Bronze Age Builders on the edge of the desert: Re-examining Wadi Suq period (2000 – 1600) settlement, lifeways, and resilience in southeast Arabia

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BRONZE AGE BUILDERS ON THE EDGE OF THE DESERT

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Cover: Aerial photograph of trench AV61 at WAJAP Site 73, also known as Burj Huraiz (Photograph by Ruben Hartman).

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Chapter 1: Introduction

Comparing the archaeological data for the Umm an-Nar (2700-2000 BCE) and Wadi Suq (c. 2000-1600 BCE) periods in southeast Arabia, a significant change in settlement patterns can be observed. Fewer settlements are occupied overall in the latter period, and it is thought that much re-use of older settlements takes place whereby existing structures see limited remodeling (Magee, 2014, pp. 186-187). This diminished and seemingly more opportunistic occupation pattern has been explained by a shift from sedentary oasis habitation to more mobile lifeways (e.g., Cleuziou, 1981). The driving factor behind these changes has been credited to the pressures of a changing climate (Gregoricka, 2016, pp. 211-212), or a reorientation of exchange networks (Carter, 2003; Crawford, 1996), with some scholars seeing a combination thereof as the root cause (Righetti, 2015, pp. 349-350). An alternative to these explanations of external pressures, has been sought in social reorganization in light of stresses put on a presumed tribal model of organization by increasing trade-derived wealth. In spite of the apparent lack of settlement sites during the Wadi Suq, it is thought that a sizeable population persisted, based on the high number of Wadi Suq cemeteries (Gregoricka, 2011, p. 84). As a challenge to this theory of higher mobility, it has been proposed that the wadi Suq sees occupation in more ephemeral sites that are not reflected in the archaeological record (cf. Cleuziou & Tosi, 2007, p. 259; Magee, 2014, pp. 152, 182).

Nevertheless, the mobility hypothesis is rooted in a limited understanding of Wadi Suq settlement. This is the result of a focus on the abundant funerary remains of this period, overshadowing the analysis of Wadi Suq settlement over the broader region. Current research reinforces this by either analyzing individual sites in their local context, or identifying sites based on surface remains during survey projects. Here, the former produces a deep knowledge of only one location that is often left uncontextualized beyond the local landscape, while the latter results in superficial knowledge but for a larger number of sites. While some parallels between sites have been recognized (cf. Kerr, 2016), an analysis directly comparing the known non-funerary sites in terms of construction styles, site layout, and organization has not yet been conducted. Knowledge on settlement location choice is also underdeveloped and often taken at face-value, although recent investigations are starting to show that complex settlement dynamics could be at play (see de Vreeze et al., 2024).

To overcome these gaps in the current state of knowledge, this thesis will attempt to analyze all known non-funerary Wadi Suq sites in a comparative framework with an emphasis on the built environment and its organization. From this analysis, it will aim to investigate whether the mobility hypothesis can be substantiated from these remains, and how such lifestyles would have been configured on a more detailed scale. This will provide a new perspective on Wadi Suq settlement and an insight into human resilience in periods of significant change.

1.1 The Wadi al-Jizzi Archaeological Project

This thesis will rely on data from the Wadi al-Jizzi Archaeological Project (WAJAP), a project that focused on archaeological survey in the hinterlands of the city of Sohar in the Batinah region of Oman with small-scale excavation campaigns in 2023 and 2024. The WAJAP investigates an area from the foothills of the Hajar al-Gharbi to the Batinah coast. Within this area lie two wadi corridors that

form the focus of the project, the Wadi Suq/Wadi al-Jizzi and Wadi Fizh/Wadi al-Zahaimi corridors (Düring & Olijdam, 2015; Düring et al., 2019). Although the WAJAP has generated significant amounts of survey data with its limitations as described above, this particular project employs an intensive survey methodology with the aim of creating both quantitative and qualitative data, rather than merely recording quantitative 'dots on the map' (Düring, 2022). The data from this project will be used in this study as a case study to assess how the changes between the Umm an-Nar and Wadi Suq periods came to expression in the study area, which represents a specific geographical region in the Batinah area. Accordingly, a more detailed account can be given of a set of sites and how they fit into wider models of settlement, providing an insight into how settlement systems might have functioned in the Wadi Suq period. Moreover, the sites in this area will be compared to the other non-funerary sites of the Wadi Suq period, to see whether they constitute unique cases, or align well with patterns observed for the other sites. In doing so, a deeper understanding of these sites will emerge.

1.2 Research Questions

To keep this research focused, the following main research question has been formulated:

- How do trends in settlement and construction from the Sohar hinterland in Oman compare to the general character of settlement and construction during the Wadi Suq period (2000-1600 BCE) in southeast Arabia, and what does this reveal about the mobility?

In order to answer this main research question, several sub-questions will be answered across different chapters to guide the progression of the thesis:

- What can trends in settlement and construction reveal about the degree of mobility among the populations?
- How can settlement and construction during the Wadi Suq period (2000-1600 BCE) be characterized across southeast Arabia?
- How can settlement and construction from the Sohar hinterland be characterized, and how does this compare to the general characterization of construction and settlement during the Wadi Suq period?

1.3 Methodology

To answer the first sub-question, a discussion of the study of mobility in archaeological contexts will be provided, highlighting methods on how different types of mobility can be recognized, and providing a framework for assessing the exact configuration of mobility in prehistoric societies more precisely. This will also focus on whether ephemerality can be correlated with higher modes of mobility. In doing so, a new angle for assessing Bronze Age settlement in southeast Arabia will emerge.

For investigating the second sub-question, an analysis of all non-funerary sites with a Wadi Suq component will be done, with a special focus on settlement patterns and construction styles. These sites will include those that see a transition between an earlier Umm an-Nar occupation and the Wadi Suq, but also those sites that appear as newly settled during the latter period. Similarities and differences in developments across different sites will become clear through this, and can be used to compose a general view of the regional developments during this period.

To answer the third sub-question, an analysis of the Wadi Suq sites from the WAJAP project will follow, again focusing on settlement and construction, but also highlighting the environmental particularities of the sites. In particular site S73, or Burj Huraiz, will be highlighted as it contains both a Late Umm an-Nar and a Wadi Suq settlement in close proximity to each other, allowing for a detailed analysis of the particularities of the transition between these periods. Moreover, this site has been investigated through two seasons of limited excavation and hence more detailed information is available.

By combining the information from these segments, an answer will be sought to the main research question by comparing the results for the WAJAP sites with those for the wider region. An assessment of general mobility will be made according to the framework derived from answering the first sub-question.

1.4 Outline of this thesis

After the current introduction chapter, the second chapter will sketch the background for this study in terms of geography, climate development, and archaeological periods. The third chapter will assess dominant theories for why change is observed in the Wadi Suq, and will also provide a framework within which mobility can be assessed. The fourth chapter presents an analysis of the available literature of all currently known non-funerary sites of the Wadi Suq period, after which chapter five will present and analyze data from the case study of the Sohar hinterland. The sixth chapter will discuss the results from the preceding chapters, and will lay the basis for answering the main research question, as well as discuss limitations of the current research. The seventh and last chapter will conclude this research by answering the main research question and provide recommendations for future research.

Chapter 2: Southeast Arabia in the Bronze Age

2.1 Environment and Geography

The Oman Peninsula is situated at the eastern extremity of the Arabian Peninsula, and consists of the United Arab Emirates (hereafter UAE) and the Sultanate of Oman. To the northwest, the Arabian Gulf is situated, and to the northeast lies the Gulf of Oman. The al-Hajar mountain range divides the coastal plain from the interior landscapes. In the southwest lies the Rub al-Khali, or the empty quarter, which is a vast arid desert (Giardino, 2019, p. 1).

Annual rainfall is generally low in the area (around 100 mm), but highly variable. It can exceed 350 mm in the mountainous areas, but is reduced to less than 50 mm in the desert interior and on the coast (Al-Barwani, 2014). Rainfall is therefore insignificant for dry-farming where the geography is suitable for it, but as water is stored in water-bearing layers – or, aquifers – in the foothills, water is still accessible in the coastal regions and the predesertic inland piedmont strips. This has allowed the exploitation of local economic resources since prehistory (Tosi, 1975, p. 187; Giardino, 2019, p. 1). The climate is hot and humid at the coast, and hot and dry in the interior. Only winter and summer seasons are distinguished, with most of the scarce and irregular precipitation occurring in winter. The mean annual temperature lies between 32 °C and 38 °C (Al-Jahwari, 2013, pp. 12-13). However, climate is regionally variable and is dictated by environmental differences at the local scale, as can also be assumed for the past.

Moreover, as the local environment influences settlement, it is important to define different geographical zones that are significantly different from each other. Below, a brief overview is presented for seven distinct regions that characterize southeast Arabia. As a basis, the zoning devised by Carter (1997a) is used, which is supplemented by one additional region, the Ja'alan coast (Figure 1). This categorization is considered suitable for the current research, as it covers all areas in which Wadi Suq period occupation has been discovered. Other divisions of the peninsula exist (e.g., Al-Jahwari, 2013, pp. 17-19), but Carter's distinction is preferred as it considers the western foothills of the Hajar Mountains ('The Western Oasis belt', see below) as a distinct region, which is appreciated in light of the significant amount of archaeological data deriving from this region alone.

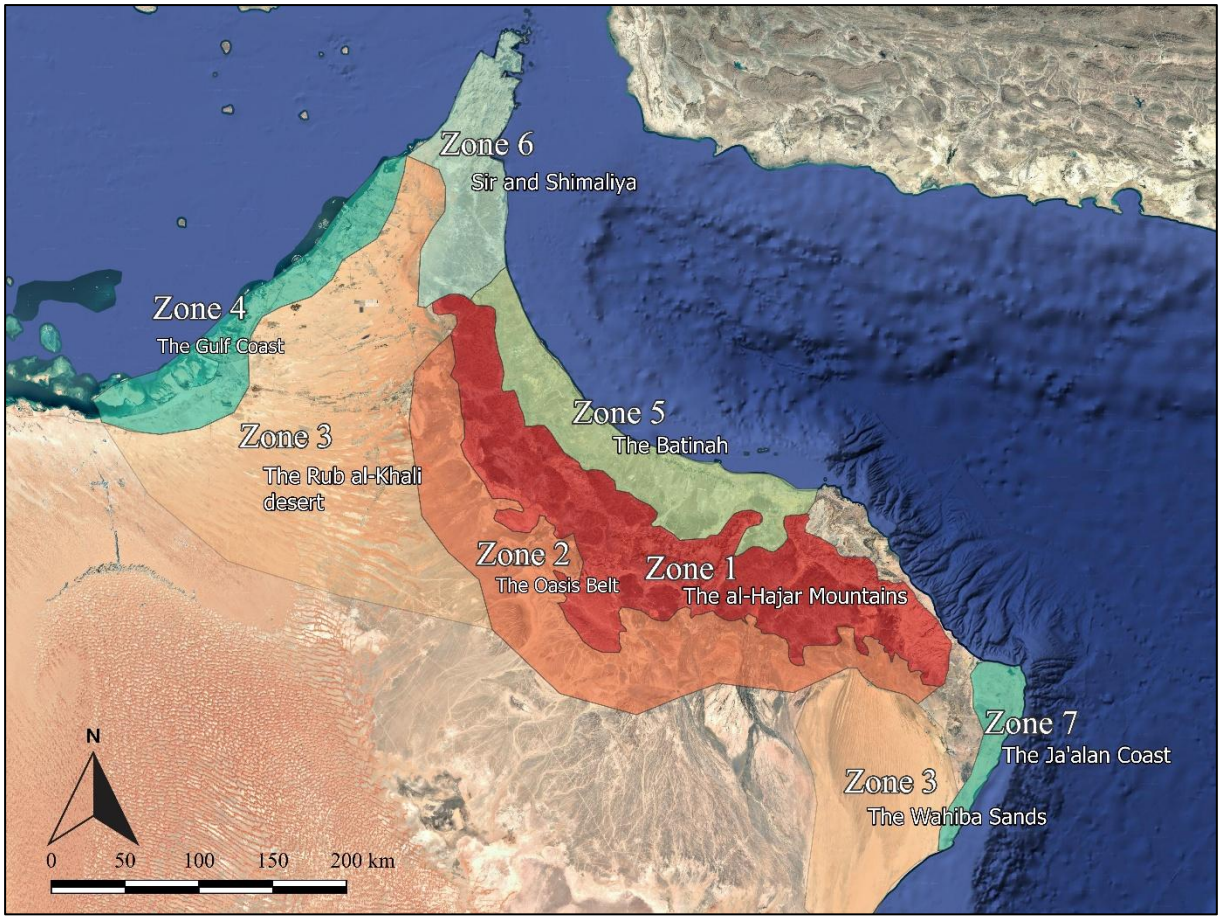

Figure 1: Map of the Oman Peninsula with the different geographical zones. Zoning extent based on Carter (1997b, p. 13, Figure 4) and Kerr (2016, p. 5, Figure 2) (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

2.1.1 Zone 1 - The Hajar Mountains and foothills

The first zone consists of the al-Hajar Mountains that dominate the Oman Peninsula. These mountains, combined with their foothills, form the first major environmental region. The mountains are found from the eastern extremity of the Arabian peninsula to the west, and go up north in a crescent-shape where they end in the water of the Strait of Hormuz.

Particular about these mountains is the rock unit of the Semail Ophiolites. This unit was formed during Mesozoic times (ca. 170-105 million years ago) and represents the ancient oceanic lithosphere. Through the process of subduction and additional compressive forces that caused the formation of the Semail ophiolites in the first place, these and another so-called ‘autochtonous’ unit, the Hawasina sediments, were thrust onto the Arabian shelf. Through this process, these oceanic layers became exposed to the level where they are found today. These layers contain most of the copper ore deposits in Oman that also made the Lands of Magan known throughout antqiuity (Giardinio, 2019, pp. 7-9; Weeks, 2003, pp. 8, 14-15). Other natural resources provided by the mountains are steatite (softstone), limestone, basalt, and, through weathering processes, clay (Magee, 2014, pp. 15-16). Deep wadi, or perennial river systems, have cut the mountain range and provide routes of communication between the Batinah and the western side of the Peninsula.

Among them are the Wadi al-Jizzi, linking the sites in the Buraimi/Al-Ain oasis to the east, and the Wadi Sumail which links the Muscat area with sites west of the mountains. Though the mountains themselves are too rugged for permanent occupation, traces of human activity can be found in these wadi corridors (Carter, 1997a, p. 16).

The foothills of the Hajar mountains, both in the east and in the west, provide the most favored habitation sites in antiquity. Rainfall is relatively steady at 100 mm, and is supplemented with surface water flows in the form of seasonal floods. The force of the wadi stream is more manageable in the foothills, and settlements tend to cluster on wadi terraces and along bends in order to make use of the water in their close proximity (Carter, 1997a, p. 17).

2.1.2 Zone 2 - The Western Oasis Belt

Located between the foothills of the Hajar mountains, and the interior desert, this area was very important in the history of the Oman Peninsula. It receives water from occasional outwash from the highlands during the wet season, and from aquifers of porous sediments that can easily be tapped through wells. These resources were amply exploited by oasis settlements of the Early Bronze Age, from which this zone derives its name. Additionally, the aquifers have historically been used in the *qanat*-systems that tap these layers higher in the foothills and guide the water down to the desired agricultural lands at surface level. However, it is thought that this technology stems from the Iron Age and was not available during the Bronze Age. An important communication route runs through this zone, from the Wadi Sumail corridor through Ibri and the Buraimi/Al-Ain oasis all the way up to Ra's al-Khaimah (Carter, 1997a, p. 18).

2.1.3 Zone 3 - The Desert

The Oman Peninsula knows two main deserts. In the west lies the Rub al-Khali ('Empty Quarter') desert, which covers most of the Arabian Peninsula and borders the western oasis belt. The second desert consists of the Sharqiya sands (once known as the Wahiba sands; Döpper, 2021, p. 322), which is located southwest of the Hajar mountains and covers an area of ca. 16.000 km^2. These deserts have generally been uninhabitable since the sixth millennium BCE, when the climate became dryer and interdunal lakes disappeared (see 3.2). An exception to this are the Bedu tribes and pastoralists that might dwell on the fringes of the desert where there is sufficient vegetation for their herds (Al-Jahwari, 2013, pp. 10-11; Carter, 1997a, p. 19).

