Mobile Peoples – Permanent Places

The construction and use of stone-built architecture by nomadic communities in the Jebel Qurma region of the Black Desert (Jordan) between the Hellenistic and Early Islamic periods

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List of abbreviations

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

1 Introduction

There are probably few regions in the world that remain so poorly known in archaeological terms as the Arabian deserts. Telling in this respect are recent discoveries made through the study of satellite imagery and aerial photographs that have shed light on the sheer amount of ancient stone-built features in the Arabian deserts (Kennedy 2011; Kennedy & Bishop 2011). Such features (Fig. 1.1) were created from the basalt rocks that occur on the surfaces of the volcanic regions of Arabia – the so-called *harra*. The large majority of these features, whose quantity has been estimated to be over a million (Kennedy 2011), remain poorly documented and, equally, poorly understood. Looking at this vast amount of virtually unstudied remains, one immediately begins to wonder about the considerable gap in knowledge that must exist about the societies who once lived in these desert regions and, consequently, what these remains might learn us if properly studied. This fascination probably lies at the foundation of this study, although there are several other, less intuitive motivations, which are outlined in this introductory chapter. Obtaining a comprehensive understanding of the archaeological remains of the Arabian deserts is by no means to be covered in single PhD dissertation. Instead, this book focusses on a region in north-eastern Jordan known as the Black Desert (Helms 1981), and is confined to the archaeological remains dating between the Hellenistic and Early Islamic periods, during which the Black Desert was inhabited by communities of nomads. In a region part of which was rendered poorly inhabitable for certain times

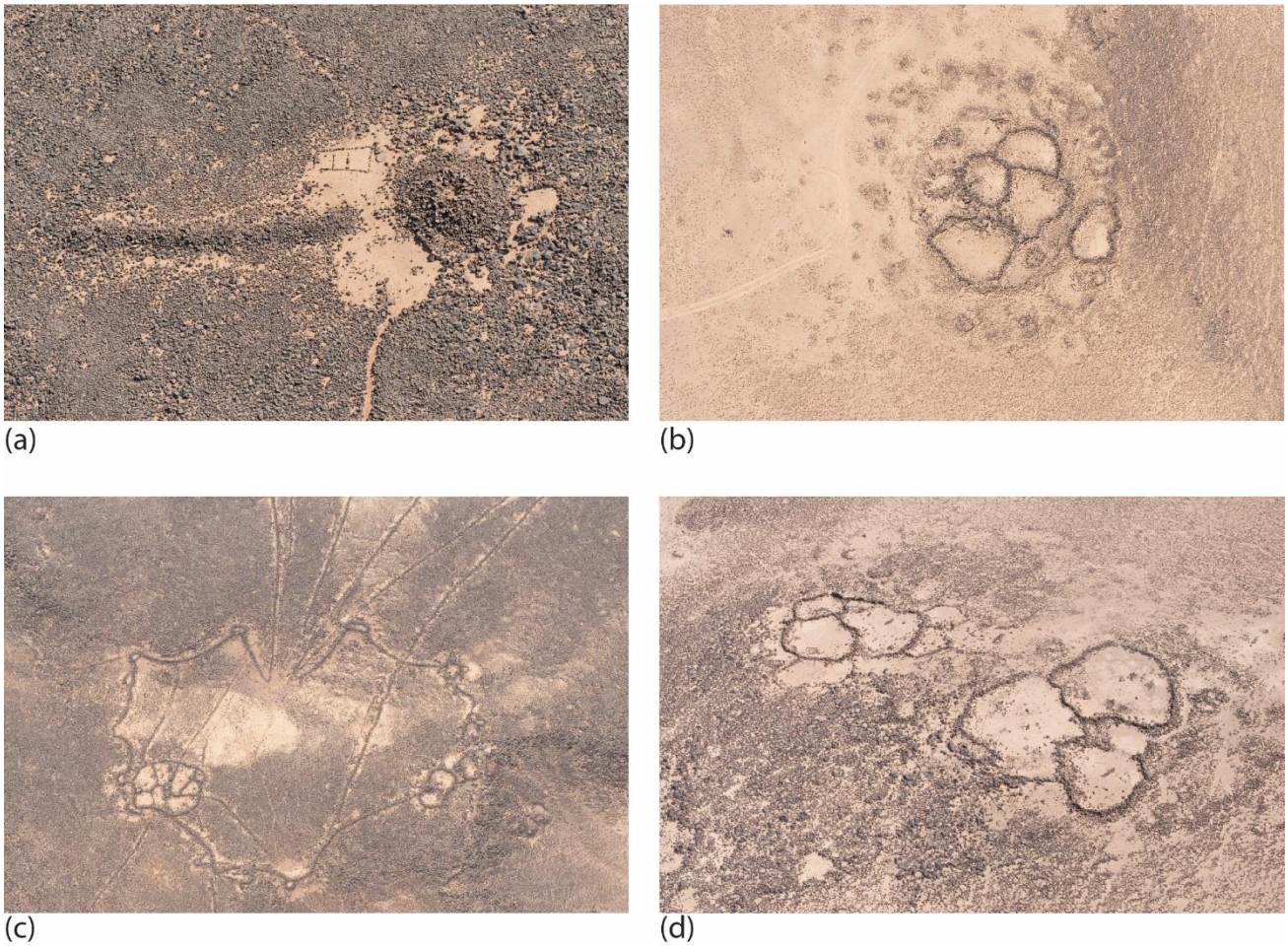

Figure 1.1: Examples of stone-built features from *harra* landscapes in north-eastern Jordan, including (a) a cairn with a pendant tail extending towards the left, (b) a wheel or jellyfish, (c) a desert kite and (d) a series of enclosures. Aerial photographs by David Kennedy (a-c) and Matt Dalton (d),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

of the year due to arid conditions, these people had a migratory lifestyle in which households moved in accordance with fluctuations in natural resources. These nomads are probably best known for the inscriptions and pictorial carvings they left behind on the desert rocks. While these have provided important insights into the people who created them, there are currently hardly any archaeological studies available that focus on nomadism in the Black Desert during historical times. As a result, there is still a poor understanding of how nomadic communities managed to survive in an environment that, at least today, looks bleak and uninviting. This dissertation is an attempt to shed light on some of the strategies employed by these nomads by investigating the desert landscapes they inhabited and modified.

1.1. THE BLACK DESERT: A HARSH AND INHOSPITABLE ENVIRONMENT?

1.1.1. Geography

The Black Desert of Jordan is a vast and seemingly inhospitable environment that today hosts hardly any permanent inhabitation. 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). The name of the region derives from the dominant surface cover, comprising a blanket of sharp and darkly coloured basalt rocks that originate from volcanic eruptions that occurred more than a hundred-thousand year ago (Bender 1968). This basalt field, known in Arabic as the *Harrat al-Sham*, stretches from the Hauran region – on the slopes of Jebel Druze in southern Syria – towards the southeast into the desert regions of north-eastern Jordan and northern Saudi Arabia, where it terminates at the oasis of Jawf (Fig. 1.2). These *harra* landscapes are surrounded by more easily accessible 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 (Fig. 1.3). Today the Black Desert receive less than 200 mm of average annual precipitation, although there may be years when no rainfall at all occurs, 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 per-

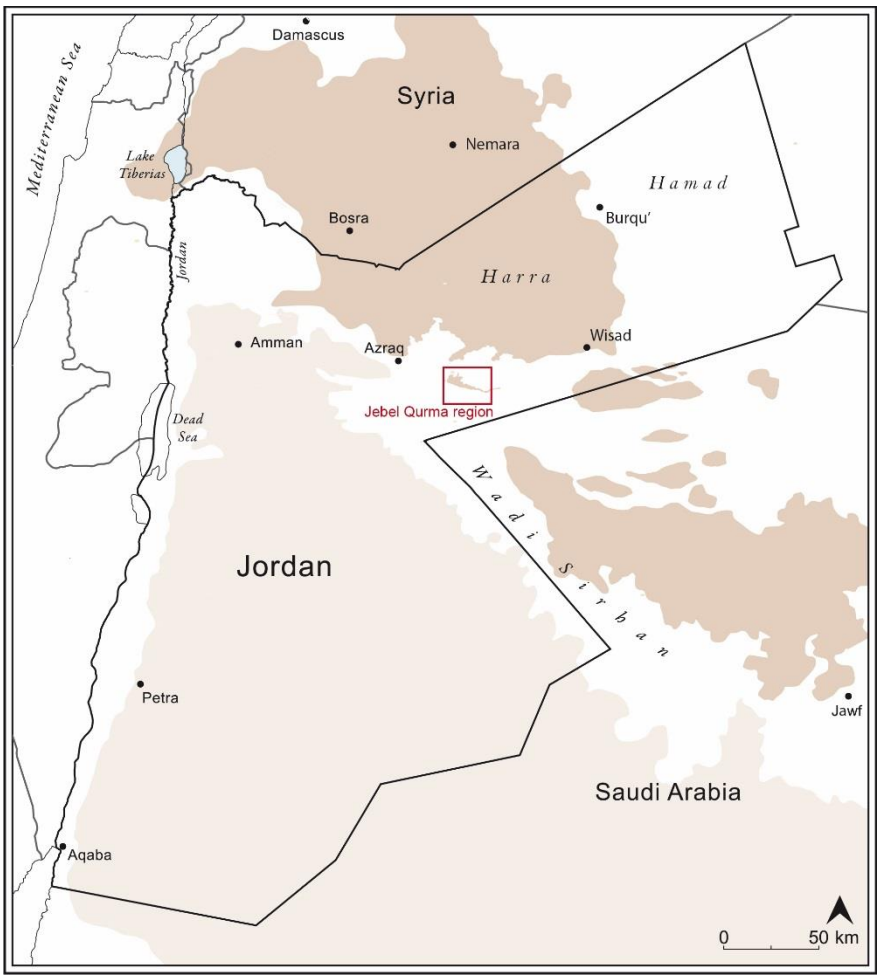

Figure 1.2: Map of modern Jordan indicating the extent of the Harrat ash-Sham basalt field. Drawn by Mikko Kriek.

manent sources of water, including at Azraq, Wisad, Burqu' and Nemara. 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.

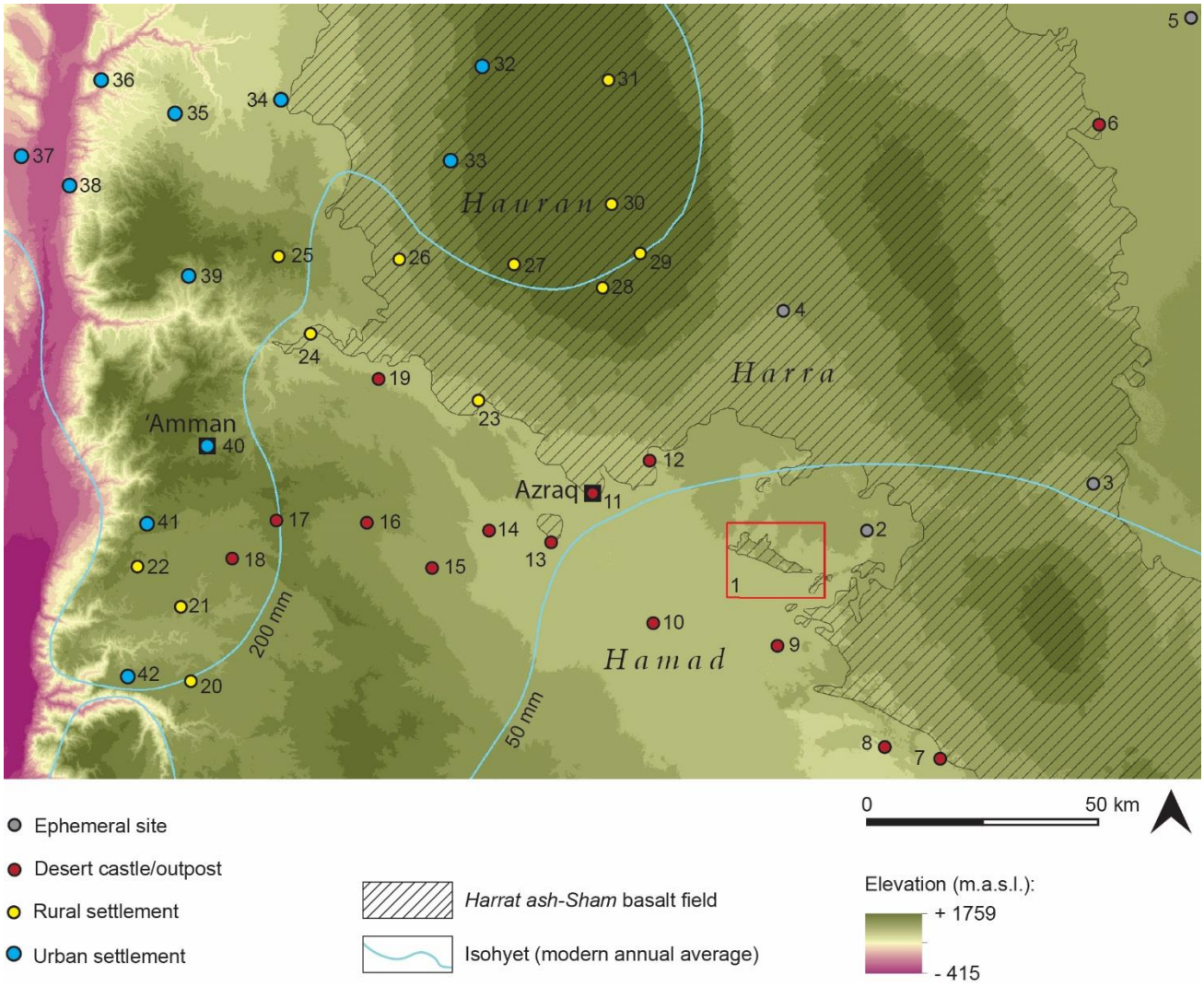

Figure 1.3: Map of the Black Desert and its surrounding, indicating the Jebel Qurma region (1) and sites referred to in this dissertation: 2) Maitland's Mesa; 3) Wisad Pools; 4) Cairn of Hani'; 5) al-Risha; 6) Burqu'; 7) Ithra; 8) Kaf; 9) Hazim; 10) Khirbet 'Umari; 11) Arzaq; 12) Usaikhim; 13) Uweinid; 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.

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. This has been known – although perhaps not widely – since the middle of the 19th century, when the first Safaitic inscriptions were discovered in the Black Desert, and subsequently deciphered in 1901. Over 30,000 Safaitic inscriptions have been documented since, and this number is probably equalled by the amount of pictorial carvings – or petroglyphs – that are often found in association with the inscriptions. Indeed, many of the inscriptions actually refer to these petroglyphs. 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). The inscriptions and petroglyphs nonetheless provide a unique testimony of nomadic communities who carved these inscriptions and petroglyphs on the basalt rocks of the Black Desert, on which they are commonly found.

Equally spectacular, however, 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 airmen who flew over the Black Desert during the British Mandate period in Jordan and made photographs of what they saw on the surface from their planes (e.g. Maitland 1927; Rees 1929). Nowadays, tens-of-thousands of stone-built features of various types – also known as "Works of the Old Men" (Maitland 1927) – have been documented through similar yet more advanced methods, such as the study of high-resolution satellite imagery (e.g. Kempe & Al-Malabeh 2010; Kennedy 2011; Kennedy & Bishop 2011; Meister et al. in press). Many of these features have been given enigmatic names such as *kites*, *pendants*, *wheels* or *jellyfish* (Fig. 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 uncertainties 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 & 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 on in the 21st century by a number of field projects (Müller-Neuhof 2014a).

In many ways, however, the archaeology of the Black Desert is still in its infancy. Most of the research carried out since the 1980s 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 effort has been put into the investigation of the inhabitation of the Black Desert in historic times or, more generally, developments over the *longue durée*. the *Jebel Qurma Archaeological Landscape Project* is exceptional in this respect, as it studies the development of settlement from the Palaeolithic up to modern times (Akkermans & Huigens in press; Huigens 2015). Without comparable research in other parts of the Black Desert, however, 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 further resulted in an incomplete understanding of the various types of stone-built architecture that are found in the *harra* and *hamad* landscapes. For example, although it has been suggested that some of the *desert kites* were constructed already in prehistory for the purpose of hunting wild animals such as gazelle (Betts & Burke 2015), others have argued that at least some of the kites may have been constructed more recently (Macdonald 2005; Maraqten 2015), and that some of them were used for penning herd animals rather than hunting (e.g. Echallier & Braemer 1995). With 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* – stone heaps of varying configurations of which thousands must be present in the Black Desert (Kennedy 2011). Some of these have proved to be prehistoric tombs (Akkermans & Brüning 2017); others appeared to contain graves associated with Safaitic inscriptions (Akkermans & 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. At this point, however, a clear understanding of the use and chronology of cairns is lacking due to the scarcity of archaeological research. Equally enigmatic are *pendants* that 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 & Makarewicz 2016, 347-348; Salzman 2002, 246). Others would reserve the term nomadism to an economic system based primarily on pastoral production in marginal environments that is facilitated through cyclical residential mobility of herds and households (e.g. Khazanov 1984; Spooner 1971, 199). This study, however, primarily engages with the relation between mobile communities and the organisation of space that 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 – one that highlights the mobile character of the communities classified as nomadic rather than a specific system of production.

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 even date back to this early period of inhabitation (Betts et al. 1998; Richter 2014; 2017). It was probably during the 7th millennium BC, i.e., during the Late Neolithic, that the herding of sheep or goat was added to the subsistence activities of these nomadic communities, who continued to inhabited 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) that are omnipresent 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 bleak 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. At this point, there is hardly any archaeological evidence for significant inhabitation during the 2nd and much of the 1st millennium BC, i.e. up to the Hellenistic period, except for a few isolated finds (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; 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 – or 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 & Loreto 2014; 2015). This strong discrepancy between textual sources and archaeological remains therefore remains to be further investigated. 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 reflect a period of abandonment or something else, such as poor visibility, or simply a lack of attention for these remains.

What is certain is that by the end of the 1st millennium BC and the beginning of the 1st millennium AD – 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 who migrated through the *harra* and *hamad* regions on a seasonal basis (Macdonald 1992a). Indeed, although few Safaitic texts have been recorded in Nabataean and Roman towns to the west of the Black Desert, the overwhelming majority of the inscriptions is 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 — mainly 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 raiding of livestock. There is no evidence, however, for all-out 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. The agricultural infrastructure 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, and later by the Romans who had 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. For example, 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 activities for the newly emerging towns in the Hauran (Rohmer 2011). Less clear, however, is the nature of pastoralist production: was it based on nomadic pastoralism, in which herds and household resided in the Black Desert for certain times of year, or was it restricted to direct outskirts of settlements?

During the same period, investments in the military infrastructure in this part of the Roman empire were carried out. Perhaps building partly on earlier Nabataean military works (Bowersock 1983, 154-158), numerous fortifications and watchtowers, connected by roads, were constructed on the western fringes of the Black Desert under Roman rule (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 put forward. 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). The latter view seems to be

based largely on ancient literary sources in which nomads are portrayed not only as uncivilised and unreliable but, moreover, also as hostile (Hoyland 2001, 96-97). It is likely, however, that such descriptions are mostly rhetoric rather than an accurate account of nomad–sedentary relations in the Hellenistic and Roman periods, as most scholars now acknowledge. Although violent conflict may have occurred from time to time, these were probably exceptions to a much more harmonious relation, defined by mutual benefit or even 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 in the Late Antique period at the latest, perhaps as early as the 4th century AD, as there are no clear indications that Safaitic or any other nomadic script was used thereafter. With an equal scarcity of archaeological data, direct information on nomadism during the Byzantine and Early Islamic periods largely grows silent. On this basis, it has been argued by some that in this period many of the nomads settled down, abandoning the Black Desert and their nomadic lifestyle for a 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 set in motion in the Hellenistic and Roman period continued well into Late Antiquity. Towns and villages in the Hauran region reached a peak in prosperity between ca. the 6th and 8th centuries AD, and a general growth in population as well as the number of villages is well attested (Villeneuve 1985; Walmsley 2005).

Others have suggested, however, 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 united by them. In Jordan, this role was fulfilled by the client kingdom of Ghassan ruled by 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 that were adapted during the Byzantine period may well have been used by local elites to meet with nomadic sections 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 at this point very scarce. This may largely be the result, however, of limited archaeological research rather than limited inhabitation in the past. To what degree there was any continuation in the presence of nomads 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, as 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 thus relies on epigraphic remains and pic-

torial rock art carved out by nomads themselves, combined with archaeological remains left behind by nomadic communities.

This has been the aim of the *Landscapes of Survival* project, a four-year interdisciplinary research project that investigates the archaeology, epigraphy, and pictorial rock art of nomadic communities who 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 area is about 300 km^2 large, 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*, of which the *Landscapes of Survival* programme is a spin-off. Over the course of five two-month field campaigns the 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 & Brüning 2017; Akkermans & Huigens in press; Huigens 2015). While the history of the Jebel Qurma region extends from the Paleaolithic up to the present day, a distinct peak in the occurrence of archaeological and epigraphic remains is observed in the late 1st millennium BC and the 1st millennium AD. These remains include about 5000 pre-Islamic inscriptions – mostly Safaitic – and an equal amount of pictorial carvings. Additionally, there are hundreds of sites with archaeological remains that can be dated to this phase of inhabitation, including ceramics and other artefacts, and stone-built features such as enclosures, clearings, and burial cairns. In the *Landscapes of Survival* programme these remains are further studied to shed light on the nomadic communities these remains derived from. A study of the epigraphic remains will be published in a separate dissertation (Della Puppa forthcoming) as will the study of pictorial rock art (Brusgaard forthcoming). The dissertation at hand 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* programme, the aim of the study at hand 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 made about 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 is not to be underestimated. Nomads of the Black Desert have sometimes featured dominantly in discussions related to the development of settlement and the organisation of defence in the eastern parts of 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 on nomads available. For other periods, there are only textual sources, which have their 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 problematic in various ways as well. For example, these sources lack detailed chronological control and, as a result, tend to be studied as one contemporaneous corpus. It remains impossible, therefore, to study the way in which communities who carved out 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 activities and phenomena that were considered to be normal. 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, reconstructions based on the carvings alone are in danger of being too much based 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 variation therein 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 may 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 rigidity – stasis even – that is completely unwarranted. 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 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, as well as the high degree of fluidity *of* such societies, who are known to be able to quickly adapt, either collectively or individually, to changing socio-political or environmental circumstances (e.g. Bacon 1954; Barth 1961; Barfield 1993; Biagetti & Howe 2017; Dyson-Hudson & Dyson-Hudson 1980; Finkelstein & Perevolotsky 1990; Khazanov 1984; LaBianca 1993; Salzman 1996a; 1996b; 2002).

Nonetheless, the assumption that the Bedouin are 'timeless' has had a profound impact on how scholars have regarded 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 as recorded in the 19th century onto nomads who resided 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 himself 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; 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 forthcoming).

Regarding nomadic societies as 'timeless' is, as explained above, theoretically unwarranted. Moreover, it is also unsound from an empirical point of view. The desert regions of Arabia host an enormous amount of archaeological remains, many of which were left behind by nomadic peoples. The archaeological landscapes they comprise are being revealed at an increasing rate, because of advances in the use of satellite imagery in archaeological prospection, but also because of a general increase in archaeological interest in ancient nomadism (cf. Honeychurch & 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 previously assumed (Rosen 2017). In many cases, these remains are hardly consistent with traditional models on nomadic land-use based on ethnographic accounts. In these models, nomadic landscapes are largely regarded as wild, natural spaces that remain almost completely unmodified, except temporarily when camps are pitched. 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 nomadic 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 approach to this objective, presented in this book, aims to shed light on how the organisation of space contributed to such strategies. As exposed above, the role of stone-built archi-

tecture 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 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 firstly attempts to investigate the way in which nomads engaged with their environment, specifically through the construction and use of permanent architectural features that typify 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 to be 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 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 clusters that are high enough in density to form sites visible to archaeologists, given the highly mobile character of the people these materials originate from (e.g. Finkelstein & Perevolotsky 1990). The argumentation behind these assumptions, and the way in which they negatively influence 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 by the 1990s solutions had been provided to many of the methodological problems he envisioned, and that 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 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 & Köhler-Rollefson 1992; Cribb 1991; Eldar et al. 1992; Simms 1988; Zarins 1992) and beyond (Bartosiewicz & Greenfeld 1999; Bradley 1992; Smith 1978). The general purpose 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. In this book Cribb questions and successfully deconstructs the notion of the invisible nomad, by exploring the material culture and the nature of settlements among contemporary pastoral nomads, and the ways in which they may form archaeological sites, thus creating 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 in which she recorded 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 contributed to 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 & 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. Whereas in more dynamic environments such remains would quickly be obscured, i.e. buried by younger sediments, the relatively stable nature of desert environments may lead 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 & Avni 1993), the Transjordan region (e.g. Al-Salameen & Falahat 2009; Banning 1993; Macdonald et al. 2012), the Syrian Desert (e.g. Morandi Bonacossi & 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 and

these remains are indeed scattered over various parts of the landscapes rather than accumulated in one place. In this respect, investigating the archaeological remains of nomads requires to focus not only on the large, visible sites, but also on the landscape beyond these sites (Wendrich & Barnard 2008) using relatively intensive survey methods (Hammer 2012). Although the use of high resolution satellite imagery has proved a useful tool to obtain an initial insight in the nature of nomadic landscapes of the Black Desert (e.g. Kempe & Al-Malabeh 2010; Kennedy 2011), it lacks chronological control and, moreover, is prone to miss a vast amount of poorly visible archaeological remains, 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 potentially poorly visible and highly scattered nature of the archaeological remains. 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 that she documented only three sites in the Jebel Qurma area – a fraction of the number of sites documented so far by the Jebel Qurma project, some of which consists of a few pieces of rock art only or a handful of pottery sherds (Akkermans & Huigens in press; 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 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, i.e., a 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 through the limited availability of substantial and well-defined stratified remains on the site-level (e.g. Banning 1993; Davidovich et al. 2014; Rosen 1993), and through the fact that stone features – both architecture and rock art – are often difficult to date. In some studies this problem is evaded by assuming a chronological correlation between features within such landscapes on the basis of spatial association alone (e.g. Avner 1984; Avner et al. 2014). What is necessary instead is to establish, rather than assume, chronological relationships between materials and features within such palimpsest contexts using dating methods through which the actual construction date of such features is determined. 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 over and over again. There are numerous examples of archaeological studies in desert landscapes of the Near East in which, for example, prehistoric features are 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 association with such features are related to the original date of construction of 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 nomad communities of the ancient Near East over the past decades. As a result, the notion of the 'invisible nomad' is longer valid (Cribb 1991; Rosen 2017; Wendrich & Barnard 2008). The archaeological record of arid environments of the Near East is rich in remains of ancient nomads that can be retrieved through the combined use of various archaeological methods that provide information on different geographic scales, with different chronological resolutions. In this study, both data from remote sensing and intensive pedestrian surveys will be consulted to document architectural features in the landscapes of the Jebel Qurma region, while 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 way in which they may have been perceived by those who engaged with them. This issue relates 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 facilitating certain economic or social strategies? In this paragraph I will present how such questions are approached in the study at hand.

The discovery of archaeological landscapes of nomads in various desert environments of the Near East, as described above, 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, as described in the 19th and early 20th century. The same applies with regard to the stone-built architecture that pervade many of such landscapes: such features were hardly described in ethnographies of the Bedouin, and new explanations are required about why such features were created 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 is 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 research in the Jebel Qurma region (e.g. Akkermans & 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), such excavations have proved to be able to provide insights into the diversity of cairns in terms of function, morphology, and date of construction, use, and reuse. Another example are the stone-built enclosures, thousands of which have been documented in the Black Desert (Meister et al. 2018). The variety of interpretations that have been proposed, including that such features were used as animal pens (e.g. Rollefson et al. 2014) or, alternatively, that they had a residential or even a cultic function (Kennedy 2011, 3189; 2012b) remain assumed rather than established. Again, excavations are required to establish the way in which these features were used in the past. If, for example, these features were primarily used to pen 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 & 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, fire places, and perhaps even 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 these features are part of 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 illuminated 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 & Makarewicz 2016).

Temporality is of 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 "riǧms," 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 claim, also when those who laid claim were not physically present themselves. In a recent study by Hammer (2012; 2014) many more examples are provided of 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 on the long term. Examples are features that improved the quality of pasture such as cairn fields and check dams, and stone-built enclosures that were 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 would entail 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 as their migrations may extend over areas of dozens or even hundreds of kilometres across. 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 & 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 through the *harra* landscapes (Betts & Burke 2015). The construction of these strings 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). This scale of analyses thus provides complementary information on the function of desert kites. Understanding the construction and use of other types of permanent architectural features may benefit from similar multiscalar 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 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

In the foregoing paragraphs it was 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 were 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 actual field methods. 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, which is ideally used, as discussed above, to obtain a broad 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 the 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. Relatively many ceramics were collected that could be dated on typological grounds, and absolute dating methods included radiocarbon dating of charred plant material and skeletal remains, as well as OSL dating of 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. The excavation results were used to better understand how individual features were used in the past, while the results from pedestrian surveys were employed to better understand how these features may have functioned on various geographic scales. Other elements of the landscape, both natural and anthropogenic, were taken into account as well 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. DISSERTATION OUTLINE

This book continues, in the next chapter, with a study of the natural elements of the landscapes of the Jebel Qurma region. This chapter provides some of the context of the archaeological remains that are discussed in this dissertation. In Chapter 3 an overview is presented of the archaeological remains that

were documented in the Jebel Qurma region through surface surveys, including pedestrian surveys and remote sensing surveys. It also includes a first chronological overview of the history of inhabitation in the Jebel Qurma region, provided by an analyses of datable remains collected on the surface – mainly pottery sherds. It further provides an initial assessment of the types of stone-built features that were potentially used during the period under investigation. In the following Chapters 4 and 5 some of these stone-built features are studied in greater detail by presenting the results of excavations carried out at a number of stone-built features and, subsequently, by a analysing the spatial distribution of these features 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.

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 elements 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 in 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.

This chapter is more, however, than simply a description of the types of natural landscapes encountered in the study area. Additionally, it presents the results of a number of digital modelling procedures that will be important in understanding the structure of the nomadic landscape, as discussed further on in this dissertation. In order to do so, datasets containing information on the physical environment, such as geological maps, topographic maps, and satellite imagery, needed to be transformed in

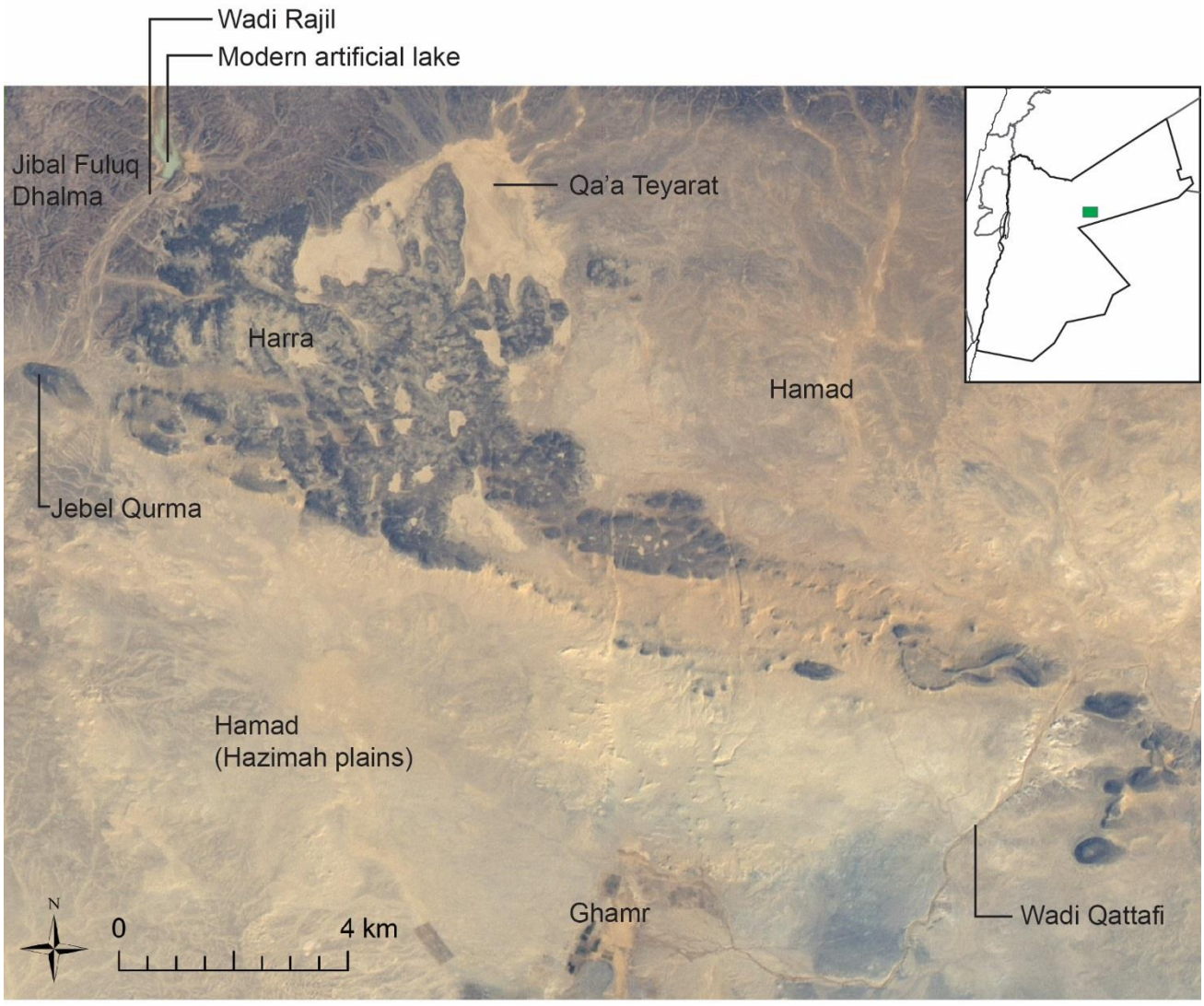

Figure 2.1: Satellite photograph of the Jebel Qurma region, with relevant features indicated (insert: location of the study area (green) in Jordan). Base map: Landsat 7, true colours.

such a way that it could be used for later quantitative and qualitative analyses. For example, although a satellite photographs may provide the observer a sense of what the physical environment is like, it requires classification in such a way that the image is analytically useful. Therefore, for this study, 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 consulted.

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 UTM (Zone 37R) coordinates 323020 E, 3522870 N and 343985 E, 3506805 N – an area of 336 km^2 large. It is roughly bordered on the west side by Wadi Rajil, on the east and south side by Wadi Qattafi (Fig. 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 has been formed through the weathering and breaking-up of solidified lava flows (Fig. 2.2), which erupted from the earth's crust mostly between 8.9 and 0.1 million years ago (Bender 1968, 106).

Jordan's Black Desert generally witnesses hot summers with maximum temperatures of between 35 and 38 °C on average, with absolute maxima exceeding 46 °C. In winter the average minima are between 2 and 9 °C, although occasionally it may freeze. Westerly winds 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 2.2: A *harra* surface in the Jebel Qurma region showing a dense packing of angular basalt rocks. Photo by author.

Today, the Black Desert receives between 150 to 200 mm of average annual rainfall in the north to 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 usually 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

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

dry (Laity 2008, 56). Also, long periods of drought may occur. In fact, short-term dry spells lasting a few decades may occur in the Middle East (e.g. Cook et al. 2016; Enzel et al. 2003), which have severe repercussions for an environmentally marginal area such as the Black Desert, possibly resulting in rendering certain regions completely dry for years on row. The availability of surface water and the degree of soil moisture are equally erratic. Runoff rates are usually high as well 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 (Fig. 2.3) or, in many cases to mudflats. A mudflat (or *qa'a* in Arabic) occurs at the bottom of a so-called endorheic or closed basin where runoff water is contained on the surface as a shallow temporary lake until evaporated (Fig. 2.4). Silts carried within the water are deposited here to form a mudflat. Mudflats also occur in wadis if the wadi gradient is limited, in which case the mudflat is called *marab* rather than *qa'a* (Allison et al. 2000, 362).

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

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 (Fig. 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. At its centre lies the Azraq oasis which contains permanent water year-round – even though nowadays artificial maintenance of the springs is required to counter large-scale modern 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 northwest part of the Jebel Qurma region and, importantly, may carry large amounts of water through the region.

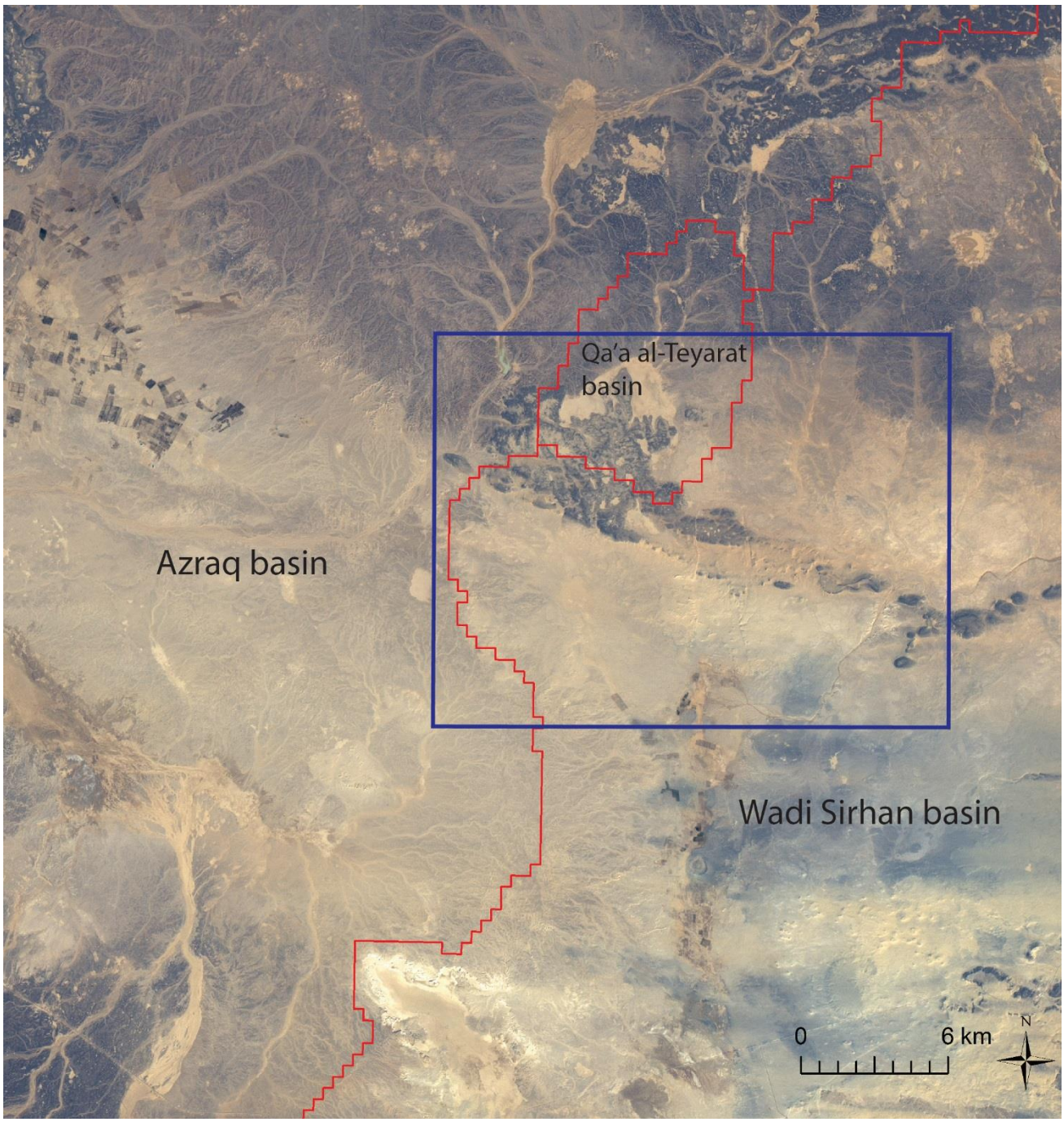

Figure 2.5: The Jebel Qurma region, outlined in blue, is part of three drainage basins whose borders – or watersheds – are indicated in red. Base map: true colour Landsat 7 image. Watershed boundaries are based on HydroSHEDs data.

The second drainage basin that is partially situated in the research area is part of the Wadi Sirhan system which is a low-lying area comprising multiple drainage basins 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 Wadi Qattafi drainage system is mostly situated to the northeast of the Jebel Qurma region. The catchment area of the Wadi Qattafi 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 with at its centre an 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.

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.

The dry, stony basalt region 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 which makes it a highly fertile region suitable for agriculture. To the north, east, and west, however, extend the vast and dry plains of the *hamad*, covered by limestone gravel and, in places, by a desert pavement of flint that 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 in 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, including *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 other may also occur in gravelly soils beyond wadis. Annuals 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 (Cordova 2007, 104-6; Al-Eisawi 1985).

To what degree the climate and environmental conditions in the Black Desert may have differed in the past is at this point difficult to say. There are hardly any published palaeoclimatological or environmental proxies in the Black Desert from the Late Holocene. The presence of nomadic camel- and sheepherders that is attested in the region based through the Safaitic inscriptions and petroglyphs suggests that 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 — most notably water and pastures — which is corroborated by epigraphic sources from the region itself (see Chapter 1). Nevertheless, 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 & 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, with 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 lake sediments of the Dead Sea 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. AD 50 and 400 (Migowski et al. 2006). Others have dated this intermediate dry spell in the Levant between ca. AD 300 and 470 (Izdebski et al. 2015). The onset of increased aridity around AD 700 is well attested at the Dead Sea, Soreq Cave and eastern Mediterranean cores, and seems to have continued until about AD 1100 (Bar-Matthews & 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, to what degree and how climatic conditions affected more localized environmental conditions is much more difficult to ascertain, as the climatic effects on environmental conditions vary from region to region and are hard to predict. More detailed information on environmental conditions and oscillations therein 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. AD 600 and 1400 (Woolfenden & Ababneh 2011), which is comparable to today's vegetation type (see above).

Other issues that remain unresolved is how reliable environmental conditions were 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 water runoff rates prevent moist absorption by soils and the 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 at this point unavailable. Also, if and to what degree rainfall was more predictable in the past is currently unknown.

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 more detail. While studies of the physical geography of the Black Desert in general abound, more detailed information on the Jebel Qurma region itself is much more scarce. Part of what is presented below therefore represents new data that has been 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

The discussion of the physical characteristics of the study area below 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 also be found in Appendix A.

Hardcopy maps

Topographic maps of the study area that were obtained from the Jordanian Natural Resource Authorities for the purpose of the project 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 with the same sheet numbers 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.

Satellite imagery

Different types of satellite imagery were obtained that were able to provide information on local geology, topography and hydrology. The first 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 that started 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 oper-

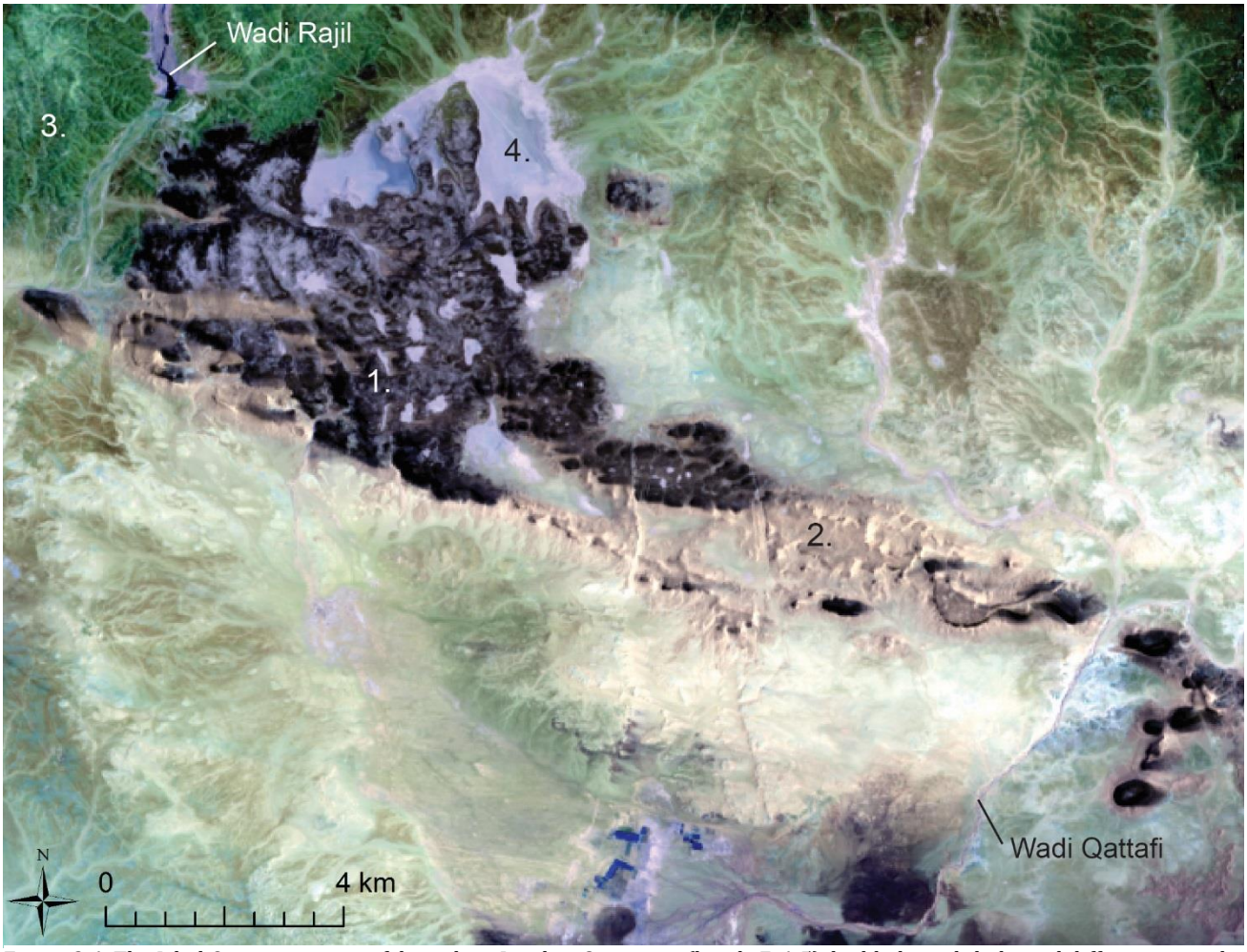

Figure 2.6: The Jebel Qurma region on false colour Landsat 8 imagery (bands 7-6-5), highlighting lithological differences on the surface, such as (1) basalt, (2) sand covering basalts, (3) chert and (4) mudflats.

ational at this moment (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 what can be recorded with the human eye, such as infrared (IR) and near-infrared (NIR) wavelengths. The spatial resolution of the imagery varies between 120 m and 15 m, depending on the recorded wavelength. The imagery is thus not suitable to detect small 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, through their digital availability free of cost, as well as the frequent updates of imagery, 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. This was originally a product of the commercial satellite company GeoEye, and the Ikonos satellite has produced optical imagery of the earth's surface between 1999 and 2015. The imagery has a high spatial resolution, i.e., 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. The imagery could be directly imported in 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 band combination highlights lithological differences on the imagery, as different rock or soil surfaces reflect different wavelengths of light that especially fall in the shortwave infrared and near-infrared light spectra (Leverington & Moon 2012). The resulting imagery (Fig. 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 containing the near- and shortwave infrared bands. On the basis of these signatures the Landsat raster covering the complete study area was classified in terms of surface cover.

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 & Space. WorldDEM data is of much higher spatial resolution, i.e. 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 subsequently used to create other topographic models. WorldDEM data was only available for the western part of the study area (see Fig. 2.7), and subsequent use of this data in landscape modelling procedures is therefore confined by this data extent (see, e.g., Figs. 2.14 & 2.20). Such modelling procedures included the calculation of slope degrees and profile curvatures in the study area (see Appendix A), 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 different variables: slope degree, profile curvature, and relative elevation (following Miller 2014; Miller & 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 Appendix A for digital modelling procedures).

The WorldDEM raster was further used to carry out a number of analyses related to visibility. It was used to define areas in the landscape that are visually more prominent than others, such as hilltops, extensive plains, and so on, i.e., locations that can be observed from many points within the landscape.

Less prominent locations are areas that are often hidden from view, i.e., secluded areas 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.

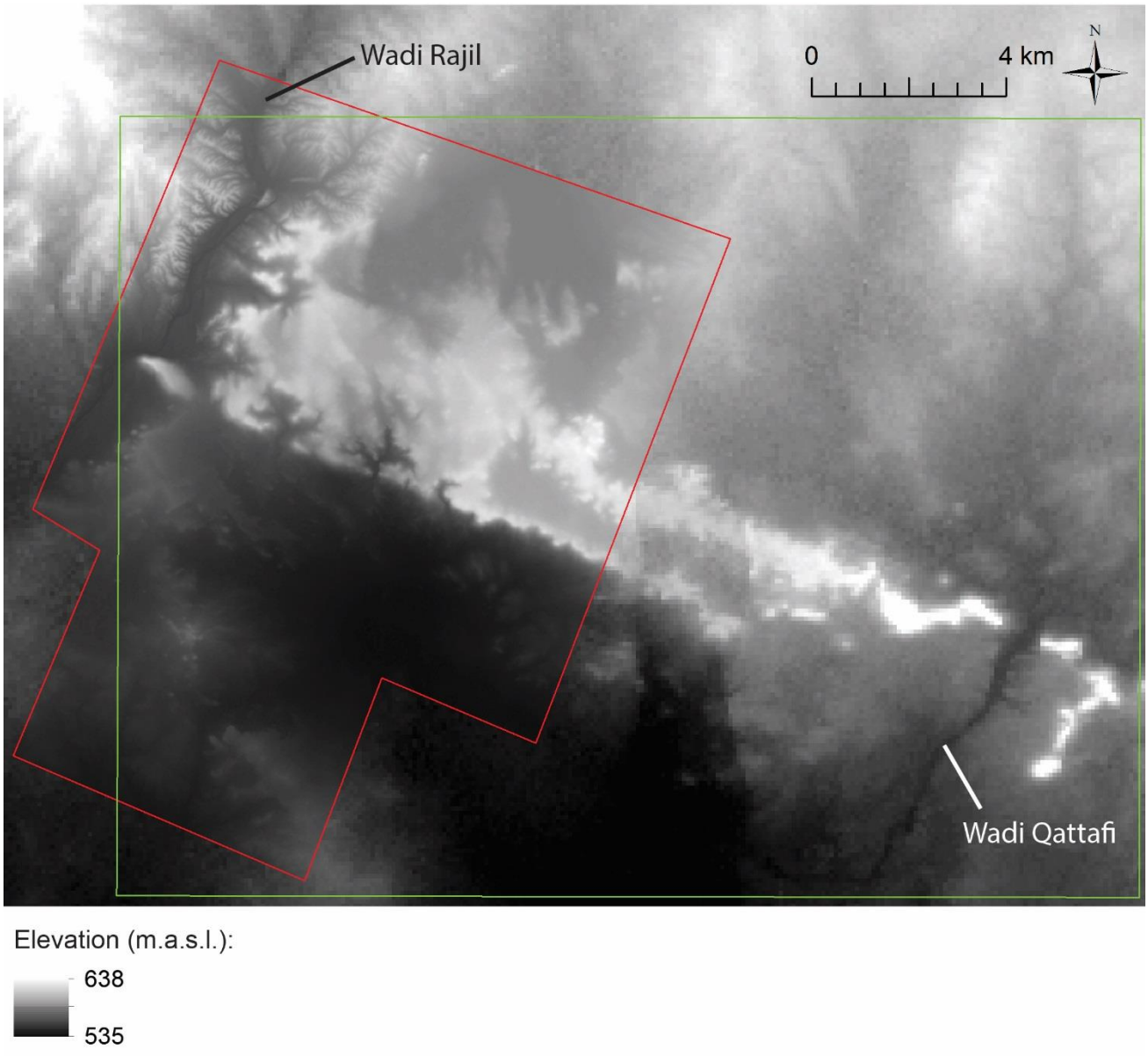

Figure 2.7: A 90 m resolution SRTM DEM of the Jebel Qurma region (green) overlain by a 12 m resolution WorldDEM (red).

The WorldDEM data was also used to define locations in the landscape that represent 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, although not visible from every location in the landscape, are visible on the horizon more often than other features.

The 'Skyline' tool in ArcGIS was used to create such skylines, and was specifically calculated using observer points placed in areas representing topographic lows, following the Hillslope Position Classification (see Appendix A). 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.

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 are calculated. In this model, cost of movement is based on two parameters, being the degree of slope and surface cover of the terrain. This is based on the assumption that passing over steep slopes is more costly than over flat areas, and passing through rough surfaces, such as basalt is more costly than passing over even surfaces, such as limestone/sandstone. 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 is a derivative of SRTM imagery 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. For hydrological modelling on a local scale, i.e. the scale of the study area, WorldDEM data was used. 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 Appendix A).

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 (Fig. 2.8) will now be further 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). The geological maps of the study area indicate that it is mostly present at the surface in its northwest and northeast corners, as well as on some isolated hills within Wadi Rajil.

The Umm Rijam formation is covered in placed 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 east part of the Jebel Qurma region.

Covering parts of the Umm Rijam and Wadi Shallala formation is a particular type of basalts 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 Wadi as-Subhi basalt, which is typically formed in large plates, and may have been an important building material. It is therefore important to note that these basalts of the Wisad group cannot be 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 southeast part of the region.

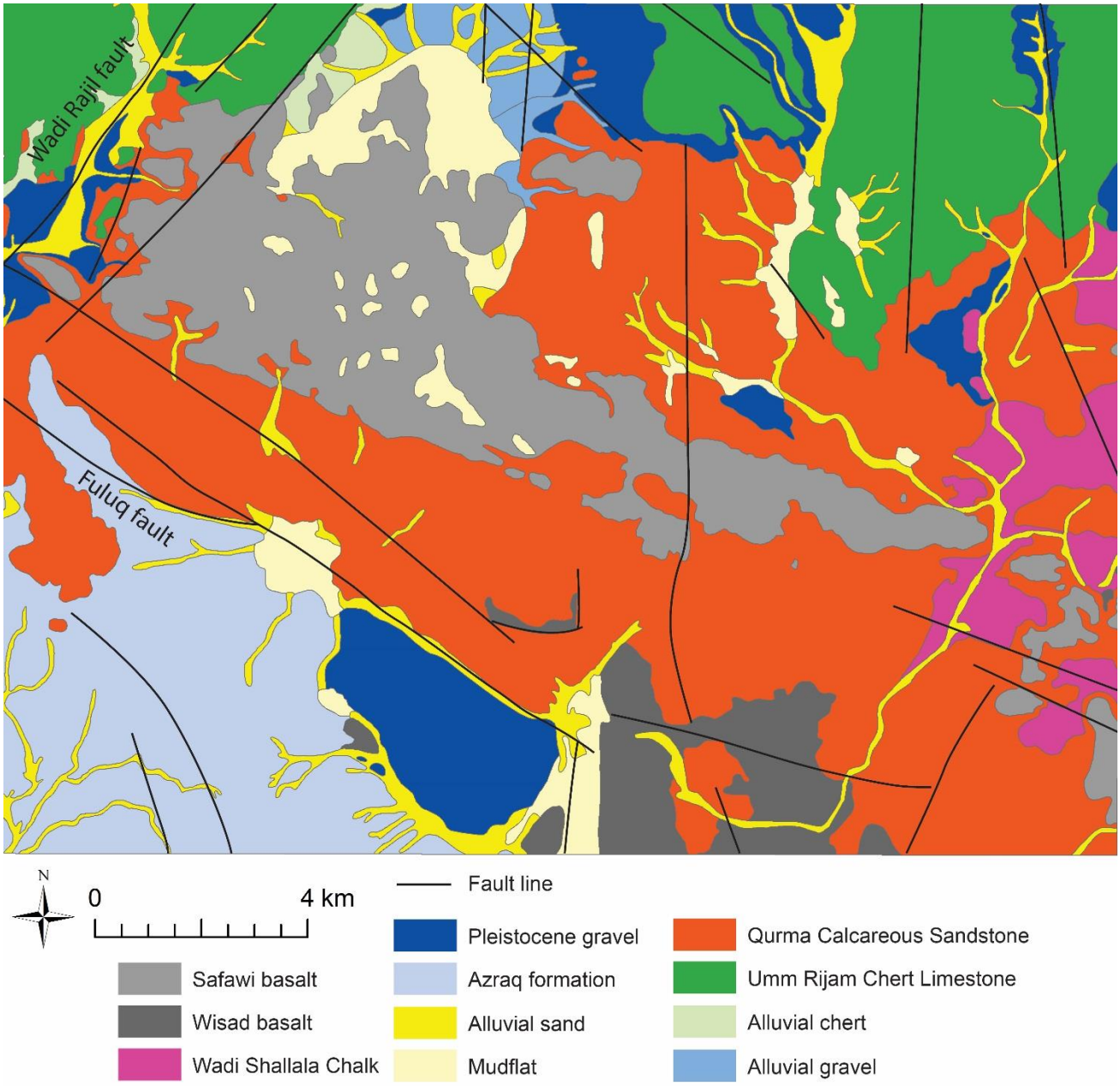

Figure 2.8: Geological map of the Jebel Qurma region. Adapted from Abdelhamid (1999) and Rabba' (1998; 2005).

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 southeast 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 basalt also overly 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.

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

Covering large parts of the Jebel Qurma region is a series of what are described as superficial Quaternary deposits, and may cover the older formations to a large extent. These deposits consist of two main components, being 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 consist of sandy deposits in wadis, where the sands also contain cobbles and pebbles of chert and limestone, and mudflat deposits composed of silt, silty clay and fine sand. Additionally, Holocene deposits include alluvial fans running down eroded hillslopes (Abdelhamid 1999, 15; Rabba' 1998, 12; Rabba' 2005, 9). In the Jebel Qurma

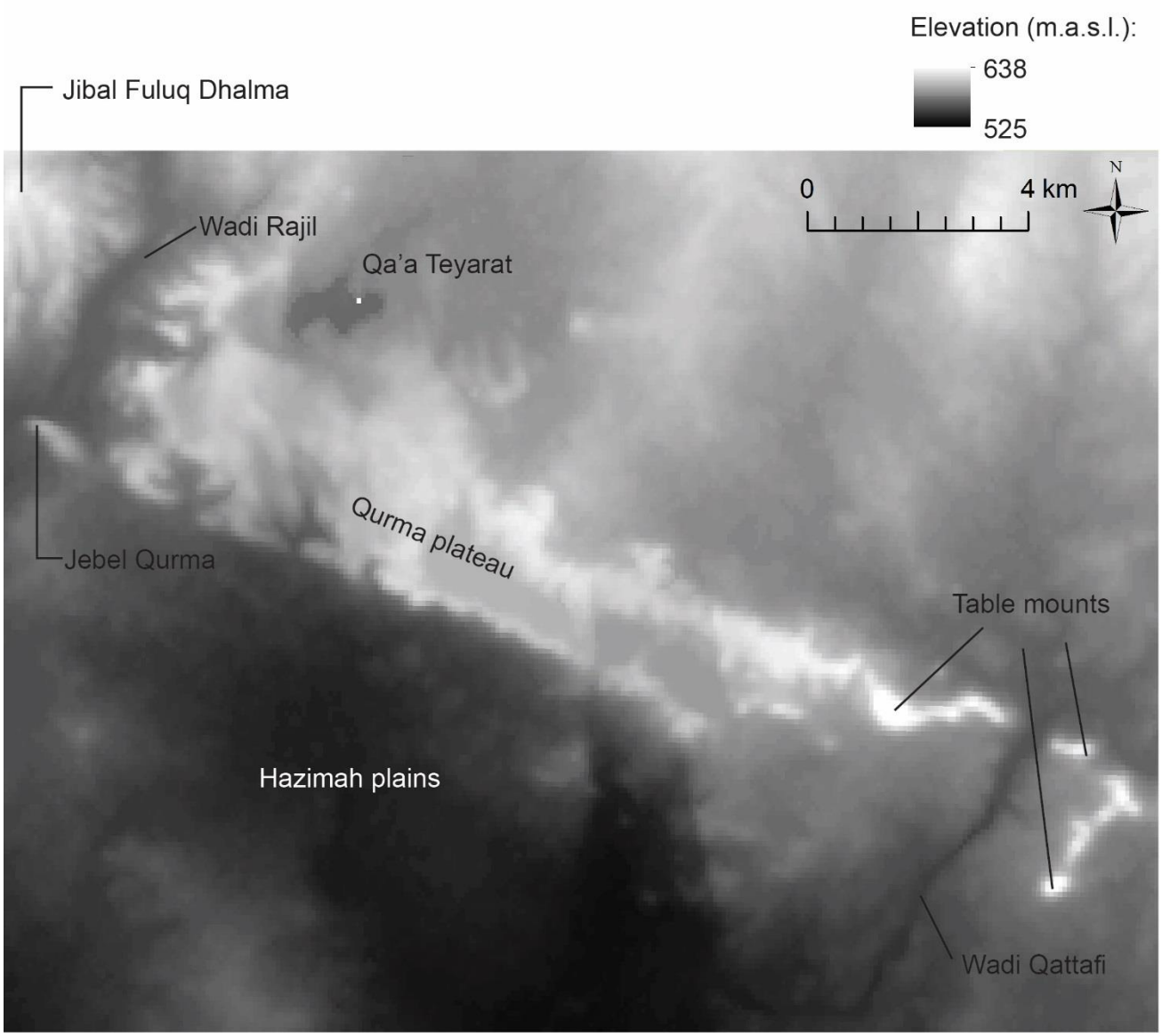

Figure 2.9: Elevation map of the Jebel Qurma region with relevant topographic features indicated. Base map: SRTM DEM.

region Pleistocene desert pavements mostly occur around a number of major wadis in different parts of the study area, whereas Holocene 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 arc in a more or less 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 of this fault, 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.

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.

Topography

The Jebel Qurma region is characterised by a variety of topographic features including table mounts, valleys, ridges and plains (Fig. 2.9). A chain of topographic highs, comprising hills, plateaus and table mounts, is situated in the centre of the study area running is a roughly NW-SE direction. These hills were formed through tectonic uplift associated with the Fuluq fault that runs parallel to this chain (see above). On the east and west 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 reach 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* (Fig. 2.10). These hills are dissected by numerous wadis that resulted in a large number of ridges, slopes and small valleys.

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.

This type of topography also occurs on the east bank of Wadi Rajil,

Figure 2.11: The Qurma plateau with steep slopes leading up to an extensive upland from which broad valleys run down. Photos by P. Akkermans.

albeit only in the northern part of the study area. The second upland terrain is the Qurma plateau (Fig. 2.11) consisting of 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 undulating, featuring low rolling hillocks, smaller valleys, as well as a number of endorheic basins. The third type of topographic highs consist of table mounts, i.e., individual hills with steep slopes and relatively flat, wide tops (Fig. 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 west 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 (Fig. 2.13). Similar plains extend to the north of the central hilly chain, although the absolute elevation of these northern plains is

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

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

higher than the Hazimah plains. These plains also feature scattered elevated terrains.

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. The much larger Qa'a al-Teyarat is situated on the northern edge of the plateau (Fig. 2.4).

A classification of the topographic features of the western part of the Jebel Qurma region was created following a Hillslope Position Classification procedure (see 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, consisting of low plateaus and table mounts, in the Hazimah plains – a region that is a low-lying area in absolute terms. The model furthermore highlights topographic lows, consisting of shallow basins and valley floors, within the Qurma plateau – an upland area in absolute terms. The model furthermore highlights different slope classes – modest and steep ones – which are largely situated on the south and west side of the Qurma plateau but also in the Fuluq hills and Hazimah plains. Finally, well pronounce ridges are present on many of the border zones between slopes and topographic highs. Most of the area for which the HPC was produced – restricted by the extent of the WorldDEM data – was classified as a topographic low (Fig. 2.15), covering 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.

