20	3	Closed vessel	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	B
17.	QUR-6	57	1	Cooking pot	Late Hellenistic/ Roman/Byzantine	Bar-Nathan 2002, Plate 11:124; Berlin 2005, Figure 9:5, 6; Gerber 2012, Figure 3.50:7; Magness 1993, p. 216 Form 1A; Tushingham 1972: Figure 9:12, 13	C
18.	QUR-15	1	1	Closed vessel	Umayyad	Acconci and Gabrieli 1994, Figure 46:14; Tushingham 1972: Figure 7:8	C
19.	QUR-22	1	4	Lamp	Late Byzantine/ Umayyad	Kehrberg 1989: Figure 5	C
20.	QUR-22	1	6	Closed vessel	Umayyad/Abbasid	Olávarri-Goicoechea 1985: Figure 15; Walker 2012: Figure 4.1:23	C
21.	QUR-22	1	7	Closed vessel	Umayyad/Abbasid	Walker 2012: Figure 4.1:16	C
22.	QUR-23	6	1	Closed vessel	Umayyad	Walker 2012: Figure 4.8:1	C
23.	QUR-123	11	1	Cooking pot	Late Byzantine/ Umayyad	Bar-Nathan 2011: Figure 11.3:11; Gerber 2012: Figure 3.63:13	H

Table 3.6 (continued)

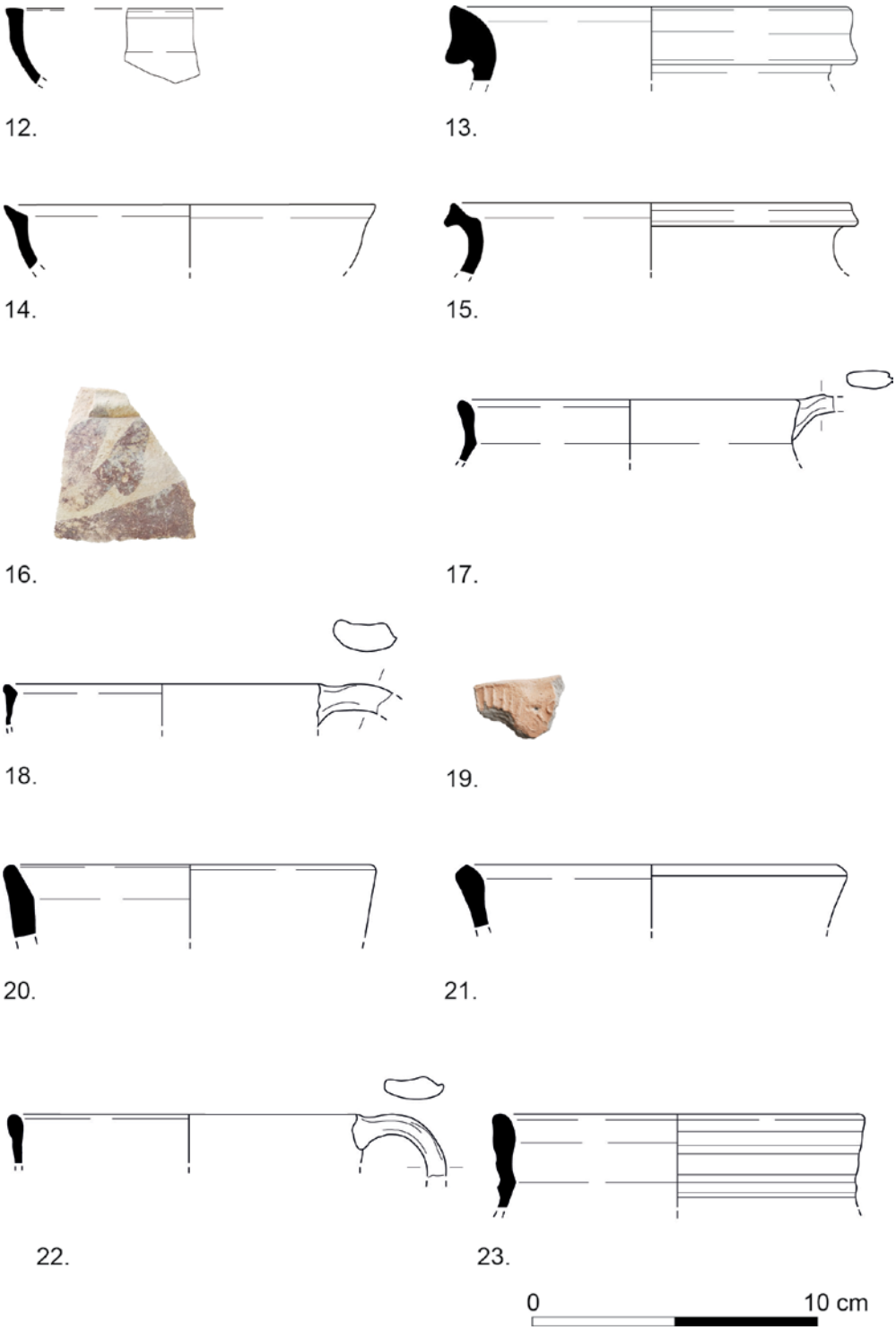


Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
24.	QUR-140	7	1	Cooking pot	Byzantine/Early Islamic	Avissar 1996: Figure XII.7:5; Parker 1998: Figure 155:29	H
25.	QUR-146	50	4	Cooking pot	Late Byzantine/Early Islamic	Ball *et al.* 1986: Figure 3.3; El-Khouri 2014: Figure 9.3; McNicoll *et al.* 1982: Plate140:1	H
26.	QUR-162	2	1	Cooking pot	Late Byzantine/Early Islamic	Ball *et al.* 1986: Figure 3.3; El-Khouri 2014: Figure 9.3; McNicoll *et al.* 1982: Plate140:1	H
27.	QUR-162	16	1	Cooking pot?	Umayyad	Acconci and Gabrieli 1994: Figure 46:14	I
28.	QUR-162	24	1	Closed vessel	Roman/Byzantine	Balouka 2013: Plate 8:13; Magness 1995: Figure 1:16-17	C
29.	QUR-162	25	1	Cooking pot	Umayyad	Parker 1998: Figure 155:29	H
30.	QUR-162	34	1	Cooking pot	Late Byzantine/Early Islamic	Ball *et al.* 1986: Figure 3.3; El-Khouri 2014: Figure 9.3; McNicoll *et al.* 1982: Plate140:1	H
31.	QUR-162	38	1	Cooking pot	Late Byzantine/Early Islamic	Ball *et al.* 1986: Figure 3.3; El-Khouri 2014: Figure 9.3; McNicoll *et al.* 1982: Plate140:1	H

Table 3.6 (continued)

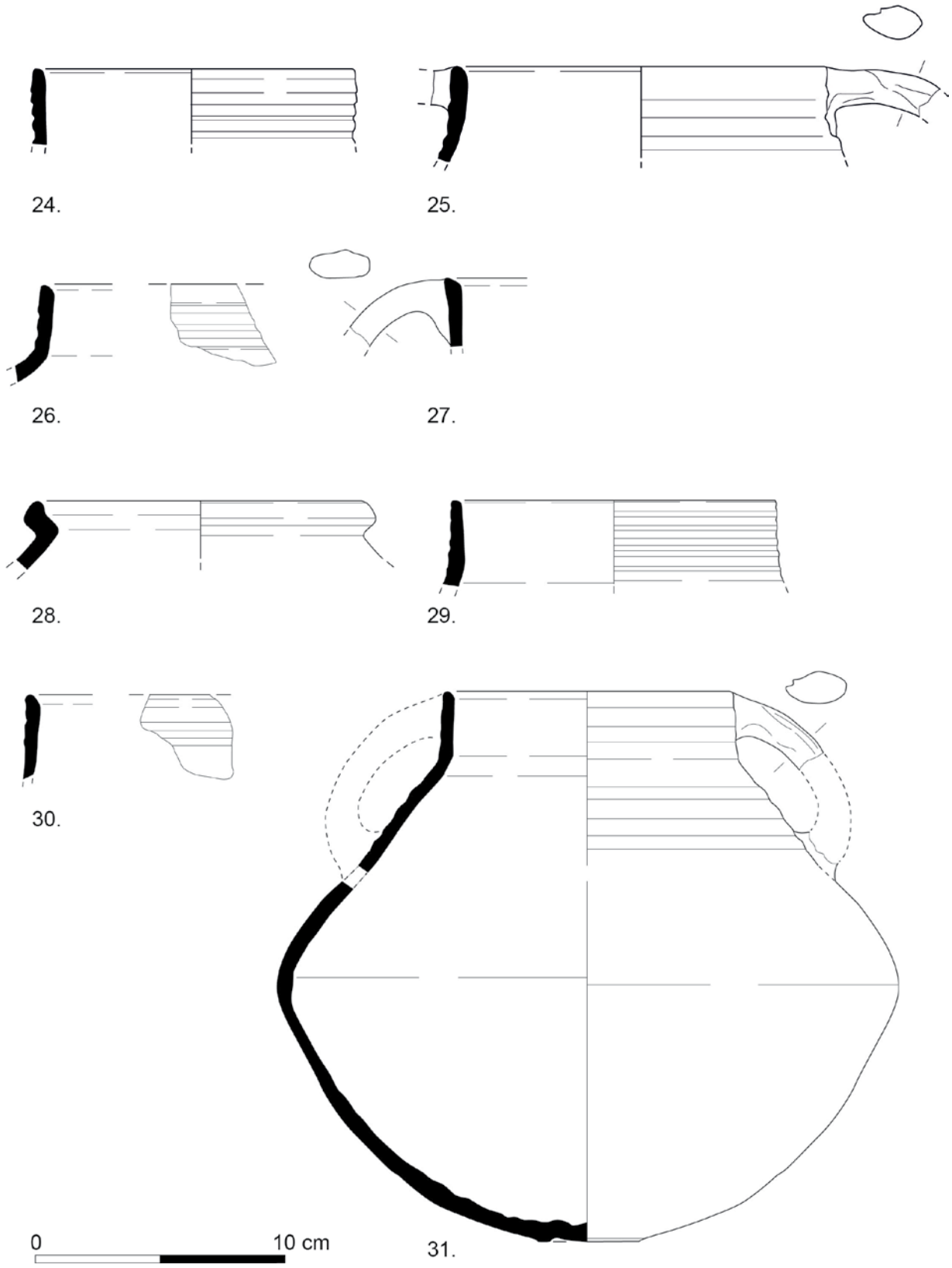


Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
32.	QUR-175	5	1	Closed vessel	Hellenistic	Kuhnen 1989: Plate 31:3	E
33.	QUR-175	12	1	Closed vessel	Late Roman/ Byzantine/Umayyad	Balouka 2013: Plate 30:5, 7; Bar-Nathan 2011: Figure 11.6:6	C
34.	QUR-175	12	3	Open vessel	Abbasid/Fatimid	Khalil and Kareem 2002: Figure 12:17; Walker 2012: Figure 4.13:2	H
35.	QUR-175	15	2	Open vessel?	Abbasid	Khalil and Kareem 2002: Figure 10:9	E
36.	QUR-175	15	4	Cooking pot	Late Byzantine/ Umayyad	Parker 1998: Figure 155:29; Bar-Nathan 2011: Figure 11.3:1	H
37.	QUR-175	17	1	Closed vessel	Late Roman/ Byzantine/Umayyad	Balouka 2013: Plate 30:5, 7; Bar-Nathan 2011: Figure 11.6:6	E
38.	QUR-175	18	2	Cooking pot	Late Roman/ Byzantine/Umayyad	Acconci and Gabrieli 1994: Figure 46:14; Bar-Nathan 2011: Figure 11.3:10; Magness 2003: Plate 18.2:16; Tushingham 1972: Figure 6:19	H
39.	QUR-175	18	6	Open vessel	Early Islamic	Walker 2012: Figure 4.2:12	I
40.	QUR-185	11	1	Cooking pot	Umayyad	Olávarri-Goicoechea 1985: Figure 18:2	C
41.	QUR-210	34	1	Closed vessel	Umayyad	Clark *et al.* 1986: Figure 21:10, 17; McNicoll *et al.* 1982: Plate 141:4; Walker 2012: Figure 4.4:18	E
42.	QUR-257	2	1	Closed vessel	Hellenistic	McNicoll *et al.* 1982: Plate 127:8	C
43.	QUR-295	1	1	Cooking pot	Hellenistic/Early Roman	Bar-Nathan 2006: Plate 32:2; Berlin 1997: Figure 13:PW201; Johnson 2006: Figure 15.3:47	C
44.	QUR-337	2	1	Cooking pot	Islamic	Cytryn-Silverman 2010: Plate 26:9; Parker 1998: Figure 155:29	H
45.	QUR-347	2	1	Bowl	Byzantine/Early Islamic	Cytryn-Silverman 2010: Plate 9.35: 8; Walker 2012: Figure 4.3:14	C

Table 3.6 (continued)

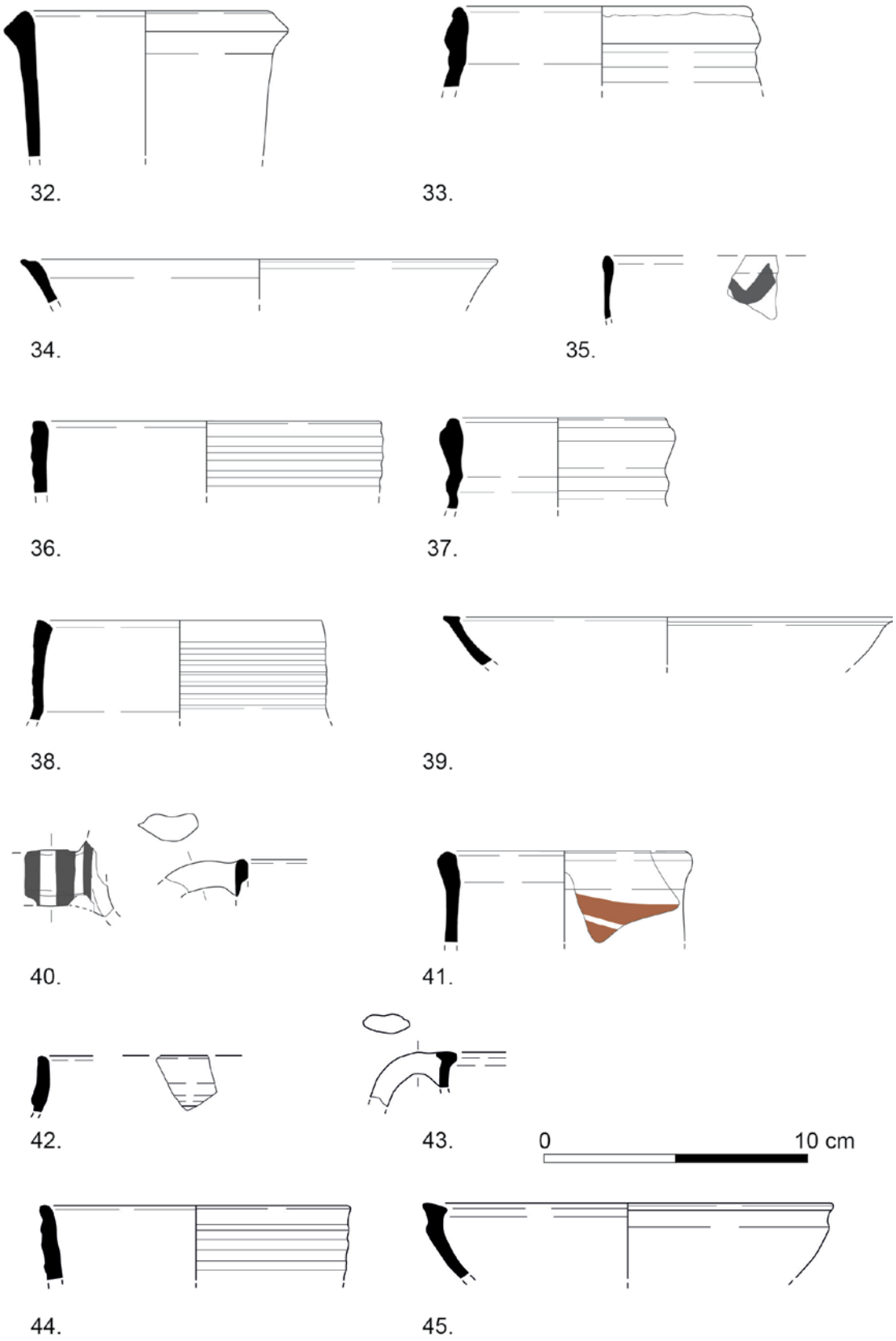


Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
46.	QUR-360	1	2	Open vessel	Byzantine	Johnson 2006: Figure 15.13:268	C
47.	QUR-370	1	4	Closed vessel	Umayyad	Tushingham 1972: Figure 6:19	B
48.	QUR-370	2	1	Closed vessel	Early Byzantine	Gerber 2012: Figure 3.46:5	C
49.	QUR-373	1	3	Closed vessel	Abbasid	Khalil and Kareem 2002: Figure 13:16	D
50.	QUR-373	9	9	Unknown	Byzantine/Early Islamic	Hendrix *et al.* 1996: 238-279; Cytryn-Silverman 2010, Plate 9.10:4; Johnson 2006: Figure 15.13:274, 275; Khalil and Kareem 2002; Smith and Day 1989: Plate 50:24; Tushingham 1972	E
51.	QUR-373	10	3	Unknown	Byzantine/Early Islamic	Hendrix *et al.* 1996: 238-279; Cytryn-Silverman 2010: Plate 9.10:4; Johnson 2006: Figure 15.13:274, 275; Khalil and Kareem 2002; Smith and Day 1989: Plate 50:24; Tushingham 1972	E
52.	QUR-373	10	27	Closed vessel	Early Islamic	Daviau 2010: Figure 8.10:5; Najjar 1989: Figure 6:24; Walker 2012: Figure 4.4:7	E
53.	QUR-373	10	28	Closed vessel	Late Byzantine	Smith and Day 1989: Plate 52:15	H
54.	QUR-373	17	6	Closed vessel	Late Byzantine/ Early Islamic/ Fatimid	Cytryn-Silverman 2010: Plate 9.8:1; Smith and Day 1989: Plate 48:6	H
55.	QUR-373	17	10	Closed vessel	Late Hellenistic/ Roman/ Byzantine/Early Islamic	Bar-Nathan 2002: Plate 27:504; Berlin 2005: Figure 6.:3, 4; Daviau 2010: Figure 8.9:8; Kuhnen 1989: Plate 45:4	I
56.	QUR-373	17	11	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
57.	QUR-373	18	1	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	D
58.	QUR-389	1	2	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	D
59.	QUR-393	1	1	Closed vessel	Late Byzantine	Gerber 2012: Figure 3.70:25	C
60.	QUR-396	4	2	Closed vessel	Byzantine/Early Islamic	Bar-Nathan 2011: Figure 11.4:6; Bar-Nathan and Adato 1986: Figure 1:4; Cytryn-Silverman 2010: Plate 9.18:3	H
61.	QUR-446	1	3	Open vessel	Byzantine	Johnson 2006: Figure 15.13:268	C

Table 3.6 (continued)

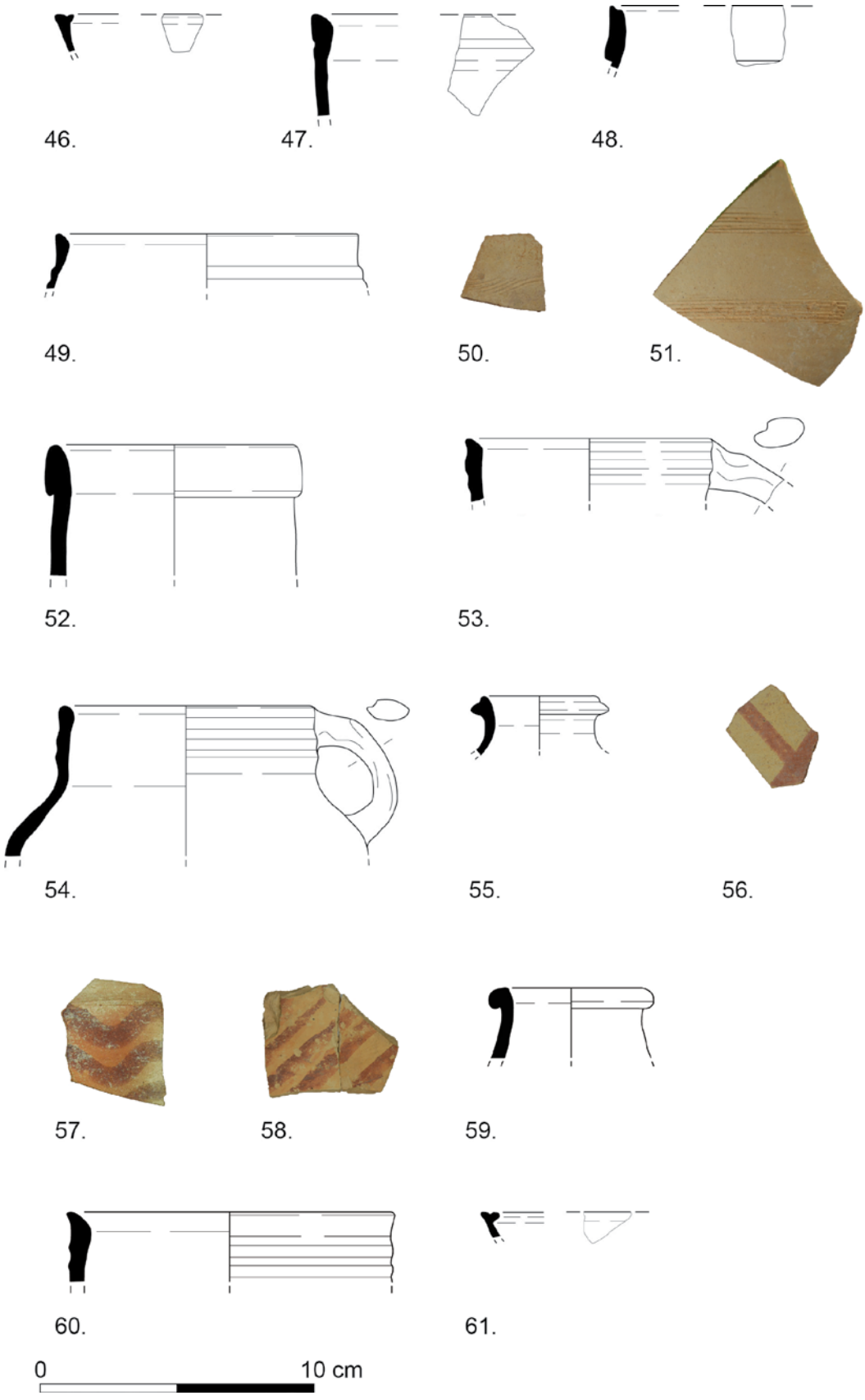


Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
62.	QUR-490	1	1	Cooking pot	Roman	Gerber 2012: Figure 3.26:3	H
63.	QUR-533	2	1	Open vessel	Late Roman/ Byzantine	Johnson 2006: Figure 15.9:179, 182 and Figure 15.6:10	F
64.	QUR-595	20	2	Closed vessel	Byzantine	Johnson 2006: Figure 15.12:25; Tushingham 1972: Figure 12:5	C
65.	QUR-615	2	1	Unknown	Late Byzantine	Gerber 2012: Figure 3.71:8	D
66.	QUR-619	2	2	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
67.	QUR-619	11	6	Closed vessel	Umayyad	Smith and Day 1989: Plate 58:20	H
68.	QUR-619	11	7	Closed vessel	Early Byzantine	Gerber 2012: Figure 3.45:7	D
69.	QUR-619	11	8	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
70.	QUR-619	11	9	Closed vessel	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
71.	QUR-619	11	10	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
72.	QUR-619	12	33	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
73.	QUR-632	3	1	Closed vessel	Iron Age II/ Hellenistic	Berlin 1997: Plate 57:PW80; Kuhnen 1989: Plate 34:5; Lapp 2008: Plate 2.7:4	B
74.	QUR-637	1	5	Closed vessel	Late Roman/ Byzantine/ Umayyad	'Amr and Schick 2001: Figure 9:20-21; Magness 1993: 232 no. 5; Tushingham 1972: Figure 9:16	C
75.	QUR-645	1	1	Closed vessel	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
76.	QUR-645	2	5	Closed vessel	Late Hellenistic/ Early Roman	Bar-Nathan 2002: Plate XI:4; Gerber 2012: Figure 3.20:4; Geva and Hershkovitz 2006: Plate 4.13:2; Geva and Rosenthal-Heginbottom 2003: Plate 6.10:5	C
77.	QUR-645	2	6	Closed vessel	Hellenistic	Johnson 2006: Figure 15.4:69, 80	B

Table 3.6 (continued)

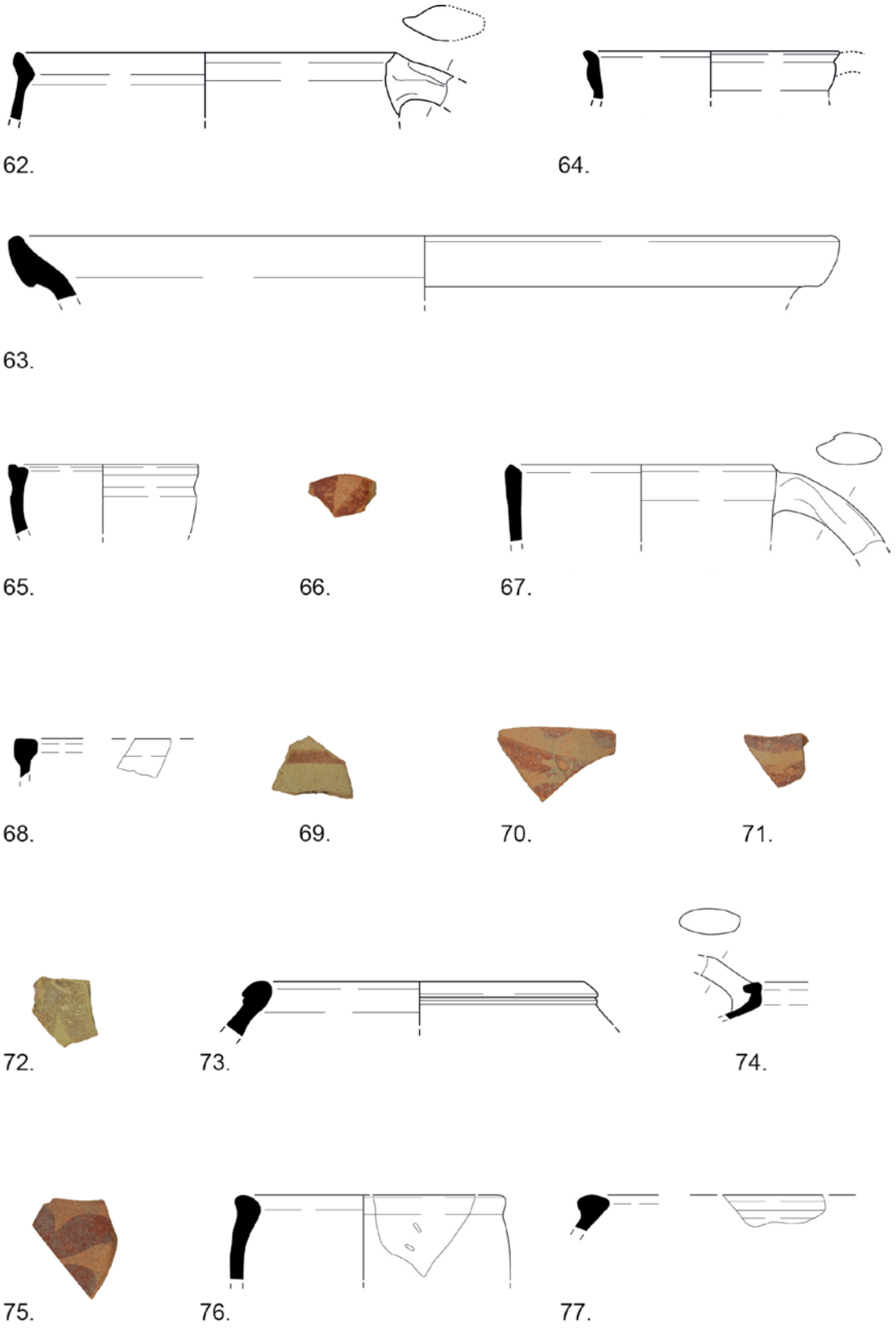
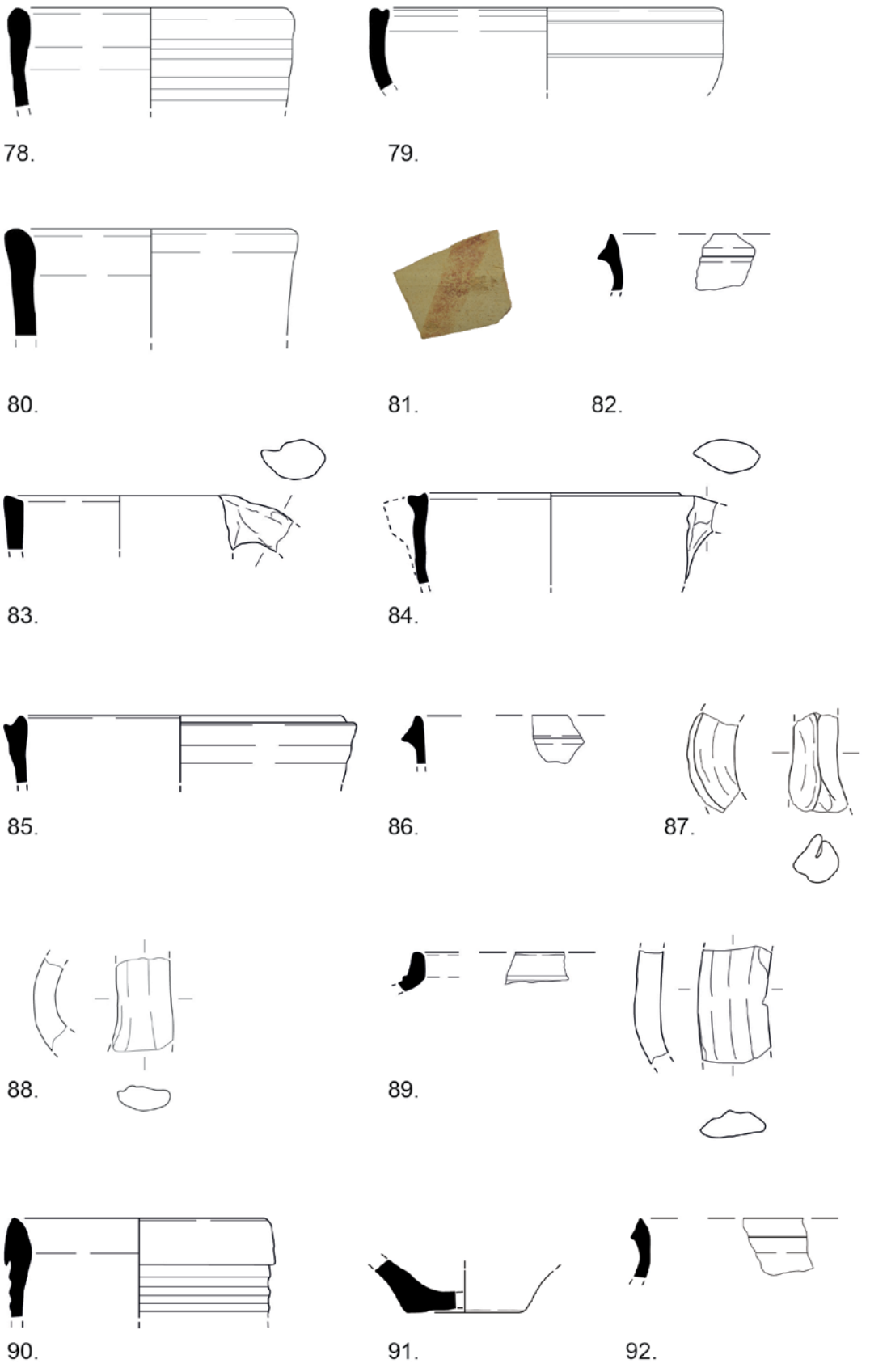


Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
78.	QUR-651	1	1	Closed vessel	Fatimid	Walker 2012: Figure 4.13:24	E
79.	QUR-653	1	1	Bowl	Roman	Gerber 2012: Figure 3.36:10	C
80.	QUR-656	1	2	Closed vessel	Late Byzantine/ Early Islamic	Alliata 1991: Figure 18:2; McNicoll *et al.* 1982: Plate 141:4; Smith 1973: Plate 31:105: 1158; Smith and Day 1989: Plate 54:2	E
81.	QUR-661	1	3	Unknown	Late Byzantine/ Early Islamic	Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76	E
82.	QUR-735	1	4	Closed vessel	Byzantine	Gerber 2012: Figure 3.70:12; Magness 1993: 219-20	I
83.	QUR-735	5	2	Closed vessel	Umayyad	Acconci and Gabrieli 1994: Figure 46:14	C
84.	QUR-735	11	1	Closed vessel	Late Byzantine	Smith and Day 1989: Plate 49:11	B
85.	QUR-735	14	1	Closed vessel	Late Byzantine	Smith and Day 1989: Plate 49:7	C
86.	QUR-735	16	3	Closed vessel	Late Byzantine	Gerber 2012: Figure 3.70:12; Tushingham 1972: Figure 12:26	H
87.	QUR-759	2	1	Unknown	Roman	Balouka 2013: Plate 15:10; Gerber 2012: Fig 3.30:20; Fig 3.31:5, 11, 12	C
88.	QUR-768	3	2	Unknown	Late Roman/ Byzantine	Balouka 2013: Plate 28:8	C
89.	QUR-773	1	1	Closed vessel	Late Roman/ Byzantine	Acconci and Gabrieli 1994: Figure 24:1; Kuhnen 1989: Plate 42:5	H
90.	QUR-785	1	1	Closed vessel	Abbasid	Khalil and Kareem 2002: Figure 13:17	B
91.	QUR-787	3	1	Unknown	Late Roman	Gerber 2012: Figure 3.41:31; Fig 3.28:26	C
92.	QUR-833	1	3	Closed vessel	Byzantine	Gerber 2012: Figure 3.70:12; Figure 3.86:15; Tushingham 1972: Figure 12:26	C

Table 3.6 (continued)



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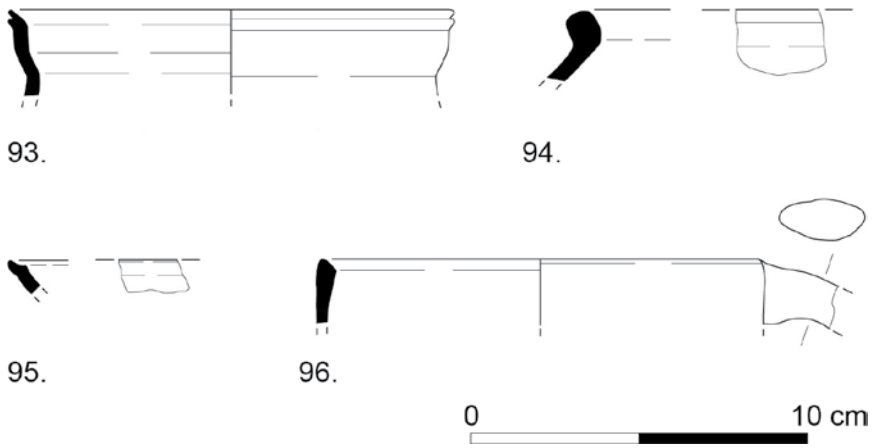

Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
93.	QUR-851	1	1	Cooking pot	Roman/Early Byzantine	Acconci and Gabrieli 1994: Figure 27:10, 11; Bar-Nathan 2006: Plate 29:42; Northedge 1992: Figure 123:4	C
94.	QUR-1016	1	1	Closed vessel	Iron Age II/ Hellenistic/Roman/ Byzantine/Early Islamic	Johnson 2006: Figure 15.3:64; Lapp 2008: Plate 2.10:4; Smith 1973: Plate 43:1252	F
95.	QUR-1016	17	1	Open vessel	Abbasid	Khalil and Kareem 2002: Figure 8:5, 13, 18	C
96.	QUR-1022	4	1	Cooking pot	Umayyad	Acconci and Gabrieli 1994: Figure 46:14	H

Table 3.6 (continued)

Chapter 4 - Residential Spaces in the Jebel Qurma Region

4.1 Introduction

In the previous chapter, a number of site types were presented that were defined through pedestrian surveys in the Jebel Qurma region. One of these site types was residential sites, which featured clearings and enclosures. On the basis of associated ceramic scatters and Safaitic inscriptions, these sites could be dated broadly between the Hellenistic and Early Islamic periods. In Chapter 1 a number of correlates for the identification of nomadic campsites were proposed, and these are further explored in this chapter. The aim of this chapter is to obtain a more detailed insight into the nature and chronology of these residential sites. It seeks to uncover further evidence for domestic activities at these sites, and what these activities entailed. Furthermore, it aims to shed light on the occupational duration of these sites: where these sites permanently inhabited or only for short periods of time? Another issue that is explored below is the degree of architectural investment at these sites. Were the enclosures created by the Classical/Late Antique inhabitants, or were they simply reoccupying prehistoric sites? Finally, this chapter explores how these residential sites were distributed in the landscapes of the Jebel Qurma region, in an attempt to explore preferences in site location and potential motivations.

These issues are addressed, firstly, by presenting the results of excavations carried out at a number of enclosures during field campaigns between 2014 and 2016. The methods of excavation and documentation are presented before the results of the excavations are discussed. These results provide detailed information concerning a number of sites. Secondly, the spatial distribution of residential sites in the study area is discussed. A number of GIS-based spatial analyses were carried out in order to explore how the landscape was structured in terms of living space. Here, the results of surveys and excavations are combined with different ways in which the landscape was classified, as presented in Chapter 2. In particular, attention is paid to the location of residential sites in the landscape and how this may have shifted through time.

4.2 Excavation methods

The excavations carried out at a number of stone-built features in the Jebel Qurma region (Figure 4.1) aimed to acquire more detailed information on the nature and chronology of particular site types, such as funerary monuments and potential campsites. Although the level of detail that can be acquired through surface surveys in the region is relatively high, a number of questions could not be answered without the more detailed results obtained through excavations. These questions often related to the function of particular stone-built features, their date of construction and use, and their relation to other nearby features.

4.2.1 Excavation procedures

Archaeological features were selected for excavation based on research questions mostly related to the nature and chronology of particular sites types, but also on some additional variables. These included: the likelihood of preserved stratigraphy, the number of artefacts found at the surface of a particular feature, the predicted state of preservation of the features, and constraints imposed by logistics, time, and the size of the excavation team.

Once a particular feature was selected for excavation a local measurement system was set up on the site. Two different devices were used for this over the years. In 2014 a Total Station was used while this was replaced in the later seasons by a Differential GPS. The local measurement system was necessary to make accurate maps of the excavation areas. In 2014 these maps were hand-drawn in the field, while in 2015 and 2016 photogrammetry was used to produce more accurate maps. This entailed the

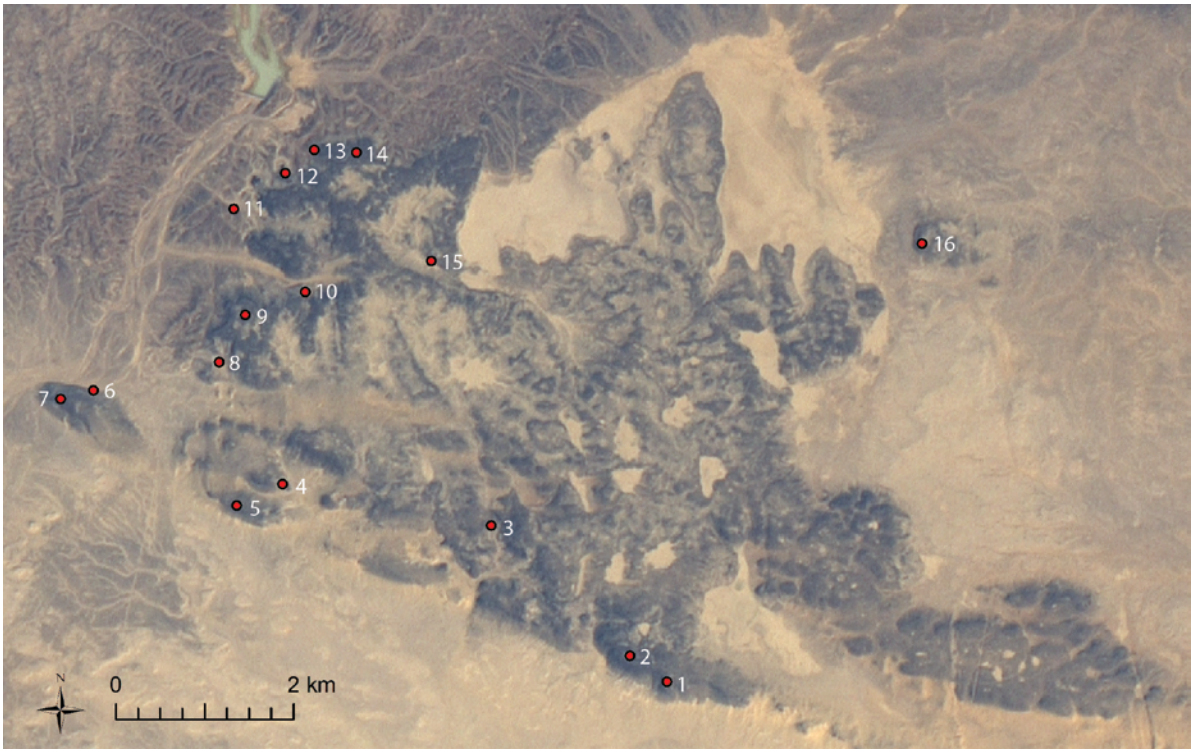

Figure 4.1 Excavated sites in the Jebel Qurma region discussed in Chapters 4 and 5: 1) QUR-32; 2) QUR-28; 3) QUR-20; 4) QUR-11; 5) QUR-9; 6) QUR-595; 7) QUR-2; 8) QUR-373; 9) QUR-215; 10) QUR-210; 11) QUR-829; 12) QUR-186; 13) QUR-956; 14) QUR-970; 15) QUR-1016; 16) QUR-148. Coordinates are given in text. Base image: Landsat 7.

processing of photographs that were made with hand-held cameras or cameras mounted on a kite or drone, through the Agisoft Photoscan Professional software. Fixed markings or 'targets', were applied on or around the structure and their location was recorded using the DGPS and in the photographs. The photogrammetric software identifies and aligns the spatial coordinates of these targets, resulting in the 3D model of the excavated structure. This model could subsequently be used to create a digital elevation model (DEM) of the excavation area and its surroundings.

It was then decided which part of the feature would be excavated, and these areas were marked out with string. In the case of enclosures these areas represented different trenches, and were usually separated by section baulks to retain stratigraphic control. Initially, trenches were subdivided into a horizontal grid of 1x1 m units (e.g. at QUR-11; see below) to retain control over the distribution of artefacts. Although this system has proven successful elsewhere (Rosen 1993), it was omitted once it became clear that the numbers of artefacts were generally very low. In the case of cairns, only a section of the cairn was usually subjected to excavation and this always included the centre of the cairn, where a burial chamber was expected. Excavation ideally included part of the cairn's surroundings, although this only became a standard procedure in 2016. For the previous field seasons sometimes only the centre of a cairn was excavated.

The excavations were documented using paper forms that allowed for the description of the various depositions and features encountered. The contents of these paper forms were later transferred to a digital database.

Excavations were carried out manually using trowels, brushes, and small picks, and all dirt was sieved. For the enclosures, sieves with mesh sizes up to 5 mm were used, while for cairns and other potential

funerary structures sieves with a 3 mm mesh size were used. Excavations usually continued until either bedrock or virgin soil was reached. Sometimes this consisted of soil full of weathered limestone concretions, or simply of a natural surface cover of basalt boulders. In the case of cairns, a floor within a central chamber of the cairn could often be recognised. This often continued underneath the walls of the chamber, and in these cases the excavation would cease at this floor.

Materials that were collected from the excavations included artefacts, skeletal remains, and charred plant materials. The find-location of these materials was documented before they were collected. Human bones were collected for skeletal analyses and radiocarbon dating, and charcoal samples were gathered for botanical analysis and radiocarbon dating. Contexts containing charred plant remains, such as fire places and ash pits, were sampled in such a way that as much material was taken as possible, anticipating that little material was preserved.

A number of samples were collected for Optically Stimulated Luminescence (OSL) dating. This method dates the moment at which a sediment was last exposed to sunlight. These were all soil samples collected from underneath stones that formed part of the base of stone-built features such as cairns and pendants (see below for more contextual information). Samples were thus collected in order to determine the initial construction date of these features. Since sampling involved the lifting of a base stone and collecting the underlying soil, sampling was carried out at night using dim red lights in order not to contaminate the samples.

4.2.2 Post-fieldwork analyses

4.2.2.1 Stratigraphy

The stratigraphic sequences documented by the excavations were analysed and arranged into stratigraphic phases after the excavations. These phases were defined according to their physical stratigraphy and associated datable remains, such as from fire pits and artefacts. These phases were numbered in chronological order according to the trenches in which they were exposed. Thus, Phase 101 refers to the oldest phase exposed in Trench 1 of a particular feature, while Phase 102 relates to a younger phase in the same trench, and Phase 201 refers to the oldest phase in Trench 2 (see subsequent section).

4.2.2.2 Artefacts

The artefacts collected during the excavations were documented in the dig-house during the field campaigns. These artefacts included ceramics and other small finds, like jewellery made of glass, metal, stone, mollusc shell and ostrich eggshell, as well as ground-stone tools, coins, and glass fragments. These finds were drawn, photographed, and described on paper forms that were later entered into the digital database. Chipped-stone artefacts were retrieved from a number of contexts and were described with various degrees of detail.

4.2.2.3 Botanical remains

Botanical remains included charred plant material that was retrieved from excavated contexts such as fire places and ash pits. The samples that were taken from these contexts were brought to The Netherlands and analysed by a specialist (Federica Fantone, see Preface). Data from the unpublished report on these botanical analyses (Fantone 2014) were incorporated in the results described below.

4.2.2.4 Human skeletal remains

The numerous human skeletal remains retrieved during excavations were analysed in the dig-house by Sarah Inskip (see Preface), whose reports were consulted for the sections on the excavations results in this chapter and Chapter 5. While most of the material has remained in Jordan, some skeletal remains were brought to The Netherlands for radiocarbon dating.

4.2.2.5 Faunal remains

Only limited amounts of faunal remains were encountered during the excavations, and not all of it has yet been studied by specialists. Animal bones from the site of QUR-595 were brought to The Netherlands and studied by archaeozoologists from Groningen University, who wrote a report on their findings (Slim *et al.* 2014). In a few cases animal bones were retrieved from burial contexts, and were tentatively identified to species level by Inskip. Other faunal remains included ostrich eggshell fragments, which were retrieved from a number of contexts, although in many cases it is not clear whether the eggs themselves or pieces of eggshell were brought into the site by people or animals.

4.2.2.6 Chronometric dating methods

Two chronometric dating methods were applied in the excavation programme. The first was radiocarbon dating, which was carried out at the Centre for Isotope Studies at Groningen University. Samples for radiocarbon dating included charred plant remains and human skeletal remains, which were analysed through Acceleration Mass Spectrometry. The returned 14C-dates were subsequently calibrated using the OxCal 4.2 program in order obtain calendar dates. The second method was Optically Stimulated Luminescence (OSL) dating, which was carried out by the Centre for Luminescence dating at Wageningen University.

4.3 Excavation results from the enclosures

4.3.1 An enclosure and ancillary structures at QUR-595

The site of QUR-595 (323992 E 3517891 N) is situated on the northern base of Jebel Qurma, along the edge of Wadi Rajil. What follows is a report on the excavations carried out at QUR-595. A number of unpublished reports of specialists affiliated to the Jebel Qurma project (Brusgaard 2015; Fantone 2014; Slim *et al.* 2014) were also consulted. The site consists of a number of different structures scattered over an elongated area that runs in a roughly east-west trajectory along the base and lower slopes of the mount.

Figure 4.2 Top view of Structure 1 at QUR-595, with the excavation trench outline indicated. Base image: photogrammetrically generated aerial view based on drone photographs.

The site was surveyed during the 2013 campaign, and yielded many ceramics, including pottery of the Byzantine period (see Chapter 3). Furthermore, recent looting at the site revealed a number of interesting features, including fire pits and what appeared to be remains of metal smithing.

4.3.1.1 Structure 1: Enclosure

Structure 1 is a grouped enclosure situated on a relatively modest slope close to the northern base of Jebel Qurma (Figure 4.2). The structure consists of a series of crude clearings bounded by low enclosure walls about 50 cm high. In total, the structure measures about 28 by 26 m, but is subdivided into a number of compartments. One of these compartments, measuring *ca.* 13 by 6 m, was excavated. The surface within this compartment sloped down gently from the south to the north, broadly following the slope of the natural terrain. An opening to the compartment from outside was present in the northeast corner. At the southern end of the compartment, looters had dug a rough pit of 2.9 m across. This pit was surrounded by debris from the looting activities that consisted mostly of soil.

Before excavations commenced in the compartment, an excavation trench was created measuring 13 by 5 m within the enclosure that had been partially looted. A portion of the western part of the enclosure was not excavated, leaving a north-south section for stratigraphic control. A section was also made through the northern wall of the enclosure to investigate the wall's profile in relation to the internal stratigraphy.

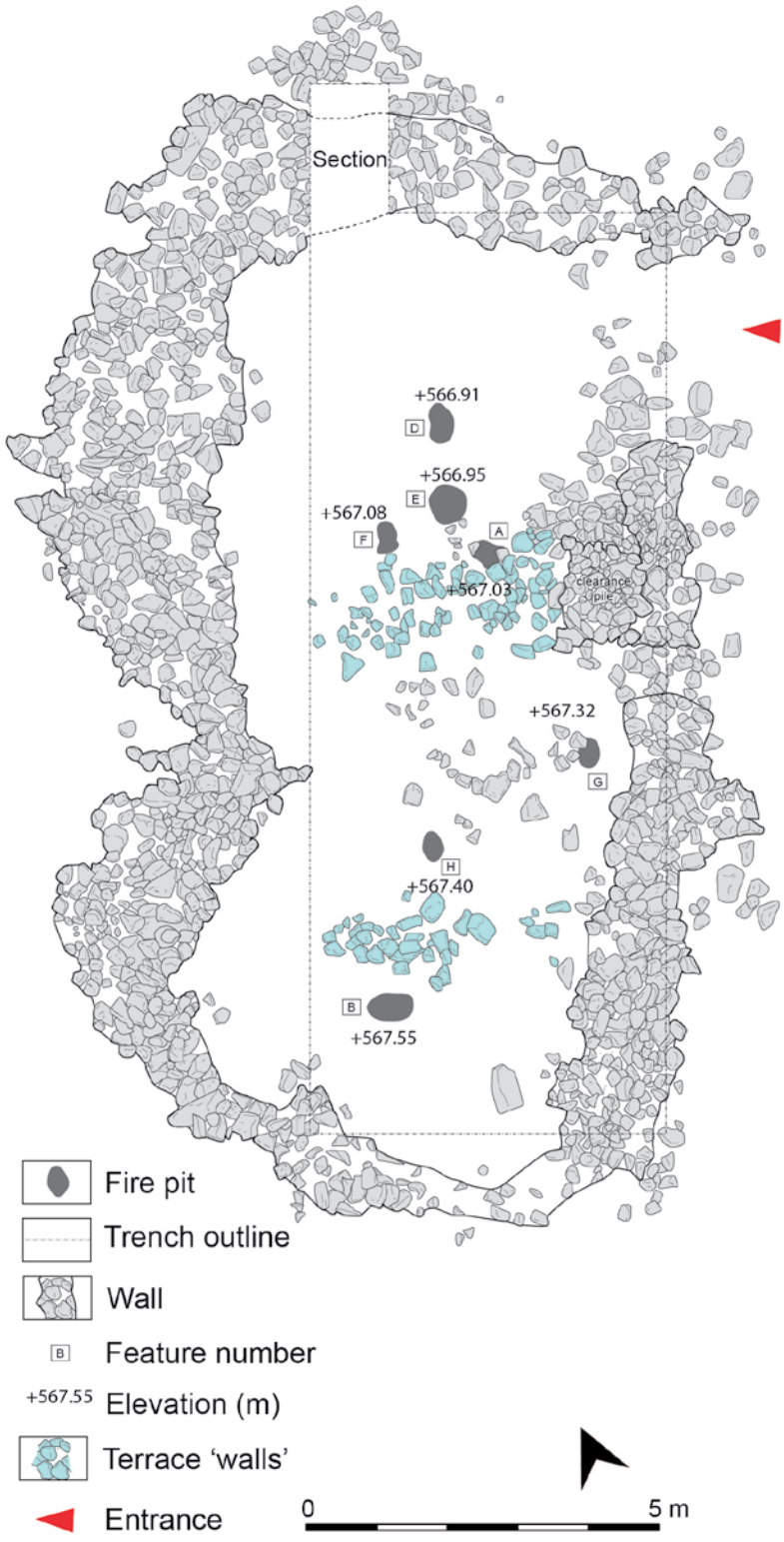

Figure 4.3 Plan of the excavation trench at QUR-595, Structure 1, showing the fire pits of Phase 103. Architecture drawn by M. Kriek.