2.1.4 Zone 4 - The Gulf Coast

The Gulf coast is located in the UAE and stretches from the Abu Dhabi in the south to Ra's al-Khaimah in the north (Kerr, 2016, p. 3). It is bound to the east by uninhabitable desert and has low rainfall. The coastal strip is made up of dry scrubland and saline marshes. Despite the generally poor resources, the coast consists of lagoons and estuaries, as well as mangroves and small islands that provided resources to past populations residing there. Archaeological evidence indicates a reliance on marine resources and pastoralism (Carter, 1997a, pp. 19-20).

2.1.5 Zone 5 - The Batinah Coast

The Batinah plain is an area with particular geographical and hydrological conditions. It is located northwest of the capital city of Muscat in the southeast and stretches almost 280 km towards the northeast. It is 10 to 20 km wide and is bordered by the Sea of Oman to the east and the Hajar mountains to the west. Today, this area is the second most populated part of Oman, after Muscat. Geologically, the area can be divided into two general zones. First, there is the piedmont zone that lies to the west and consists of alluvial terraces created through runoff rainwater from the mountains. Second, there is the surface of the plain, consisting of coarse sand and gravel deposits cut by meandering wadi channels that drain in the Gulf of Oman. This plain has formed over millennia from the outwash of sediments from the mountains.

In the Batinah plain, precipitation is at an annual average of 76 to 100 mm. However, there is relatively more groundwater available, as a consequence of runoff water from the mountains being transported down through the wadi valleys, and being dammed by the saline water table of the sea. This makes it an attractive area for agriculture. Close to the coast, groundwater can generally be accessed through shallow wells, making well irrigation the most important source of water for agricultural purposes. Next to agriculture, fishing has also been an important source of subsistence, while mangroves provide another resource-rich environment that has been exploited in the past (Abulibdeh et al., 2021, pp. 4-5; Al-Jahwari, 2013, p. 11; Carter, 1997a, pp. 20-21).

2.1.6 Zone 6 - The Sir and Shimaliya

This zone encompasses the Musandam peninsula, the northern coastal plain of the Arabian Gulf coast, and the Shimaliya on the eastern side of the Hajar mountains, where the elevation is relatively lower. This zone includes the northernmost part of the Hajar mountains and the Batinah coast as well. Rainfall is higher here compared to the rest of the Hajar mountains. Groundwater is plentiful and well-based agriculture is dominant, and large date palm plantations are found here.

2.1.7 Zone 7 – The Ja’alan Coast

The Ja’alan Coast is situated at the easternmost edge of the Oman Peninsula. In the north and northeastern parts of this area, large marine abrasion terraces are cut into the local limestone geology, and the cliffs can rise up to 30 m above sea level here. There are three lagoons (*khors*) that are being fed by wadi’s that carry water down from the inland hills and mountains. Positioned at the mouth of these perennial rivers, they feature a mangrove biotopes with the associated vegetation and resources. From Ra’s al-Jinz, which forms the easternmost point of the Arabian Peninsula, the coastline is characterized by a narrow promontory and stretches several kilometers southwards. From Ra’s al-Khabbah the coast becomes sandier, and fossil lagoons and *sabhkas* (coastal mudflats) are observed in the immediate hinterland. The upwelling of cold water along the Arabian Sea coast has provided ample fish resources in this zone, along with their marine predators, forming a valuable food source that has been exploited from a very early date (Berger et al., 2005, p. 48).

2.2 Development of climate through time

The arid conditions in southeast Arabia establish water availability as a key factor in determining settlement location in modern times and it is likely that this was even more crucial in the past (Tosi,

1975, p. 187). Therefore, changes in climatic conditions in this region are often seen as crucial in understanding large-scale change in human behavior, as is the case for the transition from the Late Umm an-Nar to the early Wadi Suq period in southeast Arabia, taking place from around 2200 to 1900 BCE. Thus, it is essential to summarize the development of the climate and landscape formation during the Holocene.

At the start of the Holocene, climate conditions in Arabia were quite different from those of today. Large parts of its landscape were shaped from the later part of the Last Glacial Maximum until the earliest parts of the Holocene, as mega linear sand dunes formed under intense aeolian transportation made possible by the increased intensity of the Shamal winds. At Awafi lake, this phase is dated to ca. 10,000-7000 BCE (Parker et al., 2006, p. 470). A northward migration of the Intertropical Convergence Zone (ICTZ) and associated Indian Ocean Monsoon (IOM) provided the peninsula with increased precipitation. This shift has been attributed to ca. 8500-7500 BCE in southern Oman, and ca. 8000 to 7000 BCE in northern Oman based on proxy data (Fleitmann et al., 2007, p. 179; Fuchs & Buerkert, 2008). The pluvial conditions allowed lacustrine sediments to develop in interdunal lakes, around which vegetation was clustered. This phase of lacustrine development is thought to have lasted until ca. 6000 BCE, when the ICTZ retreated southwards and climate conditions became dryer once again (Fleitmann et al., 2003; Fleitmann et al., 2007; Parker et al., 2016, p. 296). Simulations based on multiproxy records show that within the Arabian Peninsula the retreat of the associated rain belt was more abrupt at latitudes above 20°N, and more gradual at latitudes below this (Lézine et al., 2017).

Mundafan lake in Saudi Arabia and al-Hawa Lake in Yemen display wet records that extend several centuries beyond the onset of the substantial aridification. This is due to their proximity to mountainous areas from which they would receive run-off water. Awafi Lake in the northeast corner of the Rub al-Khali benefitted from similar circumstances, and also from a higher water table due to its proximity to the sea (Lézine et al., 2010). These proxy records are thus non-linear in their reflection of climatic shifts, and show that although aridification was inescapable in most of the peninsula, some places remained more beneficial in terms of water availability due to local circumstances.

After the aridification set in, small populations could still exploit those areas that remained more favorable for a bit longer, such as the lakes described above. However, at some point they inevitably also had to adapt to the changing landscape, in which resources became increasingly scarce and concentrated in certain niches, like the coastal areas. Increasingly complex social and technical configurations developed during this period and set the stage for the Hafit and Umm an-Nar periods, when the complex agricultural system of the irrigated oasis site emerged (Lézine et al., 2010, p. 426).

2.2.1 The 4.2 ka event

Towards the end of the third millennium, around 2200 BCE, a range of paleoenvironmental proxies indicate an aridification event, more commonly known as the 4.2 ka event. This climatic event has been subject to numerous environmental studies that are yet to come to a consensus on its exact magnitude and impact.

Due to the lack of a general comprehensive body of paleoenvironmental proxy data from the study area, first a brief incursion into data from surrounding regions is made. Looking at environmental proxies from Egypt, Mesopotamia, Iran and the Indus valley (Figure 2), several patterns and similarities emerge. First, the climatic changes are expressed, as would be expected, in phenomena related to water. For the Nile and Omo rivers in Africa, reduced flow is observed (Halfman et al., 1992, p. 32; Krom et al., 2002; Pennington et al., 2019). Furthermore, low lake levels are attested for Lake Faiyum and Lake Turkana (Halfman et al., 1992, pp. 30-32; Hamdan et al., 2015, pp. 42-44; Zhao et al., 2017, pp. 23-28). A reduced discharge is also recorded in the Indus delta at 2200 BCE (Giesche et al., 2019; Staubwasser et al., 2003). In central India, Lonar Lake shows signs of aridification around 2400 BCE (Prasad et al., 2014) while in Mesopotamia, the Euphrates and Tigris rivers both show reduced flow rates (Cookson et al., 2019, p. 4). Lake Faiyum, Lake Turkana, Lonar Lake, Lake Van and the Northern Dead Sea all see an enhanced oxygen isotope ratio, which is a proxy indicating an increased level of evaporation with limited replenishment of these bodies of water by precipitation (Arz et al., 2006; Halfman et al., 1992; Hamdan et al., 2015; Lemcke & Sturm, 1997; Prasad et al., 2014; Zhao et al., 2017). In the Nile and Indus River deltas, the Gulf of Oman, and at Gol-e-Zard cave, sedimentological and speleothem proxies indicate an influx of dust that is mainly sourced from Mesopotamia (Carolin et al., 2019; Hamdan et al., 2015; Younes & Bakry, 2022; Zhao et al., 2017), with the Indus River delta core also showing signs of dust sourced from northern Arabia (Staubwasser et al., 2003, p. 3). Interestingly, the high-resolution stalagmite record from Gol-e-Zard cave in Iran shows two periods of increased dust influx. These periods are dated to 4510 and 4260 (± 66y) BP and last 110 and 290 years respectively (Carolin et al., 2019, p. 71).

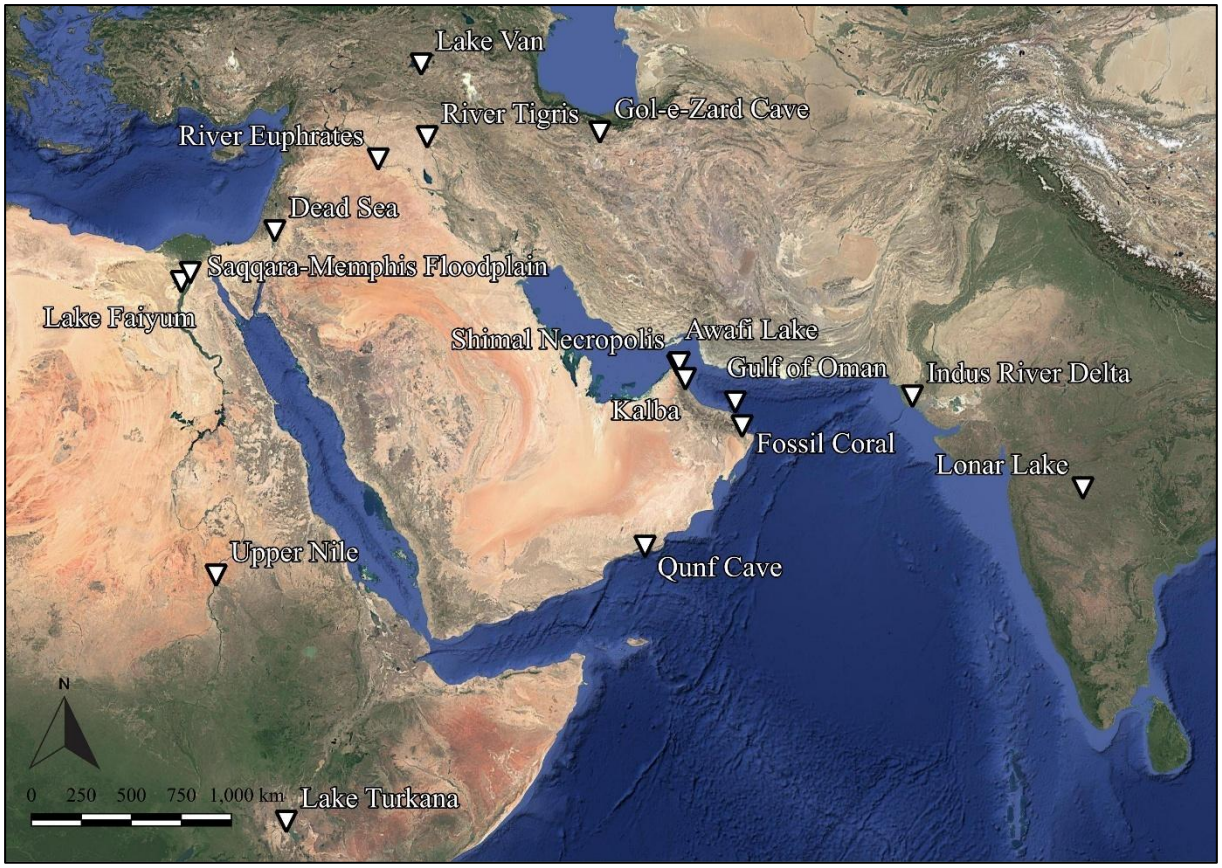

Figure 2: Map with the locations of the paleoenvironmental proxies mentioned in the text (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021)

From the synopsis above, evidence appears to indicate that some change in climatic conditions did take place around 4.2 ka in the areas surrounding the study area. Some scholars have even extended this phenomenon to a near-global 'megadrought' event (cf. Weiss, 2017). Due to resolution constraints, the events that are observed in the proxies under discussion here are all dated to between 4.4 and 4.0 ka, lasting from ca. 300 years (cf. Krom et al., 2002; Watanabe et al., 2019) to over 1000 years (cf. Lemcke & Sturm, 1997). However, the observed changes are variable – where some studies stress the abruptness and intensity of the climatic events (e.g., Halfman et al., 1992; Carolin et al., 2019; Prasad et al., 2014), others emphasize that change took place over the longer term and at a much reduced scale (e.g., Arz et al., 2006; Lemcke & Sturm, 1997).

In a recent meta-analysis of 109 studies investigating the 4.2 ka event, McKay et al. (2024) found that there is a high variability in the impact, timing, and duration of the climatic excursion. The event is recorded to begin at 4.6 ka at the earliest, with the median at 4.2 ka, and ending as late as 3.4 ka, with the median at 4.0 ka. The average duration of the event is reported at 325 ±170 years (Figure 3).

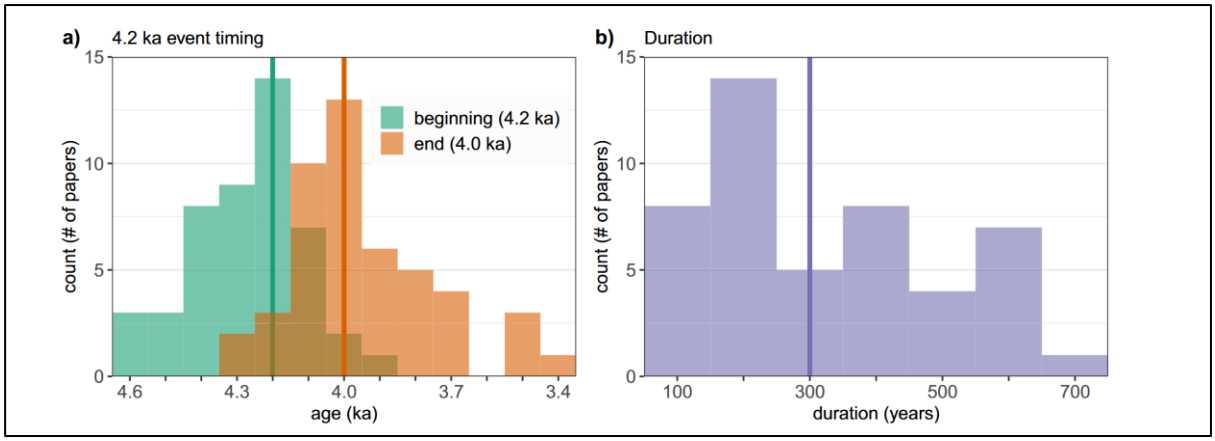

Figure 3: The timing and duration of McKay's meta-analysis represented in two histograms. Graph A shows the count of the timing of the 4,2 ka event's beginning in green, and the timing of its end in orange. Graph B represents the count of the duration of the 4.2 ka event across the different papers. Median values are indicated by the vertical lines (McKay et al., 2024, p. 3, Figure 1).

They conclude that the event cannot be seen as a global phenomenon and is not remarkable in the context of Holocene climatic fluctuations (McKay et al., 2024, pp. 7-8). However, they also note that in some regions there were indeed significant excursions at this time, and that the effect of these events, although not remarkable in the Holocene context, may have been impactful at the local level (McKay et al., 2024, p. 7). The latter idea resonates with Arz et al.'s notion that although changes in climate are visible in many locations around 4200 BP, these are often not abrupt events but unfold over a longer time period, sometimes even hundreds of years. The fact that an abrupt climatic event is visible in the Mediterranean, northern Africa, and the northern Red Sea proxies is explained as the result of regional feedback and threshold mechanisms that catalyzed the otherwise regular variations that we see throughout the Holocene climatic record (Arz et al., 2006, p. 440). This reinforces the idea of variable local expression of climatic events, as was already briefly mentioned before. Despite these interesting explanations the issue of the exact magnitude, and the temporal and spatial extents of the 4.2 ka event remains a topic that warrants further investigation.