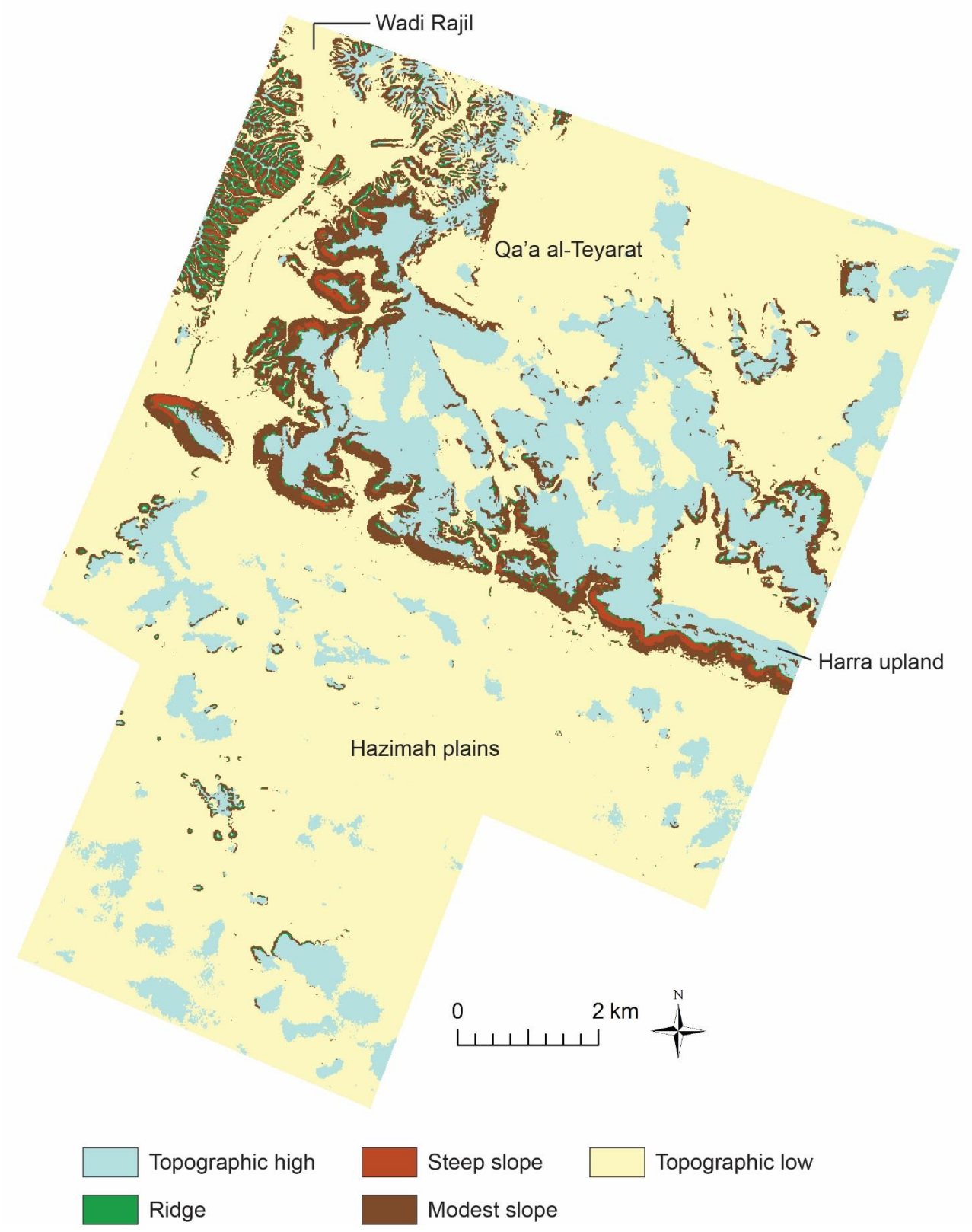

Figure 2.14: Result of a Hillslope Position Classification, which differentiates between various topographic features based on slope degree, elevation, and surface curvature.

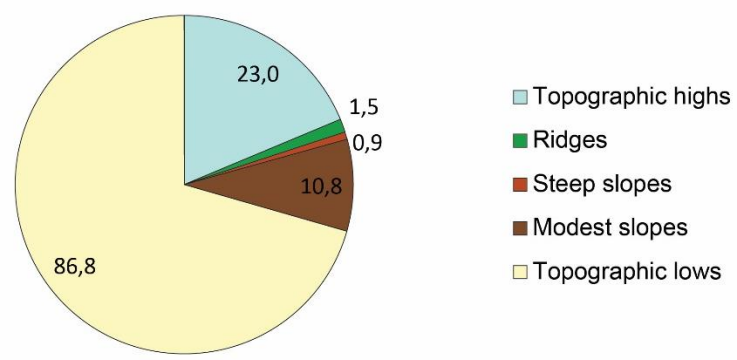

Figure 2.15: Proportion of topographic features in the western part of the Jebel Qurma region, based on the Hillslope Position Classification. Absolute area sizes (in km²) are indicated.

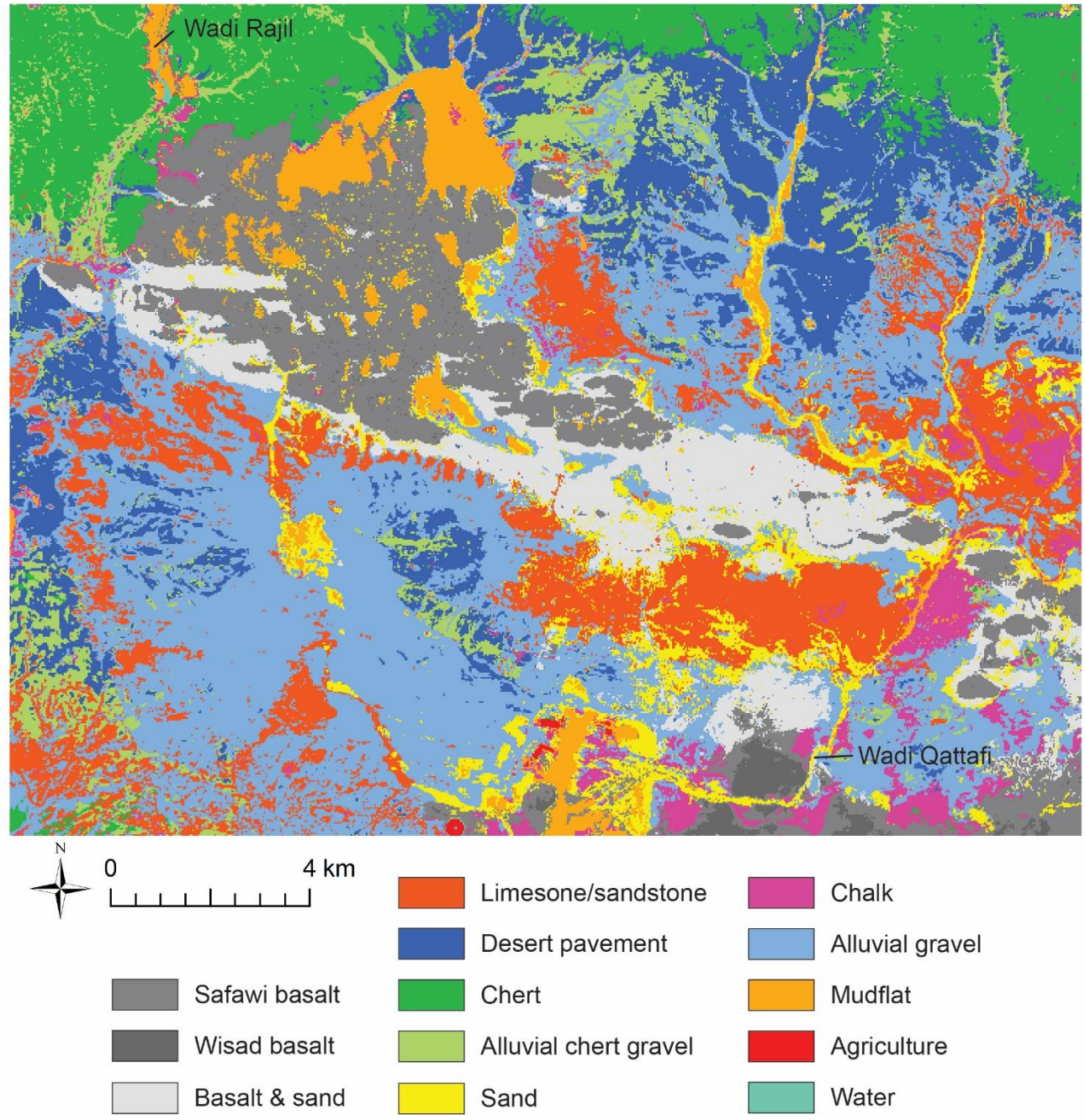

Figure 2.16: Surface Cover Classification of the Jebel Qurma region based on Landsat 8 imagery (see Fig. 2.6).

Surface cover

Surface cover in the Jebel Qurma region is largely governed by the geological formations described above, given the scarce amount of vegetation, surface water, buildings and infrastructure in the area. 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.

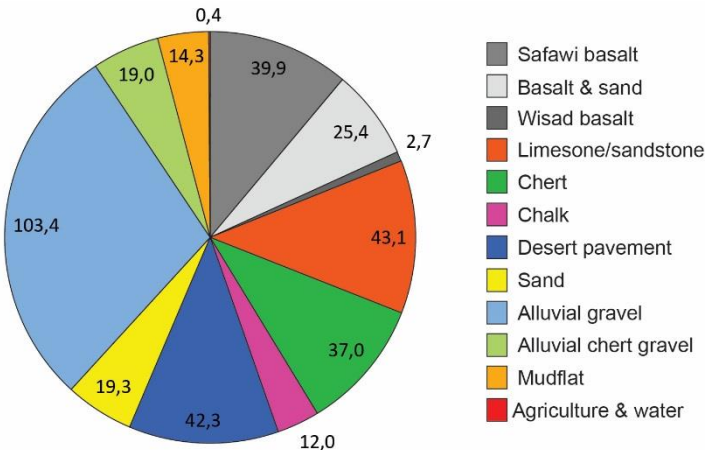

Figure 2.17: Proportion of different types of surface covers in the Jebel Qurma region, based on the Surface Cover Classification. Absolute area sizes (in km²) are indicated.

For the SCC (Fig. 2.16) 13 different classes were defined based on geological formations and observations on high resolution Ikonos satellite imagery. 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 & Al-Malabeh 2010, 49; Rosser 2002, 17), were not depicted on geological maps but were clearly visible on Landsat imagery as mottled brownish areas. Observations on the ground further corroborated the existence of such surfaces (see also Fig. 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), of which *hamad* surfaces cover the largest area by far (Table 2.1). These surfaces surround the *harra* landscapes on most sides. 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.

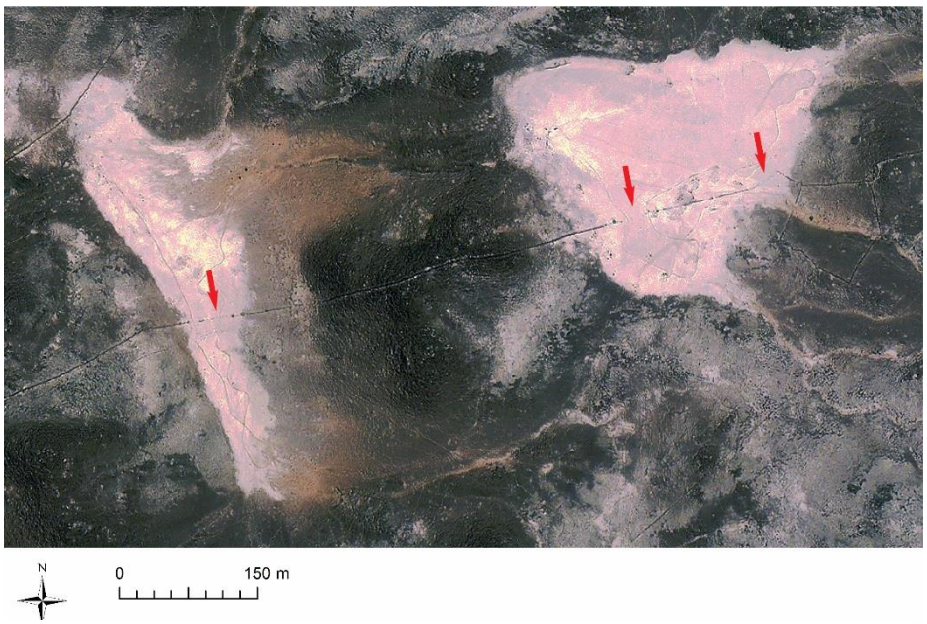

Figure 2.18: Mudflat sediments (pink) in the Jebel Qurma region that appear to have partially buried a wall feature (indicated by the arrows). Base image: Ikonos satellite photo.

The area sizes per surface cover are given in Figure 2.17, which shows that Holocene alluvial grav-

els form one of the largest classes, covering more than 100 km^2, 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 exactly they developed and how quickly is not available, aerial photographs show that archaeological features are sometimes partially buried by mudflat sediments (Fig. 2.18). Sands may obviously also have covered archaeological remains (Fig. 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 may have 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 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 only 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, while this has also occurred to some extent in the western part. Wisad basalt is present in the central south, 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 in the plains more varied desert pavements and alluvial deposits mostly occur. The limestone/sandstone and chalk outcroppings that also occur in these plains largely represent the local topographic highs, i.e., the hillocks, plateaus and low table mounts present here. Mudflat deposits occur in topographic lows representing basins, but also in wadi courses where apparently still standing surface water may be present in wet periods.

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

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 (Fig. 2.20) and surface cover (see above). As shown above, these aspects were calculated and a combination of the two models results in a model that gives insight into relative costs of movement (Fig. 2.21). This model shows, perhaps not surprisingly, that movement is restricted mostly in the basalt covered upland and least restricted in the low lying plains. Steep slopes covered by basalt form the most severe boundaries in terms of movement – although these boundaries are not absolute – while corridors are formed by valleys in which non-basaltic surface covers as well as more gentle slope gradients occur.

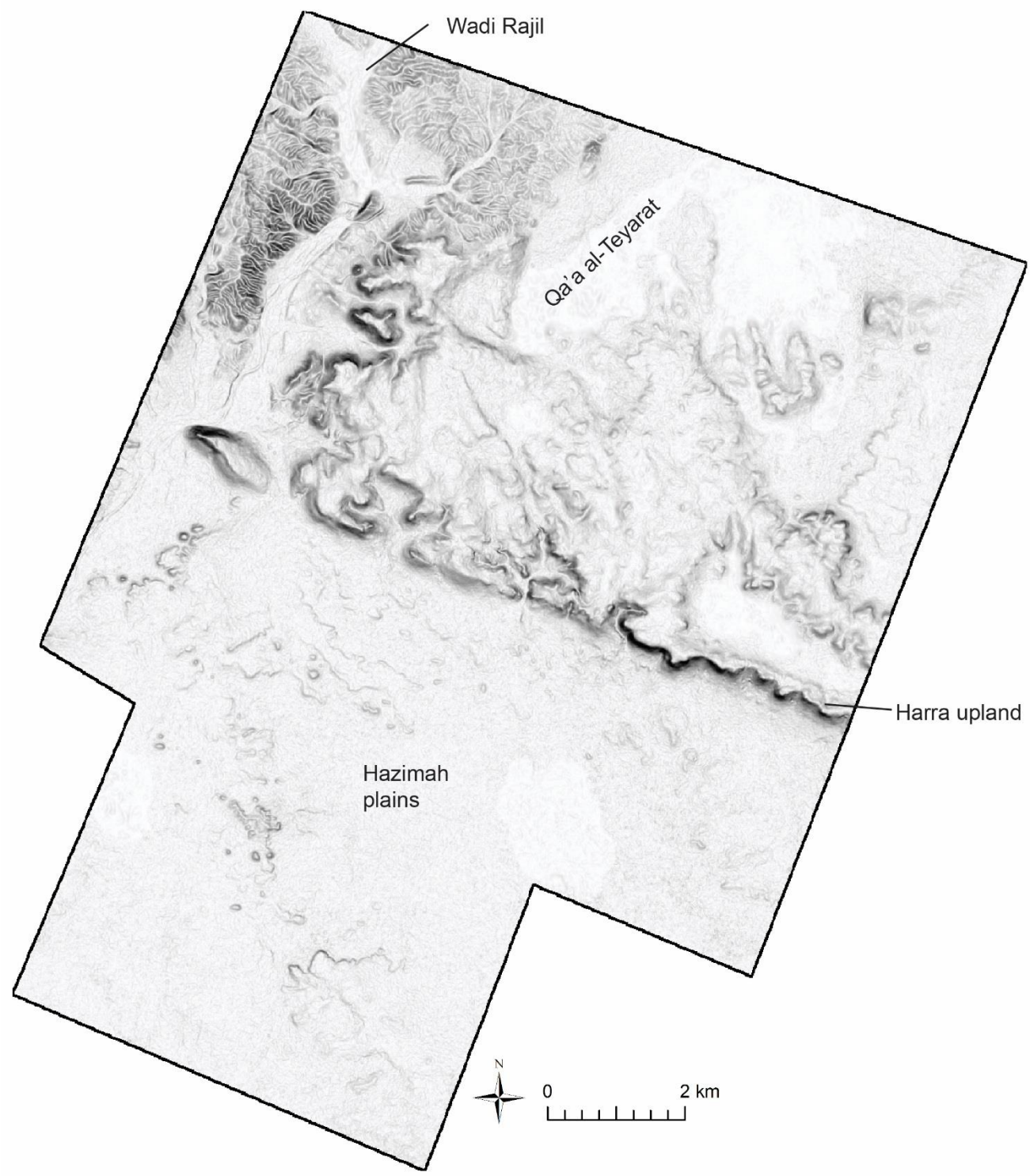

Figure 2.20: Relative degree of surface slope in the western part of the Jebel Qurma region. Darker shades indicate steep slopes while lighter shades indicate gentler slopes. Based on WorldDEM.

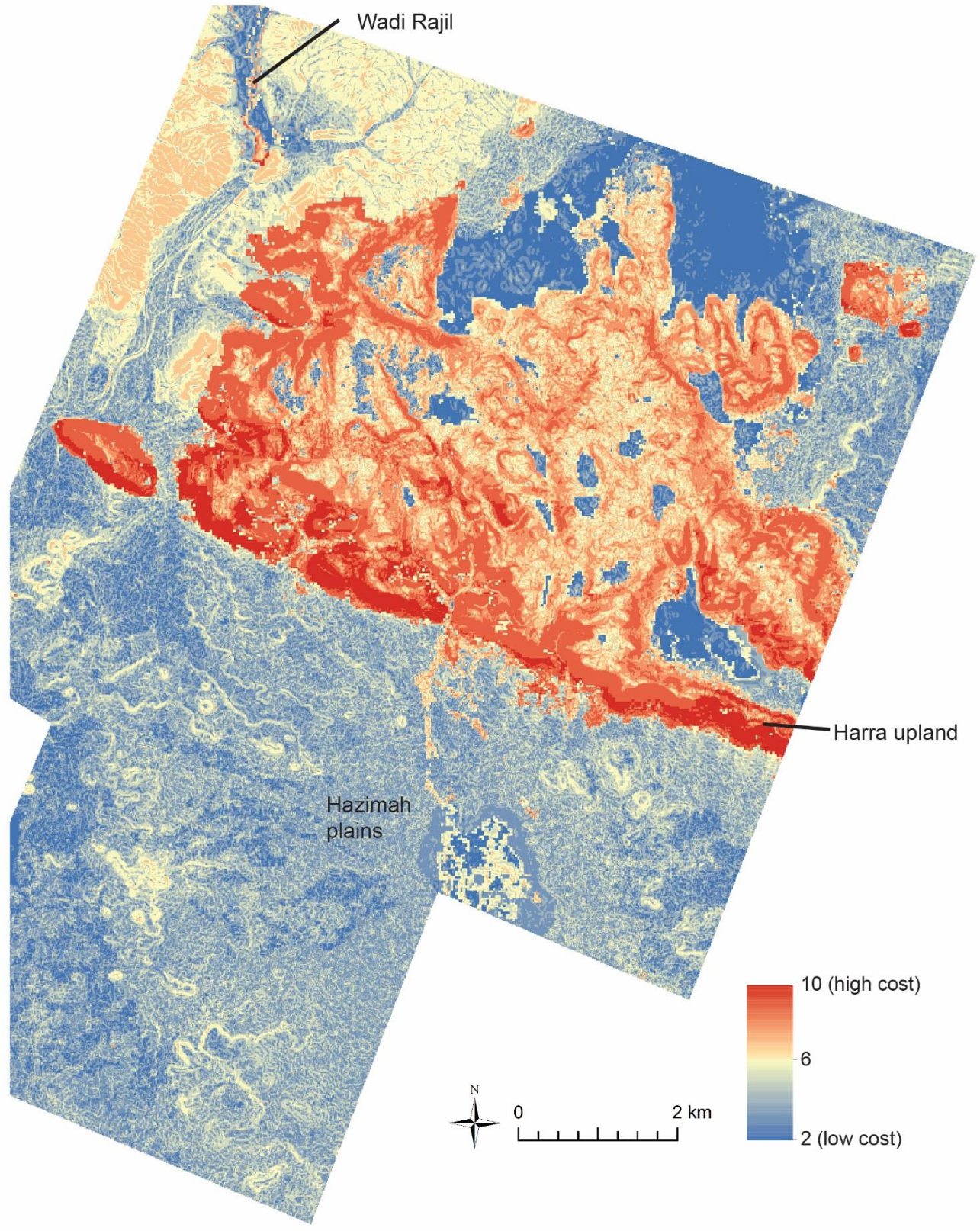

Figure 2.21: Cost Surface Raster showing the relative cost of movement on a scale of 2 (low cost) to 10 (high cost) through the western part of the Jebel Qurma region based on slope degree and surface cover.

2.3.4. Drainage systems

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

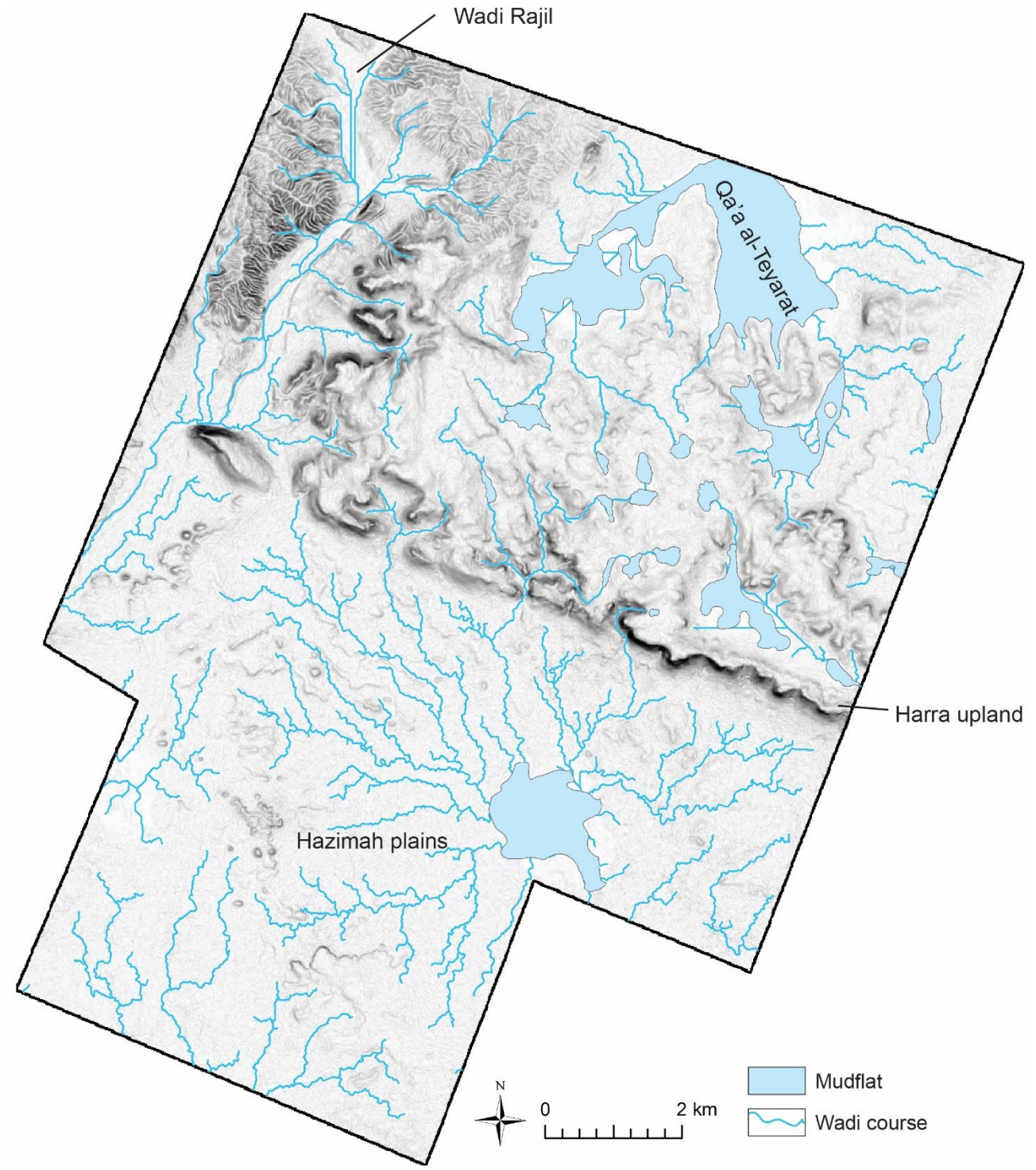

Figure 2.22: Drainage patterns in the western part of the Jebel Qurma region, showing wadi courses as modelled based on WorldDEM data and mudflats indicated on topographic maps. Base image: WorldDEM slope map.

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. Of importance in this respect are the smaller, tributary drainage basins represented by valley systems that run down from the Qurma plateau, as well as a number of small endorheic basins on the plateau itself. The watershed boundaries of these systems were calculated on the basis of WorldDEM data (see § 2.3.1.) and are depicted in Figure 2.23. This figure shows the presence of eleven tributary- or valley systems that run down from the cen-

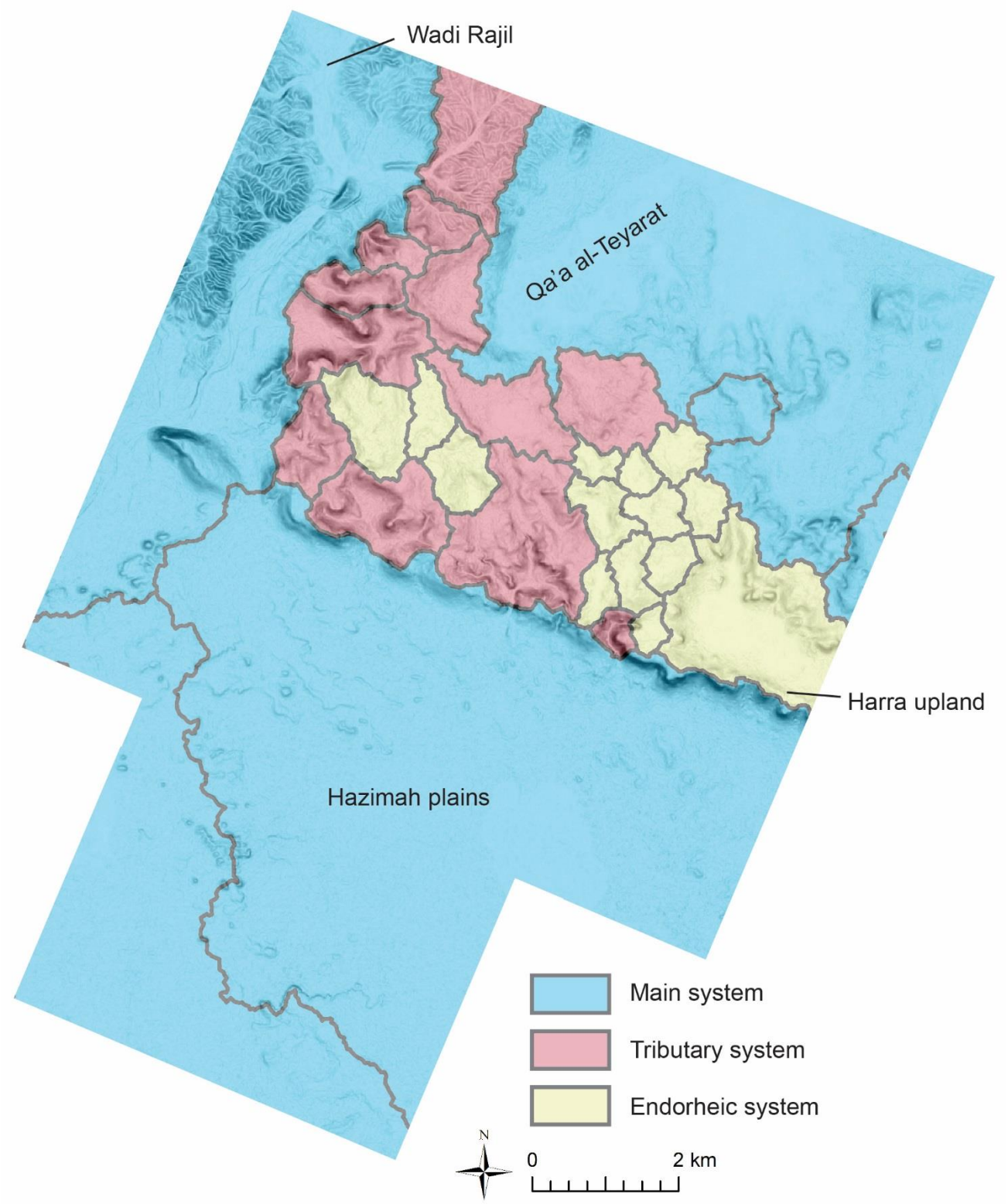

Figure 2.23: Classification of different drainage systems in the western part of the Jebel Qurma region. Base image: WorldDEM slope map.

tral plateau , covering an area of ca 17 km² in total. The individual sizes of these valleys lies between ca. 0.3 and 3.3 km², when taking into account only the ones of which the full extent is known. In addition to these tributary systems, a number of small endorheic systems were defined. These cover a total area of 7.7 km², again taking into account only the ones for which the complete extent is known. The individual sizes of these basins lies between 0.25 and 1.25 km², 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 enclosed by basalt surfaces and bounded by slopes on all sides.

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

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 for sparsely vegetated areas such as the Jebel Qurma region is problematic. 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 a mathematical 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 & Feng 2015). The use of VI is therefore unsuitable for studying vegetation in a sparsely vegetated area such as the Jebel Qurma region.

While direct and systematic ways of studying vegetation patterns in the Jebel Qurma region is thus problematic, some remarks of a more general nature can be made based on inference. 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 (Fig. 2.24). Smaller shrubs are also present in the *harra* and *hamad* landscapes. Furthermore, seasonal vegetation of grasses and weeds may start to grow after the occurrence of heavy rainfall, as was observed in the field during the 2016 campaign, which took place shortly after a period of rainfall. 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 (Fig. 2.25), where the basalt boulders offer 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, probably because part of the runoff water seeps into the wadi beds and is contained 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 2.25: Annual/biennial vegetation in various landscapes of the Jebel Qurma region. Photos by P. Akkermans.

2.3.6. Visibility

Much of the Jebel Qurma region is dominated by undulating terrains, which creates high variability in terms of visibility, i.e., what can be seen from different locations in the landscape. Visibility in the Jebel Qurma region is largely restricted by the topography of the landscape. Vegetation, at least nowadays, is too restricted 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 shielding extensive areas from view. Indeed, some locations in the study area represent highly prominent places in the landscape – areas that can be observed from relatively many locations – 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 (Fig. 2.26), which shows that the central southern part of the study offers mostly locations that are highly exposed, including the southern ridge of the basalt plateau and the Hazimah plains at its foot. 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 the landscape. Much more secluded locations include many low-lying areas confined by high slopes, including Wadi Rajil itself and its tributary valleys, as well as the bottoms of valleys running down from the south of the plateau.

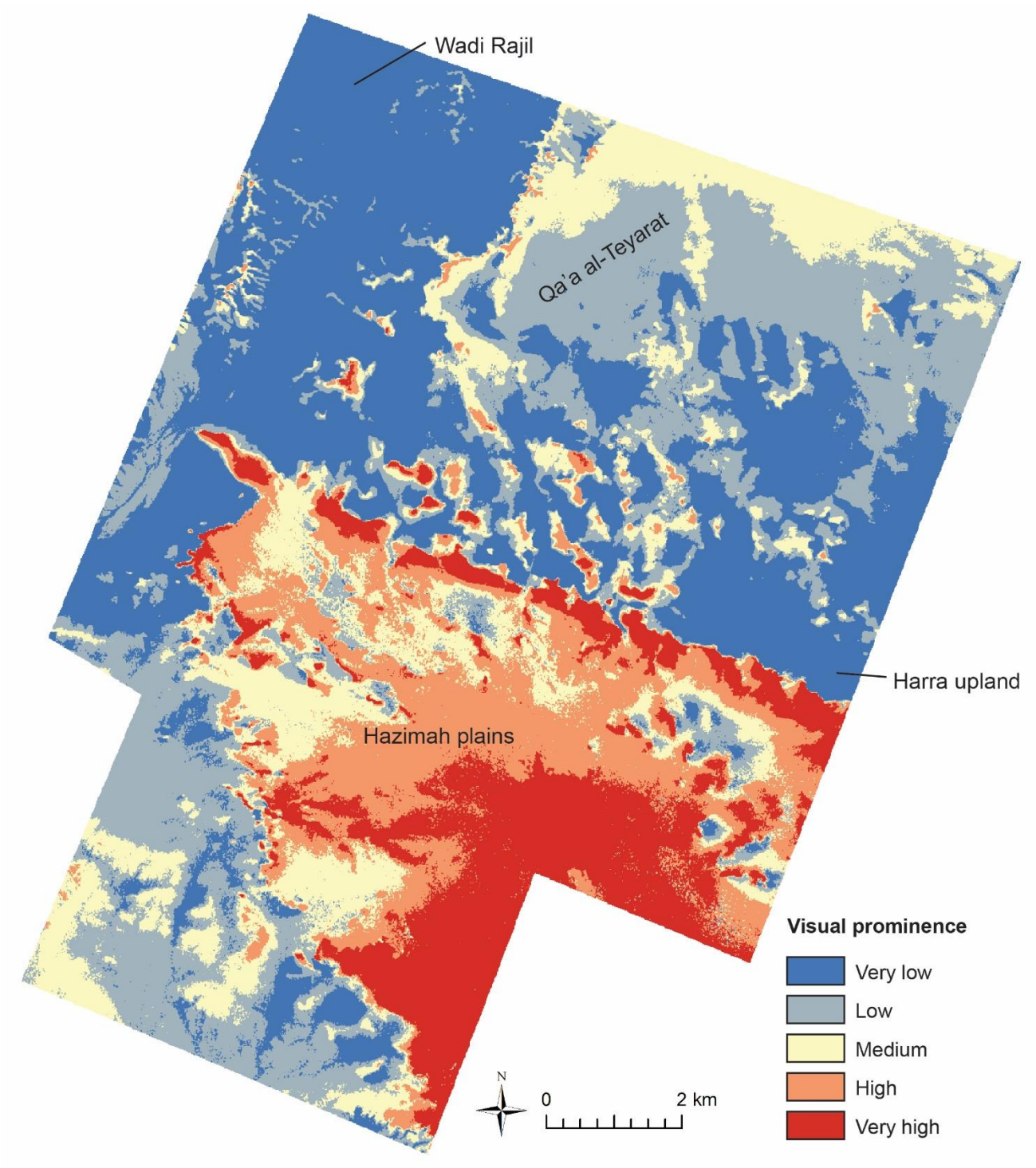

Figure 2.26: Visual Prominence Classification of the western part of the Jebel Qurma region.

Dominant features on the horizon in the Jebel Qurma region, as indicated through the Skyline analysis map (Fig. 2.27) include most of the ridges and hilltops of the undulating terrain that characterise the study area. 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 (Fig. 2.28).

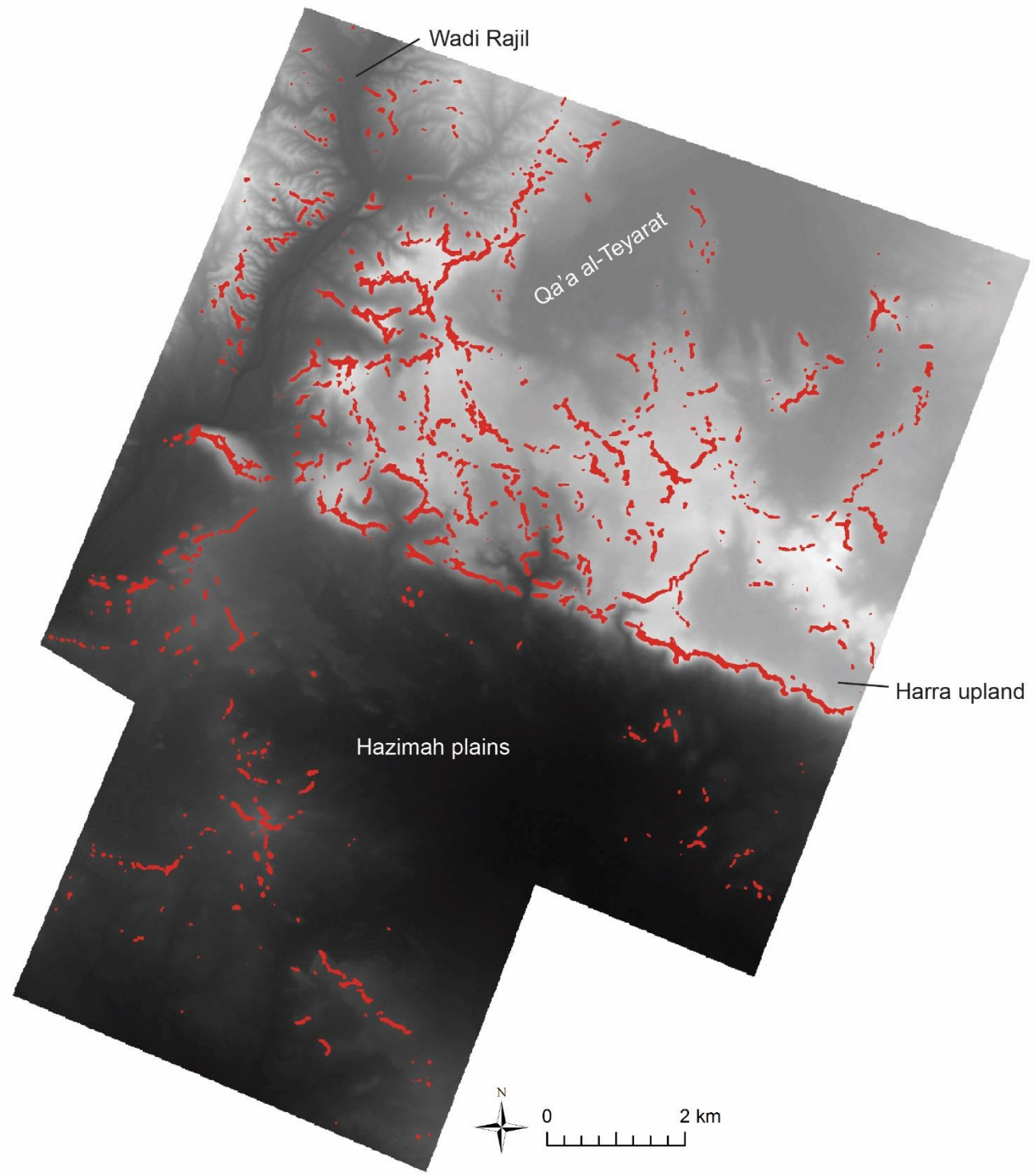

Figure 2.27: Result of a Skyline analysis of the western part of the Jebel Qurma region. Landscape features that are most dominantly present on the horizon are indicated in red. Base map: WorldDEM.

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 different parameters. These classifications will be compared to the archaeological remains in the landscape in Chapters 4 and 5.

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

The Jebel Qurma region hosts a wide diversity of natural environments that offer various potentials 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.

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 aims to present its archaeological remains as documented through surface surveys that were carried out through remote sensing and pedestrian survey methods since 2012. The *Jebel Qurma Archaeological Landscape Project* is not confined in scope to the remains of Classical and Late Antiquity, but 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, as remains from the Palaeolithic period up to recent times are represented (Akkermans & Huigens in press). This chapter presents, firstly, the methods that have been employed to document the surface remains of the region. Secondly, the results of the surface surveys are presented, including the types of archaeological and epigraphic remains that have been documented, and the criteria used to date these. More detailed information retrieved through excavations is not included in this chapter, but presented in Chapters 4 and 5.

In general, an intensive prospection methodology was used to investigate in detail the full diversity of the archaeological landscapes of the study area. As was outlined in Chapter 1, no intensive landscape study has been carried out before in the Black Desert, and to a large degree field methods had to be developed from scratch, although to some degree building on experiences from comparable regions elsewhere. 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, obviously, inscriptions and rock art. At the same time, 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 alteration of field strategies. Admittedly, to some degree, this has led to inconsistencies in the dataset. This is of course only natural in field projects that start out basically from scratch, and making any inconsistencies in the dataset explicit is warranted.

This study incorporates the result of fieldwork carried out between 2012 and 2016. Although in more recent years fieldwork has been carried out 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

An intensive pedestrian survey methodology has been used to study of the Jebel Qurma region, which aimed to document the full diversity of both archaeological and epigraphic remains in a systematic and comprehensive way. Survey studies carried out in the Black Desert commonly rely heavily – if not entirely – on aerial photographs and satellite imagery (see Chapter 1), but although such imagery provides a useful additional source of information, many – if not most – of the surface remains, such as small stone structures, inscriptions and rock art, and artefacts, are too small to be visible from above (Huigens 2013). Therefore, the surface survey carried out in the Jebel Qurma region mostly relies on data acquired through pedestrian surveys, while remote sensing data provides an additional source of information. This was the case, for example, when observed features are so extensive that a view from

above helps determining the spatial extent and configuration of features. Desert kites are a good example in which the study of satellite imagery may aid establishing the configuration of such features.

The pedestrian survey may be defined as the study of archaeological surface remains on the ground which usually includes field walking, i.e. the systematic prospection of a given area, collecting artefacts from the surface, and cleaning archaeological features. Excavations are usually not part of surveying but entails a different archaeological method that focusses on a particular site rather than a broader landscape. The systematic pedestrian survey has been a major tool to study archaeological landscapes of the Near East from the 1960s onwards (Wilkinson 2000, 220-2; 2003, 37-9). Although surveys have sometimes been used mainly 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 of archaeological remains and variability therein and the history of inhabitation in a given area.

It is also, however, a rather labour intensive method, as it requires the archaeologists to be actually in the field, usually with a team of colleagues, with numerous logistical and financial consequences. Sampling strategy is therefore often an important issue in pedestrian survey projects. Particular choices always need to be made in such projects in terms of sampling, which can relate to the geographic extent of the survey area, to the degree of coverage within that area – also referred to as the survey intensity – and to the exclusion of particular datasets, such as materials from a particular period.

Another important issue, both methodologically and interpretatively, in pedestrian surveys 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 is used to indicate a well-defined cluster of archaeological remains (Binford 1964, 431). Traditional site categories include, for example, villages, sanctuaries, cemeteries, forts, etc. 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 archaeological features that are wholly different from traditional site categories. These remains include small artefact clusters or even individual, isolated artefacts, but also extensive features such as roads or walls, field systems, and so on. Even though all of these features can essentially be called sites, the enormous variability that may occur between them, i.e. ranging from a single artefact to an entire city, means that in survey archaeology 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

Although the pedestrian survey is a widely used and accepted archaeological field method, 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.

Sampling strategy

From 2012 to 2016 five field campaigns have been carried out in the Jebel Qurma region by the *Jebel Qurma Archaeological Landscape Project*. All of these field campaigns included a period of field survey-

ing. These periods varied in length between two to ten eight weeks, and were carried out with a team of varying composition, comprising professional archaeologists and students.

The areas that were 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 (Fig. 3.1). On the Qurma plateau the survey aimed to cover different topographic areas such as, on the south and west side, its ridges and slopes and the low lying areas at the foot of these slopes, but also the valley systems running into the plateau and the upland areas on top of the plateau. 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 Hazimah plains, where various different topographic zones were surveyed, 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.

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.

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 thus far not surveyed either. At this point, only information from remote sensing studies is available, 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.

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

The largely flat, open terrains 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 were set out and studied through intensive field walking. All transects were subdivided into parcels of 30 m wide and 100 m long, and three field walkers were spaced 10 m apart within these parcels (Fig. 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 were 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 it was only possible through this extensive survey method to locate the bigger, more visible sites (Huigens 2015).

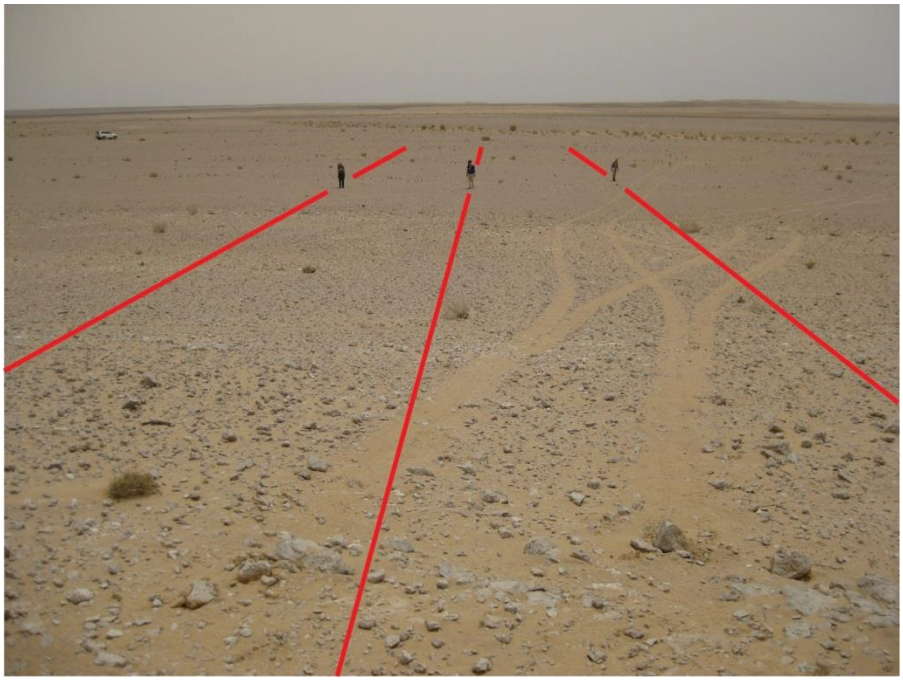

Figure 3.2: Systematic transect surveying in the Hazimah plains. Photo by author.

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 (Fig. 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.

Site definition

The Jebel Qurma project uses 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, for example, 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 (Fig. 3.4). It is thus important to realise that, in the Jebel Qurma project, the term 'site' does not equate to 'settlement', but is little more than a collection of spatially clustered finds.

Figure 3.4: Sites of varying sizes. Left: The very large site of QUR-162 comprising several large enclosures and other features. Right: QUR-250 – a small site comprising a single isolated stone feature.

Documentation structure & 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 sketch drawings of inevitably less detail were produced. On these sketches the local topography was recorded as well as anthropogenic remains. General photographs were made of the site and its location and on paper forms the location and nature of the site was described in detail.

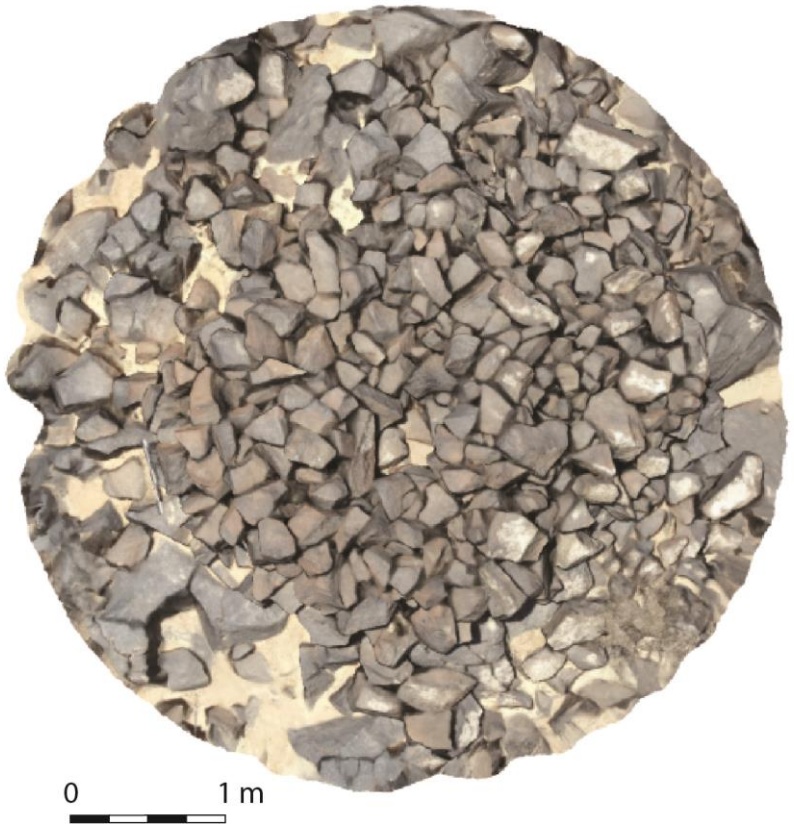

Figure 3.5: Photogrammetrically reconstructed top view of a cairn (QUR-943, Structure 13).

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, etc., were described using 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 results in a much more detailed rendering of a structure compared to handmade sketches (Fig. 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 a form was filled out to document information such as slope, surface cover, and the number of artefacts counted and collected. Usually all pottery sherds were collected from a site given the general scarcity of pottery sherds, 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 were recorded in detail on paper forms as well. Their location was recorded in different ways, either by indicating them on the site plan or by using devices such as handheld GPS or – especially when clusters of rock art were particularly large – more precise equipment such as a Total Station or Differential GPS.[1]

Processing of finds and data coming from the field during 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.

Challenges

Data inconsistencies

Although the aim of the Jebel Qurma project is to systematically document archaeological and epigraphic remains within its survey area some problems in data consistency have occurred, which need to be

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

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 has been spatially pinpointed using a GPS device. Rather, during these seasons only site locations were pinpointed with a GPS, while the location of its component features was indicated only on site plans. Therefore the spatial data from these earlier seasons is somewhat less detailed, and this issue has to be taken into account in later spatial analyses (Chapters 4 and 5). Another issue is that over the years the visual documentation of structures has changed to some degree. Where hand-made sketches were made of structures during the earlier survey seasons, i.e. the 2012, 2013 and 2014 survey campaigns, in the 2015 and 2016 campaigns photogrammetric documentation has taken over hand-made sketches to some degree. Thus, a number of structures were documented in a much higher level of detail – something that needs to be taken into account when comparing different structures.

Buried sites

As was noted already 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 (Fig. 2.16). Although the presence of such deposits does not necessarily imply that architectural features are completely buried (see Fig. 2.19), smaller remains such as rock art and artefacts may become completely buried and thus invisible for detection during pedestrian surveys. This has implications for the amount of datable remains, and therefore sites, in these parts of the study area. This issue should be 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 is most significantly the case in 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 more 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 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 present on the surface, as documented through pedestrian and remote sensing surveys (Chapter 3), were often found to be of widely varying temporal origin, i.e., from prehistoric up relatively recent times. A relevant example in this respect is the temporal variation 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, as indicated by excavations. For example, it was difficult to establish a relationship between architectural remains and the Safaitic inscriptions often encountered on- or around them. This was only possible when such inscriptions were truly incorporated in these structures, i.e., when a stratigraphic relation could be made, which was not the case in the majority of situations.

The palimpsest situations encountered over the course of this study are the result of seemingly limited accumulation 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 materi-

als, 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 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 understanding the development of these landscapes and of their past inhabitants.

While it is by no means the aim to justify such looting activities here, it should be noted that they 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, such as human skeletal remains, fire pits, and architectural features, which could be used to further steer the fieldwork strategy with regard to what to excavate and where.

3.3. REMOTE SENSING: OBJECTIVES AND METHODS[2]

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 good preservation and visibility of stone features makes 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). Caution, however, is also warranted is using remote sensing data. Even though an enormous amount of features can be detected in the Black Desert using aerial and satellite photos, actual pedestrian surveys and excavations are still required to check and provide more detailed information on the information acquired from above.

The aims of the remote sensing study of the Jebel Qurma region was 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

Imagery selection, acquisition, and processing[3]

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 have produced photographs between 1959 and 1972, and were declassified by the USA government, and since then available for archaeological research, in 1995 (Beck 2004, 134-5). Digital

[2] The remote sensing study presented here was carried out between 2011 and 2013 (Huigens 2013). Only after this period high resolution imagery of the study area became available on open source web mapping services and virtual globes such as Bing Maps and Google Earth, and is therefore not included in this study.

[3] See Appendix A for more detailed information of imagery processing in ArcGIS.

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 12.2 and 1.8 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 (Fig. 3.6). These photographs were taken in 1968, and have a spatial resolution of ca. 2.3m. This resolution is high enough to document large archaeological fea-

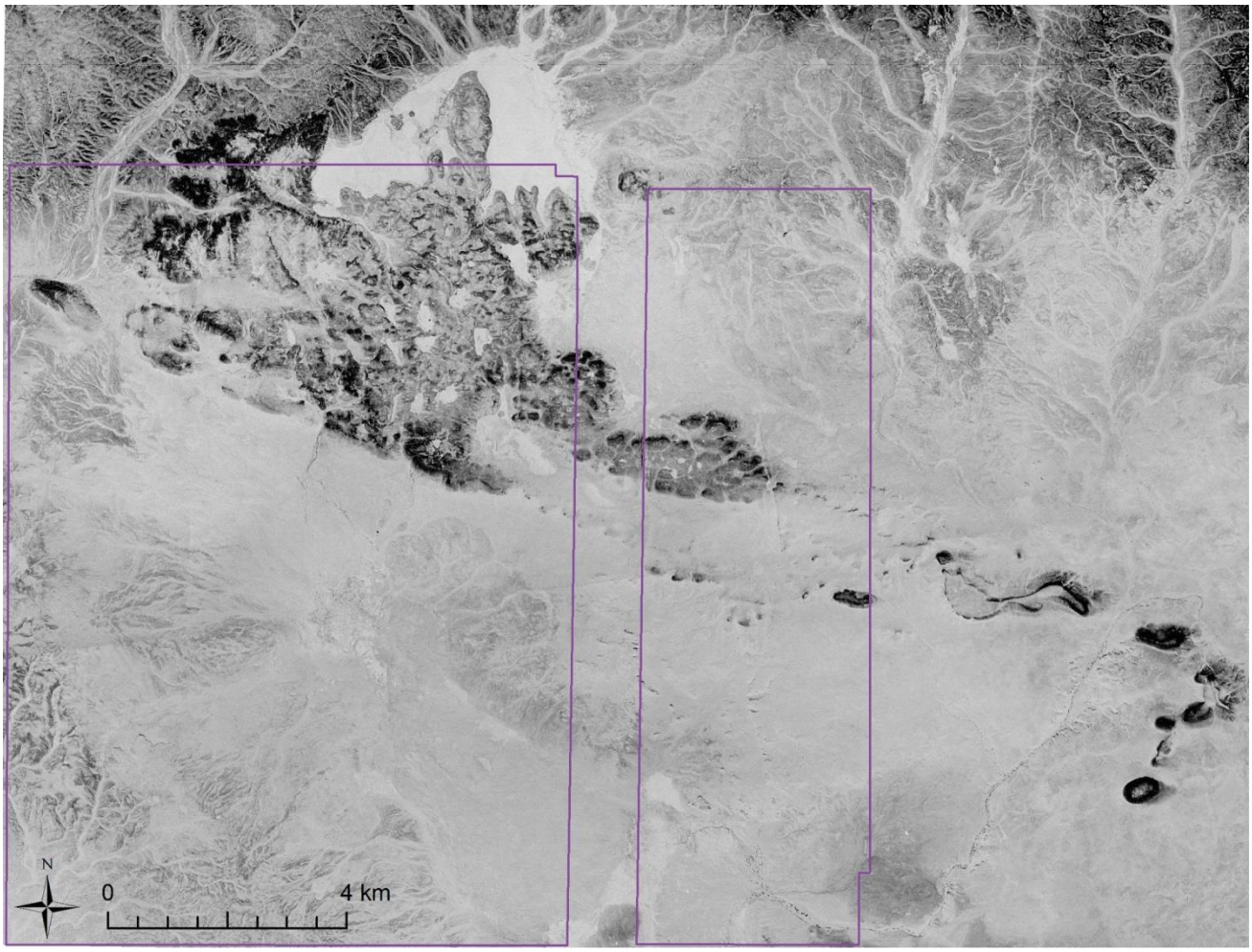

Figure 3.6: Corona imagery of the Jebel Qurma region (courtesy of the USGS) with the extent of available Ikonos imagery indicated in purple.

tures such as walls and large cairns (Fig. 3.7). These images came in digital TIFF format but did not have spatial reference data. They were first mosaicked in Photoshop. Following Casana & Cothren (2008, 4-6), who used geocoded imagery to georefence ungeocoded imagery, the mosaicked image was imported in 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 about 80 cm – considerably higher than CORONA imagery – and it is therefore more useful for the detection of small features (Fig. 3.7). This imagery, however, is expensive and could not be acquired for the entire study area but only for part of it. The imagery extent covered 172.1 km^2, i.e. about 50% of the study area, 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 (Fig. 3.6). Many of the basalt-covered table mounts in the eastern part of the study area fall 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 comprises a flying 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 (Fig. 3.7). The geographic location of where the photos were taken are contained in the photographs' metadata, and can be imported into ArcGIS. A drawback of these photographs is that many of them are taken from an oblique angle and proper orthorectification is often very time-consuming and sometimes impossible through a lack of adequate ground control points. 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. Orthorectification of the photographs was only done for a few photographs given the difficulty of finding adequate ground control points.

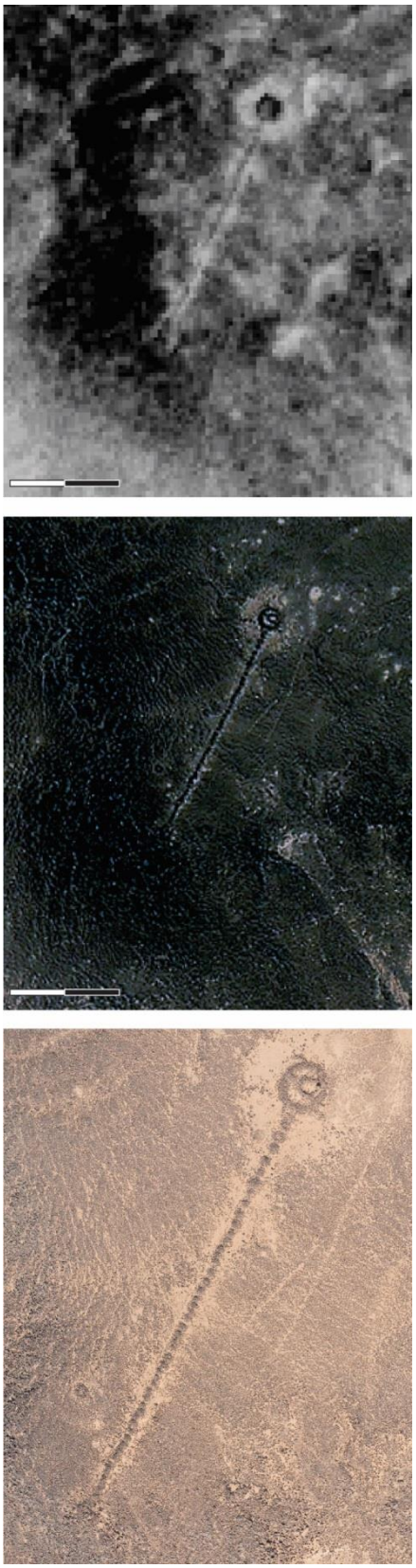

Figure 3.7: An archaeological feature observed on various imagery types. Top: Corona satellite image (courtesy of the USGS). Middle: Ikonos image (courtesy of Jordan Oil Shale Company). Bottom: APAAME image (photo by David Kennedy, courtesy of APAAME). Scale is 100 m.

Feature detection and documentation

For the detection of archaeological features on the satellite imagery and aerial photographs a strategy of systematic manual detection was chosen. 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. This contrast between the feature and its negative is very

well detectable from above, on both aerial photographs and satellite images (Fig. 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 visibility of stone-built features in the *hamad* landscapes.

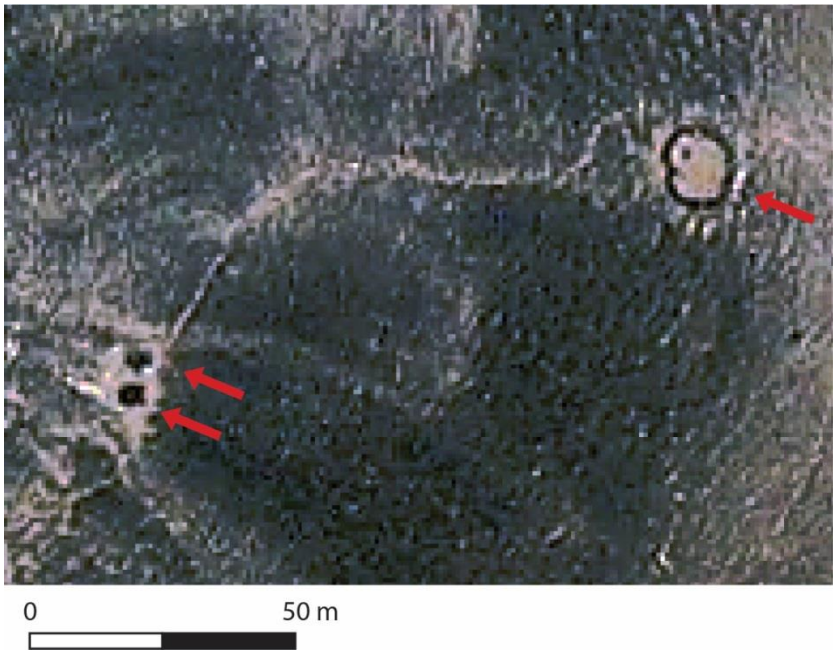

Figure 3.8: Example of Ikonos imagery showing two cairns, a small enclosure, and a path running between them.

The detected potential features were 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 included relatively straightforward categories, largely based on previous remote sensing studies of stone features in the Black Desert (e.g. Kennedy 2011; Kennedy & Bishop 2011). Feature sizes were measured with the ArcGIS measure functionality, for which a margin of error should be 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.

3.4. THE HELLENISTIC TO EARLY ISLAMIC-PERIOD LANDSCAPE: DATABLE SURFACE REMAINS AND ASSOCIATED FEATURES

Through surface surveys in the Jebel Qurma region a wide variety of archaeological and epigraphic remains were documented. Some of these remains could be attributed with relative ease to certain periods while for others the date was highly uncertain or completely unknown. Relatively well-datable remains included ceramics and other artefacts as well as inscriptions and petroglyphs. These remains are discussed here first as they provide, to a considerable degree, the basis on which 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 next section.

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 carried out there a total of 8597 ceramics were

encountered and collected. 829 (9.6%) of these sherds included rims, bases, handles and decorated body sherds, and were potentially diagnostic, i.e. datable with a variable degree of precision to a particular time period. The high number of sherds is by no means comparable to other regional projects in the Black Desert, where ceramics are hardly reported. It is doubtful, however, that the Jebel Qurma region is unique in the widespread occurrence of ceramics. Rather, it would seem more likely, given the focus on the prehistoric periods of many other projects, that there simply has been little interest in the collection, or at least publication, of pottery sherds.

For the purpose of this study the ceramic corpus from the Jebel Qurma region is important for a number of reasons. Firstly, they potentially serve as chronological markers for human occupation of the Jebel Qurma region in general and of individual sites in particular, during the Classical and Late Antique periods. While chipped-stone artefacts have been used as such 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 obviously the case when at least some of the ceramics are not locally produced but imported from elsewhere. This is potentially informative about relationships of mobile peoples with sedentary communities from which ceramics may have derived.

Challenges

Dating and classifying the ceramics from the Jebel Qurma region posed a number of problems. Firstly, there was a lack of local ceramic sequences from which a chronology could be derived. Well-stratified ceramics were hardly encountered during excavations within the region itself (see Chapters 4 and 5), which rendered impossible the creation of a local ceramic typology. Dating the diagnostic pottery sherds was therefore only possible on the basis of published ceramic corpora from other excavated and well-dated contexts. Corpora that could have been useful in this respect, including the potentially well-stratified remains from the Roman military structures in the Azraq region, have unfortunately 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). This absence of local ceramic sequences probably has a negative influence on the number of datable ceramics.

Secondly, the chronological resolution of the datable ceramics is usually limited. The number of ceramics that are usually closely datable, such as high-quality fine wares and amphorae, is very low. Coarse wares predominate within the ceramic corpus, while there is a total absence of *terra sigillata* wares and Nabataean Painted Fine Wares. Coarse wares are usually difficult to date with much precision, i.e. to a century or less, and ceramics from the Classical and Late Antique period are not different in this respect.