Stratigraphy and features (Figure 4.3)

Phase 101**:** The earliest use phase attested in Trench 1 was a gravelly surface layer with few basalt rocks, and soft sand in between the gravel. It most likely represents the original surface in the area, largely cleared of basalt boulders. Dug down into this surface were a number of fire pits (Features C/N, J, M, and K). This surface layer is stratigraphically associated with the foundation of the enclosure wall, although whether or not the wall is contemporaneous with the fire pits remains uncertain. Two linear features that run through the enclosure are also associated with Phase 101 (Figure 4.3). These are very low, unstable walls that are interpreted as the remains of natural terrace "walls" rather than a man-made compartmentalisation of the enclosure wall. The walls of the enclosure were built on top of them.

Phase 102**:** On top of the surface of Phase 101 lay a deposition of windblown sand varying in thickness from 9 cm (in the south) to 29 cm (in the north). This sand filled the interior of the enclosure to a considerable degree. At some point, part of the enclosure wall collapsed, leaving a debris layer of basalt rocks in the sand. Sand continued to accumulate after this phase of collapse.

Phase 103**:** Covering the windblown deposits of Phase 102 was another surface layer represented by a number of small fire pits (Features A, B, D, E, F, G and H), which were dug down from the top of the loose sand deposits of Phase 102. During this period, the enclosure that had been partially filled up with sand was apparently reused. These fire pits were finally covered by a thin layer of loose soil.

Radiocarbon dates

Several radiocarbon dates were produced from the material in Structure 1 at QUR-595 (Table 4.1). Charcoal from the four of the fire pits[9] of Phase 101 gave a variety of radiocarbon dates from the Late Neolithic period (SN13-2) and Persian/Early Hellenistic period (SN15-72). One of the fire pits (E) of Phase 103 gave a date in the Late Hellenistic period (SN13-1). Another fire pit from Phase 103 returned a late 15th to early 17th century AD date (SN15-67), suggesting that Phases 101 and 103 both represent a palimpsest. No radiocarbon dates were retrieved from Phase 102, although its stratigraphic position between dated fire pits indicates that this abandonment phase must have occurred after the 4th/3rd centuries BC and before the 1st century BC to 1st century AD.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/ AD (1 σ)	Calibrated date BC/AD (2 σ)
SN15-67	Charcoal	Fire pit E	GrA-66000	345 ± 30	1486-1524 AD (24.4%) 1558-1631 AD (43.8%)	1465-1638 AD (95.4%)
SN15-72	Charcoal	Fire pit J	GrA-66002	2260 ± 30	390-356 BC (32.0%) 285-234 BC (36.2%)	397-350 BC (39.7%) 308-209 BC (55.7%)
SN13-1	Charcoal	Fire pit B	GrA-62238	2015 ± 30	47 BC-22 AD (68.2%)	95 BC - 61 AD (95.4%)
SN13-2	Charcoal	Fire pit C	GrA-62324	6880 ± 40	5802-5720 BC (68.2%)	5869-5664 BC (0.6%) 5846-5671 BC (94.8%)

Table 4.1 Radiocarbon dates from the enclosure at QUR-595.

Ceramics

During the survey only five undiagnostic body sherds were collected from the surface of the excavated area. Excavation revealed another 64 sherds, most of which were undiagnostic body sherds, and of

[9] This includes fire pit C that was exposed by looters and already sampled in the 2013.

which only two could be dated on typological grounds. The Phase 103 context produced 35 sherds, and 25 came from Phase 102, including the two datable sherds. These were a rim sherd of a Late Byzantine or Umayyad period storage jar, and a single red-on-cream ware body sherd: these possibly both came from the same vessel (Figure 4.4). Importantly, however, I would suggest that these sherds are intrusive to their find context, as the radiocarbon dates suggested that Phase 102 must predate the 2nd c. AD. In any case, these ceramics are indicative of another phase of frequentation or use of the site younger than those established through radiocarbon dates.

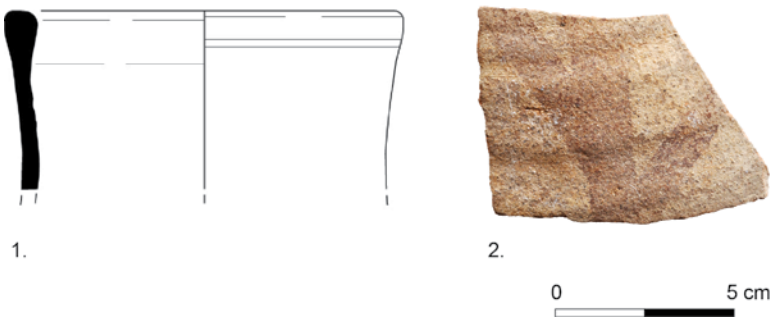

Figure 4.4 Diagnostic ceramics from QUR-595. A buff ware rim dated to the Late Byzantine or Umayyad period (parallels: Smith and Day 1989: Plates 52:8, Plate 58:14, 15). A red-on-cream decorated body sherd dated to the Late Byzantine or Early Islamic period (parallels: Hendrix *et al.* 1996: 238-279; Parker 1998: 215; Smith 1973; Smith and Day 1989; Tushingham 1972: 67-76).

Small finds

Very few small finds were retrieved during the excavations. One of these was a complete bronze ring of unknown date. It was 7 mm in diameter and 1 mm thick, and was found in the sandy fill of Phase 102. A modern piece of metal was found in the surface layer of Phase 103.

Chipped-stone artefacts

Unfortunately, the chipped-stone artefacts retrieved during the excavation have not yet been studied.

Botanical remains

Five pieces of charred plant material retrieved from fire pit B (Phase 103). These were dated between 95 BC and AD 61, and were identified as cf. *Fraxinus* (Fantone 2014). Botanical remains from the other Classical-period fire pit (J) from Phase 101 were, unfortunately, not yet studied.

Faunal remains

In total, 18 fragments of ostrich eggshell were found from all of the phases. Additionally, two small unidentified bone fragments were found in Phase 102, as well as two pieces of mollusc shell.

Discussion

Phases 101 and 103 both represent a significant palimpsest phase: stratigraphically indistinguishable fire places yielded radiocarbon dates spanning a very long time period. The oldest of these radiocarbon dates is actually prehistoric, which may indicate a prehistoric origin of this enclosure wall, although it cannot be excluded that the wall was constructed at a later date. Whatever the case, the wall must have been created during or prior to the 1st century AD, as indicated by the radiocarbon date from Phase 103. At this point, sediments had already accumulated within the enclosure. Equally problematic is the poor stratification of find material. Ceramics from the Late Byzantine or Early Islamic period were retrieved from Phase 102, the soils of which must have been deposited prior to the 2nd century AD. Bioturbation or other post-depositional processes must have considerably mixed the deposits.

Nevertheless, the occurrence of fire pits in what was clearly an enclosed space (Phase 103) suggests that the enclosure was used at some point during the Late Hellenistic period for activities not necessarily related to the penning of animals. Direct evidence for what these activities entailed is lacking at this

point. Artefacts that probably represent domestic waste include ceramics, even though only a few of these could be dated on typological grounds. Whether the small bronze ring from Phase 102 is pre-Islamic as well is difficult to say. Because of the highly mixed nature of this phase it cannot be excluded that it originates from a more recent use phase of the enclosure.

Also important is the possible identification of *Fraxinus* (ash) from the Late Hellenistic fire pit B. This taxon is presently absent from the Black Desert (see Chapter 2; cf. Willcox 1999, Table 1) and is usually associated with habitats that are more humid than the Saharo-Arabian habitats that prevail today (cf. Asouti *et al.* 2015; Blondel and Aronson 1999: 106; Hegazy and Lovett-Doust 2016: 68; Kaniewski *et al.* 2012).

4.3.1.2 Structures 26, 27 and 28

Structures 26, 27 and 28 are three small, roughly circular structures recognized on a low knoll at the base of Jebel Qurma during the 2013 campaign. They are situated about 75 m to the east of Structure 1. The structures consisted of roughly oval concentrations of basalt that were heavily disturbed by recent looting activities (Figure 4.5). Looters had dug pits within and around the structures, up to 3.8 m across and 60 cm deep, and had thrown debris from within the structures on top of what seemed to be remains of low walls. During the survey, large amounts of charred plant material and metal slag was recognized, suggesting metal production at this location. However, human skeletal remains were also collected, indicative of a burial context. Although the structures seemed very poorly preserved due to the looting activities, excavations were carried out to better understand the nature and chronology of the structures.

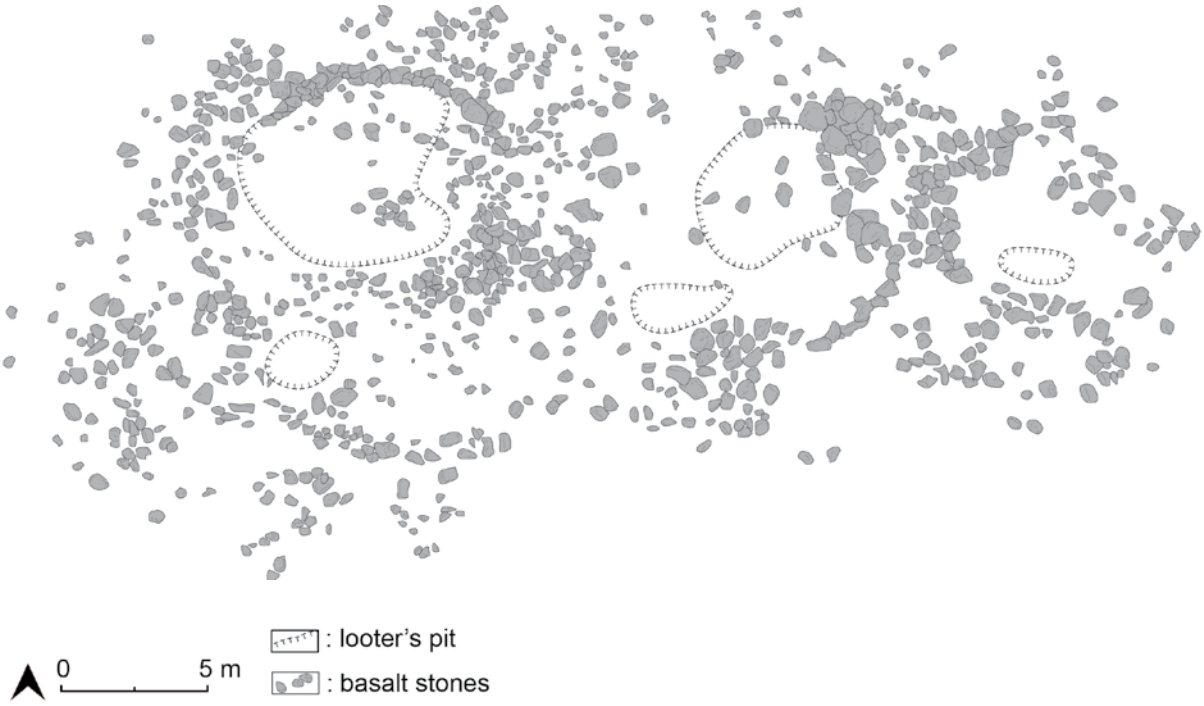

Figure 4.5 Pre-excavation situation of Structures 26, 27, and 28 at QUR-595. Drawn by M. Kriek.

Excavations were carried out in two stages. Some of the looter's debris was already sieved during survey activities in the 2013 campaign, while more formalized excavations were carried out in 2015. An accurate drawing of the structures was first created on the basis of drone photographs, and an excavation grid was marked out over the structures in order to better document the distribution of the scattered remains within the looter's debris. The looter's debris was then removed and sieved. The damage done by looters

turned out to be extensive, having destroyed any stratigraphic sequence. What follows below is a report on the nature and distribution of finds retrieved from the debris in 2013 and 2015.

Architecture

The architectural remains of the three structures turned out to be fairly limited (Figure 4.6). Although some of the architecture was surely destroyed by looters, the amount of basalt stones in general appeared to be too limited to have originated from, for example, elaborate walls or a cairn. The only clear remains of walling were identified on the north side of Structure 26, where a relatively narrow wall of basalt stones, stacked up to 3 courses high, was preserved (Figure 4.7). The other boulder concentrations delineating the roughly oval areas turned out to be loosely piled heaps of stone rather than actual walling. It is not unlikely that these concentrations are a mix of originally placed stones and stones cast away by looters. In any case, the structures together demarcate three crude compartments extending over an elongated area of about 18 m long and 7 m wide. Despite these measurements, it remains unclear to what extent the looters changed the configuration of the structures, or what the structures may have looked like originally.

Remains of metal working

From the looter's debris came large amounts of charred material, which included wood remains, iron smithing slags, fragments of worked iron, and a few pieces of cinder. These were found in the debris in and around Structures 26 and 27 (Figure 4.6), although the largest quantities of charcoal, iron slags, and iron fragments were found in association with Structure 26. The combined presence of these materials is suggestive of iron working activities, and the small size of the slags indicates secondary smithing

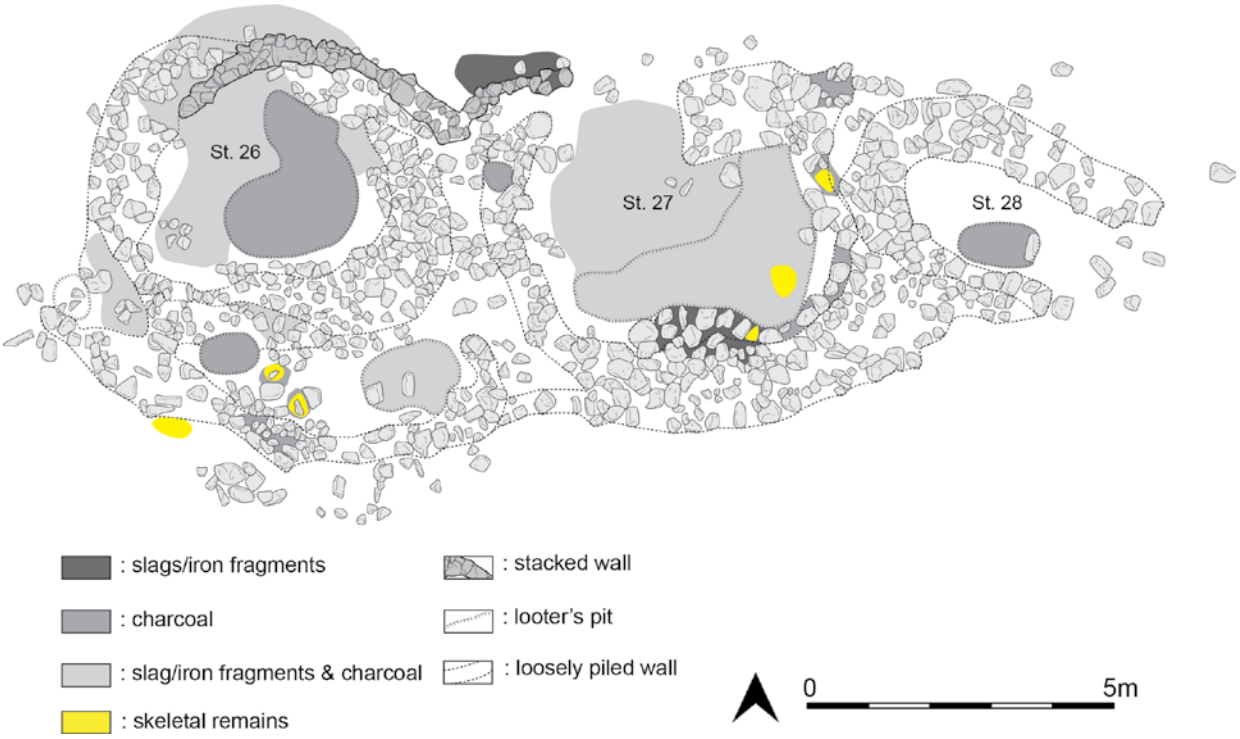

Figure 4.6 Distribution of finds at Structures 26, 27, and 28 at QUR-595.

activities, in which finished iron products were reworked, rather than created (Brusgaard 2015). The original hearth for smithing was not found and was probably largely destroyed by recent looting activity. Nonetheless, based on the concentration of the finds it can be suggested that the smithing occurred within Structure 26.

The charred plant remains from the smithing area were submitted for radiocarbon dating and botanical analysis. The obtained radiocarbon dates range between the 2nd and early 4th centuries AD (Table 4.2: SN13-3; 4; 11; SN15-6; 23; 34). The botanical analysis was carried out by Fantone (2014), who identified a variety of plant and tree taxa, including *Platanus*, *Ficus carica*, *Pinus*, cf. *Fraxinus*, as well as Chenopodiaceae and Pomoideae.

Figure 4.7 Remains of a stacked wall on the north side of Structure 26, exposed through excavations. Scale is 50 cm. Photo by P. Akkermans.

Other finds

A total of 31 ceramic sherds were found in the looter's debris. These were mostly undiagnostic sherds (n=30), and all except one were found in or around Structure 26. A rim sherd of a 6th to 8th century AD cooking pot was found in the looter's pit within Structure 26 (Figure 4.8). Fragments of one or more glass vessels were found as well. Six pieces of glass came from inside Structure 26, and four from around it. The highly corroded surfaces of the fragments suggest that the glass is certainly not modern, yet the rim fragments could not be dated more closely on typological grounds. Additionally, six beads were found in association with Structure 26, and were made either of stone, mollusc shell, and possibly glass paste. A few pieces of bronze were found, as well as a few ostrich eggshell fragments. Lastly, fragments of a stone vessel or tube were found, to which small pieces of iron adhered. The attached iron suggests that the object is likely related to the smelting activities in the area, although in what way remains uncertain.

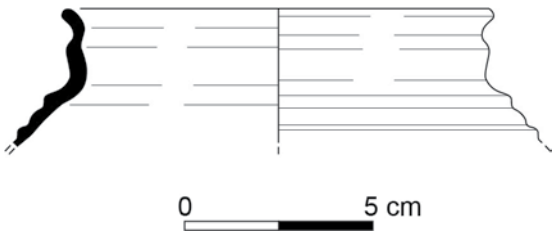

Figure 4.8 Rim of a cooking vessel found in the looter's debris of Structure 26 (QUR-595). It was dated on typological grounds to the Late Byzantine or Early Islamic period (parallels: Daviau 2010: Figure 8.7:2; El-Khouri 2014: Figure 9:4). Drawing by A. Kaneda.

Skeletal remains also were found within the looter's debris in connection with Structures 26 and 27 (Figure 4.6). These highly fragmentary remains belonged to one individual that was apparently

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN13-4	Charcoal	Looting debris	GrA-62243	1770 ± 30	230-264 AD (25.9%) 275-330 AD (42.3 %)	138-345 AD (95.4%)
SN13-3	Charcoal	Looting debris	GrA-62240	1780 ± 30	216-262 AD (33.6%) 277-328 AD (34.6%)	137-335 AD (95.4%)
SN13-11	Charcoal	Looting debris	GrA-62244	1760 ± 30	239-264 AD (20.5%) 275-330 AD (47.7%)	171-194 AD (2.3%) 211-383 AD (93.1%)
SN15-6	Charcoal	Looting debris	GrA-65947	1820 ± 30	138-198 AD (45.4%) 206-234 AD (22.8%)	98-100 AD (1.0%) 124-257 AD (90.7%) 296-320 AD (3.7%)
SN15-23	Charcoal	Looting debris	GrA-65948	1755 ± 30	242-264 AD (18.3%) 273-330 AD (49.9%)	180-185 AD (0.4%) 214-384 AD (95.0%)
SN15-34	Charcoal	Looting debris	GrA-65949	1760 ± 30	239-264 AD (28.5%) 274-330 AD (47.7%)	170-194 AD (2.3%) 210-383 AD (93.1%)
SN15-94	Human bone	Looting debris	GrA-67034	645 ± 30	1298-1313 AD (28.1%) 1358-1388 AD (39.6%)	1281-1328 AD (42.2%) 1341-1396 AD (53.2%)
SN15-173	Human bone	Looting debris	GrA67064	590 ± 35	1310-1360 AD (50.7%) 1387-1405 AD (17.5%)	1297-1415 AD (95.4%)

Table 4.2 Radiocarbon dates from Structures 26, 27, and 28 at QUR-595.

buried under one of the structures (Slim *et al.* 2014). However, radiocarbon dates of the human bones indicate that the individual was buried here between the late 13th and the early 15th century AD (Table 4.2, SN15-94; SN15-173). Also retrieved from the looter's debris, and possibly associated with the burial, were skeletal remains of a single adult camel that were also highly fragmented and scattered around Structures 26 and 27.

Discussion

The damage done by looters to Structures 26 to 28 as well as the great diversity of finds retrieved from the debris makes it difficult to form a conclusive account of the nature of these structures. The oldest evidence of activity at this location are the remains of smithing activities dated between the 2nd and early 4th centuries AD. From the distribution of the debris in which these remains were found it may be suggested that these activities were associated with Structure 26. The remains are suggestive of secondary smithing that was apparently carried out at this location during the Roman period. What kind of objects were reworked, and to what extent, is impossible to say at this point. Perhaps it simply entailed repairing bent or broken objects, or transforming existing iron objects into entirely different artefacts.

It seems most likely that the large amounts of charcoal retrieved from the structures are associated with these smithing activities. Interestingly, these wood remains came from a number of tree taxa that can be characterised as hydrophylous, including *Platanus, Ficus* and, possibly, *Fraxinus*, and must have come from a relatively wet habitat. This is remarkable, since none of the attested tree types are found in the Black Desert today (see Chapter 2). The water-loving characteristics of these tree types raises the question whether the local environment around QUR-595 was wetter and more arboreal in antiquity. An important issue in this respect is the origin of the wood: was it collected locally or brought in from

elsewhere? In this case, 'elsewhere' would potentially be the Azraq oasis, situated only 30km to the west of QUR-595, which would be a likely location for the presence of the attested tree types given the presence of permanent water there. Given the large amount of fuel required for smithing it is, at the very least, not improbable that wood was brought in from the oasis or another wooded region for such a specialised activity. On the basis of the botanical evidence from this context alone, it is unlikely that the attested tree types were growing locally during the 2nd to early 4th centuries AD. The possibility of a wetter and more arboreal local environment remains a possibility that should be further explored on the basis of other evidence.

The occurrence of a single pottery sherd datable to the 6th to 8th centuries AD is hardly suggestive of substantial Late Antique use of Structures 26-28. It is possible that it originates from one of the Late Antique campsites situated nearby (see below). More significant reuse of the site is attested by the human skeletal remains dating to the later medieval period. Some of the artefacts, including the beads and the remains of the camel bones are possibly associated with this burial. Again, however, the destruction caused by looters makes it difficult to reconstruct the detailed history of these three structures and their associated finds.

4.3.2 An enclosure at QUR-373

The large site of QUR-373 (325407 E 3518209 N) consists of a number of clearings and enclosures that were occupied during multiple periods, from prehistory up to relatively recent times. One of these structures was explored in greater detail. Structure 7 is a large enclosure that is situated on the eastern side and just below of an elevated ridge. It lies on the upper part of the site of QUR-373, overlooking a large valley and several other structures that are part of the site. The structure is a grouped enclosure, consisting of two smaller enclosures surrounded by a clearing (Figure 4.9). The structure consists of a small inner circle, measuring about 7.5 by 6 m, which lies roughly within an outer circle measuring about 18.5 by 17 m. This outer circle is surrounded by a clearing demarcated by a number of broad clearance cairns: these are stone piles resulting from removing stones from the surrounding surface. Prior to excavation, much of the enclosure appeared to have been filled up by wind-blown sands, which obscured major sections of the walls. The accumulation of sands is likely the result of the prevailing westerly winds that deposits sand on the leeward side of the ridge. Relatively many pottery sherds of mostly Byzantine to Early Islamic dates were encountered on the surface (see Chapter 3), as were prehistoric flint artefacts. Also, a single panel with a number of Safaitic inscriptions was found on a boulder inside the enclosure (QUR-373.3.1 to 3, see Della Puppa forthcoming). The aims of the excavation were to determine the nature and chronology of the inhabitation of the enclosure. In that respect, the goal was also to identify whether there was a functional and/or chronological difference between the inner and outer circle.

Prior to excavations, a drawing was made of the entire structure, after which trenches were marked out. Excavations took place in the outer circle (Trench 1), the inner circle (Trench 2), and on the surrounding clearing (Trench 3). Trench 1 was laid out in the eastern half of the outer circle, as this was the part where the least windblown sand had accumulated. The inner circle (Trench 2) was excavated in its entirety. Trench 3 was only a small trial trench. In all trenches, excavations were continued down to bedrock. Profiles were maintained for stratigraphic control, although these were removed in Trench 2 in the final stages to obtain a wider horizontal exposure.

4.3.2.1 Stratigraphy and features

Trench 1:

Phase 101: The oldest phase in Trench 1 represents the construction phase of the outer enclosure wall, which was built on top of a layer of bedrock that had been covered by thin natural erosion layers. From the top of this sequence of natural soil, a roughly circular fire pit (H) was cut down into the bedrock (30

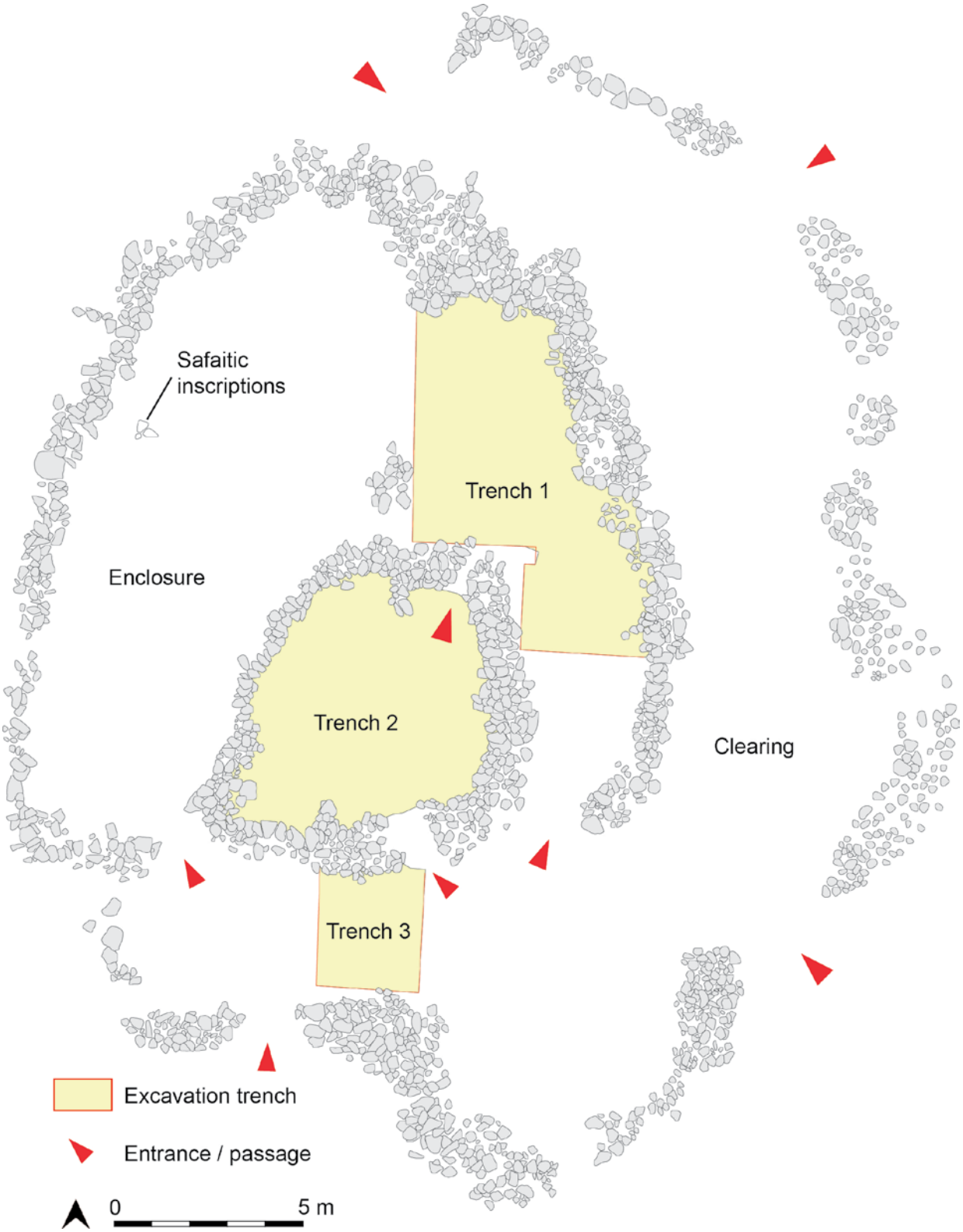

Figure 4.9 The grouped enclosure at QUR-373 prior to excavation. Architecture drawn by A. Kaneda.

cm in diameter by about 4 cm deep). Although this is the only feature that may be directly associated with the construction phase of the enclosure wall, no datable material was contained within the fire pit.

Phase 102: A compact layer of silt containing much gravel was situated on top of the natural soil. This gravel consisted of limestone and basalt. This gravelly layer was only 10 cm thick but was clearly distinguishable due to its toughness and inclusions. Within this gravelly layer was a sequence of fire pits, which could be divided into two sub-phases. The oldest sub-phase comprised two fire pits (G and I). These were about 40 to 80 cm across and were dug down into the gravelly layer to a depth of only about 10 cm. Both of the pits contained many basalt stones in the ashes. A younger sub-phase of fire pits was dug down from the top of the gravelly layer. These comprised three pits that were between 26 and 53 cm across, and also not deeper than about 10 cm.

Phase 103: This is a phase of abandonment, represented by a *ca.* 35 cm thick accumulation of windblown sand in the western part of the trench. This windblown sand was not present in the eastern part of the trench. Instead, a thin layer of soft silt formed the topsoil here. In the layer of windblown sand, a small fire pit was recognised, which probably represents the remnant of ephemeral frequentation of the site.

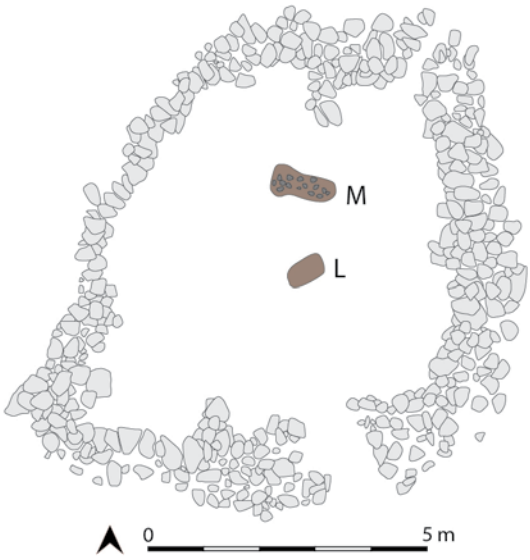

Figure 4.10 Plan of Phase 201 in the enclosure of QUR-373, with the fire pits indicated.

Trench 2:

Phase 201 (Figure 4.10): The oldest phase in the inner circle of the enclosure consisted of two shallow fire pits (M and L) that were dug straight into the bedrock. They were situated in the centre of the circle. These fire pits were filled with dark ash and basalt stones, and surrounded by scorched soil. They may correspond to the earliest construction phase of the inner round wall surrounding Trench 2, although there is no dating evidence to support this. The wall was preserved to a height of about 95 cm (Figure 4.11), and was built directly onto bedrock.


Figure 4.11 Northern enclosure wall in Trench 2. Scale is 50 cm. Photo by P. Akkermans.

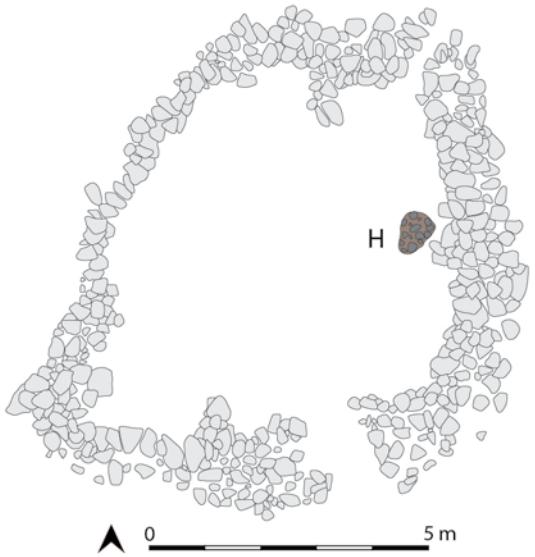

Figure 4.12 Plan of Phase 202 in the enclosure of QUR-373, with fire pit H indicated.

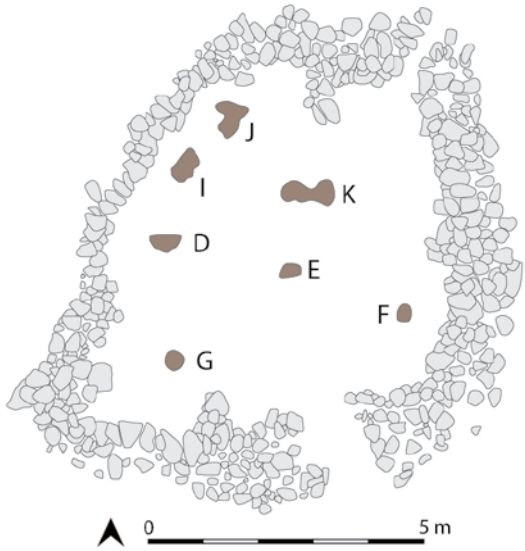

Figure 4.13 Plan of Phase 203 in the enclosure of QUR-373, with the fire pits indicated.

Phase 202 (Figure 4.12): Covering the bedrock and the fire pits was a layer of compact silt with gravel inclusions. It was only *ca.* 8 cm thick, and probably was an ancient surface level. Associated with this layer was another fire pit (H) of about 70 by 55 cm wide and 8 cm deep. This was a nicely constructed fire pit as its walls and base were fully lined by basalt stones. Many of the stones were cracked, presumably by the heat of the fire. This was the only feature associated with this surface level.

Phase 203 (Figure 4.13): This phase is represented by yet another surface level of *ca.* 10 cm thickness, to which a number of fire pits were associated (Figure 4.14). The surface level consisted of highly compacted silt and much gravel inclusions. The fire pits were not all dug down from the same level. Instead, subdivisions can be made within the sequence of fire pits of Phase 203 based on their stratigraphy. The oldest series (Phase 203a), comprises three fire pits (E, F and K) that were all dug down from the same level. An intermediate phase (203b) was represented by only one pit (D), which began at a higher elevation. The youngest sub-phase (203c) was represented by three more fire pits (G, I and J), beginning about 5 to 10 cm above the older pits. Unlike the pits in Phases 201 and 202, these fire pits were not characterised by the presence of basalt stones. Rather, these were simple and irregularly shaped pits without any lining of stone or other kind.

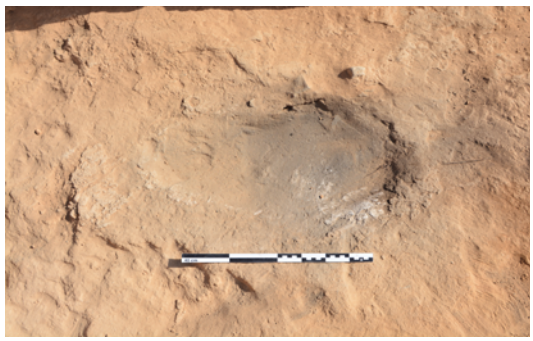

Figure 4.14 Fire pit E in Trench 2 of the enclosure at QUR-373. Scale is 50 cm. Photo by P. Akkermans.

Phase 204: Covering the surface layer of the previous phase was an accumulation of sand of *ca.* 5 to 10 cm thick. Within this thin sand layer were a number of ashy patches, but no clear fire pits or other features. The deposit probably represents windblown sand intermingled with ash that probably originated from elsewhere. This phase thus represents a phase of abandonment of this particular area.

Phase 205 (Figure 4.15): This phase is represented by the partial renewal of the wall of the inner circle of the enclosure. This new wall was built on top of the sandy layer from Phase 204, and against the interior part of the west side of the old wall (see Figure 4.16). This new wall was preserved to a height of 45 cm. It

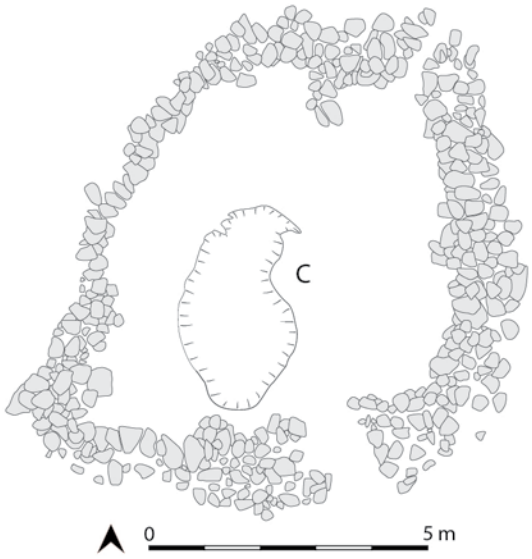

Figure 4.15 Plan of Phase 205 in the enclosure of QUR-373, with pit C indicated.

probably served to reinforce the old wall, which may have become unstable over time. Directly associated with this wall renewal was the digging of a large, shallow pit (C), in which a large amount of ash was deposited. There were no traces that a fire had been burning in the pit itself. Rather, the ash was probably dumped in the pit. The ash also contained some sandy patches and a few small basalt stones. The pit measured 2.70 m by 2.13 m and was about 10 cm deep. Also associated with this phase is a single fire pit (B).

Phase 206: The final phase in Trench 2 is mainly represented by the accumulation of a thick layer of windblown sand against the interior of the western wall. This deposition was up 65 cm thick. Some ashy pockets, possibly the remains of deflated fire pits, were found in the accumulation of sand, but other than that the layer is probably mostly natural. Relatively many basalt rocks were lying in the sand next to the enclosure walls. These most likely represented collapsed wall debris. In the eastern part of the trench the sand accumulation was relatively thin (*ca.* 5 cm).

Figure 4.16 Northern wall in Trench 2 of the enclosure at QUR-373. The old Phase 201 enclosure wall founded on bedrock is indicated in green. The renewed Phase 205 enclosure wall founded on windblown deposits is indicated in blue. Scale is 50 cm. Photo by P. Akkermans.

Trench 3:

Phase 301: This is a layer of compact silt with many gravel inclusions. It was only about 5 cm thick, and was deposited directly above the bedrock.

Phase 302 is a natural deposit of windblown sand, up to 30 cm thick, containing sporadic pockets of ash.

4.3.2.2 Radiocarbon dates (Table 4.3)
Although all fire pits from Trench 1 were sampled, only one of the samples contained charred plant material, which returned a post-16th century AD radiocarbon date.

All fire pits and the ash pit from Trench 2 were sampled and nine of these samples appeared to contain charred plant material. Six of them were subjected to radiocarbon dating. Unfortunately, the

sample from Phase 201 (fire pit M) was contaminated as it returned a modern date, which is impossible on stratigraphic grounds. A sample from Phase 203a (SN14-127) was dated to the 3rd or 4th century AD, while two samples from Phase 203b (SN14-133 and SN14-134) both returned a 5th to 6th century AD date. Phase 205 was dated to the late 7th or 8th century AD on the basis of samples from the ash pit and fire pit (SN14-122 and SN14-124).

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN14-122	Charcoal	Trench 2, fire pit B	GrA-61125	1310 ± 35	662-710 AD (49.9%) 746-764 AD (18.3%)	654-770 AD (95.4%)
SN14-124	Charcoal	Trench 2, pit C	GrA-61128	1335 ± 35	652-690 AD (59.3%) 750-760 AD (8.9%)	644-723 AD (78.1%) 740-768 AD (17.3%)
SN14-127	Charcoal	Trench 2, fire pit F	GrA-61130	1750 ± 35	243-334 AD (68.2%)	176-191 AD (1.4%) 212-390 AD (94.0%)
SN14-133	Charcoal	Trench 2, fire pit I	GrA-61131	1530 ± 35	432-490 AD (33.4%) 532-580 AD (34.8%)	427-601 AD (95.4%)
SN14-134	Charcoal	Trench 2, fire pit J	GrA-61132	1540 ± 35	430-492 AD (42.1%) 530-566 AD (26.1%)	425-594 AD (95.4%)

Table 4.3 Radiocarbon dates from the enclosure at QUR-373.

4.3.2.3 Ceramic finds
Numerous ceramics were retrieved from the surfaces within and around the enclosure during survey work (see Chapter 3). However, an additional 137 pottery sherds were unearthed during excavations, most of them from Trench 2. All of these were grey-ware sherds, and many if not all of them appeared to have belonged to two cooking pots of similar type that could be partially reconstructed (Figure 4.17). These pots were dated on typological grounds to the Late Byzantine/Umayyad period. Other diagnostic sherds were not retrieved. The sherds from the two cooking pots were not all found in their original context of deposition. Some of them were encountered on the surface prior to excavation, while others were retrieved during excavations from deposits belonging to different phases. Therefore, a lot of mixing of materials seems to have occurred, at least within Trench 2, which can likely be attributed to bioturbation given the generally shallow nature of the deposits. Importantly, the extensive mixing of materials within this structure prevents dating artefacts on the basis of the stratigraphic context they were retrieved from.

4.3.2.4 Chipped-stone artefacts
Over 90 chipped-stone artefacts were collected. These included several prehistoric tool types, such as concave truncation burins, which are most likely indicative of a late prehistoric occupation phase of the site (cf. Akkermans *et al.* 2014). Most of these came from various deposits within Trench 1. These artefacts relate to the initial prehistoric occupation phase at the site.

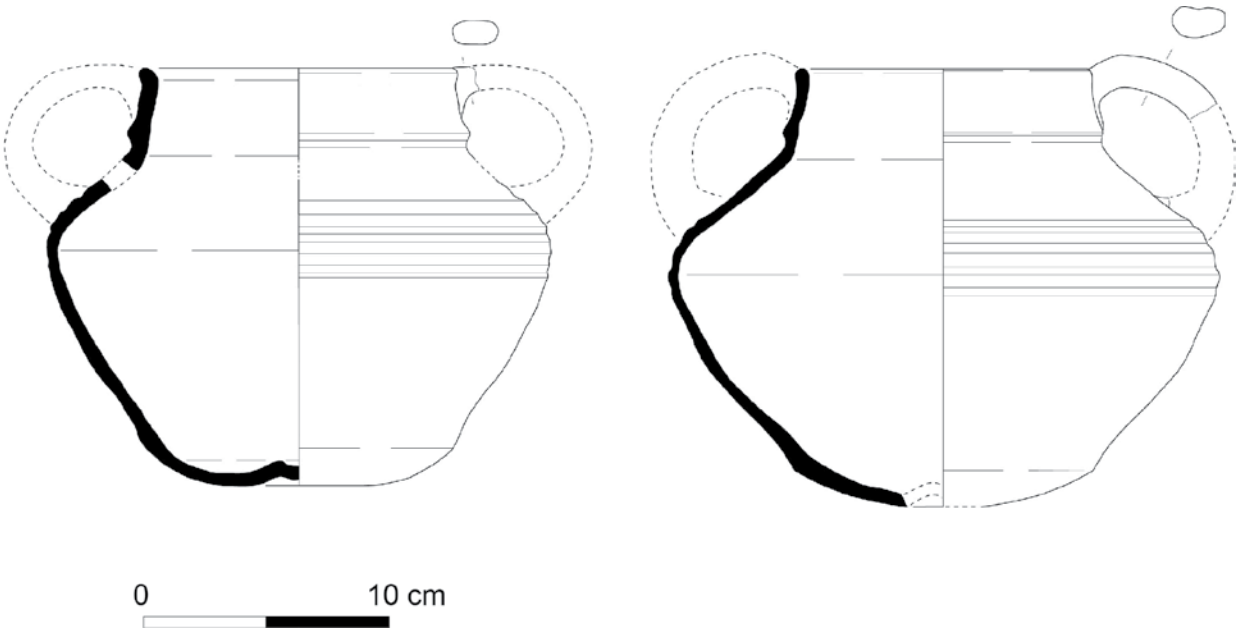

Figure 4.17 Pottery vessels from the enclosure at QUR-373, dated on typological grounds to the Late Byzantine or Umayyad period. Fabric: Grey Ware Gritty (parallels: Bar-Nathan 2011: Figure 11.13:3; McNicoll *et al.* 1982: Plate 145:5). Drawings by A. Kaneda.

4.3.2.5 Small finds

A limited number of small finds were collected during excavations. In Trench 1, a hammer stone and a piece of sheet iron were found. The piece of sheet iron is probably modern while the hammer stone is difficult to date with certainty. From Trench 2 came a small bronze fragment, part of a pierced stone disc, and a bead made of glass or stone. These artefacts are difficult to date: the hammer stone and disc may relate to the prehistoric occupation phase at the site, while the other artefacts may be younger – although exactly how young is currently impossible to say.

4.3.2.6 Botanical remains

Although charred plant materials were collected from the excavated fire pits, these remains have unfortunately not yet been studied.

4.3.2.7 Faunal remains

Although 17 bone fragments have been collected these have not yet been studied by specialists. Additionally, 56 ostrich eggshell fragments were found. For both the bones and the eggshell fragments it is unclear whether they were brought onto the sight by people or animals and, therefore, what these finds represent.

4.3.2.8 Discussion

The excavations at Structure 7 of QUR-373 provided evidence for the episodic use of this grouped enclosure during different periods. Many prehistoric chipped-stone artefacts were found during the excavations, which may suggest that the enclosure itself had already been constructed in prehistory. Any clear stratigraphic evidence for this remains absent, however, as the chipped-stone artefacts from Trench 1 and its surrounding walls were from the same stratigraphic level. The inner compartment of the enclosures must have been present by the 3rd or 4th century AD. This date comes from the radiocarbon dates from fire pits related to a deposit that accumulated within the compartment. The compartment was subsequently revisited until the late 7th or 8th century AD, substantiated by dated fire pits and an ash pit. During this final phase of occupation, the inner compartment was structurally reinforced. Also

dated to this phase of occupation are the remains of at least two nearly identical cooking pots, which were found in a fragmented state of preservation. Whether these pots were abandoned at the site in a complete or broken state is impossible to say.

The evidence for episodic frequentation of the enclosure between the Roman and Early Islamic periods consists mainly of fire pits and pottery vessels. A few small finds possibly date to this period as well. The remains suggest that the enclosures were not solely used for the penning of animals but were used for other purposes as well, possibly including the use of the enclosure as a residential space. However, clear footings of residential architecture such as huts or tents were not encountered. At first sight, there may seem to be a difference in use between the inner and the outer compartments of the enclosure, as all the fire pits dated to the Classical and Late Antique phases are situated in the inner compartment. Importantly, three of the fire pits from the outer compartment remain undated because of the absence of charred plant remains. Therefore, unfortunately, it remains unclear whether there were differences in the use of the compartments.

After the occupation of the site in the Early Islamic period, the enclosure appears to have been abandoned, as there is no evidence for Middle Islamic use of the structure. During this abandonment phase a relatively thick accumulation of wind-blown sand (up to 65 cm thick), was deposited within the structure. Providing a more exact date for when the sands were deposited or how rapidly they accumulated is difficult to say as there were no datable remains covering the sand deposit.

4.3.3 An enclosure at QUR-11

Structure 1 is the main feature of the site of QUR-11 (326122 E 3516838 N). It is a roughly round enclosure measuring 22.6 m in diameter (Figure 4.18). It consists of three roughly oval compartments of varying dimensions, made of undressed basalt boulders obtained from the direct surroundings. The walls of the enclosure were preserved to a height of 0.9 m. The surfaces within the enclosure were much higher than the surrounding area, suggesting that deposits of considerable depth were preserved in the structure. Furthermore, relatively many ceramics were found within and around the enclosure.

Excavation trenches (Figure 4.19) were initially set out in the north-western compartment (Trenches 1 and 2) and in the southern compartment (Trench 3). Trenches 4 and 5 were later added in the north-western compartment to increase the horizontal exposure. Trench 5 was later expanded to include the enclosure wall in order to investigate the stratigraphic correlation between the wall and the interior sediments.

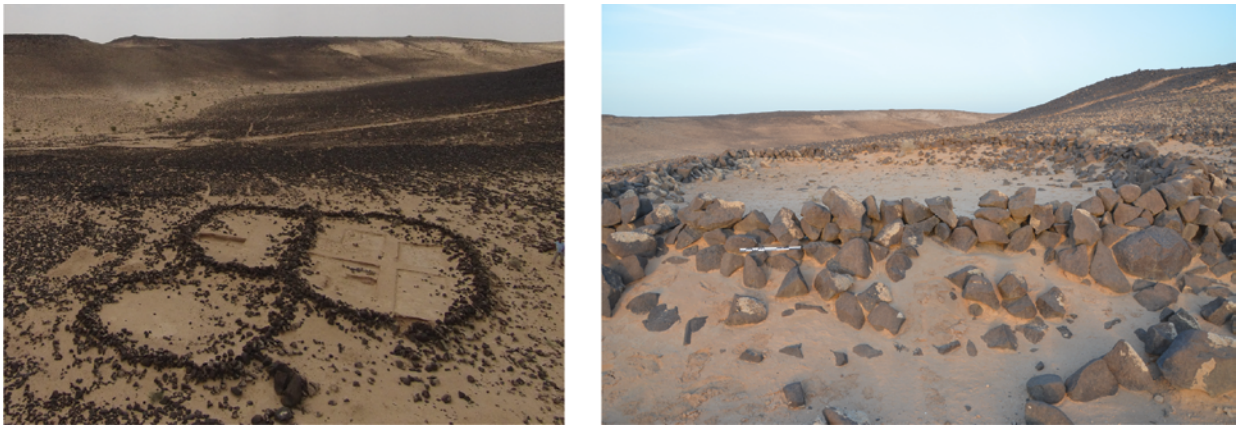

Figure 4.18 Enclosures at QUR-11. Photos by author (left) and P. Akkermans (right).

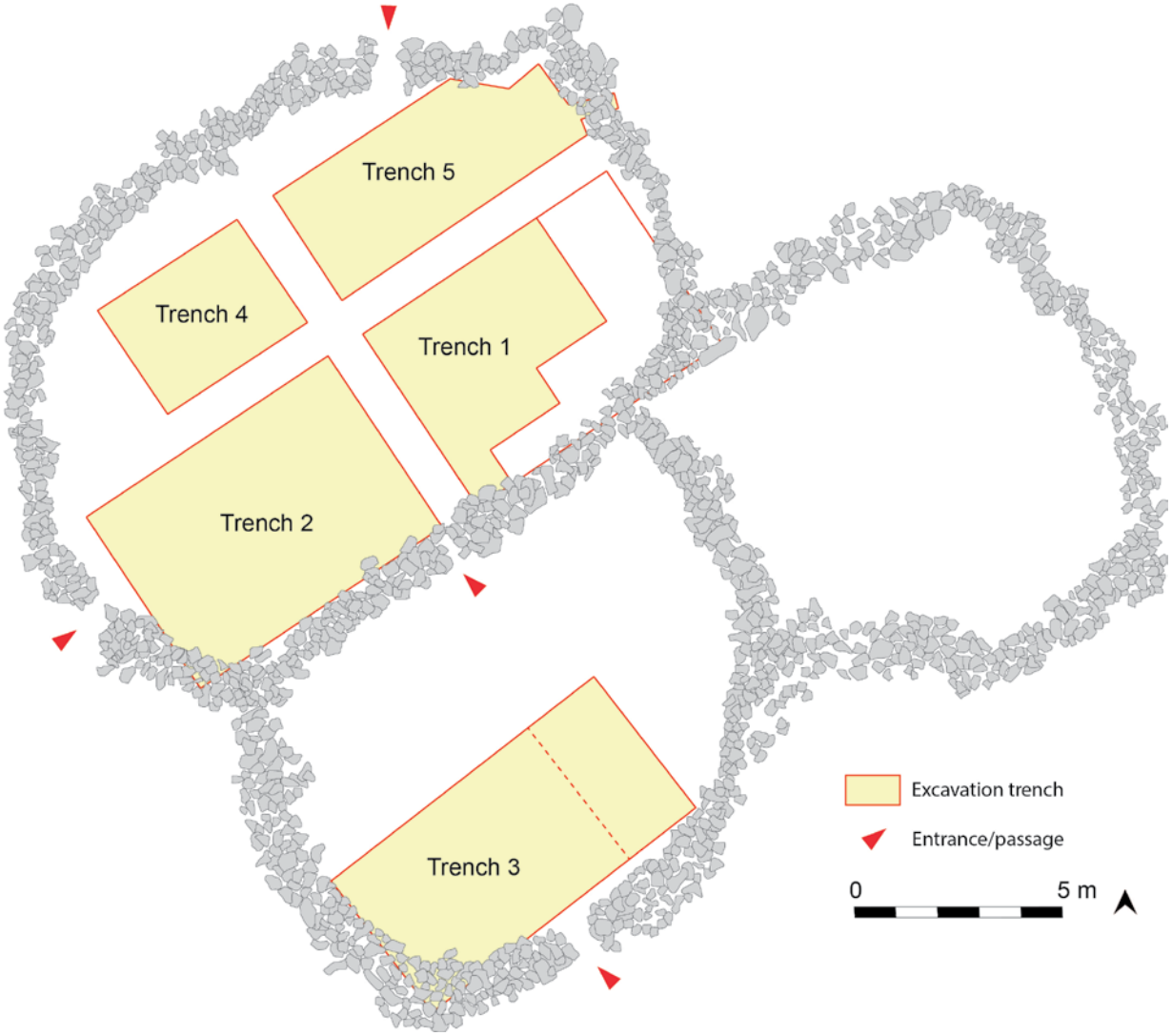

Figure 4.19 Enclosure at QUR-11 prior to excavations. Architecture drawn by M. Brüning.