The 4.2 ka event in southeast Arabia

From the foregoing review and the discussion of climatic developments in Arabia during the Holocene, it is clear that climatic change tends to have a variable local expression (cf. Petraglia et al., 2020, p. 8265). Therefore, to see what happens in the Oman Peninsula during the 4.2 ka event, several proxies are reviewed that most directly inform on the study area. These include a deep sea core, a fossil coral record, marine shell samples, a paleolake sedimentological record, speleothem data, and oxygen isotope data. For each of these proxies, however, only one study is known to date. For the locations of the respective proxies, see Figure 2.

Cullen et al. (2000) investigated a deep sea core (core M5-422) which was retrieved from the Gulf of Oman, and provides proxy data with fluctuations at a centennial resolution. In the core, based on the radiogenic isotope and mineralogic results an increase in aeolian-sourced material (dolomite and calcium carbonate) is observed at 4025 ±150 BP (Cullen et al., 2000, pp. 380-381). These data indicate an increase in dust storms that are sourced mainly from Mesopotamia (Al-Hemoud et al., 2022, p. 19). Data from fossil Omani corals, that also serve as a proxy for increased aeolian sediment

influx, corroborate this view (Watanabe et al., 2019), and speleothem records from Iran show a similar view (Carolin et al., 2019). Cullen et al. relate the increased aeolian influx to an abrupt and short lived (ca. 400 years) aridification event in the Tigris and Euphrates flood plains, the primary sources of this Mesopotamian dust. Although no direct reference is made to the influence of increased dust storms on the southeast Arabian climate, it can be imagined that as the peninsula was on the receiving end of these more frequent and intensive dust storms, it held consequences for the Arabian climate. This notion is strengthened by the fact that Mesopotamian dust has been found as far east as Gol-e-Zard cave (see above), and that in the Indus River delta, dust sourced from northern Arabian sources was found (Staubwasser et al., 2003, p. 3)

Another proxy record comes from the geochemical analysis of sediment cores from Awafi Lake in the UAE. These indicate more humid conditions between ca. 3000-2300 BCE, coinciding with the Hafit and Umm an-Nar periods in which settled agricultural communities first appeared in southeast Arabia. The exact spatial extent of the increase in moisture is not clear. The total desiccation of the Awafi Lake basin at 2200 BCE paired with an increase in detrital sediment flux between 2300-1900 BCE indicate the onset of an abrupt, major drought event (Parker et al., 2006, pp. 472-473; Parker et al., 2016, p. 297). Subsequently, aeolian deposition peaked at around 4100 BP, and the Awafi basin was filled in completely (Parker and Goudie, 2008, p. 468). From the site of Kalba on the east coast of the UAE, several marine shell samples were tested to assess the local marine reservoir effect. The researchers found that between the Neolithic and 1600 BCE, the reservoir effect drastically decreases, coeval with other multiproxy records, and can be explained by a declining sea level and a progressively drier climate (Lindauer et al., 2017). In the southern part of Oman, the high-resolution stalagmite record from Qunf Cave shows a gradual decrease in precipitation levels from 8000 BP (Fleitmann et al., 2003). Remarkably, this record has a very high temporal resolution, but does not display an abrupt nor an extreme anomaly at 4.2 ka where it would be expected. However, because the processes behind the formation of speleothem $\delta^{18}O$ are complex and respond to climatic change on a large spatial scale (Carolin et al., 2019, p. 68), the lack of abrupt and large amplitude changes in $\delta^{18}O$ are not necessarily an indication of the absence of sudden climate fluctuations.

Recently, also oxygen isotope compositions observed in ancient human tissues have been used as a climate proxy. The ratio of ^{16}O to ^{18}O isotopes (commonly written as $\delta^{18}O$) in water responds to aridification as the lighter ^{16}O isotopes tend to evaporate more quickly than the heavier ^{18}O isotopes, so that the ratio becomes more enriched in ^{18}O. As humans take up these isotopic compositions as they consume water, these values become stored in different tissues in the body. Dental enamel, which forms during early life, thus forms a record of Oxygen isotopic composition of water resources in the place where an individual grew up. By measuring these ratios in ancient human remains and comparing them, the $\delta^{18}O$ values can function as a proxy for climate conditions over time (Gregoricka, 2013, p. 354; 2016, pp. 214-215). At the site of Shimal (UAE), spanning both the Umm an-Nar and Wadi Suq periods, the application of this methodology on a range of individuals from tombs of both periods held different $\delta^{18}O$ signatures. Based on a significant ^{18}O enrichment in the Wadi Suq period, together with other factors that rule out the possibility of non-local individuals

being represented in the sample, it is clear from this population that an aridification event indeed took place between the periods (Gregoricka, 2016, pp. 218-219).

In sum, the sediment sequence of the Awafi Lake basin, the shell material from Kalba, and the dental enamel $\delta^{18}O$ signatures in individuals from Shimal point towards an aridification between ca. 2200-2000 BCE, which is consistent with the interregional patterns. The speleothem record from Qunf Cave does not corroborate this pattern, but does also not necessarily contradict such an interpretation due to the particularities of speleothem formation. In fact, convincing evidence opposing a development towards more arid conditions is generally absent for southeast Arabia. Notwithstanding the relative scarcity of environmental studies in this area that investigate specifically this time period, it is clear from the results here that there is a significant difference between the third millennium climate, with relatively more rainfall in the study area, and a more arid climate for the second millennium BCE and beyond, a situation that has been deemed relatively constant up to today. This change likely occurred between 2200 and 2000 BCE, for which a more exact chronology cannot currently be given beyond the local level, and these changes likely altered the landscape through threshold changes that resulted in fluctuating lake levels, dune reactivation, and vegetation loss, as proposed by Parker et al. (2016, pp. 296-297).

2.2.2 Problems with interpreting environmental proxies

The debate surrounding the 4.2 ka event is concerned with several issues that in my view stem from a range of misconceptions more generally, which warrants a short discussion. First is the issue of chronology. As highlighted by McKay et al., the duration and timing of climatic events is highly variable between different proxies. It is possible that this is due to the scale disjunction between archaeologists and paleoenvironmentalists when considering timescales. The latter may apply terms like “abrupt and rather short-lived” (Cullen et al., 2000, p. 381) to describe periods lasting ca. 400 years. Such timescales are significant in the archaeological record, where the chronological resolution at the scale of generations (ca. 20-30 years). However the use of words such as ‘abrupt’ and ‘short-lived’ may have influenced archaeologists interpreting changing settlement and demographic patterns to adopt the notions in their own timescales, which would then create the misconception that environmental change took place over short timespans.

Another issue that reinforces what is described above is the general misinterpretation or exaggeration of results. Values measured in one study are exaggerated in references in other studies. One example is observed in Carolin et al. (2019), where it is stated that Cullen et al. “captured an abrupt factor-of-5 increase in aeolian deposits from Mesopotamia … in the Gulf of Oman”. This is the peak value in aeolian deposits reported by Cullen et al., which went from the average 1,5% to 9% by weight. In fact, the aridification event Cullen et al. describe unfolds over a period of ca. 400 years and is indicated by (only) a factor 2.5 increase in (weighted) average mass flux of dolomite, from a background value of ca. 0.4 $g/cm^2/k.y.$ to a weighted average value of ca. ~1.0 $g/cm^2/k.y.$ (Cullen et al., 2000, p. 380). The representation of longer-term processes through their peak values have fueled the notion of abrupt climate change around 4200 BP.

A last obstacle of current scholarship, is that climatic data are extrapolated from one region to the next, without taking into consideration the regional variability of the expression of climatic change. The data for one region are often not applicable when looking 1500 km to the west, as is done, for example, by de Vreeze et al. (2024, p. 2), who take proxy data from the Indus River delta and apply this to southeast Arabia. Instead, we must look for local proxies to account for local variation. The transposing of such results over large distances works to generalize and simplify the complex climatic mechanisms at play, and can create a narrative in which large regions are affected negatively, even though specific niches might have remained more inhabitable, as seems to be the case for southeast Arabia (cf. Petraglia et al., 2020).

From this discussion it becomes clear that the changes observed around the 4.2 ka mark likely unfolded gradually over several centuries. Furthermore, care must be taken when interpreting paleoenvironmental data and it must be validated by local proxies when extrapolating non-local proxy data to a region, as climatic change is expressed variably at the local level.

2.3 The Hafit period

The first traces of settled life in the eastern Arabian Peninsula occur towards the end of the fourth millennium, at around 3100 BCE. Settlement over the following four centuries, covering the first half of the Early Bronze Age, or 'Hafit' period, is extremely scarce. Evidence for this has only been found at five sites, consisting of Ra's al-Hadd, al-Ayn, Hili, Bat and al-Khashbah (Deadman, 2017, pp. 53-59). Constructions are generally made out of local stone or regular mudbricks, with buildings adhering to a rectilinear plan. In this period, the first iterations of the monumental round 'tower' structures appear, which become more widespread in the following Umm an-Nar period (see below).

The Hafit period is known for the enormous quantity of still surviving tombs. Located on prominent locations in the landscape, mostly on hillcrests, it has been estimated that over 50,000 Hafit tombs still survive today (Deadman, 2017, p. 148). The monuments are often grouped together in necropoles and represent the first moment in the history of southeast Arabia that such large stone monuments are built for burying the dead. In terms of energy expenditure, it is estimated that the construction of one such tomb took a team of five people up to one month. In the tombs, the dead are deposited on the ground surface, rather than being buried as was the case in the Neolithic (Munoz, 2019). Generally, the tombs hold up to four individuals, and where undisturbed, the structures have yielded grave goods that include small copper artefacts, different kinds of beads, and imported pottery from Mesopotamia dating to the Jemdet Nasr period (Deadman, 2017, p. 66).

2.4 The Umm an-Nar period

The second part of the Early Bronze Age is also known as the Umm an-Nar period and dates from ca. 2700-2000 BCE (Cleuziou and Tosi, 2020, p. 216). This period sees developments in settlement, subsistence, funerary constructions, and pottery, amongst others, which likely resulted from the establishment of agricultural settlements in well-based irrigated oases (Al-Jahwari, 2009; Frenez, 2020, p. 13) enabled in part by favorable climatic conditions (see 3.1.1). In this period, the exploitation of copper and its trade continues and is intensified (cf. Cleuziou & Tosi, 2020 pp. 101, 281, 285-286; Giardino, 2019; Magee, 2014, pp. 114-118).

2.4.1 Settlement

The sites of the Umm an-Nar period extend over most of the Oman Peninsula, covering an area from the Gulf Coast in the modern-day UAE to the Ja'alan coast in eastern Oman, and include piedmont sites on the interior of the Hajar mountains as well as sites in the Batinah and Oman sea coast. Several of the main sites of this period are represented in Figure 4 (for a more complete overview, see Eddisford, 2022, p. 26, Figure 2).

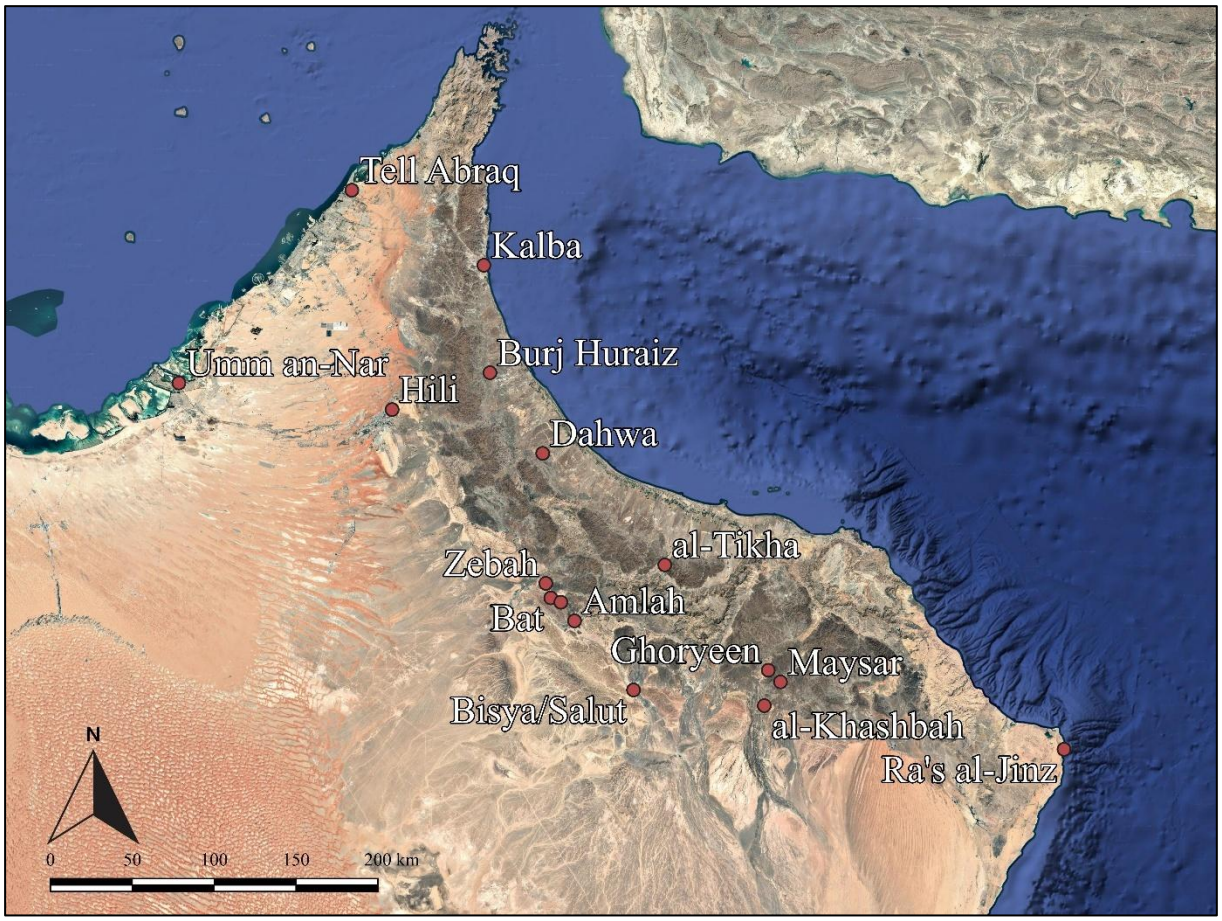

Figure 4: A map of the main Umm an-Nar sites (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

As mentioned in the previous chapter, the Umm an-Nar period sees a development in the number of known agricultural oasis sites. These sites are characterized by the presence of monumental round 'tower' structures in many cases, for example at Hili 8 (Cleuziou, 1979), Kalba (Carter, 1997a) and at Tell Abraq (Potts, 2000). In total, 73 Bronze Age towers are known, which range in construction date from the earliest part of the third millennium to the first centuries of the second millennium BCE. Of these, only seventeen have been (partially) investigated. The Umm an-Nar towers consist of large, round platforms built of locally available stone, mudbricks, or both, and typically have a central well. The monumental structures cluster around the western and southern piedmont of the Hajar Mountains, in the oasis belt zone, and are concentrated particularly in the Bronze Age settlements of Bat, Bisya, and Hili, although they also occur in more isolated contexts. The towers mostly lie on alluvial floodplains associated with wadis or on rocky substrata in more hilly areas. Generally, the towers average between 20 and 25 m in diameter, with the exception of Tell Abraq and Bisya where

the towers range between 35 and 45 m in diameter (Cocca et al., 2019, pp. 85-86). The monumentality of these structures have resulted in a better preservation and make them more easily identifiable in the landscape than smaller and buried settlements. As a result, they have received more scholarly attention and are relatively well investigated. More recently, the focus has started to shift to the settlement contexts beyond the towers, which is starting to fill in gaps in the understanding of this period (cf. Döpper, 2018).