Thirdly, possibilities of dating the ceramics is further reduced by the high fragmentation rates observed within the corpus. The average weight of only 15.7 grams per potential diagnostic sherd may be telling in this respect. 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. This can be because during some periods less distinctive pottery types were produced, or because some periods are simply better studied that others. While ceramics from the Roman period are relatively well studied, Hellenistic-period pottery – except perhaps for fine Nabataean wares – are relatively poorly known. There are also problems with Late Antique pottery, as differentiating between

Byzantine and Umayyad-period pottery is often difficult, while Abbasid period pottery is poorly known. These issues may create certain dating biases that need be taken into account.

Documentation method

During field surveys in the Jebel Qurma region ceramics were collected according to the loci that were defined in the field, and each lot of materials from these loci was first sorted out into batches according to fabric and form (base, rim, body, etc.). 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 are available. The fabric groups that were defined that are relevant for 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.

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.

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 context. Descriptions of the find contexts of these parallels and the way in which they were dated can be found in Appendix B.

A note on periodization

Notoriously, historical periods are termed and dated in different ways, largely following differences in research tradition, the issues under investigation, and differences in local historical developments. It is therefore warranted to describe briefly the way in which various historical periods are defined in this research. Although there is no local tradition of periodization of phases of inhabitation in the Black Desert, especially not for the historical periods, common terminology and associated dates were adopted from neighbouring regions, in such a way that they more or less 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 may wonder whether such terminology has any relevance in relation 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 by contemporaries still regarded as 'Roman' (Treadgold 1997). What this terminology does relate to, then, are conventions of the archaeological discipline derived from broad culture-historical developments and event which are used to provide some historical frame 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) who take 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).

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 is found at the end of this chapter (§ 3.7.: Table 3.6 & Fig. 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, as some of the sherds could be dated quite closely while others show a much wider date range. This is why Table 3.3 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 both differences in the 'lifespan' 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, i.e. 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 is from the Byzantine/Early Islamic period, it is likely that these sheds 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.

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%
Sub-total	**31**	
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%
Sub-total	**56**	
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%
Sub-total	**11**	
Total	**98**	

Table 3.3: Number of dated ceramics per period collected during pedestrian surveys (see also the catalogue of dated ceramics: § 3.7).

Little chronological distinctiveness 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 while Byzantine/Early Islamic sherds are mostly of buff and grey fabrics, all fabric types occur in both broad chronological periods. It therefore seems impossible at this point to ascribe any of the fabric groups to a particular period.

3.4.2. Other artefacts

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

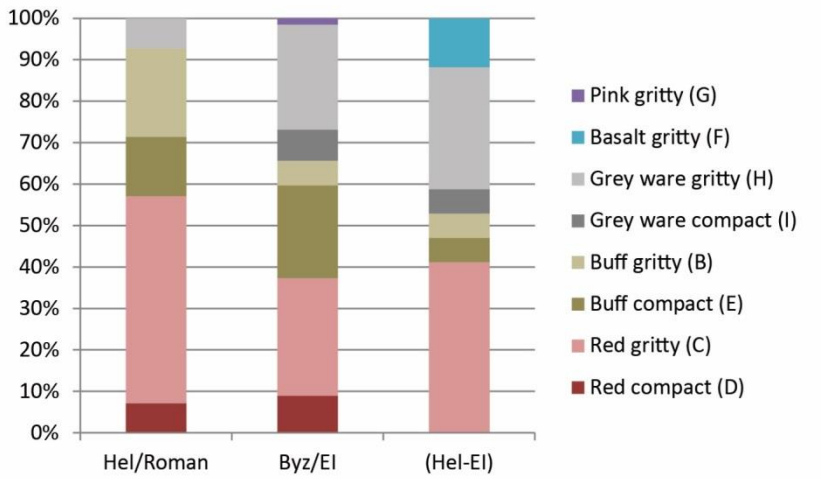

Figure 3.9: Occurrences of fabrics in the Hellenistic/Roman period (Hel/Roman) and the Byzantine/Early Islamic period (Byz/EI). The final column shows fabrics that could only be assigned to the Hellenistic to Early Islamic periods.

Other than ceramics, very few other artefacts were encountered that 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, which was identified as a Seleucid tetradrachm minted in Tyre under the reign of Antioch VII (Fig. 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 undatable.

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

Material that was datable to earlier phases of inhabitation, i.e. in prehistory, 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 more recent times. Modern artefacts were found in the form of trash such as plastics, bullet casings, paper, and metal and glass containers, which were left behind by Bedouin and other occasional visitors to the region such as hunters, truckers, grave looters, and so on.

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 (Fig. 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 should date between the Late Hellenistic or Roman periods, but the timeframe 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 pre-Islamic inscriptions were written in other scripts, including Hismaic, which is dated between ca. 100 BC and AD 100, 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 probably date anywhere between the Hellenistic and the Byzantine period. Associated with the Safaitic and other pre-Islamic inscriptions are thousands of petroglyphs (Brusgaard forthcoming). 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 is Kufic, i.e. from the Early Islamic period.[4] Rather, the earliest Arabic inscriptions in the study area are a few dozen texts from the 13th and 14th centuries AD, i.e. the Mamluk period (Abbadi 1986). The remaining Arabic inscriptions and associated pictorial carvings are modern.

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 – an attempt will

[4] Based on preliminary readings of the Arabic inscriptions by Prof. Dr. Petra Sijpesteijn (Leiden) and Dr. Ilkka Lindstedt (Helsinki).

now be made to propose the date of construction and/or use of these features. 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.

Feature type	Pedestrian survey area		Beyond 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.

Enclosures

Enclosures are defined as walled structures enclosing a space that may or may not be cleared of basalt boulders (Fig. 3.12). Although enclosures are a well-known feature type of the Black Desert, their date of construction and use is largely unknown, and even their function remains unclear. Betts' survey and excavation programme targeted a number of enclosures 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, evidenced either in multiple phases of construction of the walls, or through find material within and around the enclosures, but 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 as animal pens in the past (e.g. Betts & Cropper 2013, 184). On the other hand, the large amount of artefacts sometimes found in around enclosures may suggest that they were also used as residential areas (cf. Abu-Azizeh 2013). It is of course possible that either may be true, especially if enclosures were reused over a long time period, i.e. 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 represents walling that encloses a single space while grouped enclosures are subdivided into a number of compartments. Single enclosures are most numerous.

Evidence for the use of a number of enclosures between the Hellenistic to Early Islamic periods is provided by the occurrence of ceramics from these periods within and directly around enclosures. This was the case at ten enclosures, while at another eleven sites where enclosures were present Hel-

lenistic to Early Islamic ceramics were attested, although not in direct association with enclosures. Further evidence for the frequentation of sites featuring 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.[5]

While many of the enclosures were visited and possibly used during the period of study, many of them, however, were possibly constructed much earlier, i.e. during prehistory. Relatively large amounts of chipped-stone artefacts have been encountered within a number of 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 were encountered as well. It is therefore possible that the enclosures at these sites were reused rather than newly constructed.

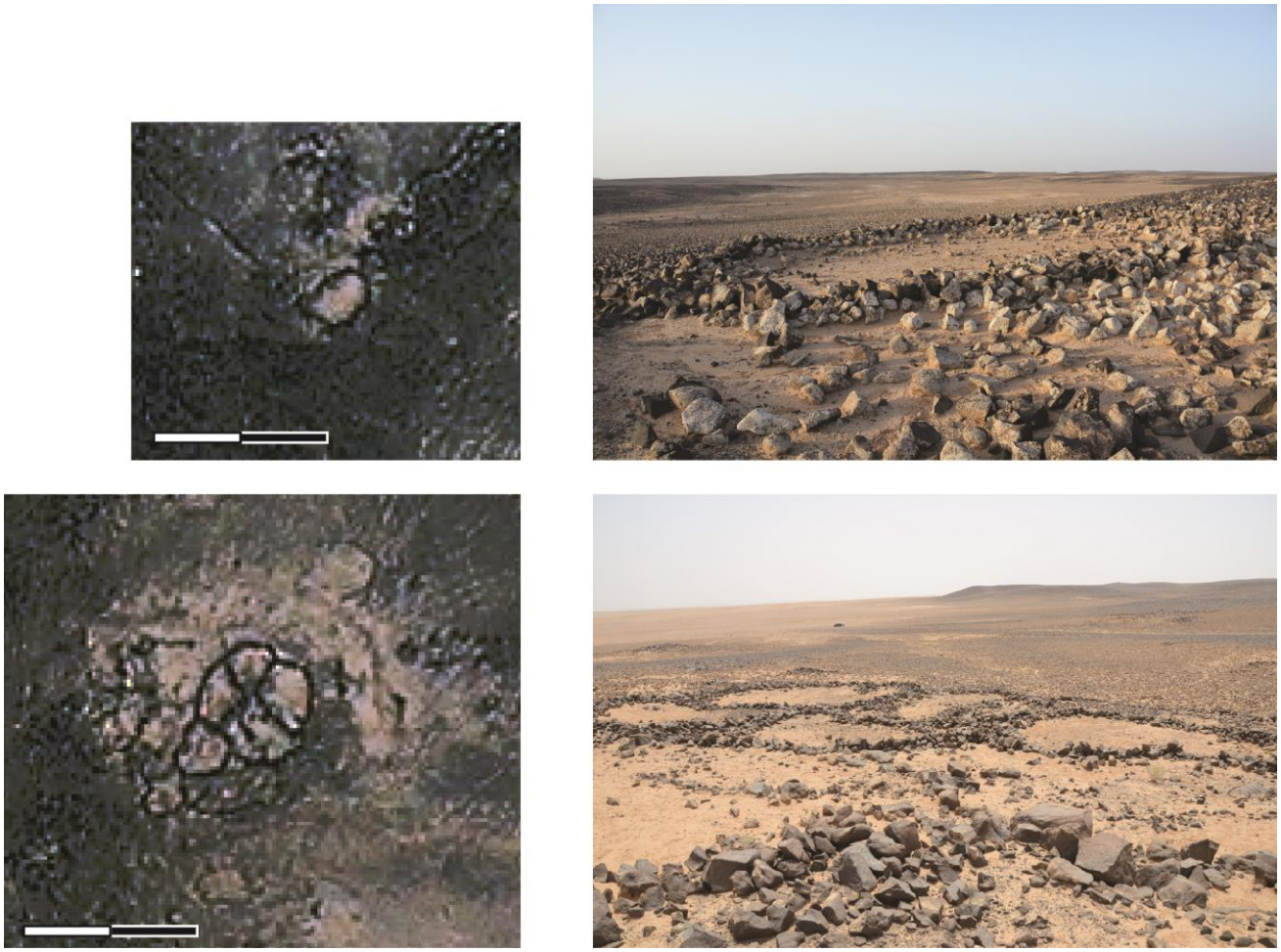

Figure 3.12: Enclosures in the Jebel Qurma region as seen from the air and on the ground. Top row: single enclosure at QUR-379. Bottom row: grouped enclosure at QUR-123. Scale is 40 m.

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 (Fig. 3.13). Clearings are among one of the most understudied feature types of the Black Desert. Although they are not unique for the Jebel Qurma region, clearings are hardly described in most of the remote sensing or field studies that were previously

[5] Enclosures are identified by the Old Arabic word *ẓrt* (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).

carried out in the Black Desert. A notable exception is the study by Kempe & Al-Malabeh (2010), in which these clearings are 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 function can be posed. First, 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 – a practice that is known from ethnographic accounts and archaeological contexts (e.g. Chang & 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 size variability among clearings is rather large. The smallest clearings may only be a few meters across, while the largest 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 remains of recent Bedouin campsites, including modern trash associated with rectangular tent outlines and animal pens (see below), are found on the clearings. Importantly, it is difficult to identify ancient features at these clearings, such as remains of residen-

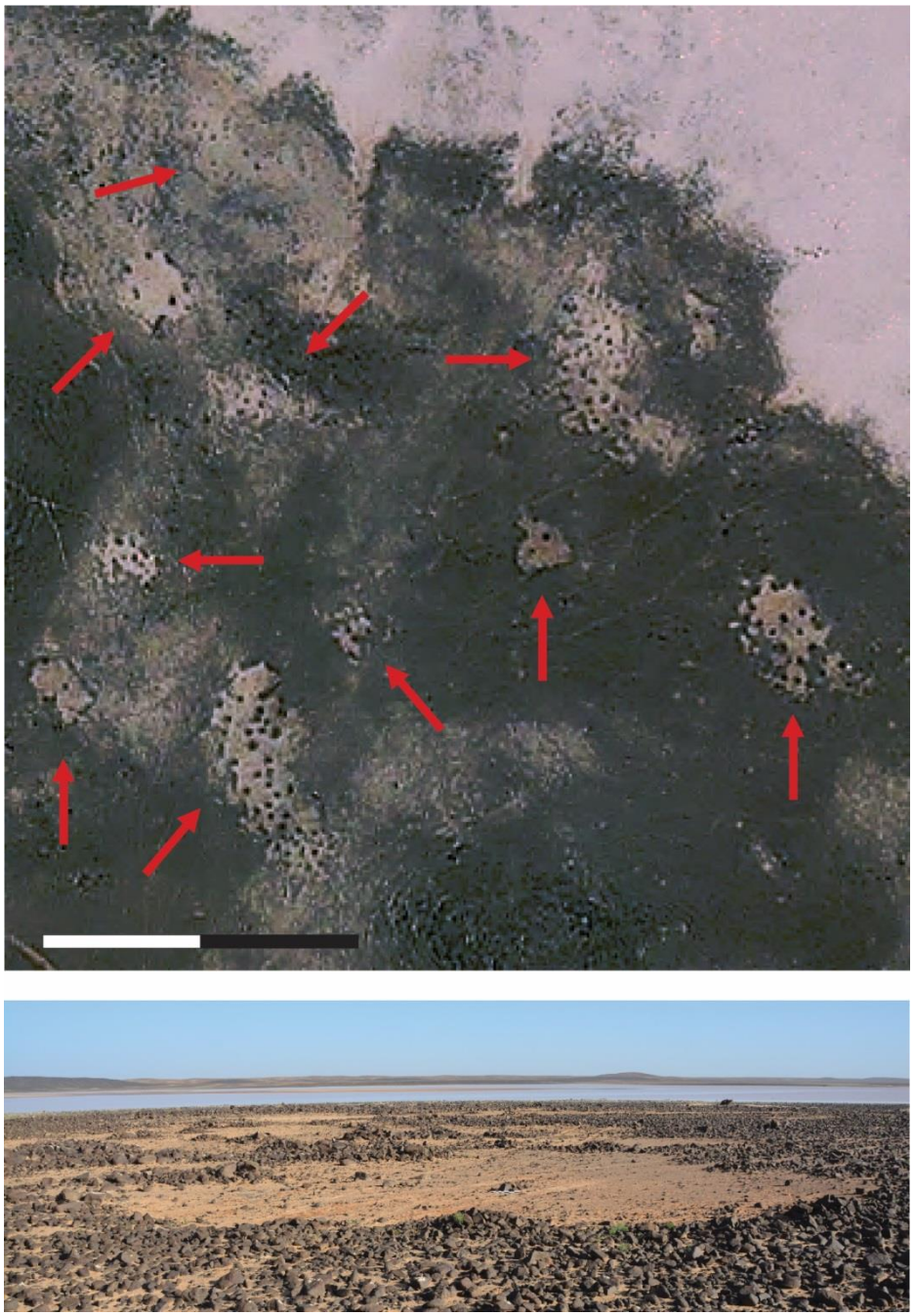

Figure 3.13: Clearings on the edge of a mudflat. Top: clearings indicated by red arrows on Ikonos satellite imagery (scale is 100 m). Bottom: a clearing at QUR-882 (photo by P. Akkermans).

tial units or other installations, as a result of these recent reconfigurations. 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.

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 & 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 a number 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 cairns. At Maitland's Mesa, for example, cairns that were originally thought to be funerary monuments, because of their similarity in appearance to tombs in the Negev, later proved to be prehistoric

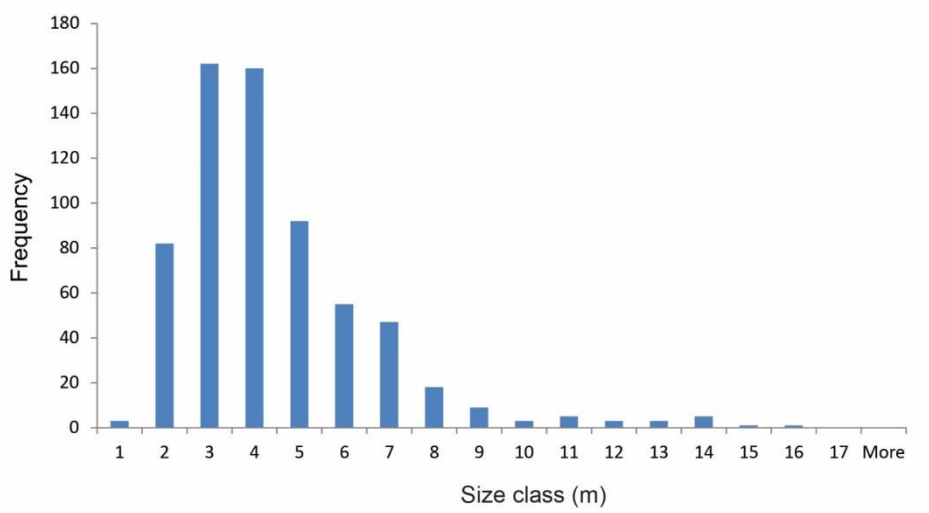

Figure 3.14: Histogram showing the number of cairns documented through pedestrian surveys per size class according to diameter (in meters).

Figure 3.15: Two types of facaded cairns. 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.

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. 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).

In the Jebel Qurma region 671 cairns were documented in total through pedestrian surveys between 2012 and 2016. 38 of these were situated in the *hamad* landscapes, the others were situated in the *harra*. The total size variability of the cairns ranges between 0.8 and 15.6 m. When the variability of the diameter of cairns is plotted in a histogram (Fig. 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 created of much larger stones that were neatly aligned (Fig. 3.15). These cairns were also more formidable in diameter, i.e. between ca. 7 and 13 m, than the cairns with lower façades, which were mostly between ca. 2 and 6 m across.[6] Any further differentiation within the large group of cairns that does not feature a façade but simply consists of a dome of rocks is at this point not possible, but requires further study through excavation (see Chapter 5).

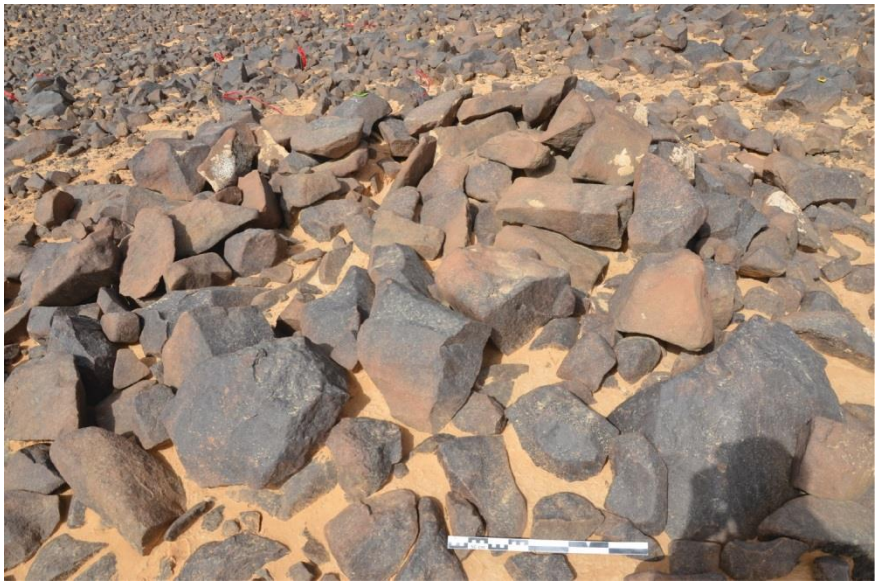

Figure 3.16: Low cairn featuring a circular outline of larger stones in the centre (QUR-529). Scale is 50 cm, photo by P. Akkermans.

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.

Some evidence was collected in terms of the function of cairns. At a total of 163 cairns a possible central chamber was observed. 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 (Fig.

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

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 (Fig. 3.17). Actual chambers, including the walls (Fig. 3.18) and sometimes even part of the roof construction (Fig. 3.19) were observed as well. Within a number of these chambers (31 in total) skeletal remains were observed – sometimes clearly human (Fig. 3.20) – suggesting that these chambers indeed represent tombs. 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 artefacts such as beads and metal objects – presumably grave gifts – or fragments thereof were sometimes exposed by such activities. Importantly, however, 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

Figure 3.18: Centre of a cairn at QUR-207 featuring a looted chamber with part of a corbelled wall preserved. Photo by author.

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.

four looted cairns at which skeletal remains were observed that were smaller than 4 m across. 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 are more frequently targeted by looters because of better visibility. Whatever the case, it is difficult to state on the basis of survey evidence alone that the smaller cairns were also used for funerary purposes, and excavations were necessary to further explore their function (see Chapter 5).

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

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

Pre-Islamic rock art was regularly present on or directly around cairns. In one case one of these inscriptions referred to constructing or visiting a burial cairn (QUR-215: Della Puppa forthcoming), in which case there is potentially a strong link between the inscriptions and a 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 these carvings must predate the construction of the cairn, although others might still have been added later.

In summary, this section has shown that cairns of highly variable size and configuration were documented through 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 have been older – prehistoric even. Excavations were required to further investigate morphological, chronological and functional differences between the cairns in the study area (see Chapter 5).

Pendants

Pendants are linear features comprising either a string of small cairns or simply a broad wall of stones, often, but not exclusively, diverging from a larger cairn (Fig. 3.22). The name 'pendant' has its origin in earlier studies of structure types 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 all the way down to Yemen, covering many of the basalt

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

regions of the western Arabian peninsula (Kennedy 2011; De Maigret 1999, 329-35). Despite their high number and wide occurrence, their function and date of construction is at this point still largely uncertain. In Yemen, radiocarbon dates from skeletal remains from the main cairns associated with pendants gave a broad date range, i.e. 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 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 are 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 are very sparse indeed. Until recently (but see Chapter 5) only at Maitland's Mesa a pendant had been investigated in detail. 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, perhaps suggesting that these are 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 further substantiated as it is based on a single case only and, again, lacks dating evidence (see Chapter 5).

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 size and

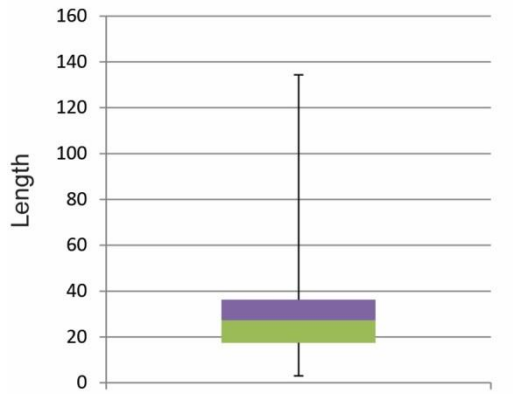

Figure 3.23: Box-and-whisker plot of the length of pendants documented though pedestrian surveys in the Jebel Qurma region.

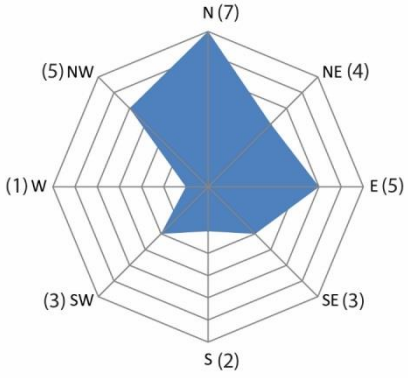

Figure 3.24: Radar chart showing the distribution in orientation of pendants from which they diverge from the main cairn. Absolute amounts are indicated between parentheses (for one of the pendants the orientation is unknown). The *p*-value of the variation is 0.45, indicating that statistically there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

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 (Fig. 3.23).[7] Almost every pendant features a larger cairn at one of its extremities, with one exception, and there does not seem to be a preferred orientation of the tail (Fig. 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 prehistoric structures, such as the prehistoric 'wheel' (see below) at QUR-148 (Fig. 3.25). Some of the pendants, however, are connected to cairns that are associated with many pre-Islamic carvings, which may suggest that the pendants are of similar date. 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 Karen Henderson/Nadja Qaili, courtesy of APAAME.

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 are installation constructed for hunting large amounts of game, including gazelle, although secondary use as animal corrals cannot be ruled out (Betts & Burke 2015). Animals would be driven towards

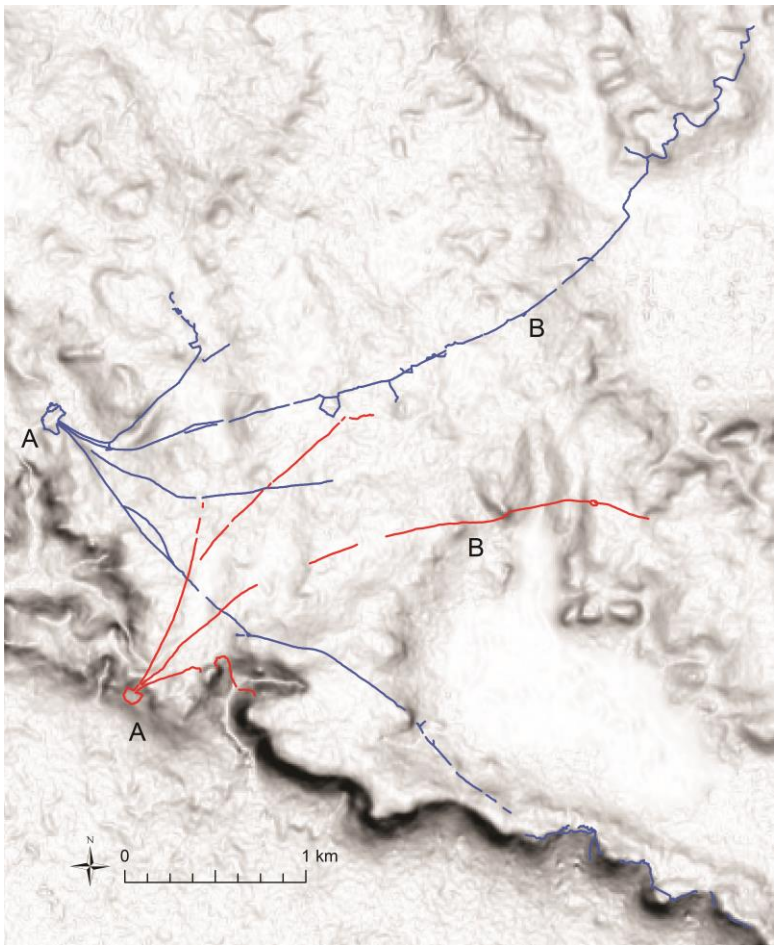

Figure 3.26: Two desert kites in the Jebel Qurma region, featuring an apex (A) and guiding walls (B). Traced from Ikonos satellite imagery. Base image: WorldDEM slope map.

[7] In a box-and-whisker plot the spread of all values in indicated by the end of the whiskers, the median is shown in the middle of the box, and the two halves of the box represent 25% of the values the median and 25% of the values above the median.

the star-shaped enclosure using the diverging arms, where hunters would wait for the animals to kill them. The actual trapping and killing was probably done through the use of pits, situated at the points of the star, where animals would jump into (Abu-Azizeh & Tarawneh 2015). The origin and period of use of 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 & 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 even newly constructed in more recent times.

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 (Fig. 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 – although 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.

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 (Fig. 3.27).

Such walls have been 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 the date of construction of these features or the way in which they were used in the past.

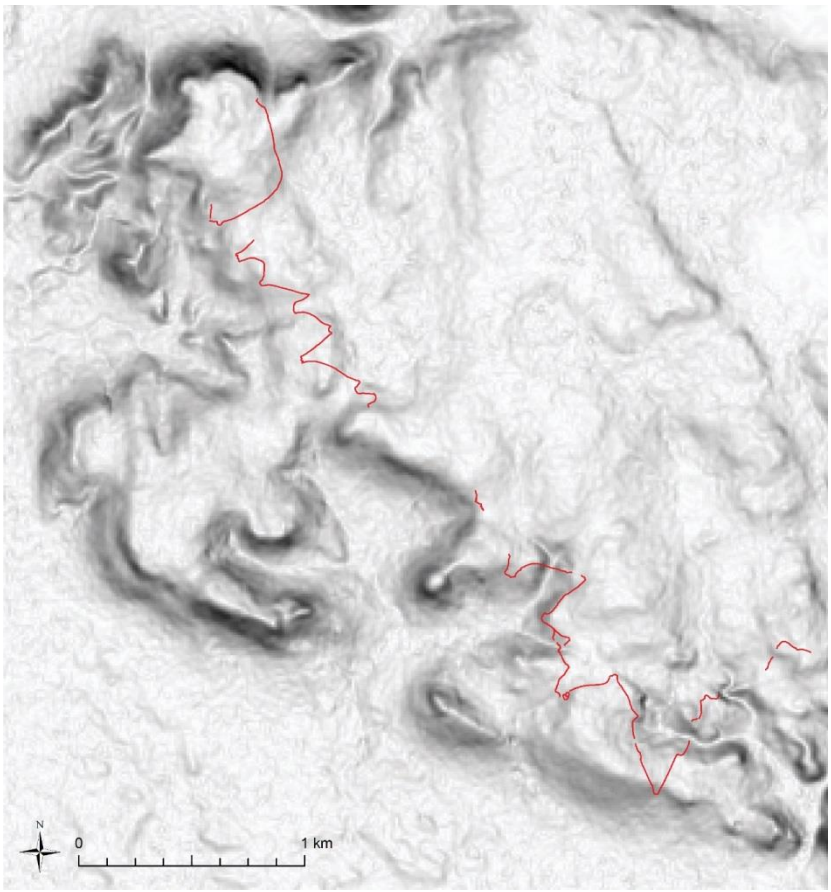

Figure 3.27: Selection of Walls in the Jebel Qurma region traced from Ikonos satellite imagery. Base image: WorldDEM slope map.

Dwelling clusters

In a number of places clusters of small circular to oval or eight-shaped features were recognised. These features had an open interior an can thus be seen as very small enclosures, but are distinctive given their small size and their tendency to form clusters (Fig. 3.28). These were characterised as dwelling clusters because of their close resemblance to other sites in the Black Desert, where excavations showed that these features represent 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 picked up at these sites represent mostly prehistoric material, i.e. chipped stone artefacts, which were 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.

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 (Fig. 3.29).

Although a well-known feature type, again 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 as he stresses that the circle of small structures around the main enclosure may actually be cairns rather than huts, 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 date of origin. OSL dates from a number of wheels suggest that they were constructed over a very long time period, i.e. between the early 7th and late 4th millennium BC (Rollefson et al. 2016).

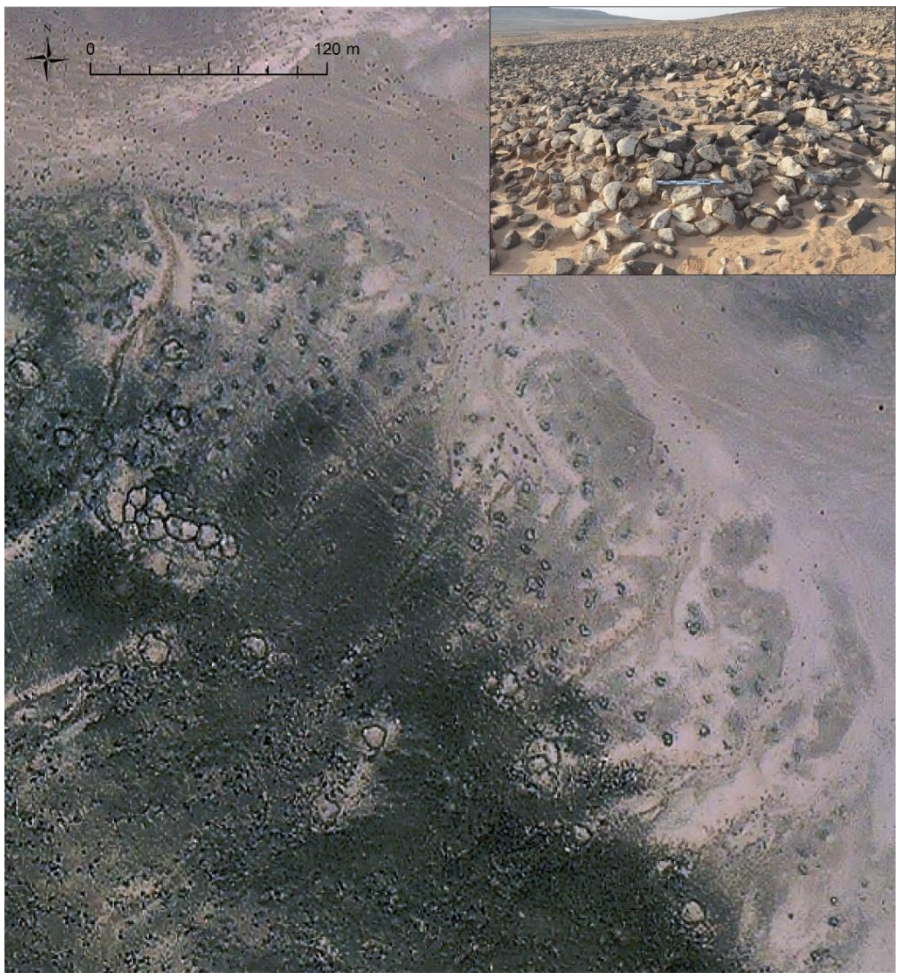

Figure 3.28: Ikonos satellite image of a cluster of dwellings at the site of QUR-6 at the foot of Jebel Qurma. Insert: a dwelling or hut foundation at QUR-6. Photo by P. Akkermans, scale is 50 cm.

In the Jebel Qurma region, numerous wheels have been documented through remote sensing and pedestrian surveys (Table 3.4). Evidence for a prehistoric origin 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, thus changing 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 had been constructed in the centre of these wheels.

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

Tent places

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

The interpretation of these outlines as tent places is further substantiated by similarities to oth-

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

er remote sensing and field studies of abandoned Bedouin campsites (e.g. Banning 1993; Saidel & 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 much earlier, i.e. from the 6th-8th century AD onwards (Saidel 2008, 473).

The field surveys in the Jebel Qurma region thus far 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.

Graves

In addition to burial cairns there were a total of 133 features that were tentatively identified during the pedestrian surveys as more simple graves. Some of these potential graves were found in isolation while others were found in clusters of up to 10 graves (Fig. 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 makes their identification as a grave more likely.

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 – site HAZ-27 – where the graves consisted of circular outlines of limestone or sandstone blocks. These graves were found in a string, 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

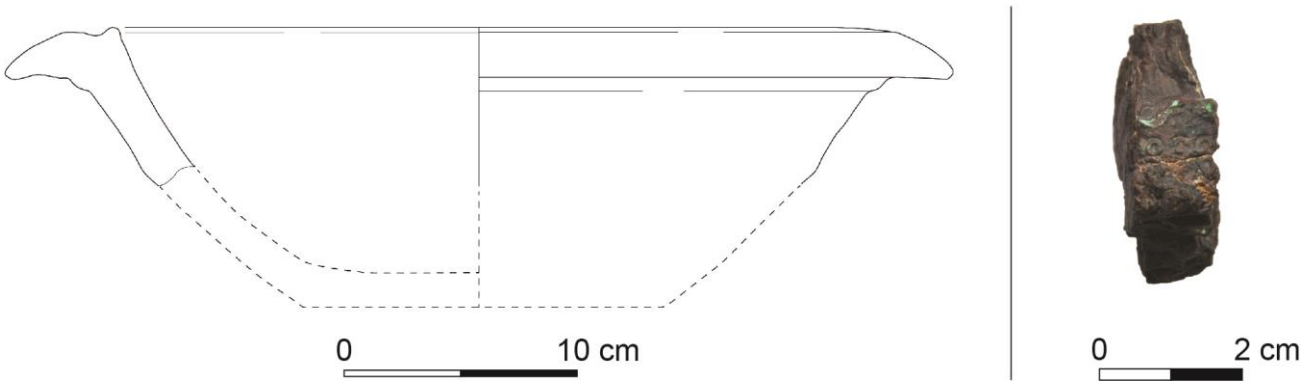

Figure 3.32: Selected artefacts from the cemetery at HAZ-27: a 3rd/4th century AD mortarium (left; see § 3.6. for details) and a fragment of an iron object with decorated bronze cladding (right).

of bronze and iron fragments as well as the remains of a large ceramic vessel dating to the early 4th century AD (Fig. 3.32). This would suggest that at least some of the inhumation graves may be of pre-Islamic origin. To further investigate this a similar kind of small 'cemetery' that was recognized during surveys at the site of QUR-829 was further investigated through excavations (see Chapter 5).

Desert mosques

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

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

Desert mosques – also called 'open-air mosques' (Avni 2007) – are well known from ethnographic and archaeological studies, including in the Black Desert, and may be associated with nomadic campsites or small agricultural settlements (Avni 1994; Carvajal Lopez et al. 2015; Betts et al. 2013) or burial grounds (Lancaster & 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.

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 on the walls of these mosques (Akkermans & Huigens in press). 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 Early Islamic use of these features in the Jebel Qurma region is not available at this point either.

Markers

Markers are conical stone pilings characterised by some visual prominence (Fig. 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. A few markers had received a white coating, no doubt in relatively recent times. The Jebel Qurma region hosts a large number of these markers, as 342 of them 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 constructed, some of them are much higher, i.e. up to 1.65 m, 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 & Ikram 2013), given their association with archaeologi-

cally 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 establishing the date of 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.

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).

Other/undefined

In addition to the better defined features types described above, a large variety of small and rather enigmatic features has been 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, which perhaps represent small temporary shelters or wind shields (Fig. 3.35), although this interpretation remains tentative. In some cases these features are associated – at least spatially – 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 one structure only – a small shelter-like feature (Fig. 3.35) – and associated with it two Safaitic inscriptions but also a recent Arabic inscription. Whether the structure is contemporaneous with the inscriptions and, if so, whether it is related to the Safaitic texts or modern Arabic inscription is impossible to say.

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.

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

Paths

The final feature type identified in the Jebel Qurma region are paths (Fig. 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 (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). Thus far however, these paths had not been identified in archaeological remote sensing or field surveys.

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

On 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 to each other (Fig. 3.37). They are normally not wider than c. 1.5 m, and may run parallel to the

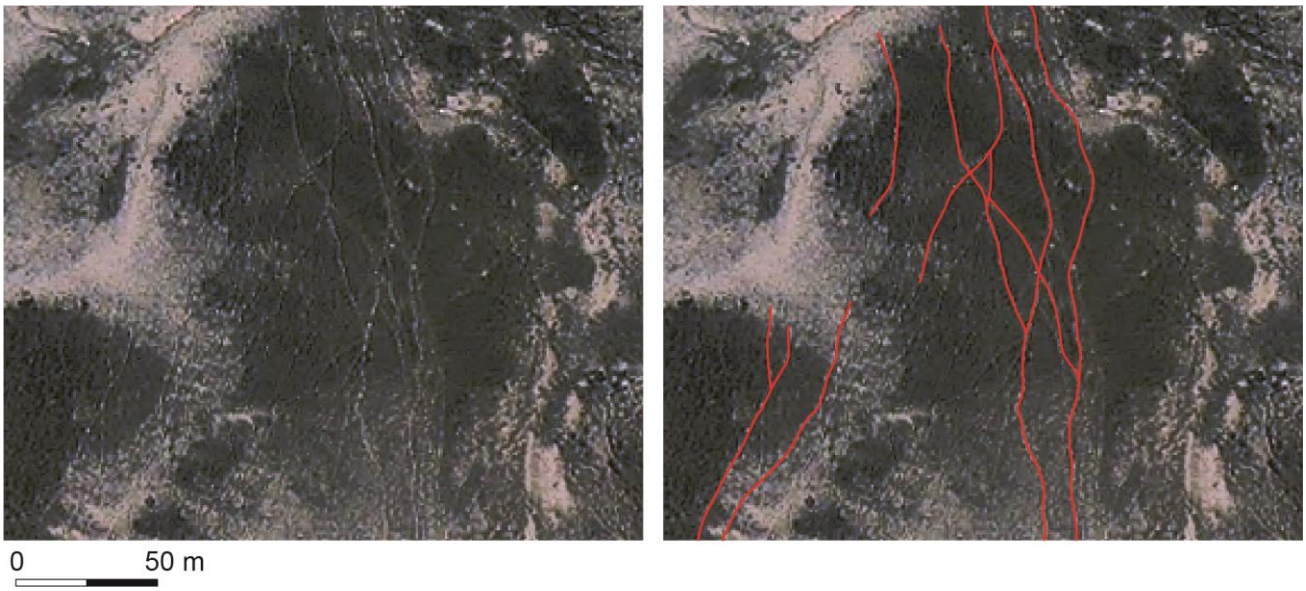

Figure 3.37: Left: Unmodified Ikonos imagery showing paths running through the *harra* landscape. Right: Paths traced on the imagery.

contour lines of the terrain or perpendicular to it. They are 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 from Ikonos satellite imagery (Fig. 3.38).

The paths recognised on satellite imagery and during pedestrian surveys in the Jebel Qurma region are relatively simple. There are no cases in which, for example, paths were paved or steps were created in paths leading up steep slopes. Rather than being built intentionally, it seems more likely that most of the paths are the result of prolonged trafficking 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, through 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 effort to increase their accessibility by removing rocks.

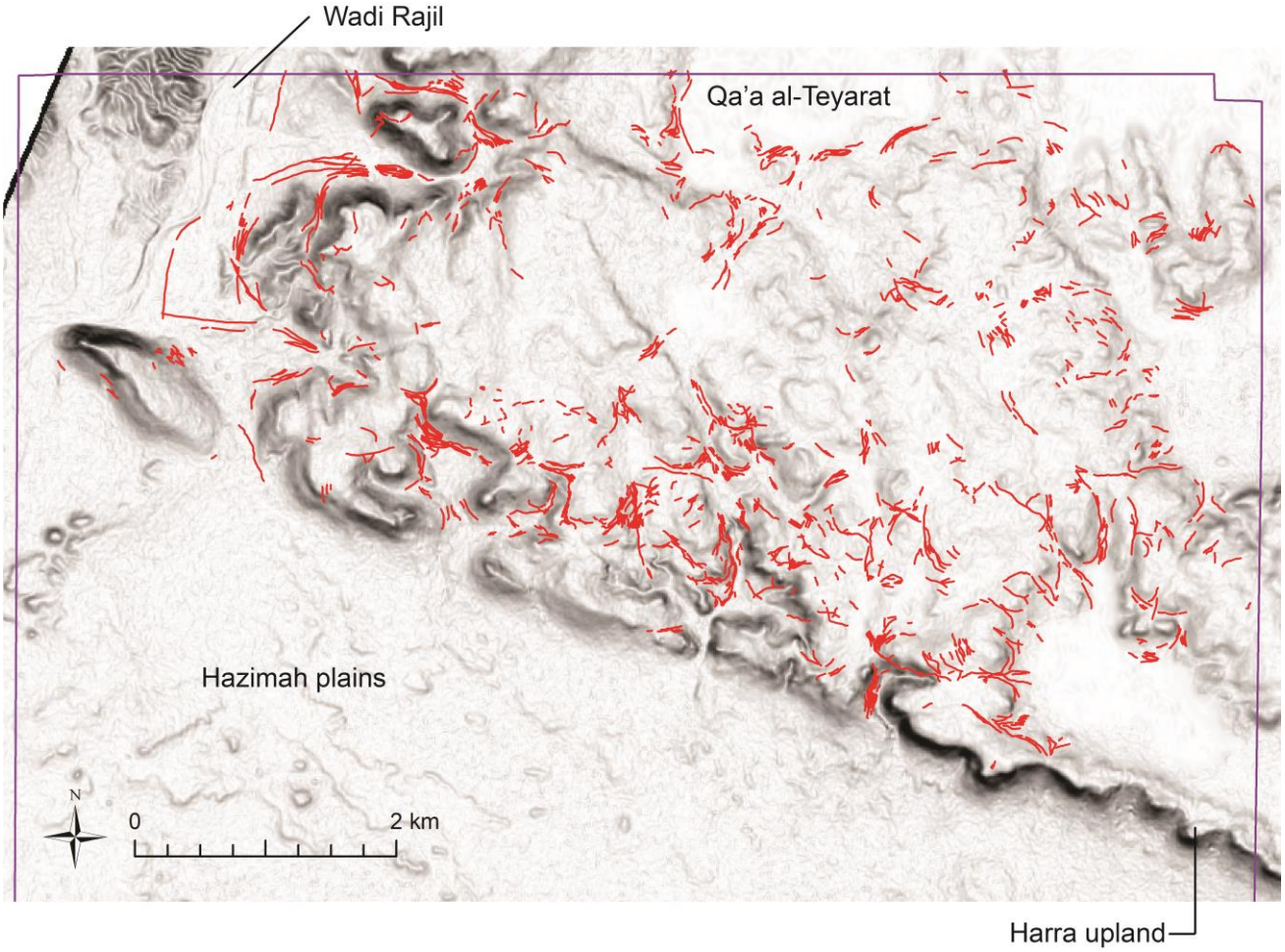

Figure 3.38: Distribution of paths in the *harra* landscape of the Jebel Qurma region. Ikonos imagery extent is indicated in purple lines. Base image: WorldDEM slope map.

Evidently, the paths themselves are difficult to date. Nevertheless, in a few instances datable remains such as ceramics and rock art were found in direct association with paths. An example from pre-Islamic times is the occurrence of a Safaitic inscription, mentioning pastoral activities, that was carved on a stone situated directly next to a path in an otherwise isolated area (Fig. 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 they may 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, 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 re-used during various different 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. Classical and Late Antique ceramics were often encountered in close association with clearings and enclosures – including some of the wheels – and 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 part 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 whether these inscriptions are related to any potential burial practices at these locations or not. This is further investigated in Chapter 5. Less elaborate funerary monuments, i.e. simple inhumation graves, were also shown to have been used in pre-Islamic times through an 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 sug-

gestion. Finally, there is limited evidence that the many paths that run through the *harra* landscape 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 have been 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 features, artefacts, and rock art. In this section an attempt is made to classify the sites on this basis.

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 general 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 from such activities at residential sites may include the remains or outlines of dwellings, waste material from domestic activities such as ceramics, animal bones, plant remains, and other trash, as well as fire places used for cooking or craft activities.

The first and most accurately datable surface remains that may serve to 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, i.e. extensive areas that were cleared of the original surface cover to create a smooth area suitable for the erection of tents or huts. The ceramics that occurred at these sites are probably best interpreted as domestic waste associated with domestic activities.

Site	Dating criteria	Period	With enclosure(s)?	Prehistoric remains?	Modern reuse?	Potential camping area (m2)
HAZ-1	Ceramics	Byzantine/Early Islamic			x	?
HAZ-15	Ceramics	Roman			x	?
HAZ-21	Ceramics	Byzantine/Umayyad			x	?
HAZ-23	Ceramics	Late Byzantine/Early Islamic			x	?
HAZ-44	Ceramics	Hellenistic/Roman or Byzantine/Early Islamic	x	x	x	?
HAZ-TA88	Ceramics	Late Byzantine				?
HAZ-TB70	Ceramics	Abbasid				?
HAZ-TD2	Ceramics	Roman/Byzantine/Early Islamic				?
HAZ-TD72	Ceramics	Late Hellenistic		x	x	?
QUR-1	Ceramics	Abbasid	x	x	x	17000

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

Site	Dating criteria	Period	With enclosure(s)?	Prehistoric remains?	Modern reuse?	Potential camping area (m2)
QUR-1016	Inscription; ceramics	Hellenistic/Roman, possibly also Byzantine/Early Islamic	x		x	4100
QUR-1022	Ceramics	Umayyad	x		x	6400
QUR-11	Ceramics; C14	Early Islamic	x	x		800
QUR-123	Ceramics	Late Byzantine/Umayyad	x	x		3050
QUR-140	Ceramics	Byzantine/Early Islamic	x	x	x	360
QUR-146	Ceramics	Late Byzantine/Early Islamic	x	x		4600
QUR-162	Ceramics	Early Roman & Late Byzantine/Early Islamic	x	x	x	4000
QUR-175	Ceramics	Hellenistic/Roman, possibly also Byzantine/Early Islamic	x	x	x	1750
QUR-185	Ceramics	Umayyad	x	x		3300
QUR-20	Inscriptions	Hellenistic/Roman	x	x	x	1600
QUR-206	Inscription	Hellenistic/Roman	x	x	x	2900
QUR-210	Inscription; ceramics	Hellenistic/Roman & Umayyad	x	x	x	1600
QUR-22	Ceramics	Late Byzantine/Early Islamic			x	8200
QUR-23	Ceramics	Umayyad	x	x		600
QUR-257	Ceramics	Hellenistic	x		x	5700
QUR-295	Ceramics	Hellenistic/Early Roman			x	850
QUR-337	Ceramics	Early/Late Islamic	x		x	2600
QUR-347	Ceramics	Byzantine/Early Islamic			x	27000
QUR-360	Ceramics	Byzantine	x		x	21000
QUR-370	Ceramics	Early Byzantine & Umayyad	x		x	1100
QUR-373	Ceramics; C14	Roman, Byzantine & Early Islamic	x	x	x	2400
QUR-389	Ceramics	Late Byzantine/Early Islamic			x	1700
QUR-393	Ceramics	Late Byzantine			x	3500
QUR-396	Ceramics	Byzantine/Early Islamic			x	1000
QUR-446	Ceramics	Byzantine				1000
QUR-490	Ceramics	Roman			x	2350
QUR-595	Ceramics; C14	Hellenistic, Roman and Byzantine/Early Islamic	x	x	x	3400
QUR-6	Ceramics	Abassid, possibly also Hellenistic/Roman	x	x	x	34400
QUR-615	Ceramics	Late Byzantine			x	4600
QUR-619	Ceramics	Byzantine/Early Islamic	x		x	7000
QUR-632	Ceramics	Iron Age II/Hellenistic			x	2050
QUR-637	Ceramics	Late Roman/Byzantine			x	2100
QUR-645	Ceramics	Late Byzantine/Early Islamic			x	3200
QUR-651	Ceramics	Fatimid			x	2000

Table 3.5 (continued)

Site	Dating criteria	Period	With enclo-sure(s)?	Prehisto-ric remains?	Modern reuse?	Potential camping area (m2)
QUR-653	Ceramics	Roman			x	3900
QUR-661	Ceramics	Late Byzantine/Early Islamic	x			750
QUR-734	Inscription	Hellenistic/Roman	x	x	x	600
QUR-735	Ceramics	Late Byzantine		x	x	6700
QUR-759	Ceramics	Roman			x	2500
QUR-768	Ceramics	Late Roman/Byzantine				160
QUR-773	Ceramics	Late Roman/Byzantine				1200
QUR-785	Ceramics	Abassid			x	1750
QUR-787	Ceramics	Late Roman			x	3800
QUR-833	Ceramics	Byzantine				5400
QUR-851	Ceramics	Roman/Early Byzantine				300
QUR-974	Inscription	Hellenistic/Roman	x	x		1100

Table 3.5 (continued)

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.

These criteria, the presence of ceramics or inscriptions referring to the use of enclosure, were used to define a number of residential sites in the Jebel Qurma region. The same materials were used to provide an indication for the period(s) during which these sites were inhabited. In cases where the 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. In total, then, 56 residential sites dating between the Hellenistic and Early Islamic periods could be identified on this basis (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 it is possibly that the number of residential sites with which Classical/Late Antique remains could be associated may not represent the total amount of residential sites that was inhabited during this period.

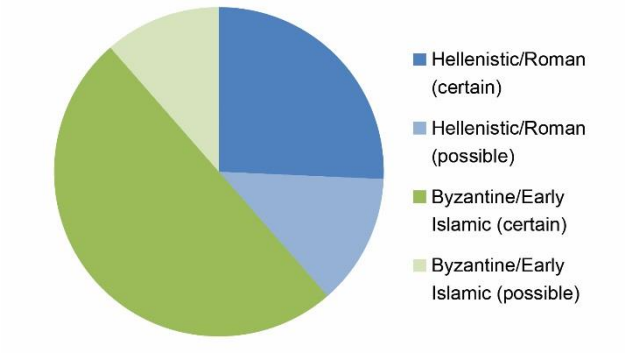

Figure 3.40: Proportion of campsites per period attested in the Jebel Qurma region.

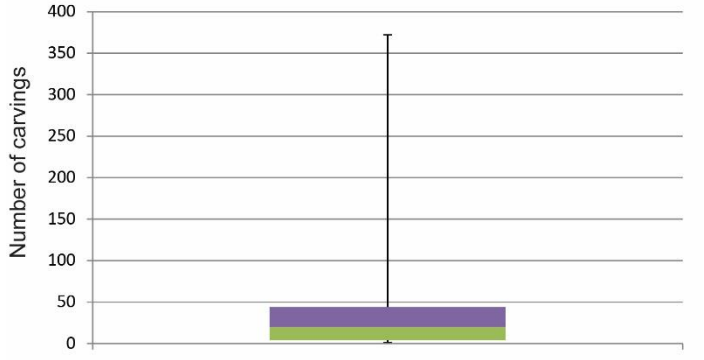

Figure 3.41: Box-and-whisker plot of the number of individual inscriptions and petroglyphs per Classical/Late Antique residential site.

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 where, in addition to Classical/Late antique ceramics, chipped-stone artefacts are present indicating a prehistoric use phase. At other sites there is evidence of modern reuse of the site indicated by the presence of modern trash, tent remains, and the like.

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 (Fig. 3.40). Materials

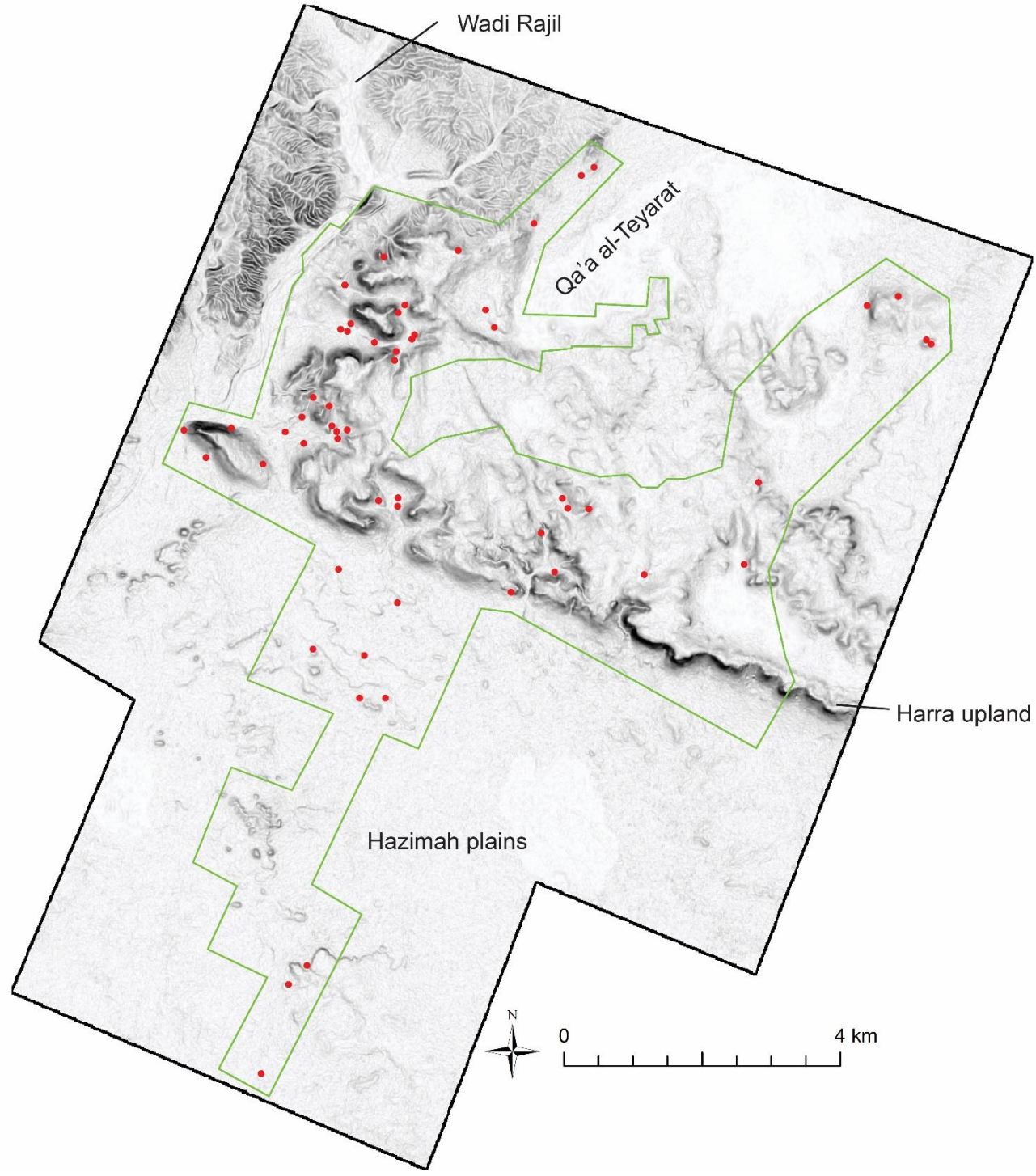

Figure 3.42: Distribution of Classical/Late Antique residential sites (red) in the Jebel Qurma region based on pedestrian surveys. The survey area is indicated in green. Base image: WorldDEM slope map.

from the Hellenistic/Roman period – ceramics and inscriptions – 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, and possible at another 8 sites for which the dating evidence was less certain.

These residential sites are invariably constituted of open spaces – mostly of anthropogenic nature, i.e. clearings and enclosures – which 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. A word of caution, however, is required here, as many of such features, and even part of the clearings and enclosures themselves, need not always be related to the ancient artefacts and inscriptions present at these sites. At most of the residential sites (73%) there was 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 and by adding features. It is therefore difficult to assess the original configuration of the residential sites, i.e., what they looked like when they were inhabited in antiquity.

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 occurred the numbers of inscriptions and figures was usually low, i.e. less than 50 with only a few exceptions (Fig. 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 floors of valleys that run down from the central plateau of the Jebel Qurma range, and in the open plains beyond (Fig. 3.42). These areas are fairly easily accessible and the basalt surface cover is often relatively open, or even non-existent, requiring limited clearing activities for the creation of 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.

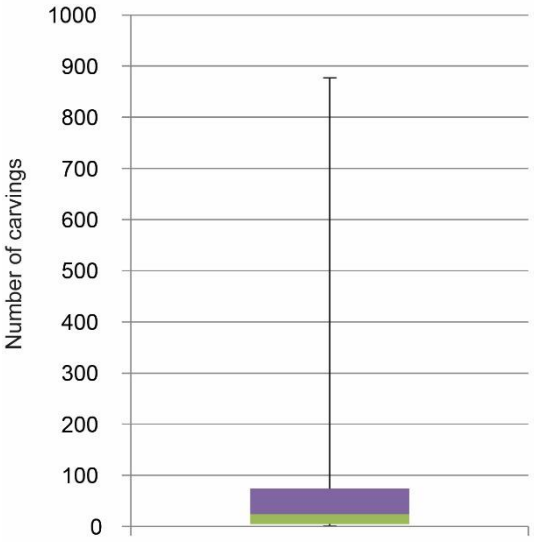

Figure 3.43: Box-and-whisker plot of the number of individual inscriptions and petroglyphs per Classical/Late Antique funerary site.

Dating these funerary monuments on the basis of surface evidence alone is difficult. In contrast to residential sites, these features are not usually clearly associated with datable surface remains. This was only

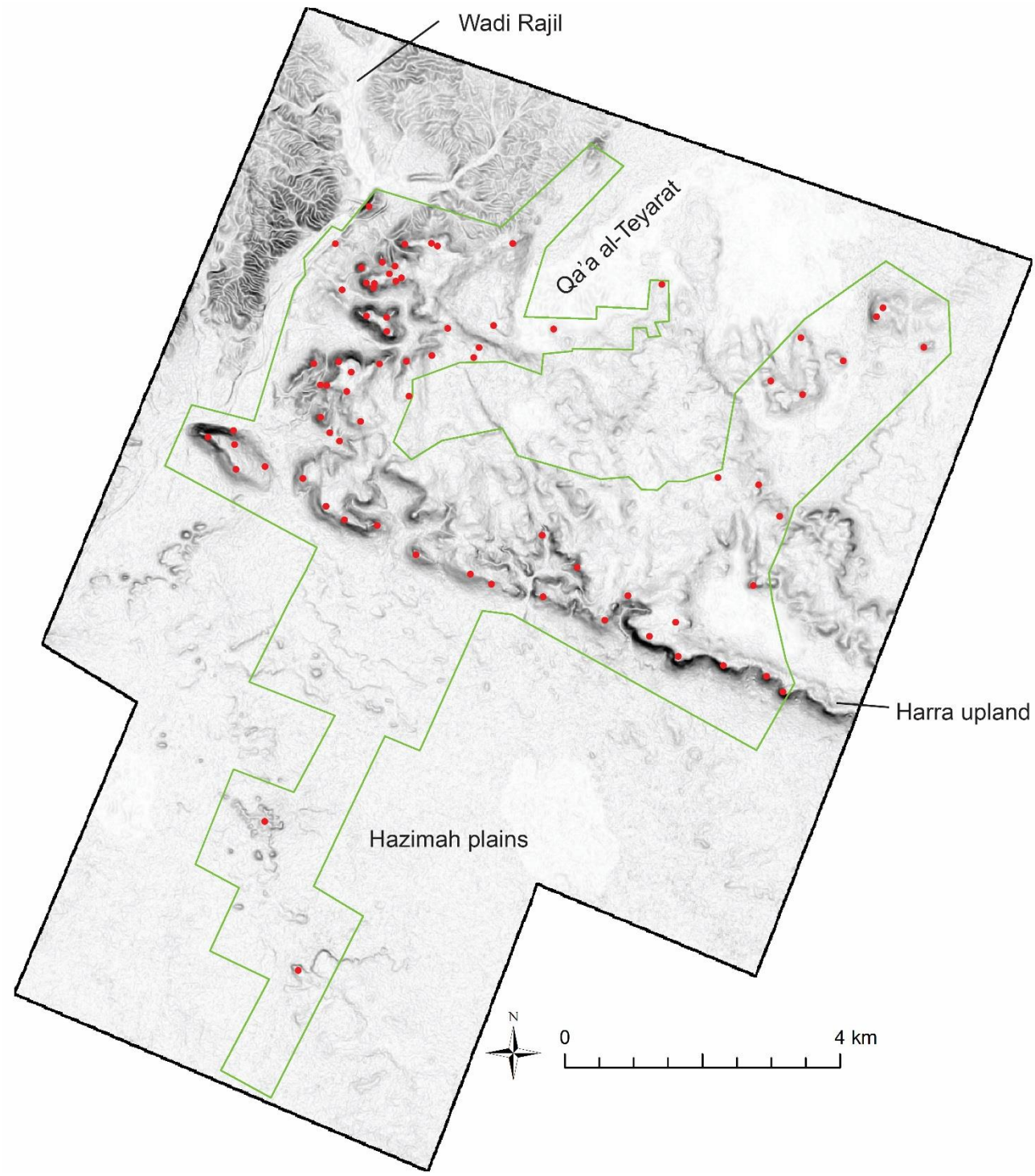

Figure 3.44: Distribution of Classical/Late Antique funerary sites (red) in the Jebel Qurma region based on pedestrian surveys. The survey area is indicated in green. Base image: WorldDEM slope map.

the case when materials could be retrieved from recent disturbances such as looting, or when Safaitic inscriptions and rock art was 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 – mainly pre-Islamic carvings – that are potentially associated with these tombs. The following criteria were used to define a number of potential 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 (but see also Chapter 5) questionable that 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 potentially contained one or more Classical/Late Antique funerary monuments. Only five of these were also defined as residential sites as they also consisted of enclosures and associated ceramics – the rest 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 (Fig. 3.43). Furthermore, funerary sites occur at relatively high places in the landscapes, such as hilltops and ridges. They follow a distribution (Fig. 3.44) that is distinct from the distribution of residential sites, as described above.

It is important to note that many of these funerary sites were probably frequented during many periods of inhabitation, i.e., from prehistory to recent times. Some of the funerary monuments may in fact be of prehistoric origin 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

The remainder of sites documented in the Jebel Qurma region through pedestrian surveys at which datable remains from the Classical/Late Antique period were encountered did not feature funerary monuments or residential features. Instead, these sites often consisted mainly of pre-Islamic carvings or small ceramics 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 site are merely suggestive of the frequentation of these locations, probably for a relatively short period of time.