4.3.3.1 Stratigraphy and features (Figure 4.20)

North-western compartment (Trenches 1, 2, 4, 5):

Phase 101: The earliest wall of the enclosure was built on top of a thin erosion layer covering the limestone bedrock. This was clearly illustrated in the section made through the enclosure wall in Trench 5. Here, the wall stood three courses high (*ca.* 40 cm), and was three to four rows wide (*ca.* 60 cm). The wall section was roughly rectangular in shape. A compact layer of silt — presumably a surface layer — was associated with the base of the enclosure wall. This surface was not level, but followed the natural slope of the terrain, which sloped down from the southwest to the northeast. No fire pits or other features, nor any artefacts, were associated with this surface.

Phase 102: This phase represents a period of abandonment of the enclosure. Covering the surface of Phase 101 and the interior of the enclosure was a layer of clean, probably windblown sand or silt. The layer of windblown sediments was only a few centimetres thick in the southwest of the compartment, but much thicker in the northeast (*ca.* 40 cm), creating a more or less level surface of soft natural silt inside the compartment.

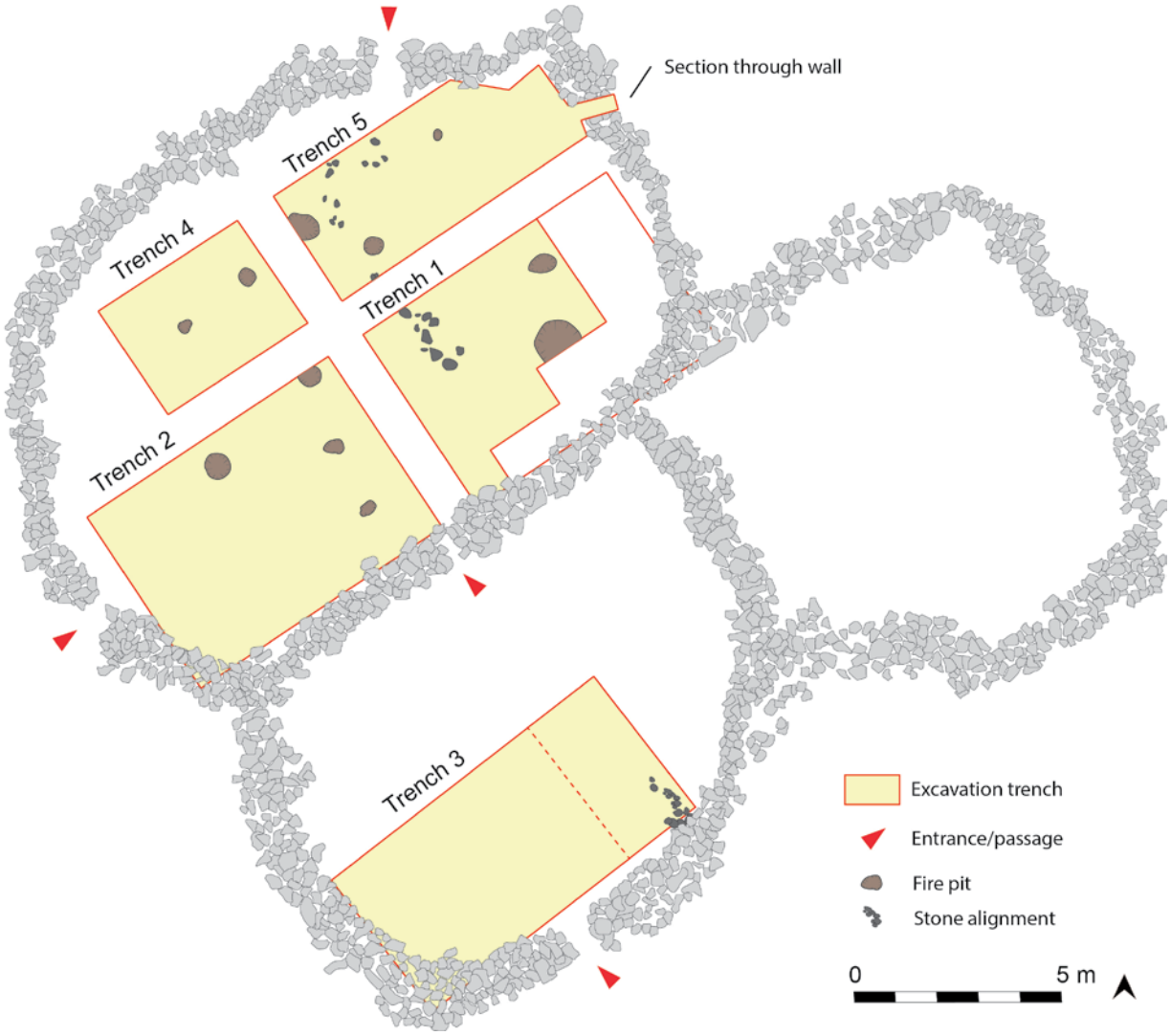

Figure 4.20 Excavated features at the enclosure at QUR-11.

Phase 103: A phase of renewed building activity and occupation is represented by the construction of a new enclosure wall and an associated surface, from which various fire pits were dug down into older layers. The construction of a new wall was attested in the section through the enclosure wall in Trench 5. The new wall was built only partially on top of the old wall, and partially on top of the layer of windblown silt or sand from Phase 102 that had accumulated within the compartment. The new wall stood higher than the old one: about four to six courses high (*ca.* 60 cm). Its section was roughly trapezoidal in shape, with a base of about one metre wide and much more narrow at the top (*ca.* 35 cm).

Associated with the base of this wall was a compact surface layer *ca.* 5 cm thick, from which a total of eleven fire pits were dug down into earlier layers. All of these fire pits were circular to oval in shape, about 30 to 90 cm wide and mostly only a few centimetres deep. Also associated with this surface was a series of basalt boulders which perhaps formed a crude alignment. As the stones were not clearly piled, it is difficult to say with certainty whether this alignment was the result of human intention.

Phase 104: The final, uppermost phase represents a layer of windblown topsoil covering the surface and associated fire pits of Phase 103. This layer consisted of soft silt of only a few centimetres thick.

Southern compartment (Trench 3):
Phase 201: The oldest phase in this compartment consisted of a layer of grey ashy silt covering the natural erosion layer that lies on top of the limestone bedrock. A crude alignment of loosely piled basalt boulders was associated with this layer. Whether this alignment represents a wall stub or simply wall debris is uncertain. In any case, the ashy layer and associated boulders represent the oldest occupational phase in this compartment. This phase was only exposed in the north-eastern part of the trench (Figure 4.20), as excavations did not continue to this depth in the south-western part.

Phase 202: This phase represents a period of abandonment. Similar to Phase 102 in the north-western compartment, this phase is represented by an accumulation of clean, windblown silt *ca.* 25 cm thick. This phase was only exposed in the north-eastern part of the trench.

Phase 203: Covering the windblown silt of Phase 202 was a compact layer *ca.* 15 cm thick. Other than in the north-western compartment, this surface layer was not associated with any fire pits. Therefore, to what degree this layer represents an occupational phase is uncertain. This surface was exposed over the entire extent of the trench.

Phase 204: The uppermost phase represents an accumulation of fine sand of only a few centimetres thick.

4.3.3.2 Radiocarbon dates
Radiocarbon dates were obtained from four of the fire pits in the north-western compartment associated with Phase 103. They ranged in date from the early 7th century to the late 9th century AD (Table 4.4).

4.3.3.3 Ceramics
A total of 40 undiagnostic body sherds were found during excavations including buff wares, grey wares, compact red wares and a single sherd of hand-made basalt-tempered coarse ware. All of these came from the uppermost layers of the enclosure, mostly from Phases 103/104 or 203/204, or from mixed contexts. None of the ceramics could be associated with Phases 101/102 or 201/202. The ceramics were fragmented to a very high degree. In addition to a number of potential diagnostics collected from the surfaces within the enclosures during pedestrian surveys, only one rim was found from Phase 103 (Figure 4.21). Although parallels for these sherds were not found, a Late Byzantine or Early Islamic date would seem to fit, if they are connected to the radiocarbon dates from the fire pits.

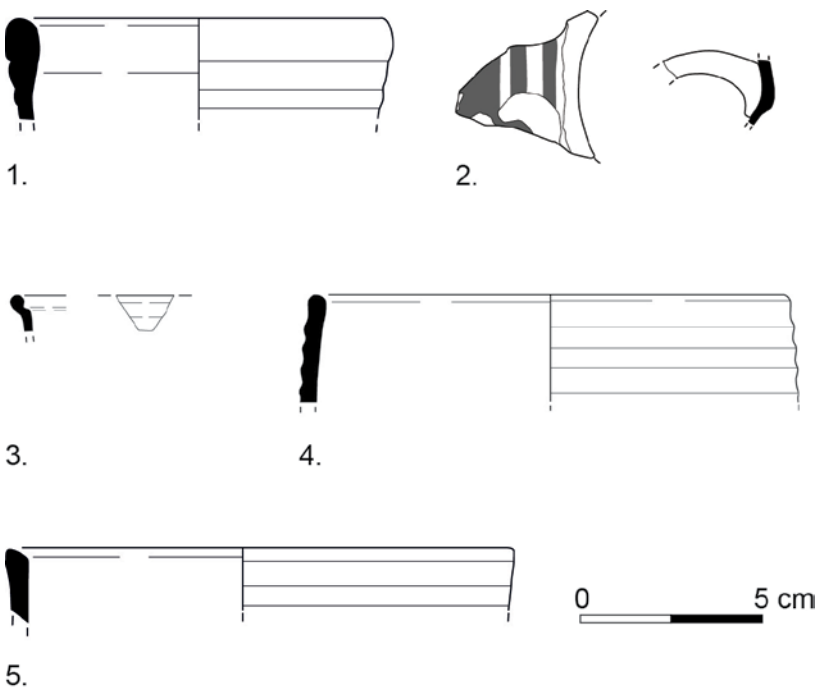

Figure 4.21 Selection of Early Islamic (?) ceramics from the enclosure at QUR-11. Numbers 1-4 were collected during pedestrian surveys; number 5 was retrieved through excavations. Fabrics: 1-3) Red Compact Wares; 4-5) Grey Gritty Wares. Drawings by A. Kaneda.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN14-6	Charcoal	Trench 1, fire pit A	GrA-61095	1305 ± 30	665-710 AD (48.7%) 746-764 AD (19.5%)	658-729 AD (66.0%) 736-769 AD (29.4%)
SN14-8	Charcoal	Trench 1, fire pit B	GrA-61096	1325 ± 30	656-691 AD (56.3%) 749-761 AD (11.9%)	650-722 AD (75.4%) 740-768 AD (20%)
SN14-16	Charcoal	Trench 5, fire pit A	GrA-61252	1355 ± 40	640-689 AD (64.8%) 752-758 AD (3.4%)	610-720 AD (85.1%) 741-767 AD (10.3%)
SN14-18	Charcoal	Trench 5, fire pit A	GrA-60952	1250 ± 35	683-776 AD (66.8%) 794-798 AD (1.4%)	674-780 AD (69.6%) 788-875 AD (25.8%)

Table 4.4 Radiocarbon dates from the enclosure at QUR-11.

4.3.3.4 Small finds

A small fragment of a basalt grinding stone was found in the deposits of Phase 103. It is made of non-vesicular basalt and broken on several sides, but had a smooth working surface on one side. The fragment measured about 7 by 6 by 4 cm. From the same phase came a pierced object made from ostrich eggshell that was possibly a pendant (Figure 4.22). A small, undefined piece of bronze and a small bead made of red semi-translucent stone were found in mixed contexts in Trench 5.

Figure 4.22 Selected artefacts from the enclosure at QUR-11: 1) fragment of an ostrich eggshell pendant (?); 2) stone bead.

4.3.3.5 Chipped-stone artefacts

Five unworked flakes were found during the excavations, all in the northeast compartment. One of them may well be a Palaeolithic Levallois flake and is unlikely to be related to the occupation of the enclosures. It is surprising that the chipped-stone artefacts were all retrieved from Phase 103 and 104 deposits, in association with the 7th to 9th century fire pits. However, given the fact that these artefacts are likely Palaeolithic in date, I would suggest that this represents intrusive material that was brought into younger contexts by anthropogenic or natural processes.

4.3.3.6 Botanical remains

Samples of charred plant materials were collected from the ashes within the fire pits. Unfortunately, these samples have not yet been studied.

4.3.3.7 Faunal remains

The only faunal remains were 5 ostrich eggshell fragments. One of these came from the abandonment Phase 202, while the others came from Phases 103-104/203-204. Again, it is possible that their occurrence is natural rather than anthropogenic.

4.3.3.8 Discussion

Of the two construction phases recognised in the enclosure walls (Phase 101 and 103), the older one (Phase 101) cannot be dated at this point due to a lack of associated find material. Thus, it remains impossible to say with certainty when the original enclosure was constructed, other than prior to the 7th century AD. The enclosure must have been lying in disuse for some time before it was reused and altered somewhere between the 7th and 9th centuries AD. In this period, the enclosure wall was heightened, and fires were lit in the north-western compartment of the enclosure. A number of artefacts were found in stratigraphic correlation with the fire pits, including ceramics, a grinding slab fragment, an ostrich eggshell object, and a number of chipped-stone artefacts. As the chipped-stone artefacts are probably

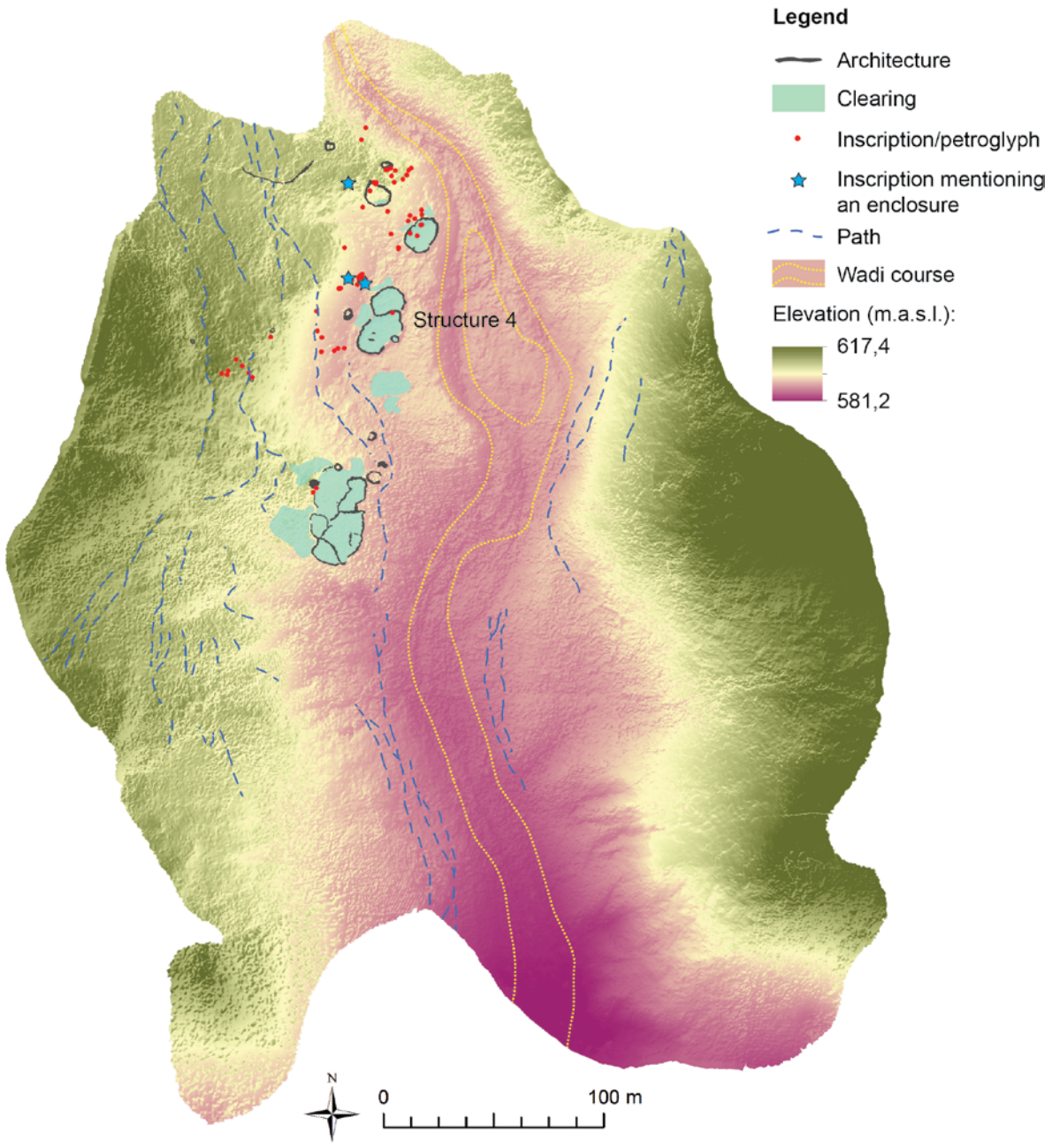

Figure 4.23 Plan of QUR-20 as documented through pedestrian surveys and aerial photographs. Close to some of the enclosures are several Safaitic inscriptions referring to such features. Base image: photogrammetrically reconstructed hillshade relief map based on drone photographs.

intrusive, it is unknown whether or not the other artefacts are contemporaneous with the fire pits. For now, however, given the lack of other datable material at the site, it would seem safe to assume that these artefacts as well as the bronze fragment and the bead date to the Late Byzantine/Early Islamic use phase of the structure. A similar association is suggested for the numerous pottery sherds found in the uppermost layers and on the surface of the enclosure.

While it is at this point difficult to reconstruct in detail how the enclosure was used, the fireplaces and artefacts found in the enclosure are suggestive of domestic activities. Despite the lack of evidence

for tent or hut footings, the north-western compartments would have provided ample space for such architecture. The stone rows encountered within this compartment may even have been used to hold down tent cloth, but this is difficult to say with certainty. Importantly, fire pits were not encountered in the southern compartment, despite their relatively broad exposure. This may indicate a difference in use between the compartments. How this compares to the third compartment cannot be determined at present as it has not been excavated.

4.3.4 Other excavated enclosures

Excavations were carried out at three more enclosures, all of which were associated with Safaitic inscriptions mentioning an enclosure. Excavations were therefore carried out at these sites to obtain information about the nature of inhabitation there.

The first of these enclosures was located at the site of QUR-20 (328472 E 3516371 N), which is situated in an extensive valley system running down from the southern part of the basalt-covered plateau (Figure 4.1). This site comprises four enclosures divided into two grouped enclosures and two single enclosures. At the site were 42 pre-Islamic inscriptions and 32 petroglyphs. Four of them explicitly refer to the site and its structures.[10]

The inscriptions mentioning an enclosure all were found within 15 m of the enclosures of the site (Figure 4.23). One of the grouped enclosures – Structure 4 – was partially excavated. Similar to the enclosures described above, many small fire pits were exposed. The 26 fire pits at Structure 4 were dug down from a compact layer that was situated only a few centimetres below the current surface. Material from five of these pits was sent out for radiocarbon dating, but all of them returned post-15th century AD dates. Few other material remains were retrieved, including a few bone fragments, five ostrich eggshell fragments, two copper-alloy pieces, a glass fragment, a basalt grinding implement, and a single buff-ware pottery sherd. None of this material can be dated with any accuracy. Therefore, archaeological evidence that can indicate what kind of activities occurred in this period is currently lacking. It is possible that some of the fire pits that were not sampled belonged to a pre-Islamic occupation phase, or that one of the

Figure 4.24 Aerial view of QUR-1016, comprising an enclosure surrounded by crude clearings and several inscriptions and petroglyphs. One of the inscriptions refers to an enclosure.

[10] The inscriptions referred to here are QUR-20.27.1; QUR-20.45.1; QUR-20.50.1 and QUR-20.50.2. See Della Puppa (forthcoming) for details.

other enclosures may have been used for camping activities. The small clearing situated to the south of Structure 4 may have served a similar purpose. All of this, however, remains speculative at this point.

Excavations at the site of QUR-1016 (327795 E 3519350 N) yielded comparable results. This site is situated in a small valley at the edge of Qa'a al-Teyarat, and consists of a single enclosure surrounded by clearings. These features are sheltered by a low ridge, onto which 54 Safaitic inscriptions and 47 petroglyphs were carved (Figure 4.24). One of the inscriptions explicitly refers to an enclosure.[11]

The enclosure was excavated in its entirety down to bedrock, and again a compact surface layer was exposed, from which no less than 35 small fire pits were dug down (Figure 4.25). Charred plant material from eleven of these fire pits was radiocarbon dated. All of them returned post-15th century AD dates. Artefacts or other material remains were retrieved in very low numbers as well, including three red-ware pottery sherds, small objects of bronze and iron, some glass sherds, a basalt grinding implement, and 13 fragments of ostrich eggshell. None of this material could be securely associated with a pre-Islamic occupation phase of the site.

Figure 4.25 Selection of fire pits exposed in the enclosure at QUR-1016. Scale is 50 cm. Photo by P. Akkermans.

The final site where excavations were carried out at an enclosure is QUR-210 (326377 E 3519001 N). This is a very extensive site situated in a large valley that runs down from the western side of the central plateau (Figure 4.1). The site comprises two single and four grouped enclosures, as well as a number of smaller structures; it was occupied episodically from prehistoric up to recent times. In the centre of the site were 33 Safaitic inscriptions and 11 petroglyphs (Figure 4.26), and one of the inscriptions refers to an enclosure.[12]

One of the enclosures at QUR-210, Structure 6, was excavated (Figure 4.27). This enclosure seemed to have been constructed already in prehistory given the dense lithic scatter present on its surface. However, a roughly rectangular outline partially cleared of prehistoric lithics was present within the enclosure, surrounded by elongated clearance cairns. This area measured about 8 by 6 m and may represent the outline of a tent. Excavations occurred within this cleared area. Nine fire pits were identified here, which were dug down from a compact surface layer. Samples from five of these pits were sent out for radiocarbon dating. None of them turned out to be older than the 12th century AD. A very limited amount of other remains was retrieved, all of them undiagnostic, including 19 ceramics, two glass fragments, two animal bones, and a few pieces of ostrich eggshell.

In summary, excavations carried out at these three sites did not yield any remains that could be securely dated to the Classical and Late Antique periods. This does not imply that these sites were not frequented during this period. The Safaitic inscriptions suggest that these sites were in fact used in some way during the Hellenistic/Roman period, and that some of the enclosures may have been built during these

[11] The inscription referred to here is QUR-1016.21.1. See Della Puppa (forthcoming) for details.
[12] The inscription referred to here is QUR-210.7.1. See Della Puppa (forthcoming) for details.

visits, or were at least present there already. Also, pottery sherds recovered during pedestrian surveys at the sites of QUR-210 and QUR-1016 also suggest frequentation of these sites during the Early Islamic period. However, the excavations did not provide additional information on the nature of settlement at these sites during these periods.

4.3.5 Discussion

The excavations carried out within six enclosures yielded important information regarding their characteristics and chronology. As stated earlier, little was known thus far about the dating or usage of enclosures. The results of the excavations show that at least some of the enclosures that were frequented during Classical and Late Antiquity may already have been constructed during prehistory. This aligns well with the evidence collected through pedestrian survey (Chapter 3). Within the enclosures at QUR-595 and QUR-373, prehistoric remains were attested in the form of fire places and chipped-stone artefacts, indicating the prehistoric use of these locations. Whether the enclosures were already constructed at that time, however, remains uncertain. The prehistoric remains may have been present there prior to the construction of the enclosures.

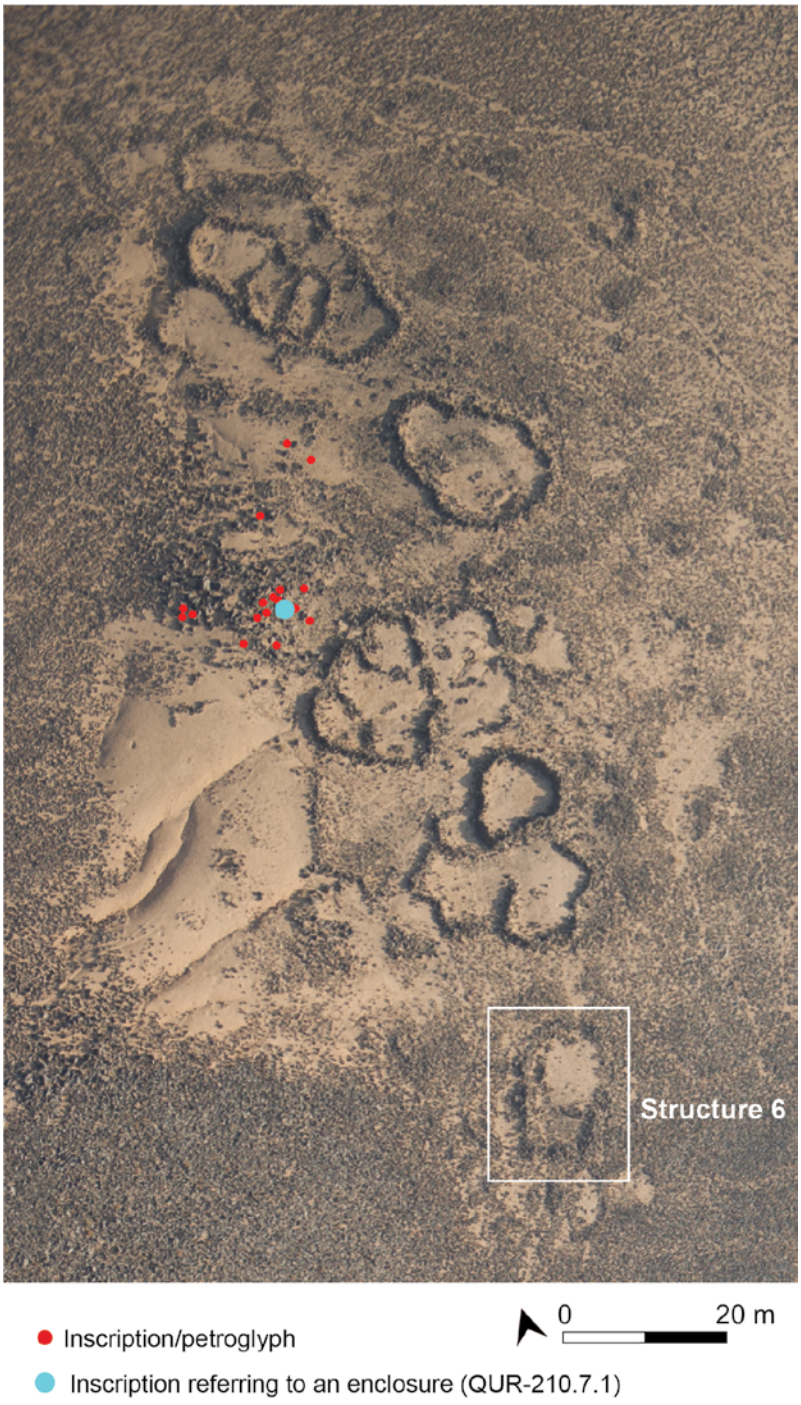

Figure 4.26 Top view of QUR-210, comprising several enclosures and rock art. One of the inscriptions refers to an enclosure. Base image: orthorectified aerial photograph by D. Boyer, courtesy of APAAME.

What is certain though, is that between the 3rd and 9th centuries AD some of the enclosures were used on multiple occasions. At least two phases of use of the enclosure were reconstructed for the enclosure at QUR-595, while the remains from QUR-373 show at least three phases between the Roman and Early Islamic period. At QUR-11 all of the material seems to derive from the Early Islamic period, but the enclosure itself had already been constructed before that, although when exactly is unknown. Also important is the fact that no material dating between the 10th and 12th centuries AD was retrieved from

any of the excavated enclosures. This pattern compares well with the chronological trends observed in the survey data (Chapter 3).

It has proven difficult to chronologically link the archaeological remains with Safaitic inscriptions present at the excavated sites, even though these sometimes explicitly refer to enclosures and/or camping activities. Even though numerous fire pits were excavated at sites where enclosure-inscriptions were found, the dates from the fire pits were all far too young to have had a relation with the inscriptions. The relation between the enclosures and the inscriptions can at this point only be inferred at best rather than established.

Figure 4.27 Structure 6 at QUR-210 after excavation, showing a roughly rectangular space surrounded by clearance heaps. The cleared area contained several fire pits. Scale is 40 cm.

The excavations within the enclosures provide some information on the use of these features in Classical and Late Antiquity. The occurrence of fire pits within the structures suggests they were used on a number of occasions for domestic purposes, such as cooking. The presence of two cooking vessels at QUR-373 provides further evidence for this interpretation. Other datable artefacts encountered within and around the enclosures, including ceramics collected during survey activities, may also represent waste from domestic activities within the enclosures. The size of the compartments in which fire pits were situated would have been suitable to contain at least one residential unit such as a small tent or hut. The exact nature of these residential units remains unknown. Not all of the excavated compartments yielded fire pits, and at QUR-11 only one of the two compartments contained fire pits. Therefore, there is a possibility that these two compartments were used differently: for example, one may have been used for residential purposes while the other was used as an animal pen. However, this must remain a tentative suggestion. At this point there is no evidence for the presence of herd animals within the enclosures.

In more general terms, what can be learned from the excavations carried out within the enclosures is that the materials encountered within them are usually limited in a number of ways. The deposits contained relatively few artefacts and other materials such as animal bones, which makes a functional interpretation of these structures difficult. Furthermore, the material appeared to be poorly stratified in many cases, which hinders dating them on stratigraphic terms. On a more positive note, the fact that these enclosures often contain small fire pits with charred plant remains provides an opportunity to precisely date certain use phases.

4.4 The configuration and distribution of campsites in the Jebel Qurma region

In Chapter 3, a list of 56 residential sites was compiled that could be dated between the Hellenistic and Early Islamic period on the basis of the survey evidence. These sites were defined mainly on the basis of associated ceramics, interpreted as domestic waste, and on the basis of epigraphic evidence. Excavations confirmed that enclosures at which ceramics were encountered were indeed used for domestic activities, indicated by the presence of internal fireplaces. In case of the inscriptions referring to enclosures at particular sites, it is less clear whether the enclosures were used for residential purposes or for the penning of animals. Nonetheless, the inscriptions do indicate that people resided in these areas, be it within the enclosures themselves or on the clearings surrounding them.

In this section a more detailed analysis is presented on the distribution of residential sites within the Jebel Qurma region in an attempt to further explore the configuration of the landscape and how this changed through time. Different types of campsites are defined based on their internal composition, as well as how they are distributed across a variety of landscape classifications, as defined in Chapter 2.

4.4.1 General distribution of campsites

Here the different landscape classifications as presented in Chapter 2 are used to analyse the spatial distribution of campsites within the Jebel Qurma region. Figure 4.28 shows the Hillslope Position Classification as presented in Chapter 2, and the distribution of campsites over the defined topographic locations. It shows that most of the campsites are situated in low-lying areas, either on topographic lows or on modest slopes at the foot of the hills. These were the most easily accessible locations as they do not require ascending steep and often rocky terrain. Campsites were also often situated in fairly secluded locations, such as in valleys and small basins on the basalt plateau rather than in the open plains around it. This is illustrated in Figure 4.29, where the distribution of campsites across the various drainage basins is illustrated. Over 60% of the campsites are situated in these secluded locations. These are also the areas that were often poorly visible to any trespassers, as illustrated by the distribution of campsites in the Visual Prominence Classification (Figure 4.30). Most campsites appear to be situated in areas with low to very low visual prominence.

As many campsites were situated on valley bottoms, they were in relatively close proximity to potential water sources (Figure 4.31). All campsites were situated within 500 m of a wadi, as illustrated in Figure 4.32. However, these wadis may have provided water only for limited amount of time and only in certain seasons; any water in their courses depended largely on surface runoff, which tends not to last very long (see Chapter 2). A more reliable potential water source may have been the mudflats, on which water may have been retained for longer periods of time. However, most campsites do not seem to have been situated in close proximity to the mudflats in the study area. Indeed, as shown in Figure 4.31, many campsites were situated several kilometres away from the nearest mudflat, up to a maximum of about 4600 m (Figure 4.33). In the *harra* landscapes, water sources were made accessible by paths running between campsites and the mudflats (Figure 4.34). Still, to collect water, a round trip between campsites and mudflats would have taken up to two hours. Although such an investment is not unusual (see, e.g., Hendricks *et al.* 2005: 119; Western and Finch 1986: 80-81), it may suggest that

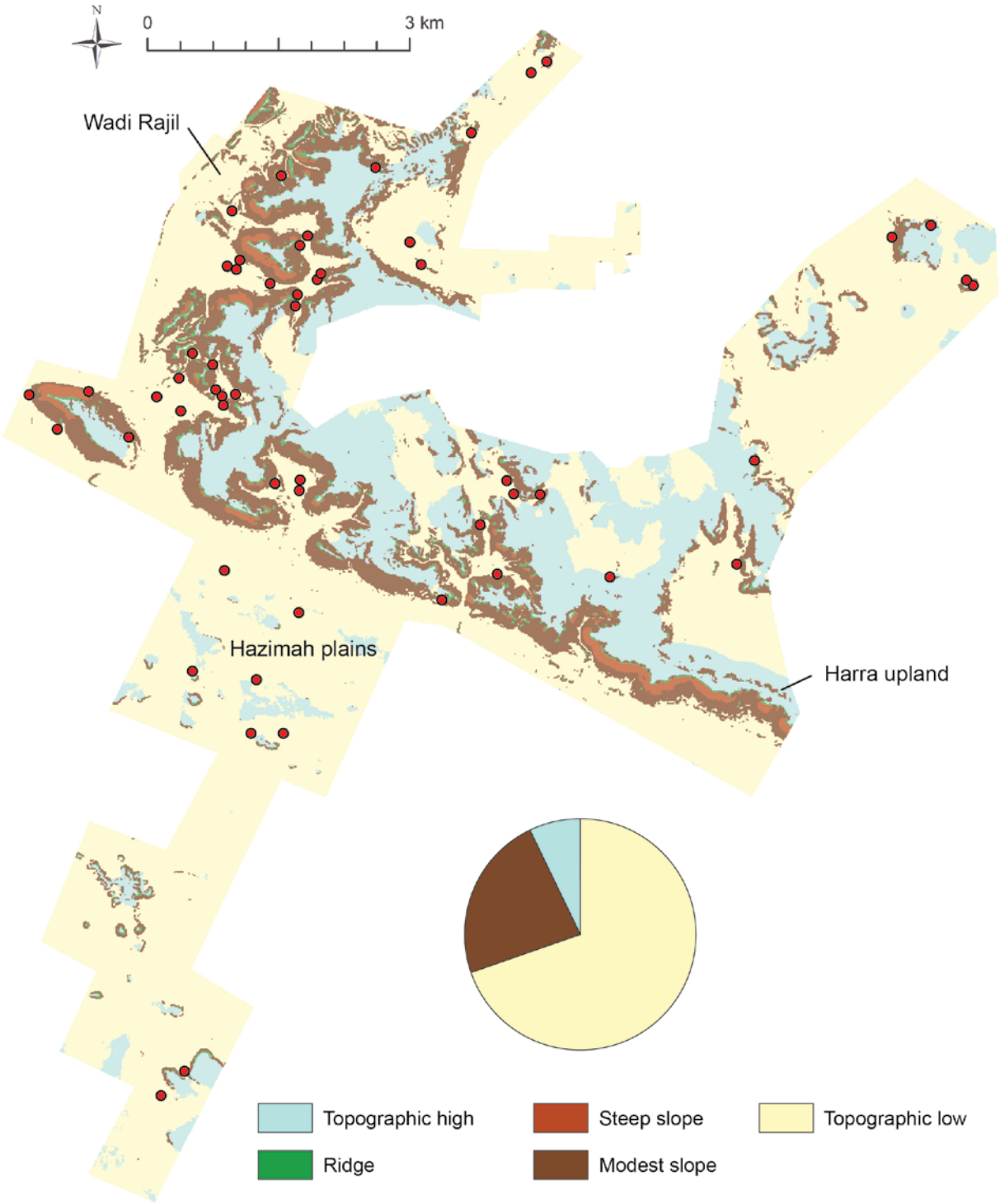

Figure 4.28 Distribution of Classical/Late Antique campsites (red dots) in the pedestrian survey area of the Jebel Qurma region, and the proportion of campsites per hillslope position. Base image: Hillslope Position Classification.

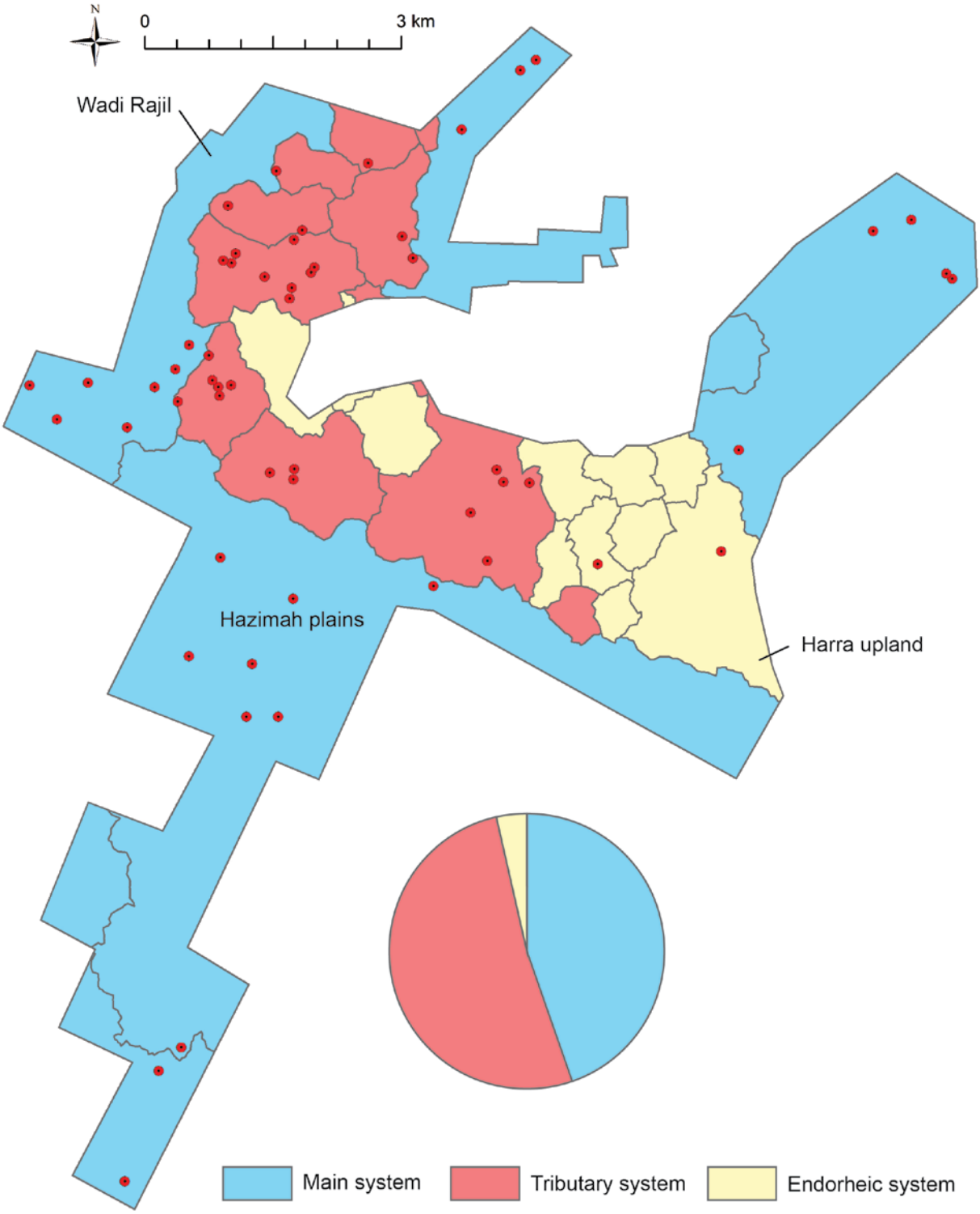

Figure 4.29 Distribution of Classical/Late Antique campsites in the pedestrian survey area of the Jebel Qurma region and the proportion of campsites per type of drainage system.

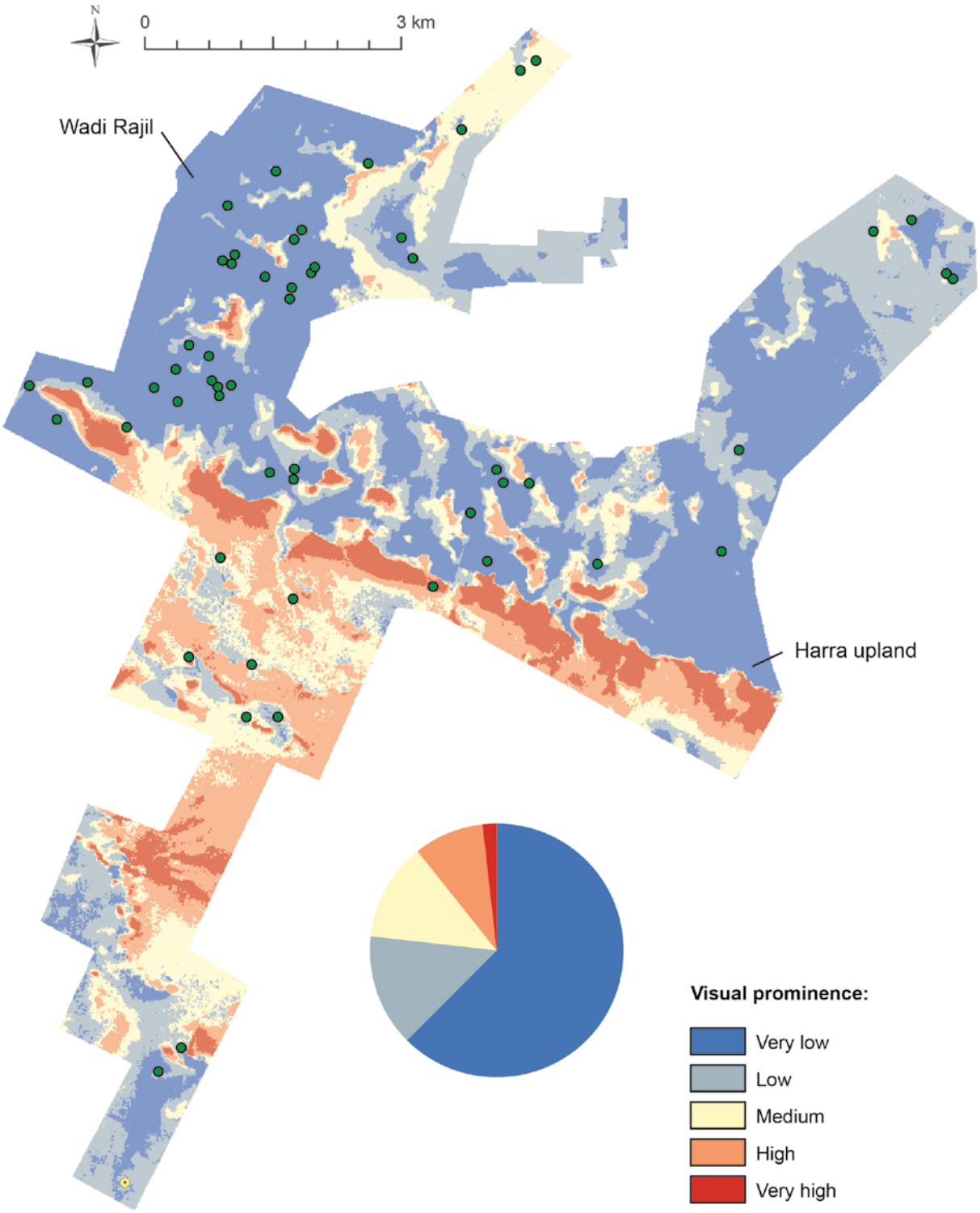

Figure 4.30 Distribution of Classical/Late Antique campsites in the pedestrian survey area of the Jebel Qurma region and the proportion of campsites per visual prominence class. Base image: Visual Prominence Classification.

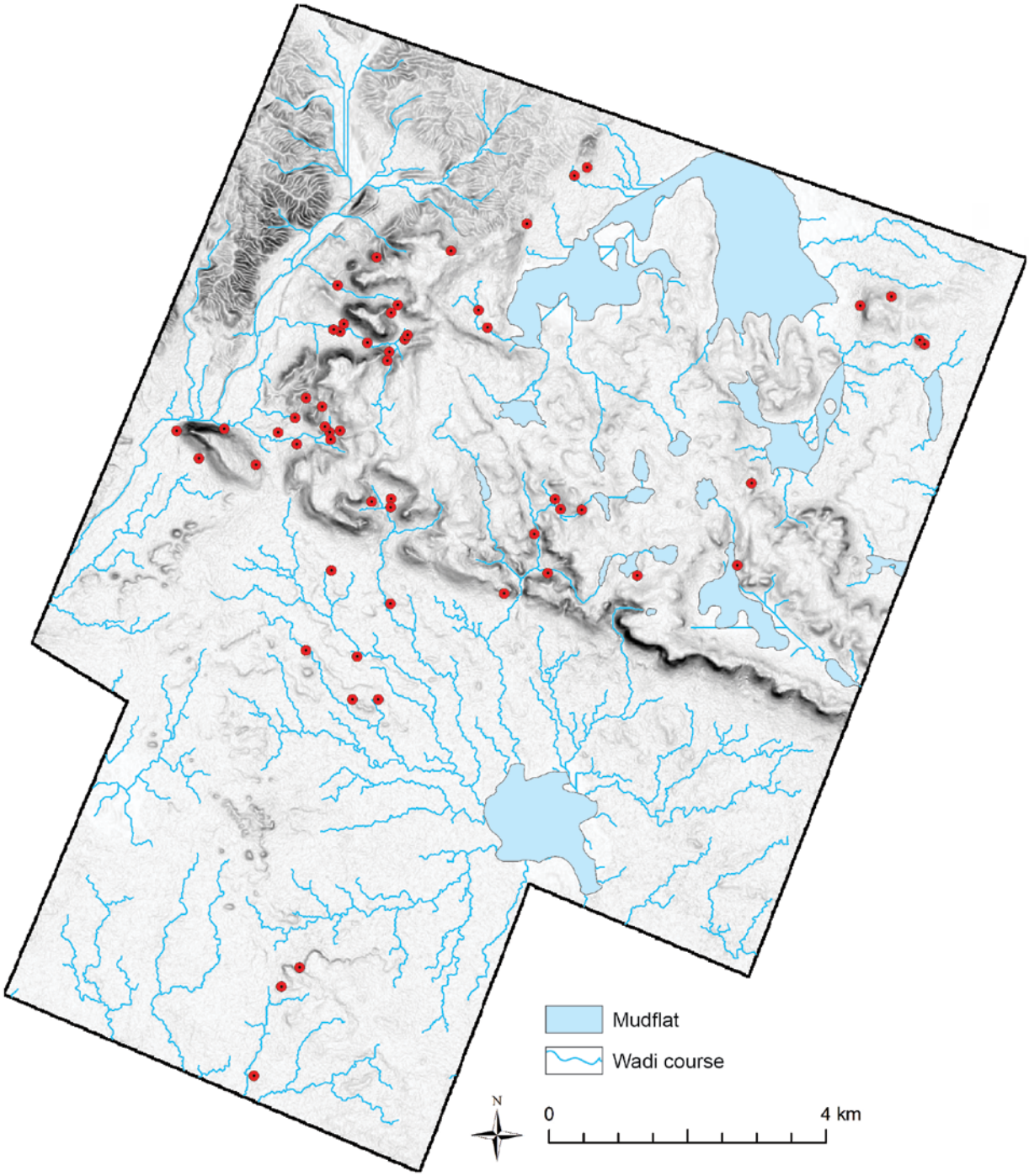

Figure 4.31 Distribution of Classical/Late Antique campsites as documented through pedestrian surveys in the Jebel Qurma region and the distribution of potential water sources. Base image: WorldDEM Slope map.

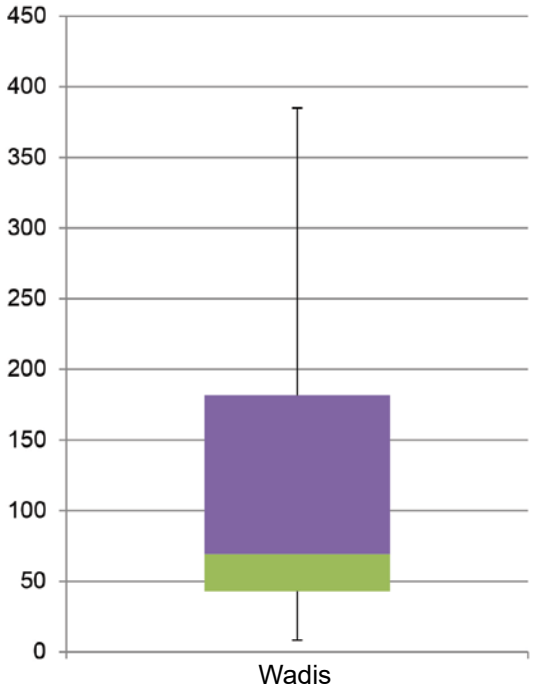

Figure 4.32 Box-and-whisker plot showing the distance (in meters) of Classical/Late Antique campsites to the nearest wadi.

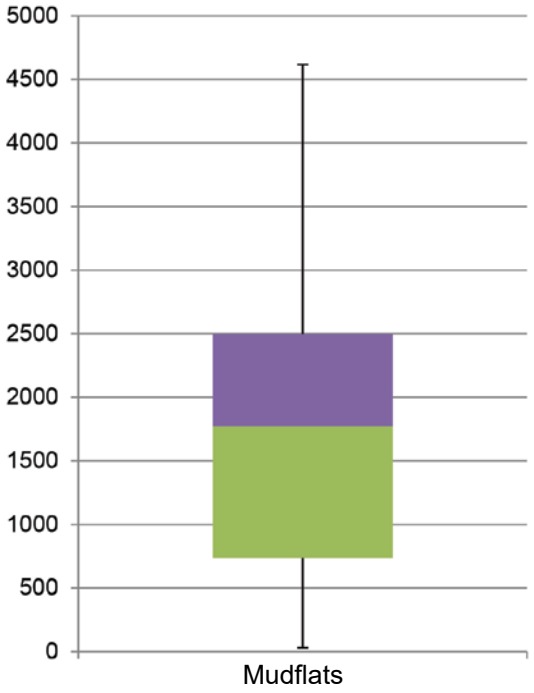

Figure 4.33 Box-and-whisker plot showing the distance (in meters) of Classical/Late Antique campsites to the nearest mudflat.

proximity to water was not the main criterion in decisions about campsite location. Indeed, perhaps some distance between water sources and campsites was preferred if one assumes that bodies of still water may also have attracted dangerous wildlife such as lions and snakes, as well as bugs. Instead, camping in more secluded areas was preferred over camping in proximity to reliable water sources.

4.4.2 Differences in campsite configuration and location

Most of the identified campsites consisted of man-made clearings or enclosures, or both of these feature types together. Only seven campsites comprised neither of these features, simply because they were situated in in the *hamad* landscape to the south of the basalt landscape, in which there is no natural stone surface cover. In the *harra*, 14 campsites consisted of only enclosures, while there were 23 campsites that comprised clearings but no enclosures. The remaining 12 campsites featured both clearings and enclosures (Figure 4.35).

There thus seems to be a differentiation between campsites with enclosures (n=26) and campsites that only consist of ceramic scatters on open areas (n=30). These two different kinds of campsites also follow different spatial distributions. Most of the campsites with enclosures were situated in areas with a basalt surface cover, which provided the building material for the enclosures (Figure 4.36). Alternatively, campsites without enclosures are mostly situated on *hamad* surfaces where little effort was required to clear the surface of any rocks.