Non-monumental Umm an-Nar buildings typically display rectilinear plans. Different iterations exist, with the most common configuration consisting of several compartments organized around a walled courtyard (Figure 5). Commonly, the structures are built with materials that are available in close proximity, with walls made of mudbrick or local stone. It is likely that the walls were not built up very high, but rather supported superstructures of less durable materials. A chronological increase in the division of the internal space has been attested at the site of Bat, for which it is argued that it reflects an increasing social complexity in its inhabitants. More compartmentalization is thought to reflect a more formalized use of space and the demarcation of territory, and could also reflect the division of labor between household members (Swerida & Thornton, 2019, pp. 107-108). This general layout of rectangular buildings has been found at Umm an-Nar island, where the largest structure was divided into seven rectangular rooms (Frifelt, 1995; Magee, 2014, p. 101). Another example is found at Ra's al-Jinz on the Ja'alan coast, where a total of twelve buildings were discovered. Again, these are regular, well-planned structures, although here they are constructed with mudbrick (this chapter; Cleuziou & Tosi, 2000).

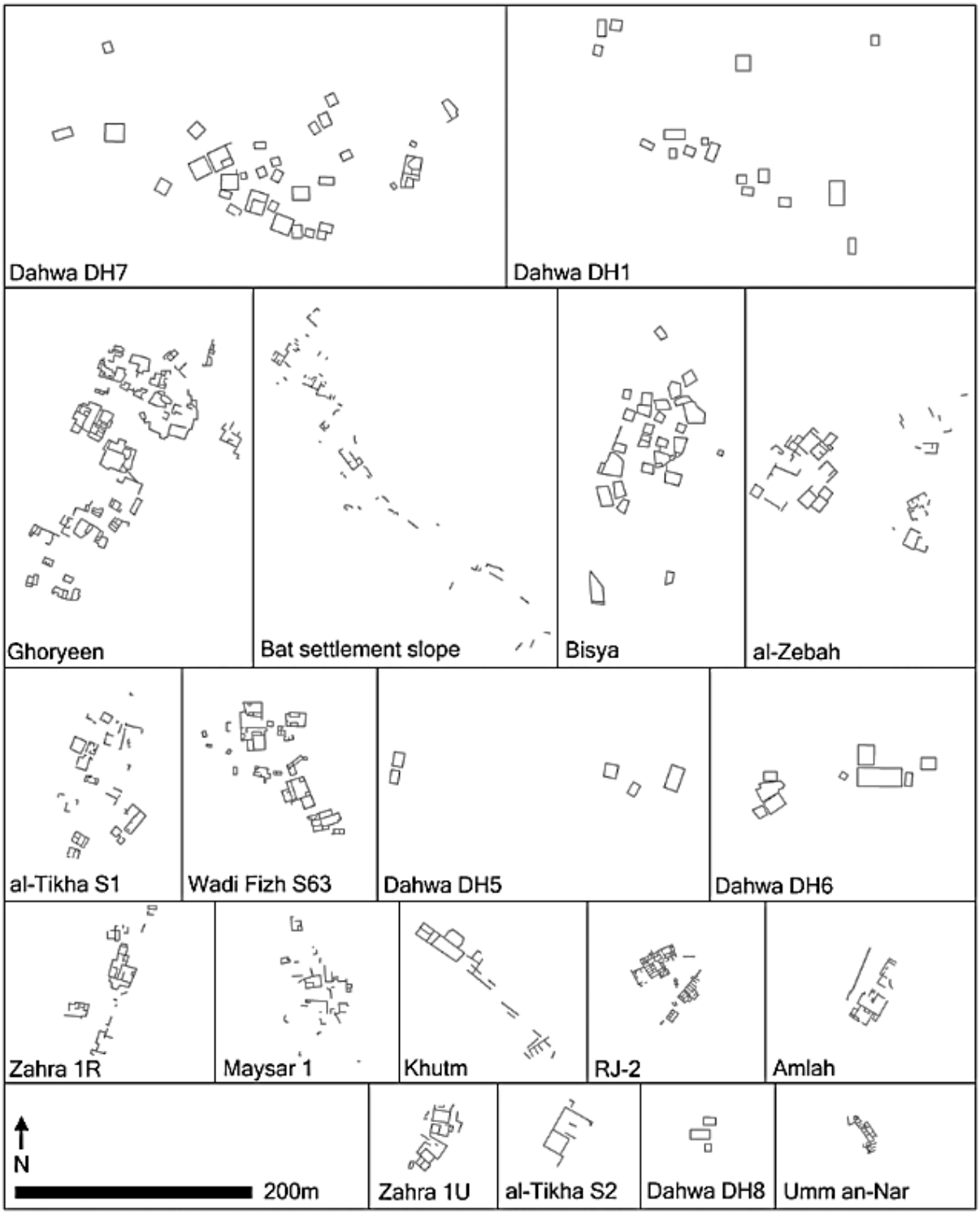

Figure 5: A comparison of different rectilinear structures from a range of Umm an-Nar sites (adapted from Deadman et al., 2022, p. 52, Figure 2).

This short overview admittedly reduces Umm an-Nar settlement to a generalized tradition of sedentary agricultural settlements of rectilinear buildings and with monumental tower structures, which were created through a communal effort that signals a significant degree of social complexity. However, it is important to realize that alternative forms of settlement also existed during the Umm an-Nar. This is evident in the example of Saruq al-Hadid in the UAE, on the northern fringe of the Rub

al-Khali desert. At this inland desert site, sequences of persistent temporary visitation are recorded over the span of more than three millennia, with no evidence for solid buildings from any one period, and is a practice likely established there during the later part of the Umm an-Nar (Hermann et al., 2012; Weeks, Cable, Franke, et al., 2019; Chapter 4.6.1). Another example is the site of 'Asimah in the northern Emirates, where a stone-built structure with limited internal stratigraphy and a related domestic activity area to its north seem to represent a short-lived site visited on a more seasonal basis (Vogt, 1994). Saruq al-Hadid will be discussed in more detail below, due to its significant Wadi Suq component, while Asimah is excluded due to the lack thereof.

2.4.2 Oasis agriculture

Agriculture is initially organized in date palm groves. These consist of several levels of vegetation that form an agrosystem adapted to local circumstances and dependent on irrigation. At the highest level are the date palm (*Pheonix dactylifera*), which acts as a keystone species. These trees grow up to twenty meters tall and provide shade to the surface beneath with their large fronds. Their fruits can be exploited for subsistence, while their stem and leaves are used for construction, fuel, and as the raw material for different kinds of containers, packaging materials, and ropes. Below the date palms grow smaller trees, often various types of fruit trees. The lowest level consist of low-growing crops in regular fields or plots for human subsistence, such as cereals, pulses, vegetables, but also for fodder, crafting or medicinal purposes. These crops are periodically planted (Tengberg, 2012, pp. 139-140). Despite the relatively late introduction of agriculture in Arabia (ca. 3000 years behind Mesopotamia and Iran), it is introduced in a fully fledged form, in an oasis setting as described above. The abrupt introduction of this practice suggests that the principle behind it derives from elsewhere (Tengberg, 2012, p. 144).

Palaeobotanical research has identified fragments of stems, leaves, and seeds of date palms from Hili 8 dating to ca. 3000 BCE. Associated with these finds are carbonized grains and impressions in mudbricks and plaster of barley, emmer and bread wheat, sorghum, peas, and several fruits (Cleuziou, 1982, pp. 16-19; Cleuziou & Costatini, 1980). Sorghum was identified in mudbricks dating to the first half of the third millennium, although its identifications is somewhat controversial (see Tengberg, 2012, p. 145). At Bat, date palm has been identified together with free-threshing wheat and barley (Tengberg, 2016). At Umm an-Nar Island date palms, free-threshing wheat, and barley have been attested for the later part of the third millennium (Willcox, 1995), and the same species were identified at Tell Abraq for its entire sequence (Willcox & Tengberg, 1995). At the site of Kalba, remains of date palms have been found, but no other cereals (Tengberg, 2012, p. 145).

Based on survey data and the resultant quantification of ceramic distributions, it has been argued that during the Umm an-Nar period more permanent, small agricultural settlements become a widespread phenomenon. The villages in this model tend to be located close to viable agricultural land (Al-Jahwari, 2009, p. 129). Studies rooted in other data sources tend to corroborate this view. For example, a study into oral health conditions during the Umm an-Nar has found that agriculture starts playing a more important role in the diets of populations both inland and on the coast (Munoz, 2017). It is observed that the dependence on agriculture is most relevant in inland sites. According to this study, the earliest traces of agriculture in oral health are visible in the Hafit period. Afterwards, a

gradual but slight development towards a greater reliance on agriculture is observed. It is stressed that the diversity in subsistence strategies prevails throughout this period, as populations adapted to different environments in various ways. One example of this can be found in the Ja'alan region. Here, local conditions did not allow for plant cultivation which resulted in a greater reliance of marine resources. The finding of donkey bones at sites in this region indicates that pack animals could have been used to transport processed fish and its products inland, increasing the economic viability and impact of the activities carried out in this region (Cleuziou & Tosi, 2000, p. 26).

2.4.3 Tombs

The tombs of the Umm an-Nar period are far less numerous than their Hafit predecessors, while having a similar geographical coverage. Umm an-Nar tombs see a development towards larger and more monumental forms, which allow for the interment of more deceased individuals (Cleuziou & Tosi, 2020, p. 216). It has been argued that the tombs are located close to locations with Hafit tombs as a way to draw on 'cultural capital' from earlier periods (Williams, 2023, p. 55). This has been echoed in Giraud's (2010) spatial analysis of a funerary landscape in the Ja'alan. Here, the tombs were found to be located not on high places, but rather in lower areas and on slopes, and closer to settlements (Giraud, 2010, p. 79). Due to this placement, the tombs are usually less well preserved than their Hafit counterparts.

The Umm an-Nar communal tombs are monumental circular structures, often built of dressed white ashlar stones also referred to as 'sugar lumps', and have walls subdividing the interior space into different chambers. The tombs generally hold the remains of highly diverse demographic groups, not discriminating between different sexes, or age groups. Furthermore, many remains appear to have been adjusted, broken, burnt, and sometimes removed and deposited in ossuary pits near the tombs, perhaps in order to clean them out. These mortuary rituals may have been intended to remove individual identity in death and create a community of ancestors into which one would enter and be absorbed upon death. Interred goods were stored in caches, and often broken before deposition (Williams, 2023, p. 84).

2.4.4 Production and crafts

Pottery

Before the Bronze Age, only imported Mesopotamian vessels are found in the Oman Peninsula. It was not until the Umm an-Nar period that an indigenous ceramic industry was developed in southeast Arabia. It is likely that these early ceramics were developed mainly in the sites of the western oasis belt (Swerida & Jean, 2025, p. 1). The earliest pottery of the region can be subdivided broadly into regionally produced wares for domestic use, and more centrally produced wares for funerary use, which were distributed over the entire peninsula (Cleuziou & Tosi, 2020, p. 258).

For an overview of the funerary wares, the assemblage of the site of Hili provides much information, as it is on the one hand very well-studied and published, and on the other hand represents a long chronological sequence covering virtually the entire Umm an-Nar period. This assemblage has been analyzed by Méry (2000) whose work can be considered foundational for Bronze Age ceramics of southeast Arabia.

Early Umm an-Nar ceramics were initially considered imports from southeast Iran, which has pottery that is relatively similar in type (Thornton & Ghazal, 2016, pp. 188-189). However, from the analysis of the clay pastes of the sherds, it became clear that an indigenous tradition was present here. In general, the Umm an-Nar pottery exhibits quite rigid styles that see longer-term continuity in their production, with some stylistic elements also carrying over into the subsequent Wadi Suq pottery tradition (Méry, 2000, p. 122). Below, an overview will be outlined based on Méry's (2000) study of the Hili assemblage. This limits this overview in that this represents just one site that features a large amount of funerary wares. However, despite efforts focusing on domestic assemblages (g., Thornton & Ghazal, 2016) and studies focusing on integrating and comparing assemblages from a few sites (e.g., Swerida & Jean, 2025) a true synthesis for this period's ceramics is still lacking. Therefore, Méry's work is taken as a basis for outlining primary ware types as well as some remarks on production, as this foundational work is still among the most detailed accounts of ceramics from this period.

The sandy red ware, with its consistent clay paste composition, manufacturing technique, and forms and decorations appears as a very homogenous assemblage at Hili. This indicates that the production of these wares was likely controlled to some extent (Méry, 2000, p. 125). This ware is commonly represented in closed forms, and likely served the goal of storage and consumption. In addition to this, specialized forms existed, such as perforated and suspension vessels, as well as miniature vessels, although these all remain a rarity. The closed forms can be divided in three categories. These are those vessels for individual use (beakers and smaller drinking vessels), collective use (necked pots), and mixed function (bowls of different sizes). Some of these are represented in Figure 6. The necked pots have a globular body and a wide mouth. At Hili, this type is abundant and shows minimal typological change over the period it was produced. The vessels can have decorations on their exterior surfaces, which consists of a wavy line between two horizontal straight lines, or two intersecting lines between two straight lines. There are also elaborate, characteristic decorations, such as spiral motifs associated with a sinuous hatched band. Overall, decorations are geometric. Firing of the vessels in the Umm an-Nar period is regular as indicated by the uniform coloring of the vessels fabric. This indicates controlled circumstances during firing, where an oxidizing atmosphere could be maintained that resulted in the reddish color. Thus, it is likely that sophisticated kilns were used for this process (Méry, 2000, pp. 125-163).

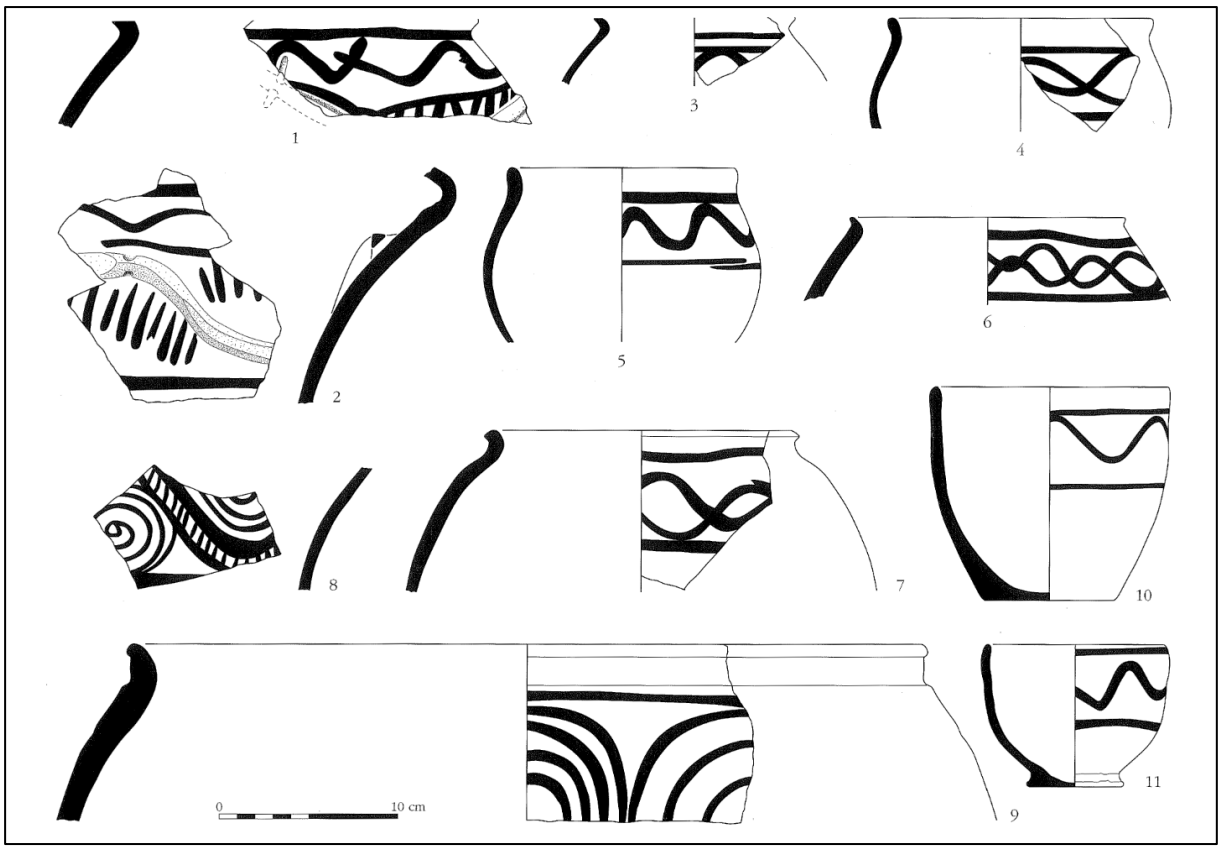

Figure 6: Some examples of Umm an-Nar pots from Hili 8 displaying different types as well as decorative motifs. Numbers. 1, 2, 3, 4, 5, 6, 7, and 9 are necked pots, while 10 and 11 are beakers (Méry, 2000, p. 129, Figure 76).