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 – where rock art occurs as well – rock art clusters mostly occur on elevated locations in the *harra* landscape (Fig. 3.45). They are mostly found in areas that were defined 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 (for a more detailed overview of the distribution of carvings, see Brusgaard forthcoming). This distribution is probably indicative of daily movements and associated activities, such as watching over animals, within the broader landscape from those residing in the region.

Ceramic scatters

Two sites were defined merely on the occurrence of small quantities of Late Byzantine to Early Islamic ceramics, 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 must remain unknown.

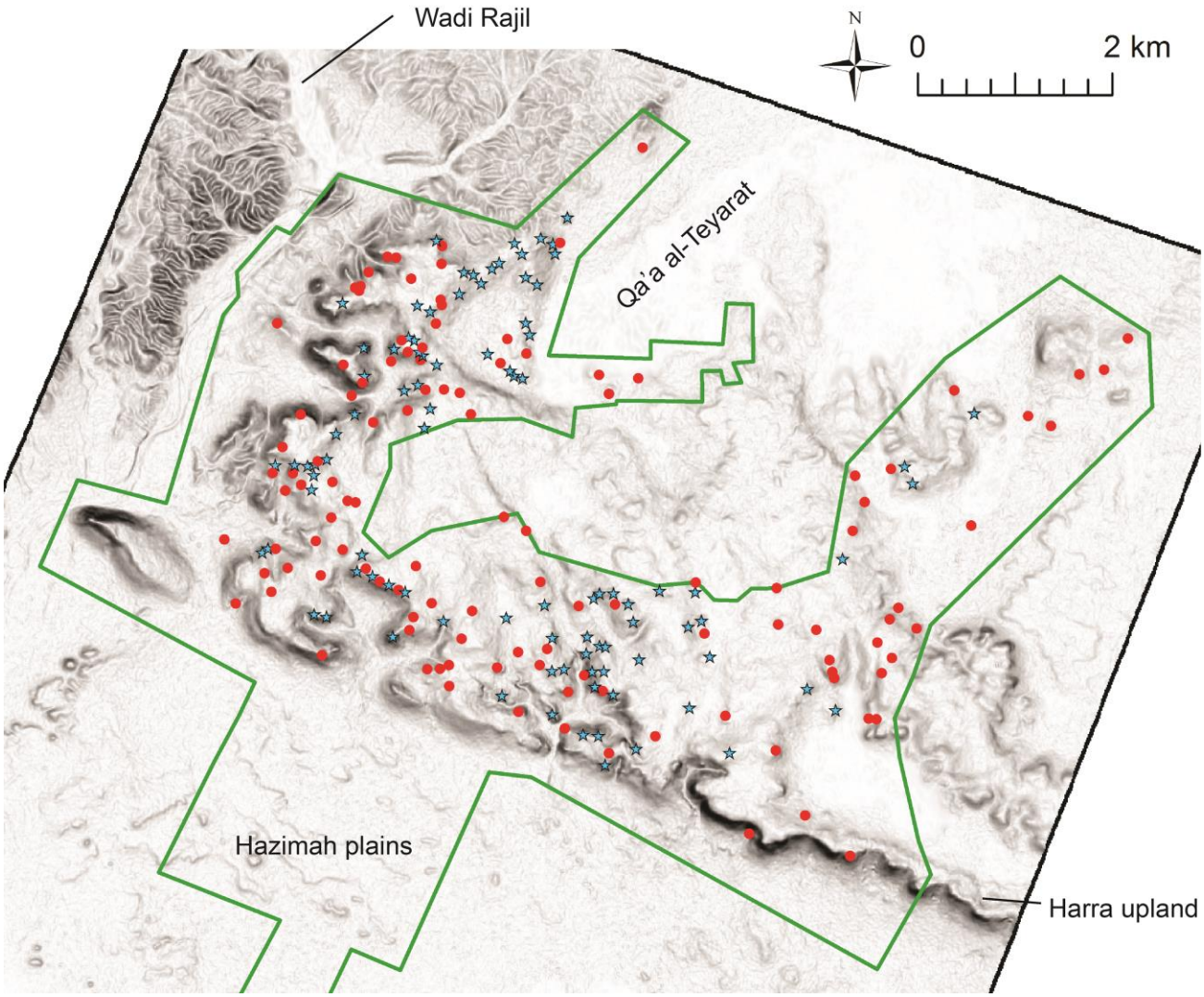

Figure 3.45: Distribution of sites containing pre-Islamic carvings that were not associated with residential or funerary features (red). Blue stars indicate rock art clusters associated with shelters. The survey area is indicated in green (no rock art clusters were encountered in the Hazimah plains).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

Desert kites

Pre-Islamic inscriptions and petroglyphs were encountered in locations with desert kites, showing that these locations were at least frequented during Classical Antiquity. Two depictions of kites, which were earlier believed to be prehistoric (Akkermans et al. 2014), that were found close to an actual desert kite (QUR-21) are likely to be associated with the Safaitic inscriptions as well (Brusgaard forthcoming). 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 suggests the kites from this area were used in historical times in a similar way.

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, as presented above, 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, which are clearly of prehistoric origin based on the association with chipped-stone artefacts and results from studies in other areas (see § 3.4.4.). There were no Classical/Late Antique ceramics associated with these features, however. Apparently, for one reason or another, the enclosures within the wheels were not deemed suitable for reuse in more recent times, in contrast to, for example, other types of enclosures (see above). The only evidence for the reuse of wheels is where burial cairns and pendants were constructed on top of them, which was the case, for example, at QUR-147 (Fig. 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, only at QUR-6 ceramics from the Classical/Late Antique period were collected, 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 and in cases where such ceramics were encountered it is more likely that the tent places are overlying more ancient campsites. In case of 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 suggests that this is the case 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 additional information may be obtained from the archaeological record. The archaeological 'visibility' of this period is reflected in a variety of ways. The ceramic corpus collected during pedestrian surveys in the Jebel Qurma region, broadly spanning the late 1st millennium BC and the 1st millennium AD, is one relevant example. These ceramics have the potential to define activity areas in the landscape, for example at clearings and enclosures, and may thus provide the means for an understanding of settlement patterning that cannot be achieved by focussing on rock art alone. This potential is further explored in the next chapter.

At the same time, however, one may wonder what the observed ceramic trends in themselves reflect. It is recalled here that there are, at this point, no ceramics that can be safely assigned an Iron Age date. 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, however, is warranted with regard to using these trends in reconstructing differences in occupational intensity. There are some indications that the ceramics trends indicate something different than the amount of people that frequented the Jebel Qurma region. For example, if we assume for the moment that the thousands of Safaitic inscriptions and associated petroglyphs from the study area indeed pre-date the Byzantine period, than the occupational intensity during the Hellenistic/Roman period must have been more considerable than is reflected by the ceramics. Another possibility, then, would be that the a limited number of ceramics – or a total absence thereof – from the preceding Iron Age does not imply limited occupation but, merely, 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 defined that were potentially constructed and/or used during the Classical and Late Antique period. To some degree, however, it has proved difficult to be conclusive about the date of these features on the basis of survey evidence alone, and their relation to artefacts and other features found nearby. For example, it was shown that there are a number of potential burial cairns that show a strong spatial association 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 chronological, let alone functional or meaningful relation 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 of the relationship between such surface features on the basis of excavations.

3.6. 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. Fig. XII.7:5; Parker 1998, Fig. 155:29	I
2.	HAZ-1	4	1	Closed vessel	Umayyad	Acconci & Gabrieli 1994, Fig. 46:14; Tushingham 1972, Fig. 6:7	C
3.	HAZ-15	2	1	Bowl	Roman	Gerber 2012, Fig. 3.13:3; Fig. 3.38:2-8	D
4.	HAZ-21	2	1	Unknown	Byzantine/Umayyad	Vokaer 2010-2011, Fig. 47:52	C
5.	HAZ-23	4	1	Cooking pot	Late Byzantine/ Early Islamic	Ball et al. 1986, Fig. 3.3; El-Khouri 2014, Fig. 9.3; McNicoll at al. 1982, Pl.140:1	H
6.	HAZ-27	2	1	Mortarium	Late Roman	Parker 2006, Fig. 16.37:191	E
7.	HAZ-44	3	1	Unknown	Hellenistic/Roman/ Byzantine/ Early Islamic	Khalil & Kareem 2002, Fig. 11; Renel 2010, Fig. 3:2, 4	B
8.	HAZ-TA88		1	Closed vessel	Late Byzantine	Tushingham 1972, Fig. 12:33	I
9.	HAZ-TB70		1	Unknown	Abbasid	Khalil & Kareem 2002, Fig. 8:18	D
10.	HAZ-TD2		1	Closed vessel	Roman/Byzantine/ Early Islamic	Berlin 2005, Fig. 9:7, 8; Walker 2012, Fig. 4.8:3	C
11.	HAZ-TD72		1	Closed vessel	Late Hellenistic	Schmid 2000, Fig. 292	C

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

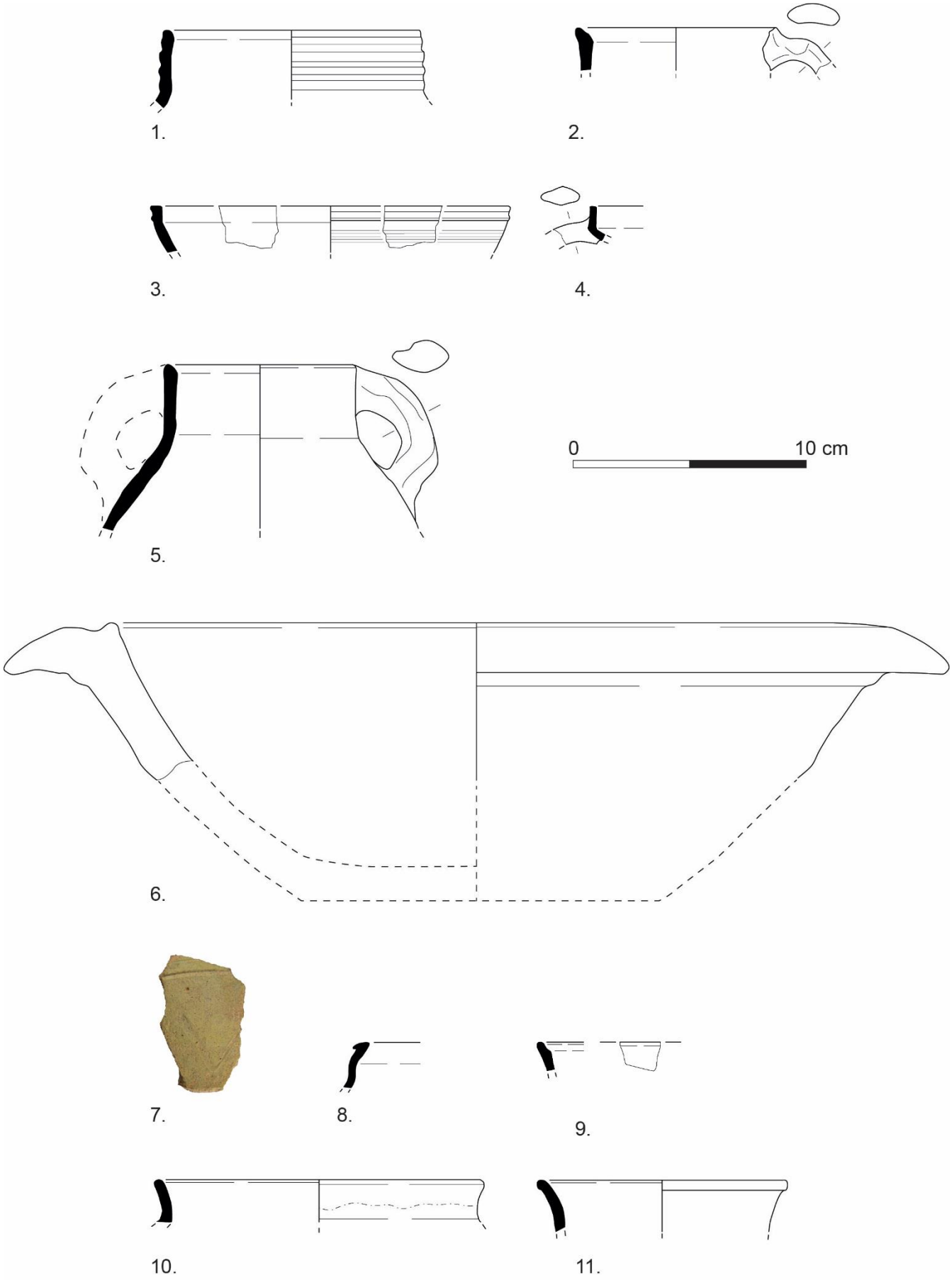

Figure 3.46: Hellenistic to Early Islamic ceramics collected during pedestrian surveys in the Jebel Qurma region (see Table 3.6. for details). Drawings by A. Kaneda.

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

Table 3.6 (continued)

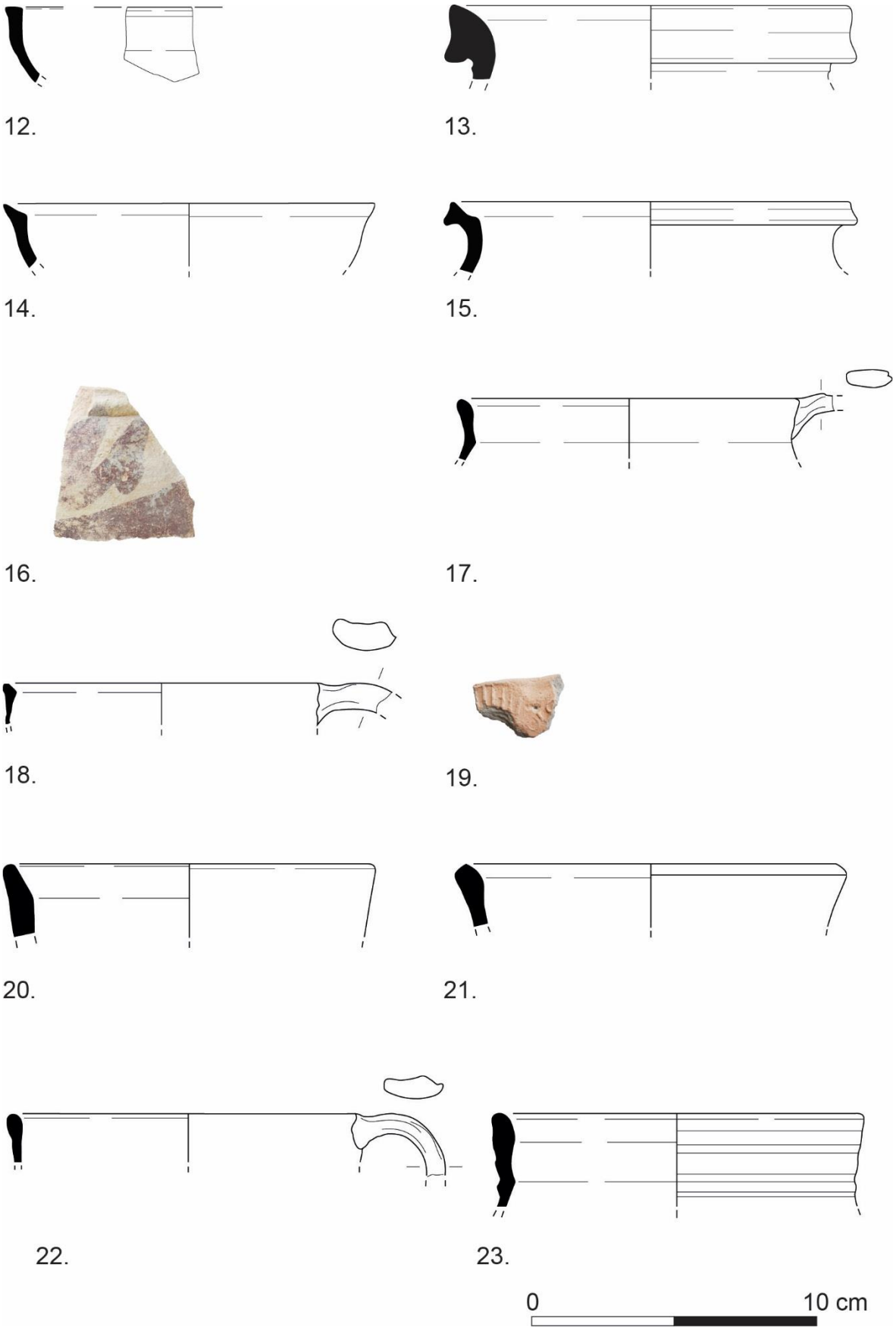

Figure 3.46 (continued)

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

Table 3.6 (continued)

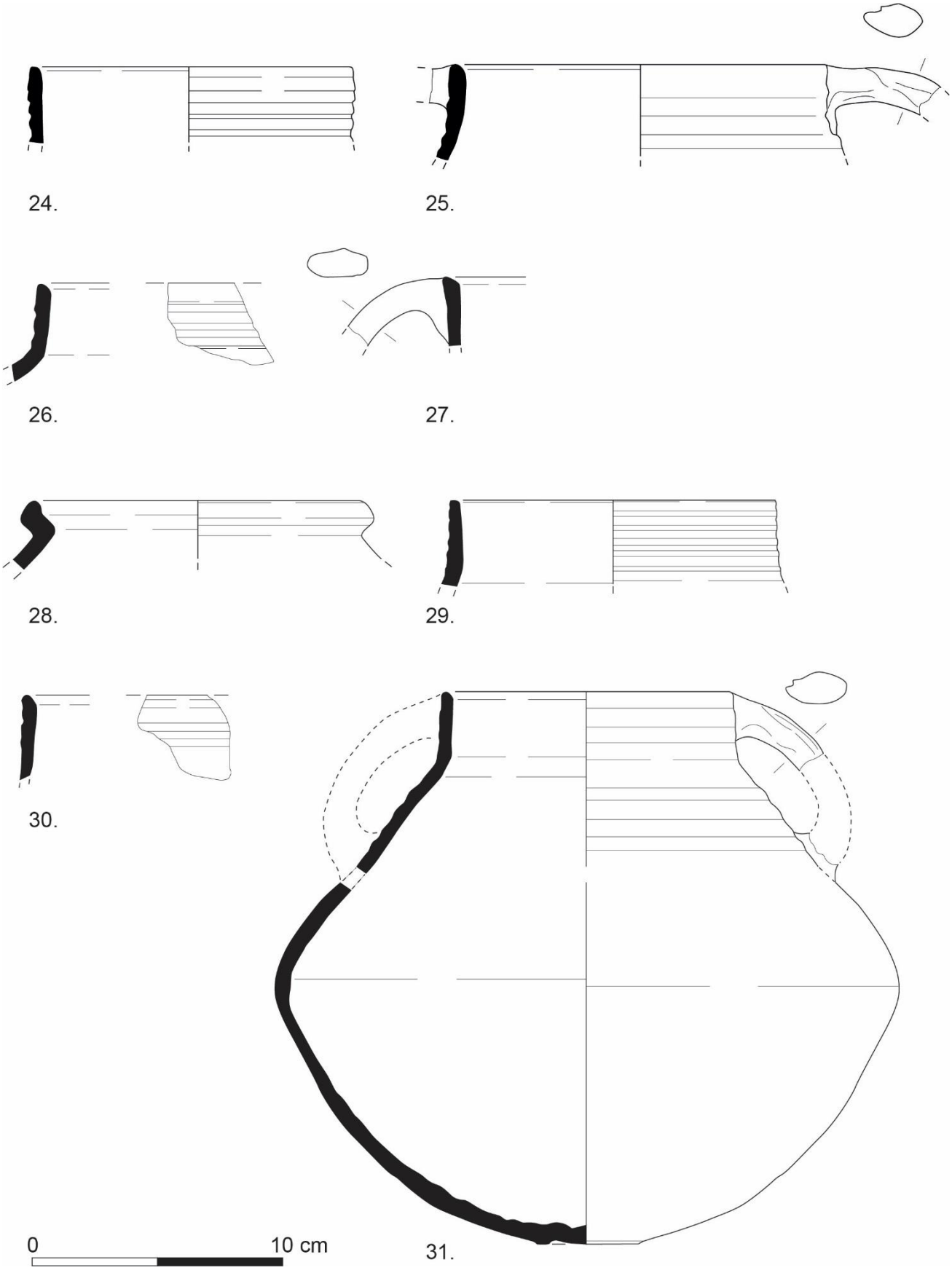

Figure 3.46 (continued)

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

Table 3.6 (continued)

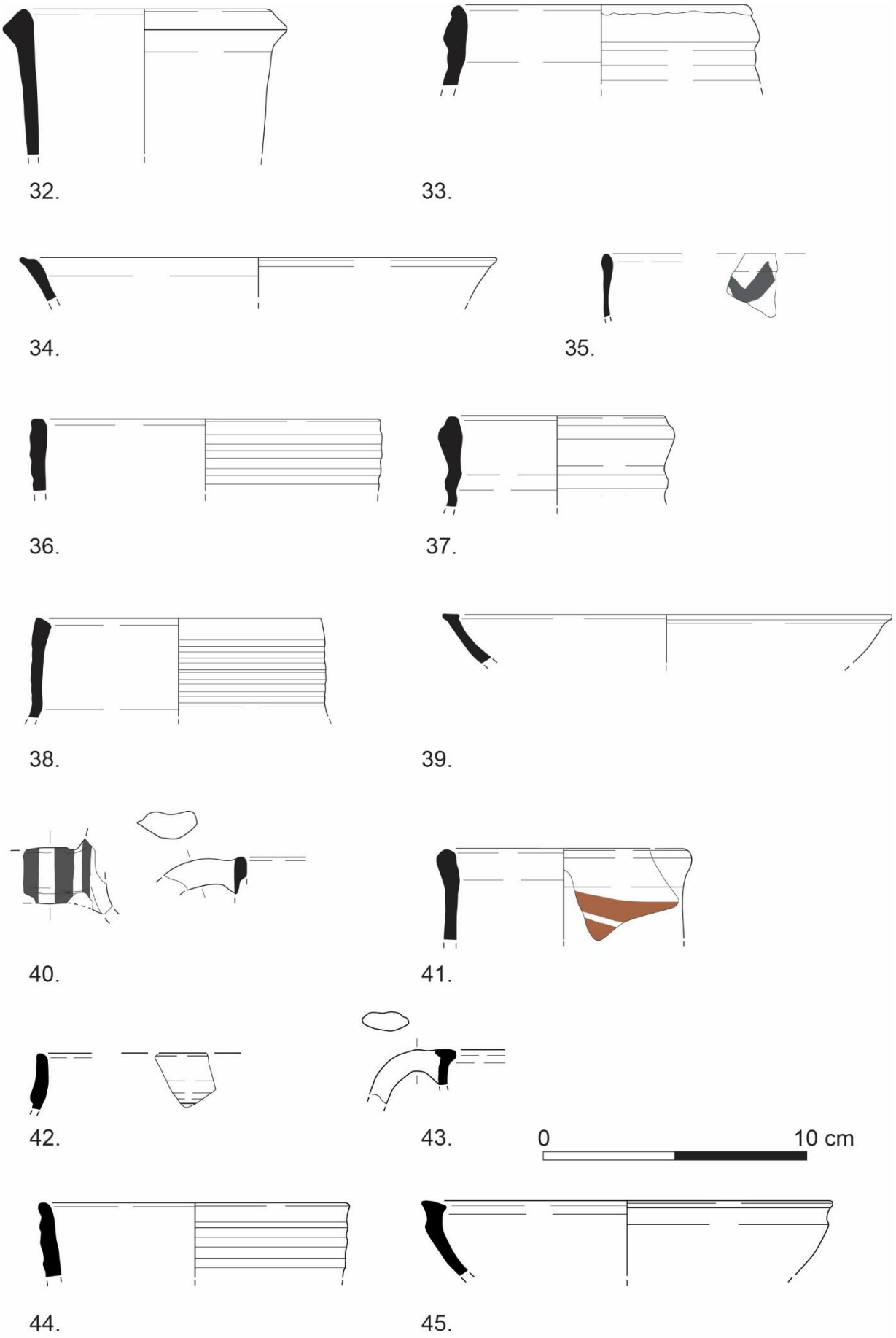

Figure 3.46 (continued)

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

Table 3.6 (continued)

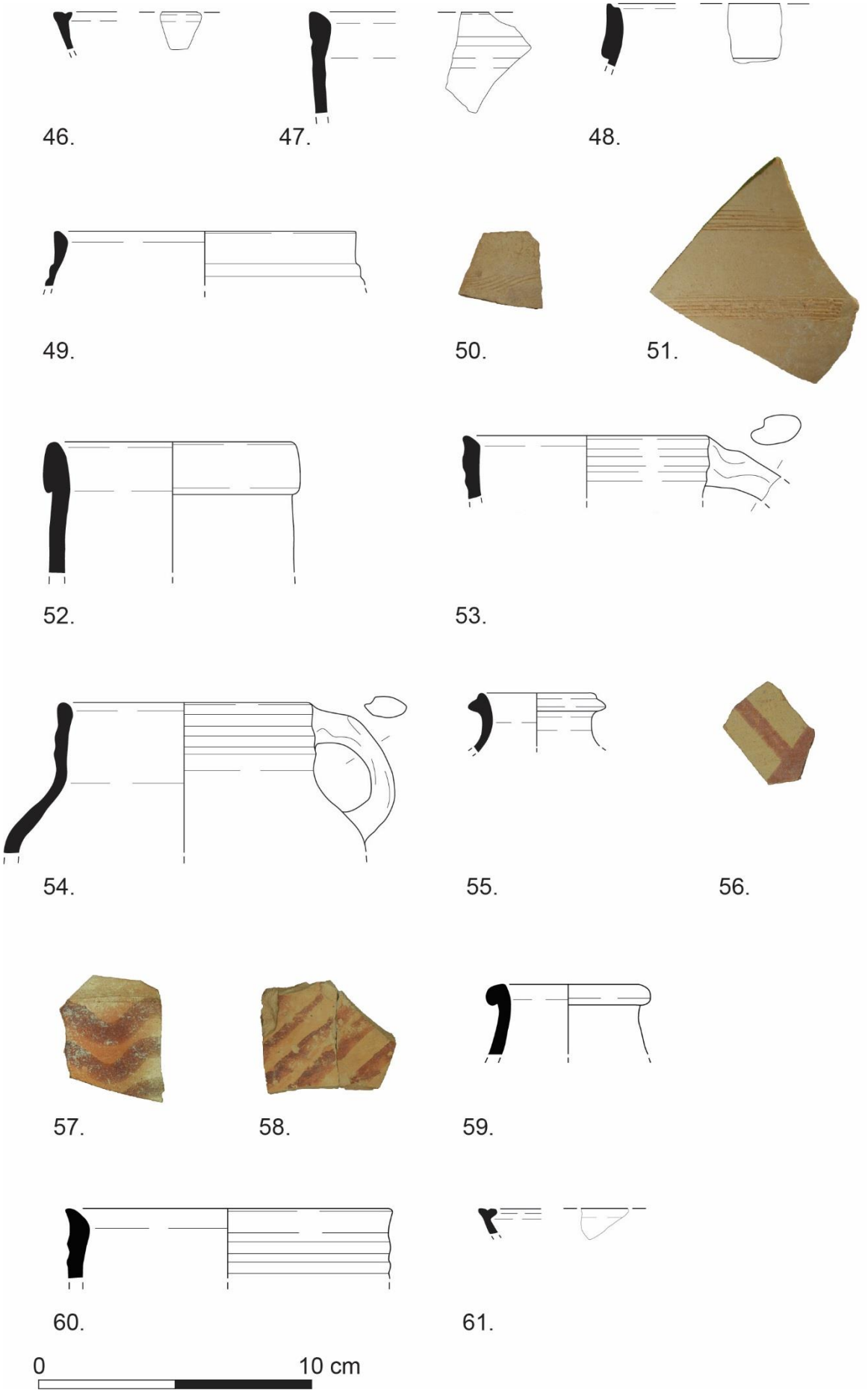

Figure 3.46 (continued)

Catalogue no.	Site	Locus	Sherd no.	Type	Date	Parallels	Fabric
62.	QUR-490	1	1	Cooking pot	Roman	Gerber 2012, Fig. 3.26:3	H
63.	QUR-533	2	1	Open vessel	Late Roman/ Byzantine	Johnson 2006, Fig. 15.9: 179, 182; Fig. 15.6:10	F
64.	QUR-595	20	2	Closed vessel	Byzantine	Johnson 2006, Fig. 15.12:25; Tushingham 1972, Fig. 12:5	C
65.	QUR-615	2	1	Unknown	Late Byzantine	Gerber 2012, Fig. 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 & Day 1989; Tushingham 1972, 67-76	E
67.	QUR-619	11	6	Closed vessel	Umayyad	Smith & Day 1989, Pl. 58:20	H
68.	QUR-619	11	7	Closed vessel	Early Byzantine	Gerber 2012, Fig. 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 & 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 & 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 & 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 & Day 1989; Tushingham 1972, 67-76	E
73.	QUR-632	3	1	Closed vessel	Iron Age II/ Hellenistic	Berlin 1997, Pl. 57:PW80; Kuhnen 1989, Pl. 34:5; Lapp 2008, Pl 2.7:4	B
74.	QUR-637	1	5	Closed vessel	Late Roman/ Byzantine/ Umayyad	'Amr & Schick 2001, Fig. 9:20-21; Magness 1993, pp. 232 no. 5; Tushingham 1972, Fig. 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 & Day 1989; Tushingham 1972, 67-76	E
76.	QUR-645	2	5	Closed vessel	Late Hellenistic/ Early Roman	Bar-Nathan 2002, Pl. XI:4; Gerber 2012, Fig. 3.20:4 - 73-135 AD; Geva & Hershkovitz 2006, Pl. 4.13:2; Geva & Rosenthal-Heginbottom 2003, Pl. 6.10:5	C
77.	QUR-645	2	6	Closed vessel	Hellenistic	Johnson 2006, Fig. 15.4:69, 80	B

Table 3.6 (continued)

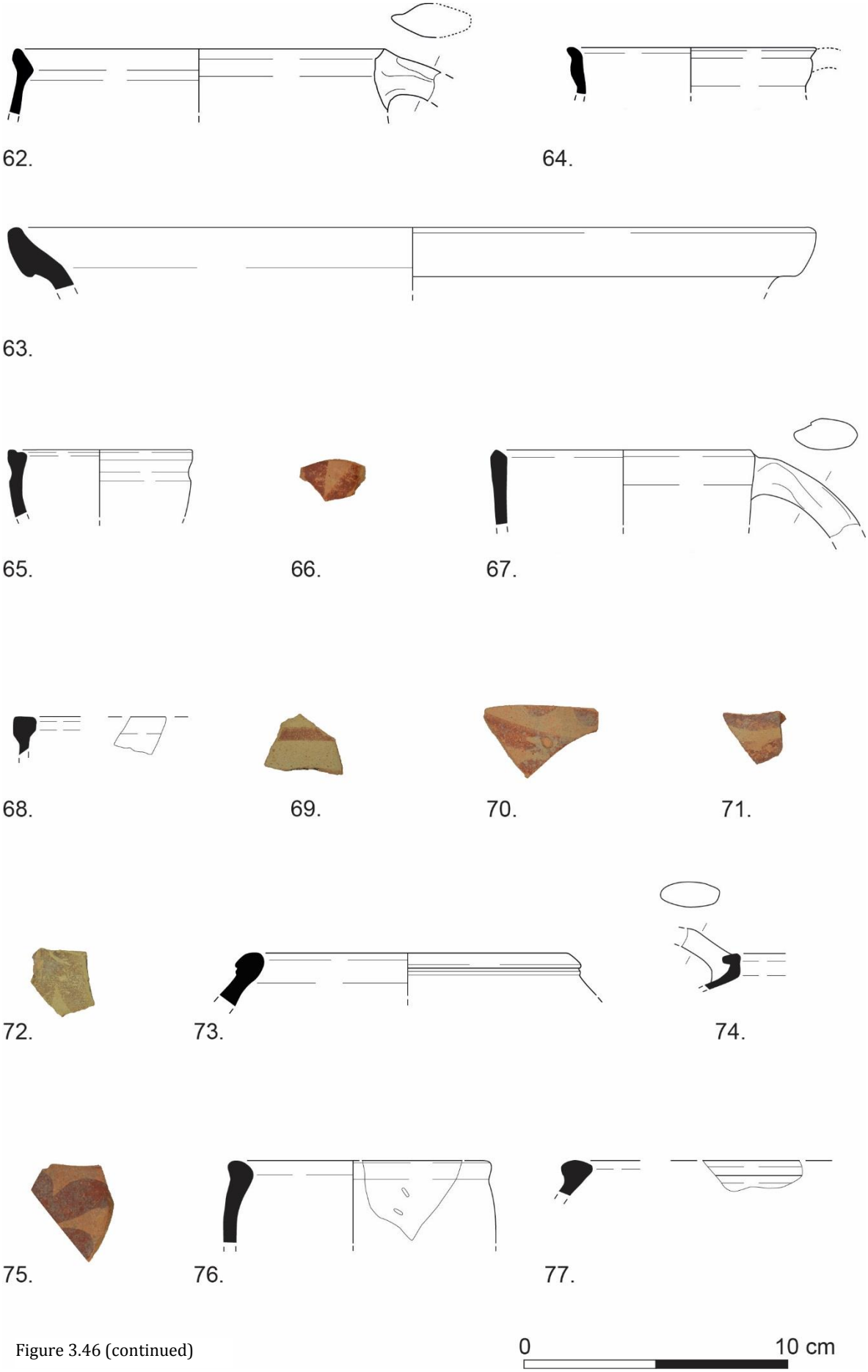

Figure 3.46 (continued)

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

Table 3.6 (continued)

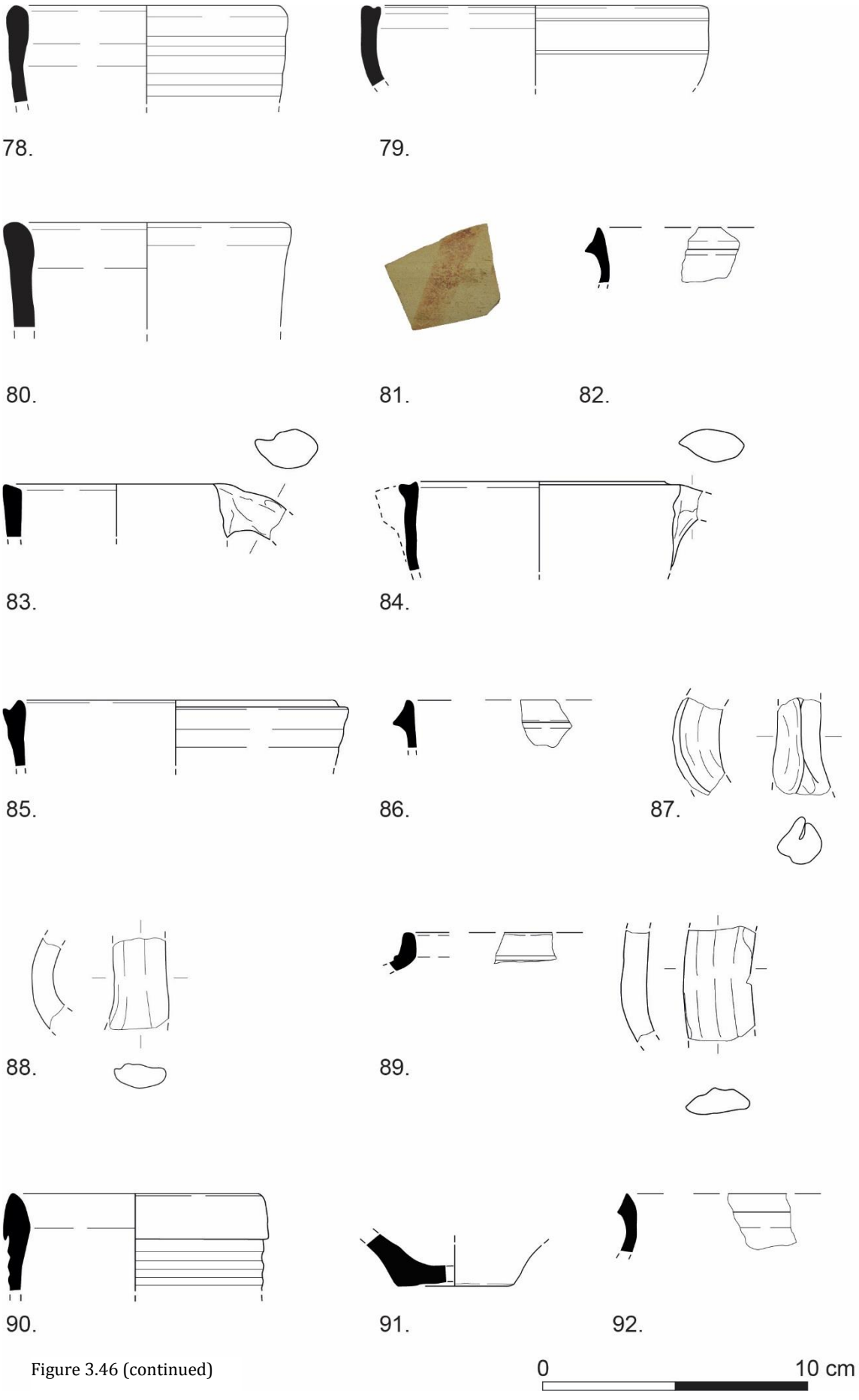

Figure 3.46 (continued)

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

Table 3.6 (continued)

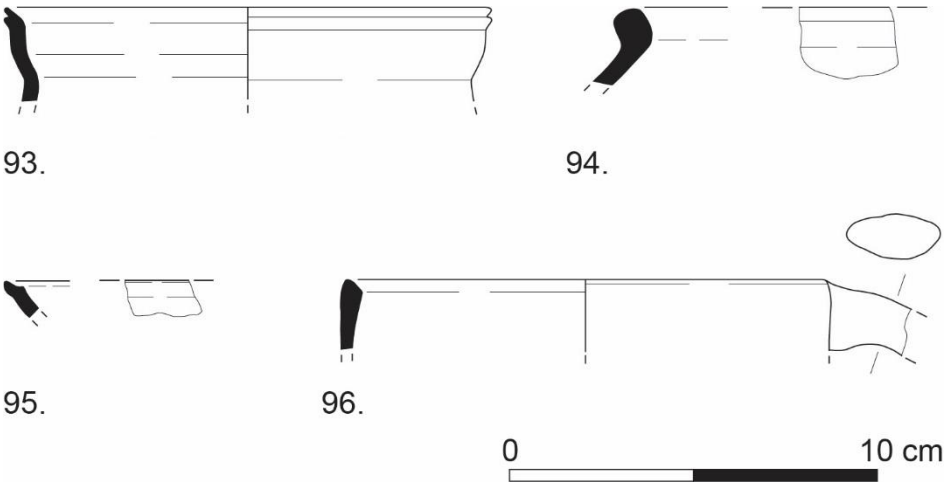

Figure 3.46 (continued)

4 Residential Spaces in the Jebel Qurma Region

4.1. INTRODUCTION

In the previous chapter a number of site types have been presented that were defined on the basis of the results of pedestrian surveys in the Jebel Qurma region. These included residential sites, featuring clearings and enclosures, that could be dated on the basis of associated ceramic scatters and Safaitic inscriptions broadly between the Hellenistic and Early Islamic periods. The aim of this chapter is to obtain a more detailed insight into the nature and chronology of these residential sites. In Chapter 1 a number of correlates for the identification of nomadic campsites were proposed, and these are further explored in this chapter. It seeks to find 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 is the degree of architectural investment at these sites. For example, were the enclosures created by the Classical/Late Antique inhabitants, or were they simply reoccupying sites of prehistoric origin? Finally, this chapter explores the way in which 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 in this respect.

These issues are addressed, firstly, by presenting the results of excavations carried out at a number of enclosures during annual 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 on 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 aim of the excavations carried out at a number of stone-built features in the Jebel Qurma region (Fig. 4.1) was 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 may be acquired through surface surveys in the region is relatively high, a number of questions could not be answered without the more detailed information that is 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 features situated nearby.

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 other variables, including the likelihood of preserved stratigraphy, the number of artefacts found at the surface of particular features, the predicted state of preservation of the features, and constraints imposed by logistics, time, and the size of the excavation team.

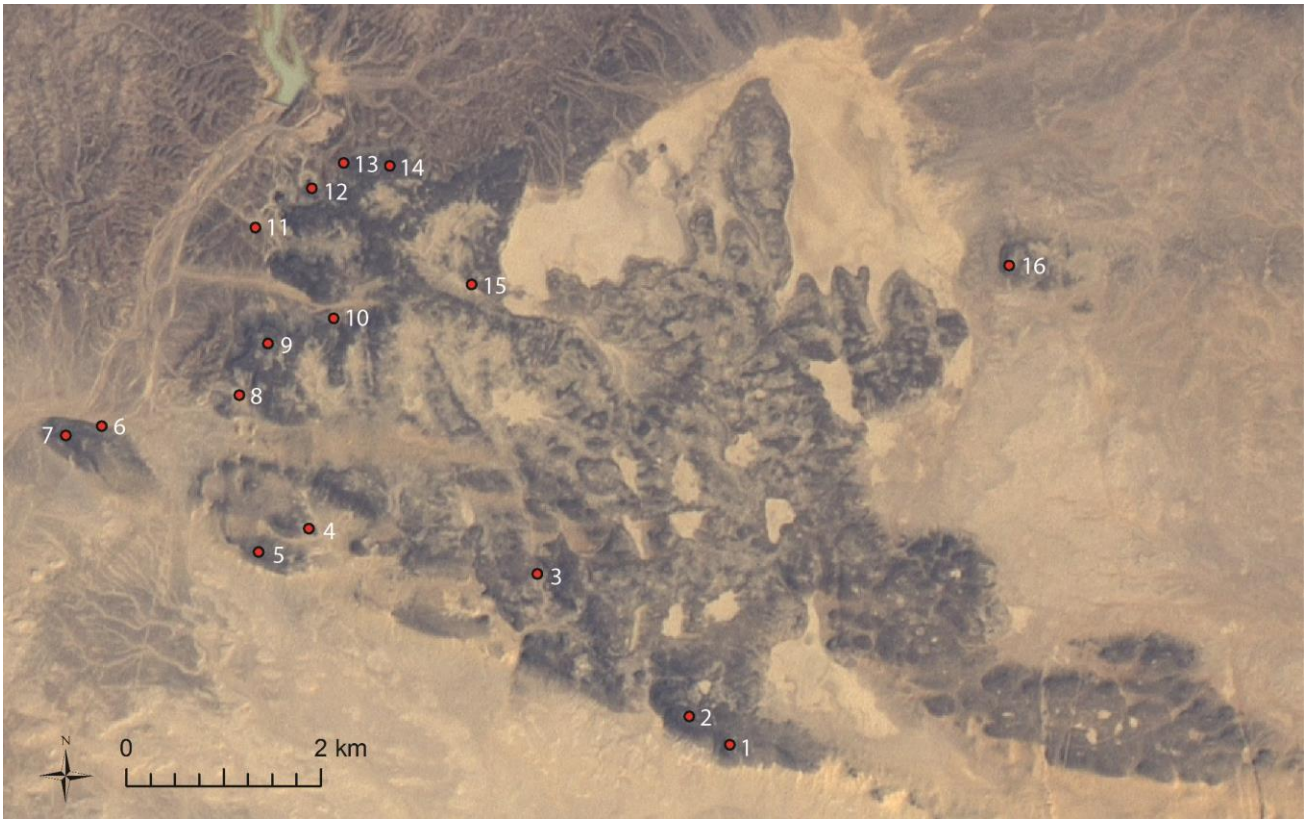

Figure 4.1: Excavated sites in the Jebel Qurma region discussed in Chapters 4 and 5: 1) QUR-32; 2) QUR-28; 3) QUR-20; 4) QUR-11; 5) QUR-9; 6) QUR-595; 7) QUR-2; 8) QUR-373; 9) QUR-215; 10) QUR-210; 11) QUR-829; 12) QUR-186; 13) QUR-956; 14) QUR-970; 15) QUR-1016; 16) QUR-148. Base image: Landsat 7.

Once a particular feature had been 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 accurate maps. This entailed the processing of photographs, made either with handheld cameras or with cameras mounted on a kite or drone, through the Agisoft Photoscan Professional software. Fixed markings or 'targets', the location of which was recorded using the DGPS, were applied on or around the structure that were then also captured on the photographs. In the photogrammetric software the spatial coordinates of these targets were added, through which the resulting model of the excavated structure could be geographically projected. 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 needed to be excavated and these areas were marked out with string. In the case of enclosures these areas represented different trenches, usually separated by section baulks to retain stratigraphic control. Initially a system in which trenches were subdivided into a horizontal grid of 1x1 m units was employed (e.g. at QUR-11; see below) to retain control over the distribution of artefacts – a system that had proved successful elsewhere (Rosen 1993). However, this system was omitted once it became clear that the numbers of artefacts were generally very low. In the case of cairns, a section of the cairn was usually subjected to excavation, which always included the centre of the cairn where a burial chamber was expected, and ideally part of its 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 virgin soil or bedrock was reached. Sometimes this seemed to consist 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, often running underneath the walls of the chamber. In these cases the excavation ceased at this point.

Materials that were collected from the excavations included artefacts, skeletal remains, and charred plant materials. The location where these materials were found was documented before they were collected. Samples that were collected included human bones for skeletal analysis and radiocarbon dating and charcoal samples 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 had been preserved.

A number of samples for Optically Stimulated Luminescence (OSL) dating were collected as well. All of these were soil samples that were 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). These samples were thus collected in order to determine the construction date of these features. Since sampling involved the lifting of a base stone and collecting 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

Stratigraphy

The stratigraphic sequences that were documented within the excavations were analysed and arranged after the excavations into stratigraphic phases. These phases were defined according to the stratigraphy and associated datable remains such as radiocarbon dates 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 reports below).

Artefacts

The artefacts that were collected during the excavations were documented in the dig-house during the field campaigns. These artefacts included ceramics as well as other small finds such as 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 a digital database. Chipped-stone artefacts were retrieved from a number of contexts and were described with various degrees of detail.

Botanical remains

Botanical remains included charred plant material that were 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 Acknowledgements). Data from the resulting unpublished report on these botanical analyses (Fantone 2014) are incorporated in the results described below.

Human skeletal remains
The numerous human skeletal remains that were retrieved during excavations were analysed in the dig-house by Sarah Inskip (see Acknowledgments) 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.

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 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 eggs or eggshell was brought into the site by people or animals.

Chronometric dating methods
Two chronometric dating methods were applied in the excavation programme. The first is 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 is Optically Stimulated Luminescence (OSL) dating, which was carried out by the Centre for Luminescence dating at Wageningen University. This method dates the moment at which a sediment was last exposed to sunlight.

4.3. EXCAVATION RESULTS FROM THE ENCLOSURES

4.3.1. An enclosure and ancillary structures at QUR-595
The site of QUR-595 is situated on the northern foot of Jebel Qurma, along the edge of Wadi Rajil. The site consists of a number of different structures scattered over an elongated area that runs in a roughly E-W trajectory at the foot and lower slopes of the mount. 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. 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.

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

Before excavations commenced 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 N-S section for stratigraphic control. A section was also made through the northern wall of the enclosure to investigate the wall profile in relation to the internal stratigraphy.

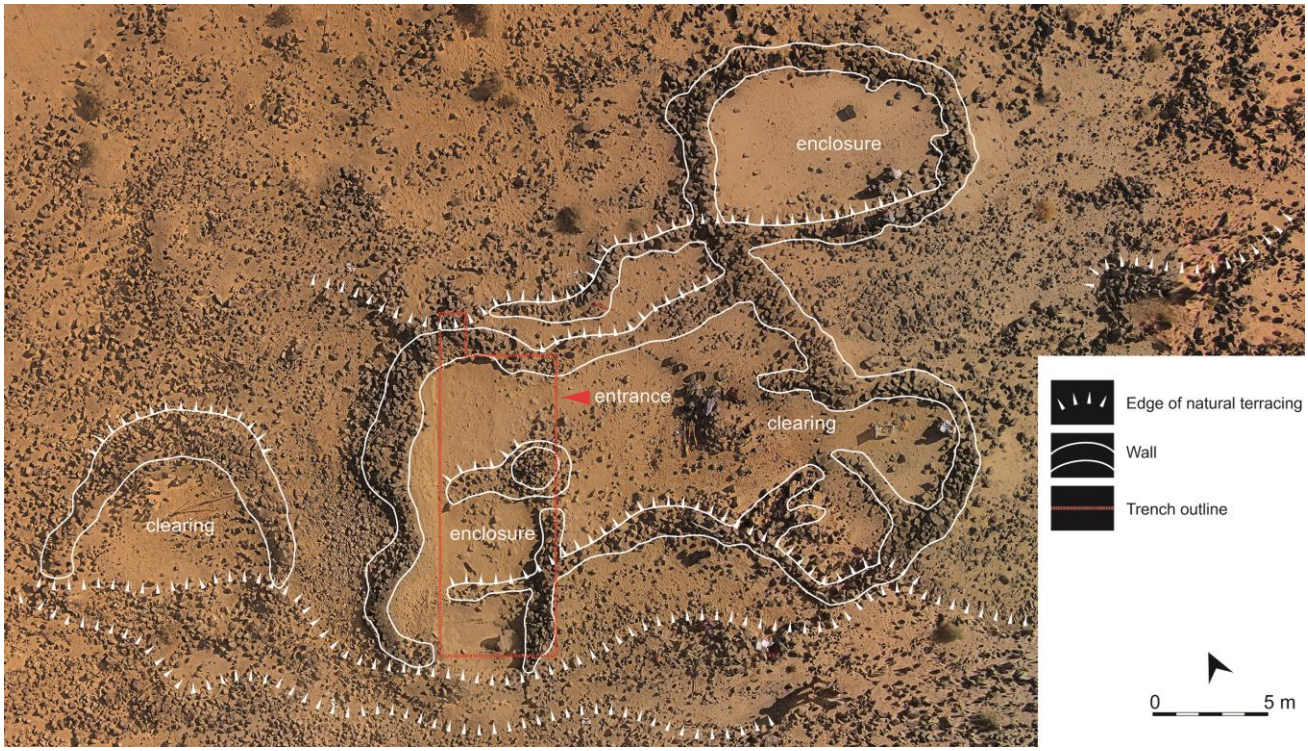

Figure 4.2: Top view of Structure 1 at QUR-595, with the excavation trench outline indicated. Base image: photogrammetrically generated aerial view based on drone photographs.

Stratigraphy and features (Fig. 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 made free of basalt boulders. Dug down from 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 the wall is contemporaneous with the fire pits or somewhat younger is uncertain. Also associated are two linear features (Fig. 4.3) running through the enclosure. These are very low, unstable walls which are interpreted as remains of natural terrace "walls" rather than man-made compartmentalisation of the enclosure wall. The walls of the enclosure were built on top of them.

Phase 102**:** On top of the Phase 101 surface lay a deposition of windblown sand of 9 cm (in the south) to 29 cm (in the north) thick, thus filling the interior of the enclosure to a considerable degree. At some point part of the enclosure wall had 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) that 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.

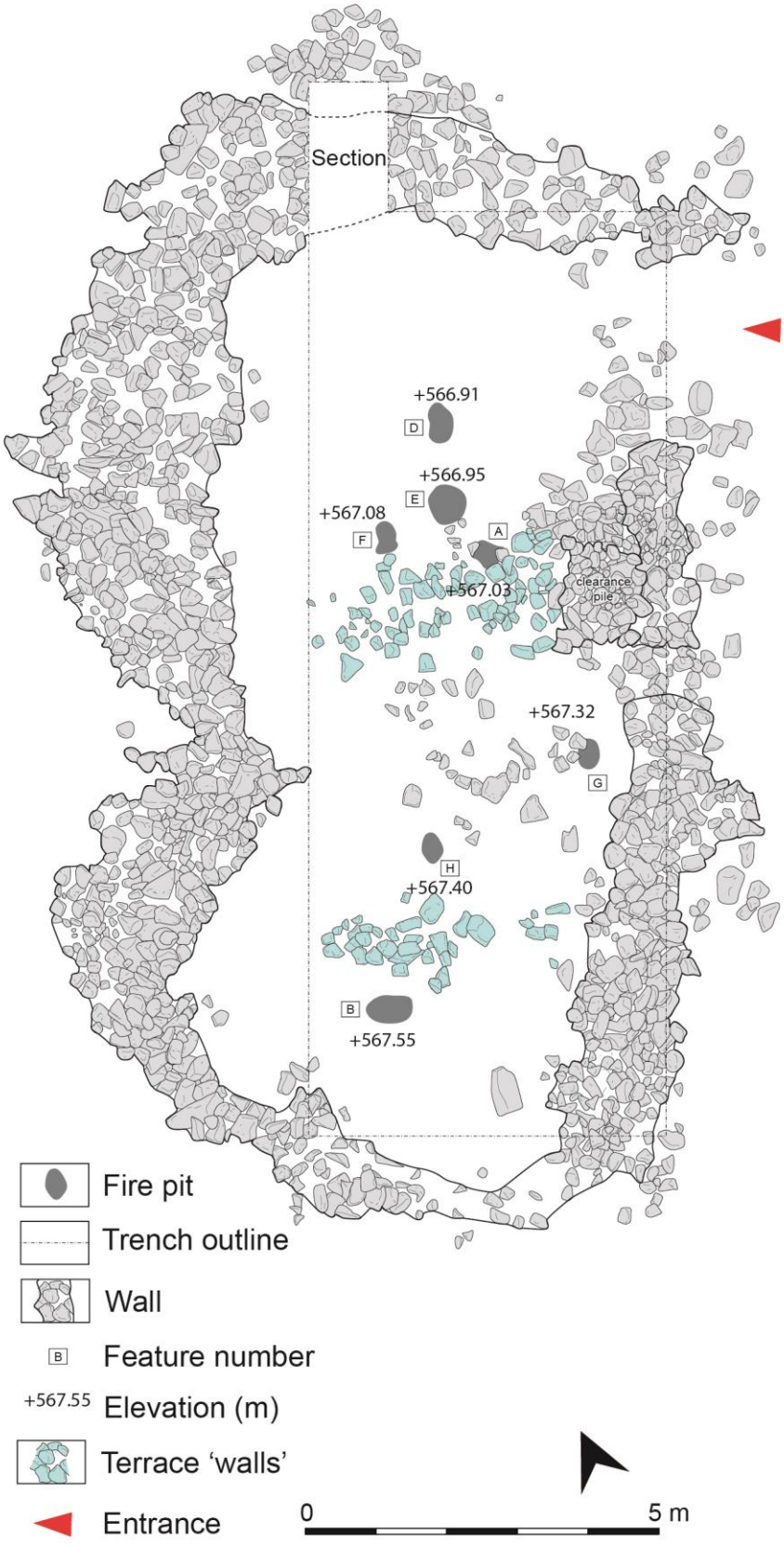

Figure 4.3: Plan of the excavation trench at QUR-595, Structure 1, showing the Phase 103 fire pits. Architecture drawn by M. Kriek.

Radiocarbon dates (Table 4.1)
Charcoal from the four of the fire pits of Phase 101, including fire pit C that was exposed by looters and already sampled in the 2013, 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 returned a Late Hellenistic radiocarbon date (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 datable material was 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.

Ceramics
During the survey only five undiagnostic body sherds had been collected from the surface of the excavated area. During the excavation another 64 sherds were unearthed, most of which were, again, undiagnostic body sherds – only two of them could be dated on typological grounds. 35 sherds were found in Phase 103 context, and 25 in Phase 102, including the two datable sherds. These were a rim sherd of Late Byzantine or Umayyad period storage jar, and a single red-on-cream ware body sherd – possibly both from the same vessel (Fig. 4.4). Importantly, however, I would suggest that these sherds are intrusive to their find context, as the radiocarbon dates suggest 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.

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 % (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 – AD 61 (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.

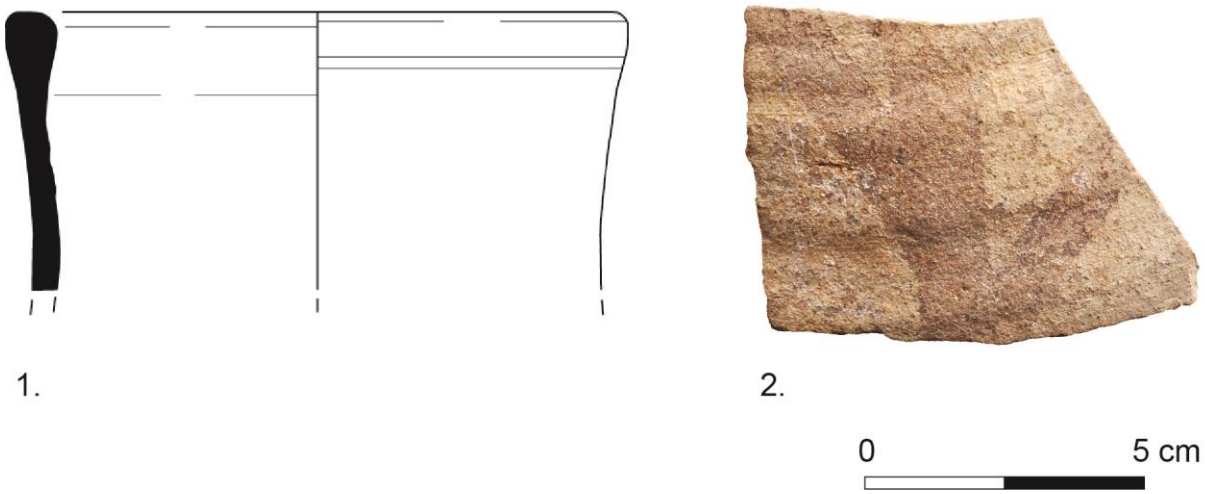

Figure 4.4: Diagnostic ceramics from QUR-595. A buff ware rim from the Late Byzantine or Umayyad period (parallels: Smith & Day 1989, Pl. 52:8; Pl. 58:14, 15) and a red-on-cream decorated body sherd from the Late Byzantine or Early Islamic period (parallels: Hendrix et al. 1996, 238-279; Parker 1998, 215; Smith 1973; Smith & 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 Phase 102 sandy fill. 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 – dated between 95 BC and AD 61 – 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

18 fragments of ostrich eggshell were found in all different phases. Additionally, in Phase 102 two small unidentified bone fragments were found, as well as 2 pieces of mollusc shell.

Discussion

Phases 101 and 103 both represent a significant palimpsest phase, insofar that 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 the 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 – indicated by the radiocarbon date from Phase 103 – when sediments had already accumulated within the enclosure. Also 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 few of the remains 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 potentially 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 & Aronson 1999, 106; Hegazy & Lovett-Doust 2016, 68; Kaniewski et al. 2012).

Structures 26, 27 and 28

Structures 26, 27 and 28 are three small, roughly circular structures recognized on a low knoll at the foot of Jebel Qurma during the 2013 campaign. They are situated about 75 m east of Structure 1. The

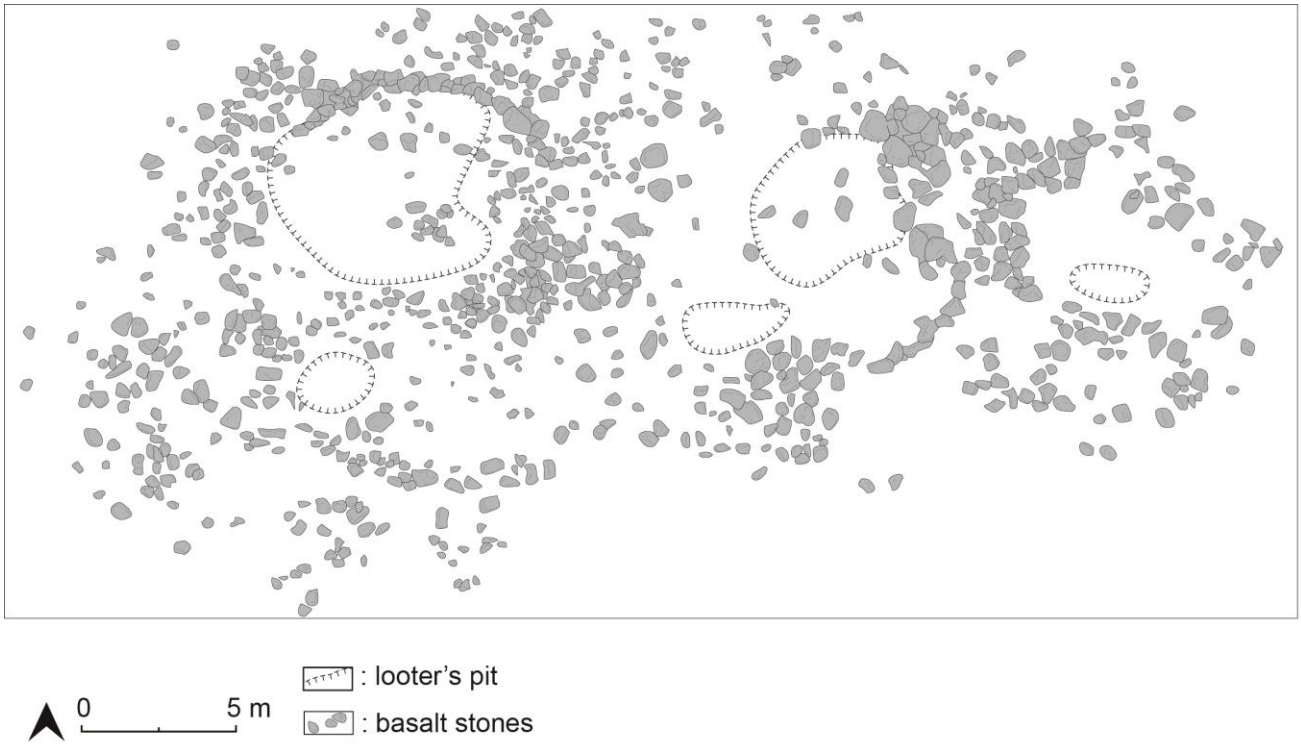

Figure 4.5: Pre-excavation situation of Structures 26, 27 and 28 at QUR-595. Drawn by M. Kriek.

structures consisted of roughly oval concentrations of basalt that were heavily disturbed by recent looting activities (Fig. 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 on top of what seemed to be remains of low walls. During the survey large amounts of charred plant material and metal slags were 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.

Excavations were carried out in two stages. Some of the looter's debris was already sieved during survey activities of the 2013 campaign, while more formalized excavations were carried out in 2015 in an attempt to get a more comprehensive view of the nature of the disturbed features. Therefore, in 2015 an accurate drawing of the structures was 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, making it impossible to reconstruct any stratigraphic sequence. What follows is therefore 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 (Fig. 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 north side of Structure 26, where a relatively narrow wall of basalt stones, stacked up to 3 courses high, was preserved (Fig. 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 original stones and stones cast away by looters. In any case, the structures together demarcate three crude compartments extending over an elongated

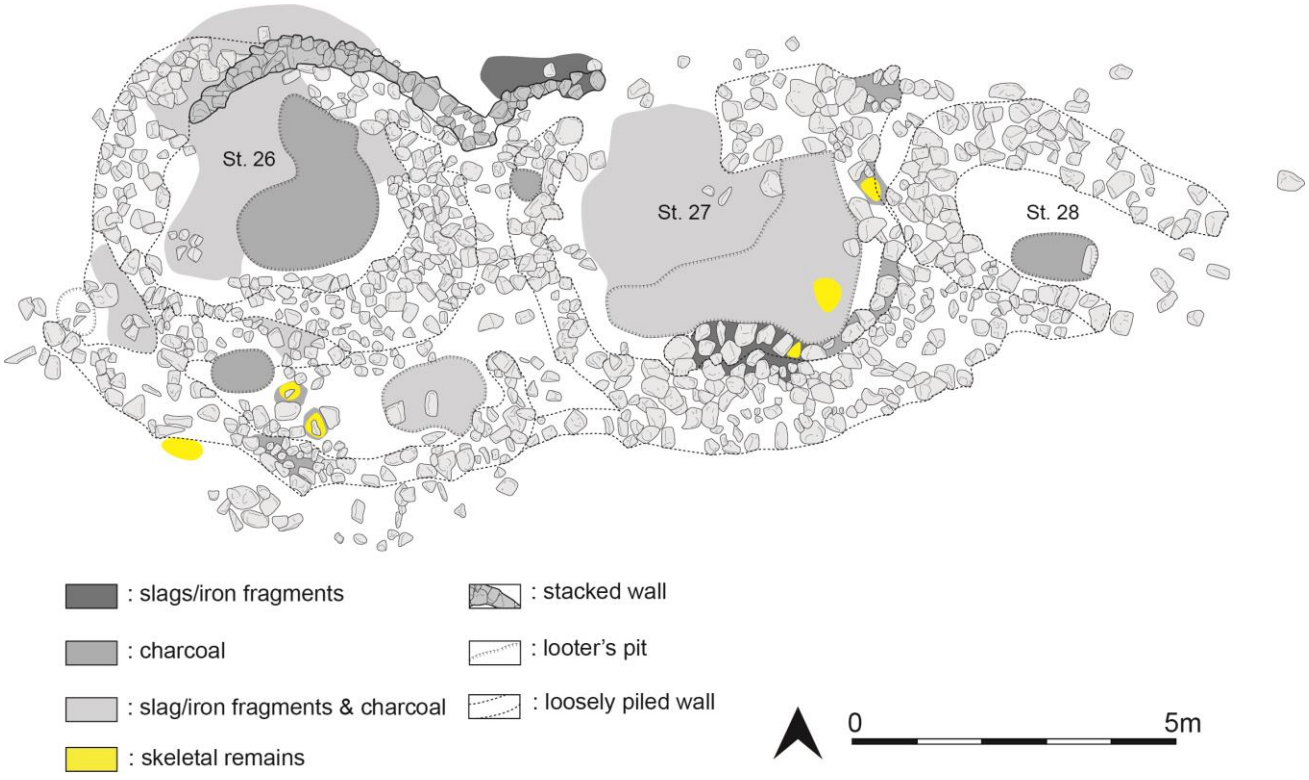

Figure 4.6: Distribution of finds at Structures 26, 27 and 28 at QUR-595.

area of about 18 m long and 7 m wide, although it cannot be said with certainty to what extent the looters had changed the configuration of the structures, or what the structures may have looked like originally.