Almost every campsite without enclosures is situated on topographic lows, such as open plains or valley floors. Campsites with enclosures, however, are situated more frequently on the lower slopes of basalt-covered hills (Figure 4.37). This is probably because denser basalt is found on the hillslopes, suitable for the construction of more elaborate stone features. Equally, this may also be the case since these hillslopes would have provided more protection against the wind. Westerly winds prevail nowadays in

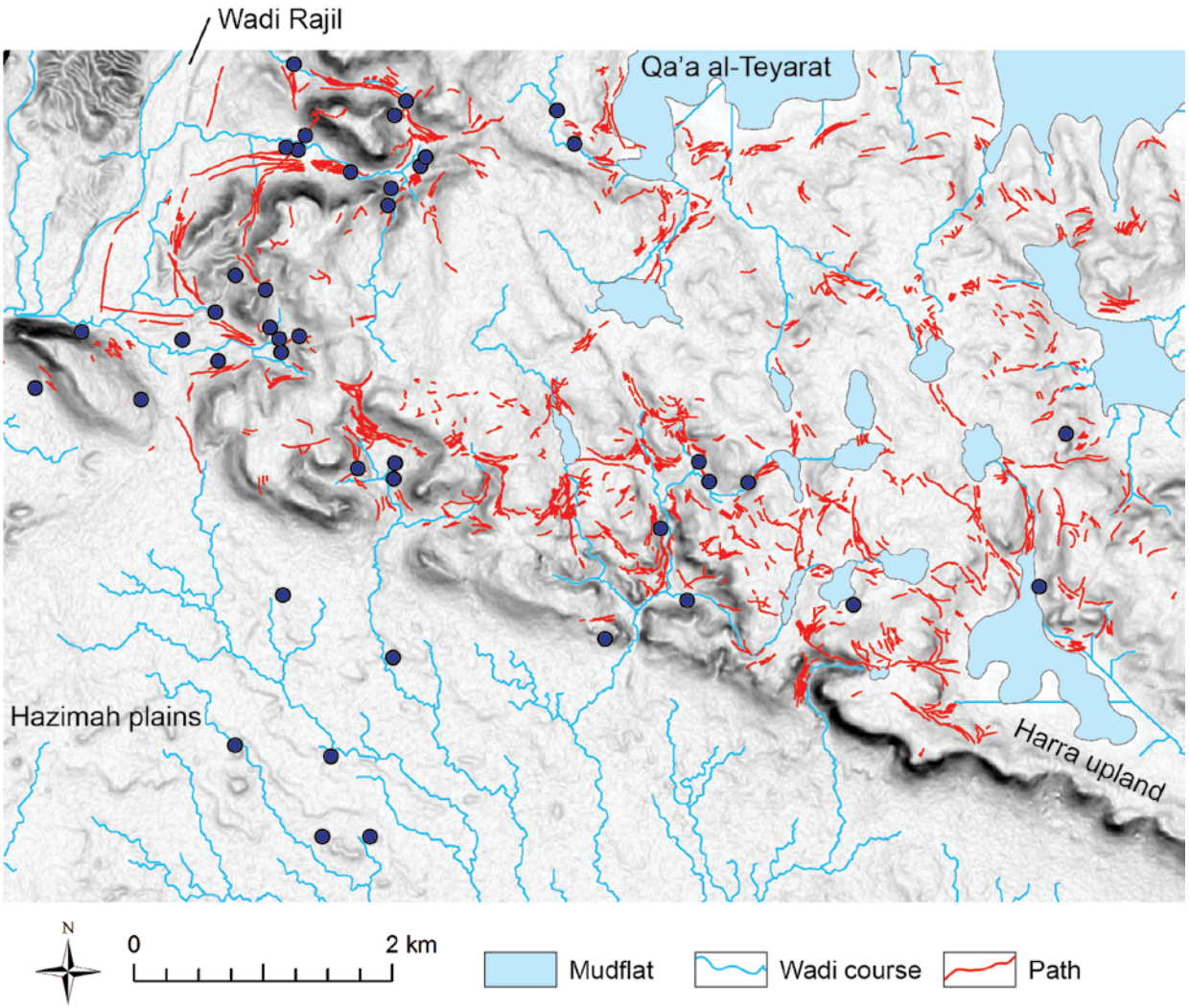

Figure 4.34 Distribution of Classical/Late Antique campsites (blue dots), potential water sources, and paths in part of the harra landscape. Many mudflats and campsites appear to be connected by paths. Base image: WorldDEM slope map.

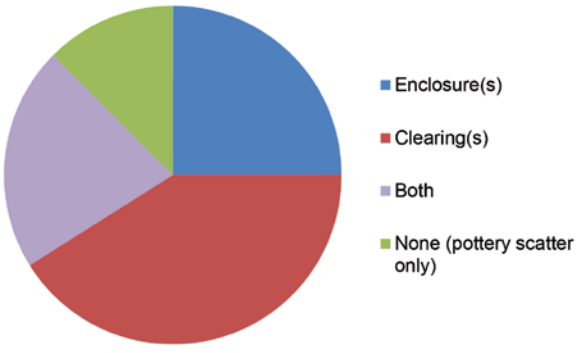

Figure 4.35 Variation in the composition of campsites.

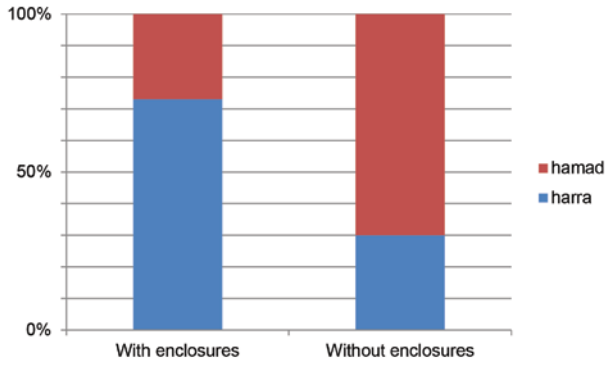

Figure 4.36 Differences in the composition of campsites between harra and hamad landscapes.

the region, and many of the enclosures on hillslopes were constructed in such a way that the slope provided shelter against these westerly winds.

The distribution of campsites over the various geographical drainage areas (Figure 4.38) further suggests that campsites with enclosures were situated in somewhat more secluded areas than campsites without enclosures. Campsites with enclosures are largely confined to deep valleys and small endorheic basins on the basalt plateau, while those without enclosures can be found in larger numbers in the main drainage areas, characterised by more open plains.

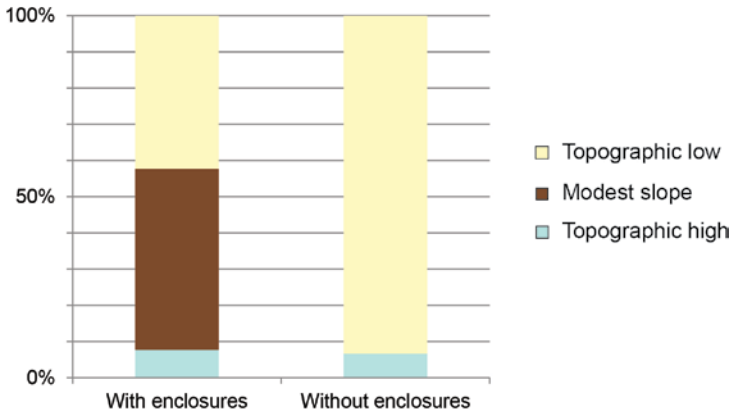

Figure 4.37 Differences in the composition of campsites between various hillslope position classes.

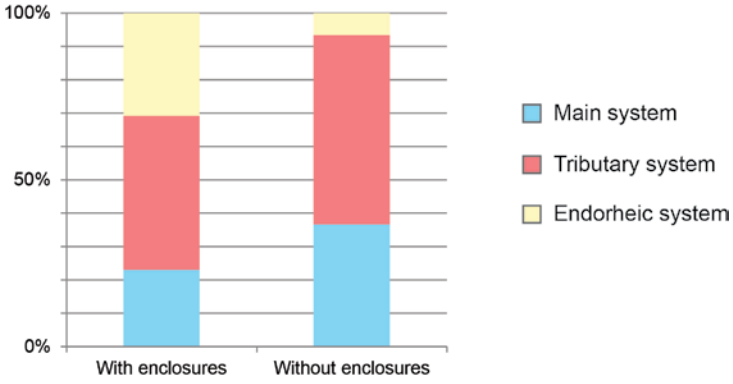

Figure 4.38 Differences in the composition of campsites between various drainage systems.

4.4.3 Chronological developments

The distribution of campsites in the Jebel Qurma region has changed considerably over time. Based on the survey evidence, a chronology was proposed in chapter 3 (§ 3.5.1.), between two main periods of campsite usage in the study area: the Hellenistic/Roman period (Figure 4.39) and the subsequent Byzantine/Early Islamic period (Figure 4.40). Excavations at various campsites have further substantiated this proposal.

Campsites that could be attributed to the Hellenistic/Roman period are mostly situated in the more secluded tributary valleys, while the location of campsites seems to diversify in the subsequent Byzantine/Early Islamic period. By that time, relatively many campsites were situated in the open plains as well (Figure 4.41). This development is paralleled when comparing the evidence from the surface cover of the areas in which campsites are situated (Figure 4.42). The majority of Hellenistic/Roman campsites were situated on *harra* surfaces. However, in the Byzantine/Early Islamic period, the number of campsites situated on various *hamad* surfaces increases. Once again this seems to represent a move towards more open, exposed terrains in the Late Antique period.

This trend is further corroborated by comparing the location of campsites in terms of the degree of visual exposure. This is illustrated in Figure 4.43, which is based on the Visual Prominence Classification. It shows that over 80% of the campsites from the Hellenistic/Roman period are located in areas with very low to low visual prominence. This figure drops considerably in the subsequent Byzantine/Early Islamic period, when more campsites become situated in areas with a higher visual prominence, or at more exposed locations.

It is more difficult to say whether all campsites saw an equal amount of occupational intensity through time, especially in terms of how many people inhabited these campsites, and for how long. A reliable measure of occupational intensity does not seem to be available at this point. The number of ceramics

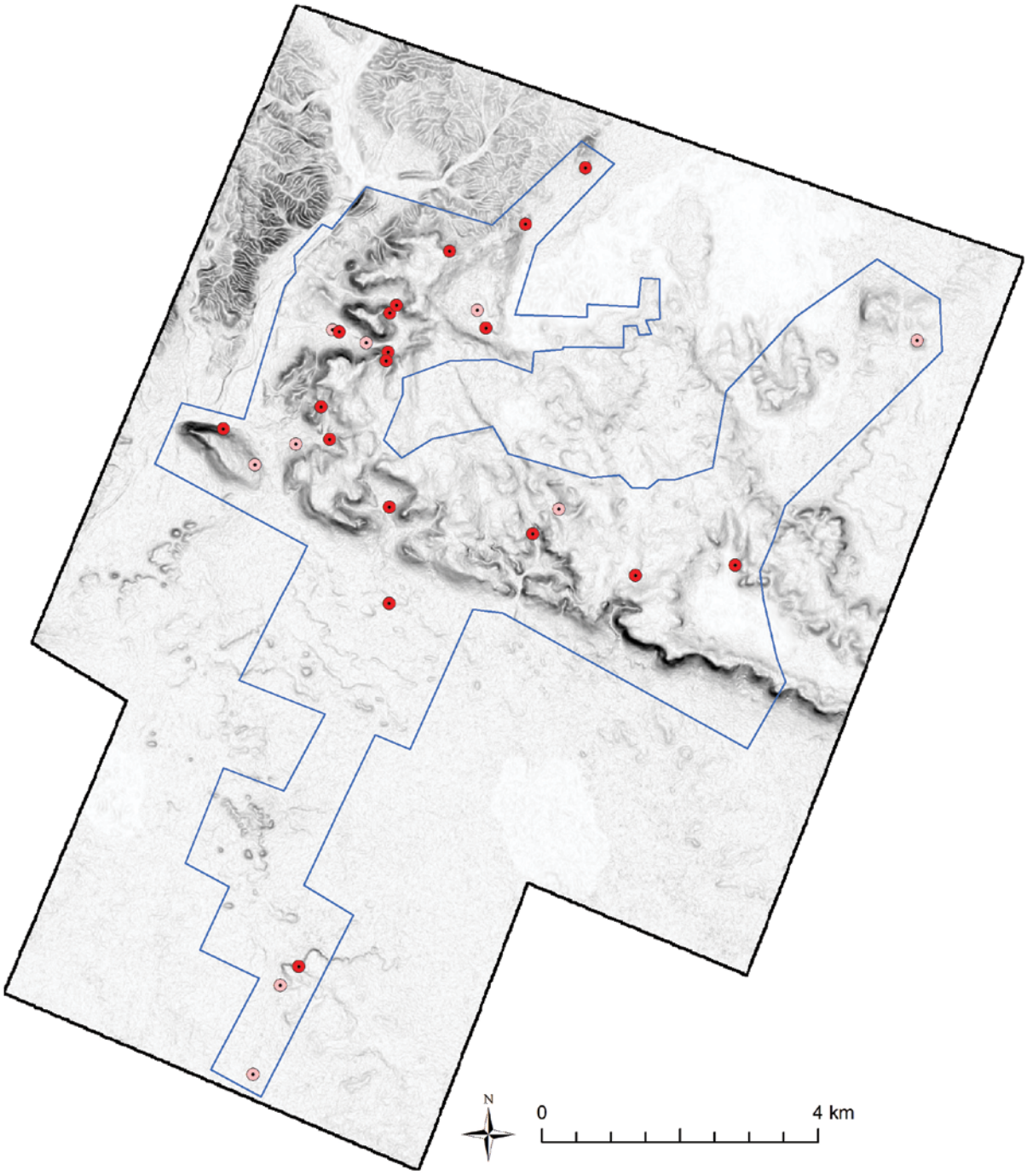

Figure 4.39 Distribution of established (red) and possible (pink) Hellenistic/Roman campsites in the pedestrian survey area (blue). Base image: WorldDEM slope map.

attested at these sites is usually very limited, and can be used to establish a certain date of occupation at best, but are too limited in number for statistical purposes. Also, as a result of the reconfigurations of campsites in recent times, the size of campsites tends to say very little about the size of these sites in antiquity (§ 3.5.1.), let alone the amount of people residing at these places.

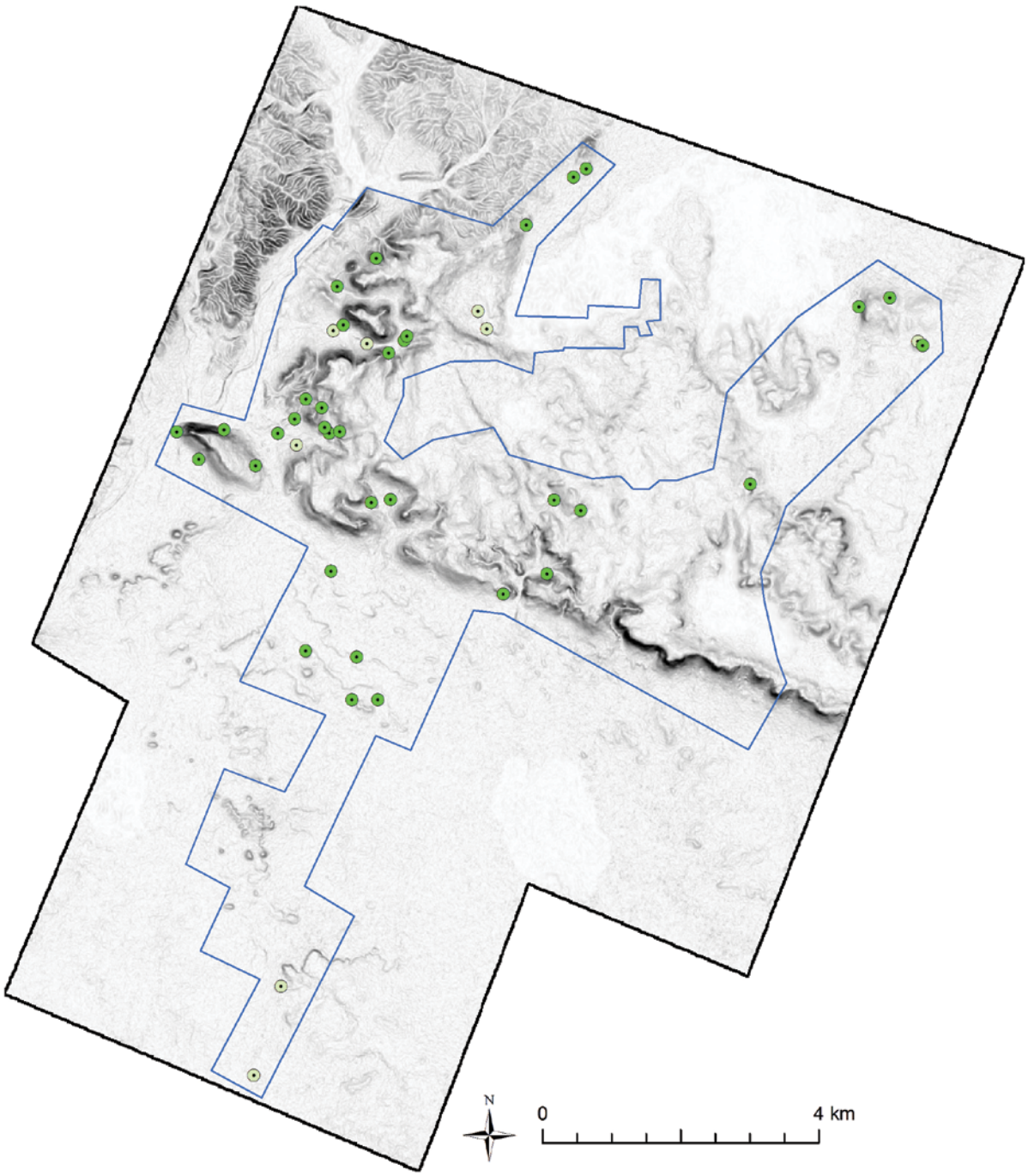

Figure 4.40 Distribution of established (dark green) and possible (light green) Byzantine/Early Islamic campsites in the survey area (blue). Base image: WorldDEM slope map.

4.5 Discussion

This chapter has presented the analyses of a number of residential sites and features. These sites were identified on the basis of ceramics, which were interpreted as domestic waste discarded where domestic activities took place. Also, the presence of inscriptions referring to enclosures was used as evidence to identify residential sites. The presence of fireplaces excavated within some of the enclosures' compartments further suggested that these features were sometimes used for domestic activities.

Clearings were not excavated as of yet, but the ceramics found upon and around these clearings suggest that they were also used for residential purposes. Both enclosures and clearings were thus interpreted as residential areas. More specifically, they were interpreted as campsites given the lack of remains of permanent dwellings at these sites. Temporary shelters, such as tents or huts, were probably used in these locations. Neither the survey nor the excavations yielded any evidence for the nature of these dwellings, but this is not surprising as tents or huts would have left very little archaeological impact, except for the open spaces that were cleared of the natural surface cover.

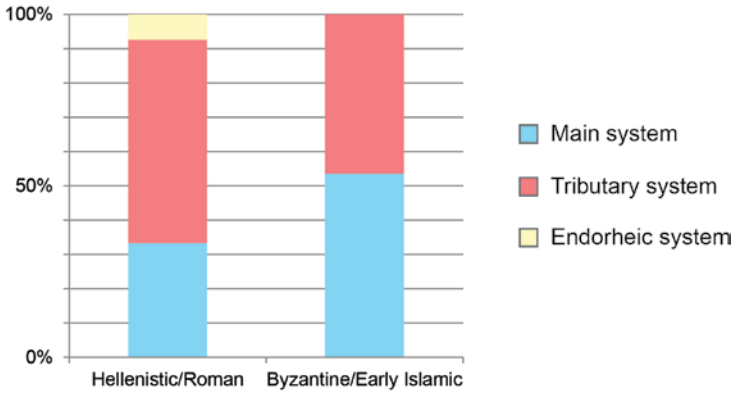

Figure 4.41 Differences in the location of campsites, in terms of drainage systems as a measure of seclusion, between the Hellenistic/Roman and the Byzantine/Early Islamic periods.

Evidence for economic practices, including pastoral activities, is very scarce at the moment, as the excavations have yielded hardly any faunal remains, nor artefacts associated to specific economic practices. Therefore, evidence for pastoral production is only circumstantial at this point. If the campsites are the product of the same people who produced the Safaitic inscriptions and petroglyphs, which is supported by epigraphic evidence in a few cases, it is likely that their herd animals were also kept at these locations. Results from the excavations indicate that not all of the spaces within the enclosures were necessarily used as residential areas, but that there may have been ample space left to pen animals. The enclosure walls could have provided protection for herd animals, especially the younger ones, against the elements that can be especially harsh during wet and cold periods.

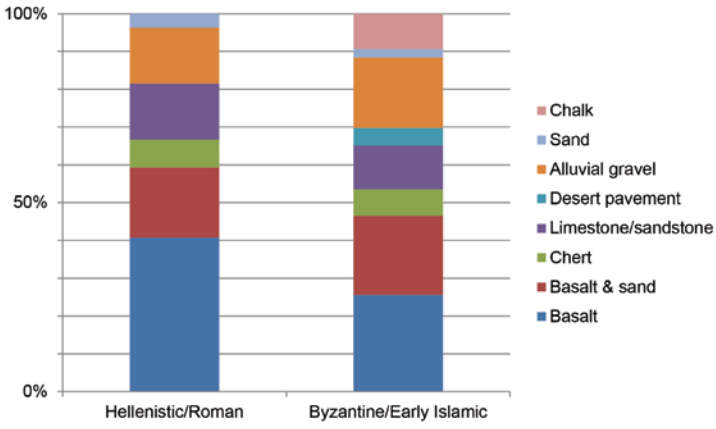

Figure 4.42 Differences in the location of campsites, in terms of surface cover, between the Hellenistic/Roman and the Byzantine/Early Islamic periods. Based on Surface Cover Classification.

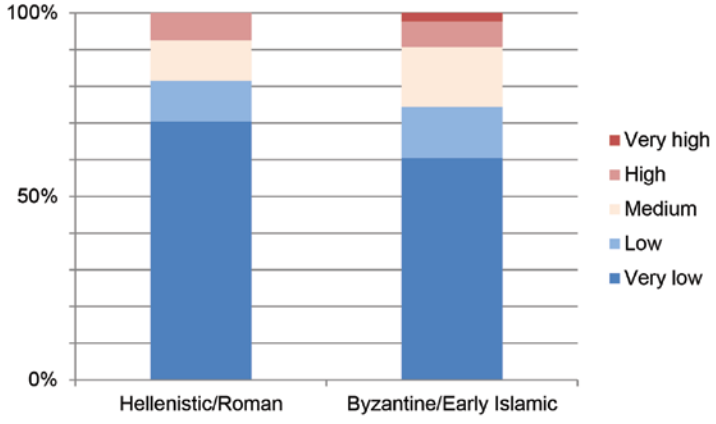

Figure 4.43 Differences in the location of campsites, in terms of visual prominence between the Hellenistic/Roman and the Byzantine/Early Islamic periods. Based on Visual Prominence Classification.

Two main types of campsites were defined: campsites with enclosures, and campsites without enclosures. These types do not only differ in terms of morphology, but also in terms of spatial distribution. The former usually occur on

rather secluded and slightly elevated locations, whereas the latter are mostly located in more exposed areas and on the bottom of valleys.

An explanation for this diversity in campsite location and morphology may be found in the occupation of the Jebel Qurma region during different times of year. It is hypothesised that campsites with enclosures were mainly used during wet and cold seasons, while campsites lacking enclosures, and mainly consisting of clearings, were occupied mainly during drier, warmer seasons. Diversification of campsite location and features related to different seasonal requirements is widely documented in ethnographic studies (Cribb 1991: 133-61). In relatively dry and warm periods the valley floors may have provided easily accessible camping areas where clearings, once created, could be reoccupied episodically. In wetter and colder conditions, however, people may have preferred using the enclosure walls and their sheltered location to provide shelter against the elements for both people and their animals. Also, their position somewhat further upslope would keep the camps away from wadis that were prone to flooding. This compares well to descriptions of recent winter camps in the *harra* provided by Max Von Oppenheim based on his journey through the Black Desert in the late 19th century:

'Etwa um vier Uhr nachmittags fanden wir dicht am rechten Ufer des Wādi isch Schām einen fast eine halbe Stunde langen, schmalen, dem Bachlaufe folgenden Lagerplatz (Manṭar), welcher im Winter dem Beduinenstamm der ir Resēje, einem de Stämme der `Orban il Ǵebel, ein Hauptstützpunkt ist. Mit unendlicher Mühe ist hier Stein um Stein entfernt, um auf dem platten sandigen Untergrund die Zelte aufschlagen und den Herden eine Lagerstätte bieten zu können. Mit den fortgeschafften Steinen hat man dann ½ bis 1 m hohe Umfriedigungen für die Zelte und Weiden der einzelnen Familien errichtet. Solche künstlich gestalteten Lagerplätze, deren die Ḥarra noch mehrere birgt, heissen Meschtā (>Winterplatz<).' (Von Oppenheim 1899: 219-220)

If this reconstruction is correct it would imply that mobile pastoralists frequented the Jebel Qurma region during different times of year rather than during one season only. Based on the Safaitic inscriptions Macdonald (1992a) has suggested that mobile pastoralists would normally only be present on the edge of the *harra* at the beginning and end of the dry season. Yet, the frequent use of enclosures in the Jebel Qurma region may suggest that the region was sometimes frequented during the wet and cold winter season as well. This is corroborated in part by the region's epigraphic remains, in which frequentation during both dry and wet seasons is attested (Della Puppa forthcoming). While this research does not seek to directly transfer modern occupation habits with communities of the past, this pattern also aligns with how the *badia* has been used in more recent times by mobile pastoralists, as documented by modern ethnographers. In recent times, some pastoralists preferred to reside in the *harra* during winter to shelter their animals. They remained there after the rainy season until natural resources such as water and pasture had disappeared. Other groups were documented as spending the winter in the *hamad* and only frequenting the *harra* at the beginning of the dry season, when surface water could still be present, or at the end of the summer, awaiting the first winter rains (Lancaster and Lancaster 1999: 100-2; Musil 1928: 584; Rowe 1999).

Lastly, several differences were observed in the distribution of campsites between the Hellenistic/Roman period and the Byzantine/Early Islamic period. In the earlier period, campsites were mostly confined to rather secluded locations within the *harra* landscape, whereas in the later period campsites increasingly appear in more exposed locations. The campsites that, by that time, appear in the open plains do not have enclosures, and may perhaps be interpreted as summer camps. Other possible implications of this move towards more exposed locations will be discussed in Chapter 6.

Chapter 5 - The Mortuary Landscape of the Jebel Qurma Region

5.1 Introduction

In Chapter 3, it was argued that there are many sites in the Jebel Qurma region that can be classified as funerary sites, featuring potential funerary monuments such as burial cairns and pendants. Many burial cairns were associated, at least spatially, with Safaitic inscriptions, some of which even referred to burial cairns. The aim of this chapter is to define the funerary practices of the Classical and Late Antique period and its development through time, including potential precursors during the 1st millennium BC. It also seeks to shed further light on these funerary customs and their relation to the pre-Islamic carvings. This is first done by presenting the results of excavations carried out at a number of funerary monuments that were tentatively defined as such during pedestrian surveys. These results provide more detailed insights into the chronology and function of the funerary features. Secondly, the distribution of these features across the variety of landscapes of the Jebel Qurma region is discussed, which provides an insight into the constitution of the mortuary landscape.

In Chapter 3 it was argued that funerary monuments in the Jebel Qurma were indicated by the presence of human skeletal remains in debris left by looters, potential burial chambers, and references to burial cairns in the Safaitic inscriptions. Furthermore, at least some of the burial cairns seemed to have particular features such as an external façade. For other cairns, it remained unclear whether they represent funerary structures at all, or something entirely different. In this chapter, these preliminary observations are further studied by presenting the results of excavations, which provide more detailed data sets regarding the nature and chronology of funerary structures and burial customs. The excavations provided an opportunity to see whether these features actually contained any burials or remains thereof, as well as when and how these tombs were constructed and possibly reused. Furthermore, they were used to further investigate the proposed correlation between the pre-Islamic carvings and the cairns they often accompany.

Between 2014 and 2016, a number of potential funerary monuments from various sites were excavated (Figure 4.1), largely following the excavation methods described in Chapter 4. Firstly, a presentation of the excavation results is given, which includes only the results from excavations that yielded datable material relevant for this study. A discussion then follows on the most important observations from these results and their implications. Secondly, a number of analyses are presented that provide insights in the distribution of funerary monuments across the variety of landscapes of the Jebel Qurma region.

5.2 Excavation results

Out of the large number of cairns, pendants, and other potential funerary structures documented through pedestrian surveys, several were selected for excavation. Based on the survey data, a number of tomb types were already tentatively established. Some of the tombs featured a well-constructed façade on the outside; others appeared simply as dome-shaped constructions, although potential burial chambers were observed within. As a result of recent looting, human skeletal remains were exposed at a number of cairns, indeed suggesting a funerary function. In terms of chronology, Safaitic inscriptions and petroglyphs sometimes clustered around cairns, suggesting a relationship between the tombs and the rock art. To further investigate these tentative observations, different types of cairns were excavated to study their function as well as their date of construction and use.

5.2.1 QUR-215

The site of QUR-215 (325694 E 3518763 N) is situated on one of the highest points in the Jebel Qurma region, towering about 60 m above the surrounding plains, and located on top of the western part of the

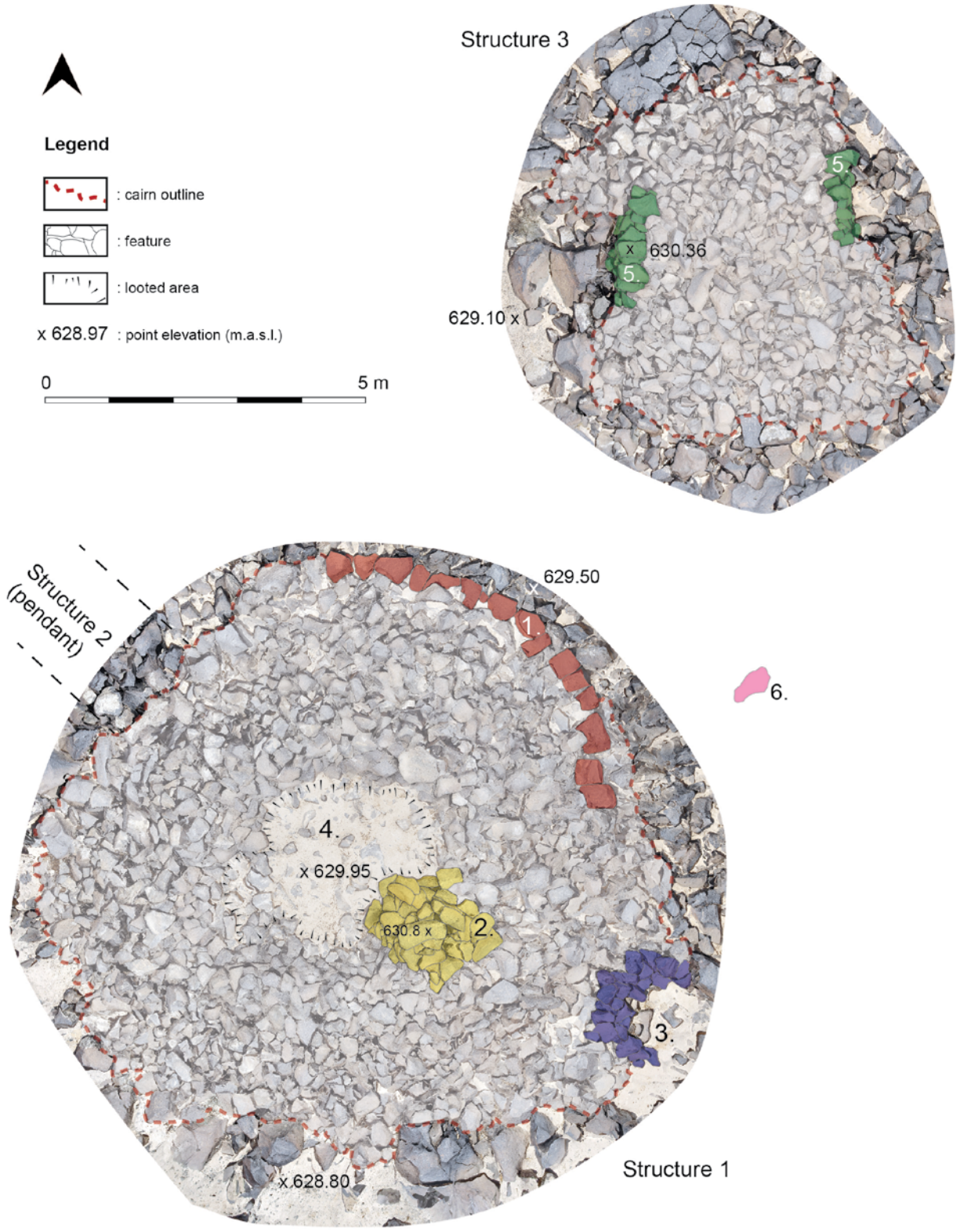

Figure 5.1 Plan of QUR-215 prior to excavation. 1) plinth G; 2) marker B; 3) shelter; 4) area disturbed by recent looting; 5) parts of a façade; 6) Safaitic inscription referring to a funerary structure. Base images: photogrammetric reconstructions.

plateau. The site (Figure 5.1) consists of a large cairn and pendant (Structures 1 and 2), and a second, smaller cairn next to it (Structure 3). Also present are 61 Safaitic inscriptions and 43 petroglyphs, distributed around the cairns. One of the Safaitic inscriptions is of special interest as it explicitly refers to a male individual buried in a tomb, presumably indicating one of the two cairns next to which the inscription was found.[13]

The two cairns (Structures 1 and 3) and the pendant (Structure 2) were excavated to further investigate to which cairn the inscription may refer, whether the remains of the mentioned individual could be retrieved, and what the general nature of these structures was.

5.2.1.1 Structure 1

This cairn was unfortunately partially looted before it could be excavated. The top of the cairn was thereby destroyed and much debris – mostly rocks – were cast down onto the sides of the cairn. The resulting large size of the cairn (*ca.* 11m in diameter) can be partially attributed to these actions. Fortunately, however, the lower parts of the cairn did not appear to be affected by the looting. Three features could be recognized prior to excavation. Firstly, a larger marker of 1.2 m tall and 73 cm wide (feature B) was standing on top of the cairn. Secondly, a small crescent-shaped feature of about 2.2 m wide and 88 cm high was built against the east slope of the cairn. Thirdly, part of large circle, or plinth, which was assumed to represent the original outline of the cairn (feature G), was observed at the northern base of the cairn. A pendant (Structure 2, see below) extended from the cairn towards the northwest.

The first step of the excavation procedure was to clear the cairn from obvious looting debris. Loose soil was present on the top of the cairn, while stones that had obviously been moved by recent looting were lying around the top of the cairn and on its slopes. Feature B was also removed, as it was observed that it must have been a relatively recent addition, given that stones containing modern tribal markings (*wusūm*) were incorporated in this feature. It was removed before further lowering the cairn fill. When the cairn was cleared of modern disturbances, layers of stone were removed, and the soil in between was sieved to expose features and to collect artefacts and other finds. The areas around the already observed plinth (feature G) were also cleared of stones and soil to expose the outline of the cairn. A section was made through the cairn, which involved excavating the northwestern part of the cairn fill until virgin soil was reached.

Architecture and Burials (Figure 5.2)

The outline of the cairn was largely defined by a plinth (feature G). This consisted of a single row of large, unworked stones, which were neatly placed to form a nearly complete circle around the base of the cairn with a diameter of *ca.* 6.7 m. In some cases, rectangular blocks were used for the construction of this plinth. On the north and east side of the cairn these blocks were placed directly onto the virgin soil, while on the west side they stood upon a foundation that raised the plinth some 36 cm, probably in an attempt to create a level surface. The plinth was poorly defined only on the south side of the cairn. Here, a number of large naturally occurring basalt blocks defined the cairn's outline, and the spaces between these blocks were filled up with loosely piled stones. At this point the base of the cairn is somewhat wider, with a diameter of about 8 m.

In the centre of the circle formed by the plinth is a small oval chamber (feature A), measuring 74 by 53 cm. Its long axis was orientated north-south. This chamber had straight walls made of unworked stones that were stacked to a height of about 64 cm high; it had a floor of flat slabs (feature C), upon which only a chipped-stone artefact was encountered. The chamber had been covered by slabs, one of

[13] The inscription referred to is QUR215.28.1 (see Della Puppa forthcoming).

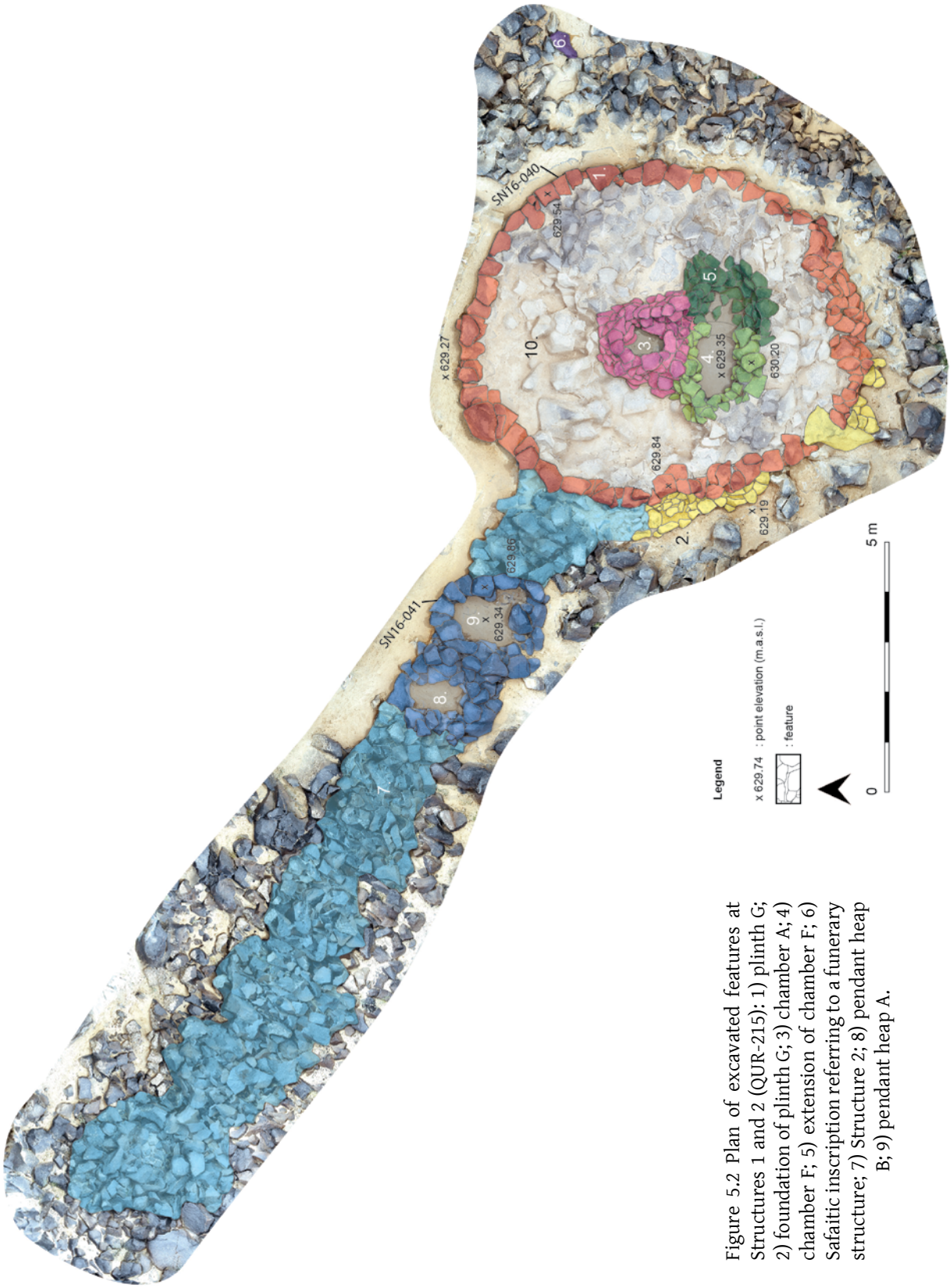

Figure 5.2 Plan of excavated features at Structures 1 and 2 (QUR-215): 1) plinth G; 2) foundation of plinth G; 3) chamber A; 4) chamber F; 5) extension of chamber F; 6) Safaitic inscription referring to a funerary structure; 7) Structure 2; 8) pendant heap B; 9) pendant heap A.

Figure 5.3 Islamic-type grave in chamber F of Structure 1 (QUR-215). Scale is 50 cm.

Figure 5.4 Chamber F in Structure 1 (QUR-215): the west part of the chamber (top) is much more neatly constructed than the east part (bottom). Scale is 50 cm.

which was found in its original horizontal position. The fill of this chamber consisted of many stones mixed together with soft windblown sediments. Supposedly modern animal remains were abundant, including mollusc shells, snake eggs, the bones of small mammals or lizards, and beetles. A few pottery sherds (see below) were retrieved from the fill of the chamber as well as a few tiny bone fragments in a 25 cm thick layer that covered floor C. It is uncertain whether these were human or animal bones.

To the south of chamber A was another chamber (feature F). This chamber was larger than feature A and was orientated roughly east-west; it measured 210 by 77 cm and was preserved to a height of 60 cm. In this chamber a complete human skeleton was found buried in an Islamic fashion: the individual was lying in an extended position on its right side, with the head to the west, facing Mecca (Figure 5.3). It was placed between a number of large slabs (feature I) that secured the position of the body. These slabs, however, did not represent the original bottom of the chamber, which was located underneath these slabs. In addition to the complete Islamic skeleton, many more skeletal remains and artefacts were found in the fill of this chamber, as well as directly around it. These artefacts included beads, pendants, and fragments of bronze and iron artefacts (see below). These occurred throughout the entire internal stratigraphy of the chamber, including underneath feature I. The Islamic grave had apparently disturbed one or more older burials that were situated more or less in the same location, thereby scattering the earlier skeletal remains and artefacts throughout the chamber and around it.

Therefore, chamber F was not found in its original configuration, but appeared to have been altered over time. This interpretation is based on the fact that there is a difference in the way of construction

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN15-202	Human skeletal remains	Remains of disturbed burial in chamber F	GrA-67063	2215 ± 35	360-348 BC (6.8%) 317-270 BC (27.8%) 263-208 BC (33.6%)	380-198 BC (95.4%)

Table 5.1 Radiocarbon dates from Structure 1 at QUR-215.

between the western and eastern part of the chamber. The west part of the chamber has neatly set, slightly corbelled walls, whereas the east part more resembles a pit than an actual chamber (Figure 5.4). Also, in the centre of the chamber, the corbelled west wall tends to curve inwards. It is therefore suggested that the west part of F represents an older burial chamber that was originally closed on the east side by a now-lost corbelled wall. This oldest burial chamber would have been about 120 cm long. At some point, this chamber gained a pit-like extension on the east side, and as a result the east wall of the original chamber was destroyed. Since the lower extremities of the Islamic burial extended into this eastern compartment it is not unlikely that the reason for the extension of the original chamber was to accommodate the interment of the Islamic burial.

The fill surrounding chambers A and F consisted of a dense packing of basalt boulders with wind-blown sediments in between, which were apparently thrown in between the chambers and plinth G to create the cairn. A number of pottery sherds were retrieved from various elevations northwest of chamber A (see below). Apart from the skeletal remains and artefacts found around chamber F, little else was found in this fill.

The skeletal remains from Chamber F

The disturbed skeletal remains from the fill in and around chamber F were studied by Inskip (2015a, 2015b), who reported that it contained the poorly preserved human remains of an adolescent and an adult. Teeth from one of the individuals were radiocarbon dated, but unfortunately it was not clear

Figure 5.5 Conjectural reconstruction of jewellery from burial chamber F (QUR-215, Structure 1).

Designation	N
Beads	580
Bronze fragments	218
Pendants	4
Cowrie shell	1
Ring	1
Glass fragment	1
Undefined	5
Total	**810**

Table 5.2 Artefacts from the disturbed burial context in chamber F (QUR-215, Structure 1).

from which individuals these bones derived because the individuals were close in age at the time of death. The teeth were dated between the 4th and 3rd century BC, although statistically a 3rd century BC date is most likely (SN15-202; Table 5.1). Remains from the second individual were not dated. In addition to the human remains, fragments of camel bone were found as well, again in and directly around chamber F.

Figure 5.6 Selected artefacts from burial chamber F (QUR-215, Structure 1): 1) shell pendant; 2) beads; 3) shell beads; 4) stone bead; 5) iron ring with bronze cladding; 6) rim fragment of a bronze vessel.

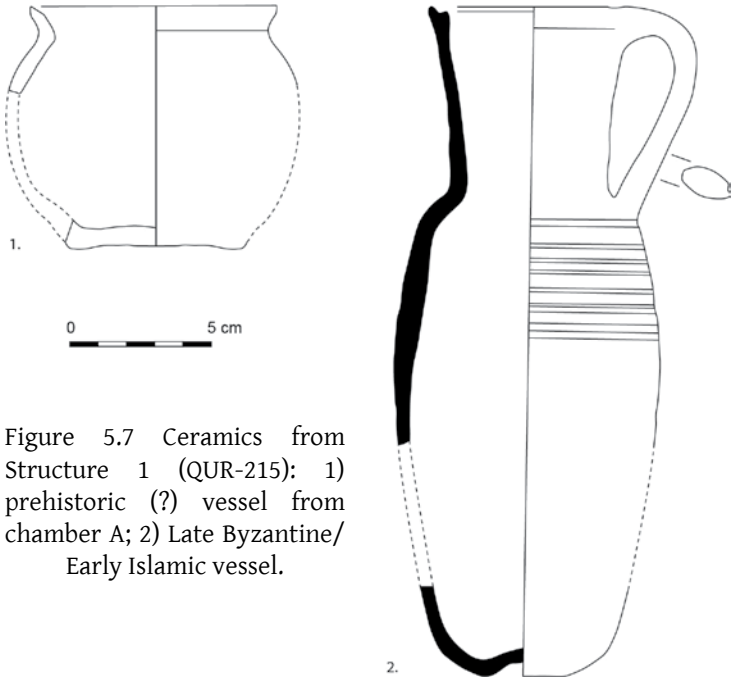

Figure 5.7 Ceramics from Structure 1 (QUR-215): 1) prehistoric (?) vessel from chamber A; 2) Late Byzantine/ Early Islamic vessel.

The artefacts from chamber F

There were a large number of artefacts that could be associated with the disturbed human remains from chamber F. A total of 810 artefacts (excluding ceramics; see below) were found in or close to chamber F (Table 5.2). Most of these were beads made of stone, seashell and, possibly, ostrich eggshell (for a parallel, see Di Lernia and Tafuri 2013); these all presumably originated from one or more pieces of jewellery. To this jewellery may also have belonged the small number of pendants made of seashell. Hypothetical reconstructions of the jewellery are given in Figure 5.5. There were also numerous fragments of bronze. Several rim fragments indicate that the bronze probably originates from one or more bronze vessels. Other artefacts included a cowrie shell and an iron ring with bronze cladding (Figure 5.6). A tiny glass fragment was also found, but this may be a modern intrusion as it showed no signs of weathering. Nearly all of the artefacts (92%) came from the fill of chamber F, while the rest was mostly found directly around the top of the chamber. Few artefacts were found in the upper fill of chamber A. It therefore seems likely that all the artefacts were originally deposited in chamber F, perhaps as grave goods for one or both of the disturbed burials. However, the construction of the Islamic tomb scattered the artefacts throughout and directly around the chamber.

Other finds

A number of pottery sherds were found throughout the fill of chamber A and directly to the north of it that probably belonged to one small vessel. Its reconstructed shape strongly resembles prehistoric

vessels retrieved from the late 3rd millennium tombs in the Jebel Qurma region (see Akkermans and Brüning 2017, Figure 3). Remains from a second vessel were found in the cairn fill north of chamber A. It was made from a fine buff ware, and the shape of the vessel strongly resembles Late Byzantine to Early Islamic vessels reported at Pella and Tel Beth-She'an (Johnson 2006, Figure 15.14:286; Fig 15.15:290; Smith and Day 1989, Pl. 52:9). The remains of both vessels are illustrated in Figure 5.7.

OSL date

In an attempt to further date the construction of the cairn, a soil sample was taken from underneath one of the base stones of plinth G for OSL dating (Figures 5.2 and 5.8). The stone had been purposefully placed onto the natural soil for the construction of the plinth, thereby blocking the underlying soil from exposure to sunlight. The analysed sample (SN16-040) returned an OSL date of 2.15 ± 0.45 ka BP (Table 5.3), indicating that plinth G was constructed somewhere between the 6th century BC and the early 4th century AD.

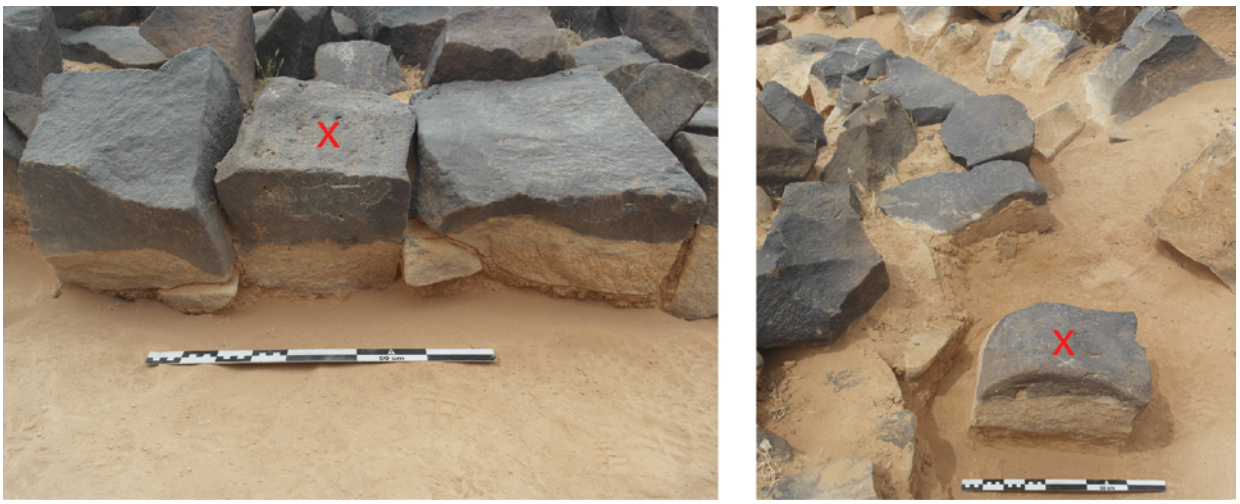

Figure 5.8 Context of OSL sample SN16-040: sediment from underneath a base stone (marked) of plinth G (Structure 1) was collected at night. Left: base stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Structure no.	Context	Lab no.	Date BP
SN16-040	Structure 1	Sediment from underneath plinth G	NCL-8216141	2.15 ± 0.45 ka BP
SN16-041	Structure 2	Sediment from underneath feature A	NCL-8216142	2.5 ± 0.46 ka BP

Table 5.3 OSL dates from QUR-215.

Discussion

A complex picture has emerged from the excavations at Structure 1. The small burial chamber in the centre of the cairn was possibly constructed already in the late 3rd millennium BC, given the remains of the Early Bronze Age IV pottery vessel in the tomb. However, the fact that the remains of this vessel were not found *in situ* makes it difficult to be certain on this point. If so, the cairn would have been considerably enlarged at a later stage by the construction of plinth G and burial chamber F, in which at least two individuals had been buried. The OSL date from plinth G and the radiocarbon date from skeletal remains chamber F together would suggest this enlargement occurred between the 6th and the 3rd centuries BC. The area between the plinth and the chamber then was filled with loosely piled

stones. The chronological relation between the plinth and the chamber is inferred from the fact that the radiocarbon date from one of the individuals buried in the chamber falls within the range of the construction date of the plinth. The original outline of chamber F was rather small (*ca.* 120 cm long) while the interred individual was a late adolescent or adult, suggesting that this individual must have been interred in a contracted position. It is currently unknown when the second individual was buried in chamber F. A third burial was added at a much later stage. Although not corroborated by radiocarbon dates, the well-preserved remains of the third individual and its typical Islamic burial position seem to suggest a relatively recent date.

5.2.1.2 Structure 2

Structure 2 is a pendant of about 16.5 m long, extending in a northwest orientation from Structure 1 (Figure 5.2). It is composed of nine stone heaps that were defined during the survey. The two heaps lying closest to Structure 1 were excavated (features A and B). First, their original outlines were established by removing debris around the features. The outlines could be clearly defined as they consisted of fairly large blocks forming crude circles. Next, the areas within these circles were excavated until the virgin soil had been reached.