Organization of ceramic industry

From the analysis of the clay pastes of the ceramics from Hili, it is suggested that pottery production and distribution were organized on a micro-regional scale, meaning in an oasis or group of oases (Méry, 2000, p. 168). Schmidt and Döpper have linked this model with a degree of mobility in part of the society which allowed for the dissemination of these vessels beyond the area where they were produced (Schmidt & Döpper, 2016, p. 260). It seems a common pottery tradition was shared in the western foothills, or the oasis belt zone. Potters separated hundreds of kilometers still selected similar clays in color ranges, texture, and mechanical strength. They coiled some vases and decorated them with geometric motifs painted in black applied to an external slip, and likely fired them in specially constructed kilns in a predominantly oxidizing atmosphere (Méry, 2000, p. 168). Whereas the earlier Umm an-Nar pottery industry is highly standardized, in later periods more local productions become apparent, which result in a lower consistency and overall quality (e.g., at al-Tikha in the Batinah; Deadman et al., 2022, p. 59).

Softstone

In the Umm an-Nar period, an indigenous tradition of softstone working emerged in Arabia. Softstone is a collective term for stones of Mohs hardness 3 or lower, which, due to their softness, can easily be shaped into stone containers and objects. In Southeast Arabia, it refers to metamorphic rocks (commonly steatite or chlorite) that are available in ophiolitic seams throughout the Hajar mountains (Magee, 2014, pp. 108-109; Phillips & Simpson, 2018, p. 2). For the Umm an-Nar a

relatively simple repertoire is known, mostly consisting of hand-carved bowls, although cannisters with matching lids are also known. Decorations remain relatively simple, consisting of one or a few horizontal rows of dot-in-circle or horizontal lines for the bowls, while the canisters generally have dot-in-circle decorations. Undecorated forms also occur. These aspects are clear in the assemblage of Umm an-Nar tombs from Hili (Figure 7; David, 2002). Many of the vessels are retrieved from funerary contexts, where in some instances jewelry was found inside the cannisters. This suggests that they might have functioned as containers for previous goods (Magee, 2014, p. 109).

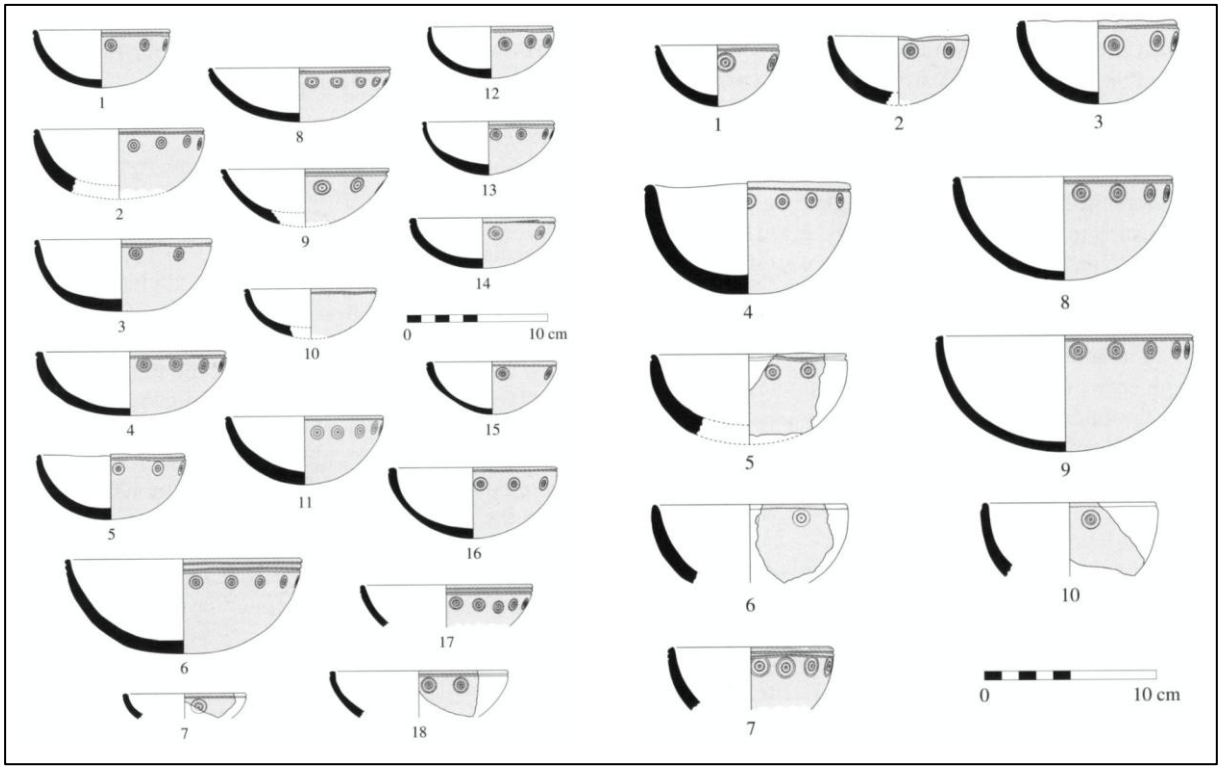

Figure 7: Two types of Umm an-Nar softstone bowls from Hili North Tomb A (adapted from David, 2002, p. 177, Figures 2 and 3).

Metallurgy

Metallurgy was already practiced during the Hafit period, but became more advanced during the Umm an-Nar. The oldest evidence of metal casting techniques derive from Ra's al-Jinz RJ-2. The site contained specialized workshop for working metal derived from further inland, possibly through exchange for local products from the coastal environment. The activities of the workshop developed in the second half of the third millennium. Most evidence has been found for hammering with hard rocks on anvils of the same material. Chisels were used to engrave objects. Worked copper bars, pyrotechnical features connected to casting or annealing, crucible fragments and casting residues all amount to evidence that metallurgy was practiced on site in different workshops. Other sites with ample evidence for metallurgical activity include Maysar, Umm an-Nar Island, Hili 8, Tell Abraq, Bat, Wadi Hilo and Ghanadha. During the Umm an-Nar, few alloys are in use and most of the metal objects consist of just copper (Giardino, 2019, pp. 63-67, 79-80).

It is now clear that the mountains of the Oman Peninsula formed the source of the 'copper of Magan' that is mentioned in Mesopotamian texts from the period. During the peak of copper exploitation in

the Bronze Age, towards the end of the third millennium, several thousand tons of copper must have been produced for both local use and export. Specialization is clear in various settlements that show evidence for production units, or specialized 'workshops' within agricultural villages (Weeks, 2003, pp. 57-58). This is further reinforced by the study of chemical signatures of copper from the Peninsula, and its comparison with that of copper objects from Mesopotamia. Copper from 'Magan' is apparent in Mesopotamia in all periods after the Uruk period (4000-3100 BCE) and comprises ca. one-third of the analyzed copper from the first half of the third millennium BCE, which increases to about half during the Early Dynastic III and Akkadian periods (ca. 2500-2150 BCE) in Mesopotamia (Begemann et al., 2010).

2.5 The Wadi Suq period

In the 1970s, investigations into new tomb types and associated, distinct archaeological material in the Wadi Suq area, a tributary of the Wadi al-Jizzi in the hinterland of Sohar, resulted in the coining of the namesake archaeological culture (Frifelt, 1975). Not long after, evidence of non-funerary Wadi Suq structures were discovered at the site of Hili 8 (Cleuziou, 1979; Righetti & Cleuziou, 2010). In the following years, more sites dating to this period were discovered and investigated, including the cemetery of Shimal (Vogt & Franke-Vogt, 1987; Velde, 1992), and the mounded site of Tell Abraq (Potts, 1990; 1991; 1993). In this segment, an overview of material characteristics of the Wadi Suq period will be presented, touching on tombs, pottery, softstone, and metalworks. Settlement will be discussed briefly, as an overview of all known settlement remains is reserved for Chapter 4.

2.5.1 Chronology of the Wadi Suq period

Initially, the name 'Wadi Suq' was used for the entire timespan from 2000 to 1250 BCE. However, Velde (2003) has demonstrated that the Wadi Suq period, as lasting from 2000 to 1600 BCE, and the subsequent Late Bronze Age, lasting from 1600-1250 BCE concern two distinct archaeological periods with their own characteristic material assemblages. This is distinction is seen in pottery, chlorite vessels, and metalworks, among others. This chronology will be adopted in the current research as well, meaning that the term 'Wadi Suq' is reserved for the centuries between 2000 and 1600 BCE.

2.5.2 Settlement

Wadi Suq settlement is often juxtaposed with the Umm an-Nar traces. On the whole, evidence for Wadi Suq settlement remains relatively scarce in comparison to the preceding period. Significantly more funerary than non-funerary sites have been found (see Carter, 1997c, pp. 88-89, Figures 1 and 2), fueling the idea of the Wadi Suq as a period of regression, collapse, and transformation (cf. Azzarà

& De Rorre, 2018, p. 23; Cleuziou & Tosi, 2020, p. 413; Carter, 1997a; Carter 1997c, p. 87). All sites that have been ascribed a Wadi Suq settlement component in the literature are visualized in Figure 8.

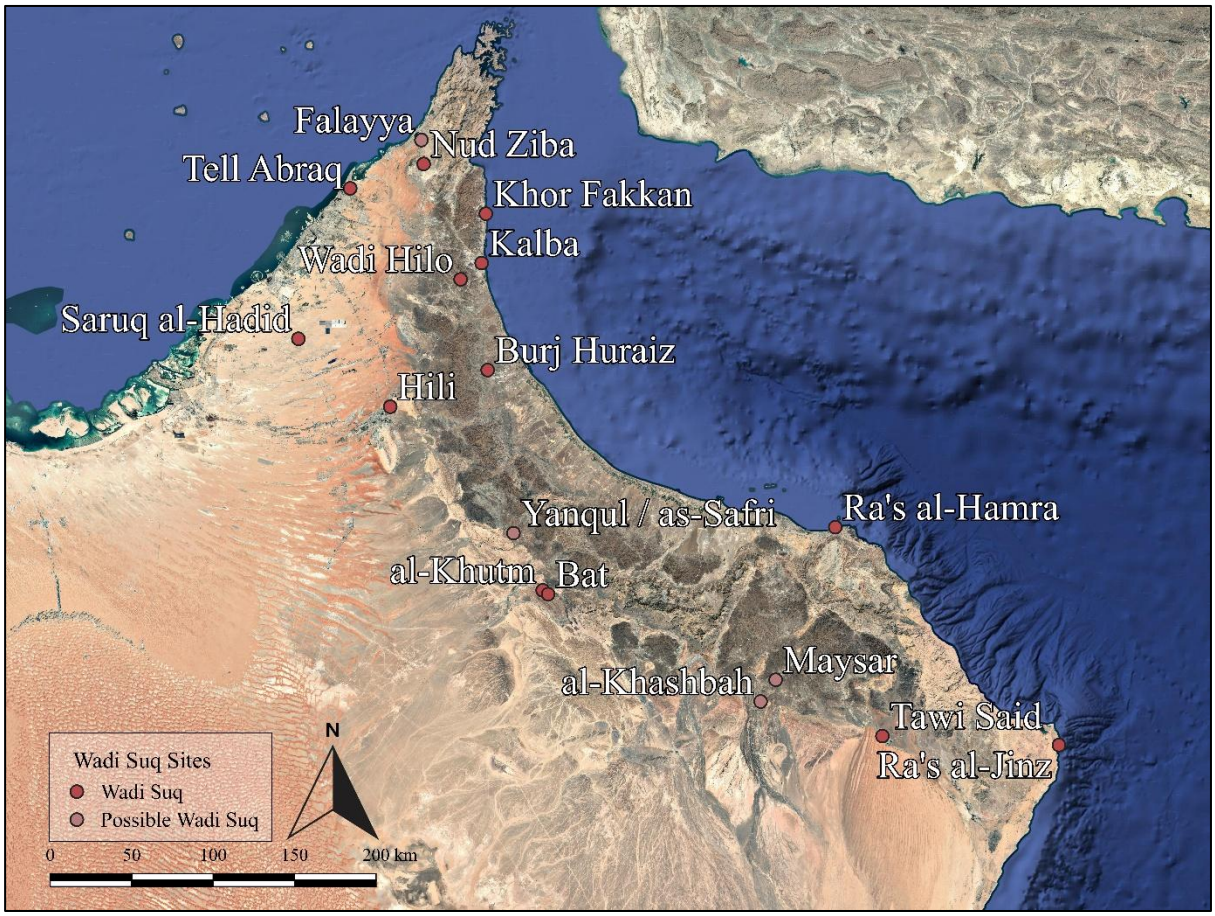

Figure 8: Map of all sites with Wadi Suq period settlement remains (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

The disjunction between the number of settlements and funerary sites is often explained in terms of a reversal to more mobile lifestyles. More recent scholarship has proposed a new model in which settlement in the north remained more sedentary, while elsewhere it becomes more mobile (cf. Righetti, 2015a, pp. 346-350; de Vreeze et al., 2024). It has been proposed that in the north, settlement was clustered for reasons of water availability as modeled from modern-day date palm garden locations. However, in these theories, the distribution of funerary sites still plays a more significant role than that of settlement sites, and where settlement is considered, many sites are accepted as a Wadi Suq settlement on the basis of limited data without scrutiny of the exact nature of remains. A more detailed discussion of these theories will be provided in Chapter 3.

To date, no exhaustive overview of Wadi Suq settlement has been published. Previous studies have focused on individual settlements, and from there have recognized parallels with other sites (e.g., Kerr, 2016). One other study has compiled a list of Wadi Suq period sites, and a summary for each of them, but without an in-depth discussion of the built remains at these sites (cf. Righetti, 2015). Carter's overview (1997a) is extensive, but was created over 25 years ago and lacks the substantial amount of data recovered since then. Therefore, in this thesis an evaluation of all currently available

settlement evidence for the Wadi Suq will be given. This will concern all sites that contain a Wadi Suq element, be it domestic, industrial, more ephemeral, or monumental, and will be discussed in Chapter 4.

As for the food economy at these sites, little is known as of today and this forms part of the ongoing debate about this period. As will be described in Chapter 4, some of the tower sites that are associated with water management due to their central well, remain in use into the Wadi Suq period. However, direct evidence for agriculture is absent in most, if not all, sites of this period. The theorized shift to more mobile lifestyles often goes paired with the assumption that a pastoralist economy was adopted in the Wadi Suq.

By assessing the currently available published data on Wadi Suq settlement, a better understanding of the mode of life can emerge from this which will facilitate new interpretations about the shift in cultural traits observed between the periods. Further, by looking at all available evidence of Wadi Suq settlement, the most detailed overview of settlement in this period will emerge. Therefore, this chapter will aim to summarize this evidence, with a special focus on transitional Umm an-Nar/Wadi Suq sites to the merit of the following analysis.

2.5.3 Tombs

The Wadi Suq period has been notorious for the large amount of funerary sites and tombs that stand in contrast with the general scarcity of settlement evidence (Carter, 1997c, p. 87). As mentioned, the first Wadi Suq tombs were excavated in the 1970s by Frifelt in the Wadi Suq. Since then, survey projects have discovered many more funerary sites, with particularly many survey projects taking place in recent years (e.g., Döpper, 2020; 2022; 2023; Döpper et al., 2023; Düring & Olijdam, 2015; Düring & Botan, 2018; Kennet et al., 2016; Kuronuma et al., 2023). In the Wadi Suq period, funerary traditions start to diverge from the Umm an-Nar. Tombs are no longer exclusively collective, as smaller individual graves also appear. There is a large variety in tomb types that characterizes the Wadi Suq period, which is highlighted by the different attempts at creating comprehensive typologies.