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.

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 few pieces of cinder. These were found in the debris in and around Structures 26 and 27 (Fig. 4.6), although the largest quantities of charcoal, iron slags and iron fragments were found in and around Structure 26. The combined presence of these materials is suggestive of iron working activities, and the small size of the slags indicates secondary smithing activities, i.e., the reworking of finished iron products, rather than primary smithing (Brusgaard 2015). The original location of smithing, i.e., the smithing hearth, was not found and was probably largely destroyed by recent looting activity. Nonetheless, based on the distribution of the finds it can tentatively 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 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.

Other finds

A total of 31 ceramics 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 (Fig. 4.8). Fragments of one or more glass vessels were found as well. Six pieces came from inside Structure 26, and four from around it. The highly corrosive surfaces of the fragments suggest that the glass is certainly not modern, but the rim fragments could not be dated more closely on typological grounds. Additionally, six beads were found made of

stone, mollusc shell, and possibly a glass paste. Again, all of these were found in or around Structure 26. A few pieces of bronze were found, as well few ostrich eggshell fragments. Lastly, fragments of a stone vessel or tube were found with, adhering to it, small pieces of iron. The adhering iron suggests that the object may be related to the smelting activities in the area, although in what way exactly in uncertain.

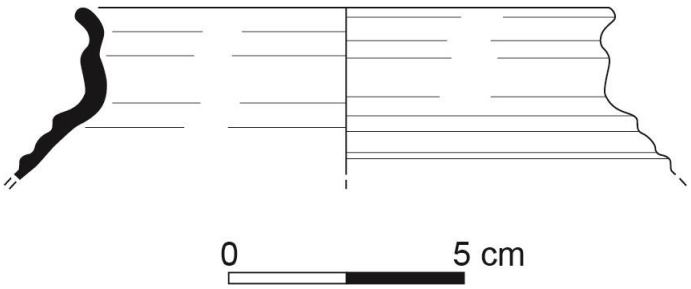

Figure 4.8: Rim of a cooking vessel found in the looter's debris of Structure 26 (QUR-595). It was dated on typological grounds to the Late Byzantine or Early Islamic period. Parallels: Daviau 2010, Fig. 8.7:2; El-Khouri 2014, Fig. 9:4. Drawing by A. Kaneda.

Of an entirely different kind are the skeletal remains that were found within the looter's debris in and around Structures 26 and 27 (Fig. 4.6). These highly fragmentary remains belonged to an individual that was apparently 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, also highly fragmented and scattered around Structures 26 and 27.

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	AD 230-264 (25.9%) AD 275-330 (42.3 %)	AD 138-345 (95.4%)
SN13-3	Charcoal	Looting debris	GrA-62240	1780 ± 30	AD 216-262 (33.6%) AD 277-328 (34.6%)	AD 137-335 (95.4%)
SN13-11	Charcoal	Looting debris	GrA-62244	1760 ± 30	AD 239-264 (20.5%) AD275-330 (47.7%)	AD 171-194 (2.3%) AD 211-383 (93.1%)
SN15-6	Charcoal	Looting debris	GrA-65947	1820 ± 30	AD 138-198 (45.4%) AD 206-234 (22.8%)	AD 98-100 (1.0%) AD 124-257 (90.7%) AD 296-320 (3.7%)
SN15-23	Charcoal	Looting debris	GrA-65948	1755 ± 30	AD 242-264 (18.3%) AD 273-330 (49.9%)	AD 180-185 (0.4%) AD 214-384 (95.0%)
SN15-34	Charcoal	Looting debris	GrA-65949	1760 ± 30	AD 239-264 (28.5%) AD 274-330 (47.7%)	AD 170-194 (2.3%) AD 210-383 (93.1%)
SN15-94	Human bone	Looting debris	GrA-67034	645 ± 30	AD 1298-1313 (28.1%) AD 1358-1388 (39.6%)	AD 1281-1328 (42.2%) AD 1341-1396 (53.2%)
SN15-173	Human bone	Looting debris	GrA67064	590 ± 35	AD 1310-1360 (50.7%) AD 1387-1405 (17.5%)	AD 1297-1415 (95.4%)

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

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 come to 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 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, although the exact location of smithing, i.e., the hearth or furnace, were not found. The remains are suggestive of secondary smithing, i.e., the reworking of completed iron objects, that was apparently carried out at this location during the Roman or Early Byzantine 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 iron objects into

entirely different artefacts, although the latter would certainly have required more skill than the former.

It seems most likely that the large amounts of charcoal retrieved from the structures are associated with these smithing activities as well. 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, also including *Pinus*, are found in the Black Desert today (see Chapter 2). The attested tree types thus raise 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 remains: 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, 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. I would thus be reluctant to suggest, on the basis of the botanical evidence from this context alone, that the attested tree types were growing locally during the 2nd-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-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 is attested by the human skeletal remains dated to the later medieval period. Some of the artefacts, including the beads, are possibly associated with this burial, as may be the remains of the camel bones. Again, however, the destruction caused by looters makes it difficult to reconstruct in detail the history of the structures and the associated finds.

4.3.2. An enclosure at QUR-373

The site of QUR-373 is a large site that consists of a number of clearings and enclosures that were occupied during multiple periods, from prehistory up to relatively recent times (see Chapter 3). 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 enclosures surrounded by a clearing (Fig. 4.9). The structure consists of a small inner circle, measuring about 7.5 by 6 m, which lies, though somewhat off-centre, 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, i.e., stone piles resulting from clearing stones from the surrounding surface. Prior to excavation, much of the enclosure appeared to have been filled up by wind-blown sands, which obscured large parts of the walls. The accumulation of sands seems to be the result of the prevailing westerly winds that leave sand on the leeward side of the ridge. Relatively many pottery sherds of mostly Byzantine to Early Islamic dates, as well as prehistoric flint artefacts, were encountered on the surface (see Chapter 3). 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 of inhabitation of the enclosure and its chronology. In that respect, the aim was also to find out if 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 clearing (Trench 3). Trench 1 was laid out in the eastern half of the outer circle, as this was the part where least windblown sand had accumulated. The inner circle (Trench 2) was excavated in its entirety.

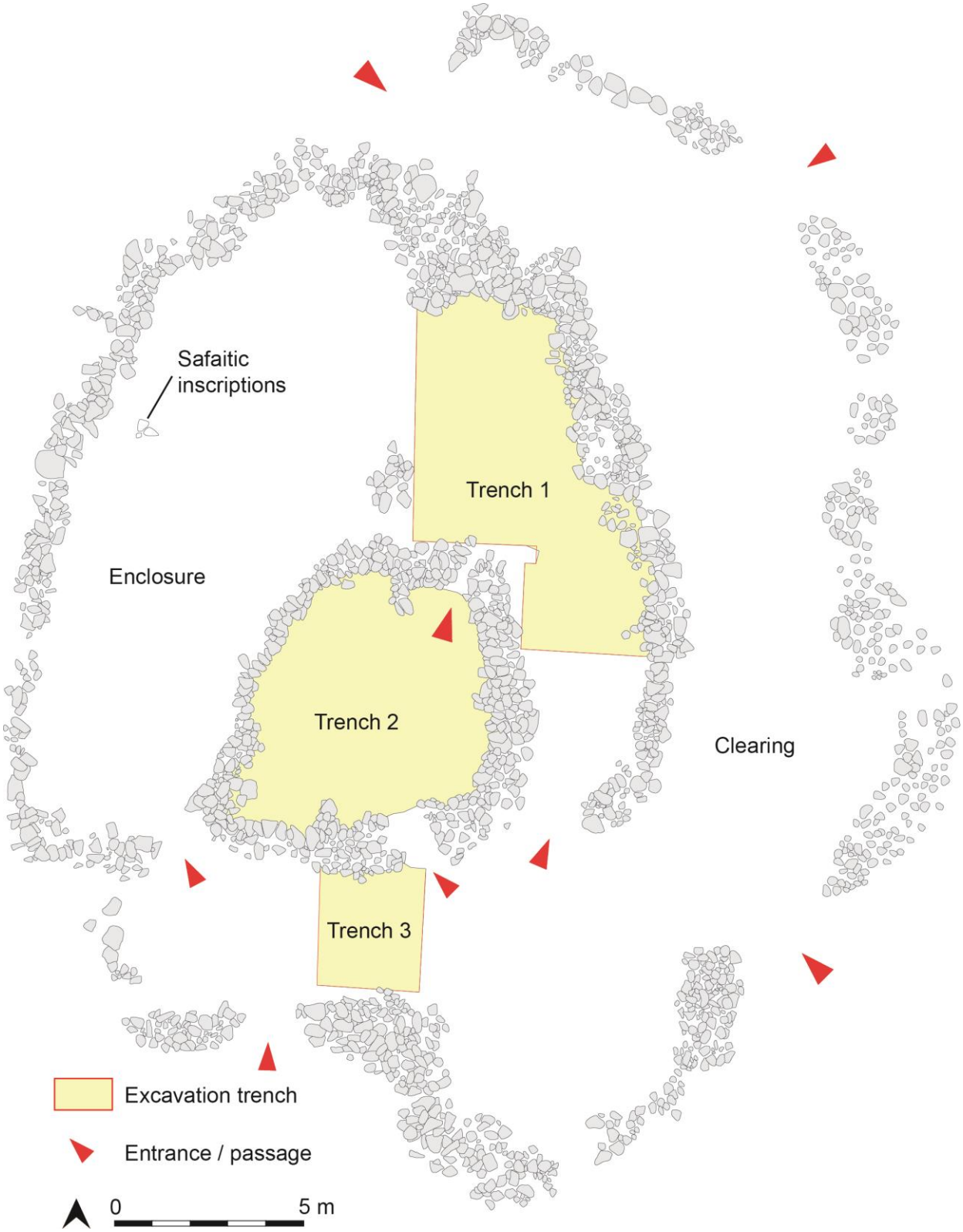

Figure 4.9: The grouped enclosure at QUR-373 prior to excavation. Architecture drawn by A. Kaneda.

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.

Stratigraphy & features

Trench 1:

Phase 101: The oldest phase in Trench 1 represents the construction phase of the outer enclosure wall, which has been built on top of a layer of bedrock covered by thin natural erosion layers. From the top of this sequence of natural soil a fire pit (H), 30 cm in diameter and only about 4 cm deep, was cut down into the bedrock. 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: On top of the natural soil a compact layer of silt containing much gravel was situated. This gravel consisted of limestone and basalt. This gravelly layer was only 10 cm thick but 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) of about 40 to 80 cm across that were dug down from within the gravelly layer to a depth of only about 10 cm. Both of these contained many basalt stones in the ashes. A younger sub-phase of fire pits — dug down from the top of the gravelly layer — 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 an accumulation of windblown sand in the west part of the trench of up to 35 cm thick. This windblown sand was not present in the east 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 — probably the remnant of ephemeral frequentation of the site.

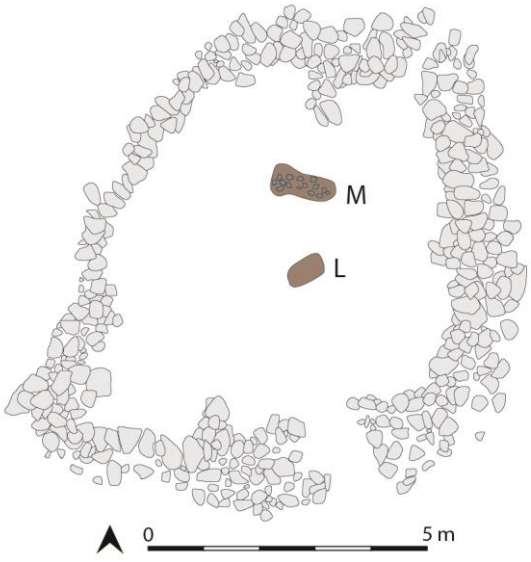

Figure 4.10: Plan of Phase 201 in the enclosure of QUR-373, with the fire pits indicated.

Trench 2:

Phase 201 (Fig. 4.10): The oldest phase in the inner circle of the enclosure consisted of two shallow fire pits (M & 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, which was built directly onto bedrock, although there is no dating evidence to support this. This wall was preserved to a height of about 95 cm (Fig. 4.11).

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

Phase 202 (Fig. 4.12): Covering the bedrock and the fire pits was a layer of compact silt with gravel inclusions. It was only up to 8 cm thick. Associated with this layer – probably an ancient surface level – was another fire pit (H) of about 70 by 55 cm wide and 8 cm deep. This was a nicely constructed fire pit as it was fully lined, including its base, 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 (Fig. 4.13): This phase is represented by yet another surface level of ca. 10 cm thick to which a number of fire pits are associated (Fig. 4.14). The surface level consisted of highly compact silt and much gravel inclusions. The fire pits were not all dug down from the same level. Instead a subdivision can be made within the sequence of fire pits of Phase 203 based on the stratigraphy. The oldest series (Phase 203a) comprises three fire pits (E, F & K) that were all dug down from the same level. An intermediate phase (203b) was represented by only one pit (D), which came from a higher elevation. The youngest sub-phase (203c) was represented by three more fire pits (G, I & J), elevated about 5 to 10 cm above the older pits. Other than 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.

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 (Fig. 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 probably served to reinforce the old wall, which may have become unstable or more burdened 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).

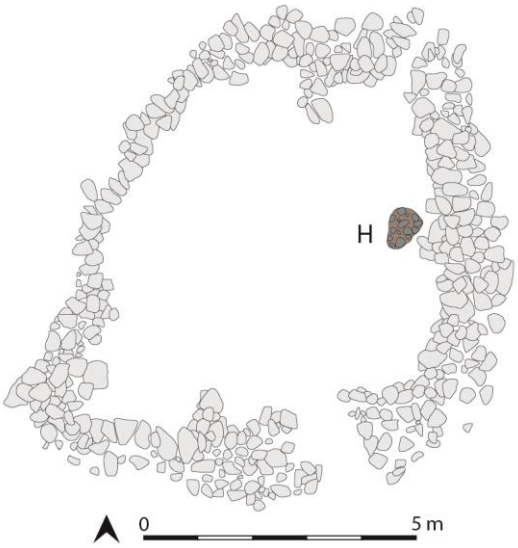

Figure 4.12: Plan of Phase 202 in the enclosure of QUR-373, with fire pit H indicated.

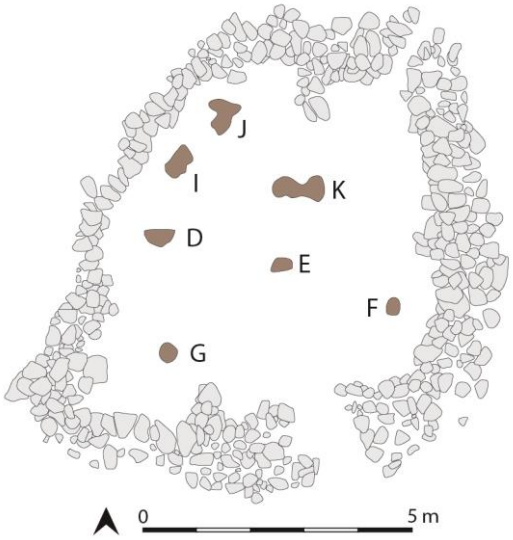

Figure 4.13: Plan of Phase 203 in the enclosure of QUR-373, with the fire pit indicated.

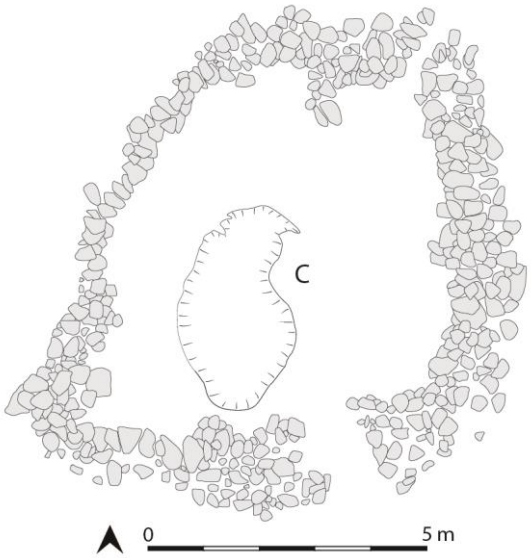

Figure 4.15: Plan of Phase 205 in the enclosure of QUR-373, with pit C indicated.

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 sands next to the enclosure walls. These most likely represented wall debris. In the east part of the trench the sand accumulation was relatively thin — down to about 5 cm.

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

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, while 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.

Radiocarbon dates (Table 4.3)

Although all fire pits from Trench 1 were sampled, only one of the samples contained charred plant material, from which a post-16th century AD radiocarbon date was returned.

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 seemed to be have been 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 & SN14-134) both returned a 5th to 6th century AD date. Phase 205 was dated on the basis of samples from the ash pit and fire pit (SN14-122 & SN14-124) to the late 7th or 8th century AD.

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	AD 662-710 (49.9%) AD 746-764 (18.3%)	AD 654-770 (95.4%)
SN14-124	Charcoal	Trench 2, pit C	GrA-61128	1335 ± 35	AD 652-690 (59.3%) AD 750-760 (8.9%)	AD 644-723 (78.1%) AD 740-768 (17.3%)
SN14-127	Charcoal	Trench 2, fire pit F	GrA-61130	1750 ± 35	AD 243-334 (68.2%)	AD 176-191 (1.4%) AD 212-390 (94.0%)
SN14-133	Charcoal	Trench 2, fire pit I	GrA-61131	1530 ± 35	AD 432-490 (33.4%) AD 532-580 (34.8%)	AD 427-601 (95.4%)
SN14-134	Charcoal	Trench 2, fire pit J	GrA-61132	1540 ± 35	AD 430-492 (42.1%) AD 530-566 (26.1%)	AD 425-594 (95.4%)

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

Ceramic finds

Numerous ceramics were picked up from the surfaces within and around the enclosure during survey work (see Chapter 3). However, also during excavations a total of 137 pottery sherds was unearthed, most of them from Trench 2. All of these were grey-ware sherds, and many of them – if not all – appeared to have belonged to two cooking pots of similar type that could be partially reconstructed (Fig. 4.17). These pots were dated on typological grounds to the Late Byzantine/Umayyad period. Other diagnostics 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 other 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 is probably to be attributed to bioturbation given the generally shallow nature of the deposits. Importantly, the potentially extensive mixing of materials within this structure prevents dating artefacts on the basis of the stratigraphic context they were retrieved from.

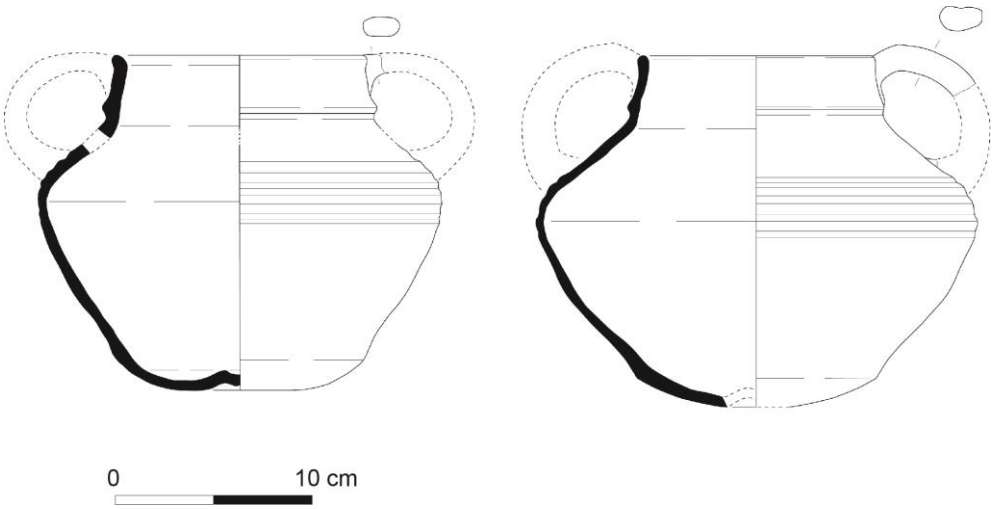

Figure 4.17: Pottery vessels from the enclosure at QUR-373, dated on typological grounds to the Late Byzantine or Umayyad period. Fabric: Grey Ware Gritty. Parallels: Bar-Nathan 2011, Fig. 11.13:3; McNicoll 1982, Pl. 145:5. Drawings by A. Kaneda.

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 an initial prehistoric occupation phase at the site.

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 how young exactly is impossible to say.

Botanical remains
Although charred plant materials have been collected from the fire pits exposed within the enclosure, these remains have unfortunately not yet been studied.

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.

Discussion
The excavations 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 the walls surrounding them were from the same stratigraphic level. The inner compartment of the enclosures must have been present, however, by the 3rd or 4th century AD, as indicated by the radiocarbon dates from fire pits related to a deposit that had accumulated within the compartment. The compartment was subsequently revisited on a number of occasions in the subsequent centuries, also evidenced by dated fire pits and an ash pit, up until the late 7th or 8th century AD. 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. Clear footings of residential architecture such as huts or tents were not encountered though. 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, however, 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 seemingly became abandoned – 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 it 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. It is a roughly round enclosure measuring 22.6 m in diameter (Fig. 4.18). It consisted of three roughly oval compartments of varying dimensions, made of undressed basalt boulders that were picked up 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.

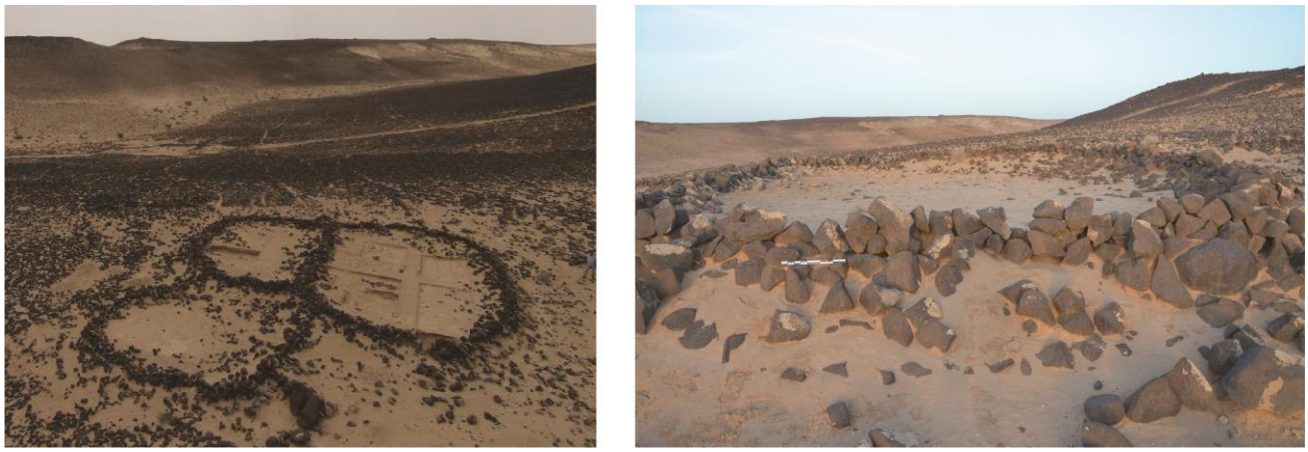

Figure 4.18: Enclosures at QUR-11. Photos by author (left) and P. Akkermans.

Excavation trenches (Fig. 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 into the enclosure wall to investigate the stratigraphic correlation between the wall and the interior sediments.

Stratigraphy & features (Fig. 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 cm 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.

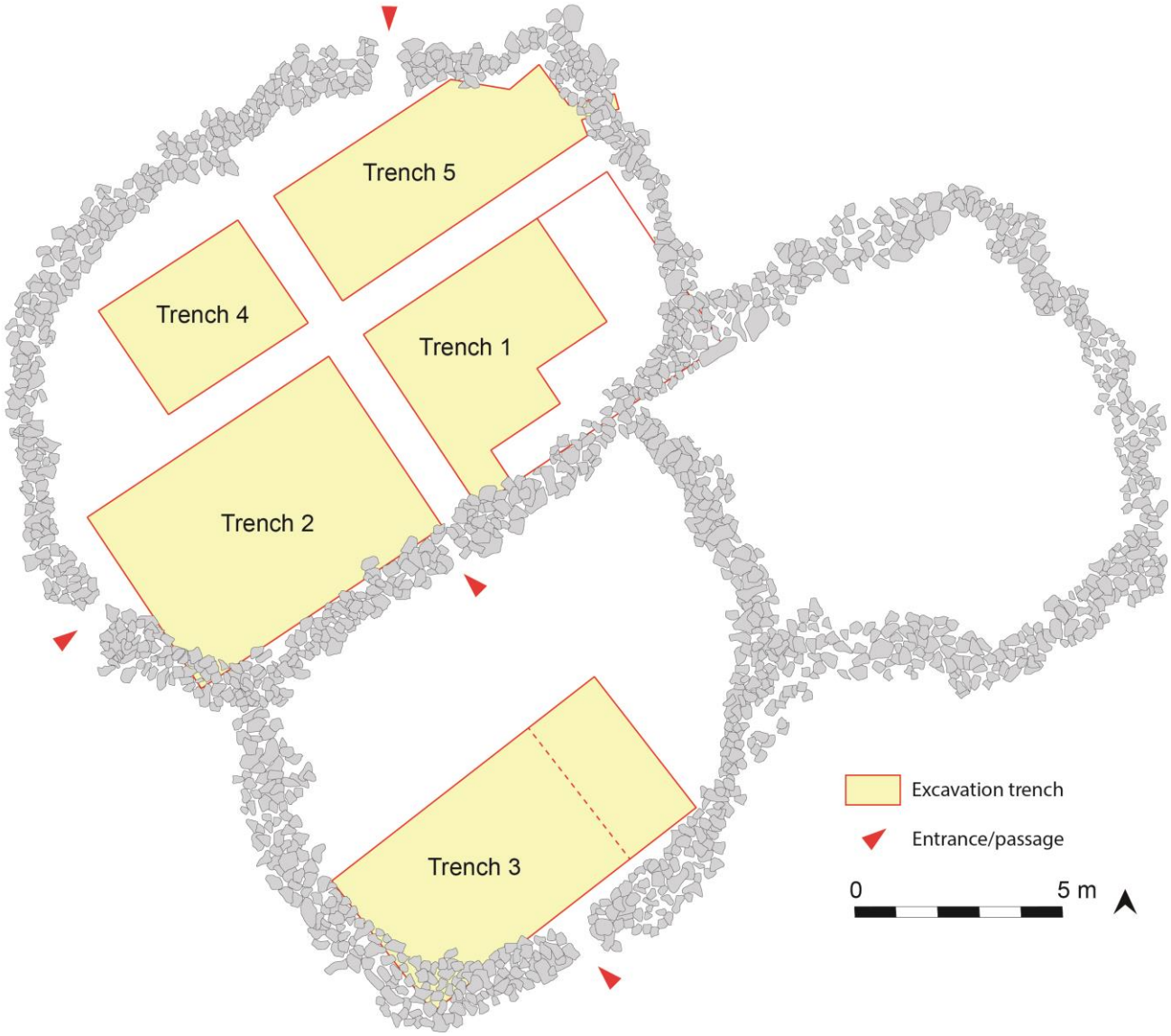

Figure 4.19: Enclosure at QUR-11 prior to excavations. Architecture drawn by M. Brüning.

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. The construction of a new wall was attested in the section through the enclosure wall in Trench 5. The new wall was built not directly on top of the old wall but only partially on top of it, 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 a much more narrow top (ca. 35 cm).

Associated with the base of the new wall was a compact surface layer of ca. 5 cm thick, from which a total of eleven fire pits were dug down. All of these fire pits were circular to oval in shape, about 30 to 90 cm wide and mostly only a few cm deep. All of these pits were dug down from more or less the same level. Also associated with this surface was a series of basalt boulders which perhaps formed a crude alignment. The stones were not piled though, so it is difficult to say with certainty that the 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 cm thick.

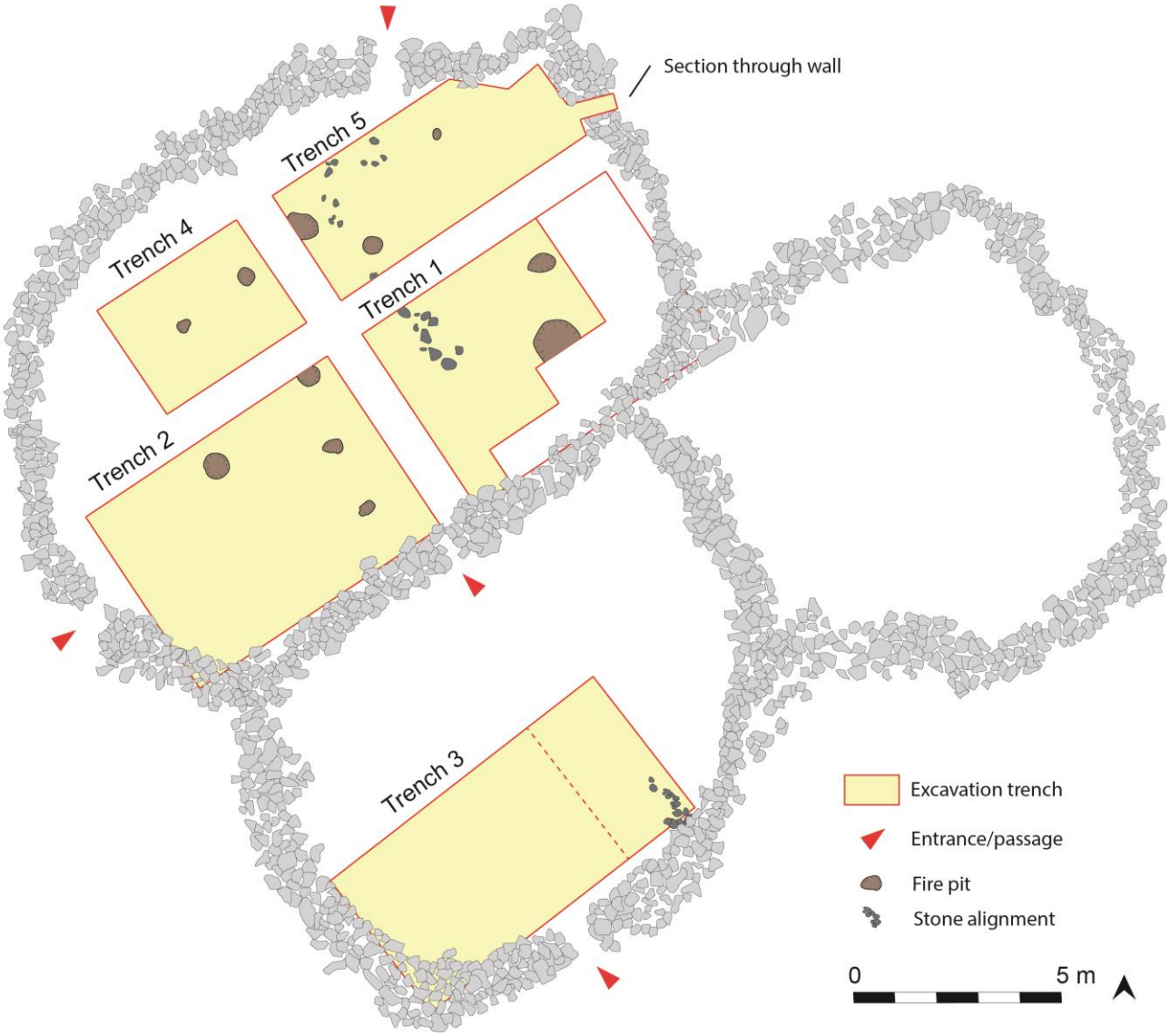

Figure 4.20: Excavated features at the enclosure at QUR-11.

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 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 (see Fig. 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 of ca. 25cm 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 of 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 cm thick.

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 seventh century to the late ninth century AD (Table 4.4).

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	AD 665-710 (48.7%) AD 746-764 (19.5%)	AD 658-729 (66.0%) AD 736-769 (29.4%)
SN14-8	Charcoal	Trench 1, fire pit B	GrA-61096	1325 ± 30	AD 656-691 (56.3%) AD 749-761 (11.9%)	AD 650-722 (75.4%) AD 740-768 (20%)
SN14-16	Charcoal	Trench 5, fire pit A	GrA-61252	1355 ± 40	AD 640-689 (64.8%) AD 752-758 (3.4%)	AD 610-720 (85.1%) AD 741-767 (10.3%)
SN14-18	Charcoal	Trench 5, fire pit A	GrA-60952	1250 ± 35	AD 683-776 (66.8%) AD 794-798 (1.4%)	AD 674-780 (69.6%) AD 788-875 (25.8%)

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

Ceramics

A total of 40 undiagnostic body sherds were found during excavations including buff wares, grey wares, compact red wares and a single hand-made basalt-tempered coarse ware sherd. 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 the older phases, i.e., Phases 101/102 and 201/202. A very high degree of fragmentation of the ceramics was observed. Only one rim was found, in Phase 103, in addition to a number of potential diagnostics collected from the surfaces within the enclosures during pedestrian surveys (Fig. 4.21). Parallels for these sherds were not found, however, but a Late Byzantine or Early Islamic date, based on the radiocarbon dates from the fire pits, would not seem to misfit the ceramics.

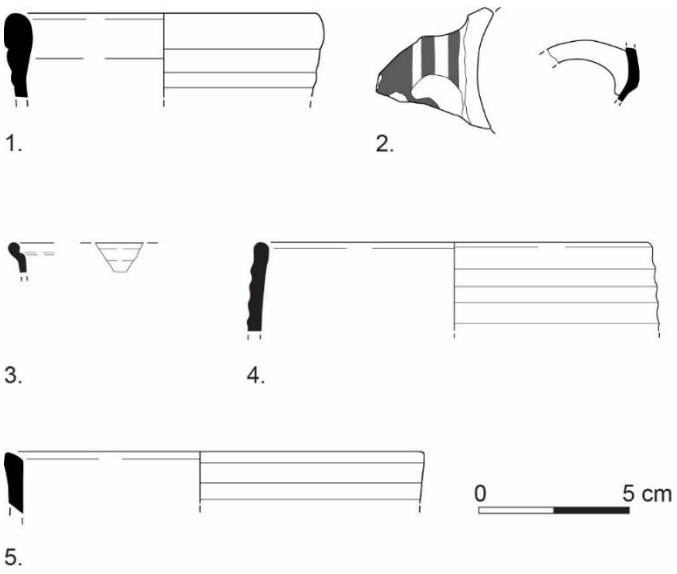

Figure 4.21: Selection of Early Islamic (?) ceramics from the enclosure at QUR-11. Numbers 1-4 were collected during pedestrian surveys; number 5 was retrieved through excavations. Fabrics: 1-3) Red Compact Wares; 4-5) Grey Gritty Wares. Draw-

Small finds

A small fragment of a basalt grinding stone was found in Phase 103 deposits. 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 –

possibly a pendant (Fig. 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.

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. The fact that the chipped-stone artefacts were all retrieved from Phase 103 and 104 deposits, i.e. in association with the 7th to 9th century fire pits, is surprising. However, given the fact that these artefacts are probably of Palaeolithic date I would suggest that this represents intrusive material that was brought into younger contexts through anthropogenic or natural processes.

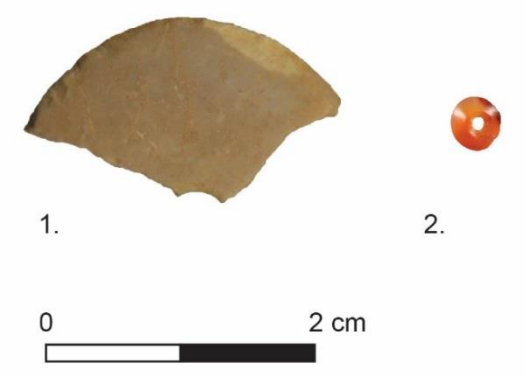

Figure 4.22: Selected artefacts from the enclosure at QUR-11: 1) fragment of an ostrich eggshell pendant (?); 2) stone bead.

Botanical remains

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

Faunal remains

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

Discussion

Of the two construction phases recognised in the enclosure walls (Phase 101 and 103) the older one (Phase 101) is at this point impossible to date due to a lack of find material associated with this phase. It is therefore 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 century AD, when 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. Given that the chipped-stone artefacts are probably intrusive we cannot be certain that the other artefacts are contemporaneous with the fire pits. For now, however, given the lack of other datable remains 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.

It is at this point difficult to reconstruct in detail how the enclosure was used. Nonetheless, the fireplaces and artefacts found in the enclosure are suggestive of domestic activities carried out at the structure. Although no clear outlines of tent or hut footings were encountered 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, despites relatively broad exposure. This may indicate a difference in use between the compartments. How this compares to the third compartment is impossible to say 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 at these sites.

The first of these enclosures was situated at the site of QUR-20, which is situated in an extensive valley system that runs down from the southern part of the basalt-covered plateau (Fig. 4.1). This site

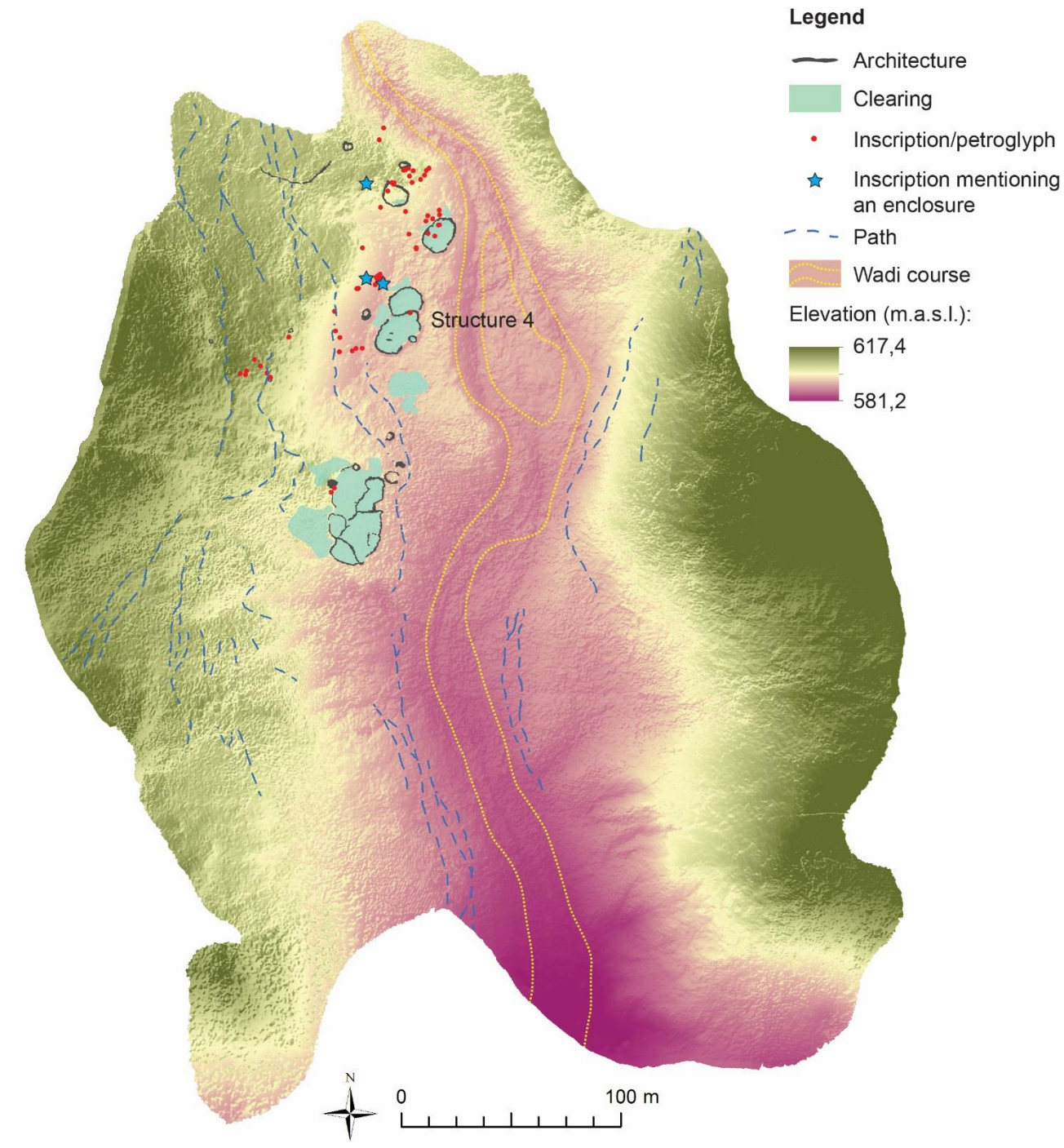

Figure 4.23: Plan of QUR-20 as documented through pedestrian surveys and aerial photographs. Close to some of the enclosures are several Safaitic inscriptions referring to such features. Base image: photogrammetrically reconstructed hillshade relief map based on drone photographs.

comprises four enclosures – two grouped enclosures and two single enclosures. 42 pre-Islamic inscriptions and 32 petroglyphs were situated at the site. Four of them explicitly refer to the site and its structures.[1]

The inscriptions mentioning an enclosure were found within 15 m of any of the enclosures of the site (Fig. 4.23). One of the grouped enclosures – structure 4 – was partially excavated. Similar to the enclosures described above many small fire pits were exposed – 26 in total – that were dug down from a compact layer situated only a few cm below the current surface. Five of these were 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 associated with camping activities from this period is currently lacking. It is possible that some of the fire pits that were not radiocarbon dated belong to a pre-Islamic occupation phase, or that one of the 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 impossible to say with certainty at this point.

Excavations at the site of QUR-1016 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, on which 54 Safaitic inscriptions and 47 petroglyphs had been carved (Fig. 4.24). One of the inscriptions explicitly refers to an enclosure.[2]

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.

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 (Fig. 4.25). Charred plant material from eleven of these fire pits was sent out for radiocarbon dating. All of them returned post-15th century AD dates. Artefacts or other material remains were retrieved in very low numbers as well, including three

[1] 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.
[2] The inscription referred to here is QUR-1016.21.1. See Della Puppa (forthcoming) for details.

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 at an enclosure were carried out is QUR-210. This is a very extensive site situated in a large valley that runs down from the western side of the central plateau (Fig. 4.1). The site comprises two single and four grouped enclosures and a number of smaller structures, and was occupied episodically from prehistoric up to recent times. 33 Safaitic inscriptions and 11 petroglyphs were present in the centre of the site (Fig. 4.26), and one of the inscriptions refers to an enclosure.[3]

One of the enclosures – Structure 6 – was excavated (Fig. 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. Within this area excavations were carried out. Again fire pits were exposed, nine in total, that 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 were 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 Classical and Late Antiquity. This is not to say, however, that these sites were not frequented during this period. The Safaitic inscriptions suggest that these sites were frequented during the Hellenistic/Roman period and that some of the enclosures may have been built during these visits, or were at least present there already. Also, pottery sherds recovered during pedestrian surveys at the sites of QUR-210 and QUR-1016 suggest frequentation of these sites during the Early Islamic period as well. 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 of the nature and chronology of these features. As stated earlier, little was known thus far about when enclosures were constructed or how they were used. 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, as

[3] The inscription refer to here is QUR-210.7.1. See Della Puppa (forthcoming) for details.

was also suggested on the basis of survey data (Chapter 3). Within the enclosures at QUR-595 and QUR-373 prehistoric remains have been found in the form of dated fire places and chipped-stone artefacts, indicating that prehistoric use of these locations. Whether the enclosures were already constructed by that time, however, is not certain. The prehistoric remains may have been there already prior to the construction of the enclosures.

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 that could be dated between the 10th and 12th centuries AD was retrieved from any of the excavated enclosures – a patterns that compares well with the chronological trends observed in the survey data (Chapter 3).

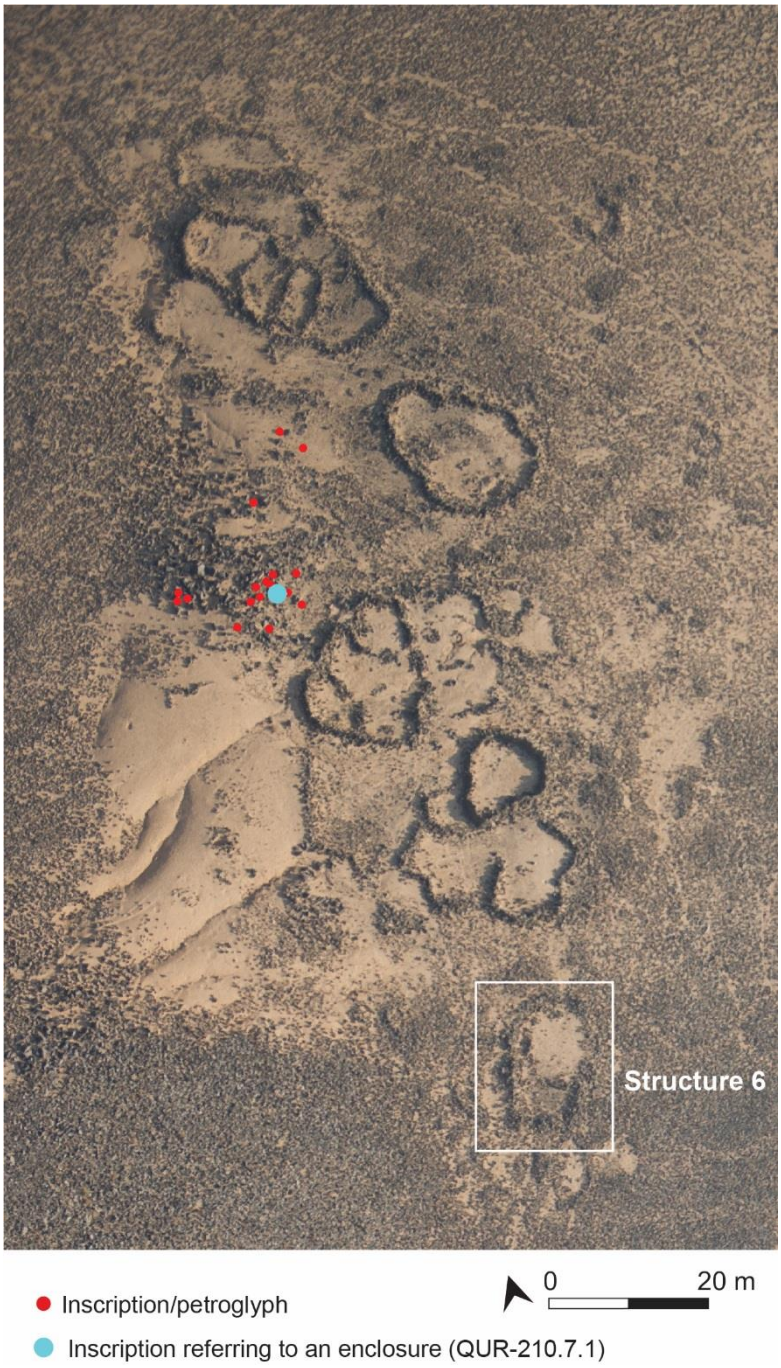

Figure 4.26: Top view of QUR-210, comprising several enclosures and rock art. One of the inscriptions refers to an enclosure. Base image: orthorectified aerial photograph by Don Boyer, courtesy of APAAME.

It has proved difficult to link with any certainty 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 encountered during excavations at sites where inscriptions were found that explicitly mention enclosures, the dates from the fire pits were all far too young to have 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.

The excavations within the enclosures provides 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. Other artefacts encountered within and around the enclosures that could be dated with any certainty, including ceramics collected during survey activities, may

Figure 4.27: Structure 6 at QUR-210 after excavation, showing a roughly rectangular space surrounded by clearance heaps. In the cleared area several fire pits were exposed. Scale is 40 cm. Photo by author.

also represent waste from domestic activities carried out 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, however, yielded fire pits. At QUR-11 only one of the two compartments contained fire pits. There is therefore 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 date certain use phases on absolute terms.

4.4. THE CONFIGURATION AND DISTRIBUTION OF CAMPSITES IN THE JEBEL QURMA REGION

In Chapter 3 a list of 56 residential sites that could be dated between the Hellenistic and Early Islamic period was compiled on the basis of the survey evidence. These sites were defined mainly on the basis of ceramics found at these sites which were interpreted as domestic waste, and on the basis of epigraphic evidence. Excavations confirmed that enclosures on which ceramics were encountered were indeed used for domestic activities, indicated by the presence of fireplaces within the enclosures. In case of the inscriptions referring to enclosures at particular sites it is less clear whether the enclosures were used for

residential purposes or merely 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 is presented 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, i.e. either on topographic lows or on modest slopes on 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 areas fairly secluded locations, i.e., 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 – again, as defined in Chapter 2 – is illustrated. Over 60% of the campsites is 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 over the Visual Prominence Classification (Figure 4.30). Most campsites appear to be situated in areas with low to very low visual prominence.

Partly because of the fact that many campsites were situated on valley bottoms, potential water sources could be found in relatively close proximity (Fig. 4.31). All campsites were situated within 500 m to a wadi, as is illustrated in Figure 4.32. However, these wadis may have provided water only for limited amount of time as 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 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 (Fig. 4.33). In the *harra* landscapes, the water sources were made accessible by paths running between campsites and the mudflats (Fig. 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 & Finch 1986, 80-81), it may suggest that 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 & location

Most of the identified campsites consisted of man-made clearings or enclosures, or both of these feature types. Only seven campsites comprised neither of these features, simply because these are situated in in the *hamad* landscape to the south of the basalt landscape where there is no natural stone surface cover. In the *harra* 14 campsites consisted of enclosures while clearings were not present at these sites, while there were 23 campsites that comprised clearings but no enclosures. The remaining 12 campsites featured both clearings and enclosures (Fig. 4.35).

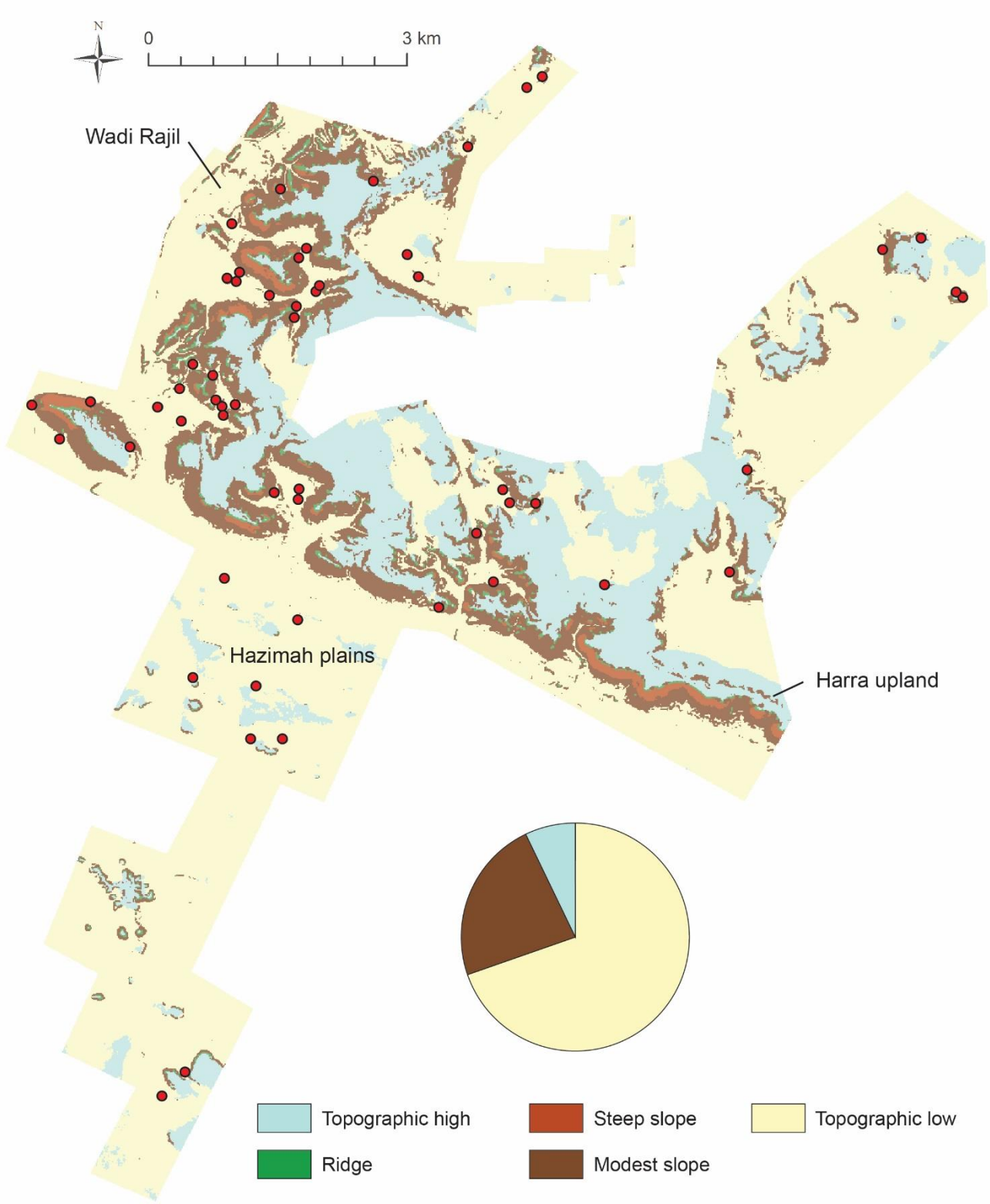

Figure 4.28: Distribution of Classical/Late Antique campsites (red dots) in the pedestrian survey area of the Jebel Qurma region and the proportion of campsites per hillslope position. Base image: Hillslope Position Classification.

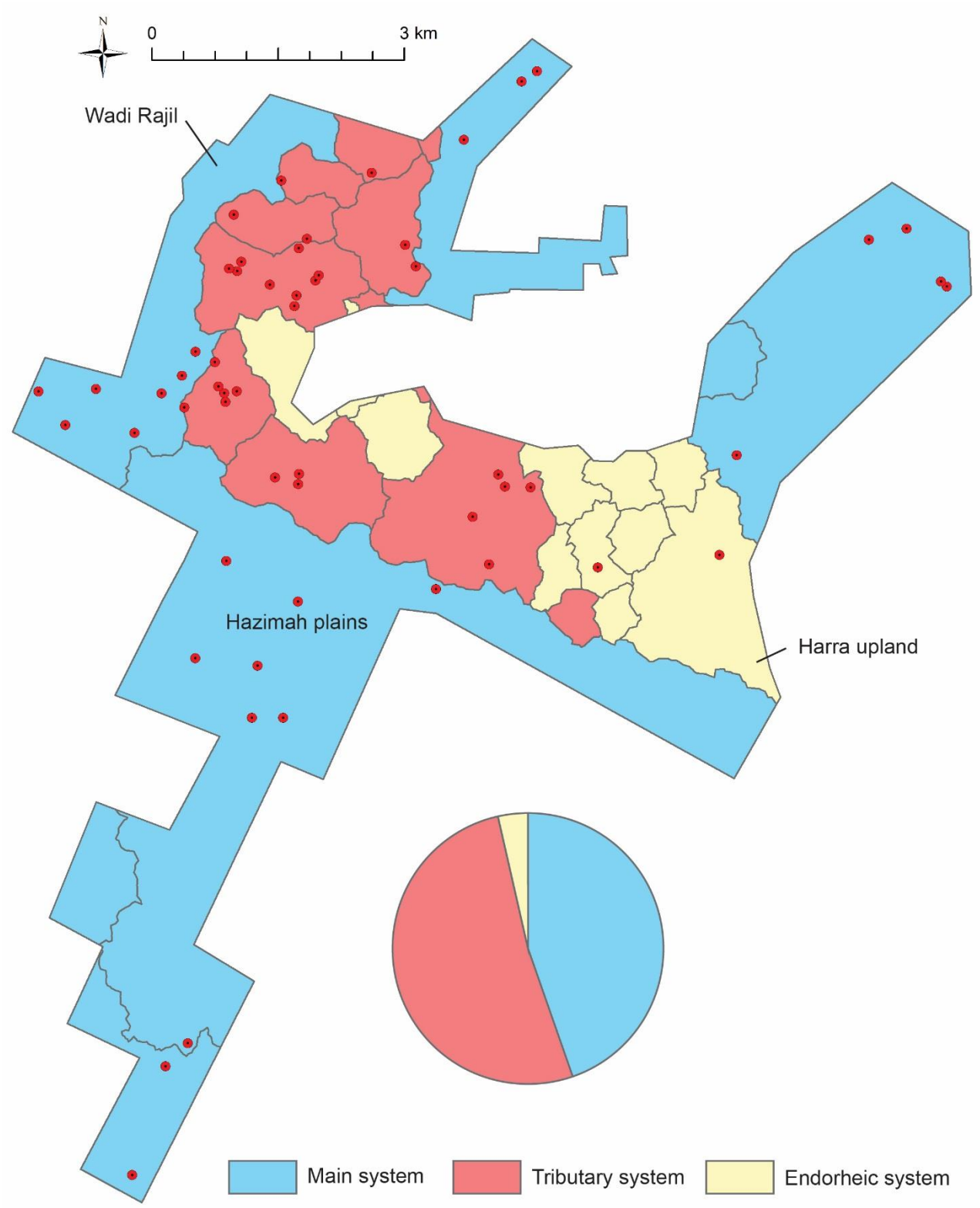

Figure 4.29: Distribution of Classical/Late Antique campsites in the pedestrian survey area of the Jebel Qurma region and the proportion of campsites per drainage system type.

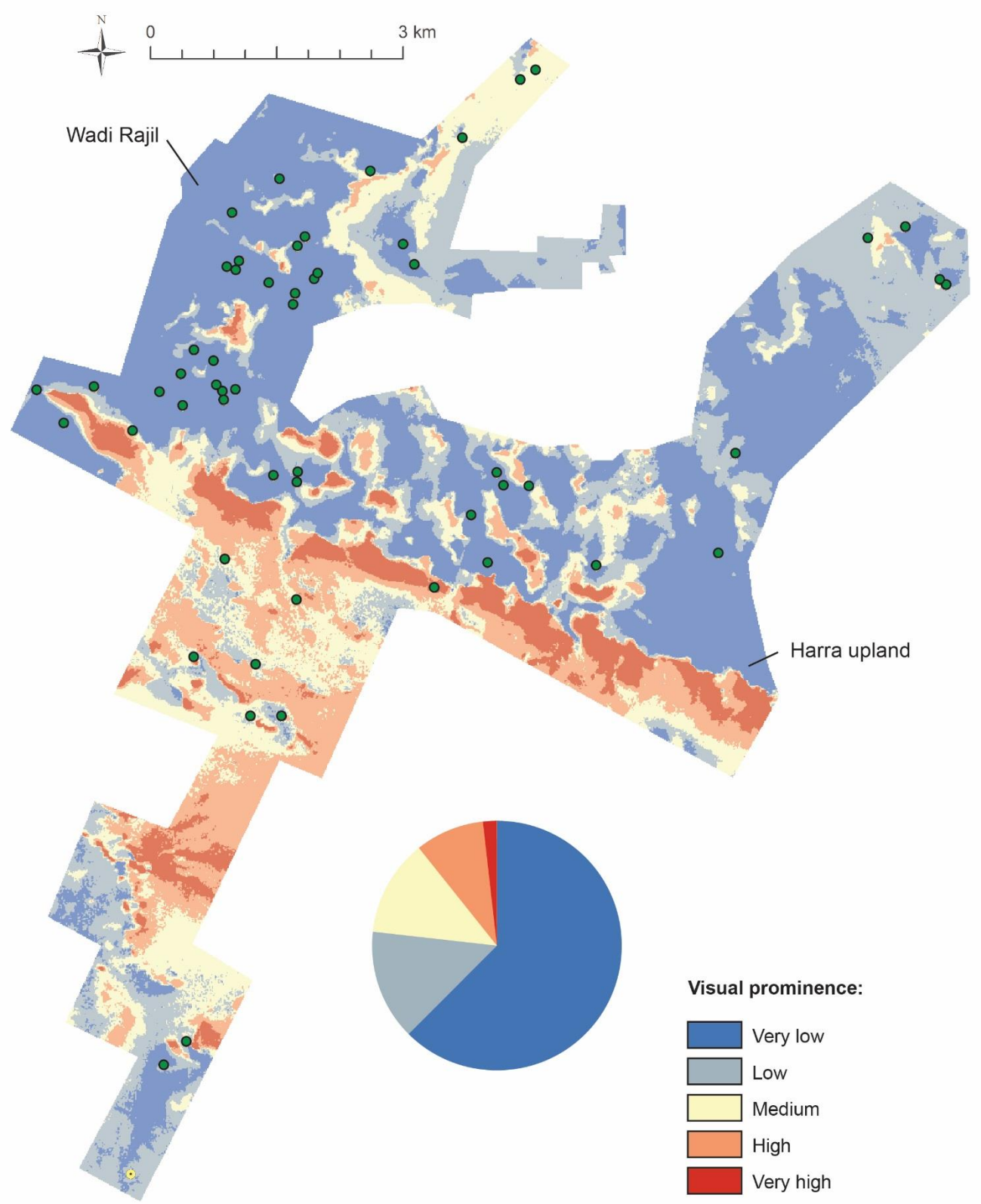

Figure 4.30: Distribution of Classical/Late Antique campsites in the pedestrian survey area of the Jebel Qurma region and the proportion of campsites per visual prominence class. Base image: Visual Prominence Classification.