Architecture

Feature A consists of an oval ring, built of large stones that were about 40 cm across on average. This ring, measuring 2.7 by 1.52 m, was constructed on virgin soil. The ring stood two to three stone courses high, up to a height of 83 cm. Its interior was completely filled in with smaller stones, that were about 20 cm across, with sediments in between. These sediments contained natural flint pieces, indicating that the soil is not aeolian but was deposited here intentionally. Virgin soil was reached at the bottom of this fill (Figure 5.9). The fill of the feature yielded no artefacts or skeletal remains.

Feature B consists of another oval stone ring, this one measuring 2.12 by 0.67 m. It was two to three stone courses high, with a maximum height of 86 cm, and was constructed on virgin soil. Large stones of up to 70 cm in length were used for the construction of this ring (Figure 5.9). Like feature A, its interior had been filled up with smaller stones and sediments containing natural flint. No artefacts were retrieved from the fill.

Figure 5.9 Features A (left) and B (right) of Structure 2 (QUR-215) after excavation. Scale is 50 cm.

OSL date

In order to determine the construction date of the pendant, a single soil sample was collected from underneath one of the base stones of feature A for OSL dating (SN16-041). This stone was deliberately placed on virgin soil as part of the construction of the outer circle that formed the low wall of feature A (Figure 5.10). The sample returned an OSL date of 2.5 ± 0.46 ka BP (Table 5.3), indicating that feature A had been constructed between the middle of the 10th century BC and the early 1st century AD.

Figure 5.10 Context of OSL sample SN16-041: sediment was collected from underneath a base stone (marked) of feature A (Structure 2). Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Discussion

Although some effort was clearly put into the construction of features A and B, these stone rings were subsequently completely filled up with stones and sediments. Any evidence for the presence of a human burial within these features was absent; the function of these features therefore remains elusive.

The OSL date obtained from feature A, establishing the date of construction of the feature in the first millennium BC or the beginning of the first millennium AD, may indicate that the pendant is broadly contemporaneous with the period during which the main cairn with its plinth G was constructed (see above). If we assume that Structure 2 was added to Structure 1 after it was enlarged through the construction of plinth G and chamber F, then the pendant cannot predate the 6th century BC, as indicated by the OSL date from plinth G. The construction date of the pendant can thus be narrowed between the 6th century BC and the early 1st century AD.

5.2.1.3 Structure 3

Structure 3 is the smaller of two cairns at QUR-215 and was encountered in a relatively good state of preservation during the survey. It measured 6.1 by 5.7 m in width and was preserved to a height of 1.26 m. The cairn appeared not to be looted, and parts of an external façade were preserved on the east and west side of the cairn (Figure 5.1). This façade had a relatively irregular face and was made of boulders rather than slabs. A small depression was observed on the top of the cairn, which was assumed to indicate a collapsed burial chamber.

The excavations initially focused on defining the outline of this presumed burial chamber. After that, the remainder of the cairn fill was also excavated to search for other potential features. The excavations revealed that this cairn had been completely surrounded by a somewhat crudely constructed façade that had a roughly rectangular plan, measuring 4.8 by 4 m. The interior of the cairn had been filled up completely with crudely piled stones. Despite the suspected presence of a burial chamber, no such feature or others were present within the cairn or underneath it. Although a few small pieces of skeletal remains were retrieved from the fill of the cairn, these could not be safely attributed as human. They may equally represent remains of animals, such as rodents or birds, brought in through natural processes. The function of this cairn, therefore, must remain unknown.

5.2.1.4 Discussion

A complex situation has emerged from the excavations carried out at the different structures of QUR-215. Structure 1 was constructed between the 6th and 3rd centuries BC with the construction of plinth G and the chamber F, with which at least one contemporaneous human burial can be associated. This

structure may have been an enlargement of a small prehistoric cairn, but this reconstruction is based only on the occurrence of a possible Early Bronze Age pottery vessel, and therefore remains uncertain. Whatever the case, the pendant tail (Structure 2) was constructed at the same time as plinth G and chamber F, or in the subsequent centuries, (between the 3rd century BC and the early 1st century AD). More burials were later added to chamber F of Structure 1, the last one in relatively recent times. The large number of artefacts in chamber F, deriving from jewellery and a bronze vessel, belonged to one or both of the earlier burials in chamber F, and should therefore be ascribed a Hellenistic date. As for Structure 3, it is at this point completely unknown when it was constructed and if it served as a burial cairn.

Since the structures at QUR-215 were modified numerous times, and the fact that some of the features remain altogether enigmatic, connecting the Safaitic inscriptions situated on and around the cairns with any of the features is difficult. It remains difficult to make a direct relation between the inscription mentioning a cairn for a deceased person (see above) and one of the attested burials. A likely candidate is the burial attested in chamber F in Structure 1, which was dated to the 4th or 3rd century BC. It remains possible, however, that it relates to the second, undated burial within this chamber that may well be somewhat younger.

5.2.2 QUR-28, Structure 2

This site (329951 E 3514905 N) is situated on the southern ridge of the basalt plateau, and consists of a large circular platform on the edge of which a small burial cairn had been constructed (Figure 5.11). 53 Safaitic inscriptions and 49 petroglyphs were present at the site, mostly clustering around the cairn. A pendant (Structure 2) comprising 22 well-defined individual cairns diverged from the platform in a southeast trajectory. The better preserved cairns stood up to 75 cm high, and were situated farthest away from the platform. The more poorly preserved cairns only featured the outline of its base, and were situated closest to the platform. Excavations at QUR-28 focused on the pendant. At a number of the pendant's individual cairns actual chambers rather than crude stone heaps were observed, possibly representing burial chambers. This hypothesis was tested by excavating two of these chambers.

Of the first chamber, feature A, only the first course of stones was preserved (Figure 5.12). The exterior measurements of the chamber were 2.7 by 1.2 m. It was filled with small basalt cobbles and wind-blown sand. No artefacts or other finds were contained within this fill; subsequent excavation underneath the chamber also lacked artefacts. The second chamber, feature B, was preserved to a much better degree. Much of the well-constructed exterior façade of the chamber was preserved 4 to 6 courses high (*ca.* 75 cm in height), and chamber B had an oval shape measuring 2.4 by 1.9 m. Within the chamber was a dense packing of stones surrounded by wind-blown sand (Figure 5.13). This fill was excavated but contained no finds. The structure was excavated down to the natural soil.

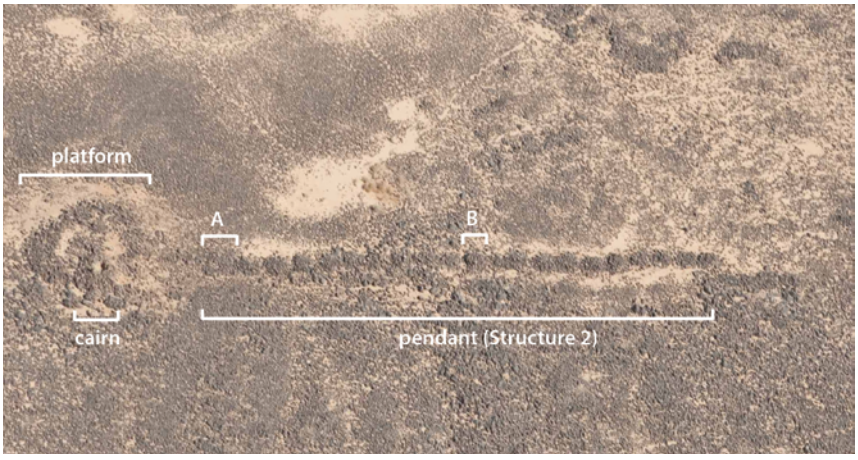

Figure 5.11 QUR-28 with its main features. Aerial photograph by M. Neville (courtesy of APAAME).

It may be concluded, then, that although both excavated features appear to have been carefully constructed, these were not burial chambers.

Figure 5.12 Feature A at QUR-28 (Structure 2): the base of a pendant heap. Scale is 50 cm.

Figure 5.13 Feature B at QUR-28 (Structure 2): a neatly constructed pendant heap. Scale is 50 cm.

Rather, as best demonstrated by feature B, they were carefully constructed cairns that had an external a façade with their interior completely filled up by stones. Although the function of these small cairns remains unknown, they do not seem to represent burial installations.

5.2.3 QUR-32, Structure 2

QUR-32 (330465 E 3514631 N) is situated *ca.* 500 m away from QUR-28, lying further to the east on the ridge of the basalt plateau (Figure 5.14). Here there is another pendant (Structure 2) that is flanked by a large platform-like structure on the northeast side and a burial cairn on the southwest side. 46 Safaitic inscriptions and 39 petroglyphs are present at the site, mostly located around the cairn. The pendant is the largest in the study area, comprising 58 individual cairns strung out over a length of nearly 135 m. Similar to QUR-28, several of these cairns appeared to have small chambers or, at least, a nicely constructed external façade. One of these cairns was excavated (feature A). Similar to Structure 2 at QUR-28, it appeared to be simply a cairn with a

Figure 5.14 QUR-32 with its main features. Aerial photograph by D. Kennedy (courtesy of APAAME).

nicely constructed façade, rather than a chamber. Its interior was completely filled up with small stones, which was excavated down to natural soil and was devoid of artefacts. Having defined the outline of the external façade of this small cairn (Figure 5.15), it was decided to take a soil sample (SN16-075) from underneath one of its base stones for OSL dating (Figure 5.16). The returned OSL date was 2.39 ± 0.38 ka BP (Table 5.4). Therefore, this feature must have been constructed somewhere between the middle of the 8th century BC and the early 1st century AD.

Figure 5.15 The excavated exterior of a small cairn that was part of the pendant (Structure 2) at QUR-32. Scale is 50 cm.

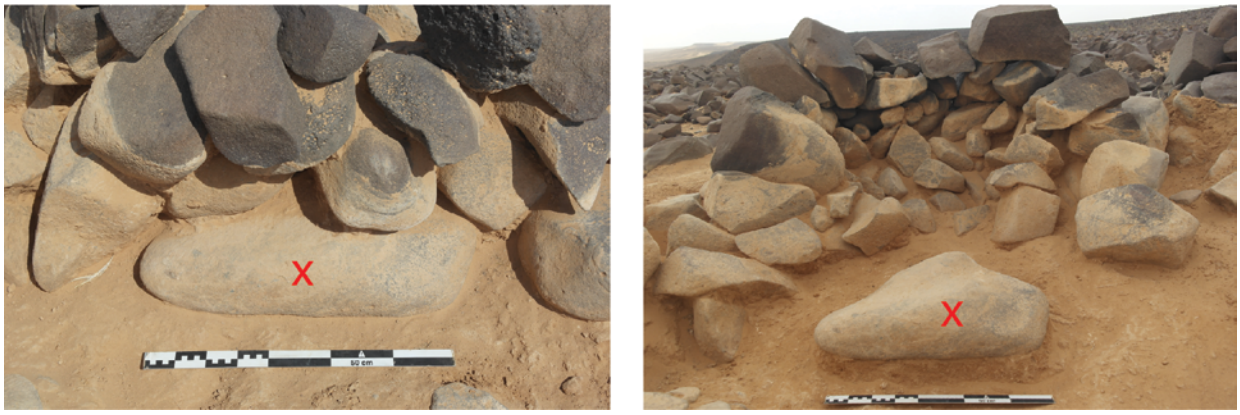

Figure 5.16 Context of OSL sample SN16-075: sediment was collected from underneath a base stone (marked) of feature A (Structure 2) at QUR-32. Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Context	Lab no.	Date BP
SN16-075	Sediment form underneath feature A	NCL-8216143	2.39 ± 0.38 ka BP

Table 5.4 OSL date from QUR-32 (Structure 2).

5.2.4 QUR-9, Structure 5

The site of QUR-9 (325700 E 3516559 N) is situated on the southern ridge of the Qurma massif, where it is delineated by topographic depressions on all sides (Figure 5.17). The site extends over an elongated area of about 1 ha that has a roughly northwest-southeast orientation. Part of the site has been covered by aeolian sand deposits, which also partially cover some of the site's features. The site consists of 6 cairns and 4 pendants; all except one of the pendants are connected to a larger cairn. The site also contains 19 Safaitic inscriptions and 8 petroglyphs. The rock art is mostly situated on and directly around the largest cairn at the site, Structure 3.

Structure 5 consists of two features, a main cairn and a pendant (Figure 5.18). Excavations at Structure 5 commenced in 2014 when three small cairns of the pendant, situated at its southeast end, were excavated. A fourth one was excavated in 2016 to obtain an OSL sample. The main cairn was excavated in 2016. A section was made through the cairn to investigate the construction.

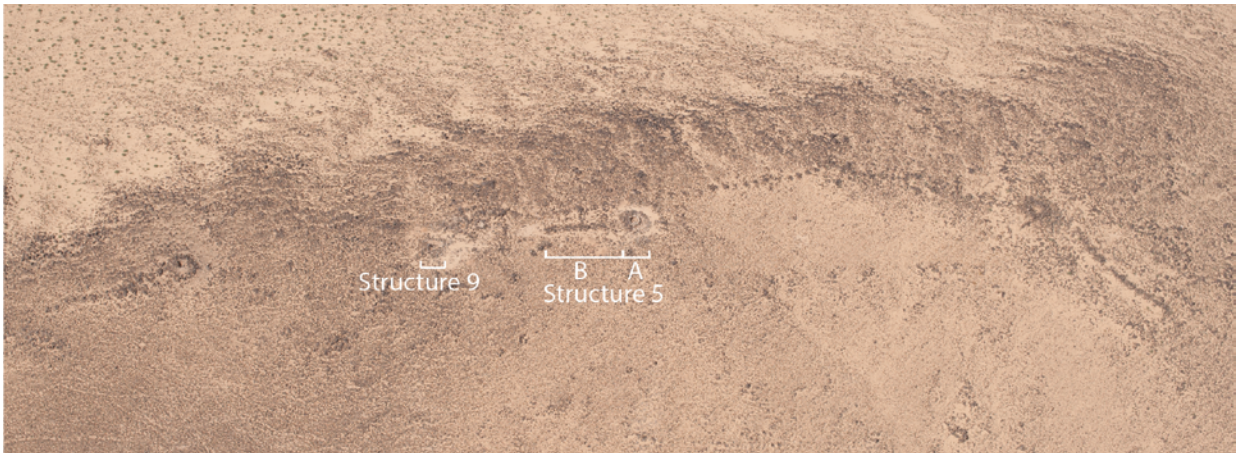

Figure 5.17 QUR-9 with features mentioned in the text. Aerial photograph by R. Banks (courtesy of APAAME).

The main cairn (Structure 5A) was encountered in an apparently good state of preservation. It had a diameter of *ca.* 7 m and stood 1.2 m tall. Two small depressions were visible on its northeast edge, possibly representing small-scale looting activities. The pendant (Structure 5B) diverged from the cairn in a southeast direction over a length of about 19 m, and consisted of 13 small cairns. A space of *ca.* 2 m separated the main cairn from the pendant. There was no rock art directly associated with these structures.

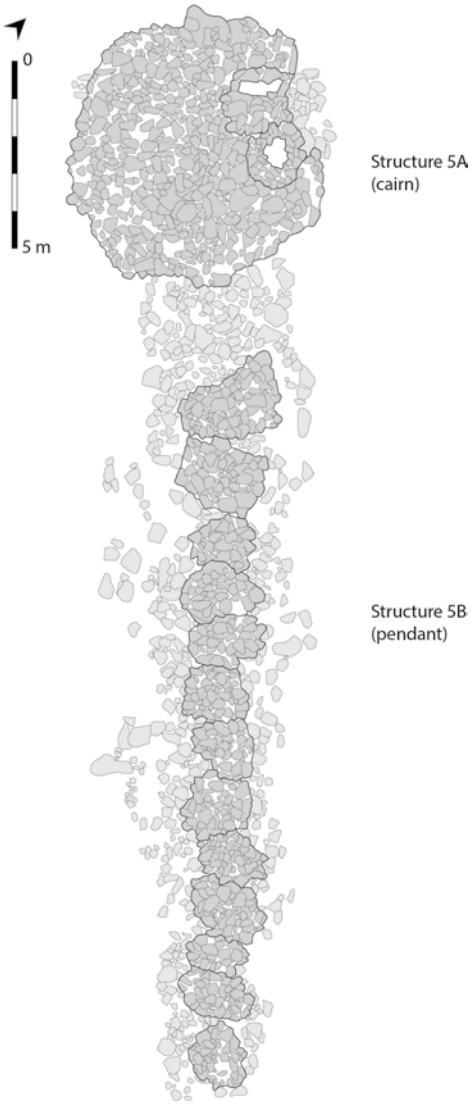

Figure 5.18 QUR-9, Structure 5 prior to excavation. Architecture drawn by A. Kaneda.

5.2.4.1 Structure 5A (cairn)

Architecture and burial

The excavations at Structure 5A revealed that the main cairn contained a circular wall with an exterior diameter of 2.9 m and an interior diameter of 2 m (Figure 5.19). This ring featured a neatly constructed façade on the outside that was constructed from basalt slabs and boulders, preserved to a height of *ca.* 80 cm (i.e. three to four stone courses). It was partially built on top of large naturally occurring boulders which gave the structure additional elevation. The top and sides of the ring wall were completely obscured by a cover of loosely piled boulders. The circular chamber does not seem to have been closed by covering slabs, as slabs large enough to span the distance were not present. Instead, the circular chamber was completely filled in with loosely piled stones, in which wind-blown deposits had subsequently accumulated. Poorly preserved fragments of a human skeleton and a number of artefacts were retrieved from this fill and underneath it, probably representing the remains of a grave (see below). Some of this material came from the bottom of the circular chamber, but some were retrieved from its fill. This suggests that the burial had been considerably disturbed and scattered through the chamber by rodents, beetles, and other small animals. The presence of bones from a small mammal, possibly a hare, is also indicative of such post-depositional processes.

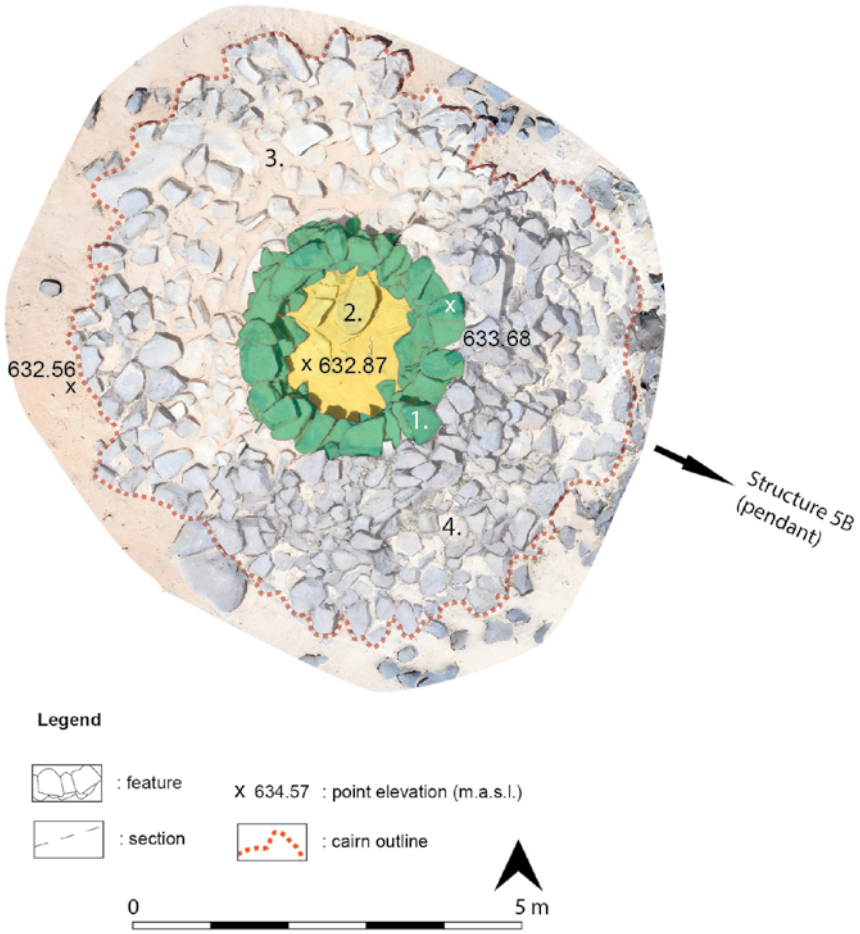

Figure 5.19 Features excavated at Structure 5A (QUR-9): 1) façade; 2) burial chamber; 3) excavated part of the cairn's cover; 4) unexcavated part of the cairn's cover. Base image: photogrammetric reconstruction.

Skeletal remains

The human skeletal remains retrieved from within Structure 5A were in a very poor state of preservation. They probably derived from a single adult individual, but further observations could not be made (Inskip 2016). Furthermore, due to the limited amount of collagen preserved in the bone tissue the remains were not suitable for radiocarbon dating.

Artefacts

A total of 39 artefacts were found, nearly all of them within the fill of the central chamber. Most of these artefacts were beads of various materials, including red semi-translucent stone, glass or glass paste, and shell, and possibly tooth (Figure 5.20). A few bronze fragments were also among the artefacts.

Figure 5.20 Artefacts from Structure 5A (QUR-9): 1) stone beads; 2) shell beads; 3) stone pendant.

Discussion

Based on the excavations, the following sequence of construction and use is proposed. The circular wall or chamber was created first, and a human body was deposited into it. The body was adorned with a number of objects, including jewellery made of beads and one or more objects made of bronze. The burial was subsequently covered by a dense packing of stones, which completely filled the chamber. Lastly, a stone cover was applied to obscure the chamber, including the top, from view. The chronology of this sequence cannot be determined on the basis of these excavations alone, as no closely datable material was found.

5.2.4.2 Structure 5B (pendant)

Architecture and OSL date

The four small cairns of the pendant that were excavated seemed to consist solely of crudely piled boulders. The cairns had a roughly circular to oval shape. External façades, similar to the one observed at QUR-32 and QUR-28, were not observed here. Again, no artefacts or other finds were present within or underneath these cairns.

An OSL sample was collected from underneath one of the small cairns of Structure 5B (Figure 5.21). The sample (SN16-155) returned an OSL-date of 2.77 ± 0.47 ka BP (Table 5.5), putting the construction date of this pendant, rather broadly, somewhere between the late 13th century BC and the early 3rd century BC.

Figure 5.21 Context of OSL sample SN16-155: sediment was collected from underneath a base stone (marked) of a small individual pendant heap of Structure 5B (QUR-9). Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Context	Lab no.	Date BP
SN16-155	Sediment underneath pendant heap	NCL-8216146	2.77 ± 0.47 ka BP

Table 5.5 OSL date from QUR-9 (Structure 5B).

5.2.4.3 Discussion

The relationship between the cairn and pendant is difficult to establish on the basis of these observations alone. The structures could be broadly contemporaneous, but alternate phases are equally plausible, with the cairn being constructed prior to the pendant or vice versa. None of the structures superimpose the other, and only one of the structures was dated with some degree of accuracy. No further comments on the relative chronology of these structures can be made at this point.

5.2.5 QUR-9, Structure 9

Structure 9 was a well-preserved cairn that appeared not to have suffered any recent looting (Figure 5.22). The cairn had a roughly circular base of about 6.3 m in diameter, and it stood up to a height of 1.3 m. Part of a wall outline was already visible in the centre of the cairn, made of relatively large basalt boulders. This wall suggested that the cairn contained a burial chamber. There was no pre-Islamic rock art associated with this cairn.

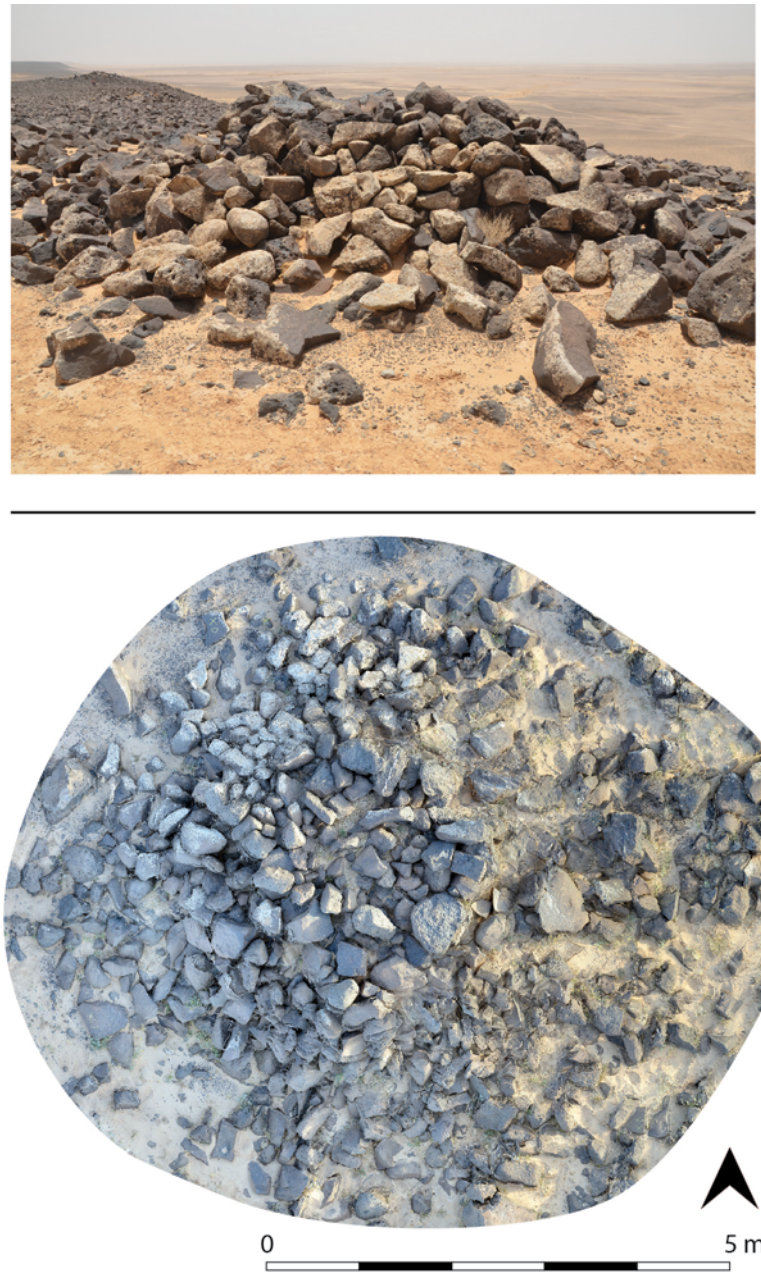

Figure 5.22 Side- and top view of Structure 9 at QUR-9 prior to excavation.

After the cairn was recorded in its current state through photogrammetric modelling, it was excavated. Excavations initially focussed on further defining the potential burial chamber. A section was subsequently created through the cairn to further investigate the architecture.

5.2.5.1 Architecture and burials

Similar to Structure 5A at the same site (QUR-9), Structure 9 appeared to contain a central circular wall (Figure 5.23). This ring had an interior diameter of *ca.* 1.5 m and an exterior diameter of *ca.* 2.75 m. It was preserved to a height of 85 cm and featured a neatly constructed exterior façade. This wall was constructed of both slabs and boulders, and partially stood on large naturally occurring rocks, which gave the wall some additional height. The fill of the circular chamber consisted of basalt boulders and wind-blown sand deposits. Numerous beads as well as small fragments of human skeletal remains were contained within these deposits. More skeletal remains and jewellery was retrieved from the layer of basalt and wind-blown sand that was covering the exterior of the circular chamber (Figure 5.24).

The bottom of the cairn's chamber was reached without encountering any articulated human skeletal remains. The chamber did not have a paved floor, and instead the floor consisted of natural virgin soil. Underneath this soil floor, a pit was discovered that was dug partially underneath the ring wall and into the bedrock. This pit measured 120 by 60 cm and was about 60 cm deep. It contained the fully articulated remains of a human skeleton (Figure 5.25). For this burial (Burial 1), the body was interred in a fully

contracted position on its right side, with the head placed in the southeast, facing northeast. The arms were flexed in front of the chest. No grave gifts were encountered. The body had been covered by loose soil that was itself covered by rocks that filled up the circular chamber. A bone sample (SN16-217) from this burial returned a radiocarbon date of AD 425-579 (Table 5.6).

5.2.5.2 Skeletal remains

Skeletal analyses showed that the articulated remains of Burial 1 were from a male that had died in his twenties. There were no indications about the cause of death. The highly fragmentary human skeletal remains from the fill of the chamber overlying Burial 1, and from the cover outside the burial chamber belonged to a second individual, also a young adult (Inskip 2016).

5.2.5.3 Artefacts

A total of 17 artefacts were found in the cairn (Figure 5.26). All of these came from the fill of the central chamber or from the layer of basalt and sand covering the exterior of the chamber.

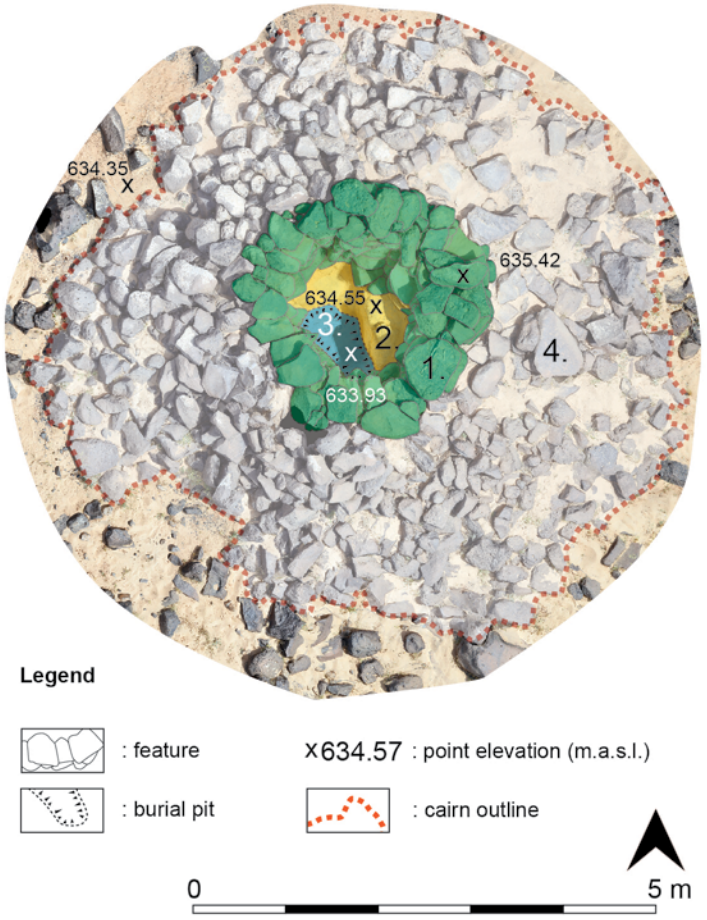

Figure 5.23 Features exposed through excavations at Structure 9 (QUR-9): 1) façade; 2) burial chamber; 3) burial pit; 4) cover. Base image: photogrammetric reconstruction.

Figure 5.24 Section through Structure 9 (QUR-9): 1) façade; 2) burial chamber; 3) cover. Scale is 50 cm. Photo by P. Akkermans.

Therefore, none of them were clearly associated with Burial 1. Instead, they most probably derive from another heavily disturbed burial that was identified within the skeletal remains. Most of the artefacts were beads made of red semi-translucent stone. However, beads made of bone, shell, and possibly glass paste were also present. None of these artefacts are closely datable. Additionally, a gold earring was found in the cairn. It had a simple hoop with an attached granulated pendant, that was flanked by two larger spheres. Altogether this composition may represent a hanging cluster of grapes. No exact parallels for this object were found, but it resembles a number of gold earrings from Tawilan in Southern Jordan, which were dated to the 10th to 9th centuries BC (Ogden 1995: Figures 8.20-24).

Figure 5.25 Burial 1 was interred in a pit that was dug out underneath Structure 9 (QUR-9). Scale is 50 cm. Photo by P. Akkermans.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN16-217	Human skeletal remains	Burial 1	GrA-68304	1545 ± 30	430-492 AD (46.8%) 530-558 AD (21.4%)	425-579 AD (95.4%)

Table 5.6 Radiocarbon date from QUR-9 (Structure 9).

5.2.5.4 Discussion

The results of the excavation of Structure 9 at QUR-9 are surprising in several ways. A remarkably well-preserved Byzantine-period grave was interred underneath the cairn rather than within its central chamber. The fact that the body was covered by soil with rocks probably contributed to its good state of preservation. However, this burial does not seem to represent the original one of the cairn. Firstly, the pit into which the body was placed was partially dug out underneath the wall of the circular chamber; this seems an unlikely procedure as it would partially undermine the wall. Secondly, the poorly preserved remains of a second burial were found in the fill of the chamber and the surrounding cover.

Figure 5.26 Selected artefacts from Structure 9 (QUR-9): 1) stone beads; 2) bone bead; 3) shell bead; 4) stone bead; 5) gold earring.

Among these remains was a gold earring that possibly dated to the Iron Age. It seems likely that these represent the remains of an earlier, perhaps original burial within the cairn. This burial may have been placed directly on the original floor of the chamber. Later, during the 5th or 6th century AD, the central chamber was reopened, and the remains of the older burial were scattered to make room for the second burial. Following this interpretation, the rocks covering the exterior of the circular chamber do not appear to be part of initial construction of the cairn: they were applied at some time after the original construction, but prior to the Byzantine burial. This assumption is based on the fact that the chamber wall itself was rather elaborately constructed, featuring a nicely set exterior façade, which was probably created to be visible from the outside. In fact, some of this façade was still visible during the survey.

5.2.6 QUR-970

The site of QUR-970 (326954 E 3520569 N) is situated on top of the north-western part of the basalt plateau. The site's main features are a large cairn (Structure 1), with an attached pendant (Structure 2) (Figure 5.27a). Two Safaitic inscriptions are located within a few meters around the cairn, and a third one was on a stone that lay on the top of the cairn. Both the cairn and pendant were excavated to investigate the nature and chronology of the architecture and to identify any potential burials.

5.2.6.1 Structure 1 (cairn)

The base of this cairn had a roughly oval outline measuring about 7.6 by 7.1 m. On the top of the cairn a potential burial chamber was observed that had an elongated shape. The total height of the cairn, including this chamber, was about 1.6 m.

The cairn was excavated during the 2015 and 2016 campaigns. Photogrammetric modelling was used to document the cairn's measurements. The chamber on the top of the cairn was excavated first, after which the remainder of the structure was excavated.

Architecture and burials

The elongated chamber placed on top of the cairn appeared to be a very recent addition to an older cairn. In this chamber, the complete skeleton of a recently (20th century) deceased individual was encountered. The older cairn was excavated below this burial and its chamber. Similar to the cairns at QUR-9, this cairn featured a circular wall in its centre acting as a burial chamber (Figure 5.27b). In Structure 1, the wall was constructed of three to four courses of basalt boulders and had an interior diameter of about 1.8 m. Its exterior diameter measured *ca.* 3 m. Although the north-western side of the chamber was poorly defined, the rest of the structure was well preserved. The chamber did not have a paved floor. Rather, its bottom consisted of an irregular layer of stone, perhaps representing the natural surface cover in this area. There was a depression within this floor layer in the southern half of the chamber, which possibly served as a burial cavity. The fill of this depression consisted of windblown deposits that contained relatively few stones, while the rest of the chamber was filled up with a dense layer of rocks. Dispersed over various parts of the cairn, in the circular chamber, and its exterior cover were highly fragmentary human skeletal remains (see below). There were also a number of artefacts in the cairn (see below).

Skeletal remains

In addition to the modern skeleton present in the chamber, the remains of two individuals were recognized within the underlying cairn. These incomplete and fragmentary remains were from a young adult and an older male adult (Inskip 2015b, 2016). The material was unsuitable for radiocarbon dating due to a lack of sufficient collagen in the bones.

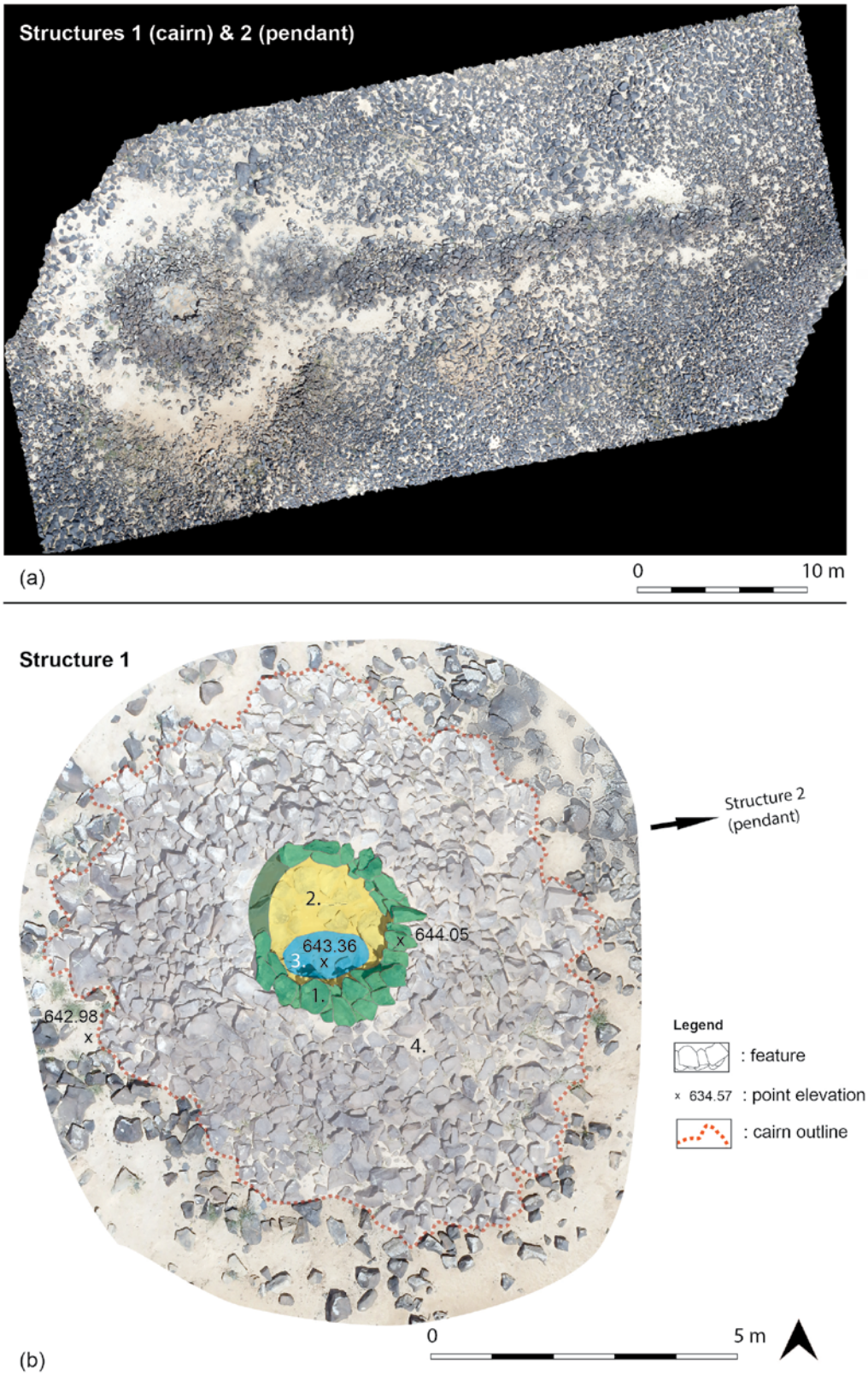

Figure 5.27 Excavated features at QUR-970: 1) façade (dark green shades are reconstructions); 2) burial chamber; 3) burial cavity; 4) cover. Base images: photogrammetric reconstructions based on drone- and handheld photographs.

Artefacts

Although many artefacts were retrieved during the excavations, most of these were associated with the modern burial. The only objects that perhaps could be associated with an older burial were four greenstone objects, including three beads.

Discussion

Although this cairn was clearly used as a tomb in antiquity, it is difficult to reconstruct the original date and nature of the tomb in detail due to its poor state of preservation. It is likely that the fragmentary skeletal remains originally lay within the oval depression in the circular chamber, although this cannot be said with certainty. Closely datable material was not encountered. It remains uncertain when this cairn was constructed and when it was first used for burials.

5.2.6.2 Structure 2 (pendant)

This pendant at QUR-970 consists of 13 clearly recognizable individual cairns, and extends for about 30 m to the east from the main cairn (Structure 1). Its individual cairns appeared as irregular, loosely piled stone heaps, none of which featured an external façade. Most of them were roughly oval in shape, between 1 to 3 m long and 40 to 60 cm tall. Four of these cairns were excavated.

Architecture and OSL date

All of the cairns indeed turned out to be simple heaps of stone that were loosely piled on top of virgin soil. A soil sample (SN16-153) was collected from underneath the second last cairn of the pendant for OSL dating (Figure 5.28). It returned a date of 2.69 ± 0.46 ka BP (Table 5.7). This heap was therefore constructed between the late 12th century BC and the late 3rd century BC.

Figure 5.28 Context of OSL sample SN16-153: sediment was collected from underneath a base stone (marked) of a small individual pendant heap of Structure 2 (QUR-970). Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Context	Lab no.	Date BP
SN16-153	Sediment underneath pendant heap	NCL-8216144	2.69 ± 0.46 ka BP

Table 5.7 OSL date from QUR-970 (Structure 2).

5.2.6.3 Discussion

No direct chronological relationship could be established between Structures 1 and 2. If the pendant was constructed during or after the construction of the main cairn, this would suggest that the cairn must have been built prior to the 2nd century AD (but see below for a more elaborate discussion).

5.2.7 QUR-956, Structure 1

The site of QUR-956 (326478 E 3520597 N) is situated on top of a basalt promontory on the east side of Wadi Rajil. Its main feature is a cairn (Structure 1) that is visible from Wadi Rajil below. It is accompanied by 118 Pre-Islamic inscriptions and 112 petroglyphs. Prior to excavation, part of a façade was visible on the eastern exterior face of the cairn. Also on this side, two stone protrusions form a crescent-shaped extension to the cairn. The rest of the cairn consisted of what seemed to be loosely piled stones. The cairn measured about 6.7 by 5.5 m. In the centre of the cairn there was a chamber visible that appeared to have been looted. About two meters to the north of the cairn, three small stone heaps formed a 9.3 m long pendant tail, which extended from the cairn in a northern direction.

The first step of the excavation procedure was to excavate the interior chamber that was already visible. This was done to see if the chamber contained any human burial remains and to further study the architectural elements of the chamber. While it was partially visible prior to excavation, the external façade was further uncovered by removing the cover of loose basalt stones that lay against it.

5.2.7.1 Architecture and burial (Figure 5.29)

The façade of Structure 1 could be traced around much of the exterior of the cairn by removing the cover of small and loosely piled basalt stones. Some of the large basalt slabs comprising the façade were more than 1 m in length, but these were sometimes interspersed by smaller boulders. The façade was best preserved on the north and east side, where it stood up to five stone courses high, more than 1 m in total height (Figure 5.30). The south side was less well preserved but still clearly defined, whereas most of the façade had already collapsed on the western side. Here, some basalt slabs had fallen out of the wall and were lying next to the presumed original outline of the façade. The partially reconstructed outline of the façade has a diameter of about 3 m.

The chamber in the centre of the cairn measured 140 by 71 cm and was about 90 cm deep. Its walls had a corbelled construction on all sides, but this was best preserved on the west side of the chamber. These corbelled walls stood on top of a floor paved with basalt flagstones. The flagstones were covered by a layer soil about 10 cm thick that contained a high amount of natural flint pieces. Above this flint-rich surface lay a layer of soil, in which the poorly preserved remains of a human burial were found; the soil included highly fragmented human skeletal remains as well as a few artefacts that probably represent grave goods (see below). This layer of soil had been disturbed to some degree by recent looting activities. The uppermost 30 cm of the chamber was completely empty. It was either emptied already by looters or had never been filled by rocks or soil. The absence of looter's debris outside the chamber suggests the latter interpretation is more likely.

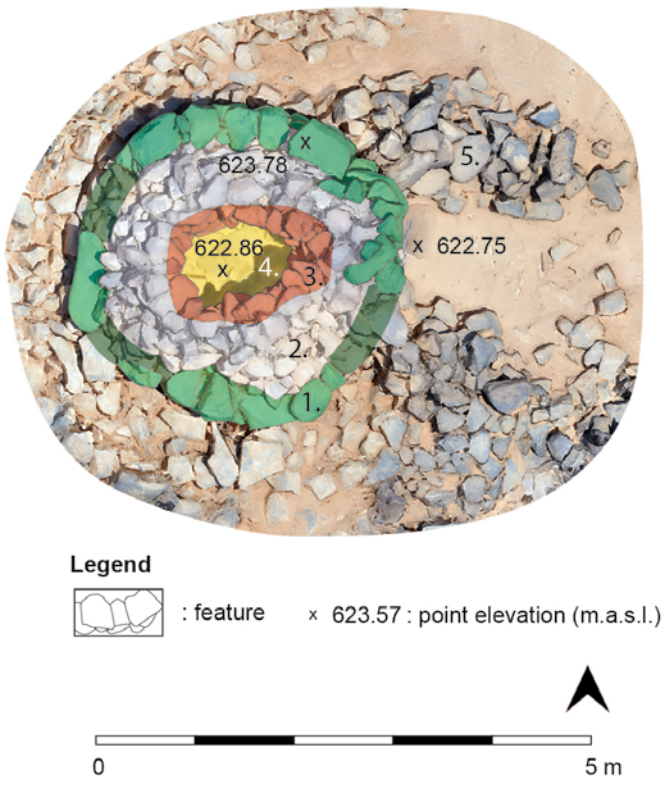

Figure 5.29 Features exposed through excavation at QUR-956 (Structure 1): 1) façade (dark green shades are reconstructions); 2) cover of burial chamber; 3) corbelled wall of burial chamber; 4) burial chamber; 5) protruding arms (not original).

Figure 5.30 Façade of Structure 1 at QUR-956 prior to excavation. Scale is 50 cm. Photo by P. Akkermans.

The fill of loose and relatively small basalt stones that lay on top of the chamber walls acted as a counterweight to support the corbelled construction of the burial chamber. Importantly, part of this fill was overlying the (partially) collapsed façade on the south and west side of the cairn. This indicates that the burial chamber, as visible today, was constructed after the façade had collapsed, and thus after the original construction event of the cairn. At this point it is not entirely clear whether this phase of renewal only entailed repairs to the chamber or, alternatively, the complete refurbishing of the interior of the cairn. Whatever the case, it seems likely that the burial remains found in the chamber represent a phase of reuse. As these remains were not lying on the original floor of the chamber but on top of the flint-rich soil layer, they may be associated with the structural modifications. This unworked flint suggests that soil was brought into the chamber purposefully prior to the interment of a body.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN15-201	Human skeletal remains	Fill of burial chamber	GrA-67035	1890 ± 30	66-136 AD (68.2%)	56-217 AD (95.4%)

Table 5.8 Radiocarbon date from QUR-956 (Structure 1).

5.2.7.2 Skeletal remains

The skeletal remains from the fill of the burial chamber originated from a single individual. Their poor state of preservation did not allow for an estimation of sex or age (Inskip 2015b). The obtained radiocarbon date (SN15-201; Table 5.8), suggests that the individual was buried between the late 1st and early 3rd century AD, although the 1 sigma range indicates that a date after the early 2nd century is unlikely.

In addition to the human bones, part of the upper jaw of a sheep or goat were also found. It was in a fairly good state of preservation and is therefore probably a fairly modern intrusive find.

5.2.7.3 Artefacts

The artefacts from the fill of the chamber (above the flint-rich surface layer) included three red semi-translucent beads, a shell bead, a bead made of blue glass. A few pieces of discovered bronze may be the remnants of a pin or broche (Figure 5.31). They are from the same contexts as the human bone fragments, and are likely to represent associated grave gifts.

5.2.7.4 OSL-dates

In order to establish the original construction date of the cairn, a soil sample was collected from underneath one of the base stones of the external façade for OSL dating (Figure 5.32). The sample (SN16-154) returned an OSL date of 5.58 ± 0.42 ka BP (Table 5.9), indicating that the façade was constructed during the 4th millennium BC (i.e. during the Late Chalcolithic period or Early Bronze Age). This date is much older than comparable structures and requires further explanation (see § 5.2.13.). There are no indications, however, that the sampling context or procedure is problematic.

5.2.7.5 Discussion

The excavation of the cairn at QUR-956 provides evidence for the reuse of a late prehistoric tomb during the Late Hellenistic or Early Roman period. The original cairn, featuring a façade, was later transformed by applying a covering layer of soil and stones that also provided structural support to the corbelled burial chamber. Within this chamber, a new floor of soil was applied, on top of which a human body was interred, accompanied by jewellery.

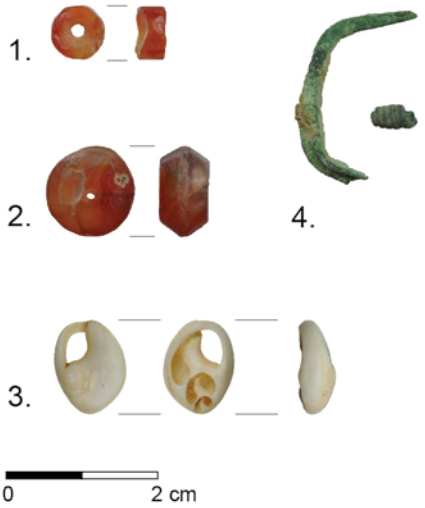

Figure 5.31 Selected artefacts from the burial chamber in structure 1 (QUR-956): 1 and 2) stone beads; 3) shell pendant; 4) fragments of bronze jewellery.

Whether this phase of reuse is directly related to the many pre-Islamic inscriptions and petroglyphs situated around the cairn is not certain. Some of the rocks covering the cairn carried inscriptions, but it is impossible to say whether these inscriptions were applied before or after the rocks were incorporated in the construction. Also, none of the inscriptions refer to a burial or burial cairn (Della Puppa forthcoming). The chronological relationship to the cairn's short pendant must remain unknown for now as well, since this pendant has not been dated. Although none of the OSL dates from other pendants dated to the prehistoric period, it remains unknown whether it is contemporaneous with the dated skeletal remains.

Figure 5.32 Context of OSL sample SN16-154: sediment was collected from underneath a base stone (marked) of the façade of Structure 1 (QUR-956). Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Context	Lab no.	Date BP
SN16-154	Sediment underneath façade	NCL-8216145	5.58 ± 0.42 ka BP

Table 5.9 OSL date from QUR-956 (Structure 1).

5.2.8 QUR-2, Structure 13

The site of QUR-2 (323620 E 3517818 N) lies on the very top of Jebel Qurma, the prominent and isolated basalt-capped hill situated on the eastern edge of Wadi Rajil (Figure 5.33). Structure 13 is the largest of several burial cairns situated on this hill. Prior to excavation it had a diameter of about 14 m. A total of 530 pre-Islamic inscriptions and 350 petroglyphs were attested at the site, including on and around Structure 13. The cairn was looted extensively in recent times, leaving a large depression in the centre of the cairn, and large amounts of looting debris on its northern slopes. Nonetheless, a number of features were visible already prior to excavation, including parts of a massive circular wall in the centre of the cairn. Incorporated in this wall were stones carrying Safaitic inscriptions. These inscriptions were visible in the seams of the wall (Figure 5.34), indicating that some of the stones at this site already bore inscriptions before they were used to construct the wall. Part of another feature was visible on the southeastern slope of the cairn, where part of a façade also appeared to be present. Importantly, these potential features were present in areas of Structure 13 that had remained unaffected by recent looting. It was therefore decided to further investigate this cairn through excavations.

Figure 5.33 Structure 13 (QUR-2) atop Jebel Qurma prior to excavation. Scale is 50 cm. Photo by P. Akkermans.