Potts (2001) mentions seven tomb types based on the sites of Shimal, Ghalilah and Dhayah. All are constructed of unworked local boulders and wadi pebbles. Collective tomb types include the ‘Shimal’, ‘Ghalilah’, and ‘Khatt’ types, which are up to 30 m in length, and four smaller forms, which are mainly subterranean tombs in different shapes, as well as one type of simple inhumation burial (Potts, 2001, pp. 45-46).

Carter (1997, pp. 31-48) provides a more extensive typology, differentiating between cist burials, overground, subterranean, collective and individual tombs (Types 1-6, 9-11), burials in rock shelters and re-used tombs from earlier periods (Types 7 and 8), and several tombs that comprise a category on their own (Types 12, 13, 15-17). Of these, types 1-6 are dated to the classic Wadi Suq, or the first half of the second millennium, and include simple cist burials and relatively simple collective overground tombs. The remaining tombs are not assigned a specific date, or date to the later part of the second millennium.

Although this is a extensive typology and already reflects the degree of variability in Wadi Suq tombs, in more recent years Sabrina Righetti has created the a more exhaustive typology, discerning between 27 different tomb types. This comprises the first systematic classification based on the constructional characteristics of the tombs. This goes beyond the classifications from before, which were often based on individual sites and included many 'site-types' that were adopted by some, but ignored by others. Righetti first distinguishes between individual and collective tombs. Individual graves are further categorized into subterranean and semi-subterranean graves on the one hand, and surface graves on the other. Collective graves are subdivided into single-cell graves, further classified by shape (round, rectilinear, curvilinear, horseshoe), and multi-celled graves (Righetti, 2015a, p. 126). This categorization is exhaustive with regard to the tombs constructed in the Wadi Suq period, but does not account for burials in rock shelters and re-used tombs from earlier periods, which Carter includes. However, as mentioned above, these might date to the Late Bronze Age and therefore postdate the Wadi Suq.

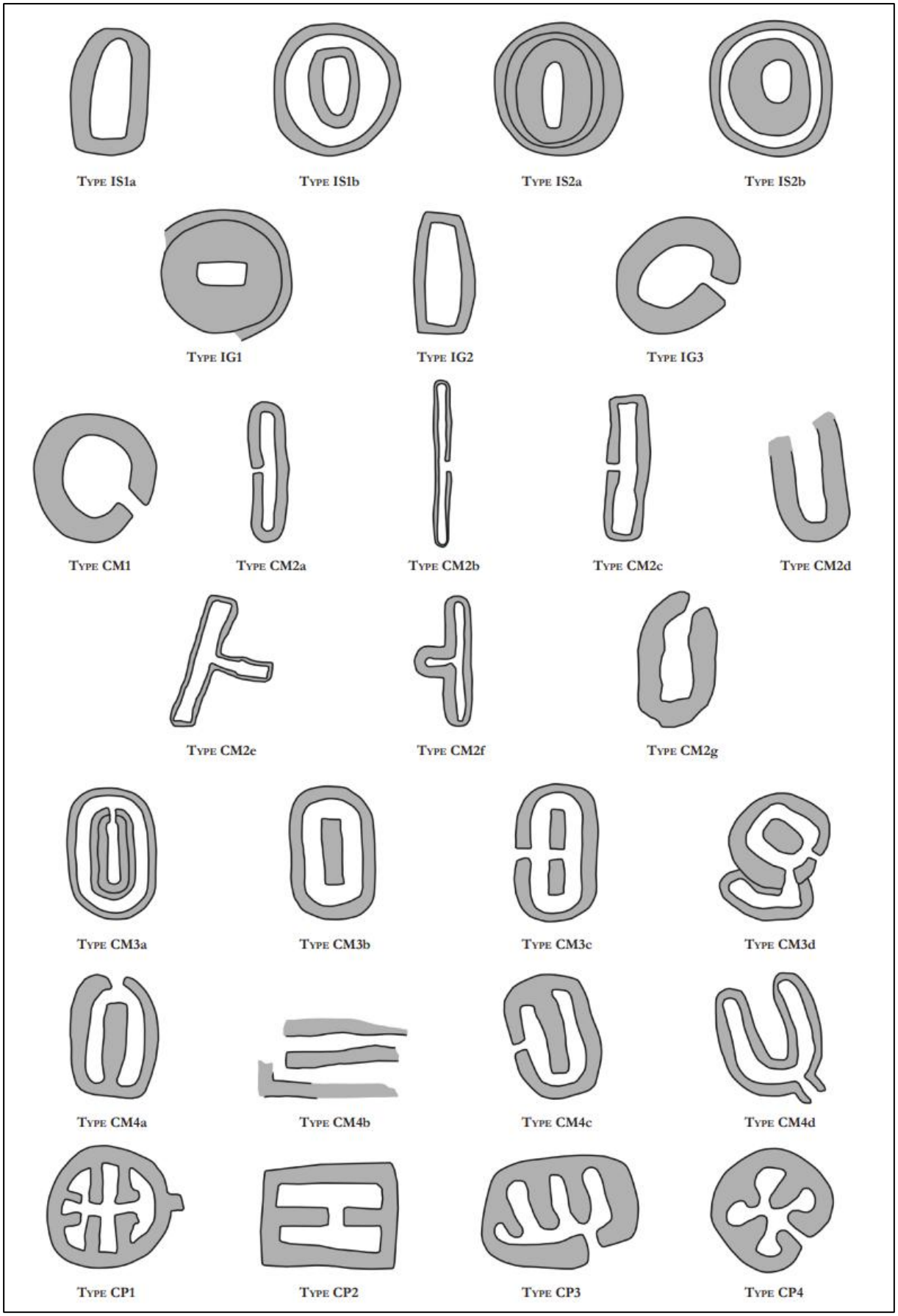

Figure 9: An overview of the 27 distinct tomb types as identified by Righetti (Righetti, 2015b, p. 21, Figure 24).

An interesting pattern is that the small, single cist burials have been observed in locations of former occupation. For example, at Bat they are constructed on top of towers 1145 and 1156, and within building SS10 at the settlement slope (Mortimer, 2016, p. 146-148; Kerr, 2016, pp. 66, 101-102). Due to their placement and the fact that the tombs incorporate stones from these structures they disrupt their day-to-day functioning. For this reason, the tomb construction has been taken to signify the end of an occupational phase, and a transition in the meaning of the space from domestic to funerary (Kerr, 2016, p. 273; Swerida & Thornton, 2019, p. 109).

Another pattern with regard to the tombs is that individual tombs tend to occur all over the region, whereas the communal tombs cluster in the northern peninsula (Frenez, 2020, p. 29; Kennet et al., 2025, pp. 398-399; Righetti, 2015, p. 346). Several possible collective tombs found at al-Khashbah (Döpper, 2021, p. 318) and Burj Huraiz (Düring et al., 2019, pp. 120-123) might provide exceptions to this rule, but are for now unexcavated. Righetti has explained the patterning as a result of the relative mobility of part of the population. These groups would use single burials for temporary purposes, as to not hinder their movements during migration seasons. When they made their seasonal return north, the remains from the single burials would be collected and transported to one of the communal tombs in the north (Righetti, 2015a, p. 347). However, this explanation does not account for the single burials found in the Northern UAE, in relatively close proximity to the collective tombs found there (cf. Kennet et al., 2025, p. 398-399) and also does not align with the fact that many Wadi Suq cist graves do contain human remains (see, for example, Frifelt, 1975, pp. 404-412). Although it is useful and interesting to think about precise configurations of mobility in this period, this particular model does not seem substantiated. It is still is possible that more mobile groups constructed the single burials, but it is unlikely that they used it fur such a temporary burial purposes.

2.5.4 Production and crafts

Pottery

In the Wadi Suq, some elements of the ceramic tradition are new, while others are a continuation from the Umm an-Nar period. The pottery of the Wadi Suq can be distinguished into two broad categories. First are the coarse wares, which are completely lacking in the preceding Umm an-Nar tradition. These wares are generally shaped like truncated cones that have irregular, but relatively straight walls, and rounded, sometimes thinned lips. Méry further distinguishes two groups within this category, which goes beyond the scope of the current discussion (but see Méry, 2000, p. 250). The other broad category consists of the semi-fine wares. These wares are reminiscent of the red sandy ware from the Umm an-Nar, but are also clearly distinct. The main differences are that these have a less sandy texture, show traces of vegetal tempers and mineral grains in the clay paste, and have colors ranging from beige, to ochre, orange, and red (Méry, 2000, pp. 254-255).

At Hili 8, open forms dominate the semi-fine ware assemblage, mainly represented by beakers with parallel or divergent walls. This form is dominant in many Wadi Suq contexts, generally making up ca. 65% of the assemblages (Velde, 2003, p. 104), and can be considered as one characteristic material aspect of the Wadi Suq period. As discussed previously, the beakers are already recognized in the Late Umm an-Nar period in small quantities and can thus be seen as a continuity between the

periods (Swerida & Jean, 2025, p. 24). The beakers have thin walls, a slight flared lip and a thin rim. Decorations consist of horizontal or wavy lines, or vertical chevrons, framed by straight horizontal lines, usually located on the upper half of the exterior surface. Generally, these decorations are painted in brown to black paint on an external red slip (Méry, 2000, pp. 253-254). In recent work, Wadi Suq beakers have been divided into earlier and later types. The first are simple in shape and have elaborate decorations, while the latter see an increasingly simplified decoration and production on the potter's wheel (de Vreeze et al., 2024). The beakers develop further into forms with distinct pedestals as pedestalled or footed goblets towards the latest phases of the Wadi Suq, which later becomes a hallmark of Late Bronze Age ceramic assemblages (Velde, 2003, p. 105).

Other forms of the Wadi Suq repertoire include dishes, bowls, bowls with diverging straight sides and jars with parallel or slightly converging straight sides. Closed forms are mostly represented by short-necked pots sometimes fitted with a pouring spout (cf. Figure 10; Méry, 2000, p. 254). These spouted jars are, next to the beakers, among the most diagnostic wares for the Wadi Suq. At Shimal they occupy ca. 10% of the assemblage and, overall, they make up ca. 20% of the Wadi Suq repertoire. The spouts are attached at the rim of the jar for early to middle period vessels, and at the level of the shoulder in later iterations (Velde, 2003, p. 104). They have a globular body, a short neck and a beveled or flattened rim. Decorations recall those of the beakers – horizontal wavy lines, chevrons – but also include more unique decorations such as opposing triangles, semicircles, palms, or vertical wavy lines (Méry, 2000, pp. 260-264). It seems that flat bowls, storage jars, and cooking pots are typical for settlement assemblages, whereas beakers, bowls, spouted jars and miniature jars and pots are found in funerary as well as settlement contexts (Righetti & Cleuziou, 2010, p. 290).

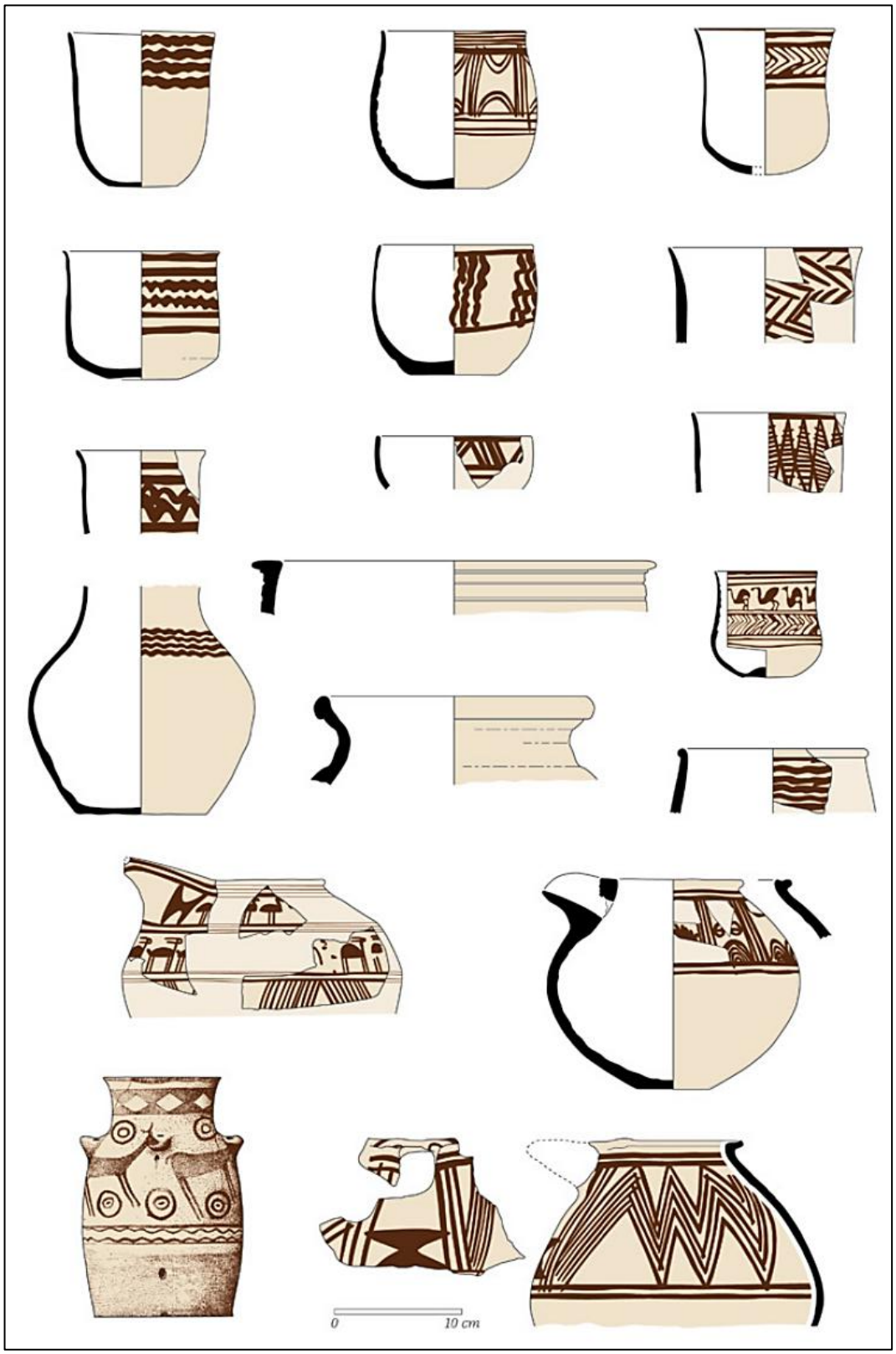

Figure 10: E*xamples of Wadi Suq ceramics and their decorations. In the top half, typical Wadi Suq beakers are depicted, while towards the bottom the spouted jars are visible* (*Cleuziou & Tosi, 2020, p. 420, Figure 243).*

There are a few clear breaks in the Wadi Suq when compared with the Umm an-Nar ceramics. At the sites of Shimal and Hili, granulometric and mineralogical investigations have shown that ceramics display a higher variability in clay paste compositions (Méry, 2000, p. 264). However, in addition to clay sources already drawn on in the Umm an-Nar, new sources are also exploited in the Wadi Suq (Méry, 2000, pp. 255-256). The same pattern is observed at the site of Saruq al-Hadid, where similar clay sources see continued use from the Late Umm an-Nar until the Late Bronze Age (Miki et al., 2024, p. 1249). From this, it is clear that knowledge about suitable clay resources is passed on at these sites, while the repertoire is extended with new sources. The ceramics of the Wadi Suq display signs of fairly low firing temperatures (below 800° C), resulting in incomplete oxidative firing and overall more variation in color (Méry, 2000, p. 271). This indicates an overall lesser control over firing conditions, which stands in contrast to the uniformly fired Umm an-Nar vessels. Moreover, from a comparison of pots between Hili and Shimal sites, which lie 150 km apart, it seems that no exchange of finished products took place between these locations (Méry, 2000, pp. 270-271). In a recent study, it was also found that exchange between Hili, Saruq al-Hadid, and Mugharat al-Kahf did not take place (Miki et al., 2024). As there was little to no exchange in finished pots, it is likely that each of the sites produced and distributed their own ceramics.