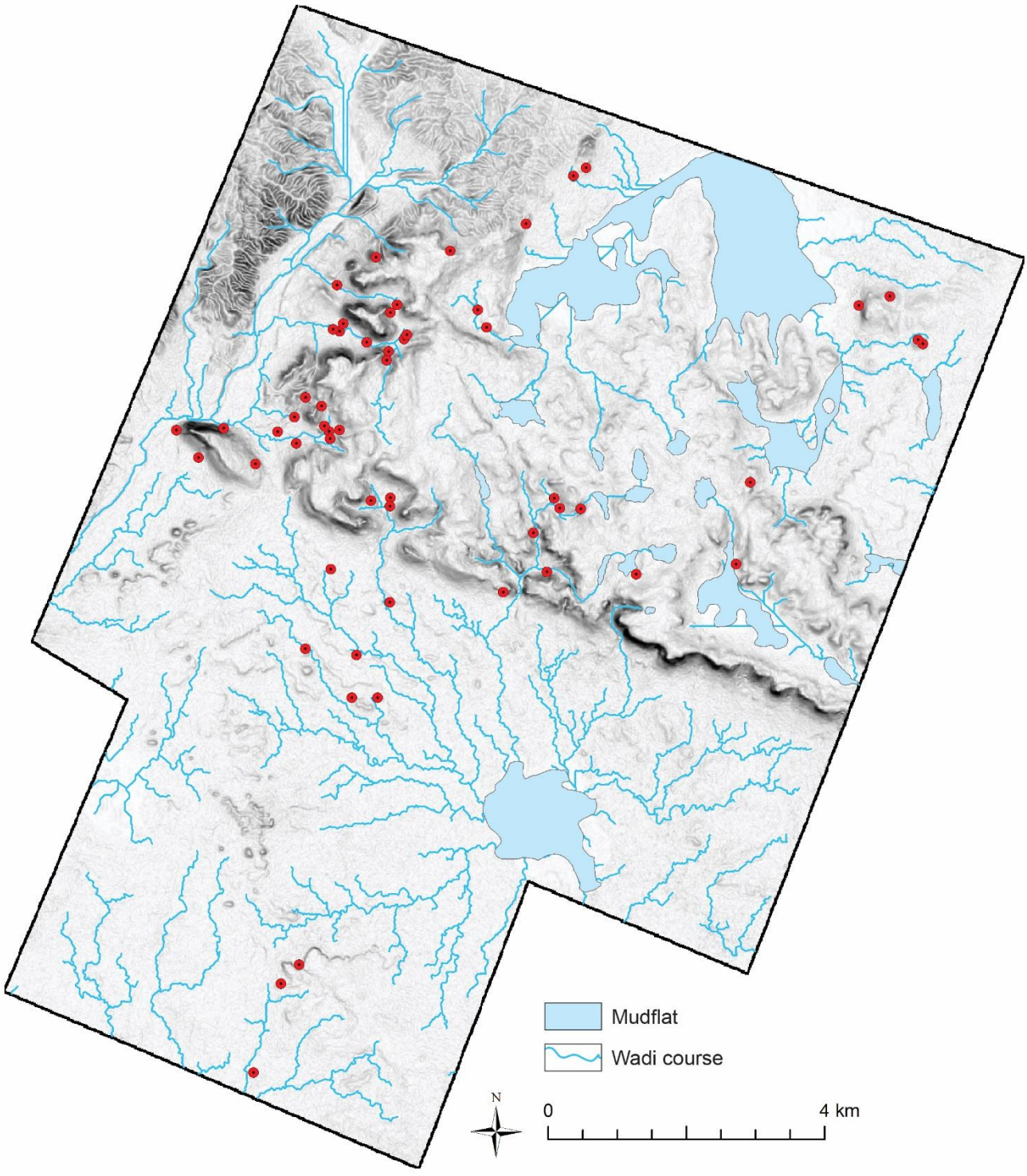

Figure 4.31: Distribution of Classical/Late Antique campsites as documented through pedestrian surveys in the Jebel Qurma region and the distribution of potential water sources. Base image: WorldDEM Slope map.

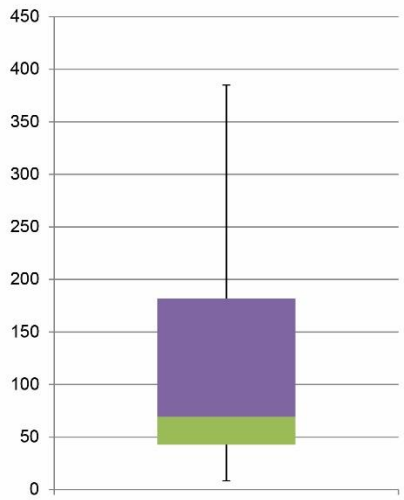

Figure 4.32: Box-and-whisker plot showing the distance (in meters) of Classical/Late Antique campsites to the nearest wadi.

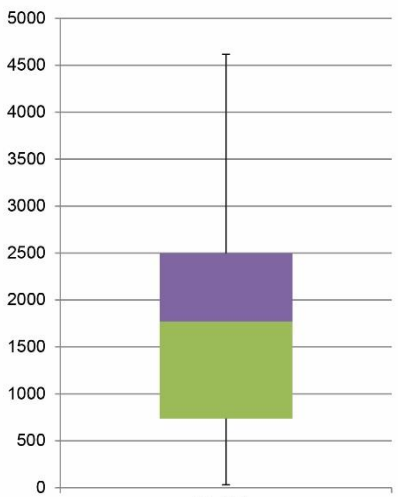

Figure 4.33: Box-and-whisker plot showing the distance (in meters) of Classical/Late campsites to the nearest mudflat.

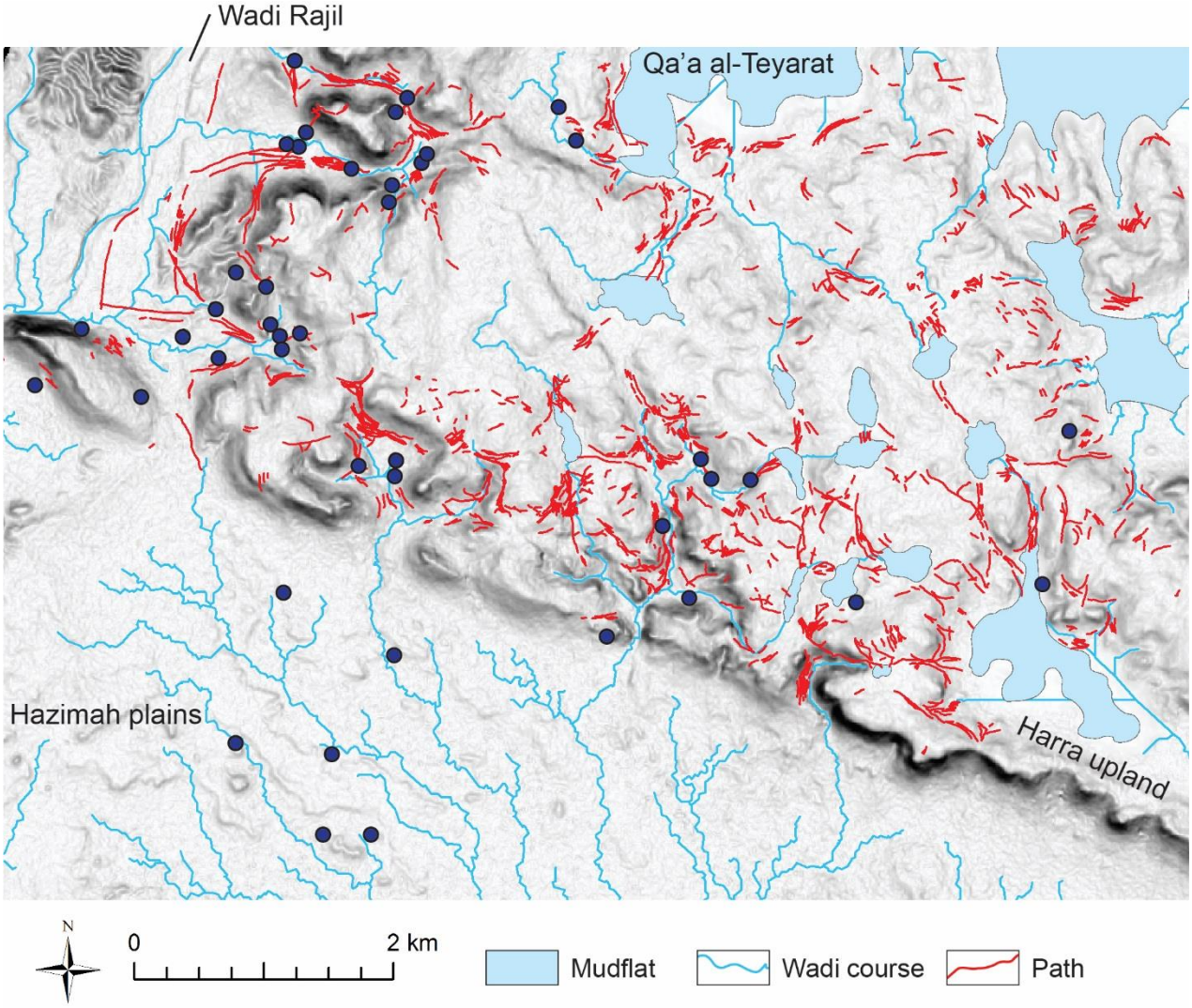

Figure 4.34: Distribution of Classical/Late Antique campsites (blue dots), potential water sources, and paths in part of the *harra* landscape. Many mudflats and campsites appear to be connected by paths. Base image: WorldDEM slope map.

There thus seems to be differentiation between campsites with enclosures (n=26) and campsites that only consist of ceramic scatters on open areas that were either of anthropogenic or of natural origin (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 (Fig. 4.36), while campsites without enclosures are mostly situated on *hamad* surfaces where less effort – or none at all – 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 (Fig. 4.37). This is probably so because denser basalt is found on the hillslopes, suitable for the construction of more elaborate stone features, but perhaps also because these hillslopes would have provided more protection against the wind. Westerly winds prevail nowadays in the region, and many of the enclosures on hillslopes were constructed in such a way that the slope provide shelter against these westerly winds.

The distribution of campsites over the various drainage systems (Fig. 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 systems, characterised by more open plains.

4.4.3. Chronological developments

The distribution of campsites in the Jebel Qurma region has changed considerably over time. In chapter 3 (§ 3.5.1.) it was proposed to differentiate between two main periods that provide evidence

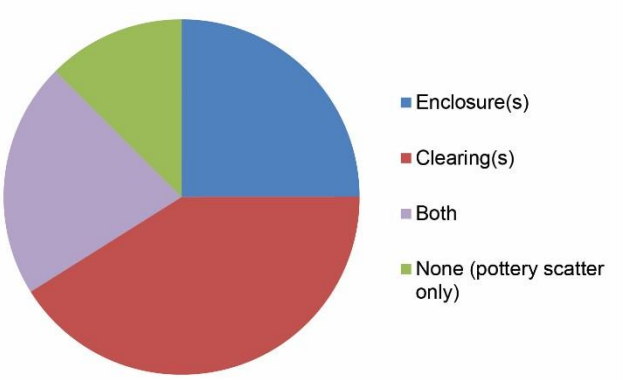

Figure 4.35: Variation in the composition of campsites.

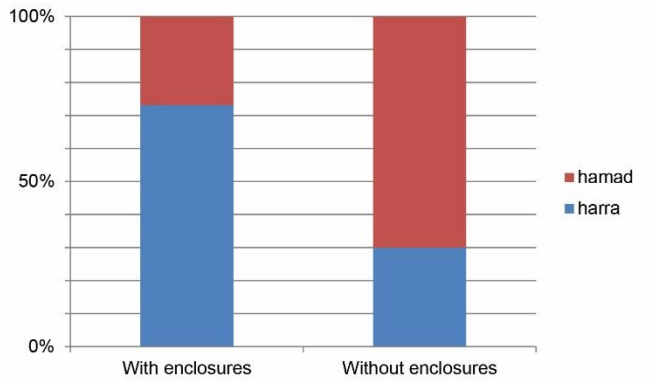

Figure 4.36: Differences in the composition of campsites between *harra* and *hamad* landscapes.

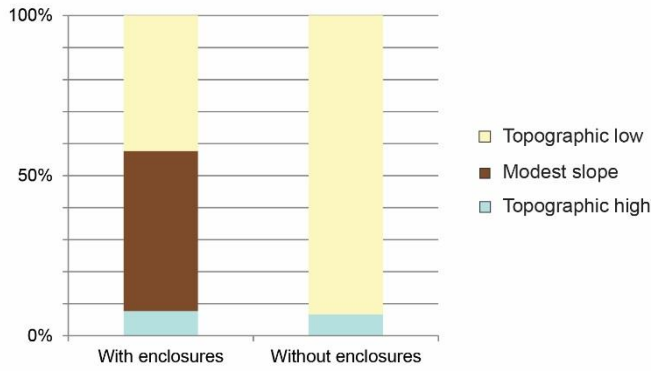

Figure 4.37: Differences in the composition of campsites between various hillslope position classes.

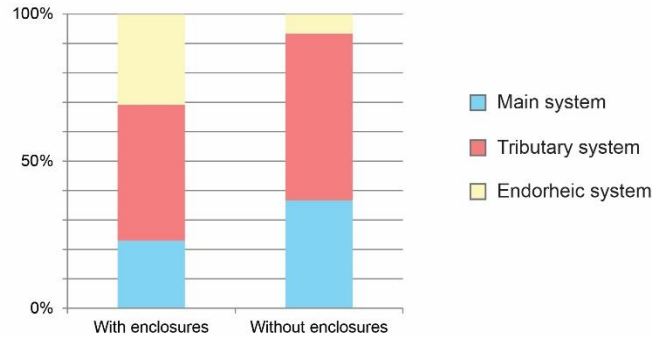

Figure 4.38: Differences in the composition of campsites between various drainage systems.

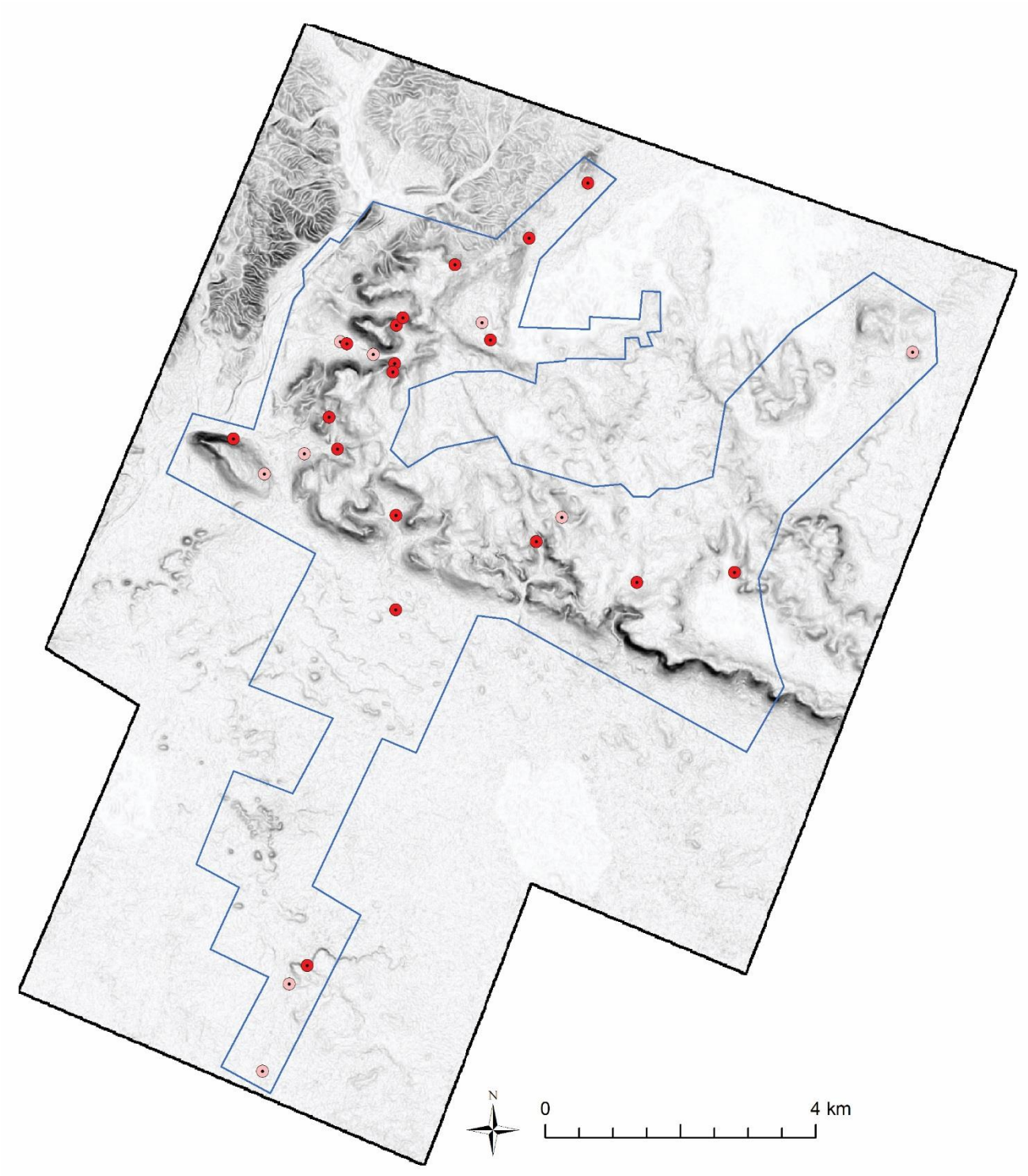

Figure 4.39: Distribution of certain (red) and possible (pink) Hellenistic/Roman campsites in the pedestrian survey area (blue). Base image: WorldDEM slope map.

for the presence of campsites in the study area: the Hellenistic-Roman period (Fig. 4.39) and the subsequent Byzantine-Early Islamic period (Fig. 4.40).

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 (Fig. 4.41). This development is paralleled when the surface cover of the areas in which campsites

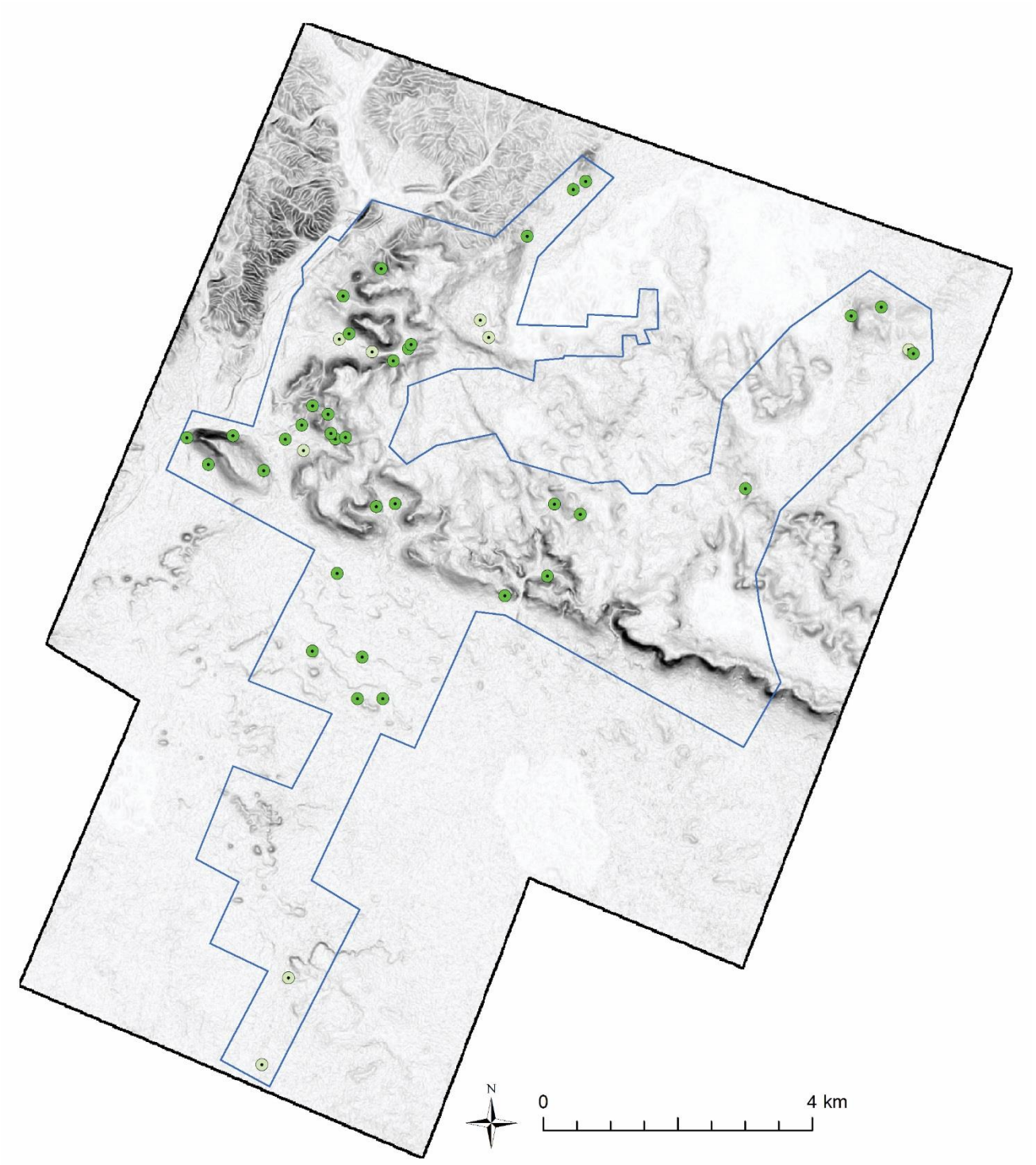

Figure 4.40: Distribution of certain (dark green) and possible (light green) Byzantine/Early Islamic campsites in the survey area (blue). Base image: WorldDEM slope map.

are situated is considered (Fig. 4.42). The majority of Hellenistic-Roman campsites is situated on *harra* surfaces. In the Byzantine-Early Islamic period, however, 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, i.e., more exposed locations.

It is more difficult to say whether all campsites saw an equal amount of occupational intensity through time, i.e., 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 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 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.

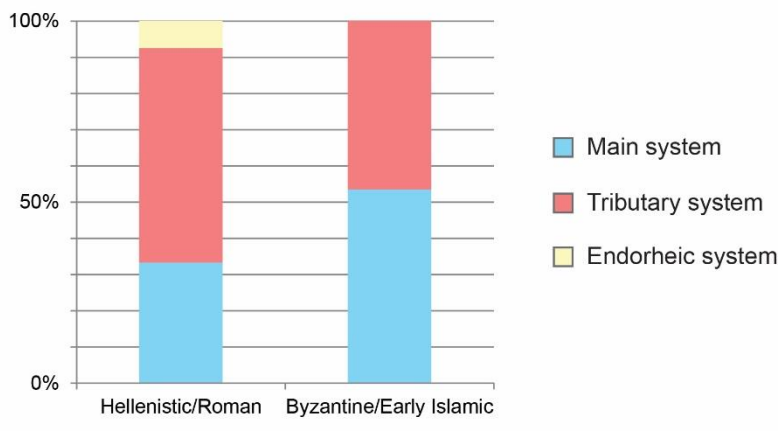

Figure 4.41: Differences in the location of campsites, in terms of drainage system as a measure of seclusion, between the Hellenistic/Roman and the Byzantine/Early Islamic periods.

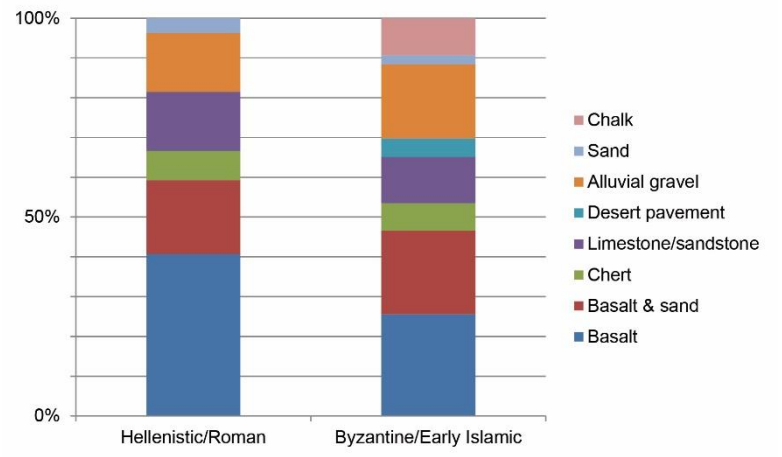

Figure 4.42: Differences in the location of campsites, in terms of surface cover, between the Hellenistic/Roman and the Byzantine/Early Islamic periods. Based on Surface Cover Classification.

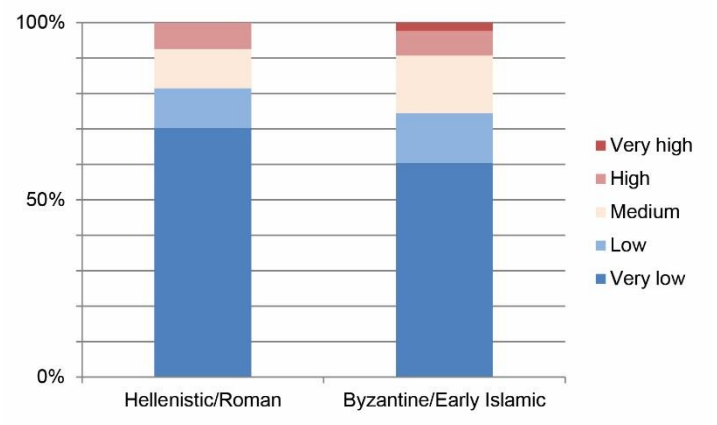

Figure 4.43: Differences in the location of campsites in terms of visual prominence between the Hellenistic/Roman and the Byzantine/Early Islamic periods. Based on Visual Prominence Classification.

4.5. Discussion

This chapter has presented an analyses of a number of residential sites and features. These sites were identified on the basis of ceramics that were interpreted as domestic waste discarded in the general area where domestic activities took place. Also, the presence of inscriptions referring to enclosures were used as evidence to identify residential sites. Excavations within the enclosures further suggested that these features were sometimes used for domestic activities given the presence of fireplaces within some of the enclosures' compartments. Clearings were not excavated as of yet, but the ceramics found on these clearings and around them are suggestive that these features 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 remains, except for the open spaces that were investigated.

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. Evidence for pastoral production is therefore only circumstantial at this point. If the campsites can be related to the people who produced the Safaitic inscriptions and petroglyphs – which is possible on the basis of epigraphic evidence in a few cases – we may assume 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 which is especially relevant during wet and cold periods.

Different 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, sometimes right on the edge of wadi courses.

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 may be 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 in terms 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 enclosures which could provide shelter against the elements for both people and their animals through the enclosure walls and their sheltered location. Also, their position somewhat further upslope would keep the camp 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 Steine 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. While Macdonald (1992a) has suggested on the basis of the Safaitic inscriptions that mobile pastoralists would normally only be present on the edge of the *harra* at the beginning and end of the dry season 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). This pattern is also in line with more recent use of the *badia* 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 and remained there after the rainy season until natural resources had depleted. Others would spend the winter in the *hamad* and only frequent 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 & 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 are 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.

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 customs 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 done, firstly, by presenting and discussing the results of excavations carried out at a number of different funerary monuments that were tentatively defined as such during pedestrian surveys. The results of these excavations provide more detailed insights into the chronology and function of these 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 was indicated by the presence of human skeletal remains observed 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 a more detailed insight into 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 insightful in the proposed correlation between the pre-Islamic carvings and the cairns they often accompany.

Between 2014 and 2016 number of potential funerary monuments from various sites were excavated (Fig. 4.1), largely following the excavation methods described in Chapter 4. What follows is, firstly, a presentation of the excavation results, in which are included only the results from excavations that yielded datable material relevant for the study at hand. 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 over 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. On the basis of 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. Through recent looting human skeletal remains had been exposed at a number of cairns, indeed suggestive of a funerary function. In terms of chronology, Safaitic inscriptions and petroglyphs sometimes clustered around cairns, suggesting a relationship between tombs and rock art. To further investigate these tentative observations different types of cairns were excavated to study their date of construction and use as well as their function.

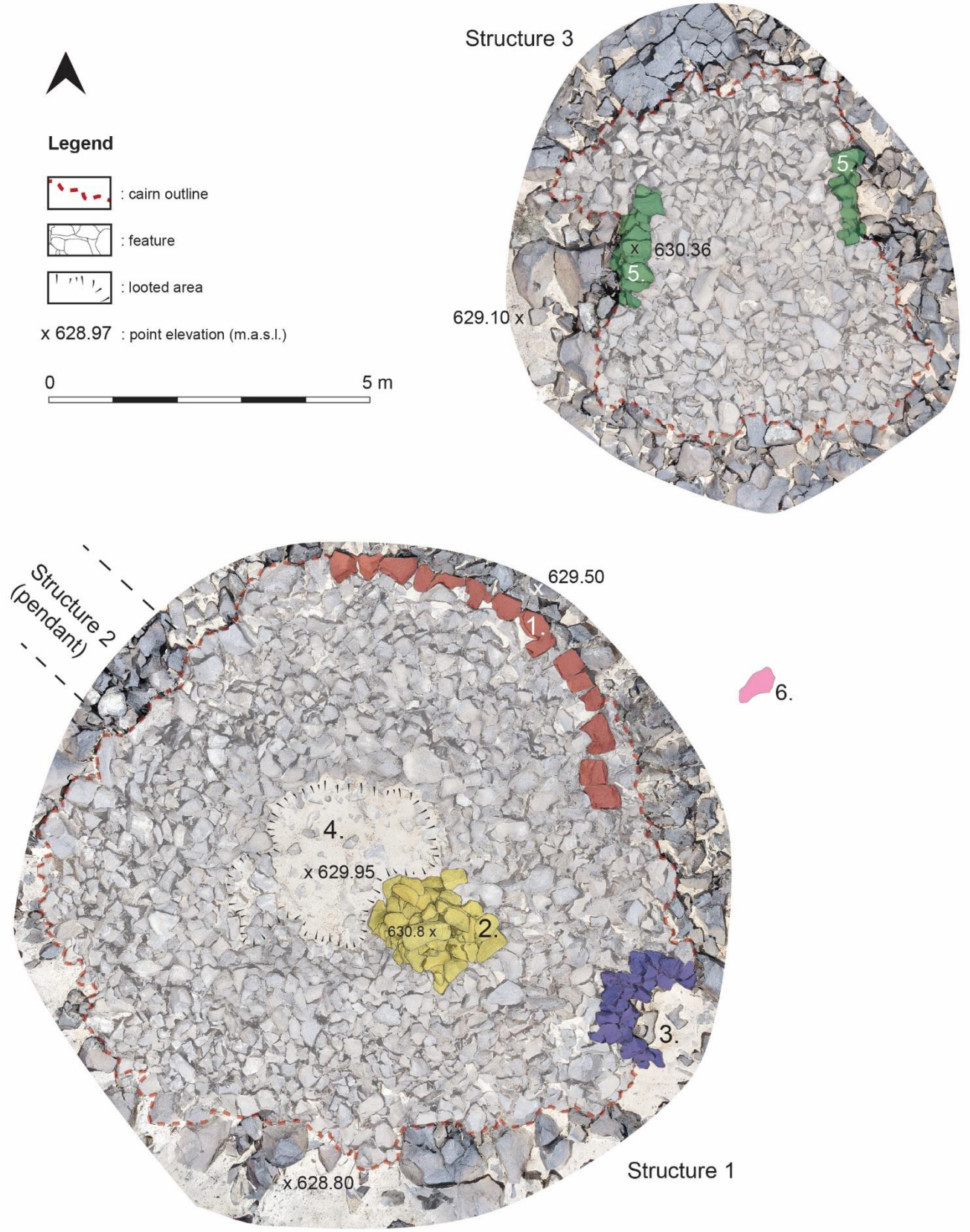

Figure 5.1: Plan of QUR-215 prior to excavation. 1) plinth G; 2) marker B; 3) shelter; 4) area disturbed by recent looting; 5) parts of a façade; 6) Safaitic inscription referring to a funerary structure. Base images: photogrammetric reconstructions.

5.2.1. QUR-215

The site of QUR-215 is situated on one of the highest points in the Jebel Qurma region, towering about 60 m above the surrounding plains, on top of the western part of the plateau. The site (Fig. 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 one of the two cairns the inscription was found next to.[1]

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

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 on the sides of the cairn. The large size of the cairn – ca. 11m in diameter – can be partially attributed to this. Fortunately, however, the lower parts of the cairn did not appear to be affected by recent 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 – this turned out to be a later addition. 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 (Str. 2, see below) diverged from the cairn in a NW trajectory.

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. Marker 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 features. 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 in order to expose features and to collect artefacts and other finds. The areas around the already observed plinth (G) was also cleared of stones and soil to expose the outline of the cairn. At some point a section was made through the cairn, which involved lowering the northwest part of the cairn fill until virgin soil was reached.

<u>Architecture & burials</u> (Fig. 5.2)

The outline of the cairn was largely defined by a plinth (G) that consisted of a single row of large, neatly set unworked stones, forming a near complete circle around the base of the cairn with a diameter of about 6.7 m. In some cases rectangular blocks were chosen for the construction of this plinth. On the north and east side of the cairn these blocks were placed directly on virgin soil, while on the west side they stood on a foundation that raised the plinth some 36 cm, probably in an attempt to overcome the height differences of the natural surface. Only on the south side of the cairn the plinth was poorly defined. Here a number of large naturally occurring basalt blocks defined the cairn's outline, and the areas between these blocks were filled up with loosely piled stones. Here the base of the cairn is somewhat wider, i.e., about 8 m.

In the centre of the circle formed by the plinth a small oval chamber (A) was situated, measuring 74 by 53 cm. Its long axis was orientated N-S. This chamber had straight walls made of unworked stones stacked to a height of about 64 cm high and a floor of flat slabs (C), on which only a chipped-stone artefact

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

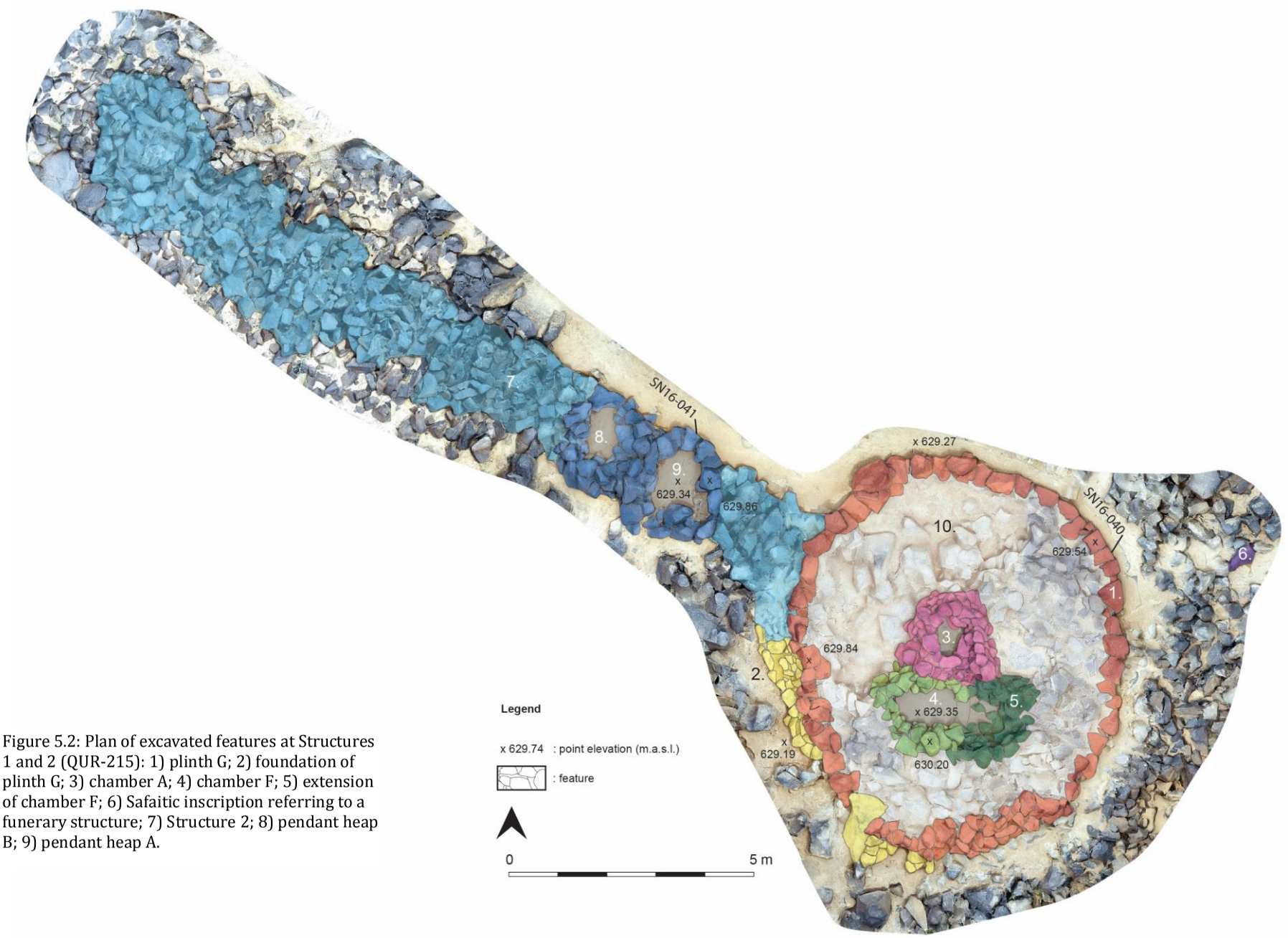

Figure 5.2: Plan of excavated features at Structures 1 and 2 (QUR-215): 1) plinth G; 2) foundation of plinth G; 3) chamber A; 4) chamber F; 5) extension of chamber F; 6) Safaitic inscription referring to a funerary structure; 7) Structure 2; 8) pendant heap B; 9) pendant heap A.

Figure 5.3: Islamic-type grave in chamber F of Structure 1 (QUR-215). Photo by author.

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).

was encountered. The chamber had been covered by slabs, one of which was found in its original position. The fill of this chamber consisted of many stones with soft windblown sediments in between. Modern animal remains were abundant, including mollusc shells, snake eggs, 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 layer of about 25 cm thick covering floor C. It is uncertain whether these were human or animal bones.

To the south of chamber A was another chamber (F), this one larger and orientated roughly E-W. It measured 210 by 77 cm and was preserved to a height of 60 cm. On the bottom a complete human skeleton was found buried in an Islamic fashion, i.e., lying in an extended position on its right side, with the head to the west, facing Mecca (Fig. 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 as well as 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 from the top of the chamber right down to the bottom – also underneath feature I. The Islamic grave had apparently disturbed one or more older burials situated more or less in the same location, thereby scattering the earlier skeletal remains and artefacts throughout the chamber and around it.

Chamber F was probably not found in its original configuration, but seemed to have been altered over time. This is based on the fact that there is a difference in the way of construction between the west part and the east part of the chamber. The west part of the chamber has neatly set, slightly corbelled

walls, whereas the east part of the chamber is more like a pit than an actual chamber (Fig. 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 closed on the east side by a corbelled wall now lost. It would have been about 120 cm long. At some point this chamber gained a pit-like extension on the east side, through which the presumed 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 chamber A and F consisted of a dense packing of basalt boulders with wind-blown sediments in between, that were apparently simply 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 as described above, little else was found in this fill.

The disturbed skeletal remains from chamber F

The disturbed skeletal remains from the fill in and around chamber F were studied by Inskip (2015a; 2015b) who reports that it contained the poorly preserved human remains of two individuals – an adolescent and an adult. Teeth from one of the individuals were sent out for radiocarbon dates, but unfortunately it is not clear from which individuals these bones derived because the individuals were close in age. 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.

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.

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 & Tafuri 2013), presumably originating 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 displayed in Figure 5.5. Also numerous were 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 (Fig. 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 the artefacts (92%) came from the fill of chamber F, while the rest was mostly

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 disturbed burial context in chamber F (QUR-215, Structure 1).

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 – presumably as grave goods with one or both of the disturbed burials – but were later scattered throughout and directly around the chamber by the construction of the Islamic tomb.

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

Other finds

In the fill of chamber A – at different elevations – and directly to the north of this chamber a number of pottery sherds were found 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 & Brüning 2017, Fig. 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, Fig. 15.14:286; Fig 15.15:290; Smith & 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 (Figs. 5.2 and 5.8). The stone had been purposefully placed onto 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 5.6: 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.

Discussion

A complex picture emerges from the excavations at this cairn. 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 occurred between the 6th and the 3rd centuries BC. The area between the plinth and the chamber was filled with loosely piled stones. The 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

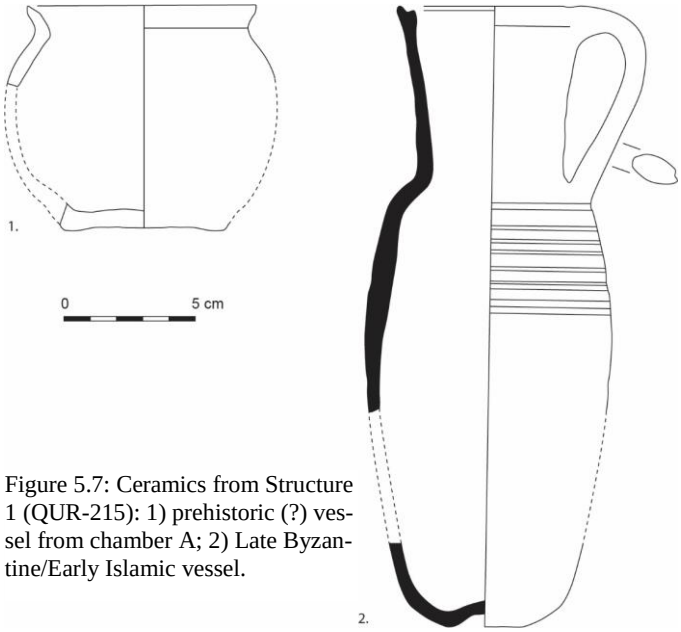

Figure 5.7: Ceramics from Structure 1 (QUR-215): 1) prehistoric (?) vessel from chamber A; 2) Late Byzantine/Early Islamic vessel.

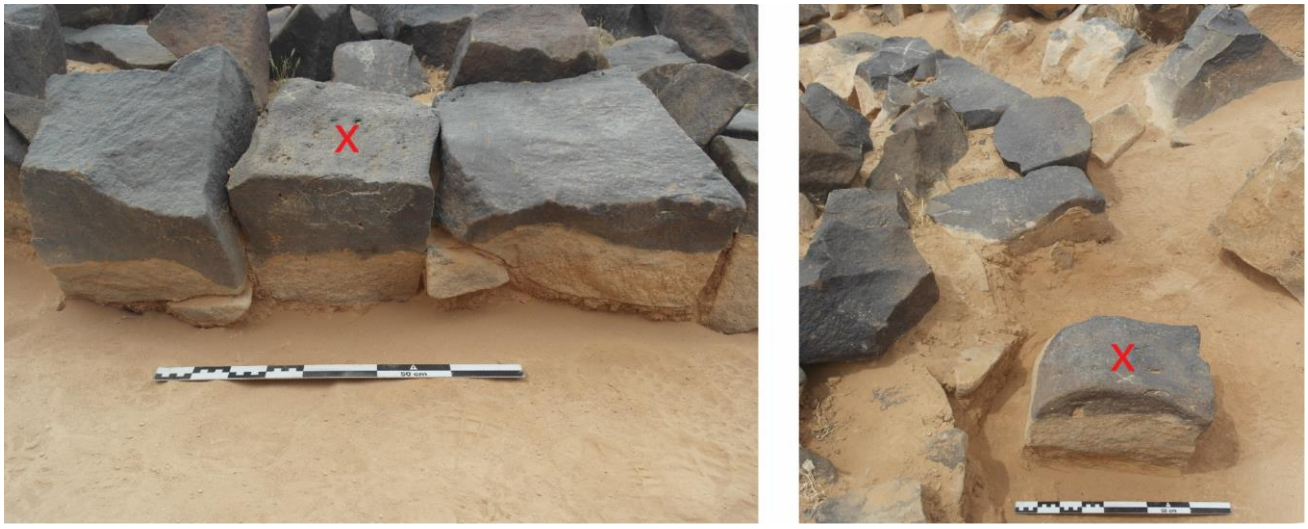

Figure 5.8: Context of OSL sample SN16-040: sediment from underneath a base stone (marked) of plinth G (Structure 1) was collected at night. Left: base stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm, photos by author.

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.

in a contracted position. When the second individual was buried in chamber F is currently unknown. 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 seems to suggest a relatively recent date.

Structure 2

Structure 2 is a pendant of about 16.5 m long, extending from Structure 1 in a NW trajectory (Fig. 5.2). Nine heaps were defined during the survey. Two individual heaps of the pendant – those who were situated 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 lowered until virgin soil had been reached.

Architecture

Feature A consists of an oval ring of large stones, i.e. 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, or up to 83 cm. Its interior had been completely filled in with smaller stones, i.e. about 20cm across on average, with sediments in between. These sediments contained natural flint pieces, indicating that the soil is not Aeolian but was brought up intentionally. Virgin soil was reached at the bottom of this fill (Fig. 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, to a maximum of 86 cm, and constructed on virgin soil. Large stones of up to 70 cm in length were used for the construction of this ring (Fig. 5.9). Like feature A, its interior had been filled up with smaller stones and sediments containing natural flint. No finds whatsoever 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, photos by author.

OSL date

In order to determine the construction date of the pendant a single soil sample for OSL dating was collected from underneath one of the base stones of feature A (SN16-041). This stone has been deliberately placed on virgin soil as part of the construction of the outer circle forming the low wall of the feature (Fig. 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 from underneath a base stone (marked) of feature A (Structure 2) was collected. Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm, photos by author.

Discussion

Although some effort was clearly put into the construction of the rings of features A and B these 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 the pendant was added to Structure 1 after it was enlarged through the construction of plinth G and the construction of chamber F, then the pendant cannot predate the 6th century BC, 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.

Structure 3

Structure 3 is the smaller of two cairns 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 (Fig. 5.1). This façade had a relatively irregular face and was made of boulders rather than slabs. On the top of the cairn a small depression was observed, of which it was assumed that it represented 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 lowered in 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 flimsy 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 brought in through natural processes. The function of this cairn, therefore, must remain unknown.

Discussion

A complex situation has emerged from the excavations carried out at the different structures of QUR-215. Structure 1 was constructed during the late 1st millennium BC with the construction of plinth G and the chamber F, to which at least one human burial from this period is associated, which was radiocarbon

dated to, most likely, the 3rd century BC. 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 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, i.e., between the 6th century BC and the 1st century AD. More burials were later added to chamber F of Structure 1, the last one in relatively recent times. The large amount 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 whether it served as a burial cairn.

Due to the fact that the structures at QUR-215 were modified numerous times, with burials added disturbing older burial remains, and the fact that some of the features remain enigmatic – especially Structure 3 – associating the Safaitic inscriptions situated on and around the cairns with any of the burials or features is difficult. A direct relation between the inscription mentioning the construction of a cairn for a deceased person (see above) and one of the attested burials remains difficult to make. A likely candidate for a burial to which the inscription refers is the one 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 which may well be somewhat younger.

5.2.2. QUR-28, Structure 2

This site 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 (Fig. 5.11). 53 Safaitic inscriptions and 49 petroglyphs were present at the site, mostly clustering around the cairn. Diverging from the platform in a southeast trajectory was a pendant comprising 22 well-defined individual cairns. Some of the cairns

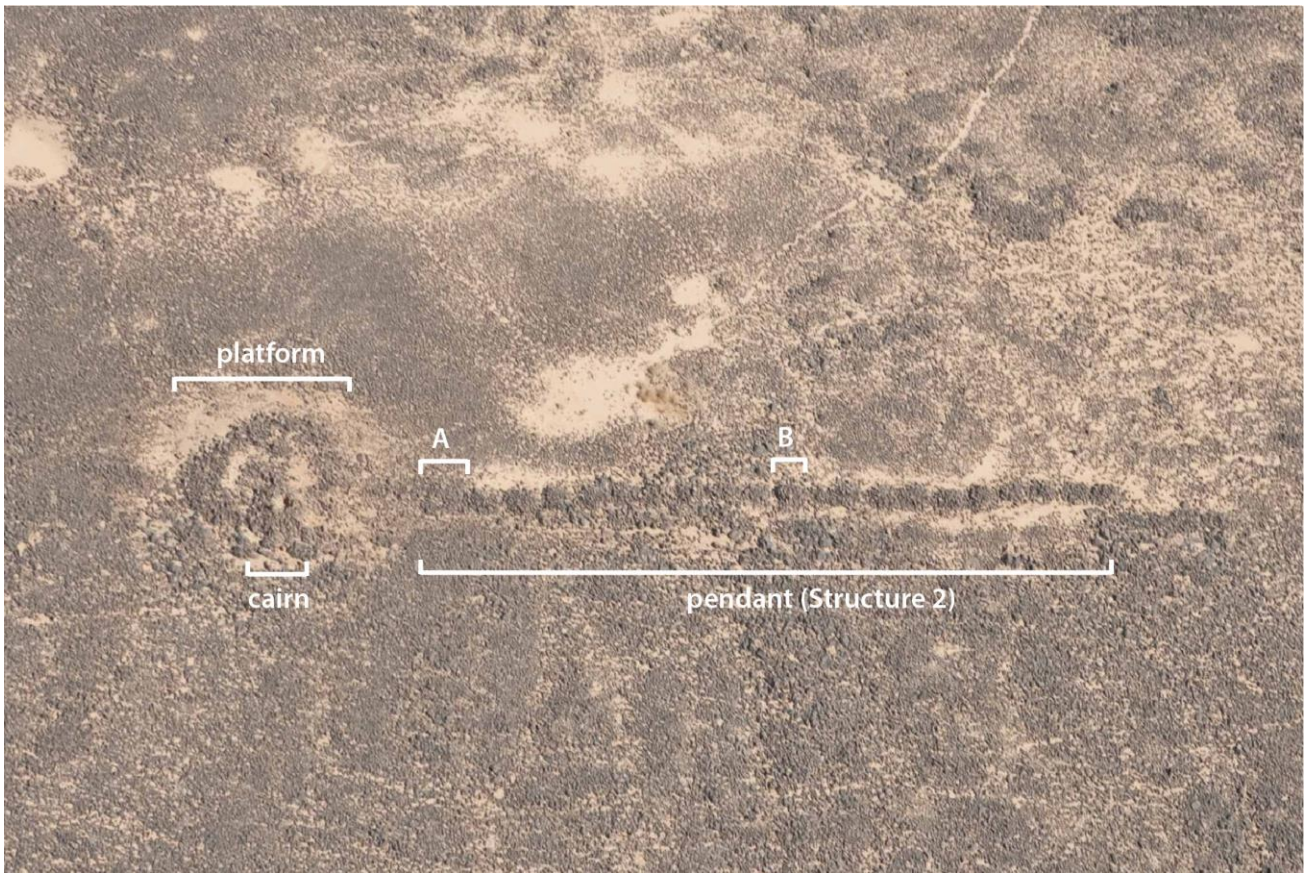

Figure 5.11: QUR-28 with its main features. Aerial photograph by Mike Neville (courtesy of APAAME).

were well preserved and stood up to 75 cm high while other cairns were preserved more poorly, and only featured the outline of the cairn's base. Most of the better preserved cairns were situated farthest away from the platform while the less well-preserved cairns were situated closest to the platform. Excavations at this site 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.

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

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

Of the first chamber, feature A, only the first course of stones was preserved. (Fig. 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 soil. No artefacts or other finds were contained within this fill. Subsequent excavation of the soil underneath the chamber did not yield anything either. The second chamber, feature B, was preserved much better. Much of the well-constructed exterior façade of the chamber was preserved 4 to 6 courses high, or up to 75 cm. Within the chamber, which had an oval shape measuring 2.4 by 1.9 m, was a dense packing of stones with wind-blown soil in between (Fig. 5.13). This fill was excavated but contained no finds either. The structure was excavated down to natural soil.

It may be concluded, then, that although both excavated features appear to have been carefully made constructions, these were not chambers. Rather, as feature B showed best, they are carefully constructed cairns featuring a façade, but the interior of these cairns was 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 is situated ca. 500 m away from QUR-28, further east on the ridge of the basalt plateau (Fig. 5.14). Another pendant is located here (Structure 2) flanked on its extremities 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 around the cairn. The pendant is the largest in the study area, comprising

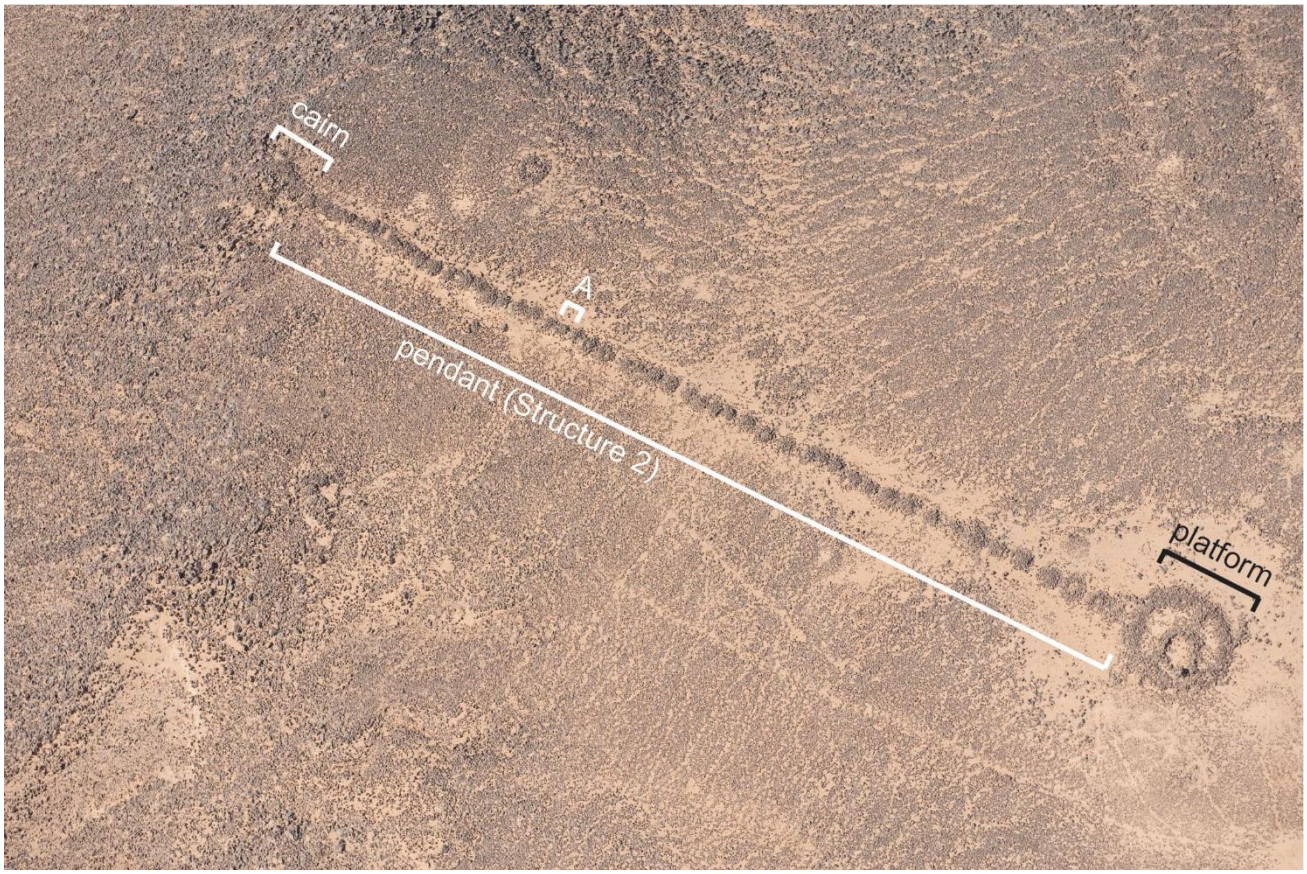

Figure 5.14: QUR-32 with its main features. Aerial photograph by David Kennedy (courtesy of APAAME).

58 individual cairns strung out over a length of nearly 135 m. Similar to QUR-28, several of these cairns appeared to consist of small chambers or, at least, a nicely constructed external façade. One of such cairns was excavated (feature A). Again it appeared to be simply a cairn with a nicely constructed façade rather than a chamber, as the interior had been completely filled up with small stones. This fill was excavated down to natural soil but did not yield any finds. Having defined the outline of the external façade of this small cairn (Fig. 5.15) it was decided to take a soil sample (SN16-075) from

Figure 5.15: Small cairn after cleaning its exterior that was part of the pendant (Structure 2) at QUR-32. Scale is 50 cm, photo by author.

underneath one of its base stones for OSL dating (Fig. 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.

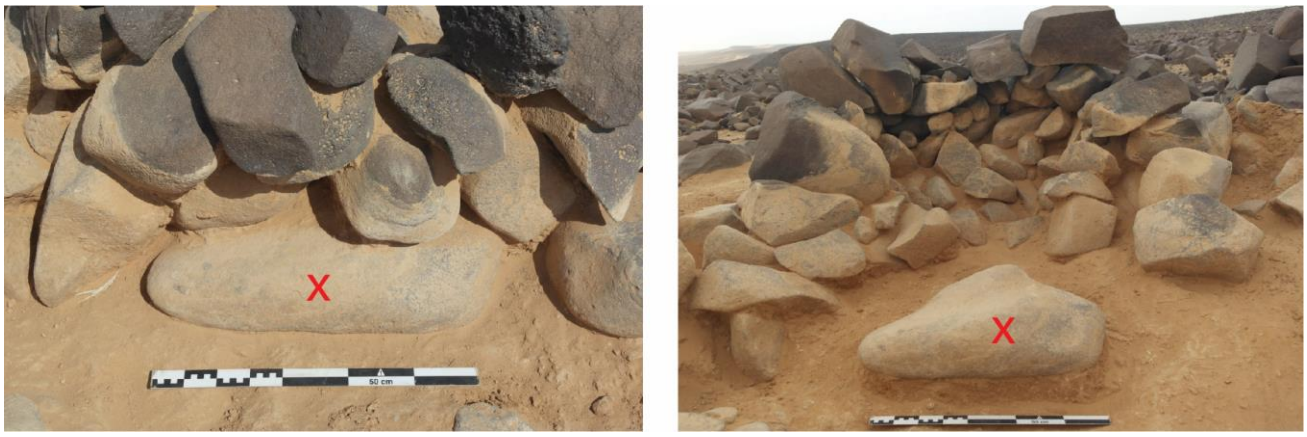

Figure 5.16: Context of OSL sample SN16-075: sediment from underneath a base stone (marked) of feature A (Structure 2) at QUR-32 was collected. Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm, photos by author.

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 (Fig. 5.17) is also situated on the southern ridge of the Qurma massif, where it is delineated by topographic depressions on all sides. The site extends over an elongated area of about 1 ha that has a roughly NW-SE trajectory. Part of the site has been covered by aeolian sand deposits, which also partially cover some of the features at the site. The site consists of a total of 6 cairns and 4 pendants, all except one of which are connected to a larger cairn. The site also comprises 19 Safaitic inscriptions and 8 petroglyphs. The rock art is mostly situated on and directly around the largest cairn at the site – Structure 3.

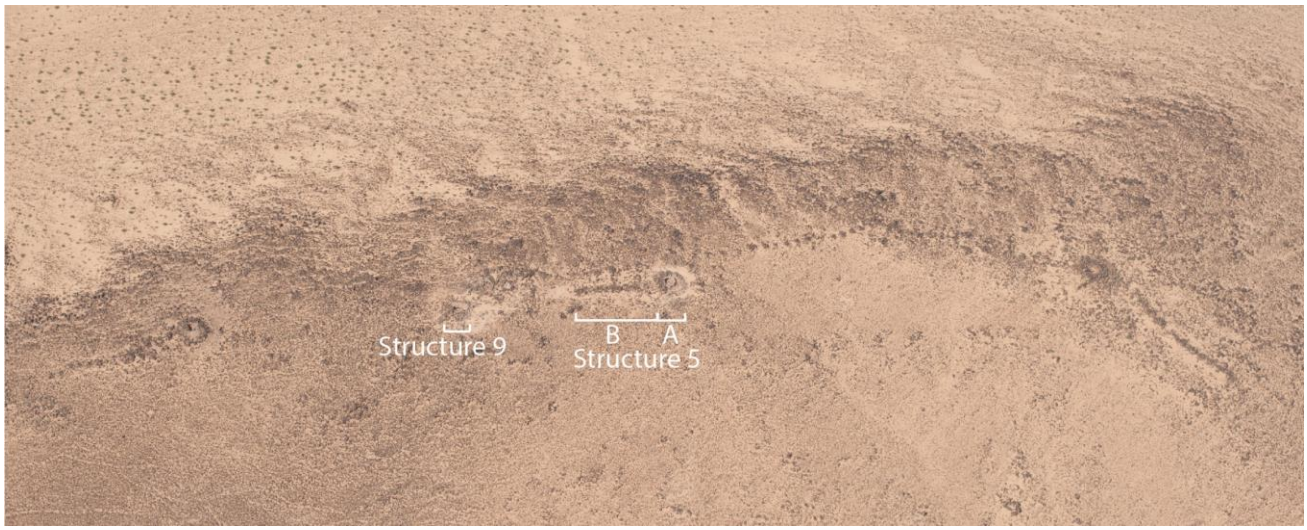

Figure 5.17: QUR-9 with features mentioned in the text. Aerial photograph by Rebecca Banks (courtesy of APAAME).

Structure 5 consists of two parts, a main cairn and a pendant (Fig. 5.18). The main cairn (Structure 5A) was encountered in an apparently good state of preservation – it seemed not be looted. It had a diameter of ca. 7 m and stood 1.2 m tall. Only on its NE edge two small depressions were visible, possibly representing limited looting activities. The pendant (Structure 5B) diverged from the cairn in a SE trajectory 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 is no rock art directly associated with these structures.

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.

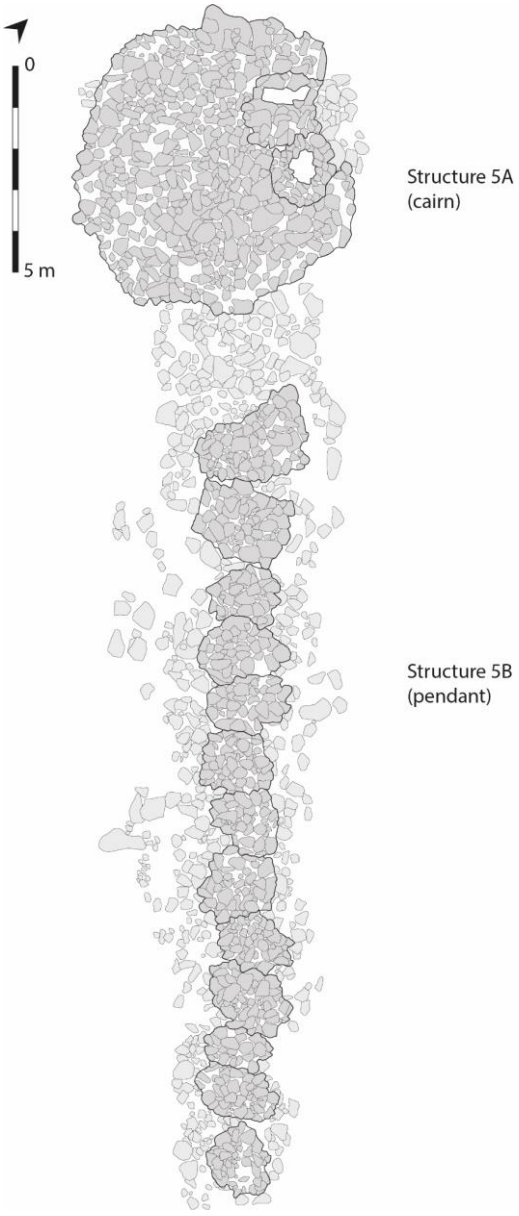

Figure 5.18: QUR-9, Structure 5 prior to excavation. Architecture drawn by A. Kaneda.

Structure 5A (cairn)

Architecture & 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 (Fig. 5.19). This ring featured a neatly constructed façade on the outside that was constructed from basalt slabs and boulders, up to a height of ca. 80 cm, or 3 to 4 stone courses. It was partially built on top of large naturally occurring boulders which gave the structure additional elevation. The ring wall had been obscured completely – on the sides and on top – 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. Within this fill and underneath it poorly preserved fragments of a human skeleton and a number of artefacts, probably representing grave goods (see below), were retrieved. Some of this material came from the bottom of the circular chamber; others were retrieved from its fill, suggesting 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 hare, is also indicative of such processes.

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 were impossible to make (Inskip 2016). Furthermore, due to the limited amount of collagen preserved in the bone tissue the remains were not suitable for radiocarbon dating.