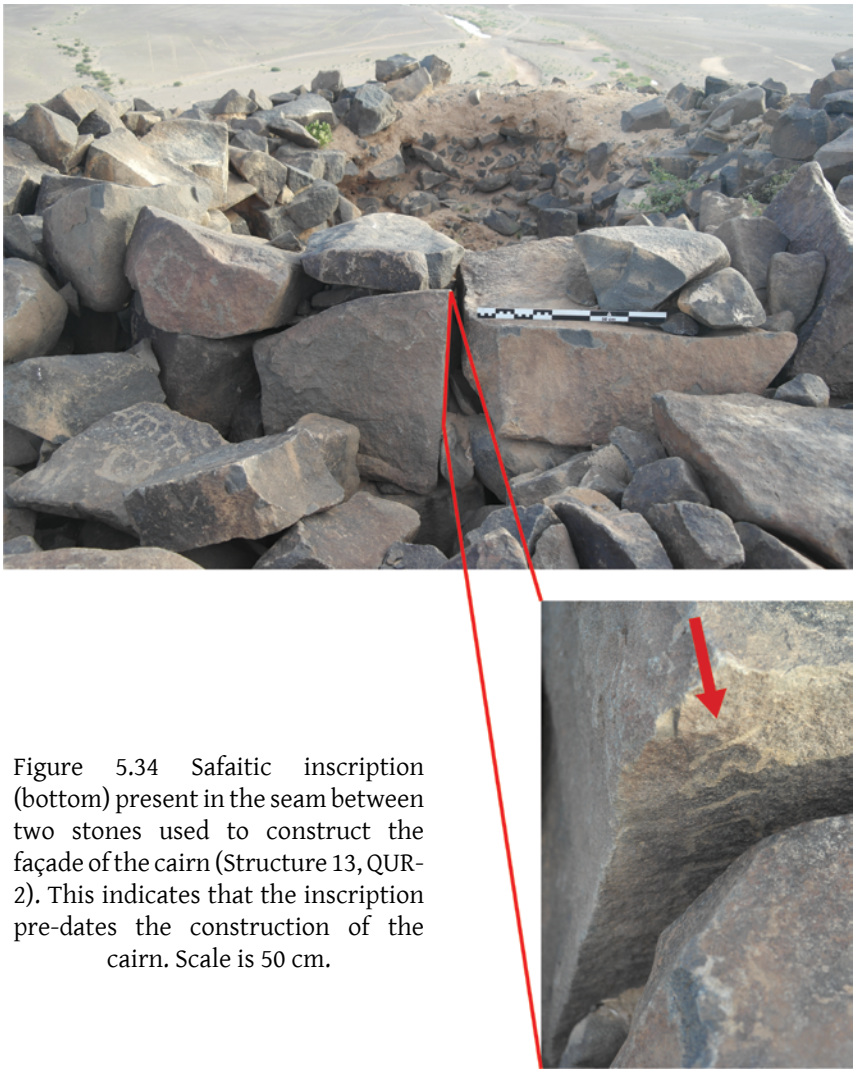

Figure 5.34 Safaitic inscription (bottom) present in the seam between two stones used to construct the façade of the cairn (Structure 13, QUR-2). This indicates that the inscription pre-dates the construction of the cairn. Scale is 50 cm.

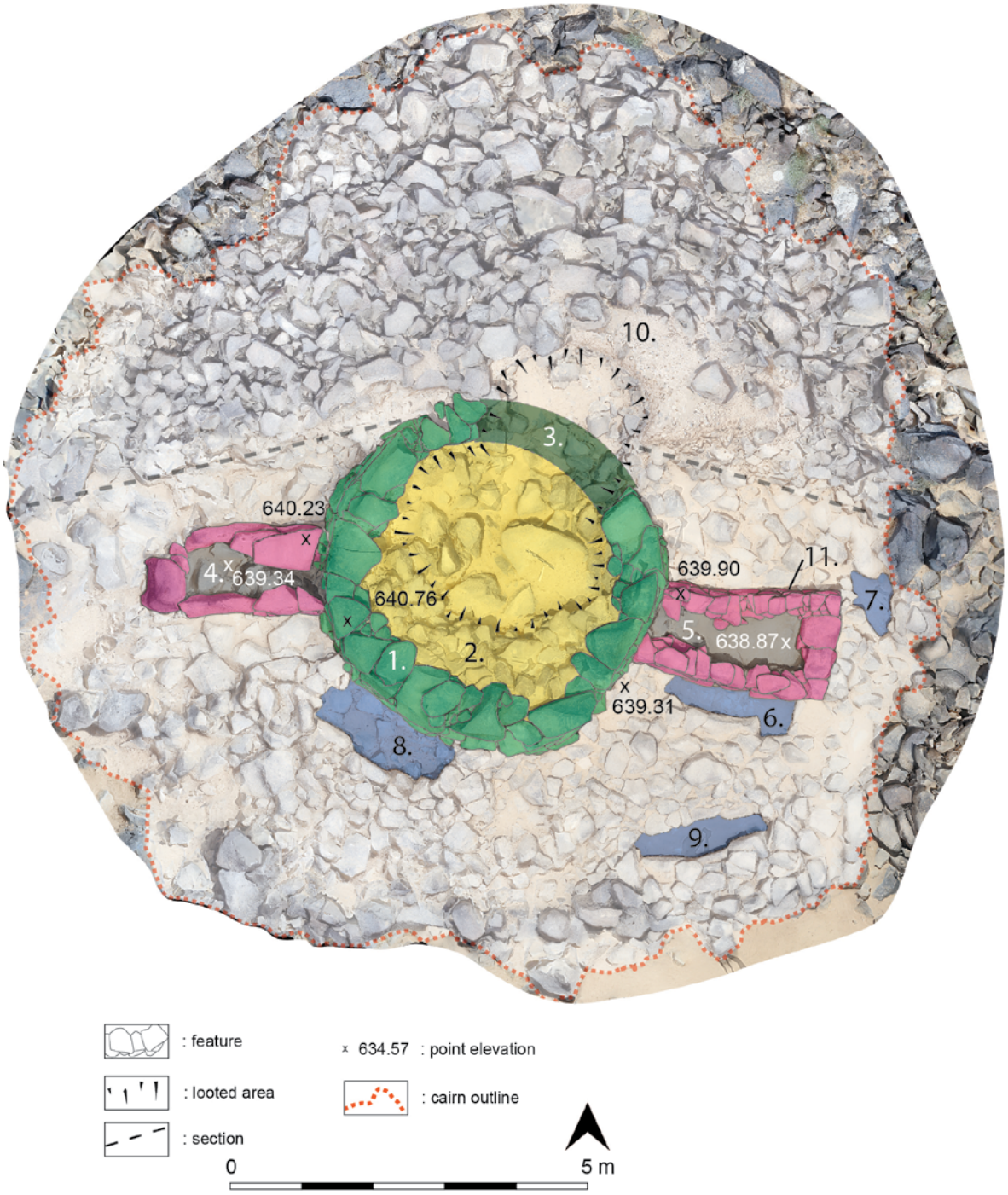

Figure 5.35 Features revealed through excavations at Structure 13 (QUR-2): 1) façade; 2) disturbed interior of the cairn; 3) reconstruction of the façade; 4) chamber A; 5) chamber D; 6) burial cavity E; 7) burial cavity F; 8) chamber B; 9) chamber C; 10) unexcavated looter's debris; 11) OSL sampling location.

The excavations largely focussed on the areas of the cairn situated outside the central circular wall observed prior to excavations. This 'cover', a mixture of loosely piled basalt stones and sand was removed one layer at a time, paying close attention to emerging architectural features. The sediments that were part of the cover were sieved. Less attention was paid to the areas that seemed to be most

heavily disturbed by looters, including the centre of the cairn and its northern slopes, where most of the looting debris had been deposited.[14]

5.2.8.1 Architecture and burials

The excavations at Structure 13 uncovered large parts of what had once been a circular tower-like feature in the centre of the cairn (Figure 5.35). It was well-preserved on most sides but looters had demolished its north-eastern side. The base of this tower had an exterior diameter of about 4.8 m and its interior diameter was about 3.15 m. The construction of this tower used up to four courses of often massive stone boulders and slabs, which reached a preserved height of 1.45 m (Figure 5.36). These blocks were neatly placed with their flat surfaces facing outwards, thereby forming a fairly smooth and straight façade. Some of the blocks used were very massive: a roughly rectangular block situated on the very top of the tower measured 84 x 40 x 34 cm, and probably weighed over 400 kg.[15] The structure also incorporated even larger stones. Extensive looting destroyed any potential remains of an interior chamber. The skeletal remains of at least three individuals (two adults and a possible sub-adult) were recognised within the debris of the looting activities (Inskip 2016), indicating that the tower had been used as a tomb. Five bone samples from these individuals were radiocarbon dated. Two of them returned an Ottoman/Mandate-period date while two others contained insufficient collagen for dating. The final sample (SN16-208), returned a late 1st century BC to early 2nd century AD date range (Table 5.10).

Figure 5.36 Façade of Structure 13 (QUR-2). Scale is 50 cm. Photo by P. Akkermans.

Figure 5.37 Exterior of chamber A, which was constructed against the façade of the main tower of Structure 13 (QUR-2). Scale is 50 cm. Photo by P. Akkermans.

Two rectilinear ante-chambers were constructed against the façade of the tower, on the western (chamber A) and eastern side (chamber D). Chamber A was largely made of basalt slabs that were placed on their sides, enclosing a room measuring 2.00 by 0.86 m (Figure 5.37). Two Safaitic inscriptions were carved (QUR-2.283.1 and 2) onto the exterior of the basalt slab on the westernmost end, which mentioned personal names and pastoral activities (Della Puppa forthcoming). The fill of this chamber contained only

[14] These areas were excavated in 2017, but not incorporated in this research.
[15] A specific gravity of 3.7 grams per cm^3 is used here, following Rollefson (2013: 222).

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN16-204	Human skeletal remains	Skeletal remains from chamber D	GrA-68302	1905 ± 30	68-128 AD (68.2%)	25-175 AD (92.4%) 191-211 AD (3.0%)
SN16-208	Human skeletal remains	Looting debris from main tower	GrA-68436	1970 ± 40	20-11 BC (5.8%) 2 BC - 72 AD (62.4%)	50 BC – 125 AD (95.4%)

Table 5.10 Radiocarbon dates from QUR-2 (Structure 13).

very fragmented and unidentifiable bone fragments. However, Chamber D yielded more convincing evidence for the use of the chamber as a tomb. This chamber had similar dimensions to Chamber A, measuring 2.30 by 0.55 m on the interior, but unlike Chamber A, had a neatly constructed drystone wall of three to four courses high (Figure 5.38). A Safaitic inscription (QUR-2.704.1) carved on the exterior face of this wall likely indicates a personal name (Della Puppa forthcoming). The chamber contained the partially articulated human skeletal remains of two individuals – a woman and probably a man (Inskip 2016). These were buried in a contracted position, on top of each other, and in the eastern part of the chamber. As the remains were not clearly separated in situ, they seem to have been buried either together or shortly after each other. A bone sample (SN16-204) from one of the individuals was sent out for radiocarbon dating and returned a 1st to 2nd century AD date (Table 5.10). The second individual was not dated. In association with these skeletal remains were number of artefacts, likely grave gifts (see below).

Figure 5.38 Exterior of chamber D, which was constructed against the façade of the main tower of Structure 13 (QUR-2). Scale is 50 cm. Photo by P. Akkermans.

Against the southern wall of Chamber D, excavations identified an elongated trench-like feature (feature E) that was surrounded by a row of neatly placed slabs. This cavity contained the remains of yet another human burial, possible of a male individual (Inskip 2016). Due to a poor state of preservation, the burial could not be radiocarbon dated. Also found here were large numbers of beads and four bronze coins, one of which was identified as a late 2nd or early 1st century BC Seleucid coin (see below). The simple tomb comprising feature E was created against the façade of Chamber D and was probably covered simply by a pile of stones. This would imply that the Seleucid coin had been circulating for one or more centuries before it ended up in the tomb, but this is not an implausible scenario (cf. Lockyear 2012: 197).

Another cavity (feature F) contained additional human skeletal remains, and was situated to the northeast of Chamber D. This cavity measured about 1.00 by 0.55 m and was unlined. It preserved the disarticulated remains of two individuals, which mostly included long bones and the skulls; this may then represent secondary burials. Their poor state of preservation prevented radiocarbon dating of the bone material. Also, this context did not have any clearly associated artefacts.

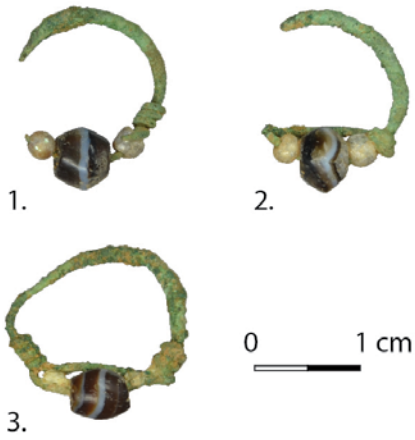

Figure 5.39 Three bronze earrings with pendants of pearl and stone from chamber D (QUR-2, Structure 13).

Two more tombs (features B and C) were added onto the structure at a much later date. From tomb B came the skeletal remains of a human individual that was radiocarbon dated to the Ottoman/Mandate-period. This burial was much better preserved than the more ancient ones, and even included textile remains. Tomb C contained similarly well-preserved skeletal remains and textiles . Its construction was already partially visible prior to excavation. Although the bones in Tomb C could not be radiocarbon dated, the state of preservation of the skeleton and textiles and its orientation supports a relatively recent date.

In summary, Structure 13 comprised various tombs and the remains from multiple individuals, only three of which could be dated with certainty to the pre-Islamic period. These include: one of the burials from the main tower, radiocarbon dated between the late 1st century BC and the early 2nd century AD; one of the burials from Chamber D, radiocarbon dated to the 1st or 2nd century AD; and the burial from feature E, which despite of the occurrence of a Seleucid coin is probably slightly younger. A number of skeletons may be of pre-Islamic origin as well, but this could not be established with certainty. These include the second individual from Chamber D, the two individuals from feature F, and one or more individuals from the central tower. Evidence for relatively recent (Ottoman/Mandate-period) reuse of the structure is also attested.

5.2.8.2 Artefacts

The excavations of Structure 13 identified a large number of artefacts, with some coming from contexts most clearly associated with pre-Islamic burials (tombs D and E). From the fill of tomb D (Figure 5.39) came a remarkable set of bronze earrings, featuring small pendants of pearl and gemstone. Three of these earrings were well-preserved while the remains of perhaps three more earrings were found in a more fragmentary state. The other finds from tomb D included two beads of red semi-translucent stone and one of glass past, as well as fragments of some kind of iron pin.

Figure 5.40 Conjectural reconstruction of a necklace made of beads and pendants from chamber E (QUR-2, Structure 13).

More jewellery was encountered in tomb E. Over a hundred beads were found here, perhaps all part of a single necklace (Figure 5.40). Most of the beads (n=100) were made of glass paste, while the remainder was made of stone (n=8), shell and coral (n=8), bronze (n=1), and perhaps bone (n=1). Other artefacts probably represented additional jewellery, including two iron rings and a bronze ring, two earrings, three fragments of a glass object, and part of a chain of three bronze links (Figure 5.41). Finally, four bronze coins were found in tomb E, with diameters between 12 and 16 mm. They were heavily corroded, completely obscuring the imprints of two of the coins. But, a third coin (Figure 5.41 no. 1) had a palm tree, which is typologically characteristic of Seleucid coins from the late 3rd to 1st centuries BC. The fourth coin (Figure

5.41, no. 2) was more clearly identifiable. Its obverse side featured the helmeted head of Athena, while the reverse side shows a prow and a text referring to king *Antiochos Philopatros*. Based on Houghton *et al.* (2008, catalogue number SC 2378), the coin can be assigned to the reign of the Seleucid king Antioch IX (114/3 – 95 BC).

5.2.8.3 OSL date

A single sample for OSL dating was collected from underneath one of the base stones of the northern wall of tomb D. This wall was built directly onto the natural soil, which was sampled to obtain the construction date of the tomb (Figure 5.42). The sample (SN16-234) returned an OSL date of 2.19 ± 0.15 ka BP (Table 5.11), which places the construction date of tomb D between 325 and 25 BC.

5.2.8.4 Discussion

The excavations at Structure 13 revealed a complex sequence of use and reuse, which can only be reconstructed in general terms due to circumstances of preservation. Nevertheless, it is clear that the central tower was constructed after the Safaitic inscriptions had been created at this site, given the fact that inscribed stones were reused in the construction of the tower. If we were to follow the traditional chronological limits of Safaitic, then the tower would post-date the 2nd century BC. However, given the OSL date obtained from underneath tomb D, the tower cannot be younger than the 1st century BC.

Originally the tower must have been free-standing, lacking the thick covering of stone and soil that was visible prior to its excavation. A number of observations support this interpretation, including the fact that several ante-chambers were constructed against the façade of the tower at a later date. The last of these additions (chamber B) contained a post-

Figure 5.41 Selected artefacts from chamber E (QUR-2, Structure 13): 1 and 2) Seleucid bronze coins; 3) bronze ring; 4) fragment of a bronze earring (?); 5) bronze chain.

Figure 5.42 Context of OSL sample SN16-234: sediment was collected from underneath a base stone (marked) of the wall of chamber D (QUR-2, Structure 13). Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm.

Sample no.	Context	Lab no.	Date BP
SN16-234	Sediment underneath wall of chamber D	NCL-8216147	2.19 ± 0.15 ka BP

Table 5.11 OSL date from QUR-2 (Structure 13).

16th century AD burial. Therefore, the original façade of the tower was meant to be visible instead of obscured.

Whether the two rectangular ante-chambers A and D were part of the original construction or added during a later event remains unclear. The OSL and radiocarbon dates from chamber D suggest that this chamber was not created much later than the tower, but the same degree of certainty cannot be given for chamber A. Also added during roughly the same period was the burial in area E, from which the Hellenistic coins originated. It is also difficult to currently determine when and where the individuals from the secondary burials in area F were originally buried.

The nature of the construction of the central tower is striking, not only in terms of its visual prominence but also given the large amount of basalt stones used for its construction. If the entire wall of the tower originally stood to a height of 1.45 m, and was about 80 cm thick, then the entire wall consisted of about 215 tonnes of stone.[16] Furthermore, some of the individual blocks were calculated as weighing more than 400 kg: such stones were not only placed at the base of the tower but placed one metre above the surface. Lifting and placing these rocks must have required perhaps six or more people or, alternatively, a ramp or other kind of construction.

5.2.9 QUR-148, Structure 23

Structure 23 is a cairn located at the large, multi-period site of QUR-148 (Figure 5.43; 333323 E 3519544 N). It was constructed on top of a large prehistoric Wheel structure. A total of 277 Safaitic inscriptions and 198 petroglyphs were found in association with the cairn. These were distributed mainly around the eastern part of the cairn, rather than directly on it. A number of architectural features were visible prior to excavation, including a burial chamber and part of a façade. The estimated diameter of the entire cairn was 9.1 m. Unfortunately, recent looting activities disturbed its burial chamber, although parts of the chamber still appeared to be intact (Figure 5.44). Concentrations of looter's debris lay on the slope of the cairn to the southwest of the chamber. Human skeletal remains already salvaged from these concentrations

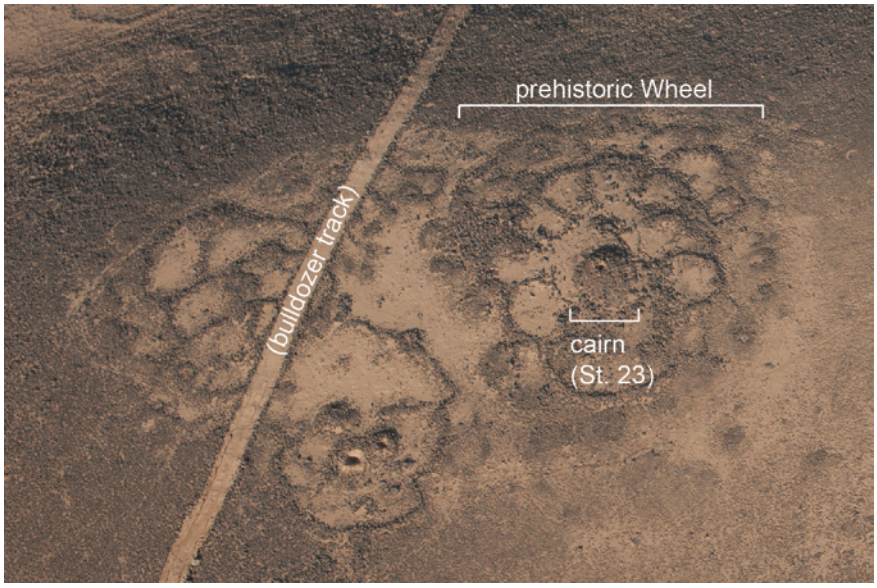

Figure 5.43 Aerial view of the site of QUR-148, showing Structure 23 overlying a prehistoric wheel. Aerial photograph by D. Kennedy (courtesy of APAAME).

[16] This total is based on the following equation: $3.7((\pi * 4.8^2 * 1.45)-(\pi * 3.20^2 * 1.45)) = 215.7$. The volume of the interior of the tower is subtracted from the volume of the entire tower, and the resulting figure is then multiplied by the specific gravity of basalt.


Figure 5.44 Structure 23 at QUR-148 prior to excavation. The burial chamber of cairn had been partially looted. Scale is 50 cm. Photos by P. Akkermans.

during the survey supported its initial interpretation as a burial chamber. A large basalt slab that likely covered the earlier chamber had fallen into it.

Initially, excavation focused on the looter's debris on the southwestern side of the cairn, as it contained some human bone material. The excavations then concentrated on the central burial chamber, the anticipated façades, and the interstitial cairn fill. Due to time constraints it was decided to excavate only about half of the cairn, although the central burial chamber was excavated in its entirety.[17]

5.2.9.1 Architecture and burials (Figure 5.45)

The excavations of Structure 23 exposed a 6 m section of a façade (D), which originally formed the exterior of a circular tomb that was about 4 m in diameter. This façade was up to 80 cm high, or five stone courses (Figure 5.46). It was constructed of basalt slabs and boulders that were neatly stacked on top of each other. Its base stood on top of a number of very large, naturally occurring stones and on smaller stones in between. Although it is unclear whether this 'platform' was natural or man-made, it was used to give the tomb some 50 cm of additional elevation above the surrounding surface.

In the centre of the tomb was a roughly oval shaped chamber (A), measuring 1.7 by 0.9 m, and with its long axis in a northwest-southeast orientation. Some corbelling was observed in the construction of its walls, and the large slab that had fallen into the chamber perhaps originally covered the chamber, creating a chamber of about 60 cm deep. The floor of the chamber consisted of small flat tones that had been placed between larger stones, which may have been naturally occurring (Figure 5.47).

Chamber A was used on multiple occasions for the interment of a human body. The looter's debris and the preserved parts of the chamber contained the skeletal remains of at least three human individuals. The remains of two individuals were radiocarbon dated to the Mamluk and Ottoman/Mandate period (Table 5.12). For the interment of one of these later individuals, the burial chamber was extended slightly on its south-eastern side. The third individual was an adult but could not be dated since no collagen was preserved in the bone tissue. In addition to these skeletal remains, the chamber had a number of beads and a small fragment of iron (see below). These may have been part of a grave inventory, but the frequent reuse and partial looting of the chamber makes a more specific attribution impossible.

Another burial chamber was constructed against the façade of the main tomb. This chamber (B) had a roughly rectangular shape and was mostly made of large slabs that were placed on their sides (Figure 5.48). A Safaitic inscription was carved onto one of these slabs. The interior of the chamber

[17] The other half was excavated in 2017, but these results are not incorporated in this study.

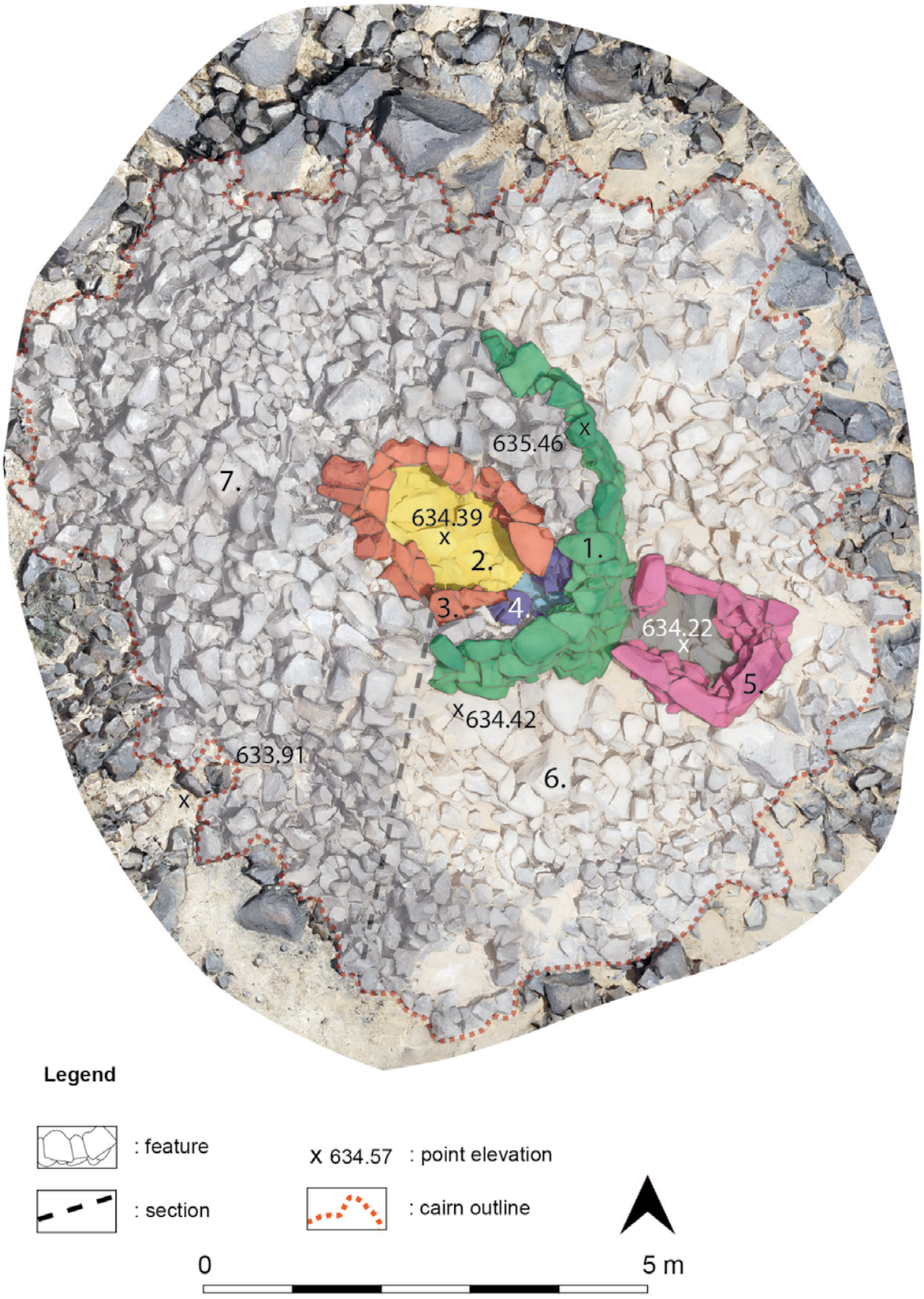

Figure 5.45 Features exposed through excavations at Structure 23 (QUR-148): 1) façade D; 2) chamber A; 3) wall of chamber A; 4) extension of chamber A; 5) chamber B; 6) excavated part of the cairn's cover; 7) unexcavated part of the cairn's cover. Base image: photogrammetric reconstruction.

measured 1.4 by 1.05 m, and the exterior façade had a preserved height of 78 cm. The bottom of the chamber consisted of irregularly placed stones rather than of a neat floor. The fill of the chamber largely consisted of stones as well, with soft sand or silt in between. This fill held the skeletal remains of two individuals. Although this chamber was not touched by recent looting, these remains were found in a poor state of preservation and disarticulated (Figure 5.49). Unfortunately, the bone tissue did not preserve any collagen, making them unsuitable for radiocarbon dating. In addition to the skeletal remains, the chamber's fill contained a large number of beads (see below).

Figure 5.46 Façade D of Structure 23 (QUR-148) as exposed through excavations. Scale is 50 cm.

Basalt boulders covered both façade D and Chamber B, and windblown sediments had accumulated between these boulders. This cover was about 80 cm thick and obscured much of the tomb after its construction. How and when this cover formed is not entirely clear. The fill of this cover preserved some skeletal remains. Much of this material probably belonged to the individuals that were originally buried in chamber A, but were thrown out of the chamber by looters. These also included the remains of a neonate.

5.2.9.2 Skeletal remains

Two individuals from Chamber A could be dated relatively recently, after the 13th century AD (Table 5.12), while the skeletal remains from the remaining individuals could not be dated due to a lack of collagen. The poor state of preservation of these bones suggests that they predate the Mamluk period, yet there is currently no way to reach a more conclusive date.

5.2.9.3 Artefacts

A total of 63 artefacts characterized as 'small finds' were found during the excavations. From Chamber A came 13 beads, mostly made of glass and stone, as well as a piece of iron. A few of the larger glass beads from this context have circular

Figure 5.47 Floor of burial chamber A in Structure 23 (QUR-148). Scale is 50 cm.

inlays, but these so-called eye beads cannot be dated with any precision. From the cairn covering layer came another 12 beads, including one made from a cowrie shell, possibly originating from looted Chamber A. From Chamber B came another 37 beads, mostly made of glass paste (Figure 5.50). They were most likely part of the grave inventory of one or both of the individuals interred in Chamber B. Many of the glass beads showed alternating light and dark bands. They loosely resemble some of the pre-Islamic beads found at QUR-2 (see Figure 5.40), and may therefore have a similar date. It is important to note that ceramics were nearly absent at Structure 23, apart from a fragment of an Ottoman pipe head found in the cairn's covering layer.

Figure 5.48 Side view of burial chamber B (QUR-148, Structure 23). Scale is 50 cm.

Figure 5.49 Limited and scattered human skeletal remains at the bottom of chamber B (QUR-148, Structure 23). Scale is 50 cm.

5.2.9.4 Discussion

In terms of morphology, the excavated cairn is closely comparable to Structure 13 at QUR-2 (see above). Structure 23 featured a large and well-constructed façade, against which a smaller burial chamber was placed. Whether a similar ante-chamber is situated on the opposite side of the cairn remains unknown as this part remained unexcavated. Beyond this sequence of construction, a more detailed reconstruction of the cairn's chronology remains much more complex. The cairn was reused and modified multiple times, extensively looted, leaving the retrieved skeletal material in a poor state of preservation. Furthermore, the encountered artefacts were mostly undiagnostic.

Figure 5.50 Selected glass paste beads from chamber B (QUR-148, Structure 23).

The original construction date of the cairn could not be established independently. Unlike the cairns at QUR-2 and QUR-956, this cairn was not suitable for OSL dating as it was constructed on top of naturally occurring rocks rather than soil. Although the oldest radiocarbon dates retrieved from the skeletal material are from the Mamluk period, the cairn must be centuries older than that, since a number of Safaitic inscriptions were situated underneath the cover of the cairn. Also, one Safaitic inscription was carved onto a stone used to construct ante-chamber B. The cairn must therefore be pre-Islamic, but for

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN16-220	Human skeletal remains	Looter's debris from chamber A	GrA-68438	160 ± 35	1668-1694 AD (13.3%) 1727-1782 AD (31.1%) 1797-1812 AD (8.0%) 1918-1950 AD (15.6%)	1664-1708 AD (16.7%) 1718-1827 AD (45.8%) 1832-1887 AD (14.8%) 1912- ? AD (18.1%)
SN16-223	Human skeletal remains	Chamber A, Burial 3	GrA-67507	545 ± 30	1326-1342 AD (19.7%) 1394-1424 AD (48.5%)	1315-1357 AD (35.1%) 1388-1435 AD (60.3%)

Table 5.12 Radiocarbon dates from QUR-148 (Structure 23).

a closer date we can only rely on inference. Because the cairn is very similar to Structure 13 at QUR-2, both in terms of configuration and in terms of the association with relatively large amounts of pre-Islamic rock art, it seems warranted to date this cairn broadly to the Hellenistic/Roman period.

It is difficult to make statements about the nature of any pre-Islamic burials here. This results from the lack of skeletal remains that can be securely dated to this period, and because none of the retrieved artefacts can be securely associated to any of the encountered burials. Although many different beads were found, none of them were clearly associated to any one burial nor were they datable on typological grounds.

5.2.10 QUR-186, Structure 1

The site of QUR-186 (326120 E 3520373 N) is situated on the slopes and top of a ridge overlooking Wadi Rajil. The site mostly consists of prehistoric features, including a series of enclosures that were partly destroyed by modern bulldozing activities, and a cairn field dating to the Early Bronze Age (Akkermans and Huigens 2018). The site also features a large cairn that is surrounded by hundreds of Safaitic inscriptions and petroglyphs. This cairn (Structure 1) is situated on the end of a narrow ridge, and is clearly visible from the plains of Wadi Rajil. Unfortunately, the cairn was extensively looted before it could be documented, leaving a *ca.* 1.8 m deep pit in the centre of the cairn and much surrounding debris. It was tentatively observed that the cairn originally featured a façade that had been largely covered by looter's debris. It was decided to first remove the looter's debris from the interior and exterior of the cairn to investigate what remained of the architecture and to collect any skeletal remains and artefacts.

As a result of the large amount of damage to the cairn, it was decided that little more could be done at this cairn than to clean its looting debris, sieve the looted soil, and to document the preserved architectural features of the cairn.

5.2.10.1 Architecture (Figure 5.51)

The cairn's façade comprised large and often flat basalt slabs that were neatly stacked on top each other with their long sides facing outwards. This façade was preserved up to four stone courses high, with a height of 0.93 m (Figure 5.52). It formed a circular tower-like structure of about 4.30 m in external diameter. Some of these slabs were over a meter long and 30 cm thick, and may each weigh well over 200 kg. The slabs were not hewn, but retained their natural irregularity. As a result, between the larger slabs were many cavities that were sometimes filled with smaller rocks.

Although the interior of the tower had been largely destroyed by looters, the eastern part preserved part of a rounded corbelled construction. This likely represents the wall and part of the cover of a burial chamber within the tower. The original shape, orientation, and dimensions of the chamber could not be reconstructed. The tower was constructed on a fairly irregular layer of stone that added about 70 cm of additional height. Whether this stone layer is of natural or anthropogenic origin is unknown.

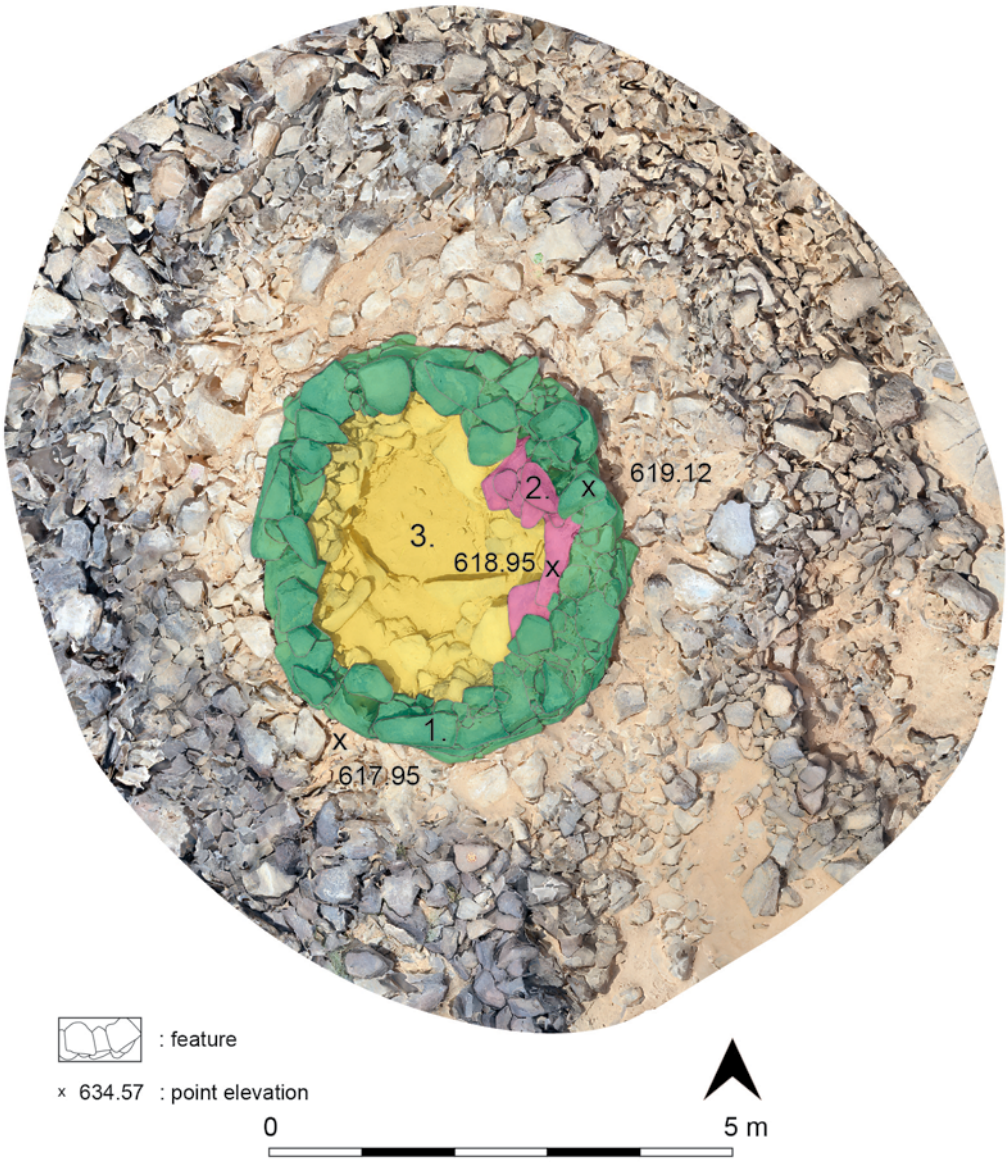

Figure 5.51 Features exposed through excavation at QUR-186, Structure 1: 1) façade; 2) remains of a corbelled wall of the burial chamber; 3) burial chamber heavily disturbed by looting.

Figure 5.52 Façade of Structure 1 (QUR-186) exposed by clearing looter's debris. Scale is 50 cm. Photo by P. Akkermans.

Some of the stones of the façade contained Safaitic inscriptions and petroglyphs. Especially interesting is the petroglyph RA-95, which depicts a camel that is rendered upside down (Figure 5.53). The Safaitic inscription next to it (QUR-186.95.1) refers to the camel. The orientation of this panel suggests that is not in its original location. Rather, it must have already existed before it was moved and incorporated into the façade of the cairn.

Figure 5.53 Detail of the façade of Structure 1 (QUR-186). The position of the rock art on a base stone indicates this panel was carved elsewhere prior to the construction of the façade. Scale is 50 cm. Photo by P. Akkermans.

5.2.10.2 Skeletal remains

The looter's debris in and around the tower contained very few and poorly preserved skeletal remains of a single human individual. The remains were too badly preserved to give an age or sex indication (Inskip 2015b). The single radiocarbon date (SN15-96; Table 5.13) obtained from these bones indicates that the individual was buried here between the 2nd and the early 4th century AD.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN15-96	Human skeletal remains	Looter's debris	GrA-67032	1795 ± 35	142-155 AD (6.2%) 168-195 AD (15.1%) 209-256 AD (36.4%) 300-318 AD (10.5%)	132-262 AD (74.2%) 277-328 AD (21.2%)

Table 5.13 Radiocarbon date from QUR-186 (Structure 1).

5.2.10.3 Small finds

A small number of artefacts came from the looter's debris in and around the cairn (Figure 5.54). These included a stone bead and a perforated shell, probably also representing a bead. Six small rod-like metal fragments of bronze and, possibly, iron were also found. The only pottery that was found was a fragment of a modern coffee cup.

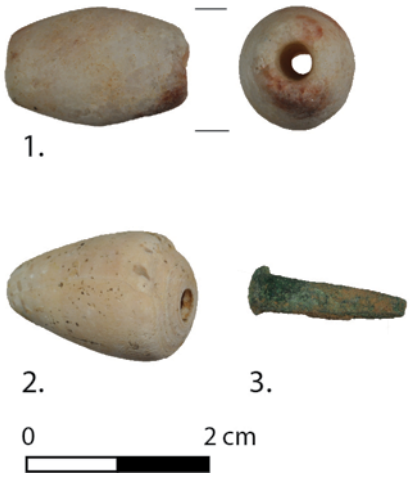

Figure 5.54 Selected artefacts from Structure 1 at QUR-186: 1) stone bead; 2) shell bead; 3) bronze pin/rod.

5.2.10.4 Discussion

Although this cairn was in a poor state of preservation prior to excavation due to recent looting, a number of observations can be made based on the cleaning activities. The human skeletal remains suggest that the structure was used as a tomb. These remains were probably interred in a burial chamber that was constructed within the cairn. Although not attested in the skeletal evidence, it cannot be ruled out that multiple individuals were buried in the tomb. In any case, the radiocarbon date from the bones suggest the structure must have been built prior to the early 4th century AD. The presence of stones within the construction containing rock art that was not in its original location further suggests that rock art was already present at the site prior to the construction of the tomb.

5.2.11 QUR-829

The site of QUR-829 (325570 E 3519935 N) is situated on a low hillock in Wadi Rajil and is covered by natural flint gravel, rather than the more common basalt covering. The site covers an area of approximately 250 m^2. Survey activities identified six oval pits on top and directly on the slopes of the hillock, all of which appeared to be the result of recent looting activities. All of the pits were broadly orientated east-west. Human skeletal remains were identified on the bottom of these pits and in the surrounding looter's debris. Subsequent excavation of these pits revealed more funerary remains, including artefacts, and some simple architectural remains of tombs.

Figure 5.55 Structure 1 at QUR-829: a small unlined pit containing the skeletal remains of a child. Scale is 50 cm. Photo by P. Akkermans.

Figure 5.56 Selected artefacts from the child burial in Structure 1 (QUR-829): 1) shell bead; 2 and 3) glass paste beads; 4) beads; 5) bone pendant fragment (?); 6) bronze (ear)ring fragment.

All of the looting pits appeared to have broadly followed the original contours of what appeared to be inhumation graves. Two of these graves appeared to be pre-Islamic, while three others were from the Middle to Late Islamic period. The first pre-Islamic grave was Structure 1, which is a small unlined pit measuring 113 by 67 cm in width about 90 cm in depth. It was situated on the westernmost slope of the hillock (Figure 5.55). The human skeletal remains retrieved from within the pit were from a young child, around four years of age (Inskip 2015a); these were radiocarbon dated to the 3rd or 4th century AD (SN14-152; Table 5.14). Additionally, numerous artefacts were associated with this burial, including 27 beads made of glass and shell (Figure 5.56), part of a possible bone pendant, as well as fragmentary remains of iron and bronze objects.

Sample no.	Material	Context	Lab no.	Date BP	Calibrated date BC/AD (1 σ)	Calibrated date BC/AD (2 σ)
SN14-152	Human skeletal remains	Looter's debris	GrA-67037	1740 ± 30	251-336 AD (68.2%)	236-386 AD (95.4%)

Table 5.14 Radiocarbon date from QUR-829 (Structure 1).

Remains of a second pre-Islamic burial were found in Structure 5, which also was an unlined pit-grave. It was *ca.* 135 by 55 cm wide and about 50 cm deep (Figure 5.57). Numerous human skeletal remains were retrieved from the disturbed fill of the pit and the surrounding looter's debris, perhaps belonging

to a single individual.[18] The disturbed fill of the pit also contained ceramics, which originated from a single pottery vessel that was likely part of the grave inventory. It was dated on typological grounds to the Late Roman or Byzantine period (Figure 5.58).

Figure 5.57 Structure 5 at QUR-829: an unlined pit with the skeletal remains of a single individual. Scale is 50 cm. Photo by P. Akkermans.

5.2.12 Other excavations

In addition to the excavation results described above, there were a number of additional cairns excavated, but these provided little information on funerary customs from the Classical and Late Antique period. Nevertheless, they merit a brief mention as they provided insights into the variability within the corpus of funerary monuments of the Jebel Qurma region.

More evidence for the presence of prehistoric burial cairns in the Jebel Qurma region came from the site of QUR-186, which was already introduced above. Here, there was a cairn field comprising about fifty small cairns, and excavations carried out at these cairns showed that many – if not all – of these cairns could be dated to the Early Bronze Age. This dating is supported by the presence of distinctive pottery vessels within some of these cairns. Importantly, these cairns generally were much smaller than the more recent cairns described above: they were not larger than about 2.2 m in diameter and 1.2 m in height (Akkermans and Brüning 2017).

As many of these prehistoric cairns were devoid of any human skeletal remains and artefacts, it should be reiterated that it is not certain whether they in fact served a funerary purpose. Although it is beyond the scope of this work to discuss the excavation results of each of these cairns in detail, most of these cairns (77%) were of a relatively restricted size, between 1.9 and 4 m in diameter, and not higher than about 85 cm. More research is required to further establish the date of construction and use of these features and, indeed, their purpose.

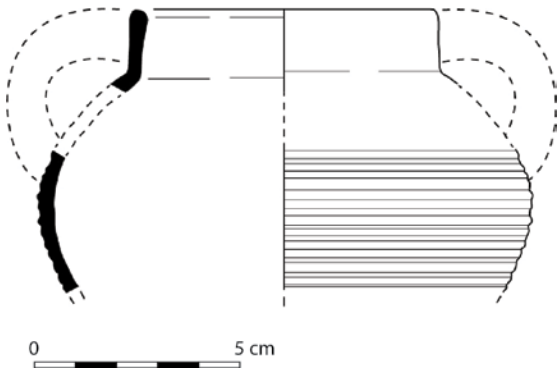

Figure 5.58 Pottery vessel fragment associated with the burial in Structure 5 (QUR-829). It was dated on typological grounds to the Late Roman or Byzantine period (parallels: Alliata 1992: Figure 9:19; Smith 1973: Plate 43:1327). Drawn by A. Kaneda.

5.2.13 Discussion

The excavations at a number of funerary monuments in the Jebel Qurma region investigated burial practices between the Hellenistic and Early Islamic periods. The results of these excavations are summarised here to highlight the development in construction and use of these features. In this respect, a typo-chronology of funerary monuments is provided based on the excavation results. The oldest funerary monuments in the Jebel Qurma region are small prehistoric burial

[18] This is a tentative observation, as no detailed osteological information is available at present.

cairns, which were attested most clearly at an extensive cairn field at the site of QUR-186. These prehistoric cairns are relatively small (up to 2.2 m in diameter) and consistently feature a corbelled burial chamber covered by loosely piled stones. Some of these also feature a rather crude an exterior façade created rather crudely. In addition to these prehistoric cairns, the excavations identified the presence of different types of tombs constructed and used in more recent times.

5.2.13.1 Ring Cairns

The earliest historical-era funerary monuments in the Jebel Qurma region are called Ring Cairns (Akkermans and Brüning 2017). This type of cairn[19] is so far only attested at the site of QUR-215, where it consists of a large circular outline of stone at the edge of the cairn measuring nearly 7 m in diameter.[20] The construction of this cairn was dated between the 6th and 3rd centuries BC based on radiocarbon and OSL dates. It was constructed on a high, prominent location in the *harra* landscape. It remains uncertain whether the Safaitic inscriptions situated around this cairn were created before or after the cairn was erected. Large amounts of artefacts were found in association with the burial(s) interred here, including remains of jewellery and a bronze vessel. Clear parallels for this type of cairn from areas beyond the Jebel Qurma region are currently lacking.

5.2.13.2 Tower Tombs

The second and probably somewhat younger type of funerary monuments are Tower Tombs (Akkermans and Brüning 2017). This type of tomb was excavated at several sites (QUR-2, QUR-9, QUR-148, QUR-186, QUR-956, and QUR-970). Tower Tombs consist of a circular tower-like construction, with measurements between 2.75 and 4.8 m in diameter, and between 0.8 and 1.45 m in height. Many of the Tower Tombs, though not all of them, were associated with large numbers of pre-Islamic rock art. However, some of this rock art apparently was already created before the construction of some of these tombs (e.g. at QUR-186 and QUR-2). This suggests that not all of the rock art was functionally associated with the construction of the monument or the disposal of the dead.

Although many of the excavated Tower Tombs have been seriously damaged by recent looting activities, at least some of them must have originally featured a central corbelled burial chamber constructed within the tower. Evidence for such a chamber was encountered at two of the Tower Tombs. Against the façade of the tower, rectangular ante-chambers were sometimes constructed, between 1.4 and 2.3 m long. These often contained the skeletal remains of multiple individuals, indicating that these ante-chambers were used as tombs. They further indicate that the Tower Tombs were used for the interment of multiple individuals. It is not possible to say with certainty whether these individuals were buried here at the same time or one after the other, but based on ordinary mortality patterns the latter scenario seems to be most likely.

The pre-Islamic burials within and around the Tower Tombs contained numerous artefacts. These included the remains of jewellery, such as beads made of stone, glass, glass paste, shell, coral, and possibly bone or tooth. The finds from the tombs at QUR-2 were more extraordinary, and included several pairs of bronze earrings with pendants made of semi-precious stone and pearl. Four bronze coins were also found here, some of which probably had been in circulation for at least a century. Also remarkable is the complete absence of pottery – pottery vessels were apparently not part of the grave inventory within Tower Tombs.

Some of the Tower Tombs provided evidence for their date of construction or use. Radiocarbon and OSL dates from QUR-2 suggested that its Tower Tomb was constructed prior to the 1st century AD – probably

[19] In a preliminary paper published earlier (Akkermans and Huigens 2018) the term 'ring cairn' was used to describe a different type of cairn. The designation used there, however, may be disregarded in favour of the typology presented here.
[20] More cairns of this type have been documented through excavations in 2017, but these results lie beyond the scope of this study.

during the late 1st millennium BC. Furthermore, a single radiocarbon date from skeletal remains at QUR-186 gave a 2nd to early 4th century AD date, although it is unclear to which of the identified individuals this date applies. Other dating evidence was somewhat more ambiguous, including the gold earring found in the cover of a Tower Tomb at QUR-9 (Structure 9); on stylistic grounds the earring dates the tower to the early 1st millennium BC. A Late Chalcolithic/Early Bronze Age date was returned from an OSL sample obtained from underneath the façade of the Tower Tomb at QUR-956. This remarkable date is completely at odds with the other dates from Tower Tombs, which most often date to the late 1st millennium BC and early 1st millennium AD. The anomalous date from QUR-956 is at this point difficult to explain. Additional research is required to corroborate such an early construction date of Tower Tombs. For the moment, it may be concluded that Tower Tombs were most often constructed between the late 4th and the late 1st century BC, and that their re-use continued up until the early 4th century AD.

Parallels for Tower Tombs are present at the site of Wisad Pools, some 70 km to the east of the Jebel Qurma region. Here, three structures show a configuration more or less similar to the ones reported by the present study. The Tower Tombs at Wisad Pools were not excavated but many architectural features remain visible. They were at least 4 meters in diameter and associated with relatively large numbers of Safaitic rock art, including pieces that were reused in the construction of the tombs. Massive blocks were incorporated in the construction of these tombs. Additionally, all of these tombs featured a rectilinear ante-chamber of about 2 m long (Rollefson 2013: 221-3).[21] The similarities between the Tower Tombs at Wisad Pools and those from the Jebel Qurma region are striking. It suggests that the construction of Tower Tombs was not a local phenomenon, but one that probably extended at least across the southern edge of the Jordanian *harra*.

5.2.13.3 Non-funerary cairns

Within a number of excavated cairns (see § 5.2.12), there was no evidence that they once served as tombs. These were usually fairly small cairns, being up to 4 m in diameter and up to 85 cm in height. The absence of human skeletal remains or potential grave goods suggests that these structures cannot presently be classified as burial cairns. If these were tombs originally, then they were possibly disturbed (e.g. by looting, animal disturbances or weathering) to such an extent that any funerary remains were obliterated. Alternatively, these cairns may have had a completely different function that has not left material traces.

5.2.13.4 Pendants

Pendants are typically found in association with burial cairns, such as at QUR-9, QUR-215, QUR-956 and QUR-970. However, the Pendants themselves are not tombs but simply small heaps of stone. This is even the case where Pendants have small chamber-like constructions. However, excavations within and underneath these chambers did not identify skeletal remains or artefacts. Also, these small chambers are not open chambers, but were filled in completely with loosely piled stones.

Similar observations come from various other regions, both in the Black Desert and beyond. At Maitland's Mesa (Rowan *et al.* 2015: 180) and Wisad Pools (Rollefson 2013: 223-4), the individual cairns of Pendants also lacked burial remains, despite their chamber-like appearance. Any attempts to date these Pendants was not carried out by these projects. Another place where Pendants were investigated, yet far removed from the Black Desert, was at the al-Makhdarah Necropolises in Yemen, where there are numerous

[21] The rectilinear ante-chambers at the Tower Tombs of Wisad Pools were interpreted as 'entrance chambers' (Rollefson 2013: 222), but the excavations at QUR-2 and QUR-148 show that these spaces are tombs themselves. This is substantiated by the presence of skeletal material and because the tower's façade is not connected to the back of the ante-chamber through an opening.

Pendants. The burial cairns to which these Pendants were attached produced three radiocarbon dates – from the early, middle, and late 1st millennium BC (De Maigret 1999: 329-35).

Dating evidence for the Pendants themselves, independent from the associated burial cairns, came from the Jebel Qurma region. OSL dates were obtained from four of the pendants, which provided broad yet fairly consistent dates of construction for these features, ranging between the late 13th century BC and the early 1st century AD. The period between the 6th and the early 3rd centuries BC is covered by all the obtained dates, which thus provides the narrowest potential date range for the construction of pendants at this point.