From the differences in clays used, firing techniques, and the more local production and distribution of vessels, it is likely that the Wadi Suq ceramic industry was organized at the level of individual sites. As de Vreeze has noted, there is a clear break with the Umm an-Nar tradition in that there is no strict dichotomy between a more centralized, highly-specialized production of fine wares, and a more dispersed household production. Instead, pottery production takes place in a larger number of localized production units organized in a more dispersed settlement pattern (de Vreeze, 2016, pp. 66, 74). Despite this more decentralized model of production, in which more variety in stylistic patterns would be expected, it appears that the Wadi Suq decorations and forms still adhere to a common standard (Méry, 2000, p. 284; Miki et al., 2024, p. 1249; de Vreeze, 2016, p. 66). Technologically this is reflected in their shaping on a potter's wheel and the wire-cut bases (Méry, 2000, p. 254). In decoration, the vessels show relatively similar schemes all over the peninsula. Such uniformity was achieved in the Umm an-Nar only in the semi-fine painted wares intended for funerary use, which are suggested to have been produced centrally and dispersed throughout the area (Cleuziou & Tosi, 2020, p. 422).

Ceramic change, continuity and social meaning

Continuity between the Umm an-Nar and Wadi Suq ceramics is apparent, as mentioned above, in the types of forms and the use of (partly) the same clay sources. The idea of such continuity between the periods has been further developed by de Vreeze based on the Qarn al-Harf assemblage (de Vreeze, 2016). It is argued that Wadi Suq pottery sees a dual inheritance from two Umm an-Nar pottery industries. First in the decorative elements, which are inherited from the black on red fine wares, and second in forming techniques which make use of a potter's wheel, as attested in sandy red ware. These elements are integrated in new Wadi Suq forms and the distinction between the different periods' industries is primarily manifested in the combination of elements in new ways and in new motifs of decoration (de Vreeze, 2016, pp. 66, 74). From this, it is clear that we are dealing with a

development of one ceramic industry into the next, which although different, still displays similarities in techniques and decorations, as well as clays used and forms shaped.

The vessels of the Wadi Suq, with the predominance of spouted jars and beakers, highlight a change in functional dimensions of the vessels, which are now focused on pouring and drinking. This shift might indicate an emphasis on feasting and social gatherings, in which these vessels would have been central. These gatherings, possibly centered around funerary rites in cemeteries such as Qarn al-Harf, would have provided a setting in which new styles and decorations could have been shared with people from outside the immediate community (de Vreeze, 2016, pp. 73-74). This might explain the common standards of pottery production despite the more decentralized mode of production of this material. Additionally, the increasingly naturalistic motifs in Wadi Suq decoration, and specifically the depiction of humans dancing in procession while holding hands, is taken by de Vreeze to indicate group cohesion, reinforcing this argument (de Vreeze, 2016, pp. 69-73).

Soft stone

In the Wadi Suq period, the production of softstone vessels continues, although here too more variety is observed in forms and decorations. Again, most objects are known from funerary contexts. The Shimal necropolis provides one of the most extensive assemblages of Wadi Suq soft stone objects. For these vessels, four different softstone sources were used for the assemblage of Shimal, which differ in color from greenish to blueish, and in composition of the material in the amount of conglomerate inclusions and/or specks and its relative hardness. Within the assemblage, different shape categories are recognized and include open shapes (primarily bowls), closed shapes (vases), and lids, all of which are visible in Figure 11a. The closed forms often have two or more knobs protruding from their external surface, possibly in place to allow the vessels to be suspended. Decorations become more diversified and consist of incisions on the exterior surface in the form of lines, dots, and circles. Together, these incisions form geometric patterns. Generally, the upper half to two-thirds of the vessel is decorated with dot-in-circle and horizontal lines, while the lower part is decorated with oblique lines and chevrons. The surface is finished by scraping, and sometimes also smoothing the decorated surface (Velde, 2003, p. 108; Velde, 2018, pp. 114-117).

Combinations of forms, material types, and decorative patterns have been used to create typological groups, as is the case for the Shimal assemblage (Figure 11b). These typologies can also inform on whether production might have been organized centrally at larger settlements, or more decentralized and closer to the different raw material sources in the mountains. For the Shimal assemblage, the later is suggested based on a stronger dependency between materials used and how the object was shaped, decorated, and finished (Velde, 2018, pp. 118-123).

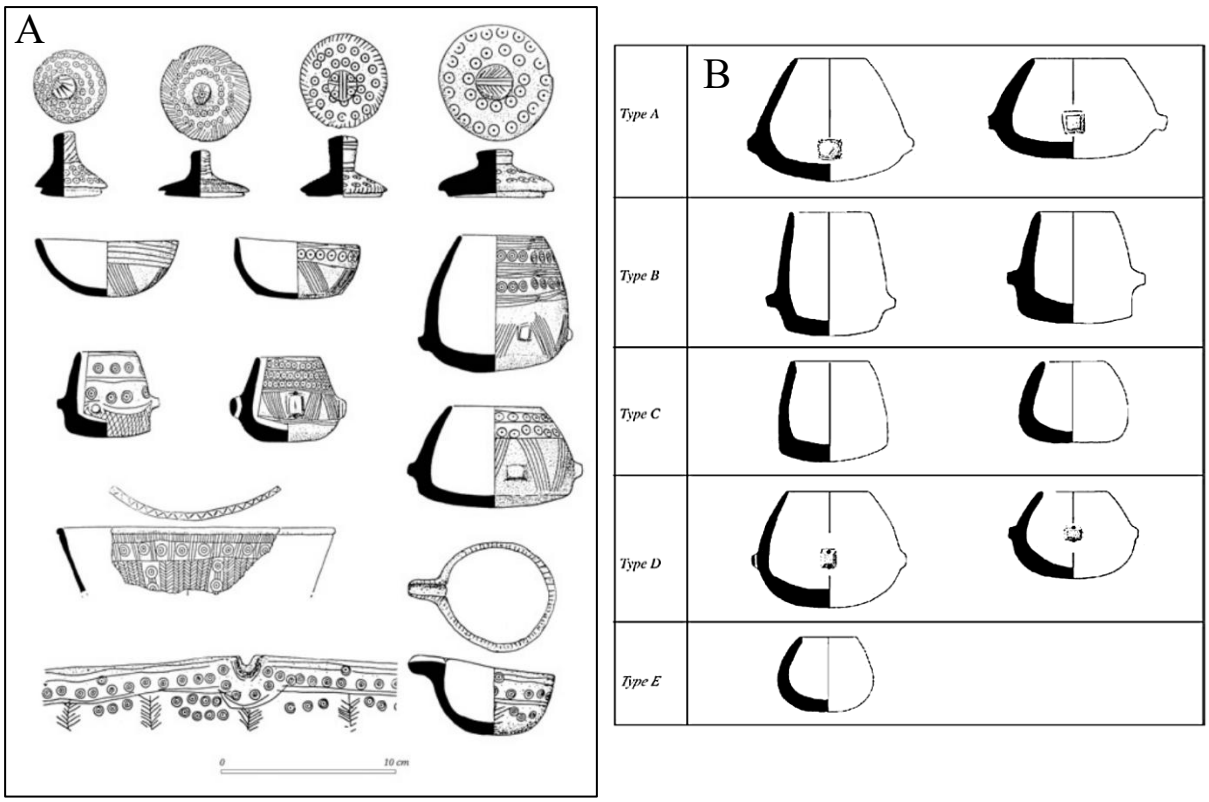

Figure 11: A) an overview of several Wadi Suq softstone vessels (adapted from Cleuziou & Tosi, 2020, p. 421, Figure 244) and B) a classification of closed Wadi Suq softstone vessels based on their form (adapted from Velde, 2018, p. 115, Figure 2).

Metallurgy

While some claim that the trade in metal completely ceased during the early second millennium as the Mesopotamian entities reoriented its demand from the southeast towards the island of Cyprus in the west (Giardino, 2019, p. 106), it is clear from evidence in Bahrain and Mesopotamia that the trade in copper persisted. The presence of bun-shaped ingots at smelting sites in the Oman Peninsula, which were also found in Bahrain and in other locations, indicates that trade in copper continued in the early second millennium (Carter, 1997a, p. 117). It has been suggested that it was the Dilmun traders who gradually monopolized trade in the Gulf, functioning as intermediaries between southeast Arabia, Mesopotamia and the Indus region (Magee, 2014, pp. 165-166).

The Wadi Suq period contexts, and particularly the tombs produced equal, if not larger amounts of copper objects. Among these are many pieces of weaponry of different kinds, and in different forms than in the preceding period. Although such an abundance of weaponry has been taken to represent a more war-like society, especially relevant in theories of collapse and abandonment of the Umm an-Nar society, it has to be taken into account that these weapons were mostly taken out of circulation (Magee, 2014, p. 183). One example is the socketed spearhead that first occurs at the end of the third millennium and becomes abundant into the Wadi Suq (numbers 1 and 2 in Figure 12). Furthermore, long, copper-base swords are introduced as well as tanged arrowheads. Other forms include short daggers, dagger-axes and double-sided daggers. More copper vessels are known from the Wadi Suq to date and include beaker-like forms as well as larger bowls with attached handles (Velde, 2003, pp. 109-111; Weeks, 2003, p. 56). Items for everyday use include smaller objects such

as fish hooks, awls, chisels, needles and copper beads, as were found at the site of Ra's al-Jinz RJ1 (Giardino, 2019, pp. 108-110).

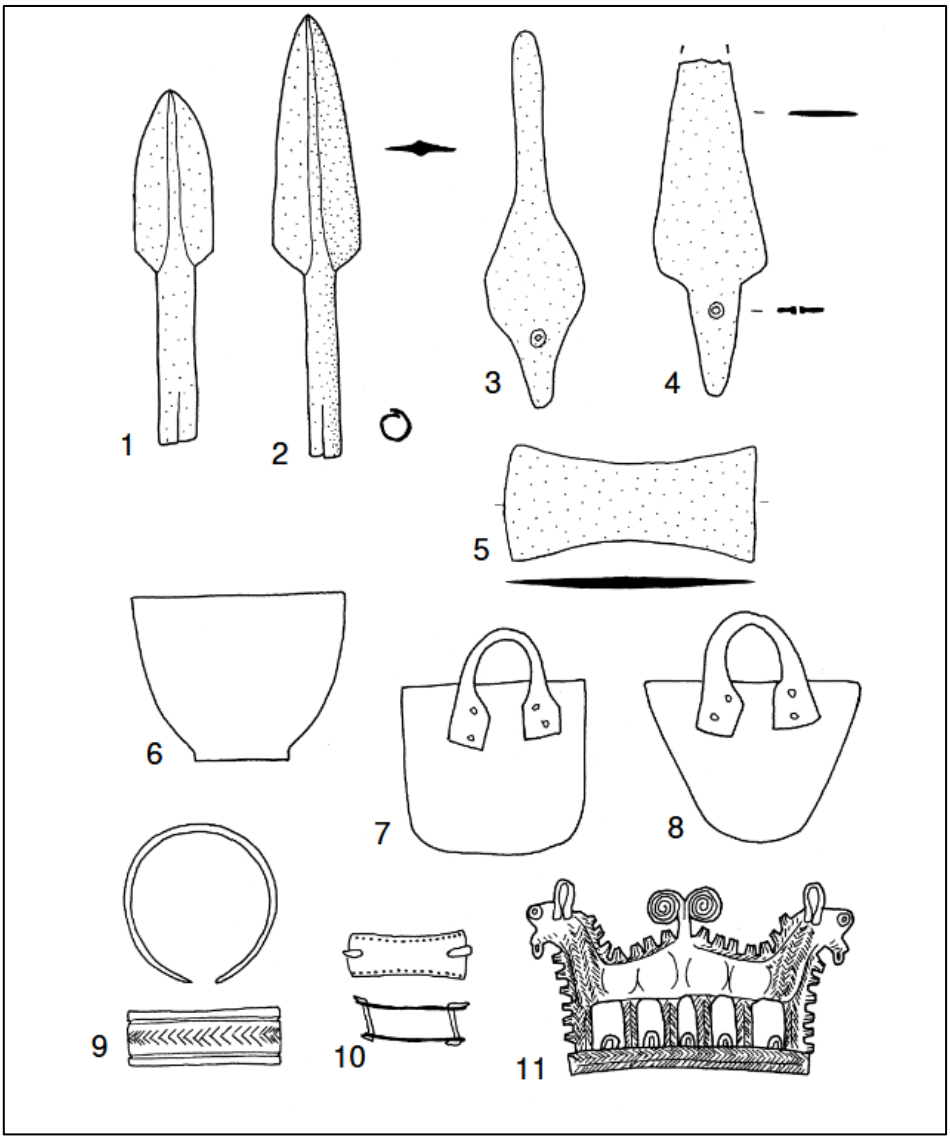

Figure 12: Examples of metal artefacts of the Wadi Suq period (Velde, 2003, p. 111, Figure 7).

Concerning jewelry, decorated rectangular sheets of metal, fixed together with rivets are known in the Wadi Suq (number 11 in Figure 12). These also include elaborate representations of animals, or groups of animals made of gold, silver, or electrum, that have been worked using a repousse technique. Examples have been found in tombs at Qattarah and Dhayah. These plaques are believed to have been sewn onto clothes (Cleuziou, 1981, p. 289; Velde, 2003, p. 111; Weeks, 2003, p. 57).

The first significant appearance of tin-bronze alloys is claimed for the second millennium. However, as there is much variability between assemblages with regard to specific types and compositions of alloys, it is not possible to link these to a chronological development of any kind (Weeks, 2003, p. 56).

The metal for these objects derived from copper outcrops in the ophiolite layers of the Hajar mountains (Chapter 2.1). Copper extraction and processing is believed to have taken place in a network of sites, such as the site at Wadi Hilo, where evidence for copper working dates back to the

Hafit period, involving multiple open-air mining cavities, kilns for copper smelting, and anvils for copper working, in addition to up to hundreds of tons of copper slag (Kutterer et al., 2013; see Chapter 4.5.1).

2.6 Summary

This chapter has provided a setting for the archaeology of Bronze Age southeast Arabia in a physical and archaeological sense. The main geographical areas have been described, as well as the development of the Holocene climate until today. Furthermore, the main cultural traits of the respective Umm an-Nar and Wadi Suq archaeological periods have been described, in order to provide a sufficient frame to position the following analysis of settlement during the Wadi Suq period.

Still, it is recognized that this short overview is not all-encompassing. In the study of southeast Arabia, much exciting new work is being done, and new insights into many facets of the above described archaeological periods are emerging. These include the relationship between Bronze Age humans and the animals that were present in their environment, both as wild and as domesticated species (e.g., Roberts, Weeks, Fillios, et al., 2018; Roberts, Weeks, Cable, et al., 2019), the way in which these populations managed hydrological questions (e.g., de Vreeze et al., 2024), and the relations that were underheld with lands far away during the respective periods (e.g., Carter, 2003; Eddisford, 2022; Frenez, 2022). Much of this research is altering our understanding of the periods under study, but go beyond the scope of the current thesis.

Continuity and change are both prominent in the transition from the Umm an-Nar and Wadi Suq. Continuity is observed in several material types, such as ceramics and softstone, as well as in the occupation of several sites throughout both periods. However, change is equally clear in the distinctiveness of the material assemblages, but also in tomb types. These changes appear to have happened at a relatively broad scale, and over short periods. The following chapter will dive into the question of what caused the changes we observe in the archaeological record over such a large area over a limited timespan.

Change, was at a very broad scale, and over a relatively short period. It is interesting to think about what can cause such large-scale change over a limited time-span.

Chapter 3: Theoretical framework

3.1 Why change? Theories and explanations

As described in the previous chapter, the Umm an-Nar and Wadi Suq periods are archaeologically differentiated in terms of their ceramic repertoires, stone and metal artefacts, as well as funerary constructions and customs. However, there is also continuity, for example in the use of specific resources and broader stylistic and decorative schemes for pottery, and the occupation of some settlements. This suggests that the observed changes are likely the result of a development from one period to the next. Still, these developments occur at a fast pace and in virtually all facets of society. The question why far-reaching changes happened in such a short time, demands further elaboration. Since the first discovery of archaeological settlement traces for the second millennium BCE, broadly three types of theories have been proposed to explain these changes.