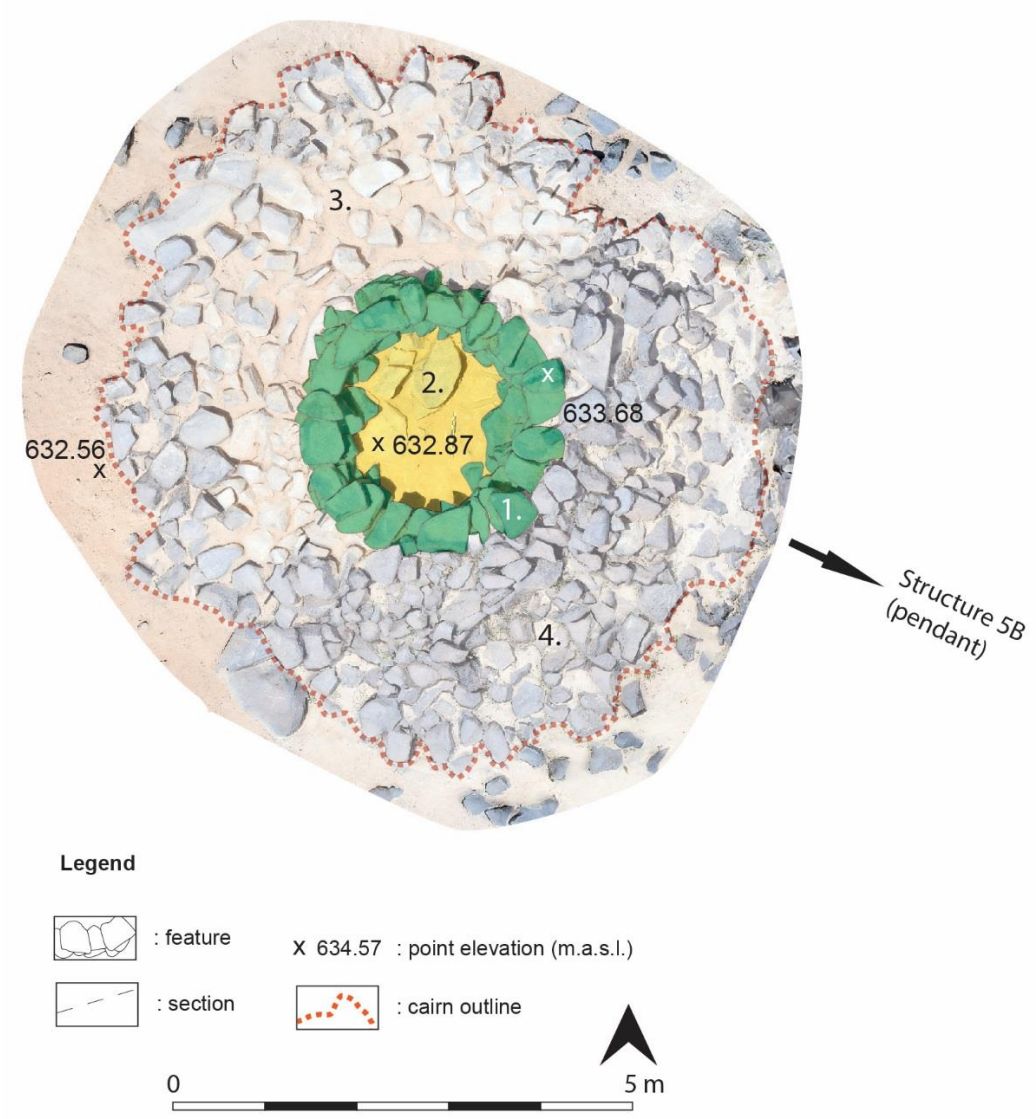

Figure 5.19: Features excavated at Structure 5A (QUR-9): 1) façade; 2) burial chamber; 3) excavated part of the cairn's cover; 4) unexcavated part of the cairn's cover. Base image: photogrammetric reconstruction.

Artefacts

In addition to the skeletal remains – and possibly associated with them – a total of 39 artefacts were found, nearly all of them in 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 (Fig. 5.20). A few bronze fragments were also among the artefacts.

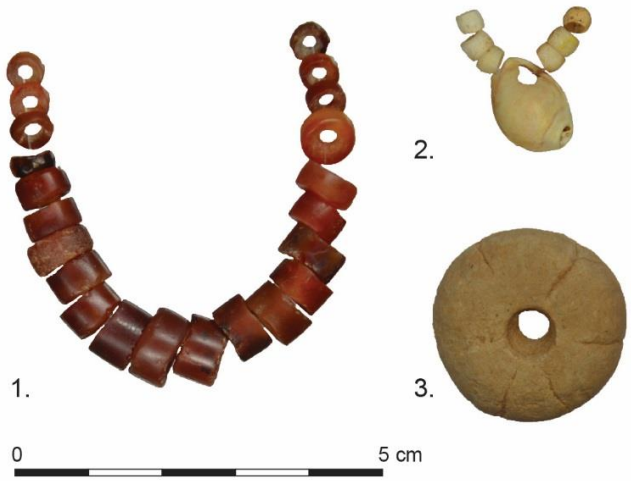

Figure 5.20: Artefacts from Structure 5A (QUR-9): 1) stone beads; 2) shell beads; 3) stone pendant.

Discussion

Based on the excavations the following sequence of construction and use is proposed. The circular wall or chamber was created initially, into which a human body was deposited adorned with a number of

object including jewellery made of beads and one or more objects made of bronze. The burial was subsequently covered by a dense packing of stones, filling up completely the chamber. Lastly a stone cover was applied obscuring the chamber, including the top, from view. Exactly when this all happened cannot be determined on the basis of these excavations alone, as no closely datable material was found.

Structure 5B (pendant)

Architecture & 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 (Fig. 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 and the early 3rd century BC.

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

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.

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 a phase difference is equally plausible, with the cairn being constructed prior to the pendant or vice versa. None of the structures is overlying the other, and only one of the structures was dated with some degree of accuracy. It is therefore impossible to make any further comments on their relative chronology at this point.

5.2.5. QUR-9, Structure 9

Structure 9 was encountered well-preserved as it was seemingly not subjected to recent looting (Fig. 5.22). The cairn had a roughly circular base of about 6.3 m in diameter, and it stood up to 1.3 m high. In

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

the centre of the cairn part of a wall outline was already visible, made of relatively large basalt boulders, that potentially was part of a burial chamber. There was no pre-Islamic rock art associated with this cairn.

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

Architecture & burials

Similar to Structure 5A this cairn appeared to contain a central circular wall (Fig. 5.23). This ring had an interior diameter of ca. 1.5 m and an exterior diameter of ca. 2.75 m. It stood up to 85 cm high and featured a neatly constructed façade on the exterior. This wall was constructed of both slabs and boulders, and partially stood on large naturally occurring rocks which gave the wall some additional elevation. The fill of the circular chamber consisted of basalt boulders and wind-blown sand deposits. Within these deposits several beads were contained as well as small fragments of human skeletal remains. More skeletal remains and jewellery was retrieved from the cover of basalt and wind-blown sand that was lying against the exterior of the circular chamber (Fig. 5.24).

The bottom of this chamber was reached without encountering any articulated human skeletal remains. The chamber did not have a paved floor. Rather, 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. In this pit the fully articulated remains of a human skeleton were encountered (Fig. 5.25). For this burial (Burial 1) the body was interred in a fully contracted position on its right side, with the head towards 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 in turn covered by rocks that filled up the circular chamber. A bone sample from this burial (SN16-217) returned a radiocarbon date of AD 425-579 (Table 5.6).

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 were from a second individual, also a young adult (Inskip 2016).

Artefacts

A total of 17 artefacts were found in the cairn (Fig. 5.26). Some of these came from the fill of the central chamber while others came from the cover on the exterior of the chamber. None of them were clearly associated with Burial 1. Instead, they most probably derive from another yet heavily disturbed burial that was identified within the fragmentary skeletal remains. 16 of the artefacts were beads, mostly made of red semi-translucent stone, but beads made of bone, shell, and possibly glass paste were also present. None of these artefacts are closely datable. Additionally

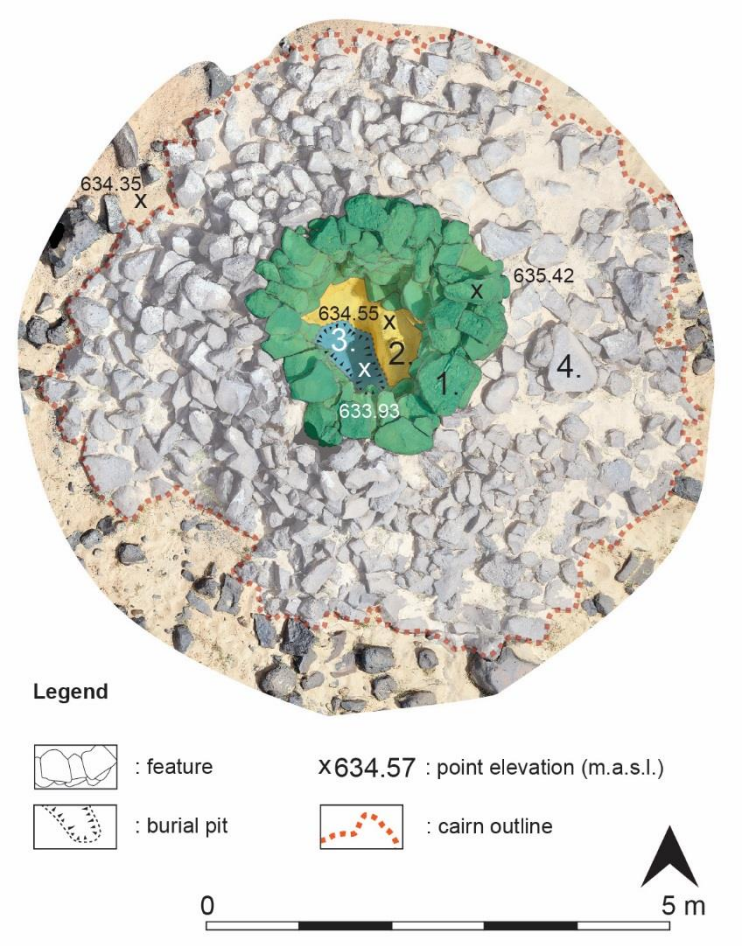

Figure 5.23: Features exposed through excavations at Structure 9 (QUR-9): 1) façade; 2) burial chamber; 3) burial pit 4) cover. Base image: photogrammetric reconstruction.

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

a gold earring was found, featuring a simple hoop to which a granulated pendant was attached, possibly representing grapes, flanked by two larger spheres. 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-9th centuries BC (Ogden 1995, Figs. 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.

Discussion

The results of the excavation are surprising in several ways. A remarkably well preserved Byzantine-period grave was encountered buried underneath the cairn rather than within its central chamber. The fact that the body was covered by soil and subsequently with rocks probably contributed to the good state of preservation in which it was encountered. This burial, however, does not seem to represent the original one. Firstly, the pit in which the body was interred was dug out partially underneath the wall of the circular chamber, which seems an unlikely procedure as this would partially undermine the structure. Secondly, remains of a second burial were found in the fill of the chamber and the surrounding cover. Among these remains was a gold earring possibly dating 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 interred on the original floor of the chamber. Later, during the 5th or 6th century AD, the central chamber was reopened for the interment of the inhumation grave, through which the older burial was disturbed and its remains were scattered over the chamber and its cover. This would also suggest that the rocks covering the exterior of the circular chamber were applied prior

Figure 5.26: Selected artefacts from fill and cover of Structure 9 (QUR-9): 1) stone beads; 2) bone bead; 3) shell bead; 4) stone bead; 5) gold earring. Note that these are not associated to Burial 1 but probably to an older, heavily disturbed burial.

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 OUR-9, Structure 9.

to the interment of the Byzantine burial, although it seems unlikely that this was an original feature of the cairn. This assumption is based on the fact that the chamber wall itself was rather elaborately constructed, featuring a nicely set façade on the exterior, which was probably created to be visible from the outside. In fact, some of this façade was still visible when encountered during the survey.

5.2.6. QUR-970

The site of QUR-970 is situated on top of the northwest part of the basalt plateau. The site's main features are a large cairn (Structure 1) with a pendant attached (Structure 2) (Fig. 5.27a). Two Safaitic inscriptions are located within a few meters around the cairn while a third one was lying on the top of the cairn. The cairn and pendant were excavated to investigate the nature of the architecture and potential burials and their chronology.

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 with an elongated shape was observed. 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 make drawings of the cairn. The chamber observed on the top of the cairn was excavated first, after which the remainder of the structure was investigated.

Architecture & burials

The elongated chamber observed on the 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. Below this burial and chamber the original construction of the cairn was unearthed. Similar to the cairns at QUR-9 this cairn featured a circular wall in its centre which had served as a burial chamber (Fig. 5.27b). This 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. Part of the chamber was poorly defined on its northwest side but other than that it was well preserved. The chamber did not feature a paved floor. Rather, its bottom consisted of an irregular layer of stone, perhaps representing the natural surface cover in this area. A depression within this floor layer was present in the southern half of the chamber, which possibly served as a burial cavity. The fill of this depression consisted of windblown deposits containing relatively few stones, while the rest of the chamber was filled up with a dense layer of rocks. Highly fragmentary human skeletal remains were found (see below) dispersed over various parts of the cairn, including the circular chamber and its exterior cover. Additionally, a number of artefacts (see below) were found, also in the circular chamber and its exterior cover.

Skeletal remains

Two individuals were recognized within the incomplete and highly fragmentary human skeletal remains from the cairn, in addition to the modern skeleton. These 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.

Artefacts

Although many artefacts were retrieved during the excavations most of these were associated with the modern burial. The only objects of a potentially more ancient origin were four greenstone objects, including three beads.

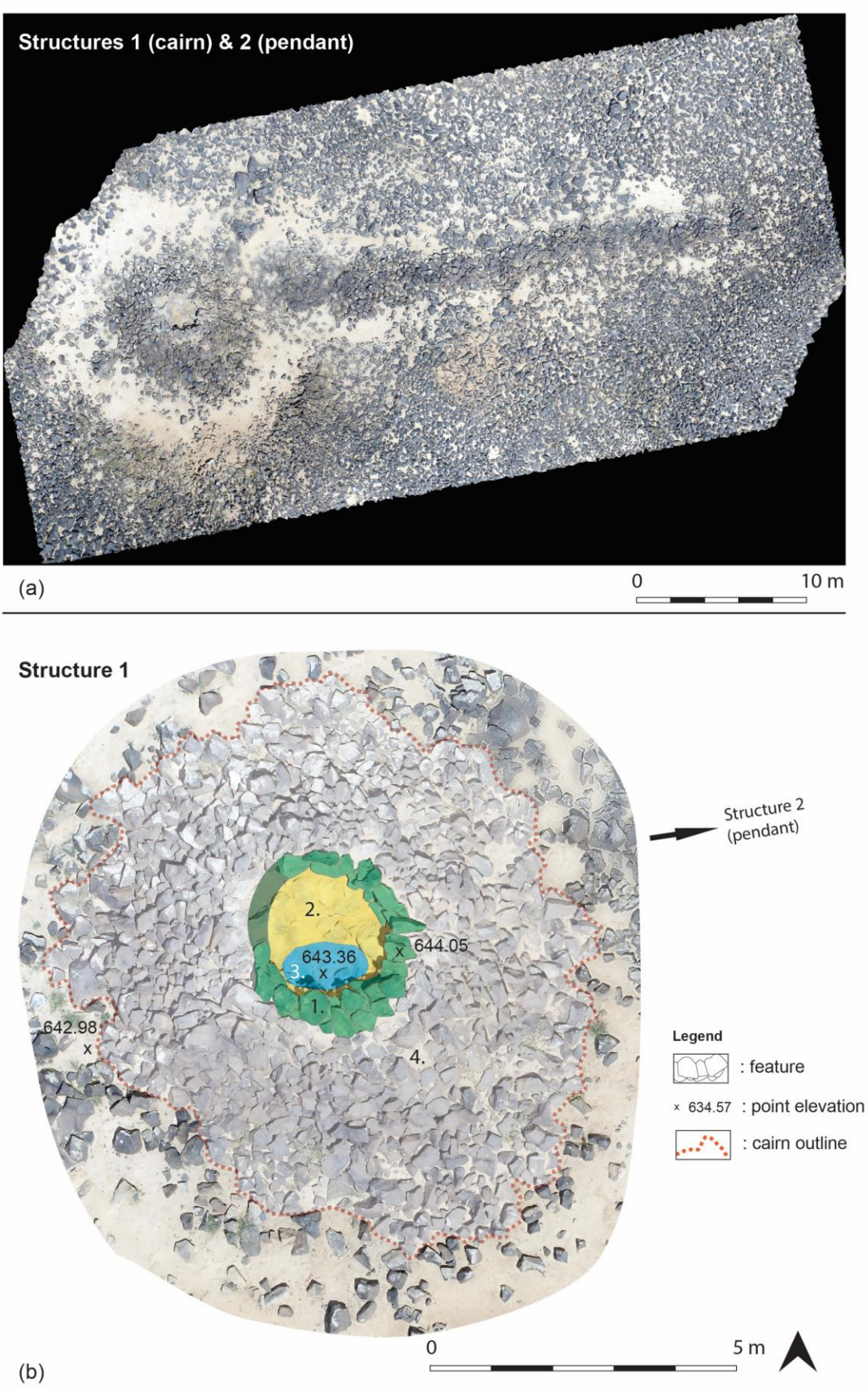

Figure 5.27: Excavated features at QUR-970: 1) façade (dark green shades are reconstructions); 2) burial chamber; 3) burial cavity; 4) cover. Base images: photogrammetric reconstructions based on drone- and handheld photographs.

Discussion

Although this cairn was clearly used as a tomb in antiquity it is difficult to reconstruct the origin and nature of the tomb in detail due to the poor state of preservation of the ancient burial contexts. A likely origin for the fragmentary skeletal remains was the oval depression within the circular chamber, but this cannot be said with certainty. Closely datable material was not encountered. It remains uncertain when this cairn was constructed and when burials were interred prior to its recent use.

Structure 2 (pendant)

This pendant consists of 13 clearly recognizable individual cairns, and diverges from the main cairn (Structure 1) over length of about 30 m in an eastern trajectory. Its individual cairns appeared as irregular, loosely piled stone heaps, and did not feature 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 & 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 (Fig. 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 and the late 3rd century BC.

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

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.

Discussion

Although no direct chronological relationship between Structures 1 and 2 could be established, if we assume that 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 is situated on the top of a basalt promontory on the east side of Wadi Rajil. Its main feature – Structure 1 – is a cairn that was already 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 of the cairn, where also two protrusions formed a crescent-shaped attachment 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 a chamber – seemingly looted – was already clearly visible. To the north of the cairn, at about two meters distance, three small stone heaps formed a pendant tail of only 9.3 m long, diverging from the cairn in a northern trajectory.

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. Secondly, the external façade, already visible prior to excavations, was further uncovered by removing the cover of loose basalt stones that lay against it, in order to study the architecture and to look for additional features.

Architecture and burial (Fig. 5.29)

The façade could be traced around much of the exterior of the cairn, by removing the cover of small and loosely piled basalt stones that obscured much of it beforehand. The facade was constructed mostly of large basalt slabs – some of which over 1 m long – that were sometimes alternated by regular boulders. The façade was best preserved on the north and east side, where it stood over 1 m high, or up to 5 stone courses (Fig. 5.30). On the south side it was less well preserved but still clearly defined, whereas on the west side most of the façade had apparently crumbled. Here, some basalt slabs had dislocated and were lying next to the presumed original outline of the façade. The outline of the façade – partially reconstructed – has a diameter of about 3 m.

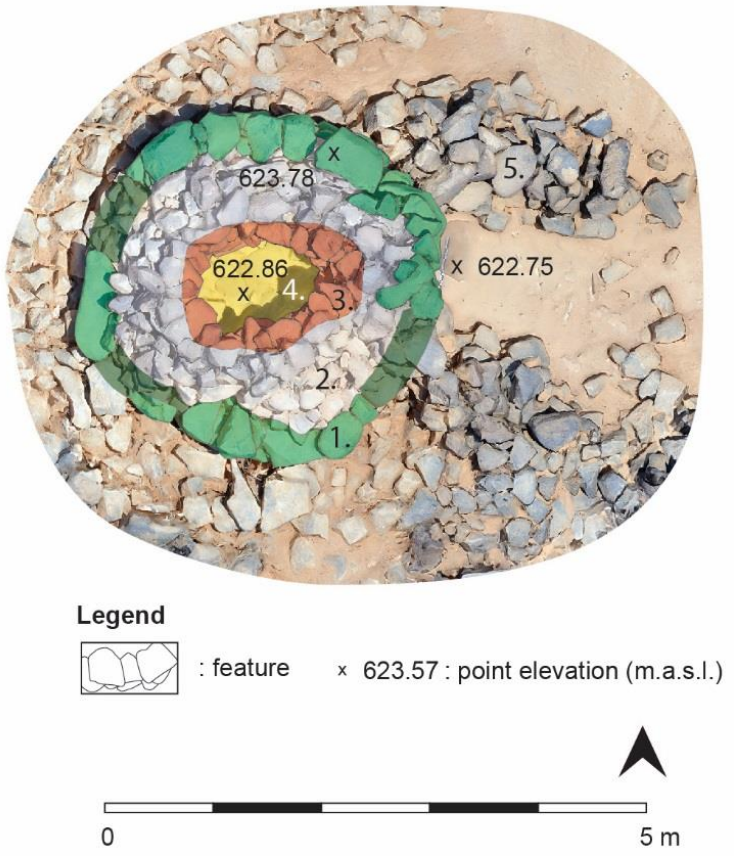

Figure 5.29: Features exposed through excavation at QUR-956 (Structure 1): 1) façade (dark green shades are reconstructions); 2) cover of burial chamber; 3) corbelled wall of burial chamber; 4) burial chamber; 5) protruding arms (not original).

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 was best preserved on the west side of the chamber. These corbelled walls stood on top of a floor paved with basalt flagstones, which was in turn covered by a layer soil of a about 10cm thick that contained much natural flint pieces. On this flint-rich surface lay a layer of soil in which the poorly preserved remains of a human burial were found, which 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 30cm of the chamber was completely empty. It was either emptied already by looters or had never been filled in by rocks or soil. The absence of looter's debris outside the chamber suggests the latter is more likely.

For the corbelled construction of the burial chamber the fill of loose and relatively small basalt stones that lay on top of the chamber walls acted as a counterweight to support the construction. Importantly, part of this fill was overlying the (partially) collapsed façade on the south and west side of the cairn. This would indicate 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 entailed only repairs of 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 – possibly associated with structural modifications – as these remains were not lying on the original floor of the chamber but on top of a soil layer containing much unworked flint. This unworked flint suggests that soil was brought into the chamber purposefully prior to the interment of a body.

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

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 the individual was buried here between the late 1st and early 3rd century AD, although the 1 sigma range shows that chances for a date after the early 2nd century are small.

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.

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.

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 and a few pieces of bronze, some of which may be the remnants of a pin or broche (Fig. 5.31). They are from the same contexts as the human bone fragment, and are likely to represent associated grave gifts.

OSL-dates

In order to establish the original construction date of the cairn a soil sample for OSL dating was collected from underneath one of the base stones of the external façade (Fig. 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 needs further explanation (see § 5.2.13.). There are no indications, however, that the sampling context or procedure is problematic.

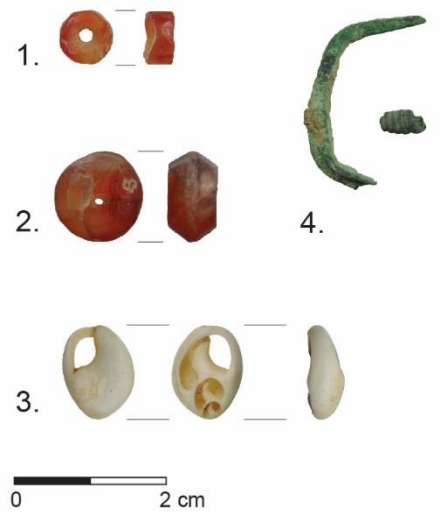

Figure 5.31: Selected artefacts from the burial chamber in structure 1 (QUR-956): 1 & 2) stone beads; 3) shell pendant; 4) fragments of bronze jewellery.

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 cover 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.

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 of the cairn's cover 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 refers to a burial or burial cairn (Della Puppa forthcoming). The relation to the short pendant must remain unknown for now as well, since this pendant has not been dated. Although it is probably not prehistoric, as suggested by all the OSL dates from other pendants, whether it is contemporaneous with the dated skeletal remains is unknown.

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

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

Structure 13 is the largest of several burial cairns situated on the very top of Jebel Qurma, the prominent and isolated basalt-capped hill situated on the eastern edge of Wadi Rajil (Fig. 5.33). 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 had been looted extensively in recent times, leaving a large depression in the centre of the cairn, and large amounts of looting debris on the northern slopes of the cairn. Nonetheless, visible already prior to excavation were a number of features, including parts of a massive circular wall in the centre of the cairn. Incorporated in this wall were stones on which Safaitic inscriptions had been carved. These inscriptions were visible in the seams of the wall (Fig. 5.34), indicating that some of the stones at this site already bore inscriptions before they were used to construct this wall. Part of another feature was visible on the southeast slope of the cairn, where part of a façade also appeared to be present. Importantly, these potential features were present in areas of the cairns 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.

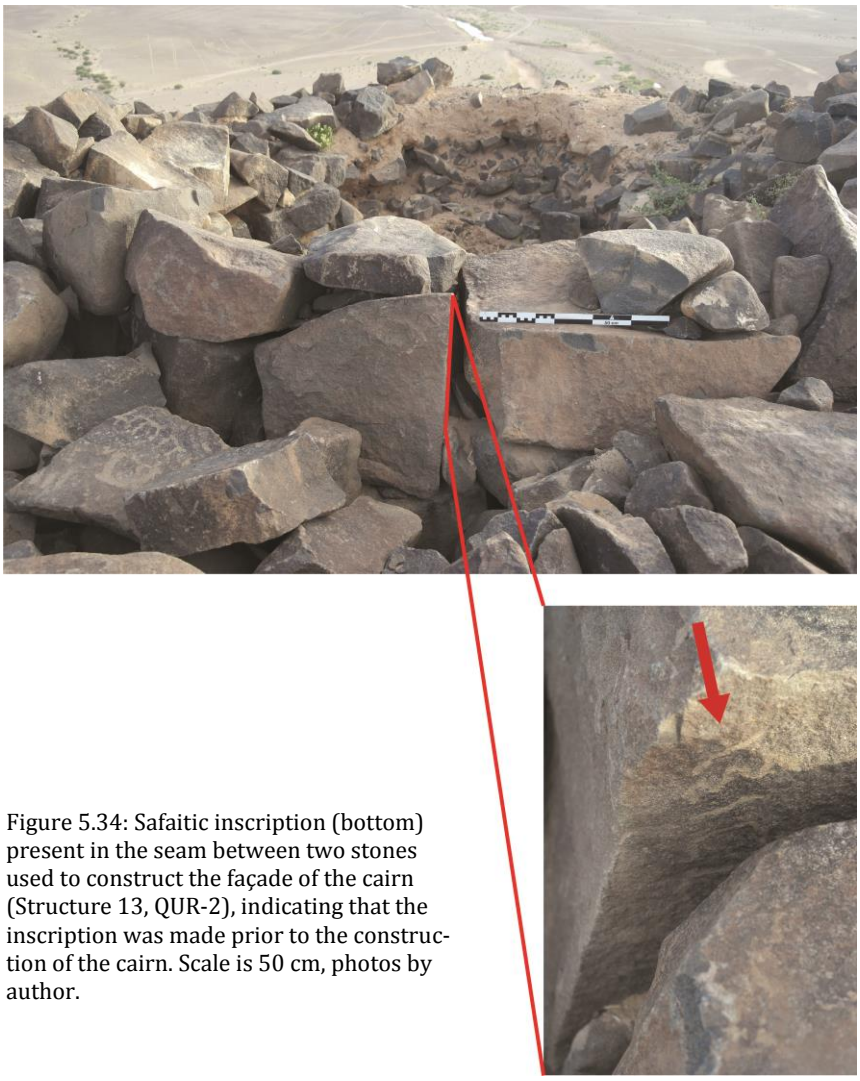

Figure 5.34: Safaitic inscription (bottom) present in the seam between two stones used to construct the façade of the cairn (Structure 13, QUR-2), indicating that the inscription was made prior to the construction of the cairn. Scale is 50 cm, photos by author.

The excavations largely focussed on the areas of the cairn that were situated outside the central circular wall observed prior to excavations. This 'cover' of loosely piled basalt stones was removed layer after layer, 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 looting debris had been deposited.[1]

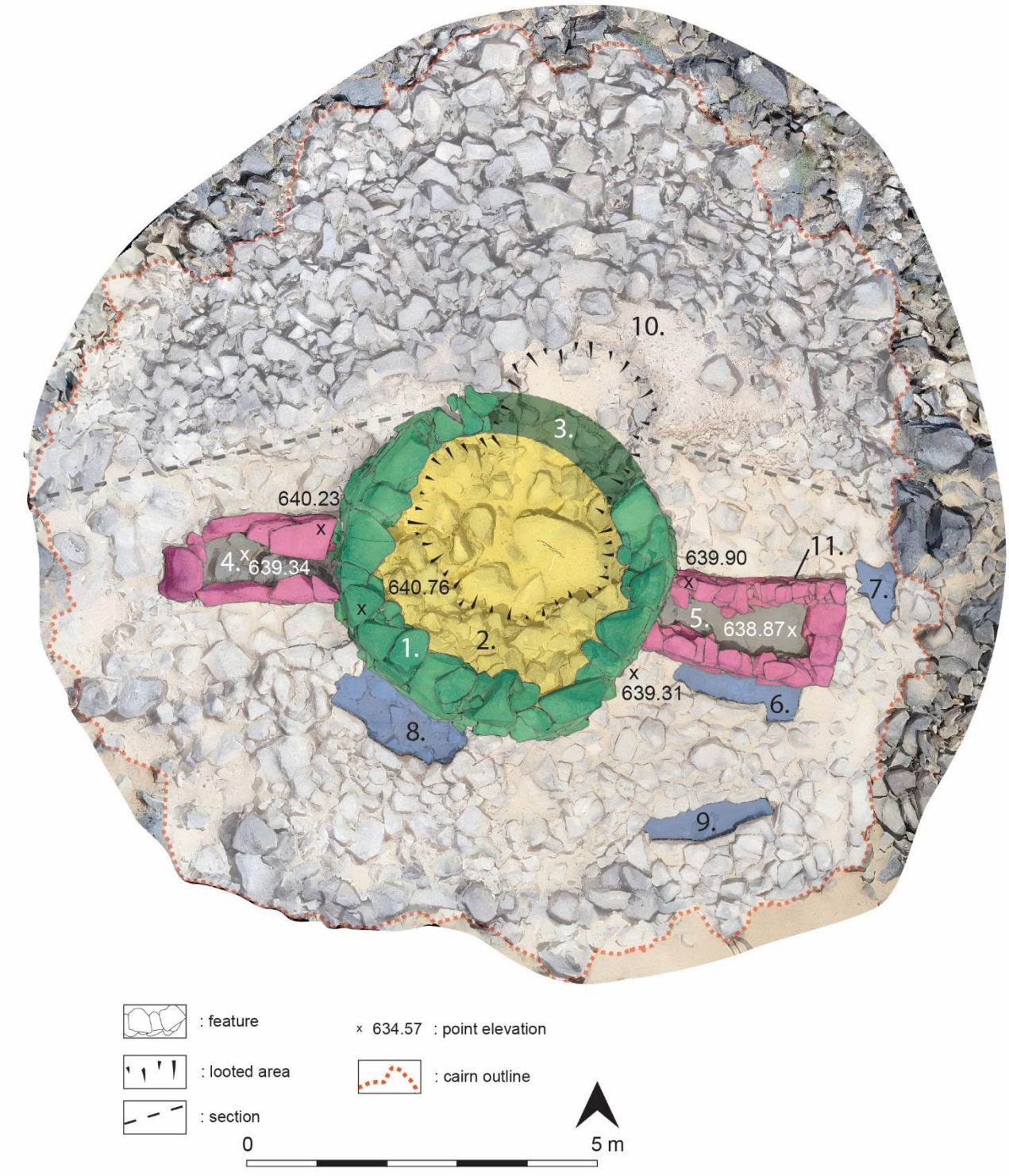

Figure 5.35: Features revealed through excavations at Structure 13 (QUR-2): 1) façade; 2) disturbed interior of the cairn; 3) reconstruction of the façade; 4) chamber A; 5) chamber D; 6) burial cavity E; 7) burial cavity F; 8) chamber B; 9) chamber C; 10) unexcavated looter's debris; 11) OSL sampling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

[1] These areas were excavated in 2017, but not incorporated in this research.

Architecture & burials

The excavations uncovered large parts of what had once been a circular tower-like feature in the centre of the cairn (Fig. 5.35). It was well-preserved on most sides but demolished by looters on the northeast side. This tower had an exterior diameter of about 4.8 m at its base and stood up to 1.45 m high (Fig. 5.36). Its interior diameter was about 3.15 m. Up to four courses of often massive stone boulders and slabs were used for the construction of this tower. These blocks were neatly placed with their flat surfaces facing outside, thereby forming a fairly smooth and nearly straight façade. Some of the blocks used for this construction were very massive. Indeed, a roughly rectangular block situated on the very top of the tower measured 84 by 40 by 34 cm, and probably weighed over 400 kg.[2] Stones even larger than this one were incorporated in the structure. Due to extensive looting any potential remains of an interior chamber were destroyed. Within the debris of the looting activities, however, the skeletal remains of at least three individuals – two adults and a possible sub-adult – were recognised (Inskip 2016), indicating that the tower had been used as a tomb. Five bone samples from these individuals were sent out for radiocarbon dating. 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 (Table 5.10).

Figure 5.36: Façade of Structure 13 (QUR-2). 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)
SN16-204	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 – AD 72 (62.4%)	50 BC – AD 125 (95.4%)

Table 5.10: Radiocarbon dates from QUR-2, Structure 13.

Two rectilinear ante-chambers had been constructed against the façade, on the west (chamber A) and east side (chamber D). Chamber A was largely made of basalt slabs that were placed on their sides,

[2] A specific gravity of 3.7 grams per cm^3 is used here, following Rollefson (2013, 222).

enclosing a room measuring 2.00 by 0.86 m (Fig. 5.37). On the exterior of the basalt slab on the westernmost end two Safaitic inscriptions had been carved (QUR-2.283.1 & 2) mentioning personal names and pastoral activities (Della Puppa forthcoming). In the fill of this chamber only very flimsy and unidentifiable bone fragments were found. Chamber D, however, yielded more convincing evidence for the use of the chamber as a tomb. This chamber had more or less similar dimensions, measuring 2.30 by 0.55 m on the interior, but had a neatly constructed drystone wall of three to four courses high (Fig. 5.38). A Safaitic inscription (QUR-2.704.1) – probably a personal name (Della Puppa forthcoming) – had been carved on the exterior of this wall. The chamber contained the partially articulated human skeletal remains of two individuals – a woman and probably a man (Inskip 2016) – which were buried in a contracted position on top of each other in the eastern part of the chamber. The remains were not clearly separated, and therefore seem 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. A number of artefacts, probably grave gifts, were found in association with these skeletal remains (see below).

Against the southern wall of chamber D an elongated trench-like feature (E) was uncovered surrounded by a row of neatly placed slabs. In this cavity the remains of yet another human burial were exposed. These included the human skeletal remains of a single individual – probably a male (Inskip 2016) – which, due to poor preservation, could not be radiocarbon dated. Also found here were large amounts of beads and four bronze coins, one of which was identified as a late 2nd or early 1st century BC Seleucid coin (see below). This simple tomb was created against the façade of tomb D and was probably covered simply by stones piled on top of the grave. 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).

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.

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.

More human skeletal remains were encountered in another cavity (F), situated to the northeast of chamber D. This cavity measured only about 1.00 by 0.55 m and was unlined. The unarticulated remains of two individuals were encountered in it, which mostly included long bones and the skulls, and may therefore represent secondary burials. Their poor state of preservation prevented radiocarbon dating of the bone material. Also, no

clearly associated artefacts were present in this context.

Two more tombs were added to 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. Similarly, well-preserved skeletal remains and textile were encountered in tomb C – the construction of which was already partially visible prior to excavation. Although the bones could not be radiocarbon dated, the state of preservation of the skeleton and textiles and its orientation makes a relatively recent date likely.

In summary, although the remains from multiple individuals were encountered in various tombs in Structure 13, only three of these 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 area 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 area F, and one or more individuals from the central tower. Evidence for relatively recent (Ottoman/mandate-period) reuse of the structure is also attested.

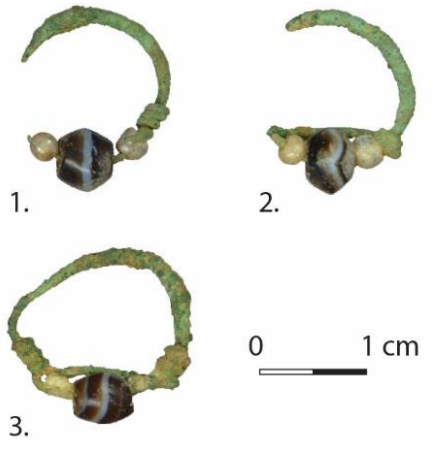

Figure 5.39: Three bronze earrings with pendants of pearl and stone from chamber D (QUR-2, Structure 13).

Artefacts

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

More jewellery was encountered in tomb E. Over a hundred beads were found here, perhaps all part of necklace (Fig. 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 representing jewellery included two iron rings and a bronze ring, two earrings, three fragments of a glass object and part of a chain

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

made of three bronze links (Fig. 5.41). Finally, four bronze coins were found in tomb E, with diameters between 12 and 16 mm. They were heavily corroded, obscuring completely the imprints of two of the coins. On a third coin (Fig. 5.41 no. 1) a palm tree was visible which is typologically characteristic of Seleucid coins from the late 3rd to 1st centuries BC. The fourth coin (Fig. 5.41 no. 2) was more clearly identifiable. Its obverse side features the head of Athena with helmet 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 therefore be assigned to the reign of the Seleucid king Antioch IX (114/3 – 95 BC).

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 on natural soil, which was sampled to obtain the construction date of the tomb (Fig. 5.42). The sample (SN16-234) returned an OSL date of 2.19 ± 0.15 ka BP (Table 5.11), which puts the construction date of tomb D between about 325 and 25 BC.

Discussion

The excavations at Structure 13 revealed a complex sequence of use and reuse which, unfortunately, cannot be reconstructed in full detail due to circumstances of preservation. Nevertheless, what is clear is that the central tower was constructed after Safaitic inscriptions had been created at this site, given the fact that stones carrying inscriptions were reused in the construction of the tower. If we were to follow the traditional chronology of Safaitic the

Figure 5.41: Selected artefacts from chamber E (QUR-2, Structure 13): 1 & 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 from underneath a base stone (marked) of the wall of chamber D (QUR-2, Structure 13) was collected. Left: stone in-situ. Right: isolated stone prior to sampling. Scale is 50 cm, photos by author.

tower post-dates the 2nd century BC. Given the OSL date obtained from underneath tomb D, however, the tower cannot be younger than the 1st century BC.

Originally the tower must have been free-standing, i.e., without the thick cover of stone and soil visible prior to the excavations. A number of observations are suggestive of this, 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-16th century AD burial. Originally, therefore, the façade of the tower was meant to be visible instead of obscured.

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.

Whether the two rectangular ante-chambers A and D were part of the original construction or added during a later event is impossible to say. The OSL and radiocarbon dates from chamber D at least suggest that this chamber was not created much later than the tower, but when chamber A was created is impossible to say at this point. Also added during roughly the same period was the burial in area E, where the Hellenistic coins came from. Where the skeletal remains from area F originate from, both in space and time, is difficult to say at this point as well.

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 the construction. If the entire wall of the tower stood 1.45 m high originally, and was about 80 cm thick, as suggested by the measurements carried out, than the entire wall consisted of about 215 tonnes of stone.[3] Furthermore, some of the individual blocks may weigh over 400 kg, and such stones were not only placed at the base of the tower but placed at a height of one metre above the surface. Lifting these rocks to place them there must have been a undertaking requiring perhaps six people or more or, alternatively, a ramp or other kind of construction that would have facilitated this arduous task.

5.2.9. QUR-148, Structure 23

Structure 23 is cairn that is situated at the large, multi-period site or QUR-148 (Fig. 5.43). It was seemingly constructed on top of a large prehistoric Wheel structure. Prior to excavation the presumed diame ter of the cairn measured 9.1 m. A number of architectural features were already visible, including a burial chamber and part of a façade. The burial chamber was unfortunately disturbed by recent looting activities, although parts of the chamber appeared to be still intact (Fig. 5.44). Concentrations of looter's debris, from which during the survey already some human

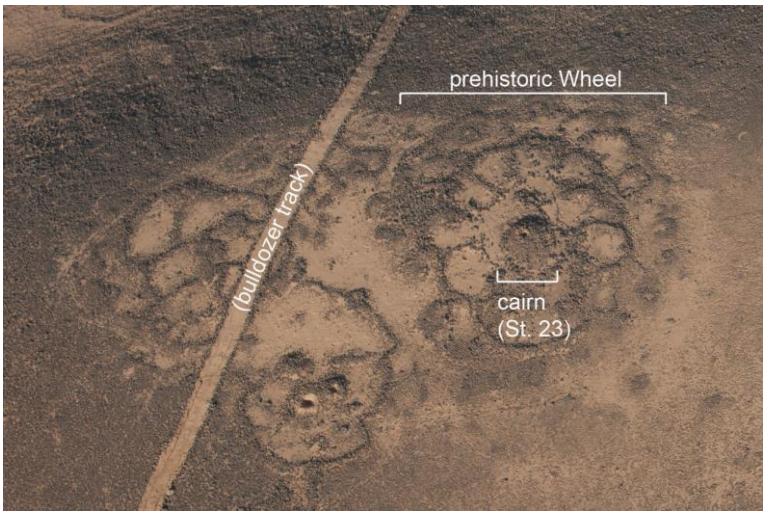

Figure 5.43: Aerial view of the site of QUR-148 indicating Structure 23 overlying a prehistoric wheel. Aerial photograph by David Kennedy (courtesy of APAAME).

[3] This number 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 entire tower subtracted by the volume of the interior of the tower, multiplied by the specific gravity of basalt).

skeletal remains were salvaged, was lying on the slope of the cairn to the southwest of the chamber, suggesting that we were indeed dealing with a burial chamber. A large basalt slab, probably covering the chamber earlier, had fallen into the chamber.

On and around the cairn a total of 277 Safaitic inscriptions and 198 petroglyphs were found, distributed mainly around the eastern part of the cairn, rather than directly on it.

Initially, some time was spent on cleaning the looter's debris on the southwest side of the cairn, where some human bone material had already been observed. The excavations then focused on the central burial chamber, the anticipated facades, and the general cairn fill in between. Due to time constraints it was decided to excavate only about half of the cairn,[4] although the central burial chamber was excavated in its entirety.


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.

Architecture & burials (Fig. 5.45)

The excavations of the cairn exposed a façade (D) over a length of about 6 m, 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 5 stone courses (Fig. 5.46). It had been constructed of both 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 blocks and on smaller stones in between. Although it is unclear whether this 'platform' is completely natural or partially man-made, it was used to give the tomb some 50 cm of additional elevation above the surface surrounding the cairn.

In the centre of the tomb was a chamber (A) of roughly oval shape, measuring 1.7 by 0.9 m. Its long axis had a NW-SE orientation. Some corbelling was observed in the construction of its walls, and the large slab that had fallen into the chamber possibly covered the chamber at some point, 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 that may have been naturally occurring (Fig. 5.47).

Chamber A was used on multiple occasions for the interment of a human body. In the looter's debris as well as in the unlooted parts of the chamber the skeletal remains of at least three human individuals were found. 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 slightly extended on the SE side. The third individual was an adult but could unfortunately not be dated since no collagen was preserved in the bone tissue. In addition to these skeletal remains a number of beads as well as a small fragment of iron were found in the chamber (see below). These may have been

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

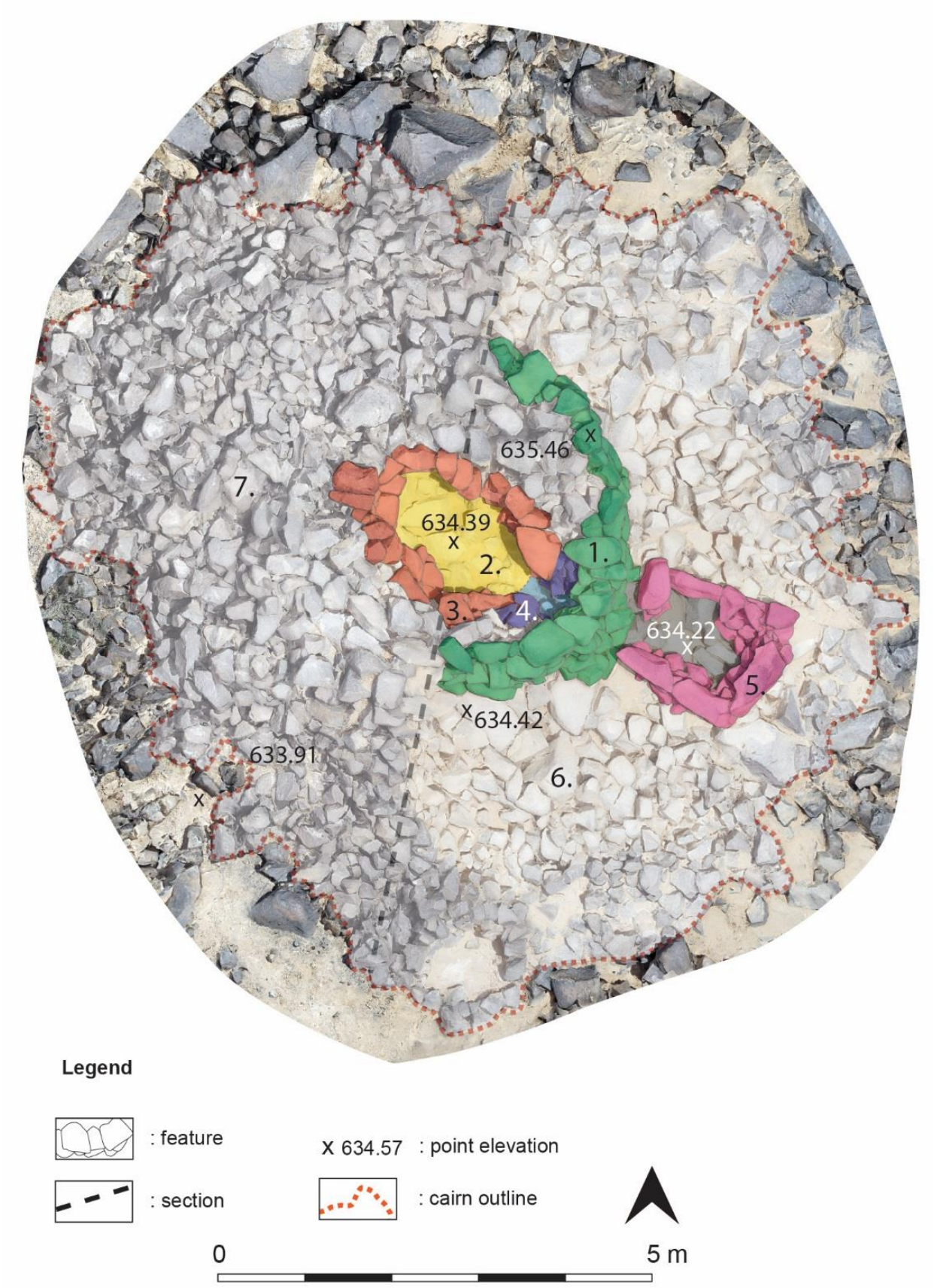

Figure 5.45: Features exposed through excavations at Structure 23 (QUR-148): 1) façade D; 2) chamber A; 3) wall of chamber A; 4) extension of chamber A; 5) chamber B; 6) excavated part of the cairn's cover; 7) unexcavated part of the cairn's cover. Base image: photogrammetric reconstruction.

part of a grave inventory, but to which burial they belonged is impossible to say because of the frequent reuse and partial looting of the chamber.

Another burial chamber had been 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 (Fig. 5.48). On one of these slabs was a Safaitic inscription. The interior of the chamber measured 1.4 by 1.05 m. The exterior façade was preserved to a 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. In this fill the skeletal remains of two individuals were situated. Although this chamber was not subjected to recent looting, these remains were found in a poor state of preservation and not in anatomical position (Fig. 5.49). Unfortunately no collagen was preserved in the bone tissue either, making them unsuitable for radiocarbon dating. In addition to the skeletal remains a large number of beads was found in the fill of this chamber (see below).

Both façade D and chamber B had been covered by basalt boulders, between which windblown sediments had accumulated. This cover was about 80cm thick and had obscured much of the tomb after its construction. How and when this cover was formed is not entirely clear. In the fill of this cover some skeletal remains were found. Much of these probably belonged to the individuals that were originally buried

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

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

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.

in chamber A, but were thrown out of the chamber and onto the cover by looters. These also included the remains of a neonate.

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

Skeletal remains

Two individuals – all from chamber A – were relatively recent, i.e. post-13th century AD (Table 5.12), while the skeletal remains from the remaining individuals could not be dated due to a lack of collagen. Although it seems reasonable to assume that these remains, given their poor state of preservation, predate the Mamluk period, there is at this point no way of telling how old they are exactly.

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, and a piece of iron. As noted above, they could not be clearly related to a specific burial. A few of the larger glass beads from this context have circular inlays. These so-called eye beads are unfortunately not datable with any precision. From the cairn cover came another 12 beads, including one made from cowrie shell, possibly originating from looted chamber A. From chamber B came another 37 beads, mostly made of a glass paste (Fig. 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 Fig. 5.40), and may therefore have a similar date. Importantly, ceramics were nearly absent, apart from a fragment of an Ottoman pipe head that was found in the cairn's cover.

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

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

Discussion

In terms of morphology the excavated cairn seems to be largely comparable to Structure 13 at QUR-2. The cairn featured a large and well-constructed façade against which a smaller burial chamber had been placed. Whether a similar ante-chamber is situated on the opposite side of the cairn remains unknown as this part was not excavated. A complete reconstruction of the chronology of this cairn is, however, 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.

The original construction date of the cairn could not be established independently. Unlike the cairns at, for example, 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 on one of the stones used to construct ante-chamber B. The cairn must therefore be pre-Islamic, but for 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, not only because none of the skeletal remains could be safely attributed to this period but also 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 of the individual burials nor datable on typological grounds.

5.2.10. QUR-186, Structure 1

The site of QUR-186, surveyed during the 2015 campaign, is situated on the slopes and top of a ridge overlooking Wadi Rajil. Although the site mostly consists of prehistoric features, including a series of

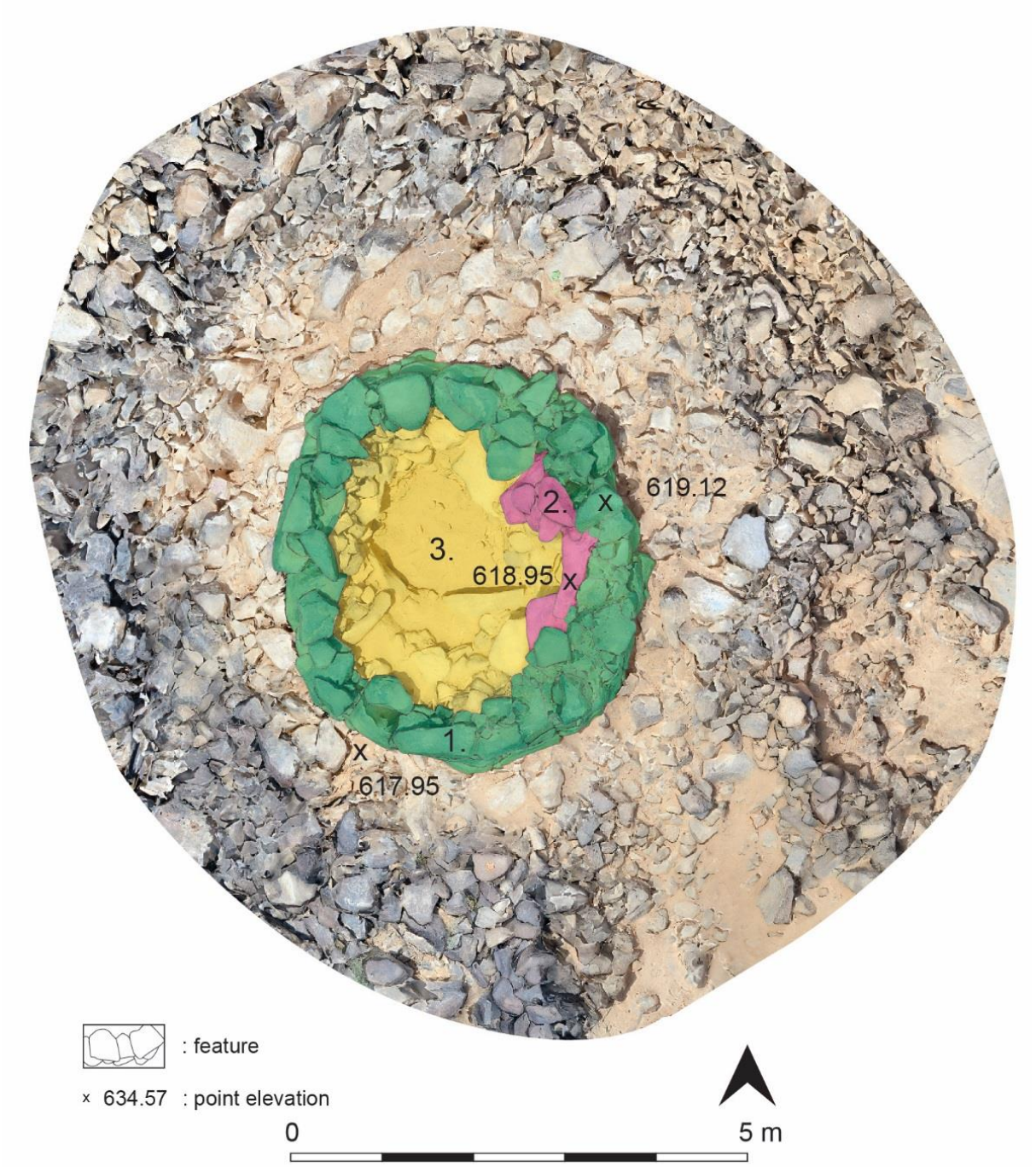

Figure 5.51: Features exposed through excavation at QUR-186, Structure 1: 1) façade; 2) remains of a corbelled wall of the burial chamber; 3) burial chamber heavily disturbed by looting.

enclosures – partly destroyed by bulldozing activities – and a cairn field dating to the Early Bronze Age (Akkermans & Huigens in press), the site also features a large cairn 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 below. Unfortunately the cairn had been extensively looted before it was documented, leaving a large pit of ca. 1.8 m deep in the centre of the cairn and much debris around it. It was tentatively observed that the cairn originally featured a façade that had been largely covered by looter's debris. It was decided to clean the interior and exterior of the cairn of looter's debris to investigate what was left of the architecture and to collect any skeletal remains and artefacts.

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

Architecture (Fig. 5.51)

The cairn's façade had been constructed of 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 0.93 m or 4 stone courses high (Fig. 5.52). It formed a circular tower-like structure of about 4.30 m in diameter. Some of these slabs were over a meter long and 30 cm thick, and may weigh well over 200 kg. The slabs were not hewn, but retained their natural irregularity. As a result, many cavities existed in the seams between the larger slabs, which had sometimes been filled up with smaller rocks.

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

Although the interior of the tower had been largely destroyed by looters, part of a rounded corbelled construction was preserved in the east part of the tower, probably representing 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 had been constructed on top of a fairly irregular stone layer that gave the tower some 70cm of additional height. Whether this stone layer is of natural or anthropogenic origin is unknown.

Some of the stones of the façade contained Safaitic inscriptions and petroglyphs. Especially interesting is RA-95, which includes a carving of a camel, now rendered as if it were floating upside down (Fig. 5.53). The Safaitic inscription next to it (QUR-186.95.1) refers to the camel. Surely this panel is not in its original location. Rather, it must have already existed before it was moved and incorporated in the façade during the construction 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.

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) that was obtained from these bones indicates 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	AD 142-155 (6.2%) AD 168-195 (15.1%) AD 209-256 (36.4%) AD 300-318 (10.5%)	AD 132-262 (74.2%) AD 277-328 (21.2%)

Table 5.13: Radiocarbon date from QUR-186, Structure 1.

Small finds

From the looter's debris in and around the cairn came a small number of artefacts (Fig. 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.

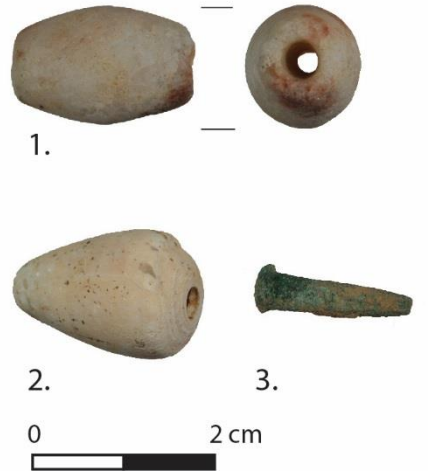

Figure 5.54: Selected artefacts from QUR-186 (Structure 1): 1) stone bead; 2) shell bead; 3) bronze pin/rod.

Discussion

Although prior to excavation this cairn was in a poor state of preservation due to recent looting a number of interesting observations can be made based on the cleaning activities. The human skeletal remains from the looter's debris suggest that the structure was used as a tomb. These remains were probably interred in a burial chamber that had been constructed within the cairn. Although there is no evidence for multiple individuals in the skeletal remains 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. Clearly, there was already rock art present prior to the construction of the tomb.

5.2.11. QUR-829

This site is situated on a low hillock in Wadi Rajil and is covered by natural flint gravel rather than basalt. The site covers an area of approximately 250 m^2. On top of the hillock and on its slopes 6 oval pits were observed during survey activities, which were apparently all the result of recent looting activities. All of the pits were broadly orientated east-west. On the bottom of these pits and in the looter's debris

Figure 5.55: Structure 1 at QUR-829: a small unlined pit containig 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 & 3) glass paste beads; 4) beads; 5) bone pendant fragment (?); 6) bronze (ear)ring fragment.

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.

around them human skeletal remains were observed. Subsequent cleaning of these pits revealed more funerary remains, including artefacts, as well as some simple architectural remains of the tombs.

All of the looted areas 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 was 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 (Fig. 5.55). The human skeletal remains retrieved from within the pit were from a young child, around 4 years of age (Inskip 2015a). These skeletal remains were radiocarbon dated to 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 (Fig. 5.56) and part of what may have been bone pendant, as well as fragmentary remains of iron and bronze objects.

Remains of a second pre-Islamic burial were found in Structure 5, which also appeared to have

been an unlined pit-grave. It was about 135 by 55 cm wide and about 50 cm deep (Fig. 5.57). Numerous human skeletal remains were retrieved from the disturbed fill of the pit and the looter's debris around it, probably from a

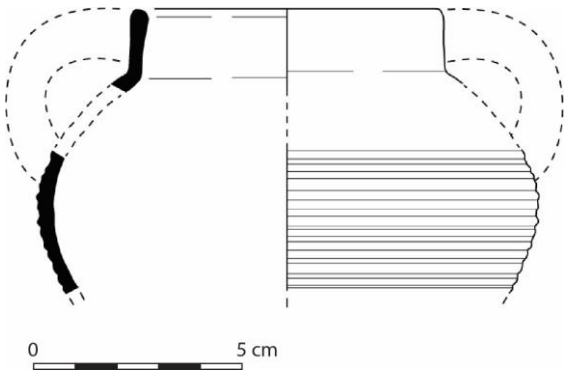

Figure 5.58: Pottery vessel fragment associated with the burial in Structure 5 (QUR-829). It was dated on typological grounds to the Late Roman or Byzantine period. Parallels: Alliata 1992, Fig. 9:19; Smith 1973, Pl. 43:1327. Drawn by A. Kaneda.

single individual.[5] Ceramics were also found in the disturbed fill of the pit, which appeared to originate from a single pottery vessel that was probably part of the grave inventory. It was dated on typological grounds to the Late Roman or Byzantine period (Fig. 5.58).

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.

5.2.12. Other excavations

In addition to the excavation results described above there were a number of cairns excavated that provided little information on funerary customs from the Classical and Late Antique period, but do merit a brief discussion as they provided insights into the variability within the total corpus of funerary monuments of the Jebel Qurma region.

More evidence for the presence of prehistoric burial cairns in the Jebel Qurma region was attested at the site of QUR-186, which was already briefly introduced above. Here, a cairn field comprising about 50 small cairns was present, and excavations carried out at these cairns showed that many – of not all – of these cairns should be dated to the Early Bronze Age, evidenced by the presence of distinctive pottery vessels within some of these cairns). Importantly, these cairns were relatively small – in any case much smaller than the more recent cairns described above. These were not larger than about 2.2 m in diameter and 1.2 m in height (Akkermans & Brüning 2017).

Furthermore, for some of the excavated cairn it is not certain that they ever served a funerary purpose, as these were devoid of any human skeletal remains and artefacts. Although it would be beyond the scope of this work to discuss the excavations results of these cairns in detail, suffice it to say that most of these cairns (77%) were of relatively restricted size, i.e. between 1.9 and 4 m across, 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.

5.2.13. Discussion

The excavations at a number of potential funerary monuments in the Jebel Qurma region were carried out in an attempt to investigate burial practices between the Hellenistic and Early Islamic periods. The results of these excavations are summarised here to provide thoughts on 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 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 an exterior façade created rather crudely. In addition to these prehistoric cairns the excavations show the presence of different types of tombs that were constructed and used in more recent times.

[5] This is a tentative observation, as no detailed osteological information is available at present.

Ring Cairns

The earliest historical-era funerary monuments in the Jebel Qurma region – except for the prehistoric tombs – appear to be what are called Ring Cairns (Akkermans & Brüning 2017). This type of cairn is so far only attested at the site of QUR-215,[6] where it consists of a large circular outline of stone at the edge of the cairn measuring nearly 7 m in diameter. The construction of this cairn was dated to the 4th or 3rd century BC based on radiocarbon and OSL dates. This cairn was constructed on a high, prominent location in the *harra* landscape. Whether the Safaitic inscriptions situated around this cairn were already present or created by the time the cairn was erected is uncertain. Large amounts of artefacts were found in association with the burial(s) interred in this cairn, 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.

Tower Tombs

The second and probably somewhat younger type of funerary monuments are what are called Tower Tombs (Akkermans & Brüning 2017). This type of tomb was revealed 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, measuring between 2.75 and 4.8 m in diameter, and between 0.8 and 1.45 m high. Many of the Tower Tombs, though not all of them, were associated with large numbers of pre-Islamic rock art. However, the fact that some of this rock art apparently was already created before the construction of some of these tombs – something that was attested at QUR-186 and QUR-2 – suggests that not all this rock art was necessarily functionally associated with the construction of the monument or the disposal of the dead.

Although many of the excavated Tower Tombs were seriously damaged by recent looting activities, at least some of these tombs 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. Additionally, rectangular ante-chambers were sometimes constructed against the façade of the tower, between 1.4 and 2.3 m long. These often contained the skeletal remains of multiple individuals, indicating that these 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 if we assume that we are dealing here with ordinary mortality patterns the latter seems to be most likely.

Numerous artefacts were encountered in association with the pre-Islamic burials within and around the Tower Tombs. Again these included remains of jewellery, such as beads made of stone, glass of glass paste, shell and coral, and possibly bone or tooth. More extraordinary were the finds from the tombs at QUR-2, which 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 one or more centuries. Also remarkable is the complete absence of pottery – pottery vessels were apparently not part of the grave inventory.

Some of the Tower Tombs yielded evidence for their date of construction or use. Radiocarbon and OSL dates were obtained from QUR-2, on the basis of which it was suggested that the Tower Tomb at this site was constructed prior to the 1st century AD. Furthermore, a single radiocarbon date from skeletal remains from QUR-186 gave a 2nd to early 4th century AD date, although whether these remains represent the original burial or a later one is not clear. Other dating evidence was somewhat more ambiguous, including the gold earring found in the cover of a Tower Tomb at QUR-9 (Structure 9), which possibly dates

[6] More cairns of this type have been documented through excavations carried out in 2017, but these results lie beyond the scope of this study.

to the early 1st millennium BC. A remarkable date was returned from an OSL sample obtained from underneath the façade of the Tower Tomb at QUR-956. This Late Chalcolithic/Early Bronze Age date is completely at odds with the other dates from Tower Tombs, i.e., those from the late 1st millennium BC and early 1st millennium AD. The anomalous date from QUR-956 is at this point difficult to explain. More research is required to corroborate such an early construction date of Tower Tombs. For the moment, it may be concluded that Tower Tombs were constructed probably at least between the late 4th and the late 1st century BC, and that their re-use possibly 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 here. The Tower Tombs at Wisad Pools were not excavated but many architectural features were apparent. 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).[7] The similarities between the Tower Tombs at Wisad Pools and 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*.

Non-funerary cairns

From a number of excavated cairns, discussed in § 5.2.12., there came no evidence that they once served as tombs. These were usually fairly small cairns, i.e. up to 4 m in diameter and up to 85 cm high. In view of the absence of human skeletal remains or potential grave goods these structures can at this point not be classified as burial cairns with certainty. If these were tombs originally, then they were possibly disturbed – 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, about which one can only speculate at this point.