Remarkably, Pendants can be associated with different types of tombs. The Ring Cairn at QUR-215 had a Pendant attached to it, but Pendants were also associated with Tower Tombs, such as at QUR-9, QUR-956, and QUR-970. It appears, therefore, that Pendants were probably associated with particular burials rather than with certain tomb types. Unfortunately, given the fact that multiple burials were often present in these cairns, and often in a poor state of preservation, it remains unclear to which kinds of burials Pendants may be associated.

5.2.13.5 Inhumation graves

Within the funerary cairns there were often stone-built burial chambers, into which the deceased were laid to rest. These chambers were either roofed or filled in with rocks to cover the corpse. Additionally, this project identified a number of proper inhumation graves: a pit was dug into the soil and a body was placed into it before being subsequently covered by soil. Such an inhumation grave was found underneath a Ring Cairn at QUR-9 (Structure 9), and in the cemetery of QUR-829. These inhumation graves were dated from the Late Roman to Byzantine period, and were significantly younger than the other, more typical cairn burials. A small cemetery of inhumation graves also was encountered during the survey at HAZ-27, which was dated through associated ceramics to the early 4th century AD (see Chapter 3).

5.2.13.6 A chronology of burial customs

To summarize the data and observations presented above, a chronology of burial customs in the Jebel Qurma region may be proposed. The earliest radiocarbon dates from cairns are from the 4th/3rd century BC, like at the Ring Cairn at QUR-215. Tower Tombs seem to occur from the 4th century BC onwards as well, and were used for the interment of the dead until the early 4th century AD. Cairns were often reused multiple times, such as in rectilinear ante-chambers constructed against the façade of Tower Tombs, but also within the cairns themselves.

Although many of the skeletal remains encountered within the cairns were in a poor state of preservation, both men and women seem to have been buried in cairns in pre-Islamic times. Whether they also contained child burials in the pre-Islamic period remains uncertain. Skeletal remains of adolescents and younger children were encountered within some cairns (e.g. QUR-215 and QUR-148), but there is no reliable evidence to date these remains. Grave gifts often included jewellery such as necklaces, bracelets, and earrings, which were at least partially fabricated from non-local materials such as metal, sea shells, coral, and pearl. The fragmentary remains of a bronze vessel at QUR-215 is the only piece of evidence that containers were sometimes among the grave inventory. Pottery vessels, however, do not seem to have been interred as grave gifts, at least not prior to the 3rd century AD.

There is at this point no evidence for the construction of cairns after the early 4th century AD. Instead, from perhaps the 3rd century onwards, but certainly by the 4th century, inhumation graves appear, although they are attested in limited numbers. Two of these inhumation burials had indications that

pottery vessels were interred as grave gifts (QUR-829 and HAZ-47). However, their chronology is difficult to ascertain, since the remains of these vessels came from heavily disturbed contexts.

5.3 The mortuary landscape of the Jebel Qurma region

5.3.1 Introduction

The previous section proposed a chronology of various types of funerary monuments in the Jebel Qurma region based on detailed excavation data retrieved from a limited number of sites. The aim of this section is to study the distribution of funerary monuments across the study area and to better understand the configuration of the funerary landscape. It seeks to answer questions, such as: How are different types of funerary monuments distributed across the landscape? And how can we explain these spatial patterns?

This will be done by analysing the spatial distribution of funerary monuments across each of the landscape classifications, as defined in Chapter 2. Furthermore, included in these spatial analyses are the excavated funerary monuments as well as other cairns identified through surveys.

5.3.2 Features included in the analyses

The previous section presented a typo-chronology of funerary monuments on the basis of the excavation results. The construction of large burial cairns, including Tower Tombs and Ring Cairns, and the Pendants often associated with them, could be dated to a relatively early period of inhabitation in the Jebel Qurma region. This period comprises the late 1st millennium BC and early 1st millennium AD. After the 3rd or 4th century AD, the creation of new burial cairns seems to have ceased, and was perhaps replaced by a different funerary custom: inhumation graves in pits. All of the cairns from this 'early' funerary tradition were shown to be relatively large, having a maximum diameter exceeding 4 m. These large cairns differ from a number of excavated cairns that were much smaller. Some of these smaller cairns were dated to the prehistoric period, while others did not provide any evidence that they were used as burial cairns at all (see § 5.2.13).

Based on these observations, a selection of cairns documented through pedestrian surveys (but not excavated) may be added to the excavated cairns for analysis. This selection is based largely on size: cairns with a maximum diameter of more than 4 m were included. It was not possibly to include other morphological traits in the selection, as it was often difficult to differentiate between different cairn types on the basis of surface data alone. For example, the excavation results show that the outer façades of Tower Tombs were often obscured by a cover of rocks. The same holds, in many cases, for distinctive features of the Ring Cairns. Only Pendants could be clearly identified on the basis of survey evidence alone. It is therefore proposed that cairns with a diameter exceeding 4 m in diameter represent either Tower Tombs or Ring Cairns of the 1st millennium BC and the early 1st millennium AD, without further typological or chronological differentiation. Finally, Pendants were also added to the selection as they are secondary features that accompany funerary monuments of broadly the same period. Following these criteria, a total of 170 cairns and 33 pendants were selected from the pedestrian survey database.

Based only on survey evidence, it is difficult to identify examples of cemeteries featuring inhumation graves similar to the ones found at QUR-829 and HAZ-27. The survey database also contains many potential cemeteries, but many of the graves at these cemeteries are strongly reminiscent of Islamic graves of relatively recent times; there is very little evidence that these graves were used already in antiquity. These cemeteries are therefore excluded from the analyses presented below.

5.3.3 The constitution of the mortuary landscape

The funerary cairns and associated pendants of the 1st millennium BC and early 1st millennium AD follow a specific distribution (Figure 5.59). This is entirely different from the distribution of campsites, as

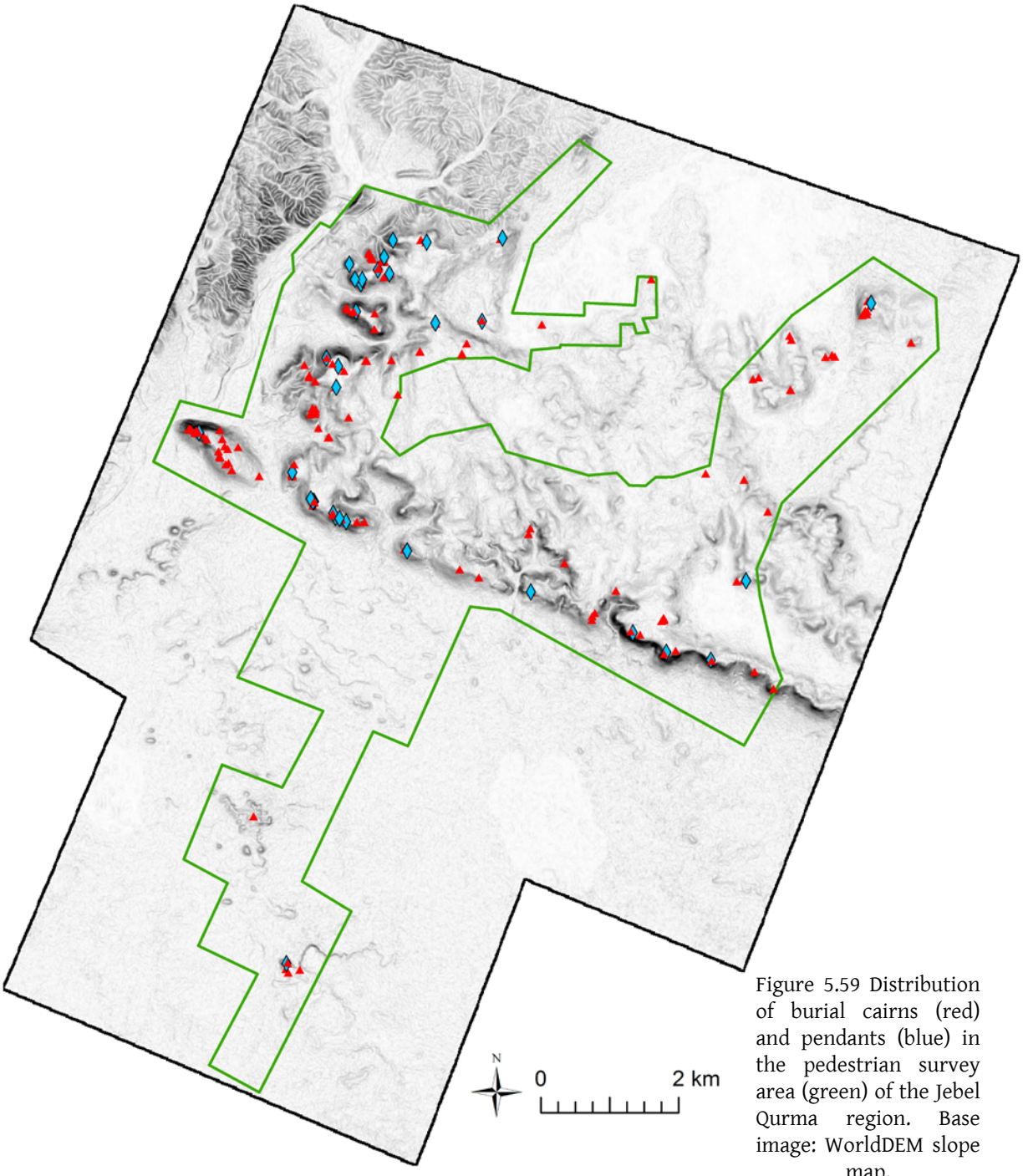

Figure 5.59 Distribution of burial cairns (red) and pendants (blue) in the pedestrian survey area (green) of the Jebel Qurma region. Base image: WorldDEM slope map.

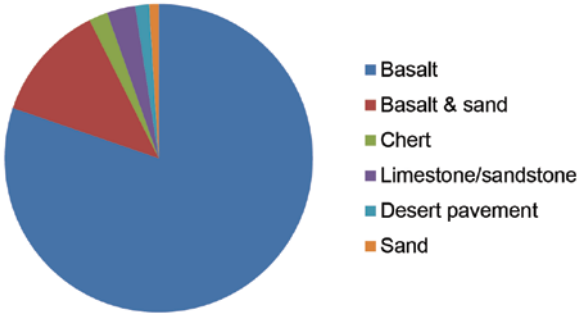

Figure 5.60 Proportion of funerary monuments per surface cover area.

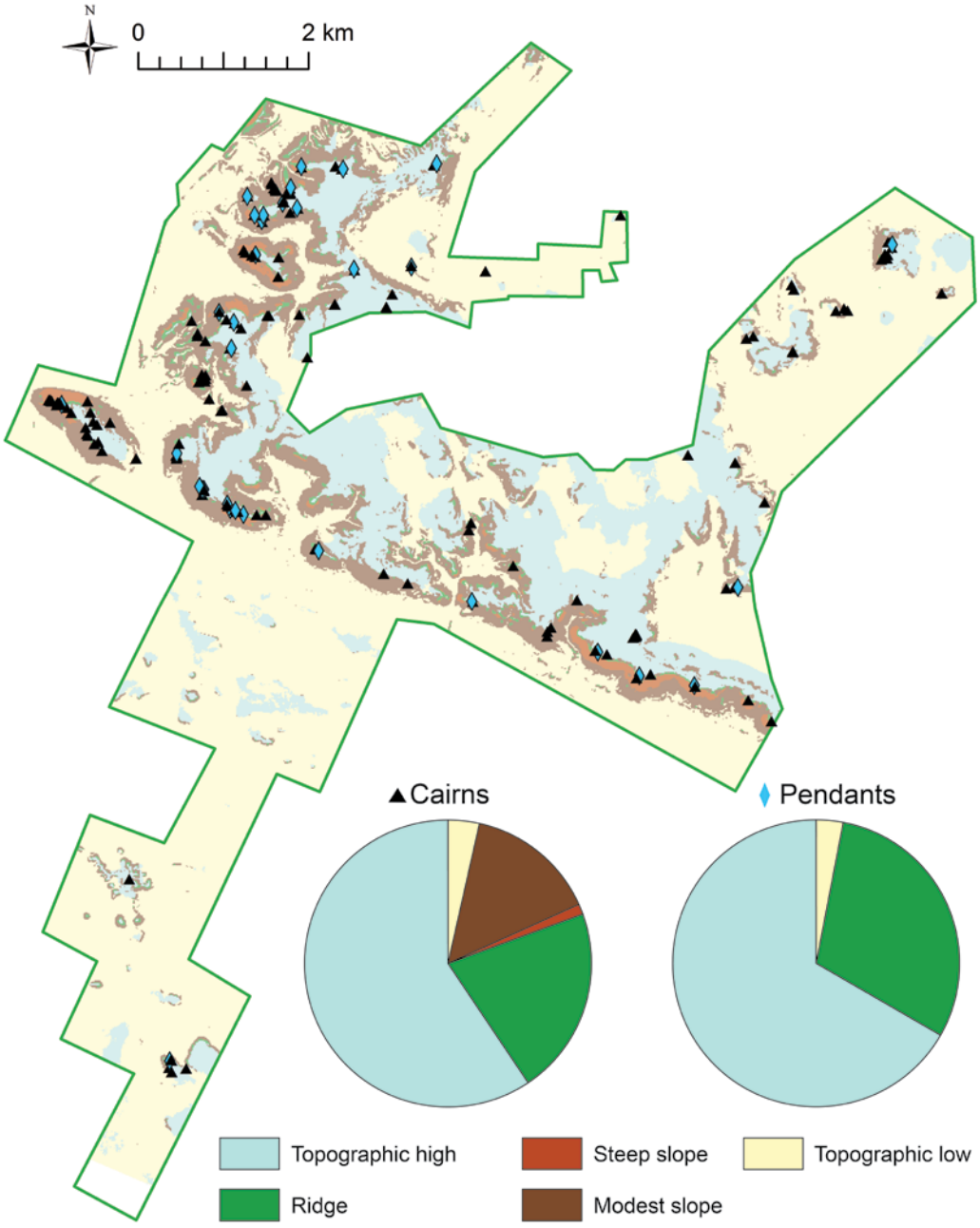

Figure 5.61 Distribution of cairns and pendants in the Jebel Qurma region and the proportion of these features per hillslope position. Base image: Hillslope Position Classification.

presented in the Chapter 4. These funerary monuments are largely found on high, prominent places in the landscape, often cresting the horizon when viewed from below. This is quantitatively supported by a number of spatial analyses, in which the distribution of funerary monuments over the various landscape classifications is studied.

The funerary monuments are largely confined to the *harra* surfaces of the Jebel Qurma region, as visible in Figure 5.60. The basalt landscapes of the study area contained 93% of the features. Both funerary

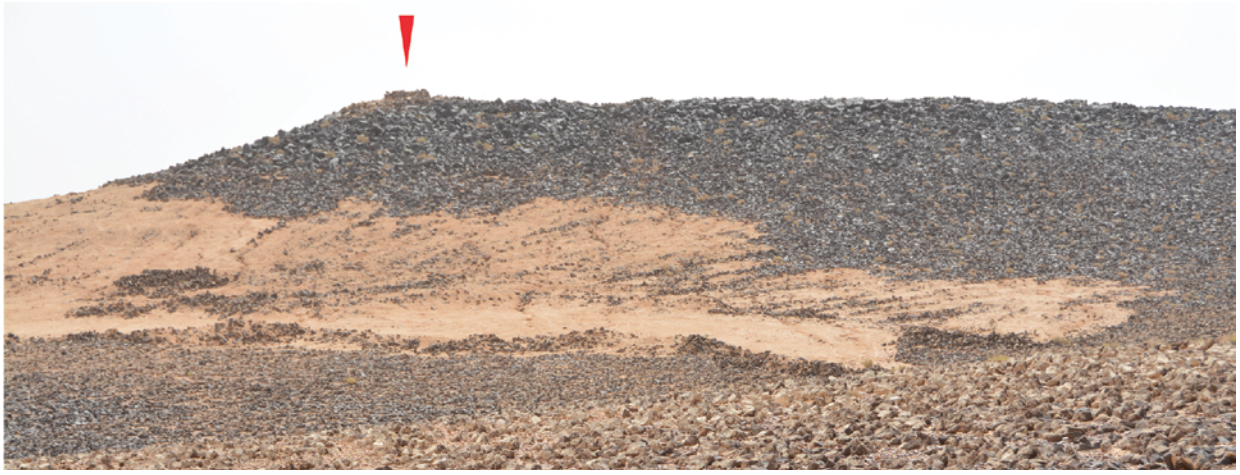

Figure 5.62 Remains of the Tower Tomb (indicated) at QUR-186 as visible on the horizon from the valley below. Photo by P. Akkermans.

cairns and pendants are present in the Hazimah plains as well, but in very limited numbers. In the *harra* landscape, most funerary monuments are situated at the edges of the basalt plateau rather than in its interior.

Furthermore, the distribution of funerary monuments indicated by the Hillslope Position Classification (Figure 5.61), shows that most of them are situated on topographic highs and ridges. This holds for 84% of the funerary cairns, and for the pendants this percentage is even higher (97%). Also, most of the funerary monuments would have been clearly visible from below as they were situated on skylines that dominated the horizon (Figure 5.62). This is illustrated in Figure 5.63, which shows that 65% of the funerary cairns are situated on a skyline, and the percentage of pendants situated on a skyline is even higher (91%).

There does not seem to be much correlation between the size of funerary cairns and pendants and the degree of visual prominence. To test this correlation, the size of cairns and the length of pendants were compared to their degree of visual prominence, and to the skyline values of the areas where the features were located. The coefficient of determination, or 'R-squared' values, between these variables is close to 0, illustrating that there is no clear relation between the three variables. In other words, the largest cairns and pendants do not usually occur in the places that are the most visually prominent.

5.4 Concluding remarks

The excavations carried out at a number of funerary monuments in the Jebel Qurma region have indicated the existence of various types of funerary customs during the late 1st millennium BC and the 1st millennium AD. It was proposed that these customs changed significantly over time. The subsequent chapter is devoted to further exploring possible reasons for these developments. Another important result that emerged from this chapter is the absence of evidence for some periods when comparing excavation and survey data. Indeed, the excavations provided strong indications for the presence of funerary practices dating to the Iron Age, while this period is currently absent in various other datasets, including the ceramics as well as radiocarbon dates from the excavated enclosures. These observations suggest that the chronology of inhabitation in the Jebel Qurma region – and presumably in other regions of the Black Desert – cannot be adequately reconstructed on the basis of survey material alone. Additional dating evidence is required to ascertain whether observations reflected in the survey material are correct. The occupation of the Jebel Qurma region during the 1st millennium BC may have been more significant and of longer duration than reflected in the survey material.

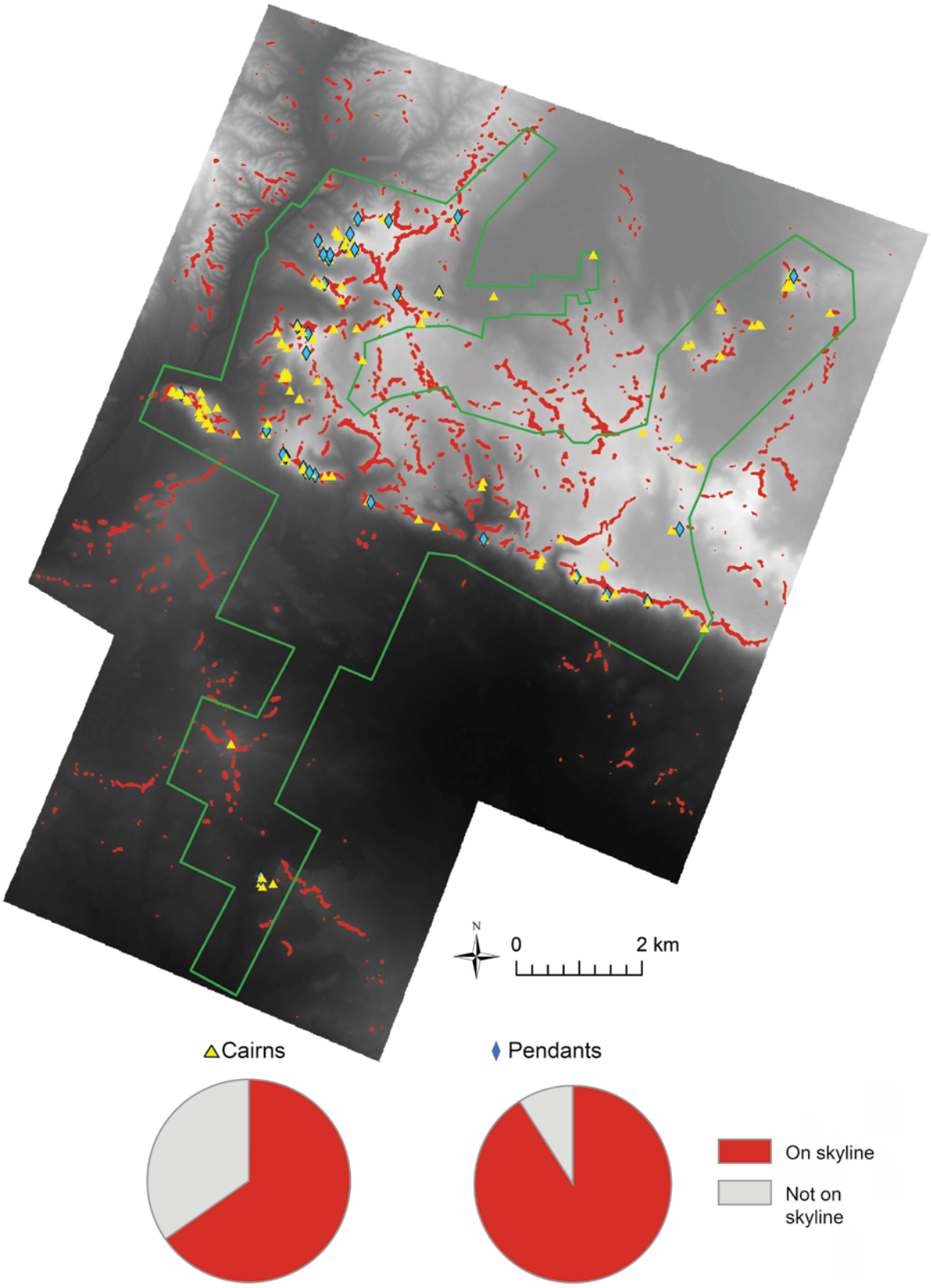

Figure 5.63 Distribution of cairns and pendants in the Jebel Qurma region and the proportion of these features present on dominant skylines. Base image: WorldDEM superimposed by dominant skylines (red) and survey area (green).

Chapter 6 - Discussion

6.1 Introduction

The research presented in this book explored the archaeological landscape of the Jebel Qurma region and the nomadic communities that inhabited it between the Hellenistic and Early Islamic periods. The specific aim was to investigate the construction and use of stone-built features by these communities. Previous chapters explored aspects of the region's natural environment (Chapter 2), followed by a more detailed account of the man-made features and artefacts encountered during surface surveys (Chapter 3), and excavations (Chapters 4 and 5). In this chapter, the results of these studies are further discussed with the following purposes in mind. Firstly, this chapter explores the degree to which the landscapes of the Jebel Qurma region were physically modified during the Classical and Late Antique periods. This is done by providing a diachronic overview of the history of inhabitation of the Jebel Qurma region in these periods, and is based on the results of the previous chapters. Secondly, in order to better understand these architectural developments, the broader context of these features will be explored. This is done by using new information on the nature of inhabitation in the Jebel Qurma region derived from its archaeological remains. Thirdly, this chapter explores how nomadic communities used the stone-built features in the Jebel Qurma region over short- and long-term periods.

6.2 An archaeology of nomadism in the Jebel Qurma region

6.2.1 A history of inhabitation

Until recently, the earliest material evidence for the presence of nomadic communities in the Black Desert during historical times came from the Safaitic inscriptions and associated petroglyphs. Although the presence of nomads in eastern Jordan prior to the 1st century BC – which, by convention, marks the appearance of the Safaitic texts – has sometimes been assumed on the basis of textual sources, this had not been substantiated by archaeological evidence (see Chapter 1). Archaeological investigations in the Jebel Qurma region have not yet provided unequivocal evidence for significant inhabitation during the early 1st millennium either, despite the occurrence of potentially early 1st millennium remains. These include gold jewellery from a burial cairn (at QUR-9), and a number of OSL dates from the soil underneath several Pendants. However, neither of these pieces of evidence can at this point be used to directly indicate the sustained presence of nomadic communities during the early 1st millennium BC. The jewellery from QUR-9 was dated on the basis of a single parallel only, and the OSL dates provided a broad time range, between the late 2nd millennium BC and the early 4th century AD. In fact, all OSL dates from Pendants continue into the late 1st millennium BC. These dates are therefore too broad to convincingly argue for a significant phase of inhabitation in the Jebel Qurma region during the Iron Age. In sum, although there is evidence that hints towards an Iron Age-period inhabitation in the Jebel Qurma region, this part of the region's chronology requires more research.

More convincing evidence for the earliest phase of sustained inhabitation of the Jebel Qurma region dates to the 4th or 3rd century BC (i.e. the beginning of the Hellenistic period). It is important to note that not a single pottery sherd collected during pedestrian surveys could be securely dated to the Early Hellenistic period. The only Early Hellenistic surface find was a Seleucid coin, retrieved from a looted burial cairn. Nonetheless, excavations yielded more Early Hellenistic materials. These included skeletal remains from a burial cairn (at QUR-215) dated to the 4th or 3rd century BC, and a radiocarbon sample from a fire pit (at QUR-595) that returned a similar date. Although the evidence remains sparse at this point, the dates are solid, and signify that the inhabitation of the Jebel Qurma region did not start in the 1st century BC, contemporary with the earliest use of Safaitic. Instead, this period of inhabitation can be pushed back several centuries, at least into the 3rd or even 4th century BC.

Whether Safaitic inscriptions and petroglyphs were already created during this early phase of inhabitation in the region remains uncertain. As the dating of the script is tentative, it remains possible that it was already in use prior to the 1st century BC, but no evidence produced by this project's fieldwork supports this earlier date for Safaitic. At this point, the earliest local evidence for the creation or rock art comes from the site of QUR-2, where inscribed stones were present prior to the construction of the Tower Tomb there. Yet, the exact date of the tower's construction is not certain. Based on the datable evidence from the ante-chamber that was constructed against the tower's façade, the tower and the inscribed stones used in its construction date back at least to the late 4th to early 1st century BC, and may even be older. How much earlier these stones were inscribed remains uncertain.

For the later Hellenistic and Roman periods, the continued inhabitation in the Jebel Qurma region is somewhat better defined, given the more precisely datable ceramics from these periods. On the basis of these ceramics, but also with help of Safaitic inscriptions, several campsites were documented that were inhabited during the Hellenistic/Roman period. Excavations provided further dates from this period. Fire pits at a number of enclosures (e.g. QUR-373 and QUR-595), attest the presence of people in the Jebel Qurma region in this period, as do the radiocarbon and OSL dates from burial cairns.

According to the conventional dating framework of Safaitic, the creation of inscriptions and petroglyphs ceased after the 4th century AD. The uncertainties about this conventional dating framework could not be solved through field research in the Jebel Qurma region. What is certain, however, is that although the creation of Safaitic inscriptions and petroglyphs may have come to a halt over the course of the 1st millennium AD, the inhabitation of the Jebel Qurma region continued throughout most of this period. This is indicated by the relatively large number of ceramics that were dated to the Byzantine and Early Islamic periods, and by a series of radiocarbon dates from residential and burial contexts. Similar to the preceding period, these remains were clearly left behind by nomadic rather than sedentary communities. As during the Hellenistic and Roman periods, residential sites from the Byzantine and Early Islamic periods consisted mainly of enclosures and/or clearings. They can be recognised through the occurrence of ceramics, sometimes in much larger quantities than at older sites.

Inhabitation of the Jebel Qurma region continued during the Byzantine, Umayyad, and Abbasid periods, but the region seems to have been largely, and perhaps quite suddenly, abandoned during the subsequent Fatimid period. Clearly datable ceramics from the Fatimid period are almost completely absent, and there is only a single radiocarbon date (from an inhumation grave at QUR-829) dating to this period. Not a single radiocarbon sample from the fire pits within the excavated enclosures returned a Fatimid period date. Therefore, there is at this point no evidence for substantial inhabitation of the Jebel Qurma region between the end of the 10th century and the 12th century AD.

6.2.2 Occupational intensities

This research has shed light on a number of periods of inhabitation in the Black Desert that have long remained archaeologically invisible. Prior to this study, the initial period of inhabitation in historical times in the Black Desert was associated with the Safaitic inscriptions and petroglyphs. This was regarded as a sudden outburst of activity that also quickly diminished again around the middle of the 1st millennium AD. One of the results of the present study is that a much more nuanced reconstruction is warranted. The Safaitic inscriptions did not appear *ex novo* around the 1st century BC. Instead, it was part of a longer period of regional inhabitation that had already begun two or three centuries before, or even earlier. Similarly, the Late Antique period of inhabitation attested in the study area has been identified at this point only to a minor degree in other parts of the Black Desert.

This study therefore shows the importance of archaeological research in the reconstruction of the history of inhabitation of the Black Desert. Relevant in this respect is to consider a variety of well-

datable remains. Rock art is poorly datable, and cannot be used by itself to attest the presence or absence of nomads in a given region during a given period. This same caution equally holds for other types of archaeological materials, such as ceramics. They are often used in archaeological surveys as an important or primary material to reconstruct the area's history and intensity of occupation (Wilkinson 1999, 2000). This reliance on ceramics seems to be completely unwarranted for the Jebel Qurma region, and most likely for other parts of the Black Desert as well (cf. Betts *et al.* 1991: 22). For example, unequivocal evidence of Early Hellenistic ceramics is at this point completely absent; from the subsequent Hellenistic and Roman period the number of ceramics also appears to be relatively limited. The presence of Hellenistic and Roman-period inhabitation of the region emerged from the consensus among a broader range of materials. In addition to ceramics and inscriptions, these included OSL and radiocarbon dates, and numismatic evidence.

Thus, it seems that in this context ceramics alone are a poor indicator for the presence or absence of people within the Black Desert. For this purpose, other datasets need to be consulted as well, as pottery may not have been as widespread during these earlier period as one would assume, for example, in the case of sedentary populations. In other words, the amount of ceramics attested for a given period most likely indicates nothing more than the use of such materials among communities rather than the direct presence or absence of the communities themselves. Following this interpretation, the increased number of ceramics from the Late Antique period does not necessarily reflect increased activity in the study area but, at most, demonstrates an increase in the use of ceramics by local communities.

6.2.3 Comparisons with other regions

The earliest attested phase of inhabitation in the Jebel Qurma region was during the Early Hellenistic period and possibly extending back into the Iron Age. Similarly early dates are at this point unparalleled by surveys or excavations in other areas of the Black Desert. On the one hand, this may partly be a result of the limited number of archaeological field projects demonstrating a specific interest in historical remains. On the other hand, the present research in the Jebel Qurma region has shown that this period is poorly visible to surveys, given the scarcity of surface pottery sherds that could be securely attributed to the Iron Age and Early Hellenistic period. However, the period is more visible in radiocarbon and OSL dates from excavations. In other words, although remains from the 1st millennium BC appear to be absent in other parts of the Black Desert, it is possible that many previously identified features were actually constructed or used during this period, and that their actual age may be known only through future excavations and with absolute dating methods.

Pendants constitute a highly interesting feature in this respect, given their distinctive shape and the fact that all four OSL dates from pendants in the Jebel Qurma region were fairly consistent, all covering part of the late 1st millennium BC. This type of feature occurs in various configurations throughout the basalt deserts of the western part of the Arabian desert. If these Pendants have a similar date range to those in the Jebel Qurma region, then there are a vast number of features in the Arabian deserts that are from a phase of inhabitation that was thus far largely archaeologically invisible.

The poor visibility of Iron Age and Early Hellenistic remains is not confined to the Black Desert, but is paralleled in adjacent regions, including the Hauran. These periods are still poorly known in the Hauran (Dentzer *et al.* 2010: 139), despite several occurrences of remains from this period at a few locations (e.g. Betts *et al.* 1996). Even so, these remains hardly match the boom in rural sites and communities during the subsequent Roman and Late Antique period (see below). Similarly, limited archaeological evidence for Iron Age occupation is reported from sedentary sites in the Wadi Sirhan. Survey and trial excavations carried out by Adams in the 1970s indicated the presence of Iron Age ceramics at two settlements in the northern Wadi Sirhan, and an extensive cairn field near the towns of Kaf and Ithra (Adams *et al.* 1977: 36). At the Wadi Sirhan's southern extremity, at Jawf, no Iron Age remains have yet been found in

recent excavations and surveys (Charloux and Loreto 2014, 2015). This is surprising as this site has been identified as the ancient town of Adummatu, mentioned in Neo-Assyrian sources (Eph'al 1982: 118-121).

The archaeological remains documented in the Jebel Qurma region from the later Hellenistic and Roman periods have a small number of parallels in other regions of the Black Desert. As mentioned before, Tower Tombs similar to the ones in the Jebel Qurma region are known from Wisad Pools, suggesting that this type of tomb extends at least along the southern fringe of the Jordanian part of the *harra*. Other tombs in the Black Desert that are known from survey and excavations reports are somewhat different in configuration than in the Jebel Qurma region. For example, the rectilinear outline of the Cairn of Hani and the location of the burial underneath the cairn (rather than within it) (Harding 1953) finds no parallel in the Jebel Qurma region. It should also be noted that there is at this point no absolute dating evidence for any of the previously excavated 'Safaitic' cairns. Making comparisons between these cairns and the ones from the Jebel Qurma region is therefore difficult, and calls for further investigation of tombs in other parts of the Black Desert.

The increase in material evidence from the Hellenistic and Roman periods in the study area is paralleled in regions adjacent to the Black Desert. Many of the towns and villages in the Hauran are probably of Hellenistic or Roman origin, as indicated by survey and excavations (see Chapter 1). The development of the region into a prosperous rural area began under Nabataean and Roman rule, when much of the agricultural infrastructure was probably created. Furthermore, various military installations and roads were developed in the Roman period along the western fringes of the Black Desert, as part of the *Via Nova Traiana* and *Strata Diocletiana*. As part of the same process, fortifications were constructed in the Azraq basin during the early 3rd century AD (Kennedy 1982, 1997; Millar 1993). In short, increased activities in the Jebel Qurma region are largely paralleled to the northwest in the Hauran. The occurrence of tens-of-thousands of Safaitic inscriptions has long illustrated this parallel development, which is now substantiated by the archaeological evidence as well.

Up to this point there have been no indications from other archaeological projects that nomadic communities continued to inhabit the Black Desert in Late Antiquity (see Chapter 1). Previous surveys in other parts of the Black Desert have hardly identified material from this period of inhabitation. This is largely the result of the lack of Late Antique epigraphic sources, as well as the limited archaeological research focusing on this period. Betts' survey programme in the Black Desert documented limited remains from the Byzantine and Early Islamic periods, but these were all situated deep in the *hamad* landscape (Betts 1993). The only Late Antique sites from the *harra* known until recently were large and partly settled aggregation sites such as Burqu' (Betts *et al.* 1990) and Nemara (Macdonald 2008). To what degree the Late Antique remains from the Jebel Qurma region are representative of other parts of the Black Desert therefore remains uncertain, and calls for additional field research in other parts of the Black Desert.

Interesting comparisons can be found, however, in regions beyond the Black Desert. During the Late Antique period, the Hauran region witnessed its peak in rural prosperity, as observed within towns and villages such as Umm al-Jimal, Deir al-Kahf, Suweida, and many others (Villeneuve 1985). Similarly, numerous outposts and small settlements emerged in the deserts of north-eastern Jordan. These include some of the so-called 'desert castles' such as at Kharaneh, Amra, and Hallabat (Walmsley 2007b), and small settlements in desert environments (Bartl and Akkermans 2016; Kennedy 2014). Settlement in the Azraq oasis also further developed in the Late Antique period (e.g. Elter and Al-Jbour 2013).

The phase of abandonment attested in the Jebel Qurma region during the Fatimid period is broadly paralleled in the Hauran and other areas beyond the Black Desert. In demographic and economic terms, the Hauran drastically declines in the 9th century AD (i.e. during the Abbasid period), as documented

in surveys and excavations (De Vries 2000; Foss 1997; Zerbini 2013). Evidence for Fatimid occupation in the Azraq oasis is highly limited as well (e.g. Lash 2009). Explanations for these broader settlement trends have been sought in social instability due to civil wars, decreased political protection after the centre of caliphal power was shifted from Damascus to Baghdad, and environmental degradation due to mismanagement and climate change (cf. Foss 1997; Izdebski *et al.* 2015; Walmsley 2000: 271-272; Wickham 2005: 457-459). However, whether there was any relation between such developments and local settlement trends in the Black Desert remains unclear at this point.

6.2.4 The nature of inhabitation

The archaeological remains from the Jebel Qurma region unequivocally suggest that between the Hellenistic and Early Islamic periods, the region was frequented by mobile communities rather than permanently inhabited. The residential sites that were documented by this study are all campsites which, although sometimes used on multiple occasions, were not inhabited year-round. This conclusion is supported by the minimal degree of architectural investment and the limited accumulation of finds. Instead, they represent campsites occupied for short periods of time (e.g. between a few days and a few months), after which they were abandoned, sometimes to be reoccupied at a later point in time.

6.2.4.1 Subsistence practices

The purposes of these short-lived visits to the region may have been manifold, including all kind of subsistence activities (e.g. herding and hunting) that are known from Safaitic inscriptions and petroglyphs. Unfortunately, excavations carried out by this project at several short-lived campsites did not yield enough material evidence to form a more detailed reconstruction of possible subsistence practices. For example, there was an absence of direct material evidence for animal exploitation, such as skeletal remains. The reason for this may be the poor conditions for the preservation of archaeological materials. The deposits within the enclosures were usually very shallow, and any bone material could have been easily degraded by moisture, animals, bacteria, or the area's severe temperature oscillations. The experiences from burial contexts equally indicate that circumstances of preservation of skeletal remains in shallow deposits are poor.

It is also possible that the low number of preserved faunal material is the result of an initially low number of deposited bones. This seems highly unlikely because there is evidence for waste materials deposited within and directly around campsites locations. Also, this waste material must have included, in at least some cases, domestic or wild animal bones. Safaitic inscriptions and petroglyphs clearly indicate the use of such animals. Therefore, it seems reasonable to assume that these animals were occasionally butchered at campsites, and that poor environmental circumstances prevented them from being preserved in the archaeological record.

The implication of this observation is that these post-depositional conditions severely hinder any reconstruction of subsistence practices based on macroscopic remains. At this point, there is no archaeological evidence that unequivocally supports any single mode of subsistence in the Jebel Qurma region during the Byzantine and Early Islamic periods. Therefore, to what degree subsistence practices such as pastoralism and hunting contributed to livelihoods here during Late Antiquity cannot be established with certainty.

6.2.4.2 Commodity production and exchange

Excavations and surveys carried out by this project retrieved a wide array of artefacts that could be dated to Classical and Late Antiquity. Ceramic vessels were especially numerous, although these were not evenly represented during all phases of inhabitation. The Hellenistic and Roman-period ceramics were relatively limited, while the occurrence of ceramics significantly increased during the Byzantine period. The amount of ceramics culminated in the Umayyad period, after which it gradually declined. As

argued above, this trend probably reflects an increase in the use of pottery among nomadic communities over time up to the Umayyad period rather than differences in occupational intensity.

Perhaps containers of other materials, like metal, were also used, especially during periods in which ceramics seem to have been used less. An example, although perhaps from a slightly earlier period, comes from a burial context at QUR-215, where fragments of a bronze vessel were unearthed. For most other identified metal fragments it was impossible to say from what type of objects they derived. They may have been part of the weaponry depicted on petroglyphs from the same period, such as spear- and arrowheads. Other objects included items for personal adornment, such as beads, pendants, and earrings, made of mollusc shell, coral, glass, glass paste, bronze, ostrich eggshell, gemstones, and even pearl. Only a few coins were retrieved, and it seems likely that although they were sometimes acquired, coins were not valued in a monetary sense.

Most of these materials, except ostrich eggshell, were not locally available and many objects must have been acquired through contacts with sedentary communities where they were created. Some of the objects required complex production processes that were most likely carried out in permanent settlements rather than among mobile communities in the desert. These include, firstly, the production of pottery vessels. Most of the pottery vessels from the study area were wheel-thrown, and although their exact provenance remains unknown, they must have originated from sedentary contexts beyond the Black Desert. While ethnographic studies indicate that mobile pastoralists are known to produce their own pottery vessels, the resulting vessels are relatively simple and made without a throwing wheel (e.g. Eerkens 2008; Grillo 2012). There is at this point no evidence that ancient nomadic communities made such ceramics themselves.

Secondly, elaborate jewellery such as the earrings found at QUR-2 and other metal objects were probably produced in sedentary contexts as well. Although there is some evidence for local metal working (e.g. at the site of QUR-595), there was no evidence at this site for primary smithing. In other words, it is most likely that objects made of bronze were reworked or mended at this site rather than newly produced. Initial production must have occurred in areas where the expertise, raw materials, fuel, and adequate time were available to produce such items.

Other non-local goods include coins, objects made of glass or glass paste, and marine items such as coral and pearl. In summary, a wide array of objects that circulated among desert communities were produced in and procured from sedentary settlements beyond the Black Desert. The exact mechanisms of procurement remain obscure at present. It is also presently unclear whether this included direct acquisition at markets, down-the-line exchange, or other mechanisms. What exactly was given in return for these products is difficult to say with certainty, but may have included all kinds of pastoral products such as milk, hides, wool, meat, or live animals. Products from wild, hunted animals were perhaps also sold. Other than goods, services may also have been given in return (see Chapter 1). However, whether this was indeed the case and what these services entailed requires further research.

Locally produced materials must have been available to the region's inhabitants as well, such as hides, textiles, and perhaps bone implements. They must have been an important part of local material culture, such as for use in domestic activities, the creation of residential units, personal adornment, and exchange. Unfortunately, such materials are not well-preserved in the archaeological record.

6.2.4.3 Relations with sedentary communities

Various types of archaeological remains indicate interactions between nomadic communities from the Black Desert and sedentary communities. Although the nature of these interactions cannot yet be defined with precision, some conclusions can be drawn based on the evidence presented in this study.

Firstly, and importantly, there is no archaeological evidence to support the notion of inherent hostile relationships between nomadic and sedentary communities. There is no evidence that indicates violent behaviour or segregation between the two. Instead, the available evidence from the Jebel Qurma region suggests contacts that included the exchange of commodities, as discussed above.

It is difficult to say whether communities who frequented the Jebel Qurma region were in direct or indirect contact with sedentary communities. Especially during the Hellenistic and Roman periods, it is unknown whether permanent settlements were situated in close proximity to the Jebel Qurma region. For this early period of inhabitation, the closest agricultural villages were situated in the Hauran, some 70 km to the northwest. At the end of the Roman period, and especially during the Byzantine and Early Islamic periods, military forts and permanent settlements encroached onto nomadic areas. Perhaps this resulted in more direct contact between the nomadic communities of the Black Desert and the settled communities on its fringe. The stark increase in the occurrence of pottery during this period in the Jebel Qurma region may perhaps be ascribed to such increased ties.

6.2.4.4 Mobility

The results of the archaeological fieldwork in the Jebel Qurma region are informative regarding mobility patterns on various scales, both within the region and beyond. Starting with local patterns of movement, evidence for repeated human activity could be found far beyond the confines of residential sites. People moved out into the landscape towards a number of different locations. In most cases, campsites were situated away from mudflats, which were potentially the most reliable sources of water in the region. To make use of such water sources, people had to cover considerable distances, and these movements were facilitated by networks of paths running through a landscape carpeted by basalt. Similarly, high and exposed locations were visited repeatedly for the creation of rock art, perhaps in combination with more mundane tasks such as pasturing herds, hunting wild animals, or simply being on the lookout. It is likely that people were well acquainted with their local landscapes.

Movements on a regional scale, beyond the arbitrary limits of the study area, are difficult to reconstruct with precision on the basis of the archaeological evidence. However, the material remains strongly suggest interaction with sedentary communities beyond the Black Desert. Pottery vessels, jewellery, and metal objects were acquired from the settled parts of the Levant.

Although there is no direct archaeological evidence for the frequentation of the Jebel Qurma region during specific times of year, the movements of nomadic communities were governed, at least in part, by the seasonal fluctuations in natural resource availability. Safaitic inscriptions are furthermore suggestive of seasonal migratory cycles (Macdonald 1992a). It was also argued in Chapter 4 that enclosures were possibly used as campsites in cold and wet seasons, while campsites without such features were used in dryer periods. This would suggest that the Jebel Qurma region was visited during multiple times of year rather than during just one season. This is furthermore suggested by the Safaitic inscriptions from the Jebel Qurma region, in which the frequentation of the region in different seasons is mentioned (Della Puppa forthcoming).

6.3 The development of the nomadic landscape

This section addresses one of the main questions posed by this research: to what degree did nomadic communities transform the landscape they inhabited through the construction of stone-built features? It summarises the history of inhabitation in the Jebel Qurma region by nomadic communities and the nature of the landscapes they inhabited, based on the research presented in the foregoing chapters.

6.3.1 Relict landscapes: prehistoric features in the Jebel Qurma region

Although prehistoric stone-built features lie beyond the scope of this study, it seems relevant to briefly discuss the kind of features that were already present in the landscape since prehistoric times. After all, when the Jebel Qurma region became re-inhabited after a period of abandonment during the 2nd and early 1st millennium BC, the region was by no means a completely natural environment. Pedestrian surveys have indicated that a number of features are most likely prehistoric in date, including desert kites, wheels, dwelling clusters, and at least a number of enclosures (Akkermans *et al.* 2014; Akkermans and Huigens 2018; Huigens 2015; see also Chapter 3). With regard to the prehistoric enclosures, it is difficult to say at this point to what degree they were reused and modified during Classical and Late Antiquity. This is certainly possible, as both prehistoric and younger materials were found within enclosures during surveys and excavations, such as at QUR-210, QUR-373 and QUR-595 (Chapters 3 and 4). However, it proved difficult to reconstruct direct correlations between the prehistoric remains, such as dated fire pits and chipped-stone artefacts, and the architectural features. Nonetheless, the fact that both prehistoric and Classical/Late Antique remains were sometimes found within the same enclosure is a likely indicator that prehistoric enclosures were occasionally reused between the Hellenistic and Early Islamic periods.

The excavation of a number of cairns indicate that some small burial cairns date to the prehistoric inhabitation phase (Akkermans and Brüning 2017). However, most of the burial cairns that were used during Classical Antiquity were newly constructed rather than reused, with the possible exceptions of the cairns at QUR-215 and QUR-956. Important morphological differences exist between the prehistoric cairns and those from the Hellenistic/Roman period. The prehistoric cairns were usually less than 4 m in diameter, while the more recent ones were generally larger. These measurements can thus be used to assign chronological differentiations between cairns documented through future surface surveys. Whether this also holds for areas beyond the Jebel Qurma region requires further research.

6.3.2 Developments in the natural environment

Although the geology and topography in the Jebel Qurma region have probably been relatively stable over time, this is likely not the case for vegetation and water availability. This research has provided new information regarding the past environmental conditions in the study area. The clearest indications that environmental conditions perhaps were more humid in the Classical and Late Antique periods are the results of the botanical analysis of charred plant remains from the site of QUR-595 (Chapter 4). While these remains may indicate that part of the Jebel Qurma hosted moister conditions than at present, this must remain a suggestion rather than a fact. This uncertainty results from the fact that these remains came from a single site only, and may have been brought into the site as fire wood from elsewhere. Analyses of botanical remains from other sites are necessary to determine further whether the environment was indeed more humid, and during which periods.

It is also recalled here that potential evidence of changing environmental conditions were encountered during the excavations at QUR-373. The enclosure at this site preserved relatively thick accumulations of wind-blown sand, which had accumulated behind the enclosure wall. These sands may have been deposited as a result of increased environmental degradation or increased wind activity (e.g. Roskin *et al.* 2013; Woronko 2012), but this hypothesis requires further investigation.

6.3.3 The construction of stone-built architecture

There is currently no unequivocal evidence that any of the enclosures researched by this project in the Jebel Qurma region were constructed during the Classical or Late Antique period. Although many of these features certainly were used in this period, their date of construction may be much earlier. None of the enclosure walls could be directly associated with datable remains, such as OSL dates or stratigraphically related floor levels. Prehistoric remains were often encountered within the enclosures,

suggesting that it is possible that the structures were of much older origin. Nevertheless, in some cases there is evidence that enclosures were structurally modified in historical times. For example, at the site of QUR-373, part of the enclosure wall was reinforced during the Early Islamic period. Similarly, part of the enclosure wall at QUR-11 was also rebuilt during this period.

While many of the prehistoric enclosures have evidence for their later reuse and modification, other features were newly created. These include clearings, which were newly created in the landscape from the Hellenistic period onwards. After the initial creation of the clearings, they were sometimes reused during later periods, attested by ceramic evidence from between the Hellenistic and Early Islamic periods.

Other features that were newly constructed during the Hellenistic and Roman periods of inhabitation are different types of burial cairns, to which Pendants were sometimes added. Tower Tombs represent the most characteristic tomb type of cairns in this period. These are relatively large burial cairns with a monumental external façade that forms a tower. In some cases, rectangular ante-chambers were constructed against the façade's exterior. Both male and female adults were interred in such tombs, and possibly children as well. Items for personal adornments such as necklaces or bracelets and earrings were often interred with the dead. Pottery vessels were completely absent from grave inventories in these types of cairns. Furthermore, a large degree of architectural investment was put into the construction of such tombs. Some of the stones used could weigh as much as 300 kg, implying that the construction of a Tower Tomb required the effort of large amounts of people. Another cairn type was the Ring Cairn, which was attested at QUR-215 and possibly represents a slightly earlier tomb type.

Although Safaitic inscriptions and petroglyphs often tend to cluster around burial cairns, there is at this point no evidence for a clear correlation between funerary practices and the creation of the carvings. It is recalled from the excavations at QUR-2, that at least some of the carvings found there were already made prior to the construction of the Tower Tomb. Furthermore, only a very small number of inscriptions from the study area actually mention the construction of a funerary structure.

On the basis of OSL dates, burial cairns and Pendants demonstrated spatial and chronological correlations. Excavation results clearly indicate that the Pendants themselves do not represent mortuary structures, as there were no remains of burials within or underneath these structures. Pendants almost exclusively occur in association with burial cairns, suggesting that Pendants played some part in burial customs, or the commemoration of the dead interred within cairns.

An important shift seems to have occurred in the Late Antique period. Significantly, the construction of burial cairns seems to have completely ceased: the latest known cairn burial is from the 3rd or 4th century AD. Instead of cairn burials, inhumation graves appear around the same period. This practice is attested at a limited number of sites, but may well represent the funerary custom that was common in the Jebel Qurma region in Late Antiquity. Some of these graves were found in isolation, and others possibly clustered together in small cemeteries. Given the scarcity of burials from this period it is difficult to make definitive statements regarding how people were buried. The inhumation grave underneath a cairn at QUR-9 from the 5th or 6th century AD was buried in a contracted position, with no grave goods. Other contemporary graves did yield artefacts, including ceramics, but these grave goods were generally more limited in number than in tombs from the Hellenistic and Roman periods.

6.3.4 The structure of the nomadic landscape

The present study has shown that the Jebel Qurma region consists of a wide variety of environments, and that these were used in different ways by their past inhabitants. The *harra* and *hamad* landscapes of the study area present clear differentiations in their use. While both landscapes contained archaeological

remains, the majority of these were confined to the basalt-covered *harra*, in the centre of the study area. The *harra* also had nearly all of the pre-Islamic inscriptions and petroglyphs. This does not imply that the *hamad* is empty; pedestrian surveys here identified a diversity of archaeological remains (e.g. campsites, burial cairns, and pendants) from the Classical and Late Antique periods. The nomadic landscape spread beyond the confines of the *harra*. This realisation is important to emphasise, because a number of recent studies still regard the *harra* as the boundary of the Black Desert and its nomadic landscapes. The archaeological remains of the *hamad* surrounding the *harra* are rarely taken into account by remote sensing studies (e.g. Kennedy 2011; Meister *et al.* 2019). The present study shows that by excluding the *hamad* many archaeological remains are missed, which has dramatic repercussions for subsequent interpretations regarding, for example, settlement patterning, land use, and mobility.

These considerations notwithstanding, there is still a considerable discrepancy between the number of archaeological remains present in the *harra* and *hamad* landscapes, with the majority of archaeological and epigraphic remains located in the *harra*. There are different explanations for this discrepancy. Firstly, the *harra* landscape offers the best potential sources of water, namely the mudflats which are transformed into temporary lakes after rainfall, and may even retain water into the dry season. The *harra* landscape also is bordered by Wadi Rajil, which may contain large amounts of water during the wet season. Secondly, the *harra* offers many places that have a relatively high degree of seclusion, including the numerous deep valleys running down from the south and west part of the plateau. These secluded areas may have been preferred over the open *hamad* plains in cold weather. The abundance of building material in the *harra* may also have been a factor in this respect, as it would have facilitated the construction of new enclosures or the repair of existing prehistoric enclosures. Seclusion may also have been sought for protection against other potential threats, including hostile communities. Although there is no evidence for violent conflict in the region, a number of Safaitic inscriptions from the study area demonstrate hostility between different nomadic lineage groups, which could escalate into violent conflicts (Norris and Al-Manaser 2018). In such cases it would not be unlikely that visual exposure to passing enemy groups was sometimes preferably avoided. In fact, one of the Safaitic inscriptions from the study area mentions hiding from cavalry (Della Puppa forthcoming, QUR 956.75.1), while several others refer to raiding and standing guard (Della Puppa forthcoming).

Although archaeological remains from the Hellenistic and Roman periods were encountered in the *hamad* of the Jebel Qurma region, this hardly holds for pre-Islamic inscriptions and petroglyphs. Such carvings were only encountered in the *hamad* in close proximity to the basalt landscapes. This is rather surprising as the combination of epigraphic and archaeological remains is typical for the *harra*. One possibility for this distribution is that the creation of such carvings was largely confined to panels made of basalt. Perhaps the material properties of basalt were better for making carvings than those of lime- and sandstone rocks, or there may be some additional cultural factors informing this practice (see Brusgaard in press). Another possibility is that there was no such differentiation between materials in the past, but that most carvings on lime- and sandstone have not survived the erosive winds. The rock types in the *hamad* are much softer than basalt, and we should take into account the possibility that any carvings on these rock types have eroded away over the course of about two millennia.

In the *harra* landscapes, further differentiation can be made between the use of lowland and upland areas. Campsites are almost exclusively found in lowland areas, including valley floors and the lower slopes of hills. There are a number of practical considerations that may explain the use of lowland areas for residential purposes. These areas were most accessible and featured a relatively open basalt cover that could be easily cleared to create suitable living spaces. Furthermore, as noted above, these areas also provided shelter against potential foul weather. Although direct inference is difficult to establish between modern and ancient nomads, many ethnographic studies of campsites have highlighted the importance of such considerations among nomads (Cribb 1991: 137; Hammer 2012: 53-57; Western and

Dunne 1979). Pasture availability may have further influenced choices for the location of campsites. Most campsites identified in the Jebel Qurma region were situated on or near the transition area between *harra* and *hamad* landscapes. Although the location of pasture zones in antiquity remains unknown, ethnographic studies have shown that both the *harra* and *hamad* landscapes may provide pasture. However, this may vary from year to year depending on the timing and amount of precipitation (Rowe 1999: 358). Camping on the transitional areas between the *harra* and *hamad* may have occurred in anticipation of such climatic variations.

The location of campsites changed to a minor degree, which may have had significant implications nonetheless. Campsites of the Hellenistic and Roman periods were mostly situated in secluded locations such as valleys and small basins in the interior of the *harra*. During the Byzantine and Early Islamic periods the location of campsites seems to have diversified into both *harra* and *hamad* landscapes, partly shifted towards somewhat more exposed locations in the open plains. Apparently, the benefits of secluded locations were no longer valid, or at least to a lesser degree in the Late Antique period.

While lowland areas predominantly hosted campsites, upland areas mostly contained entirely different features. Hilltops and ridges mostly contained funerary monuments, such as burial cairns and pendants, as well as concentrations of rock art (Brusgaard in press). Such features were present in far fewer numbers in lowland areas. While lowlands were often relatively secluded, many of the basalt-covered hilltops and ridges are places with a high degree of visual prominence: these places could be observed from relatively large distances, and also offered extensive views over the surrounding terrain. In the Hellenistic and Roman periods, such places were preferred for the creation of clearly visible funerary monuments and for the carving of inscriptions and petroglyphs.

6.4 The purpose of stone-built architecture

This research set out to more clearly identify the ways in which the nomadic inhabitants in the Jebel Qurma region used stone-built features between the Hellenistic and Early Islamic periods. It also investigated the broader significance of such features to certain economic and social strategies of these communities. Archaeological fieldwork in the region has indicated that these nomadic communities made use of a variety of features. Some of these features were newly created, while others appear to represent reused prehistoric installations. In Chapter 1, a number of hypotheses were proposed regarding the purpose of stone-built architecture for mobile communities. Firstly, it was argued that stone-built features could have a variety of purposes related to the short-term inhabitation of particular spaces. Secondly, it was proposed that features could also serve particular purposes in the long term, related to anticipated return visits to the region. Based on the archaeological research presented above, these hypotheses are now revisited in this section.

6.4.1 Ephemeral use of stone-built architecture

The research presented above provides a number of indications about the usage of stone-built architecture in short term periods. As there are no permanently inhabited settlements, the region does not seem to have been inhabited year-round, but was frequented only during particular times of year, probably following the seasonal availability of water and other resources. Therefore, mobile communities were occasionally present in the Jebel Qurma region while at other times they migrated to different areas of the Black Desert or even beyond. It is difficult to say exactly how long such visits lasted and, furthermore, it is likely that this varied to a considerable degree. Whatever the case, such short-term visits are indicated by the occurrence of temporarily inhabited campsites, many of which were identified through surface surveys and excavations. Architectural features at these campsites sometimes include stone-built enclosures which, as indicated by the presence of fire places and domestic waste, were often used for residential purposes. Clearings were also used for such purposes,

but without the enclosing walls. The actual residential units likely consisted of perishable materials such as cloth or hides, although such materials were not retrieved. The purpose of the stone walling of the enclosures was to provide additional protection against cold winds and rainfall which occurred, at least occasionally, in winter or even in spring and autumn. The use of such architectural features for this protective purpose is known from ethnographically documented nomadic campsites (e.g. Cribb 1991; Hammer 2012; Von Oppenheim 1899).

To what degree the enclosures also provided shelter for herd animals is at this point impossible to say. Ethnographic studies indicate that especially young animals are vulnerable to foul weather and benefit from some form of protection (e.g. Biagetti 2015; Salzman 1983: 37). The excavations carried out by this project have indicated that some enclosures or parts thereof were not used for residential purposes, and may have functioned to shelter animals. Any definitive answer to this question requires further investigation. It is important to stress that at least one of the potential purposes of the enclosures can now be identified (i.e. their use as camping areas). Until now there was hardly any archaeological information about the way in which they were used, as was outlined in Chapter 1.

Another important realisation is that many of the enclosures may actually have been constructed long before nomadic communities came to inhabit the Jebel Qurma region in the late 1st millennium BC. Several of the excavated enclosures likely date to the prehistoric period, and the same holds for many of the other enclosures documented through pedestrian surveys as they are often associated with prehistoric chipped-stone artefacts. Relict prehistoric features profoundly impacted future engagements with the landscape, at least in the case of campsite location, even if these features were reused and modified only for the sake of convenience. In other words, there may have been no need to newly construct enclosures, as many of them were already present in the landscape since prehistory.

This does not imply that prehistoric enclosures were reused only because they provided areas cleared of the rocky surface cover and would be suitable camping areas. The walling around the cleared areas was certainly relevant, as is indicated by the fact that they were occasionally reinforced, such as at the site of QUR-373. Moreover, if the availability of stone-free surfaces was the only requirement for the selection of campsite areas, the many clearings created in the *harra* landscapes could be used as well. However, these clearings were in many cases situated on more open terrain and somewhat better accessible locations. While these clearings were sometimes used for camping as well, in other cases enclosures were preferred. This differentiation is possibly explained by the use of these features in different times of year, as argued above (Chapter 4).

In addition to seasonal use of enclosures for residential purposes, other short-term uses of stone-built features can be found within the funerary landscape. The disposal of the dead is a short-lived activity that is manifested in the Jebel Qurma region in a variety of ways. From roughly the late 1st millennium BC until the 3rd century AD, burials occurred in cairns, while burials underground without additional architecture emerged in the subsequent period. In the earlier practice, considerable effort was put into the construction of a stone-built tomb and the movement of the body of the deceased up to high locations in the landscape. At these highly visible locations, the interment of a new body involved the creation or modification of a cairn. Why it was deemed important to bury the dead at such locations and in elaborately constructed tombs is a question that goes beyond the practical purpose of disposing the dead. This question is addressed further in the following paragraph.

6.4.2 Investment in permanent landscape features and their long-term significance

Understanding the construction and use of stone-built architecture in nomadic landscapes extends beyond classifying the practical function of such features and how they related to short-term activities of nomadic communities. It is also important, as argued in Chapter 1, to investigate the potential

long-term relevance of such features to economic and social strategies of those who created, used and perceived them. In other words, in what way was the creation of permanent architectural features beneficial in the long term? The research presented above demonstrated that various features were used on multiple occasions rather than incidentally. The first kind of site to be considered in this respect are campsites. These consisted of clearings, enclosures, or both, and were often used during different time periods. In some cases, enclosures may already have been present during prehistory. Other features, such as clearings, were created during the Hellenistic or Roman period but reused after that on multiple occasions. Therefore, nomadic communities who frequented the region during later periods were able to make use of these features for their own purpose, and may not have needed to create new features. Over time, the landscape became increasingly modified and suitable for hosting the inhabitation of short-lived visits by nomadic peoples.

Funerary monuments differ considerably from the features found at campsites as their configuration is in many cases more elaborate and, arguably, geared more towards symbolic rather than practical concerns. Tower Tombs, Ring Cairns, and the Pendants often found in association with them were situated on hilltops and ridges that dominated the skylines of the Jebel Qurma region. Their visibility was enhanced by their size and configuration. The straight façades characteristic for the Tower Tombs, and sometimes also Pendants, made them further stand out on the horizon. They were not concentrated in one particular place but well-distributed over the landscape. Through their location and morphology, these burial cairns visually presented themselves to anyone visiting the region. The purposeful creation of such features and their use as tombs may have created a strong relationship between the dead and later occupants in the region. The dead were not hidden, but remained present in the landscape by means of their funerary monuments. Furthermore, later burial features attached themselves onto these earlier funerary monuments, as is attested at several tombs. These tombs thus remained important elements in the landscape long after their initial construction.

What may these tombs have signified through their morphology, position in the landscape, and their recurrent use as tombs? It is difficult to answer this question with certainty as it largely relates to the intangible domain of perception. It seems likely that these funerary monuments symbolised a sense of attachment between the people who buried their dead here and the landscape itself. This relationship may express itself through the mnemonic properties of these monuments: the monuments may invoke memories related to the buried individuals, and to the people and events associated with these individuals (cf. Bloch 1971; Bradley 1998; Holtorf and Williams 2006). In the Jebel Qurma region, the invocation of such memories was imposed on those who frequented the region by their dominant presence in the landscape. The monuments themselves communicated a history of the individuals and communities who visited the region in the past to the current viewer. Some people addressed in this way may have identified with this history, perhaps belonging to the same social group as the buried individuals. Similarly, to members of different social groups these features may have invoked a sense of otherness, or detachment from the places marked by the monuments. In this respect, it is important to take into account the geographic scale on which these funerary monuments were erected. Tower Tombs were identified not only on prominent locations in the Jebel Qurma region, but also about 75 km to the east at Wisad Pools (e.g. Rollefson 2013). It is possible, therefore, that Tower Tombs dotted at least the entire southern limit of the Jordanian *harra*. If so, these tombs would have had a communicative function on a scale much larger than the Jebel Qurma region.

If the funerary monuments indeed conveyed the relationship of certain groups to the associated landscapes, and if this relationship was the motivation for their construction and usage, this would fit well with the model introduced in Chapter 1, i.e., that the function of burial cairns was to communicate territorial claims. Examples of territorial behaviour among nomads is found in Safaitic inscriptions from Jebel Qurma and beyond (Al-Jallad 2015: 16-17; Norris and Al-Manaser 2018). However, this

reconstruction rests on the assumption that the same social groups used the same burial cairns. More research is required to test this assumption, such as through a comparative analysis of DNA from the skeletal remains inside the tombs to investigate potential kinship ties (e.g. Baca *et al.* 2012; Gamba *et al.* 2011).

Yet, following this line of thought a bit further, the inhumation graves that replaced the cairn burials roughly around the 3rd century AD may have had much less dominant mnemonic properties; they lacked the visual properties of the burial cairns. Instead of visually imposing themselves on visitors to the Jebel Qurma region, these graves could have invoked the memory of the deceased and their associated histories only when approached up close. Thus, with the introduction of inhumation burials, the material relationship between the living, the dead, and the landscapes of the Jebel Qurma region was apparently discontinued with seemingly no replacement medium. Does this discontinuity imply a decreased sense of spatial attachment among nomadic communities in the Late Antique period, a loss of territorial behaviour, or even social cohesion? This remains unclear at this point as there may have been other mechanisms to maintain such relations between people and the landscape. What is clear, is that stone-built architecture no longer fulfilled this role in Late Antiquity.

Chapter 7 - Conclusion

7.1 Introduction

This chapter concludes the research presented in this book, and aims to summarise its most important conclusions by formulating an answer to the main research question posed in Chapter 1. This is followed by an overview of the broader implications of this research and its conclusions. The chapter ends with a number of suggestions for future research, as many new questions have emerged from this research.

7.2 Conclusions

The research presented in this book set out to explore the rich archaeological landscapes of the Jebel Qurma region. It identified the degree to which nomadic communities who inhabited the region between the Hellenistic and Early Islamic periods modified their environment through the construction of stone-built features, how these features were used, and what their significance was to nomadic lifeways. Based on the research presented in this book, the following can be concluded.

What has become clear is that the Jebel Qurma region, similar to other regions of the Black Desert, hosts a wealth of stone-built features. Many of these features are evidently prehistoric, and their persistence in the landscape for thousands of years after their initial construction considerably impacted future engagements with the landscape. Those who visited the region in historical times were able to make use of features such as enclosures for their own purpose, sometimes with minor modifications. The nomads who came to inhabit the region in the late 1st millennium BC did not enter a pristine, natural environment but a landscape that already was cultivated to some extent since prehistory, to their benefit.

But the relict prehistoric landscape was not simply reoccupied, it was restructured to a considerable degree. After a period of limited inhabitation or even abandonment during the 2nd and early 1st millennium BC, nomadic activity in the Jebel Qurma region strongly increased during the Hellenistic and Roman period. New camping areas were created in the landscape by clearing the basalt surface cover, and burial cairns were erected in the landscape that were much larger and of entirely different configurations than those already present. The period is also broadly contemporaneous with the creation of Safaitic inscriptions and petroglyphs in the region.

The Hellenistic and Roman period is now known to be the period of most vigorous transformation of the landscape. From about the 3rd or 4th century AD onwards, burial cairns and pendants seem to fall out of use as funerary monuments. Instead, in this period, the dead were interred in poorly marked inhumation graves. Furthermore, there is no evidence that the rock art in the Jebel Qurma region continued to be made in the Byzantine or Early Islamic period. At the campsites, clearings and enclosures continued to be used for residential purposes in this period.

The construction and use of various stone-built features in the Hellenistic and Roman period can be explained in several ways. Campsites were not only created or modified for a single, short-lived visit, but for occupation on multiple occasions. This strong adherence to certain places is a stable and structured way of inhabiting the landscape. The reason for this may be the potential instability of the environment and its resources that were exploited by nomadic communities. The position of campsites on the transitional zone between *harra* and *hamad* landscapes permitted the exploitation of environments offering different resources; they could flexibly use the landscapes from more or less the same locations. It would have been possible for nomads to camp in the same locations year after year regardless of whether sources of water or pastures were situated in the *harra* or *hamad* landscapes.

Instead of having to change campsite location following resource availability, the inhabitants of the Jebel Qurma region created campsites that could be used over long term periods and in anticipation of variable environmental conditions. The creation of campsites with permanent features spread through the landscape facilitated an efficient exploitation of the environments of the Jebel Qurma region.

Such strategies are furthermore indicative of a strong adherence of the nomads to particular places. These were places that they intended to inhabit not only at one moment in time, but also in the future. This sense of spatial attachment may have been both reinforced and communicated through the construction and repeated use of funerary cairns and pendants, as well as by their high perceptibility in the landscape. These must have been powerful symbols of the attachment of people with the landscape, based on the memory of ancestors and their associated histories.

While the inhabitation of the Jebel Qurma region by nomadic communities continued after the Roman period, the importance of stone-built architecture in nomadic lifeways considerably diminished during the Late Antique period and up to the Abbasid period. The construction and use of funerary cairns and pendants came to a near-complete halt. Furthermore, Late Antique campsites were situated in a wider diversity of locations, and the number of campsites consisting only of clearings increased relative to campsites with enclosures. These developments seem to signify a less rigid adherence to the episodic use of the same locations as was the case during the preceding Hellenistic and Roman periods.

7.3 Implications of this research

This research sought to contribute to a better understanding of nomadic communities in the Black Desert during the Classical and Late Antique periods. Until recently these communities were mostly studied through textual sources. This research has shown the benefits of adding an archaeological perspective to this field of study. Based on previous successful methodologies of locating the archaeological remains of nomads, as well as on the rich archaeological landscapes in the Black Desert, this research set out from the premise that a combination of various archaeological methods could retrieve the archaeological remains of nomads in the Jebel Qurma region. These methods have identified a wide variety of archaeological remains that were left behind by nomadic communities, and many of the materials could be dated to the period of study. These remains have the potential to be informative on many aspects of nomadic lifeways, including the history of inhabitation by nomads, their material culture, land-use strategies, burial practices, and relations with settled areas. They warrant a positive attitude to the archaeology of nomadism in the Black Desert not just with regard to the prehistoric periods, which have been investigated more thoroughly, but also with regard to more recent periods of inhabitation.

Furthermore, this research has shown that a combination of archaeological methods may be used to obtain a better understanding of nomadic engagements with the landscape. Prior to this research, the combined analysis of survey and excavation data had hardly been carried out in the Black Desert. The strong focus on remotely sensed surface data taken by several previous research projects has been useful to some extent. Yet, the chronology and function of feature types clearly visible from above can only be obtained through pedestrian surveys and excavations. Crucial in this respect, as shown by this research, is the use of several complimentary chronometric dating methods, including radiocarbon and OSL dating.

Additionally, this research has identified the presence of relatively many ceramics on the surface of the Black Desert landscapes, which was not previously acknowledged. These ceramics are important in locating and analysing nomadic activities in the Black Desert landscapes. What this research has also demonstrated, is that these datable surface remains should be regarded with caution. When studied in isolation, these remains are poor indicators for the presence or absence of people in the landscape.

Although a relatively large number of ceramics were collected, these cannot be uncritically used to reconstruct occupational intensities, as ceramics need not have been equally widespread during the period of investigation. Excavations indicated the importance of the Hellenistic and Roman period of inhabitation to the Jebel Qurma region; this period is poorly visible in terms of surface ceramics. Equally, based solely on the ceramic evidence, it cannot be concluded with certainty whether the early 1st millennium BC represents a phase of abandonment in the region. Although Iron Age ceramics are completely absent so far, other datable remains hint towards the possibility that nomadic communities may have been present in the region nonetheless – a possibility that requires to be further scrutinised. What is important in this respect is to take into account a broad spectrum of potentially datable remains, including ceramics, coins, skeletal remains, and soil samples, as was attempted in this research, to accurately reconstruct the history of inhabitation within a region.

On a more substantive note, this research has shown that an archaeological approach to nomadism has the potential to highlight a number of significant developments among nomadic communities that sharply contrast with the 'timeless' Bedouin model. Firstly, after the development of camel nomadism in the early first millennium BC, there is no evidence to suggest the continuous inhabitation of the deserts of northern Arabia by nomads up until recent times. Instead, the present research in the Jebel Qurma region identified periods in which the desert likely was largely abandoned. This makes the stereotypical view of the eternal nomad untenable. Secondly, even within a period of relatively continuous inhabitation, such as between the Hellenistic and Early Islamic periods, there were profound changes in nomadic lifeways. This research has highlighted some of these changes: those related to nomad–landscape interactions, that are poorly compatible with Bedouin analogies and, moreover, suggest that nomadism cannot be regarded as static but as a continuously developing way of life.

Finally, this research has indicated that a broader understanding of nomadism in the Black Desert during historical times can be achieved by archaeological research. Until recently, most archaeological research focused on the region's prehistoric remains, while the more recent periods were approached through textual sources. Most important with respect to the latter are the Safaitic inscriptions and other pre-Islamic texts. These texts, however, were mostly studied in terms of content rather than context, as stated in Chapter 1. This research has provided some essential context to the inscriptions and has proven that the Safaitic inscriptions and associated petroglyphs are not an isolated phenomenon, but part of a broader tradition of landscape modifications. These modifications were not meaningless but served specific socio-economic purposes, as summarised above. In view of these conclusions, it seems warranted to evaluate the potential cultural significance of carving and encountering rock art in the landscape, rather than dismissing them as meaningless.

7.4 Suggestions for future research

Investigating the degree to which nomads modified the landscapes of the Jebel Qurma region and the purpose of these modifications involved the successful use of several methods as discussed above. Nonetheless, there are many remaining lacunae that require further research and the use of different archaeological methods. While this research has established the function and initial construction date of a number of stone-built feature types, a number of issues remain. While it was possible to date the construction of Pendants in the Jebel Qurma region with OSL dates, the resulting date ranges were very broad. This is unfortunate, as these features hint at potentially much earlier phases of inhabitation, specifically, during the early 1st millennium BC. The poorly understood purpose of these features adds to this problem. Their consistent association with funerary cairns, and the fact that no burials were found within or underneath the pendants, suggests that they may have served as features to commemorate the dead buried within cairns. Previous interpretations that viewed pendants as gradually growing over

time by the episodic addition of small cairns to the pendant remain unsubstantiated. This issue may require a sequence of OSL dates from the pendant's constituent cairns.

Similar uncertainties remain regarding the use of enclosures. Although it has been established that some of the enclosures in the Jebel Qurma region were used, at least partly, for residential purposes, the hypothesis that they were also used as animal pens remains plausible but unconfirmed. This could be investigated in the future by investigating potential microscopic remains within the enclosures. More research is further required with regard to cairns, for which it has been proposed by the present study that they were used by members of the same social group. This may be further studied through the analysis of DNA from the skeletal remains within tombs to study possible kinship relations between deceased individuals.

In the Jebel Qurma region, there are a number of feature types that remain relatively poorly explored, as they fell outside the limits of this research. For a number of reasons this research was largely limited to the investigations of two different site types, campsites and funerary sites. Features that deserve future research attention include desert kites. Although many of these kites were evidently created in prehistoric periods, their persistence in the landscape implies they were possibly reused in historical periods as well. Whether this was the case or not, and how they were used exactly, may be explored in the future.

The reconstruction of environmental conditions in the Black Desert in antiquity is another issue that requires further scrutiny. The present study has provided hints rather than substantial evidence for past environmental conditions in the Jebel Qurma region and changes therein. A potential proxy for past climatic conditions is charred plant material, which was identified by this project at numerous fire pits at ancient campsites. A more widely encompassing analysis of such remains may be useful to reconstruct local environmental conditions. Other proxies that may be explored include plant and faunal remains within the alluvial deposits in mudflats.

This research was based on the premise that nomadic communities in the Jebel Qurma region relied on a number of subsistence practices, including pastoralism and hunting. This assumption was based on the evidence from textual sources. The archaeological materials retrieved through fieldwork in the Jebel Qurma region hardly provided more detailed information on such practices, such as the composition of herds, the kinds of wild animals hunted, or the seasons in which people performed such practices. A useful observation in this respect is the fact that skeletal remains seem to be poorly preserved in the archaeological record of the region, perhaps due to the shallow nature of deposits at campsites, or a variety of unfavourable post-depositional factors. If this applies to other areas of the Black Desert as well, it is necessary to develop other methods to investigate subsistence activities such as, for example, pastoral production.

Finally, this research has focused on an area of fairly restricted size, in comparison to the vast region comprised by the Black Desert. There is a need to extend this research to other parts of the Black Desert for a number of reasons. Investigating the archaeology of nomadism on a broader geographic scale provides a broader understanding of the variability of nomadic lifeways in the Black Desert; there is no reason to assume that the conclusions derived from the Jebel Qurma region apply directly to other parts of the Black Desert. Furthermore, in order to better understand the relationship between nomadic communities of the Black Desert and sedentary communities in neighbouring regions, such as the Hauran, it would be useful to compare archaeological data from different locations to test models of nomad–sedentary interactions.

7.5 Final remarks

This research has been an initial attempt to shed light on a small percentage of the enormous number of stone-built features present in the Arabian desert. Many of these features and their associated landscapes remain unexplored, and it is hoped that this research has demonstrated the potential of studying such landscapes to better understand the ancient nomadic communities who created them. Investigating these landscapes can be challenging as it requires developing new methodologies and chronological frameworks. Nevertheless, this process creates opportunities to investigate nomads, who have long been regarded as invisible to the archaeologist.

Classical and Late Antiquity remain among some of the most intensively studied periods of Near Eastern history, and archaeological research has long contributed to a better understanding of many of the profound developments occurring in this period. Initially a great deal of that research focused on the urban populations and its monumental archaeological remains and, later, it turned towards rural settlements and their hinterland. Building upon previous research approaches, the present research has attempted to bring the people on the environmental margin into the focus of historical archaeology. While the archaeological remains of nomadic peoples may not be as architecturally spectacular as what can be found in the settled regions, the investigation of these remains is nonetheless essential. After all, although nomads resided in remote areas such as the Black Desert, they were not at all isolated from Classical and Late Antique society. In order to come to a more complete understanding of that society, its nomadic component needs to be better understood, and towards this end archaeological research can offer a significant contribution.

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Appendix A - GIS procedures

This study has used various digital methods to store, model and analyse geographic information. This was carried out in a geographic information system (GIS). The GIS used in this study is ArcGIS, version 10.2, produced by Esri company. All imagery and geographic data were stored and displayed in the WGS 84 coordinate system and Universal Transverse Mercator projection.

Georeferencing and orthorectification

Georeferencing refers to relating coordinates from maps, aerial photographs and imagery to coordinates on the ground, in order to accurately store and project the imagery. Georeferencing is required when such coordinates are not incorporated in the digital imagery files, for example when it includes scanned files of hardcopy maps of photographs. For this study, scans of topographic maps and geological maps, Corona imagery, and aerial photographs were processed this way using the 'Georeferencing' tool in ArcGIS. This tool is also to orthorectify georeferenced raster data. Orthorectification entails creating a geometrically correct projection of the raster. This is required when, for example, oblique aerial photographs are stored in the GIS, in which case the scale differs (i.e., the foreground has a smaller scale than the background). In this case the imagery needs to be warped to create an equal scale over the entire raster. In some cases, a DEM was used to further reduce image distortions that result from topographic variations.

Surface Cover Classification based on Landsat 8 imagery following a supervised classification procedure (Chapter 2, Figure 2.16)

Image classification entails the classification of cell values of a raster dataset in a number of classes. In a supervised classification these classes are predefined by 'teaching' ArcGIS cell values that should represent different classes. This is done by manually creating signatures. In the case of a surface cover classification different types of surface cover are given a different signature. These signatures are then used in ArcGIS to classify the image.

The following procedure was used to create a classification in terms of surface cover:

1. Image selection: Landsat 8 imagery with no 0% cloud cover and as little water as possible. The selected image for this purpose was LC81730382013194LGN00, taken on July 13, 2013.

2. Create a composite raster of bands 7, 6 and 5 (following Leverington and Moon 2012) in RGB, using the ArcGIS 'Image Analysis' toolbar.

3. Create of a polygon shapefile to define signatures.

4. Manually draw polygons over areas for which the surface cover was known, based either on geological maps or on Ikonos satellite imagery. 13 classes were defined:

1. Basalt (Qurma formation)
2. Chert (Umm Rijam formation)
3. Mudflat
4. Limestone/sandstone
5. Agriculture

6. Desert pavement
7. Alluvial gravel
8. Sand
9. Basalt (Wisad formation)
10. Chalk (Wadi Shalalah formation)
11. Water
12. Alluvial chert gravel
13. Basalt & sand

5. Create Signatures for the areas indicated through the signature polygons using the 'Create Signatures' tool

6. Classify the Landsat imagery (Bands 7-6-5) based on the created signature file using the 'Maximum Likelihood Classification' tool.

Hillslope Position Classification of WorldDEM data (Chapter 2, Figure 2.14)

Hillslope Position Classification (HPC) is a method developed by physical geographers Bradley Miller and Randall Schaetzl (Miller 2014; Miller and Schaetzl 2015) in which absolute elevations, slope degrees and slope curvatures are classified in order to create a model that differentiates between different topographic classes, being:

1. Summits (or other topographic highs)
2. Shoulders (or ridges)
3. Backslopes (or steep slopes)
4. Footslopes (or modest slopes)
5. Toeslopes (or topographic lows)

A toolbox that can be used in ArcGIS was developed by Miller for creating a Hillslope Position Classification. This 'Relief Analysis' toolbox was downloaded from http://www.geographer-miller.com/relief-analysis-toolbox/.

The following procedure was used to create a HPC of WorldDEM data, using the 'Relief Analysis' toolbox:

1. Project the WorldDEM raster to UTM_Zone_37N using the 'Project Raster' tool, with a bilinear resampling method.

2. Create a slope degree raster based on the projected WorldDEM using the 'Slope' tool.

3. Classify the slope degree raster using the '3 Class by Breaks' tool of the Relief Analysis toolbox. Three classes were defined:

1. < 5 degrees ('flat' areas)
2. > 5 < 15 degrees (modest slopes)

3. > 15 degrees (steep slopes)

4. Create a curvature raster based on the projected WorldDEM using the 'Curvature' tool.

5. Classify the curvature raster using the '2 Class by Breaks' tool of the Relief Analysis toolbox. Two classes were defined:

1. < 0.5 ((near-)linear or concave areas)
2. > 0.5 (convex areas; i.e. shoulders)

6. Clean up the classified curvature raster using the 'Majority' tool three consecutive times. Residual pixels are thus cleared from the raster.

7. Calculate the relative elevation of areas (topographic highs and lows) using the 'Relative elevation' tool of the Relief Analysis toolbox, using a Neighborhood setting of 500 m on the map.

8. Classify the relative elevation raster using the '2 Class by Breaks' tool of the Relief Analysis toolbox.

9. Create a HPC raster based on the three classified rasters (slope degree, curvature and relative elevation) using the 'Manual classification Method' tool of the Relief Analysis toolbox. The resulting raster has five classes:

1. Topographic highs : high regions relative to their immediate surrounding, with less than 5° of slope
2. Ridges: areas with a very convex slope curvature, i.e., > 0.5
3. Steep slopes: areas with a slope degree higher than 15°
4. Modest slopes: areas with a slope degree between 5° and 15°
5. Topographic lows: low regions relative to their immediate surrounding, with less than 5° of slope

10. Clip the Hillslope Position Classification raster to remove erroneous cells resulting from edge effects.

Modelling of drainage systems based on WorldDEM data (Chapter 2, Figure 2.23)

For landscape models related to the drainage networks of the study area, including wadi courses, major drainage basins, as well as tributary drainage basins (or small valleys) and closed (or endorheic) basins, WorldDEM data was used. The Hydrology toolbox in ArcGIS allows for the reconstruction of the direction and accumulation of water flows. However, endorheic basins are not modelled correctly by these tools, as the 'Flow Accumulation' tool forces endorheic basins to 'spill out' into adjacent drainage basins rather than to drain internally. Therefore, endorheic basins had to be defined manually to some extent before they could be incorporated into a model (see below).

The following procedure was used to create these models:

1. Project the WorldDEM raster to UTM_Zone_37N using the 'Project Raster' tool, using a bilinear resampling method.

2. Ensure hydrological consistency of the projected WorldDEM raster using the 'Fill' tool.

3. Create a direction of flow raster based on the projected and filled WorldDEM raster using the 'Flow Direction' tool.

4. Create a model of wadi courses based on the Flow Direction raster using the 'Flow Accumulation' tool.

5. Model major drainage basins in a raster based on the Flow Direction raster using the 'Basin' tool.

6. Create manually defined pour points in a point shapefile to define tributary valleys and endorheic basins. Tributary valleys were defined through visual inspection of the WorldDEM raster, while endorheic basins were defined through visual inspection of mudflats on Ikonos imagery.

7. Model tributary valleys and endorheic basins in a raster based on Flow Direction and the manually defined poor points using the 'Watershed' tool.

8. Convert the raster delineating valleys and basins into polygons using the 'Raster to Polygon' tool.

Cost Surface raster classification based on WorldDEM data and Surface Cover Classification (Chapter 2, Figure 2.21)

In a cost surface raster, the relative costs of movement through a landscape are modelled based on parameters influencing cost of movement, which in this case were slope degree and surface cover. For this model WorldDEM data and the surface cover classification based on Landsat 8 (see above) were used.

The following procedure was used to create a cost surface raster:

1. Project the WorldDEM raster to UTM_Zone_37N using the 'Project Raster' tool, using a bilinear resampling method.

2. Create a slope degree raster using the 'Slope' tool.

3. Classify the slope degree raster into 10 classes using the 'Reclassify' tool, using a quantile classification method.

4. Create a cost surface raster based on the classified slope degree raster and the classified surface cover raster using the 'Weighted Overlay' tool, setting the influence of both rasters to 50%. The 13 classes of the surface cover raster were divided over a 1 to 10 scale (1 = lowest cost; 10 = highest cost) as follows:

1.	Basalt	8
2.	Chert	3
3.	Mudflat	1
4.	Limestone/sandstone	3
5.	Agriculture	/
6.	Desert pavement	3
7.	Alluvial gravel	5
8.	Sand	10
9.	Wisad basalt	8
10.	Chalk	3
11.	Water	10

12. Alluvial chert gravel 3

13. Basalt & sand 10

Cumulative viewshed analysis for Visual Prominence Classification (Chapter 2, Figure 2.26)

In a viewshed analysis the visible and non-visible cells of a DEM from a number of observer points are calculated. In the resulting raster, the value of each cell shows from how many observer points the cell is visible. In a cumulative viewshed analysis the outcomes of multiple viewshed analyses are combined in a single raster dataset. In the resulting raster, the value of each cell is the sum of the raster values of the separate viewshed analyses.

A cumulative viewshed analyses can be used to visualize locations in the landscape that are more prominent than others, by creating viewsheds of a number of randomly created observer points within a DEM and creating a cumulative viewshed from the resulting rasters (Bourgeois 2013; O'Driscoll 2017). The resulting raster may then be classified into a Visual Prominence Classification (VPC) raster, showing areas with different degrees of visual prominence.

For the VPC of the Jebel Qurma region 10 viewsheds were created on the basis of 10 sets of randomly created points within the extent of the WorldDEM dataset. This DEM was also used for the viewshed analyses. The resulting rasters were combined to create a cumulative viewshed, which was subsequently classified into five classes indicating the degree of visual prominence.

The following procedure was used to create the VPC raster:

1. Create ten sets of random points on the WorldDEM data extent using the ArcGIS 'Create Random Points' tool. Each set contained 100 points with a minimal spacing of 250 m.

2. Create ten viewshed rasters of the ten randomly created collections of observer points, using the WorldDEM as surface, with the ArcGIS 'Visibility' tool. A surface offset of 1.5 m was used, and an observer offset of 1.7 m. 'Frequency' was used as the analysis type, so that each resulting cell contained a value indicating the number of observer points to which the cell was visible.

3. Create a cumulative viewshed raster by combining the ten viewsheds, using the ArcGIS 'Raster Calculator' tool.

4. Classify the resulting raster into 5 classes using a Jenks classification method. These classes were labelled as follows to indicate the degree of visual prominence: 1) Very low; 2) Low; 3) Medium; 4) High; 5) Very high.

Skyline analysis of WorldDEM data (Chapter 2, Figure 2.27)

The WorldDEM dataset was used to determine dominant skylines in the Jebel Qurma region, i.e., ridgelines of prominent hills cresting the horizon of observers is low-lying areas. This was done by performing a skyline analysis in ArcGIS. This analysis determines which elements of the landscape are visible along the horizon from a number of observer points. These observer points were placed in areas that were defined as topographic lows in the HPC, as described above.

The following procedure was used:

1. Create a total of 60 observer points by manually placing these within areas defined as 'topographic lows' in the HPC.

2. Convert these observer points into 3D features, i.e., containing z-values required for the skyline analysis. The ArcGIS 'Extract Values to Points' tool was used here, extracting the z-values from the WorldDEM

cells to the corresponding point features. Added to these z-values was a value of 1.7 m, representing the estimated height of an average observer. The ArcGIS 'Feature to 3D by Attributes' tool was subsequently used to create 3D features based on the extracted z-values.

3. Create skylines using the ArcGIS 'Skyline' tool, using the default settings, without any surface constraints. The 60 3D observer points were used and the WorldDEM raster as surface dataset. The results are a total of 60 polylines each representing the skyline of an individual observer point.

4. Create points from the resulting vertices. The ArcGIS 'Feature Vertices to Points' tool was used to convert the skyline polylines into points, with each point representing a spot on the horizon visible from an observer point.

5. Remove points along the edges of the WorldDEM raster. False points were present on the edges of the WorldDEM raster as a result of edge effects. These points were manually removed.

6. Define skylines in the landscape. The ArcGIS 'Kernel Density' tool was used to calculate the density of points with a search radius of 50 m around each point along each of the 60 skylines. The densities were classified using Jenks classification, resulting in a raster that highlights the dominant skylines in the study area.

Appendix B – Description of find contexts of consulted ceramic parallels

For this study a variety of published pottery corpora were consulted for the purpose of dating ceramics from the Jebel Qurma region on typological grounds (see § 3.4.1.). Care was taken in using reliable sources, i.e., materials from secure stratigraphic and well-dated contexts. Presented below are descriptions of these contexts, ordered chronologically.

Late Iron Age II period (539 - 332 BC)

Tell Balata, Stratum V, Field VII (Lapp 2008: Plate 2.10:4). This context represents a fill sealed by a Hellenistic surface. The stratum was dated between 525-475 BC, based on limited numismatic evidence and imported Attic wares.

Hellenistic period (332 BC – AD 106)

Pella, Area XIII: the Jebel Sarbata fortress (McNicoll *et al.* 1982: Plate 127). Although the precise contexts of the ceramics are not reported, the entire corpus was dated on typological grounds to the Hellenistic period.

Beth She'an (Scythopolis), the *tell*, Area P, Stratum P-5 (Johnson 2006: Figure 51.1-51.5). These ceramics are from a well stratified domestic context that was dated on the basis of imported fine ware types and numismatic evidence between the 3rd and 1st centuries BC.

Tell Anafa, Stratum HEL1A (Berlin 1997: Plate 57:PW80). This is a stratified context sealed by the Stuccoed Building of the Late Hellenistic period. The date of this stratum was further established through coins.

Late Hellenistic period (100 BC – AD 106)

Tell Anafa, Stratum ROM1A (Berlin 1997: Plate 68:PW536). This stratum is associated with buildings 1 to 5, and was dated between the late 1st century BC to the early 1st century AD on the basis of imported fine wares and coins.

Jericho, Stages 2 to 7 of the Hasmonean Palace complex (Bar-Nathan 2002: Plate 11), Herod's Third Palace (Bar-Nathan 2002: Plate 27), including circular room B68 (Bar-Nathan 2002: Plate XI). These represent stratified remains dated on typological grounds between the 1st century BC and the first half of the 1st century AD.

Jerusalem, the National Convention Centre, ceramic phases 2-4 (Berlin 2005: Figures 6 and 9). These are ceramics from stratified remains which were dated on typological grounds between the late 1st century BC to AD 70. However, it is not made explicit how the 'ceramic phases' relate to the stratigraphy at the site.

Jerusalem, the Jewish Quarter. Area A, strata 4 and 4a (Geva and Rosenthal-Heginbottom 2003: Plates 6.9-6.10) are well stratified remains separated by floor levels. Numerous coin finds indicate an early 1st century AD date. Area E, stratum 2 (Geva and Herschkovitz 2006: Plate 4.13) represents the fill of Pool L.742, dated between 1-70 AD on the basis of numismatic evidence and ceramic typology.

Masada, Zealot occupation levels in the Western Palace (Bar-Nathan 2006: Plate 29:37-43; Plate 32). These are remains from a number of floor contexts, dated on typological grounds to the third quarter of the 1st century AD.

Late-Hellenistic – Early Roman period (100 BC – AD 200)

Petra, ez-Zantur (Schmid 2000). The domestic complex yielded a large number of ceramics that were published in great detail. They represent a well-stratified corpus that could be dated on the basis of coins and imported fine wares.Sepphoris, Western Summit (Balouka 2013: Plates 8-12). These are well-stratified remains retrieved from the residential area. They were dated on typological grounds and through coins between 70-135 AD.

Early – Late Roman period (AD 106 – 324)

Sepphoris, Western Summit (Balouka 2013: Plates 13-15, 17-27). These ceramics are from refuse layers in the cisterns, dated on the basis of ceramics, including well datable lamps, between 135-300 AD.

Umm al-Rasas (Kastron Mefa'a), Church of the Lions (Alliata 1992: Figure 9:15-38). From the fill above the floor of an atrium to the west of the church came a number ceramics. Their typology indicated that the fill should be dated to the 3rd-4th century AD.

Late Roman – Byzantine period (AD 200 – 634)

Jerusalem, the Jewish Quarter, Area W, Stratum 2 (Magness 2003, Plate 18.2:1-22). This stratum represents a fill between Byzantine wall remains. Although this fill was not sealed it contained a fairly homogeneous set of ceramics dated with coins and imported fine wares between the 4th and early 6th century AD. El-Lejjun, Area P, the East Vicus Building (Parker 2006: Figure 16.37). Soundings in several rooms of a building in the vicus at the Roman fort at al-Lejjun exposed a number of contexts that could be dated, on the basis of numismatic evidence, between 284 and 363 AD.

Madaba, Bajali courtyard. Stratum US12 (Acconci and Gabrieli 1994: Figure 24) was situated outside a Byzantine house and yielded ceramics from the Late Roman and Byzantine period. The stratum could only be dated on relative terms, i.e. on typological and stratigraphic grounds. Stratum US10 (Acconci and Gabrieli 1994: Figure 27) was situated in Cistern I and was dated, again on relative terms, between the 3rd and 5th centuries AD.

Sepphoris, Area 84 on the Western Summit (Balouka 2013: Plates 28-32). Area 84 yielded well-stratified remains from the Late Roman and Byzantine period, some of which were sealed by earthquake destruction layers. Other dating evidence included coins, lamps, and imported fine wares.

Beth She'an (Scythopolis), the *tell*, Area P, Strata P-3 and P-4 (Johnson 2006: Figure 15.6). Excavations on the shoulder of the *tell* yielded stratified remains that could be dated, on the basis of imported fine wares and amphorae, between the 4th and 6th centuries AD.

Early Byzantine period (AD 324 – 500)

'Amman (Philadelphia), Area C (Northedge 1992: Figure 123). An abandonment context on a floor of a building was dated on typological grounds between the middle of the 4th to the early 5th centuries AD.

Early – Late Byzantine period (AD 324 – 634)

Caesarea Maritima, Stratum 5 (Bar-Nathan and Adato 1986: Figures 1 and 2). These are fairly poorly stratified remains from a modestly exposed area, yet broadly datable on the basis of numismatic evidence between the 5th and 6th centuries AD.

Dhiban (Dibon), Areas S3 and S4 (Tushingham 1972: Figures 9-12). These represent stratified remains from an open area outside the church complex wall. The strata were dated on the basis of imported fine wares and seriation with other excavated parts of the site.

Beth She'an (Scythopolis), the *tell*, Stratum H-2 in Area H (Johnson 2006: Figure 15.13) and Stratum L-2 in Area 2 were both dated on typological grounds to the Byzantine period.

Pella, East Cemetery, Stratum IIA (Smith 1973: Plates 43 and 44). These are remains from a small domestic structure, represented by *c.* 10-20cm of occupational debris covering a plastered floor. This layer was dated to the Byzantine period on the basis of ceramic typology.

Late Byzantine period (AD 500 –634)

Caesarea Maritima, Area V/4 (Magness 1995: Figure 1:16-17). These ceramics are from Locus 4061, a well-stratified context above the foundation trench of the Byzantine city wall. The corpus was dated on typological grounds between the 6th and early 7th century AD.

Pella, Area IX: The Civic Complex. Loci 77, 101 and 105 from the Baths (Smith and Day 1989: Plates 52 and 53) are stratified remains that were dated on typological grounds to the 6th-early 7th century AD. Loci 44, 52 and 62 (Smith and Day 1989: Plates 46-51) are refuse layers in the Classical Odeum that were also dated, in this case on the basis of numismatic evidence, to the 6th-early 7th century AD.

Late Byzantine – Umayyad period (AD 500 – 750)

Yoqne'am, Area E, Phase 3 (Avissar 1996: Figure XII.7:5). This pottery came from mixed layers underneath the crusader period church, which were dated on the basis of imported fine wares between the 5th and 7th centuries AD.

Beth She'an (Baysan), the Pottery Workshop, fill of Kiln 4, Locus 50618 (Bar-Nathan 2011: Figure 11.3:1, 11). These are well-stratified remains, dated by numismatic evidence to the 6th or 7th century AD.

Barsinia (El-Khouri 2014: Figure 9). Little contextual information is available for this pottery corpus, and it seems it was dated solely on typological grounds.

Umm al-Rasas (Kastron Mefa'a), St. Stephen church complex, Room F (Alliata 1991: Figure 18:1-14). This is a context sealed between a floor and a destruction layer. It was dated through many coin finds between the 6th and 8th centuries AD.

Jerash (Gerasa), kiln area, phases 2 and 3 (Ball *et al.* 1986: Figure 3). The strata were dated on the basis of coin evidence and ceramic typology between the late 6th and early 8th centuries AD.

Jerash (Gerasa) Hippodrome, carceres area (Kehrberg 1989: Figure 5). Late Byzantine and Umayyad remains came from a layer sealed by the tumble of the starting gates of the hippodrome, which was destroyed in AD 749.

Umayyad period (AD 634 – 750)

'Amman citadel (Olávarri-Goicoechea 1985). These represent well-stratified remains within the Umayyad palace. The stratum dates are based solely on ceramic typology.

Dhiban, North Church. Sherds from an abandonment phase of the church (Tushingham 1972: Figure 6:1-10, 14-23) were dated on typological grounds to the Umayyad period. The sherds from debris in room A (Tushingham 1972: Figure 7:1-20) were dated on the basis of a destruction event to the early 8th century AD.

Madaba, Bajali courtyard, Stratum US20 (Acconci and Gabrieli 1994: Figure 46). These are well-stratified remains from the Umayyad period House H. The stratum was dated on the basis of ceramic typology.

Pella (Tabaqat Fahl). Remains between two destruction layers related to earthquake events dated to 717 and 746/747 AD were encountered in a number of areas in the Civic Complex (McNicoll *et al.* 1982: Plates 140-141; Smith and Day 1989: Plates 54, 55, 58, 59). Another context that was sealed by earthquake events came from the West Church Complex, Area I (Smith 1973: Plates 30-33), and was dated between the mid-7th and the mid-8th century AD. This date is corroborated by numismatic evidence. Pottery sherds from the South Building, Area IB (McNicoll *et al.* 1982: Plates 145 and 146) were found in a destruction layer related to a 746/747 AD earthquake, and is therefore said to represent early 8th century material.

Umm al-Jimal (Parker 1998: Figures 155-157). This is well-stratified material from contexts within three buildings. The dates of the strata were based on ceramic typology.

Jerash, North Theatre, Phase 5 (Clark *et al.* 1986: Figure 21). This phase represents the pottery workshop area at the Classical theatre, dated on typological grounds to the first half of the 8th century AD.

Beth She'an (Baysan), the Theatre Workshop. Pottery from various stratified contexts was retrieved from the pottery workshop. Locus 60669 (Bar-Nathan 2011: Figure 11.13:3, Figure 11.6:6) represents a latrine waste deposit dated on the basis of coins to the Umayyad period. Locus 50620 (Bar-Nathan 2011: Figure 11.3:10) represents an early 8th century use phase of Kiln 2, sealed by a 749 AD earthquake destruction layer. Strata 7-5 in Unit 2 (Bar-Nathan 2011: Figure 11.4:6) cover a destruction layer of a 659/660 AD earthquake, and were further dated with coins between the late 7th and early 8th centuries AD.

Humaymah, Lower Church, Room 5 ('Amr and Schick 2001: Figure 9:20-21). These sherds are from a context that was covering a floor and was sealed by debris from a conflagration event. This sealed context was dated on typological grounds to the early 7th century AD.

Umayyad – Abbasid period (AD 634 – 969)

Tell Jawa, Building 600 (Daviau 2010: Figures 8.7, 8.9, 8.10). This 'Early Islamic House' yielded rich and well-stratified pottery finds. The dates of the strata were largely based on numismatic evidence, and were mostly from the 8th century AD.

Beth She'an (Baysan), the *tell,* Area P, Stratum P-2 (Johnson 2006: Figure 15.14). Part of an Early Islamic building was excavated here. Its date is based solely on ceramic typology.

Ramla, Area 82.1, Strata IV and V (Cytryn-Silverman 2010: Plate 35:1-10). These are well-stratified ceramics associated with Umayyad period architecture that remained in use during the Abbasid period. The strata were dated on the basis of ceramic typology.

Abbasid period (AD 750 – 969)

Ramla, Square O-2 (Cytryn-Silverman 2010: Plate 9.18). These sherds are from a fill above natural soil, sealed by a plaster floor that was dated to *c.* 800 AD. The ceramic typology furthermore suggests a late 8th century date for this context.

Khirbat Yajuz, Area E (Khalil and Kareem 2002: Figures 8-22). A late 8th to 10th century settlement phase was covering a destruction layer associated with a 749 AD earthquake event. This date of this phase is partially based on limited coin evidence.

Al-Muwaqqar palace, Area IV, square H14 (Najjar 1989: Figures 5-8). An Abbasid occupation phase of the palace was exposed in this area, which was dated on the basis of glazed wares and lamps to the late 8th-early 9th century AD.

Other sources

A number of parallels were found in a typo-chronological study by Kuhnen (1989) on excavated contexts of the Carmel region of Northern Israel. Other parallels come from a typo-chronological study by Magness (1993) on published material from excavations in Jerusalem. The same holds for the study by Renel (2010) that includes ceramics from various excavated contexts in the Hauran region of Southern Syria.

Parallels were also found in the extensive pottery reports from the excavations at Tell Hisban (Gerber 2012; Walker 2012). These ceramics were excavated in the 1970s, but because their original contexts are largely unknown (Herr 2012: 5) they could only be dated on the basis of the original typology of the Tell Hisban ceramics and comparative evidence from other sites. Nevertheless, the publications appear to be thorough in terms of the large number of cited parallels, and were therefore considered for comparative purposes as well.

Other dating criteria

Two types of decoration were encountered numerously on the ceramics from the Jebel Qurma region, and these could be attributed to the Byzantine and Early Islamic periods. The first is painted decoration, executed in various colours including orange/red, brown, purple, and grey, applied on a lightly-coloured surface. In a regional comparative study by Hendrix *et al.* (1996) this kind of painted decoration is dated to the Late Byzantine period, when multiple colours and motifs were used on differently coloured wares, including white paint on grey ware, and red-orange paint on buff ware. Subsequently, during the Umayyad period painting occurs in red, white, purple and brown, and is applied in different motifs. This type of painting continues into the Abbasid period. Limited painting occurs in the Fatimid period, and is discontinued altogether after that (Hendrix *et al.* 1996: 238-79). These observations are largely paralleled when looking at a number of individual sites. At Dhiban so-called "red-on-light" painted ceramics already appear at the very end of the 6th or early 7th century and continue into the Umayyad period (Tushingham 1972: 67-76). At Pella, so-called "red-on-cream" ware seems to continue into the 8th century (Smith 1973; Smith and Day 1989). Parker contends that this red-on-cream painted decoration should be attributed to the 8th and 9th centuries, while white-on-grey paint can be dated more generally to the Late Byzantine and Early Islamic period (Parker 1998: 215). It thus seems that the ceramics from the Jebel Qurma corpus that show painting in various colours on light wares can be safely attributed to the Late Byzantine, Umayyad or Abbasid periods (see § 3.6.).

The second type of decoration is represented by lightly incised parallel lines characterised as "combing". In the regional comparative study by Hendrix *et al.* (1996) combing is shown to appear already in limited amounts in the Early Byzantine period and is widely attested in the Late Byzantine, Umayyad and Abbasid

period. Fatimid and later ceramics do not have combed decoration. They also show that combing was usually applied on large jars and basins (Hendrix *et al.* 1996: 238-79). Looking at individual sites, combing appears in Pella in the 6th-early 7th century (Smith and Day 1989: Plate 50:24), and perhaps even earlier at Beth She'an where it is dated to the Byzantine period (Johnson 2006: Figure 15.13:274, 275). At Dhiban combing seems to continue into the 8th century (Tushingham 1972), and at Ramla combing also appears on Abbasid ceramics (Cytryn-Silverman 2010, Plate 9.10:4). At Khirbet Yajuz combing is also attested on Abbasid pottery, where it continues into the 10th century (Khalil and Kareem 2002). Summarising, it seems safe to ascribe a Byzantine to Early Islamic date to sherds with combed decoration.