Pendants

Pendants are typically found in association with burial cairns, which is evident for example at QUR-215, QUR-9, 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 do seem to consist of small chamber-like constructions. However, excavations revealed that even these features are devoid of skeletal remains or artefacts, both within them and underneath them. Also, these small cairn are not open chambers, but were filled in completely with loosely piled stones.

Similar observations were reported from various other regions, including Maitland's Mesa (Rowan et al. 2015, 180) and Wisad Pools (Rollefson 2013, 223-4) where some individual cairns of Pendants were found to be devoid of burial remains as well, despite their chamber-like appearance. Any attempts to date these Pendants was not carried out. Another place where Pendants were investigated, yet far removed from the Black Desert, was at the al-Makhdarah Necropolises in Yemen, where numerous Pendants are situated. Three radiocarbon dates – from the early, middle, and late 1st millennium BC – were obtained from the burial cairns to which these Pendants were attached (De Maigret 1999, 329-35).

Dating evidence for the Pendants themselves, in addition to the associated burial cairns, was collected in the Jebel Qurma region. OSL dates were obtained from four of the pendants, which provided

[7] The rectilinear side-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 they are tombs, not only because of the presence of skeletal material but also because the tower's façade is not open at the back of the ante-chamber.

broad yet fairly consistent dates of construction for these features. The OSL dates indicate that the broadest possible date range for the construction of pendants is between the late 13th century BC and the early 1st century AD. The period between ca. the early 8th and the early 3rd centuries BC is covered by all obtained dates, which thus provide the narrowest potential date range for the construction of pendants at this point.

Remarkably, Pendants were 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 with what kind of burials Pendants may be associated.

Inhumation graves

Within the funerary cairns stone-built burial chambers were typically encountered in which the deceased were laid to rest. These chambers were either roofed or filled in with rocks covering the corpse. Additionally, a number of proper inhumation graves were encountered as well, where a pit was dug into the soil in which a body was placed that was 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 – significantly younger than the other, more typical cairn burials. It is also recalled here that a small cemetery of inhumation graves was encountered during the survey at HAZ-27, which was dated through associated ceramics to the early 4th century AD (see Chapter 3).

A chronology of burial customs

In summary of 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, i.e., from the Ring Cairn at QUR-215. Tower Tombs seem to occur somewhat later, i.e. between the 1st century BC and the early 4th century AD. In addition to the construction of burial cairns, several cairns were reused multiple times for the interment of the dead, such as in rectilinear ante-chambers constructed against the façade of Tower Tombs, but also within the cairns proper.

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 remains uncertain. Skeletal remains of adolescents and younger children were encountered within some cairns – such as at 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. 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), although remains of these vessels came from heavily disturbed contexts, which makes it difficult to be certain on this point.

5.3. THE MORTUARY LANDSCAPE OF THE JEBEL QURMA REGION

5.3.1. Introduction

In the previous section a chronology of various types of funerary monuments was presented on the basis of detailed excavation data retrieved from a limited number of sites in the Jebel Qurma region. The aim of this section is to study the distribution of funerary monuments in the study area and to better understand the configuration of the funerary landscape. It seeks to answer questions related to the configuration of the mortuary landscape, such as: How are different types of funerary monuments distributed across the landscape? And how may we explain these spatial patterns?

This will be done by analysing the spatial distribution of funerary monuments across different landscape classifications, as defined in Chapter 2. Furthermore, included in these spatial analyses are not only the excavated funerary monuments but also other cairns identified through surveys.

5.3.2. Features included in the analyses

In the previous section a typo-chronology of funerary monuments was presented on the basis of the excavation results. Large burial cairns, including Tower Tombs and Ring Cairns, and the Pendants often associated with them, were shown to have been constructed in a relatively early period of inhabitation in the Jebel Qurma region, i.e., during the late 1st millennium BC and early 1st millennium AD. After the 3rd or 4th century AD the creation of burial cairns seems to have ceased, and was perhaps replaced by a different funerary custom that took the form of inhumation graves in pits. All of the cairns from this 'early' funerary tradition were shown to be relatively large, i.e., with a maximum diameter exceeding about 4 m. These large cairns can be placed in opposition to a number of excavated cairns that were much smaller. Some of these were shown to have been of prehistoric origin while others did not provide any evidence to say that they were burial cairns (see § 5.2.13.).

Based on these observations, a selection of cairns documented through pedestrian surveys (but not excavated) may be compiled. This selection is based, then, 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 had often become 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 secondary features accompanying 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.

Examples of cemeteries featuring inhumation graves similar to the ones found at QUR-829 and HAZ-27 are difficult to identify on the basis of survey evidence alone. Although the survey database contains many potential cemeteries, many of the graves at these cemeteries are strongly reminiscent of Islamic graves of relatively recent times, and there is very little dating evidence indicating that they 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 (Fig. 5.59) that is entirely different from the distribution of campsites, presented in the previous chapter. These monuments are largely found on high, prominent places in the landscape,

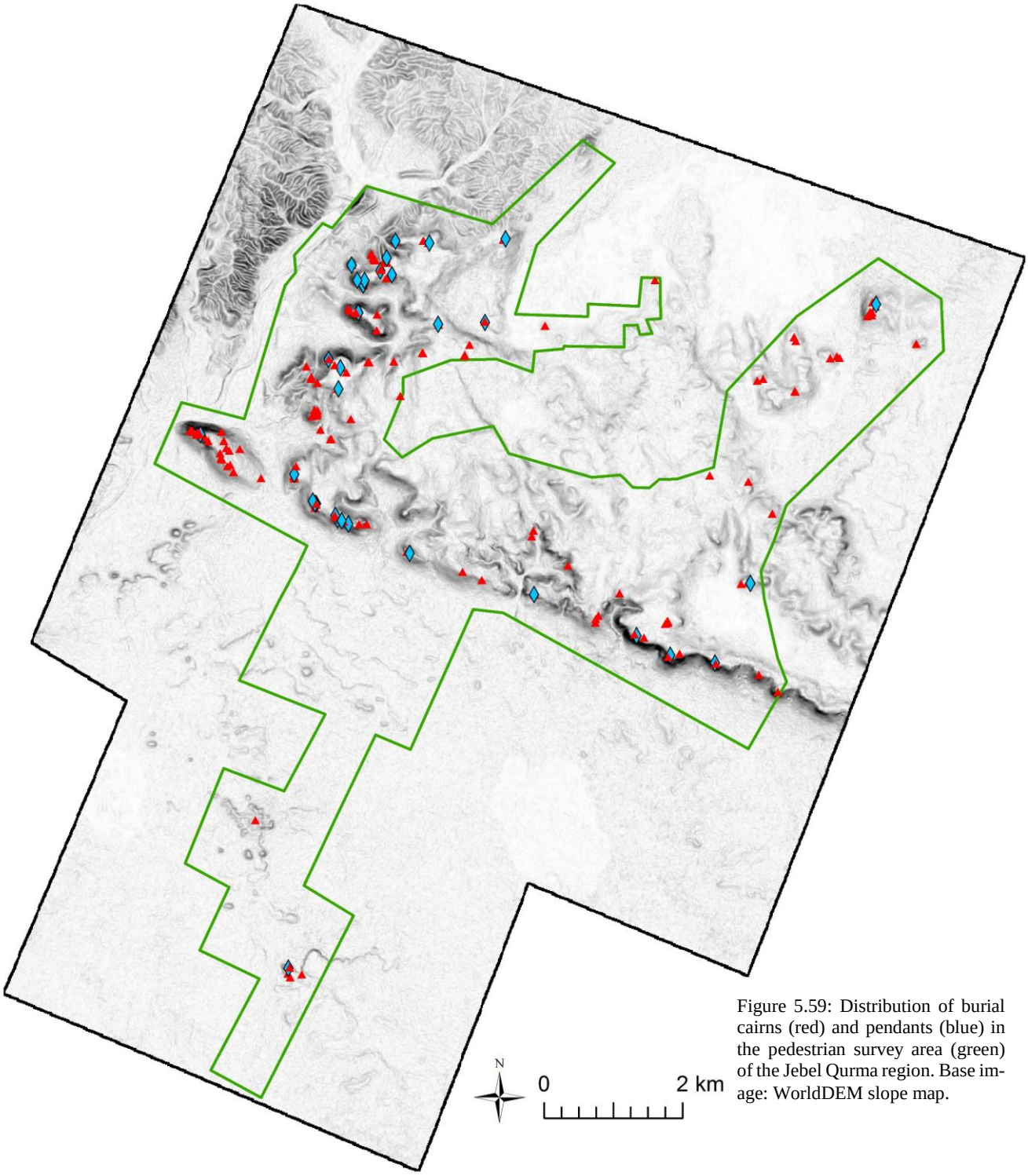

Figure 5.59: Distribution of burial cairns (red) and pendants (blue) in the pedestrian survey area (green) of the Jebel Qurma region. Base image: WorldDEM slope map.

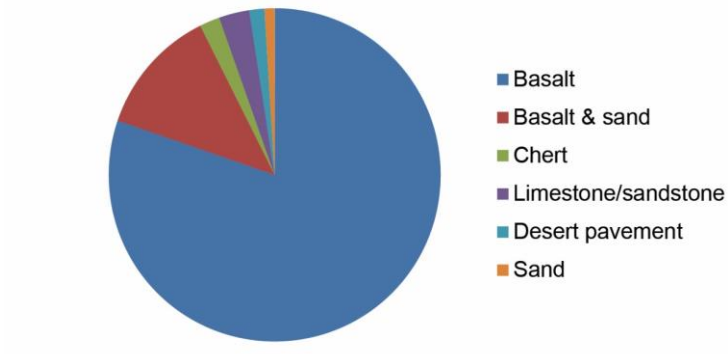

Figure 5.60: Proportion of funerary monuments per surface cover.

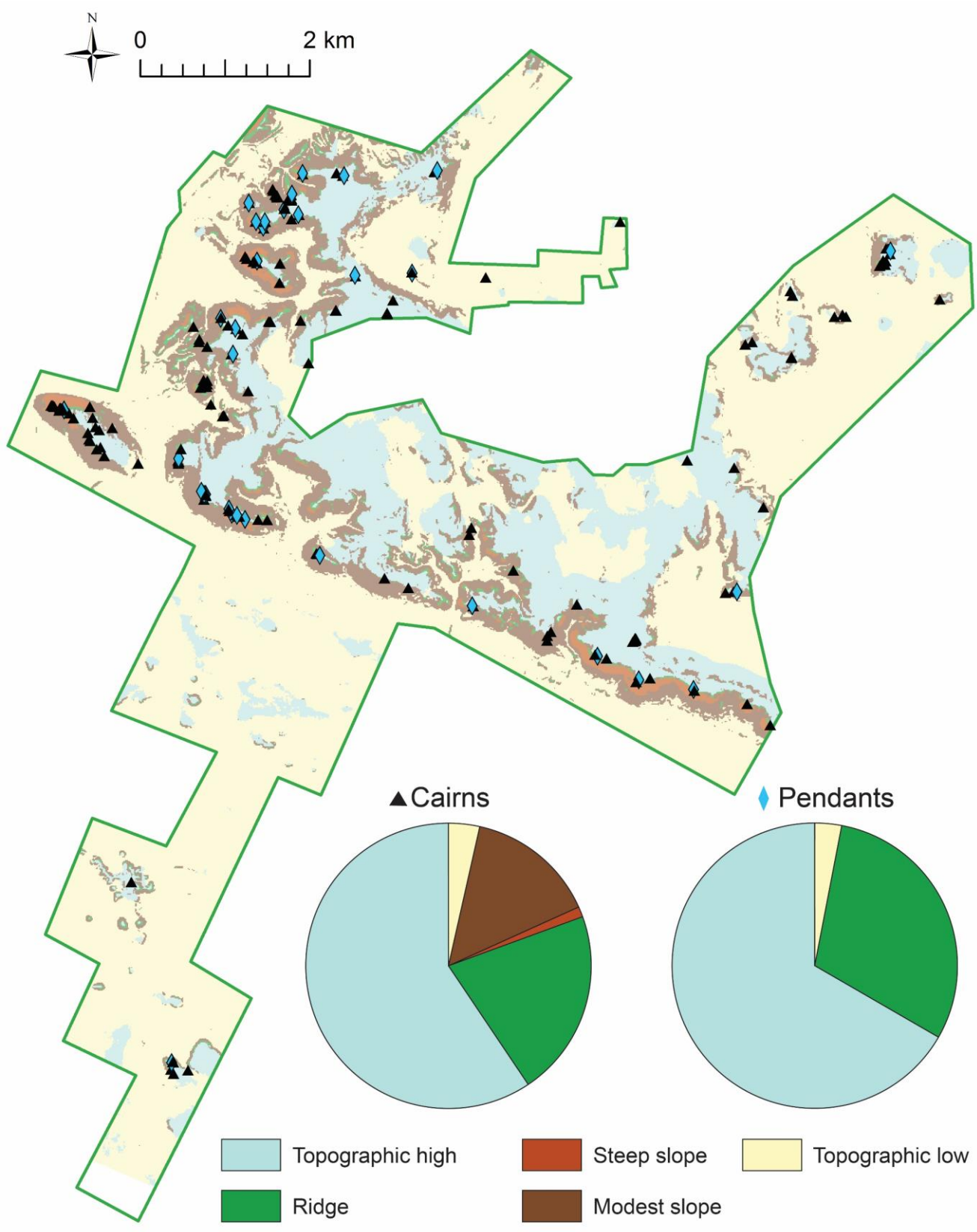

Figure 5.61: Distribution of cairns and pendants in the Jebel Qurma region and the proportion of these features per hillslope position. Base image: Hillslope Position Classification.

Figure 5.62: Remains of the Tower Tomb at QUR-186 as visible on the horizon from the valley below. Photo by P. Akkermans.

often cresting the horizon when viewed from below. This becomes clear from a number of spatial analyses, in which the distribution of funerary monuments over the various landscape classifications, as presented in Chapter 2, is studied.

The funerary monuments are largely confined to the *harra* surfaces of the Jebel Qurma region, as visible in Figure 5.60. 93% of the features was documented in the basalt landscapes of the study area. Both funerary 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 over the Hillslope Position Classification (Fig. 5.61) shows that most of them are situated on relatively high places, i.e., 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 when viewed from below (Fig. 5.62). This is illustrated in Figure 5.63, showing the proportion of funerary monuments that are situated on a skyline. 65% of the funerary cairns is 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 both funerary cairns and pendants and the degree of visual prominence. To test this correlation the size of cairns and the length of pendants was compared to the degree of visual prominence and 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 variables. In other words, it is not possible to say that the largest cairns and pendants usually occur in the places that are visually the most 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 next chapter is devoted

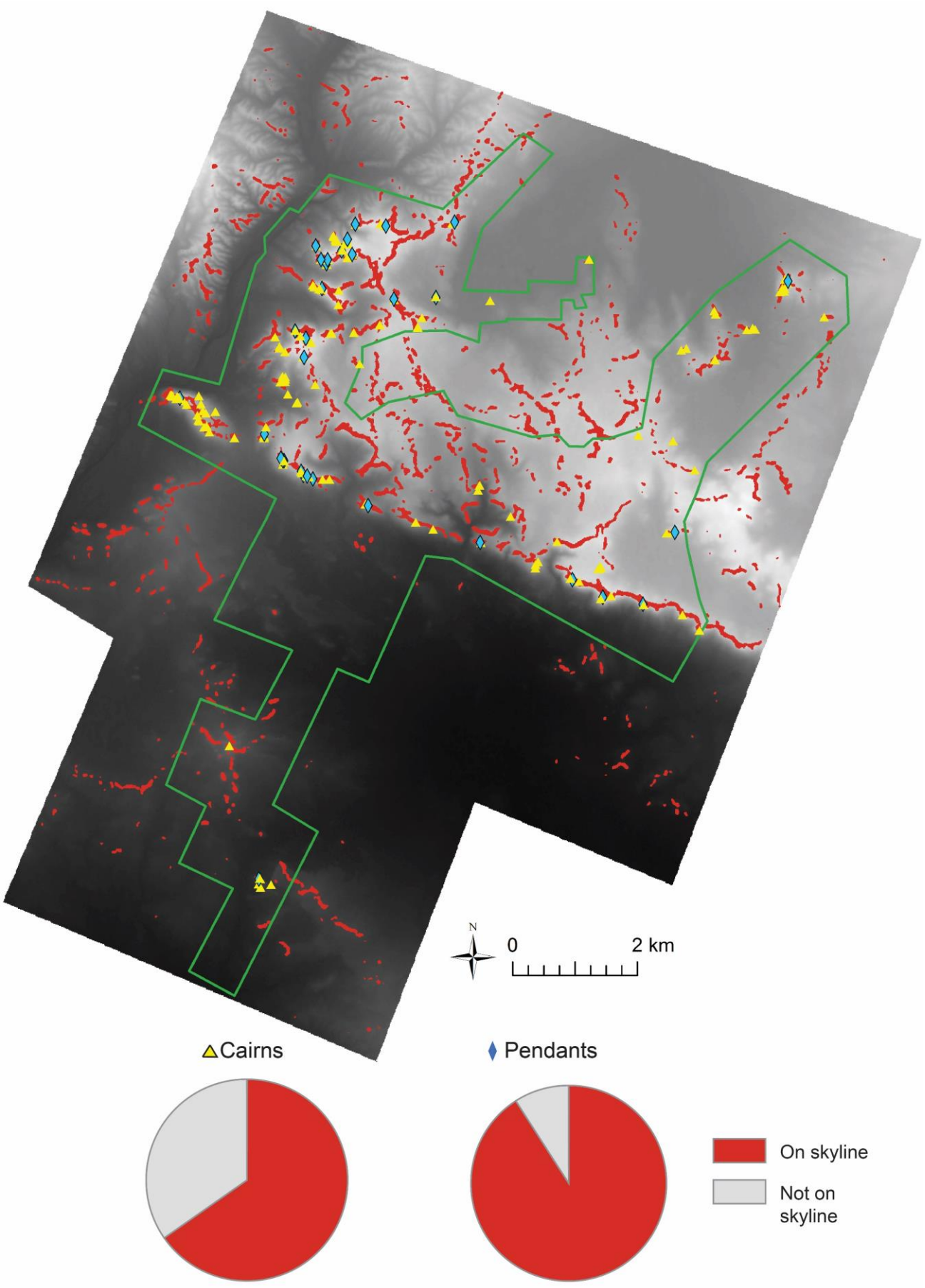

Figure 5.63: Distribution of cairns and pendants in the Jebel Qurma region and the proportion of these features present on dominant skylines. Base image: WorldDEM superimposed by dominant skylines (red) and survey area (green).

to further exploring possible reasons for these developments, among others. Another important issue resulting from the excavation results presented in this chapter is the fact that some of the periods attested through excavations is hardly attested – if at all – in the 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. In the Jebel Qurma region the occupation during the 1st millennium BC may have been more significant and of longer duration than reflected in the survey material.

6 Discussion

6.1. INTRODUCTION

The research presented in this dissetation set out to explore the archaeological landscape of the Jebel Qurma region and the nomadic communities that inhabited it between the Hellenistic and Early Islamic periods, with the specific aim to investigate the construction and use of stone-built features by these communities. Over the course of the previous chapters, elements of the natural environment of these landscapes have been explored (Chapter 2), and 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 in a synthesising manner the degree to which landscapes of the Jebel Qurma region were physically modified over the course of the Classical and Late Antique periods. This is done by providing a diachronic overview of the history of inhabitation of the Jebel Qurma region during the period under investigation, based on the research presented in the previous chapter. Secondly, in order to better understand these developments in the built environment, the context in which these features were constructed will be explored, using new information on the nature of inhabitation in the Jebel Qurma region derived from the archaeological remains. Thirdly, this chapter explores what the short- and long-term purpose of the stone-built features in the Jebel Qurma region was to nomadic communities.

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 were 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 with archaeological evidence (see Chapter 1). The 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, firstly, gold jewellery from a burial cairn at the site of QUR-9 and, secondly, a number of OSL dates from Pendants that cover part of the early 1st millennium BC. These, however, can at this point not be used as solid evidence for a 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 provide a broad time range, between the late 2nd millennium BC and the early 4th century AD. The oldest OSL sample from a Pendant returned a date covering the entire 1st millennium AD. Even this early date is too broad and lacks corroborating evidence to convincingly argue for a sustained and significant phase of inhabitation in the Jebel Qurma region during the Iron Age. In sum, although there is evidence that hints towards the possibility for an Iron Age-period inhabitation in the Jebel Qurma region, more research is required to substantiate this.

The earliest more convincing evidence for inhabitation of the Jebel Qurma region dates to the 4th or 3rd century BC – the beginning of the Hellenistic period. Notably, however, this period was hardly represented in the artefacts collected during pedestrian survey. Not a single pottery sherd 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,

including skeletal remains from a burial cairn at QUR-215 that were dated to the 4th or 3rd century BC, and a radiocarbon sample from a fire pit at QUR-595 that returned an equally early 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 – as the conventional date of Safaitic would suggest. Instead, this period of inhabitation can be pushed back several centuries, i.e., into the 3rd or even 4th century BC at the least.

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 there is no new evidence from the fieldwork in the Jebel Qurma region suggesting that this must have been the case. At this point the earliest local evidence for the creation or rock art comes from the site of QUR-2, where carvings had already been present prior to the construction of the Tower Tomb there. The exact date of construction of the tower itself, however, is not certain. Based on the dating evidence from the rectangular ante-chamber constructed against the Tower's façade, the Tower and, therefore, some of the rock art, must predate the 1st century AD, but by how far remains uncertain.

For the later Hellenistic and Roman periods the continued inhabitation in the Jebel Qurma region is somewhat better defined, as more ceramics could be dated to these periods. On the basis of these ceramics, but also with help of Safaitic inscriptions, several campsites were documented that were inhabited during the period broadly defined as Hellenistic/Roman. Excavations provided further dates from this period. Fire pits at a number of enclosures, such as at QUR-595 and QUR-373, attest the presence of people in the Jebel Qurma region in this period, as do the dates from burial cairns including radiocarbon and OSL dates.

According to the conventional dating framework of Safaitic, the creation of inscriptions and petroglyphs ceased after the 4th century AD at the latest. The uncertainties about this conventional dating framework cannot be solved on the basis of field research in the Jebel Qurma region. Although there is at this point no evidence to suggest that any of the carvings from the Jebel Qurma region should date to Late Antiquity, it cannot be excluded with certainty that some of the carvings were created in this period. 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 for most of this period. This is indicated, firstly, by the relatively large number of ceramics that were dated to the Byzantine and Early Islamic periods and, secondly, by a series of radiocarbon dates from residential sites 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, and were recognised through the occurrence of ceramics, sometimes in much larger quantities than at older sites.

While inhabitation of the Jebel Qurma region continued during the Byzantine, Umayyad and Abbasid periods, during the subsequent Fatimid period the region seems to have become largely, and perhaps quite suddenly, abandoned. Ceramics that were clearly datable to the Fatimid period are almost completely absent, and there is only a single radiocarbon date – from an inhumation grave at QUR-829 – that dates 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 invisible in archaeological terms. Prior to this study, the period of inhabitation associated

with the Safaitic inscriptions and petroglyphs was regarded as a sudden outburst of activity in the Black Desert, which also quickly diminished again around the middle of the 1st millennium AD. One of the results of the study at hand is that a much more nuanced reconstruction is warranted. The Safaitic inscriptions did not appear more or less out of the blue around the 1st century BC. Instead, it was part of a period of inhabitation that started two or three centuries before that – perhaps even earlier. Similarly, the Late Antique period of inhabitation attested in the study area has thus far hardly been exposed – mainly due to a lack of archaeological research – 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 take into account a variety of well-datable remains. Rock art in itself 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 equally holds, however, for other types of archaeological remains. Ceramics are a relevant example here, as they are often used in archaeological surveys as an important material – if not the only material – to reconstruct the history and intensity of occupation within a survey area (Wilkinson 1999; 2000). This, however, 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 for Early Hellenistic ceramics is at this point completely absent, and from the subsequent Hellenistic and Roman period the number of ceramics also appear to be relatively limited. The presence of Hellenistic and Roman-period inhabitation of the region was defined on a broader range of materials which, in addition to ceramics and inscriptions, included OSL and radiocarbon dates and coins.

It thus seems that in this context ceramics are a poor indicator for the presence or absence of people within the study area. 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 presence or absence of the communities themselves. Following this line of reasoning, the increased number of ceramics from the Late Antique period is not necessarily reflective of increased activity in the study area but, at most, an increase in the use of ceramics by communities residing in the region.

6.2.3. Comparisons with other regions

The earliest attested phase of inhabitation in the Jebel Qurma region, i.e., during the Early Hellenistic period and possibly extending back into the Iron Age, is at this point unparalleled in other areas of the Black Desert. Indeed, there are no unequivocal attestations of Early Hellenistic remains documented in other survey or excavation projects in the Black Desert. On the one hand, this may partly be a result of the limited number of archaeological field projects with a specific interest in historical remains. On the other hand, the research in the Jebel Qurma region has shown that the visibility of this period is poor in terms of surface remains, given the scarcity of pottery sherds that could be securely attributed to the Iron Age and Early Hellenistic period, while the period is more visible in results in radiocarbon and OSL dates from excavations. In other words, although remains from the 1st millennium BC may have remained obscure in other parts of the Black Desert, it is possible that many features were actually constructed or used during this period, but that this may only become visible in the future through excavations and absolute dating methods.

Pendants constitute a highly interesting feature in this respect, given their distinctiveness 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, albeit in various configurations, throughout the basalt deserts of the western part of the Arabian desert. If these Pendants follow a date

range similar as defined in the Jebel Qurma region there is a vast number of features in the Arabian deserts of 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 regions situated on the fringes of the Black Desert, including the Hauran. The Iron Age and Hellenistic period are still poorly known in this region (Dentzer et al. 2010, 139) despite several occurrences of remains from this period at few locations (e.g. Betts et al. 1996). Yet 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. Adams' survey and trial excavations in the 1970s indicated the presence of Iron Age ceramics in the northern Wadi Sirhan, at two settlements and an extensive cairn field near the town 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 carried out there (Charloux & Loreto 2014; 2015), even though this site has been identified as the ancient town of Adummatu that is 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 are limitedly paralleled in other of the regions of the Black Desert. As mentioned before, Tower Tombs similar to the ones in the Jebel Qurma region have been reported 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 known from survey and excavations reports are somewhat different in configuration. 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 be noted, however, that there is at this point no absolute dating evidence or 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 the 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 there (see Chapter 1). The development of the region into a prosperous rural area began under Nabataean and Roman rule, when much of agricultural infrastructure was probably created. Furthermore, in the Roman period various military installations and roads were developed along the western fringes of the Black Desert, as part of the *Via Nova Traiana* and *Strata Diocletiana*, and fortifications in the Azraq basin were constructed during the early 3rd century AD (Kennedy 1982; 1997; Millar 1993). In short, increased activities in the Jebel Qurma region are largely paralleled in the Hauran to the northwest. The occurrence of tens-of-thousands of Safaitic inscriptions has long illustrated this parallel development, which is now echoed in the archaeological evidence as well.

Up to this point there have been no indications from other archaeological projects that the Black Desert continued to be inhabited by nomadic communities in Late Antiquity (see Chapter 1). Surveys in other parts of the Black Desert have thus far hardly picked up on this period of inhabitation, which is probably largely the result of the lack of epigraphic sources from this period, as well as the limited efforts invested in archaeological research focusing on this period of inhabitation. Betts' survey programme in the Black Desert has documented limited remains from the Byzantine and Early Islamic periods, but these were all situated deep in the *hamad* landscape (e.g. 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. While the Jebel Qurma region continued to be frequented by nomadic communities during the Late Antique period, during the same 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 & Akkermans 2016; Kennedy 2014). Similarly, settlement in the Azraq oasis also further developed in the Late Antique period (e.g Elter & Al-Jbour 2013).

The phase of abandonment attested in the Jebel Qurma region during the Fatimid period phase is broadly paralleled in the Hauran and other areas on the fringes of 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 restricted 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 must remain 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 visited by mobile communities rather than permanently inhabited. The residential sites that have been documented are all campsites which, although sometimes used on multiple occasions, were not inhabited year-round. The degree of architectural investment and accumulation of finds is simply too limited to support such a reconstruction. Instead, they represent campsites occupied for short periods of time – between a few days and a few months – after which they were abandoned, sometimes to be reoccupied at a later point in time.

Subsistence practices

The purposes of these short-lived visits to the region may have been manifold, including all kind of subsistence activities such as herding and hunting which are known, for example, from the Safaitic inscriptions and petroglyphs. Unfortunately, however, the excavations at various short-lived campsites hardly yielded remains that allow for a more detailed reconstruction of the variety of subsistence practices that may have been carried out. For example, direct material evidence for animal exploitation, such as skeletal remains, were almost entirely absent. Poor conditions in terms of preservation are perhaps to be blamed, as the deposits within the enclosures were usually very shallow, and any bone material within these deposits could have been easily exposed to degradative elements, including moisture, animals and bacteria, and severe temperature oscillations that the area receives. The experiences from burial contexts equally indicate that circumstances of preservation of skeletal remains in shallow deposits are poor.

Hypothetically, it would of course be possible that instead of poor preservation there were few animal bones deposited to begin with. This, however, seems highly unlikely because, firstly, waste materials do seem to have been deposited within and directly around campsites locations. Secondly, 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. It therefore seems reasonable to

assume that these were occasionally butchered at campsites, and that poor circumstances prevented them from being preserved in the archaeological record.

The implication of this observation, however, is that the reconstruction of subsistence practices through macroscopic remains is considerably hindered by circumstances of preservation. At this point, for example, there is no archaeological evidence that unequivocally supports particular modes 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 in the study area during Late Antiquity cannot be established with certainty.

Commodity production and exchange

Excavations and surveys retrieved a wide array of artefacts that could be dated to Classical and Late Antiquity. Ceramic vessels were especially numerous, although not during all phases of inhabitation. The Hellenistic and Roman-period ceramics were relatively limited, while the occurrence of ceramics significantly increases during the Byzantine period, culminating in the Umayyad period, after which it gradually declines again. 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 other types of containers, such as pots made of metal, were used as well, especially during periods in which ceramics seem to have been limitedly used. 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 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 and pendants made of mollusc shell, coral, glass or glass paste, bronze, ostrich eggshell, gemstones, and even pearl. Only a few coins have been 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 which 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. Even though mobile pastoralists are known to produce their own pottery vessels from ethnographic studies, these vessels are relatively simple and made without help of a throwing wheel (e.g. Eerkens 2008; Grillo 2012). There is at this point no evidence that 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 – 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 both the expertise, raw materials and fuel, as well as adequate time was 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 were circulating among desert communities were produced in and procured from sedentary settlements beyond the Black Desert. The exact mechanisms of procurement remain obscure for the moment. It is impossible to say at this point whether it 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 goods from the desert, including pastoral products such as milk, hides, wool, meat, or live animals. Animal 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 is impossible to say at this point.

Other materials, perhaps locally produced, must have been available to the region's inhabitants as well, such as hides, textiles, and perhaps bone implements. Such materials do not seem to have been preserved well in the archaeological record, even though 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.

Relations with sedentary communities

Various types of archaeological remains indicate interactions between nomadic communities from the Black Desert and sedentary communities beyond. 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 supporting the notion of predominantly 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 contact which in any case included the exchange of commodities, as discussed above.

It is difficult to say is whether communities who frequented the Jebel Qurma region were in direct or indirect contact with sedentary communities. Especially for the earlier phase of inhabitation, i.e., during the Hellenistic and Roman periods, it cannot be said with certainty that permanent settlements were situated in close proximity to the Jebel Qurma region. For this period, 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, the encroachment of military forts and permanent settlements onto the nomadic zone, as discussed above, perhaps resulted in more direct contact between nomadic communities of the Black Desert and 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.

Mobility

The results of the archaeological fieldwork in the Jebel Qurma region are to some degree informative on mobility patterns on various scales, both within the region and beyond. Starting with local patterns of movement, it has been observed that evidence for repeated human activity could be found far beyond the confines of residential sites. People moved out towards a number of different locations in the landscape. 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 sources considerable distances had to be covered, and these movements were facilitated by networks of paths running through parts of the landscape that were most densely covered 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 confines of the study area, are difficult to reconstruct with precision on the basis of the archaeological evidence. However, the material remains are suggestive of interaction with sedentary communities beyond the Black Desert. Utensils such as

pottery vessels, but also jewellery and metal objects were acquired, either directly or indirectly, 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 was probably governed, at least in part, by fluctuations in natural resources based on the seasons. 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 relates to one of the main questions addressed in 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 seeming abandonment during the 2nd and early 1st millennium BC, the region was by no means a pristine, natural environment. Pedestrian surveys have indicated that a number of features are most likely of prehistoric origin, including desert kites, wheels, dwelling clusters and at least a number of enclosures (Akkermans et al. 2014; Akkermans & Huigens in press; 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. It is certainly possible, as both prehistoric and younger materials were found within enclosures during surveys and excavations, such as at the sites of QUR-210, QUR-373 and UQR-595 (Chapters 3 and 4). It proved difficult, however, to solidly reconstruct 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 for the occasional reuse of prehistoric enclosures between the Hellenistic and Early Islamic periods.

The excavation of a number of cairns indicate that some small burial cairns can be ascribed with certainty to a prehistoric inhabitation phase (Akkermans & 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 were observed between the prehistoric cairns and those from the Hellenistic/Roman period. The prehistoric cairns were fairly small – usually less than 4 m in diameter, while the more recent ones were generally larger. These measurements may thus be used to make chronological differentiations between cairns documented through surface surveys. Whether this holds for areas beyond the Jebel Qurma region as well requires further research.

6.3.2. Developments in the natural environment

Although the geology and topography in the Jebel Qurma region has probably been relatively stable over time, this need not have been the case for vegetation and water availability. This research has provided limited new information on past environmental conditions in the study area. The clearest indications that environmental conditions may have been more humid in the period under investigation are the results from botanical analysis of charred plant remains from the site of QUR-595, discussed in Chapter 4. In recollection, these remains may indicate that part of the Jebel Qurma hosted moister conditions than at present. However, this must remain a suggestion rather than a fact given that these remains came from a single site only and, moreover, may have brought into the site as fire wood from elsewhere. Analyses of botanical remains from other sites are further necessary to determine whether the environment was indeed more humid, and during which periods.

It is also recalled here that potential clues to changing environmental conditions were encountered during the excavations at QUR-373. In the enclosure at this site relatively thick accumulations of wind-blown sand were encountered. These accumulations were deposited behind the enclosure wall that acted like a trap for aeolian sediments. 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 remains uncertain at the moment and requires further investigation.

6.3.3. The construction of stone-built architecture

There is, at this point, no unequivocal evidence that any of the enclosures that were attested in the Jebel Qurma region were constructed during the Classical or Late Antique period. Although many of such features 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 enclosure were structurally modified. 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 enclosures may have been reused and modified, other features were newly created. These include clearings, which seem to have been newly created in the landscape from the Hellenistic period onwards. After the initial creation of these features they were sometimes reused during later periods, evidenced by the occurrence of pottery sherds from various phases of inhabitation between the Hellenistic and Early Islamic periods on these clearings.

Other features that were newly constructed during the Hellenistic and Roman periods of inhabitation are different types of burial cairns, and Pendants were sometimes added to these tombs. Tower Tombs represent the most characteristic tomb type. These are relatively large burial cairns with a monumental external façade forming the tower. These towers served as tombs, as did, in some cases, rectangular ante-chambers 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. Furthermore, a large degree of architectural investment was put into the construction of such tombs. Some of the blocks of the construction weighed as much as 300 kg, and the total construction of a Tower Tomb may have been the effort of large amounts of people. Another cairn type was the Ring Cairn, which was attested at QUR-215 and possibly represent 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 such

carvings. It is recalled from the excavations at QUR-2 that at least some of the many carvings found there were already made prior to the construction of the Tower Tomb. Furthermore, there are only very few inscriptions from the study area that actually mention the construction of a funerary structure.

Another spatial and chronological correlation was established between burial cairns and Pendants, on the basis of OSL dates. The 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 at Hellenistic/Roman period burial cairns, and this strong association with burial cairns does suggest that they 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 of inhabitation. Significantly, the construction of burial cairns seems to have come to a complete stop: 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, others possibly in small cemeteries. Given the scarcity of burials from this period it is difficult to make generalisations about 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 graves did yield artefacts, including ceramics, but the 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 study at hand 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. A clear differentiation has been observed between the *harra* and *hamad* landscapes of the study area. Although archaeological remains have been documented in both landscapes, the majority of these remains were confined to the basalt-covered *harra*, in the centre of the study area. Also, nearly all of the pre-Islamic inscriptions and petroglyphs were situated here. It should be noted, however, that the *hamad* is far from empty, as a diversity of archaeological remains from the Classical and Late Antique periods were recorded here during pedestrian surveys, including campsites, burial cairns, and pendants. The nomadic landscape thus appears to spread beyond the confines of the *harra*. This is an important realisation because a number of recent studies have still regarded the *harra* as the confines of the Black Desert and its nomadic landscapes. For example, in remote sensing studies (e.g. Kennedy 2011; Meister et al. 2018) the archaeological remains of the *hamad* surrounding the *harra* are rarely taken into account. This study shows, however, that by doing so much of the archaeological remains are essentially missed, which has obvious repercussions for subsequent interpretations with regard to, 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, as most archaeological and epigraphic remains are found in the *harra*. There may be different explanations for this discrepancy. Firstly, the *harra* landscape offers the best potential sources of water, namely the mudflats which may become transformed into temporary lakes after rainfall, and may even retain water into the dry season. The *harra* landscape is furthermore bordered by Wadi Rajil, which may also contain large amounts of water during wet seasons. Secondly, the *harra* consists of many places offering a relatively high degree of seclusion, including the many deep valleys that run down from the south and west part of the basalt-covered plateau. These secluded areas may have been preferred over the open *hamad* plains in cold weather. The abundance of building material in the *harra*, as opposed to the *hamad*, may also have been a factor in this respect, as this would have facilitated the construction of new enclosures or the repair of

relict prehistoric enclosures. Seclusion may also have been sought for protection against other potential threats, including communities that were regarded with hostility. 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 possibly also included risk of violent conflict (Norris & 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 have been 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 this combination of epigraphic and archaeological remains is typical for the *harra*. One possibility for this observation is that the creation of such carvings was indeed largely confined to panels made of basalt. Perhaps the material properties of basalt was better for making carvings than those of lime- and sandstone rocks, or some cultural factors are involved here (see Brusgaard forthcoming). Another possibility is that there was no such differentiation originally, but that most carvings on lime- and sandstone have not been preserved due to wind erosion. 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 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 easily 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. Many ethnographic studies of campsites have highlighted the importance of such considerations among nomads (Cribb 1991, 137; Hammer 2012, 53-57; Western & 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 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, but that this may vary from year to year depending on the timing and amount of precipitation (Rowe 1999, 358). Camping on the transition between the *harra* and *hamad* may have occurred in anticipation of such variations.

Minor developments were observed in the location of campsites which, nonetheless, may have been significant. Campsites that were used during 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 as campsites from this period appear in both *harra* and *hamad* landscapes, and thus partly shifted towards somewhat more exposed locations in the open plains of the study area. 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 features of an entirely different nature. Hilltops and ridges mostly contained funerary monuments such as burial cairns and pendants, as well as concentrations of rock art (Brusgaard forthcoming). Such features were present in far less numbers in lowland areas. While lowland areas were often relatively secluded, many of the basalt-covered hilltops and ridges were characterised as 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 apparently

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 better understand the way in which stone-built features in the Jebel Qurma region were used by its nomadic inhabitants between the Hellenistic and Early Islamic periods, and 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 possibly represent reused prehistoric installations. In Chapter 1 a number of hypotheses were proposed on the purpose of stone-built architecture in the context of mobile peoples. Firstly, it was argued that stone-built features could have a variety of purposes related to short-term periods of inhabitation of particular spaces. Secondly, it was proposed that features could also serve particular purposes on the long term, related to anticipated return visits to the region. These possibilities are reviewed in this section based on the archaeological research presented in this dissertation.

6.4.1. Ephemeral use of stone-built architecture

The research presented so far provides a number of indications about the functioning of stone-built architecture on the short term. The region does not seem to have been inhabited year-round on routinely basis – there are not permanently inhabited settlements – but frequented only during particular times of year, probably following the availability of resources related to seasonal variations in precipitation. Therefore, mobile communities were occasionally present in the Jebel Qurma region while at other times migrated to different areas of the Black Desert or even beyond. It is difficult to say at this point exactly how long such visits lasted and, furthermore, it is not unlikely that this varied to a considerable degree from time to time. 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 within them, were often used for residential purposes. Other spaces used for such purposes, but without the enclosing walls, were clearings. It is expected that the actual residential units consisted of perishable materials such as cloth or hides, even though such materials were not retrieved. The purpose of the stone walling of the enclosures, then, may have been to provide additional protection against cold winds and rainfall which are expected to have been present, at least occasionally, in winter or even in spring and autumn. The use of such features for this purpose is known from ethnographically documented nomadic campsites (e.g. Cribb 1991; Hammer 2012; Von Oppenheim 1899).

To what degree enclosures were also used to provide shelter for herd animals that potentially accompanied people camping at these locations is at this point impossible to say. Ethnographic studies indicate that especially young animals may be vulnerable to foul weather and therefore benefit from some form of protection against it (e.g. Biagetti 2015; Salzman 1983, 37), and the excavations 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, however, requires further investigation. For now, however, it is relevant to have established at least one of the potential purposes of the enclosures, i.e., their use as camping areas, as 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. For several of the excavated enclosures a prehistoric origin is likely, 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 may thus have 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, however, that prehistoric enclosures were reused only because they provided areas made free of the rocky surface cover and, therefore, suitable camping areas. The walling itself was certainly relevant, as is indicated by the fact that these walls 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 configuration of campsite areas, one of the many clearings created in the *harra* landscapes could be used as well. These clearings, however, were in many cases differently situated, i.e., on more open terrains 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 earlier on (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 inherently a short-lived activity which is manifested in the Jebel Qurma region in a variety of ways. In the early period of inhabitation, i.e., roughly from the late 1st millennium BC until the 3rd century AD, burials occurred in cairns, while in the subsequent period underground graves emerged, mostly unrelated to elaborate architecture. In the former case, 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 where cairns were created or modified for the interment of a new body. 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 be addressed in the next paragraph.

6.4.2. Investment in permanent landscape features and its long-term significance

Understanding the construction and use of stone-built architecture in nomadic landscapes goes beyond investigating the practical function of such features related to short-term activities of nomadic communities. What is also important, as argued in Chapter 1, is to investigate the potential long-term relevance of such features to economic and social strategies for those who created, used and perceived them. In other words, in what way was the creation of permanent architectural beneficial on the long term? The research presented in this dissertation provides information on this issue in several ways. Various features were used on multiple occasions rather than incidentally. The first kind of sites to be considered in this respect are campsites. These consisted of clearings, enclosures, or both, and were often used during different time periods considering the presence of materials datable to different periods, including dated fire pits and ceramics. 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. Importantly, 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 had the need to invest in new features. Over time, the landscape became increasingly modified and suitable for hosting the inhabitation of short-lived visits by nomadic peoples who required to invest less in the creation of such features, as they were already present in the landscape.

Funerary monuments differ considerably from the features found at campsites as their configuration is in many cases more elaborate and, arguably, geared not so much towards practical use as towards what they may have conveyed. Tower Tombs, Ring Cairns, and the Pendants often found in association with them were constructed on highly prominent locations in the landscape as they were situat-

ed on hilltops and ridges that dominated the skylines of the Jebel Qurma region. Their visibility was enhanced by their size and configuration. The straight facades characteristic for the Tower Tombs, and sometimes also observed in 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 thus visually imposed themselves to anyone visiting the region in the past. The purposeful creation of such features and their use as tombs may thus have created a strong relationship between those who were buried within the tombs and those who frequented the region at a later point in time. The dead were not hidden, but remained present in the landscape using the funerary monuments as a medium. Furthermore, after their initial construction they continued to be added upon through the interment of more burials, which 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 would seem likely, however, that these funerary monuments symbolised a sense of attachment between, on the one hand, the people who buried their dead in these monuments and, on the other hand, the landscapes in which these monuments were constructed. This relationship may have been vested in the mnemonic properties of these monuments, i.e., the memories they may have invoked related to the individuals who were buried and the people and events associated with these individuals (cf. Bloch 1971; Bradley 1998; Holtorf & Williams 2006). In the Jebel Qurma region, the invocation of such memories was imposed on those who frequented the region through their dominant presence in the landscape, and thus communicated to them a history of individuals and communities who visited the region in the past. The people who were addressed in this way would have identified with this history, i.e., those who belonged to the same social group of those who were buried in the tombs. Similarly, to members of different social groups these features may have invoked a sense of otherness, or detachment, to 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 at Wisad Pools about 75 km to the east (e.g. Rollefson 2013). It is possible, therefore, that Tower Tombs dotted at least the entire length of the southern limit of the Jordanian *harra*. If so, these tombs would have a communicative function on a scale much larger than the Jebel Qurma region.

If the funerary monuments indeed conveyed the attachment of certain groups of people to the landscapes in which they were erected and, therefore, if this would have been the motivation for why they were constructed and used as was documented, this fits well the model in which burial cairns functioned to communicate territorial claims (see Chapter 1). Examples of territorial behaviour among nomads is found in the Safaitic inscriptions from Jebel Qurma and beyond (Al-Jallad 2015, 16-17; Norris & Al-Manaser 2018), and one of the ways in which territorial claims were communicated may have been through burial cairns. This reconstruction, however, rests on the assumption that burial cairns were exclusively used by the same social groups. More research is required to test this assumption, such as through by 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).

Following this line of though a bit further, however, the graves that seem to have replaced the tradition of cairn burials after roughly the 3rd century AD may have had much less dominant mnemonic properties as they lacked the visual properties of the burial cairns. Instead of visually imposing themselves onto those who visited the Jebel Qurma region, these graves could only have invoked the memory of the deceased and the histories attached to them when approached up close. With the introduction of this burial custom, then, material expressions of the attachment between people and the landscapes of the Jebel Qurma region, vested in relations with the dead, were apparently discontinued

with seemingly no medium that replaced it. 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 is impossible to say at this point as there may have been other mechanisms to maintain such relations between people and the landscape. What is clear though that stone-built architecture did not fulfil this role any longer in Late Antiquity.

7 Conclusion

7.1. INTRODUCTION

This chapter concludes the research presented in this dissertation, 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 the conclusions drawn from it. The chapter concludes with a number of suggestions for future research, as many questions stem from this research in addition to answers.

7.2. CONCLUSIONS

The research presented in this dissertation set out to explore the rich archaeological landscapes of the Jebel Qurma region. It sought to explore the degree to which nomadic communities who inhabited the region between the Hellenistic and Early Islamic periods modified their living space 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 dissertation, 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 has 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. Thus, 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 was already cultivated to some extent since prehistory, to the benefit of the new inhabitants.

But the relict prehistoric landscape was not simply reoccupied, it was restructured to a considerable degree. During the Hellenistic and Roman period, when the Jebel Qurma region was reoccupied after a seeming period of abandonment in the 2nd and early 1st millennium BC, new camping areas were created in the landscape by clearing the basalt surface cover in many places, and burial cairns were erected in the landscape that were much larger than those already present and of entirely different configurations. The period is also broadly contemporaneous with the creation of Safaitic inscriptions and petroglyphs in the region.

The Hellenistic and Roman period can be regarded as the period during which the landscape was transformed most vigorously. From about the 3rd or 4th century AD onwards burial cairns and pendants seem to get out of use. Their use as funerary monuments seems to have come to a near-complete stop during Late Antiquity. Instead, in this period the dead were interred underground in poorly marked 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, however, for residential purposes.

The construction and use of various stone-built features in the Hellenistic and Roman period has been explained in several ways. Campsites were not only created or modified for a single, short-lived visit, but for the 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 nomadic communities came to exploit. The position of campsites on the transitional zone between *harra* and *hamad* landscapes allowed for the exploitation of environments offering different resources, and were thus geared towards a flexible use of the landscape from

more or less the same locations. It would have been possible for nomads to camp in the same locations year after year irrespective 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 on the long term and in anticipation of variable environmental conditions. The creation of campsites with permanent features thus 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 – 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 use on multiple occasions of funerary cairns and pendants and their high perceptibility in the landscape. These must have been powerful symbols of the attachment of people with the landscape, vested in the memory of ancestors and their associated histories.

While the inhabitation of the Jebel Qurma region by nomadic communities continued in the Late Antique period up to the Abbasid period, the importance of stone-built architecture in nomadic lifeways considerably diminished relative to the preceding period. The construction and use of funerary cairns and pendants came to a near-complete stop. Furthermore, campsites came to be 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 (Chapter 1). This research has shown, however, the benefits of an archaeological contribution. 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 with a combination of various archaeological methods, including surface surveys and excavations, the archaeological remains of nomads would be retrievable in the Jebel Qurma region. These methods have provided a wide variety of archaeological remains that were left behind by nomadic communities, and many of the materials could be dated using a variety of methods 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 a variety 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 of several research projects on remotely sensed surface data is useful to some extent, but information on 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 in this research, is the use of several chronometric dating methods including radiocarbon and OSL dating. Additionally, this research has presented the presence of relatively many ceramics on the surface of the Black Desert landscapes, which was not acknowledged thus far. These ceramics are important in locating and analysing nomadic activities in the Black Desert landscapes.

What this research has also shown, however, is that these datable surface remains should be regarded with caution. When studied in isolation, these remains are by themselves poor indicators for the presence or absence of people in the landscape. It has been argued that although relatively many 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. If it were not for the excavations, the Hellenistic and Roman period of inhabitation in the Jebel Qurma region would be poorly visible in terms of ceramics. Equally, it cannot be concluded with certainty that the early 1st millennium BC represents a phase of abandonment in the region based on ceramics alone. 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, radiocarbon dates and OSL dates, 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 the 'timeless' Bedouin model, as discussed in Chapter 1. Firstly, after the development of camel nomadism in the early first millennium BC there is no reason to assume that the deserts of northern Arabia were continuously inhabited by nomads up to recent times. Research in the Jebel Qurma region suggests that there may have been periods in which the desert was largely abandoned, which thus breaks with the stereotypical view of the eternal nomad. Secondly, even within a period of relative continuation of 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, i.e., 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 exposed in Chapter 1. This research has provided some additional context to the inscriptions and indicates, importantly, 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 to potential cultural significance of carving and encountering rock art in the landscape, rather than dismissing them as meaningless.

7.4. SUGGESTIONS FOR FUTURE RESEARCH

In the attempt to investigate the degree to which nomads modified the landscapes of the Jebel Qurma region and the purpose of these modifications, several methods were successfully employed, as discussed above. Nonetheless, there are many lacunae remaining that require further research using different archaeological methods. While this research has established the function and date of construction of a number of stone-built feature types, a number of problems remain to be solved. For example, while it has been possible to broadly date the construction of Pendants in the Jebel Qurma region the OSL dates that were used in this respect have provided a very broad date range. This is unfortunate as they potentially shed light on the possibility of a relatively early phase of inhabitation, i.e., during the

early 1st millennium BC. A related problem is the fact that the purpose of these features is still poorly understood. Based on their consistent association with funerary cairns, and on the fact that no burials were found within or underneath the pendants, it has been suggested that they may have served as features to commemorate the dead buried within cairns. The suggestion that pendants gradually grew over time by episodically adding small cairns to the pendant remains unsubstantiated at this point, and may require a sequence of OSL dates from the pendants constituent cairns.

Similar uncertainties remain in terms of 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 animals pens remains plausible but unconfirmed. This may 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 suggested that they were used by members of the same social group. This may be further studied for example through the extraction and analysis of DNA from the skeletal remains within tombs to study possible kinship relations between the deceased.

There further are a number of feature types that remain relatively poorly explored in this research. For a number of reasons this research was largely limited to the investigations of two different site types, i.e. campsites and funerary sites. Features that therefore remained poorly explored include, for example, desert kites, for which there are some indications that they may have been used in historical times as well, as discussed in Chapters 1 and 3. Although many of these features were evidently created already in prehistoric times, through their persistence in the landscape 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 archaeological research in the Jebel Qurma region has provided hints rather than substantial evidence for past environmental conditions and changes therein. Potential proxies include charred plant material that is widely available in the remains of fire pits on ancient campsites, as this research has shown. A more widely encompassing analyses of such remains may be useful to reconstruct local environmental conditions. Other proxies that may be explored potentially 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 founded on what has been known 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 were active in the region to perform 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, and a variety of unfavourable factors to which they were thus exposed. If this holds for other areas of the Black Desert as well, it is important to come up with 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 the Black Desert entails. There is a need to extend this research to other parts of the Black Desert as well, for a number of reasons. Investigating the archaeology of nomadism on a broader geographic scale may benefit a broader understanding of the variability of nomadic lifeways in the Black Desert, as there is no reason to assume that the information of the Jebel Qurma region equally holds for 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 Hau-

ran, it would be useful to compare archaeological data on nomadism from different locations to test models on nomad–sedentary interactions.

7.5. FINAL REMARKS

This research has been a modest attempt to shed light on a small part of enormous amount of stone-built features that can be found in the Arabian desert. Many of these features and the landscapes they are part of remain unexplored, and it is hoped that this research has shown the potential of studying this landscape to come to a better understanding of the ancient nomadic communities who created them. Investigating these landscapes can be challenging as it requires developing new methodologies and chronological frameworks, but nonetheless provides 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 that occurred in this period. While much of this research initially focused on the urban populations and its monumental archaeological remains and, later, on rural settlements and their hinterland, this 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 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 far from 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 was 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, Fig. 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 & 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, Fig. 2.14)

Hillslope Position Classification (HPC) is a method developed by physical geographers Bradley Miller and Randall Schaetzl (Miller 2014; Miller & 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, Fig. 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, Fig. 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, Fig. 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, Fig. 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, Pl. 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, Pl. 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, Fig. 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, Pl. 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, Pl. 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, Pl. 11), Herod's Third Palace (Bar-Nathan 2002, Pl. 27), including circular room B68 (Bar-Nathan 2002, Pl. 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, Figs. 6 & 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 & Rosenthal-Heginbottom 2003, Pls. 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 & Herschkovitz 2006, Pl. 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, Pl. 29:37-43; Pl. 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, Pls. 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, Pls. 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, Fig. 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, Pl. 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, Fig. 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 & Gabrieli 1994, Fig. 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 & Gabrieli 1994, Fig. 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, Pls. 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, Fig. 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, Fig. 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 & Adato 1986, Figs. 1 & 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, Figs. 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, Fig. 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, Pls. 43 & 44). These are remains from a small domestic structure, represented by ca. 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 1994, Fig. 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 & 105 from the Baths (Smith & Day 1989, Pls. 52 & 53) are stratified remains that were dated on typological grounds to the 6th-early 7th century AD. Loci 44, 52 and 62 (Smith & Day 1989, Pls. 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, Fig. 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, Fig. 11.3:1, 11). These are well-stratified remains, dated by numismatic evidence to the 6th or 7th century AD.

Barsinia (El-Khouri 2014, Fig. 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, Fig. 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, Fig. 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, Fig. 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 (Olavarri-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, Fig. 6:1-10, 14-23) were dated on typological grounds to the Umayyad period. The sherds from debris in room A (Tushingham 1972, Fig. 7:1-20) were dated on the basis of a destruction event to the early 8th century AD.

Madaba, Bajali courtyard, Stratum US20 (Acconci & Gabrieli 1994, Fig. 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, Pls. 140-141; Smith & Day 1989, Pls. 54, 55, 58, 59). Another context that was sealed by earthquake events came from the West Church Complex, Area I (Smith 1973, Pls. 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, Pls. 145 & 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, Figs. 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, Fig. 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, Fig. 11.13:3; Fig. 11.6:6) represents a latrine waste deposit dated on the basis of coins to the Umayyad period. Locus 50620 (Bar-Nathan 2011, Fig. 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, Fig. 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 & Schick 2001, Fig. 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, Figs. 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, Fig. 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, Pl. 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, Pl. 9.18). These sherds are from a fill above natural soil, sealed by a plaster floor that was dated to ca. 800 AD. The ceramic typology furthermore suggests a late 8th century date for this context.

Khirbat Yajuz, Area E (Khalil & Kareem 2002, Figs. 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, Figs. 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 & 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 & Day 1989, Pl. 50:24), and perhaps even earlier at Beth She'an where it is dated to the Byzantine period (Johnson 2006, Fig. 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, Pl. 9.10:4). At Khirbet Yajuz combing is also attested on Abbasid pottery, where it continues into the 10th century (Khalil & Kareem 2002). Summarising, it seems safe to ascribe a Byzantine to Early Islamic date to sherds with combed decoration.

Samenvatting (Dutch summary)

De Zwarte Woestijn van Jordanië staat bekend als, aan de ene kant, een desolaat landschap dat vandaag de dag nauwelijks bewoonbaar is en, aan de andere kant, een gebied met een grote rijkdom aan archeologische en epigrafische resten. Toch zijn veel van deze resten lange tijd onderbelicht gebleven, waardoor er opmerkelijk weinig bekend is over de bewoningsgeschiedenis van de Zwarte Woestijn. Een belangrijke periode uit deze geschiedenis is de Klassieke en Late Oudheid – ca. het late 1e millennium voor Christus en het eerste millennium na Christus – wanneer nomadische groepen die leefden van het hoeden van kuddes en de jacht rondtrokken door de Zwarte Woestijn. Veel van wat tot nu toe over deze groepen bekend was kwam uit tekstuele bronnen, zoals de Safaitische inscripties en de rotstekeningen die men er vaak bij vindt. Van dergelijke inscripties en tekeningen zijn er vele duizenden ingekrast in de donkere basaltstenen die het oppervlak van deze woestijn vormen. Veel minder aandacht was tot nu toe uitgegaan naar andere vormen van materiele cultuur die is achtergelaten in de woestijn, zoals de grote diversiteit aan stenen bouwwerken, en gebruiksvoorwerpen van bijvoorbeeld aardewerk en metaal. Deze bieden echter een uitgelezen mogelijkheid een completer beeld te krijgen van de nomaden die destijds huisden in de Zwarte Woestijn, en die deze resten achterlieten. Deze dissertatie heeft als doel een bijdrage te leveren aan de kennis over deze groepen die in de Klassiek en Late Oudheid in de Zwarte Woestijn rondtrokken, door te bestuderen op welke wijze zij hun landschap vormgaven door de bouw en het gebruik van de opmerkelijke stenen architectuur die men daarin aantreft.

Het onderzoeksgebied van deze studie is de Jebel Qurma regio, dat ca. 300 km^2 groot is en voor een aanzienlijk deel bedekt is door de zwarte basaltstenen waaraan de woestijn zijn naam ontleent. Hier ondernemen Leidse archeologen en epigrafen sinds 2012 jaarlijkse veldwerkcampagnes. Onderdeel van dit onderzoek is het *Landscapes of Survival* onderzoeksprogramma waar deze dissertatie een resultaat van is. Deze studie maakt gebruik van remote sensing, survey en opgravingsgegevens die tussen 2012 en 2016 zijn verzameld in dit gebied.

Deze dissertatie betoogt dat de nomaden die de Zwarte Woestijn bewoonden rond het begin van onze jaartelling naast het maken van inscripties en rotskunst ook op andere wijzen investeerden in hun cultuurlandschap. Bouwwerken zoals graftomben en stenen omheiningen werden in grote getalen aangetroffen tijdens veldverkenningen en in meer detail onderzocht door middel van opgravingen. Aan de hand hiervan kon worden gereconstrueerd dat een groot deel van deze bouwwerken werd opgetrokken en gebruikt in het late 1ste millennium voor- en het 1ste millennium na Christus – iets wat tot noch toe niet vast was komen te staan.

Ook over de functie van dergelijke bouwwerken is veel naar voren gekomen. Zo werden de stenen omheiningen niet alleen gebruikt om vee in te stallen, maar ook voor menselijke activiteit, gezien de vele vuurplaatsen die vaak werden aangetroffen binnen deze omheiningen. Het is daarom goed mogelijk dat dit de plaatsen waren waar men kortstondig huisde, ook omdat huiselijk afval van bijvoorbeeld aardewerk hier is aangetroffen. Verschillen in de locatie en inrichting van deze kampplaatsen zouden kunnen wijzen op bewoning van het landschap tijdens verschillende seizoenen. Het is voor het eerst dat op deze manier een inkijk is gegeven in de kampplaatsen van de nomaden.

Hoewel lang het vermoeden bestond dat veel van de steenhopen die te vinden zijn op de heuveltoppen van de zwarte woestijn werden gebruikt als grafmonumenten was slechts een handvol van dergelijke structuren tot voor kort onderzocht. In dit proefschrift zijn deze *cairns* voor het eerst veel uitgebreider

onderzocht. Hieruit blijkt dat het hier inderdaad veelal of graftomben gaat, gezien het menselijke skeletmateriaal dat werd aangetroffen, vaak vergezeld door grafgiften. Deze resultaten geven een nieuwe inkijk in de manier waarop men in het verleden omging met de doden. De grafgiften bestonden vaak uit sieraden van (edel)metaal en kleurrijke stenen, en soms munten. Dergelijke materialen moesten van ver komen en waren waarschijnlijk erg kostbaar. Ook geven ze een inkijk in de relatie tussen nomaden en sedentaire groepen, waar dit soort voorwerpen vandaan kwamen. Vaak werd deze relatie namelijk als vijandig betiteld, terwijl in dit onderzoek daar geenszins bewijs voor is aangetroffen. De uitwisseling van goederen duidt eerder op meer vreedzame contacten.

Het feit dat veel van de graftomben van monumentale aard zijn en werden gebouwd op prominente plaatsen in het landschap duidt erop dat deze tomben ervoor bedoeld waren om gezien te worden. Het doet vermoeden dat op visuele wijze het contact met voorouders in stand werd gehouden en dat op deze wijze een sterke band tussen het verleden en het landschap waarin dit zich afspeelde werd gecommuniceerd. Mogelijk voelden sommigen hierdoor een sterke band met het landschap dat generatie op generatie bezocht kon worden. Dit duidt op een langdurige in plaats van kortstondige verhouding met het landschap. Het weerspreekt een stereotypisch beeld, waarin nomaden worden neergezet als opportunistisch en weinig begaan met het behoud en ontwikkeling van het landschap.

De archeologische resten die zijn aangetroffen tijdens het onderzoek veranderden aanzienlijk door de tijd heen. Deze geven inzicht in de ontwikkelingen die zich in het verleden voltrokken. Een belangrijk omslagpunt lijkt te liggen rond de 3^{e} of 4^{e} eeuw na Christus, waarin veranderingen optreden in grafgebruik en materiele cultuur. De doden worden vanaf dit moment ondergronds begraven in plaats van in bovengrondse graftombes, en aardewerk wordt veel vaker aangetroffen dan in voorgaande periodes. Dit omslagpunt valt samen met een toenemende aanwezigheid van sedentaire groepen aan de randen van de woestijn, zoals die van het Romeinse leger en vele boeren gemeenschappen.

Met dit proefschrift is, tot slot, gepoogd een bijdrage te leveren aan hoe we als archeologen meer inzicht kunnen krijgen in de manier waarop nomaden in het verleden hun samenleving inrichtten. Dit is een belangrijk thema, niet in de minste plaats omdat mobiele groepen altijd in contact stonden met, en invloed uitoefenden op, sedentaire gemeenschappen. De nomaden in de Zwarte Woestijn stonden in contact met het de naburige Romeinse, Byzantijnse en Vroeg-Islamitische Rijken, welke een belangrijke rol spelen in onze geschiedenis. Wanneer we deze samenlevingen goed willen begrijpen kunnen we de rol die nomaden hierin speelden niet links laten liggen.

Author's biography

Harmen Huigens was born in Ridderkerk, The Netherlands, in 1987. After he finished his secondary education at 'De Oude Hoven' in Gorinchem, he moved to Leiden in 2006 to study archaeology at Leiden University. As an undergraduate he became particularly interested in the archaeology of the Ancient Near East. He was trained to do fieldwork at excavation- and survey projects in Syria (Tell Sabi Abyad excavations) and Turkey (Çide survey). He continued to study at Leiden to obtain his MA degree, again with a major focus on the archaeology of the Ancient Near East. During this period – from 2011 onwards – he became involved in the Jebel Qurma Archaeological Landscape Project, Jordan, for which he carried out a remote sensing study that became the topic of his MA thesis. In this period he developed himself as a landscape archaeologist and GIS-specialist, by being involved in devising and carrying out field surveys in the Jebel Qurma region, and through his engagement with an archaeological landscape project in Oman (Wadi al Jizzi project). He started his PhD research as a member of the *Landscapes of Survival* programme shortly after graduating in 2014. During his years at Leiden he co-edited an excavation report and (co-)authored several research papers.