3.1.1 Environment

The first category comprises theories that draw on changing environmental conditions as the main cause for the cultural shifts observed in the archaeological record. As discussed in Chapter 2, it is clear from a range of proxies, local and regional, that some kind of climate change occurred towards the end of the third millennium. This likely held different outcomes in different places based on local variables. While such changes are unlikely to have be truly abrupt events that took place within the lifespan of individuals, it is feasible that change over the longer term might have affected how people adapted to their surroundings and sought for new ways to maintain their existence. In the arid environments of southeast Arabia, particularly water availability would have been a relevant variable, as it is scarce and fluctuations could have far-reaching consequences. However, looking at specific cases, some problems with this category of explanation arise. As mentioned in Chapter 2.2.1, analysis of radiogenic oxygen isotopes for the site of Shimal has shown that an aridification is clear at this site (Gregoricka, 2016), which seems to align well with environmentally-based theories. However, additional diachronic analyses were conducted for strontium and carbon isotopes, which revealed that the site's inhabitants had consistent diets throughout both periods with a high reliance on C_3 plant domesticates. At the same time the tight clustering of strontium values implies that the population was relatively sedentary (Gregoricka, 2016, p. 217). These markers that inform on the behavior and reaction of the site's inhabitants suggest that in general, lifeways stayed relatively similar despite the change in climate. Climate change thus does warrant cultural change necessarily, and such climate determinism should be approached with skepticism. Still, this study is based on a relatively small sample size of 32 individuals, from only two Wadi Suq and one Umm an-Nar tomb. More similar studies are needed to substantiate this pattern at a scale surpassing the hyper-local. Another critique of the climatic explanations, is that much of the climatic research is focused on a point in time at 4.2 k years BP, or ca. 2200 BCE. This dating does not align with the transition to the Wadi Suq, which is timed at ca. 2000 BCE. Furthermore, several sites show that Umm an-Nar societies endure and thrive well into the 21st century (Magee, 2014, p. 124; also see Chapter 4). This paints a complex picture. It is possible that climatic changes did occur, but did not affect societies as intensely as is thought at 2200 BCE. Alternatively, it could be the case that these changes did not come to a similar, intense expression everywhere at the local level. A last option is that the timing of

the events is not correct and should be placed ca. 200 years later, if we accept that the changes observed in the Wadi Suq are a direct result of climatic and environmental shifts. This last option, however, is not substantiated in current paleoenvironmental research, as became clear in the previous chapter. Based on these critiques, the environmental hypothesis thus does not provide a waterproof explanation for the patterns observed in the archaeological record of southeast Arabia.

3.1.2 Networks and exchange

A second strand of explanation focuses on large-scale economic systems and is embedded in network thinking. It has been suggested that the reorientation of Mesopotamian economic demand to Anatolia and Cyprus in the west, and the subsequent demise of the Dilmun state, which is assumed to have monopolized trade from the Gulf to the north, led to the disintegration of a presumed economic base on which southeast Arabian society was built (Crawford, 1996; Edens, 1992). These developments likewise caused the disintegration of the wider regional networks in the Gulf, which included Mesopotamia, and modern-day Iran, Pakistan and India. These views were adopted by scholars of southeast Arabia, such as Méry, who in Wadi Suq ceramics from Shimal and Hili sees an adaptation to a socio-economic system different from the Umm an-Nar period. This restructuring is linked to emerging new social, economic and political conditions related to international events at the time, such as the decline of the Indus civilization (Méry, 2000, p. 285). However, this perspective also has limitations. First, it is a top-down perspective, linking institutional and wider-network developments to societal change at a smaller level. It shapes a narrative where the prosperity of regions like the one under study can only exist by merit of its interactions with other regions. For instance, in the model described above, southeast Arabia is reduced to a peripheral region that is restricted to a role of supplier of copper and timber (cf. Crawford, 1996, p. 20), usually for the benefit of a 'core' region such as Mesopotamia. Furthermore, in doing so, the populations that formed these 'peripheral' societies are marginalized, even though they developed different complex mechanisms to overcome hardships cast by the barren environments. A second issue is that in most Wadi Suq settlements evidence for maintained trade contact with different neighboring polities exists well into the Wadi Suq period. For instance, Indus black slipped jar fragments were found at Tawi Sa'id in early Wadi Suq contexts (Döpper et al., 2018, p. 24). Moreover, at Kalba and Tell Abraq imported ceramics indicate that trade connections with neighbors in the Gulf and beyond were sustained into the Wadi Suq period (Magee et al., 2017, pp. 211-212). A last issue is the timing, once again. The Dilmun State and its trade networks diminished from the middle of the 18th century BCE (Crawford, 1996, p. 14; Edens, 1992, p. 132; Magee, 2014, p. 177). This timing does not align with either the start of the Wadi Suq period at ca. 2000 BCE, nor with the transition to the following Late Bronze Age at ca. 1600 BCE.

3.1.3 Integrated approaches

A third approach to explaining change combines elements of the two concepts discussed above. For instance, Carter suggests that environmental change impacted society from the bottom up by lowering agricultural output, while the disintegration of the trade networks impacted it from the top down by reducing its trade-derived wealth. Together, these resulted in a mutual feedback loop, where worsening environmental conditions made it both harder to transport copper and to sustain

the population required for its extraction (Carter, 1997a, pp. 247-248). Righetti also proposes an integrated explanation, but argues for a separate timing of the two events. The first event, an aridification caused an initial crisis timed at around 2000 BCE, which instigated a reorganization of the society into a group of settled agricultural populations in the north of the peninsula and more mobile pastoralist groups in the south. The former, built communal tombs and upheld maritime connections with the Dilmun state, while the latter moved around to exploit natural resources, such as coastal regions in the east and copper outcrops in the south. As discussed before, the mobile groups could have constructed the single burials found in the south of the peninsula, but likely did not use these for temporarily allocating the bodies of the deceased to later inter them in communal tombs in the north. A second crisis is timed in the 17th century BCE after the disintegration of the Dilmun state and impacted regional networks and economic wealth. After this crisis, as Righetti puts it, more sites are abandoned and populations organize themselves in enclaves in the north and on the coast. This marks the transition to the Late Bronze Age (Righetti, 2015a, pp. 346-350). In this interpretation, as well as the idea by Carter, the temporal mismatch between the traditional timing of climatic change at ca. 2200 BCE and the onset of the Wadi Suq cultural horizon at 2000 BCE is again not accounted for, similar to the environmental explanation described above. If climate change occurred around 2200 BCE, it is unlikely that its effects materialized only after 200 years later.

3.1.4 Socio-political internal upheaval

A last perspective that requires mention here focuses on internal, rather than external factors. Magee proposes that monumental collective tombs signify a counter-value of social cohesion in the face of emerging social inequality during the Umm an-Nar. The tombs mitigated differentiation, as all members of society became equal in death through the collective tombs, with their belongings deposited in caches in the very same tombs. Magee hypothesized that this is the product of millennia of adaptation to the barren desert environment, which crystallized the tribal values characterizing the society (Magee, 2014, pp. 124-125; 189). Taking this further, Frenez has suggested that rather than being an involuntary consequence, the disintegration of regional networks that characterizes the Wadi Suq period was a conscious, internal reaction against an increasing degree of socio-economic inequality. The reaction was, according to Frenez, intended to reinstate the egalitarian tribal values held before (Frenez, 2020, p. 34). However, direct indications of the validity of this theory would be hard to point out archaeologically, and Magee also admits that this "remains no more than an attractive hypothesis" requiring further investigation (Magee, 2014, p. 125).

None of the theories discussed explain the full range of changes observed for the Wadi Suq, and it is likely that multiple complex processes are at play, coming to variable expression in different ecological niches and at different scales both temporally and geographically. Although an interesting topic, it goes beyond the scope of this thesis to investigate this question further. Thus, disregarding the exact reason for why it happened, the focus is shifted to the change in settlement in this period.

3.2 Mobility and changing settlement

As mentioned, the number of known settlement sites declined during the Wadi Suq period. While a decrease in settlement numbers can sometimes be correlated with a population decline, such a case

is not substantiated for the Wadi Suq period where the many cemeteries that have been discovered indicate a relatively sustained population level (Carter, 1997c, pp. 88-89). Instead, the disjunction between relatively many funerary and few settlement sites has led scholars to suggest a higher degree of mobility in the society was at play. However, care must be taken with this concept, as mobility and sedentarization are often (mis)used and oversimplified as a manner of explaining sudden demographic changes in the archaeological record (Bernbeck, 2008, pp. 47-49; Cribb, 1991, p. 66). Such misuse of the concept is also clear in early theories for the Wadi Suq period, where it was suggested that the transition represented a period of collapse, abandonment, and transformation, after which a reversal to full-time nomadism in the Wadi Suq occurred (Cleuziou, 1981, p. 292). This theory relied on the domestication of camelids, which has since been attested to have occurred only in the Iron Age (Uerpmann & Uerpmann, 2002). As sedentary sites with continuous sequences for the first half of the second millennium were discovered, these ideas were disproven beyond doubt (Weeks, Cable, Franke, et al., 2019, p. 160), although this idea of collapse, abandonment, and transformation still sometimes features in modern work (cf. Miki et al., 2024).

As de Vreeze has noted, it is because the archaeological research tradition in this region is relatively young that there was an initial need to define distinct archaeological periods. This led to an emphasis on change and difference over continuity and similarity, while both are present to different degrees in different places (de Vreeze, 2016, p. 66). This is increasingly recognized which allows for new, more nuanced narratives to emerge. In this thesis an attempt is made to contribute to this process. By describing what mobility can be, how it is recognized archaeologically, and what it means for our understanding of the past, a better understanding of the possible strategies adopted by Wadi Suq populations will emerge.

3.2.1 Sedentary bias

The study of mobility in archaeology has traditionally been overshadowed by that of sedentary societies. In the field of architectural theory, a sedentary bias has developed over the last century that sets up “an exclusive culture of permanent, static and heroically individualistic buildings as the sole ‘civilised’ works of architecture”(Cowan, 2002, p. 4). This sedentary bias is rooted in underlying linear evolutionary models of history, where there is a development from the ‘primitive and nomadic’ to an ‘advanced and culturally superior’ settled civilization, which are unrealistically reductive (Bernbeck, 2008, p. 47; Cowan, 2002, p. 4; Cribb, 1991, p. 16). It is clear that this bias has seeped through to archaeological analyses of the built environment. For example, the focus has long been on whether herding can be seen as a precursor to settled agricultural societies, rather than investigating it as a lifeway in itself, and much of the literature on pastoral societies focuses on determining the degree of sedentism (Steadman, 2015, pp. 83-84).

Further reasons for the sedentary bias include that ethnographical analogies between modern mobile pastoralists and mobile groups in the past are often assumed, although continuity is not proven (Hammer, 2025, pp. 105-106). Modern conditions also paint a skewed picture, as the technological gap between mobile and sedentary groups, or indeed, the western observer, and the non-western pastoralist, may be quite large. Before industrial times, however, this technological gap was almost nonexistent (Bernbeck, 2008, p. 46; Rosen, 1992, pp. 79-80). Ancient sources on mobile

groups further skew this image, as they provide mainly biased accounts of an elite scribal class that was socially both external and distant to nomadic groups (Bernbeck, 2008, p. 48; Wendrich & Barnard, 2008, p. 10). The sedentary bias is also echoed in some of the ideas about the Umm an-Nar to Wadi Suq transition as outlined above. A contrast is created between the flourishing, permanent settlements with oasis agriculture of the Umm an-Nar, while the Wadi Suq is framed as a mobile society in which settlement, interconnection, and overall complexity declines.

From the time that sedentary configurations become dominant that the mobile, nomadic way of life becomes overshadowed. Exemplary is the amount of literature on the archaeology of (settled) architecture versus that on the archaeology of mobility and nomadism. This disjunction is partly the result of preservation bias of the larger and more permanent settlements left by sedentary groups, while research into non-sedentary groups often results in more superficial inquiries, whereby traces left by these groups are labelled as ephemeral and are not investigated in much detail (Wendrich & Barnard, 2008, p. 1). This is especially pertinent when compared to the study of hunter-gatherer lifeways, which leaves comparatively equal or less traces, but for which a much more detailed profile has been created (Cribb, 1991, p. 66). Moreover, archaeological investigations of mobility often is based on the presumptions that movement is always seasonal, occurring at several points throughout the year, that entire populations are involved in the movements, and, related to this, that year-round use of a site is always indicative of sedentary occupation (Bernbeck, 2008, p. 50). Therefore, mobility must be considered as a strategy in and of itself and not only as an inferior alternative to a 'superior' sedentary way of life.

3.2.2 Mobility: terminology, fluidity, agency, social organization

In the study of mobility, different terminologies have been defined over the years, facilitating the discussion of different forms of mobility on common grounds, and also helping to describe the subject matter more broadly. This includes nomenclature such as 'agropastoralism', 'tethered pastorialism', 'vertical mobility', and 'horiziontal mobility'. However, it has for some time been recognized that the use of such terms also limits capturing the true diversity and fluidity of mobile strategies among different populations, as they describe only a single moment among mobile groups and their strategies and do not account for temporal variation or adaptations (Wendrich & Barnard, 2008, pp. 7-9). Moreover, as Frachetti notes, the focus of characterizing archaeological remains as either mobile or settled has restricted the exploration of the plurality of strategies employed among populations dealing with variable environments, and instead the focus should be on identifying the variability that accounts for the specific geographical and temporal context that is dealt with (Frachetti, 2008, p. 367).

In line with this, Wendrich and Barnard provide a framework for assessing mobility among societies in terms of fluidity, the role of social organization, and agency in the mobilization and settlement process. They recognize that mobility should be defined for every population separately, and in order to do so, specific questions can be asked that need to be assessed over longer periods of time. The focus lies on four key aspects, namely moment, movement, motivation, and segment, that form the basis of a range of possible questions (see Table 1).

Table 1: The different aspects that determine the type of mobility in a specific society as defined by Wendrich & Barnard (Wendrich & Barnard, 2008, p. 9, Table 1.3).

	Factor	Range
Moment	Period of movement	Specific day, week, month, season, year
	Length of period of movement	Total no. of nights
	Length of stay in each location	Total no. of nights
	Repetition of mobility pattern	Daily, weekly, monthly, seasonally, yearly, etc.
	Stability of mobility	Repetition over multiple years, decades or centuries
	Variation of mobility over time	Inventory of multiple years, decades, centuries
Movement	Range of movement	Number of km per period of movement
	Pattern of movement	Fixed, flexible, random (specified with map)
Motivation	Purpose of movement	Hunting, gathering, herding (specified with activities)
	External factors	Climate, war, social pressure, illness, etc.
	Decision base for movement	Who decides (group or high-status individual), basis on which decision is made
	Assessment of mobility within the group	Identity, cause for pride, neutral, necessity, compassion, scorn
	Assessment of mobility by outsiders	Identity, cause for pride, neutral, necessity, compassion, scorn
	Mobility integral part of identity	No / Yes (specify how)
Segment	Distribution of mobile population	One group, multiple camps
	Percentage of population in motion	0–100%
	Part of population in motion	Gender, age, social position, profession, cultural identity
	Variation of mobility within the group	Gender, age, social position, profession, cultural identity
	Location of burials / cemetery	Central location (monumental or not), buried 'en route,' cremation, other means

This framework will be applied to the case study in Chapter 5, and will provide the basis for investigating the detailed configuration of mobility in one particular population, namely that residing at the case study site of Burj Huraiz during the Wadi Suq period.

It is likely that not all of the questions can be answered in detail, as we are dealing with archaeological data and not ethnographic observation. First, there is insufficient chronological resolution to make any statement about the exact length of stay of Bronze Age groups, let alone the number of nights. In other cases, such as the question of who or what determines when movement is required, it is even more complicated to find a viable answer when working with archaeological data. Nonetheless, this framework provides a guideline for gauging the diversity of strategies employed

among mobile groups, focusing on the fluidity of movement and highlighting agency of the people involved. As such, this will contribute to an analysis of mobility in the archaeological data that is not inherently reductive and constraining.

3.2.3 The material side of mobility: Ephemerality and movement

Roger Cribb (1991) has outlined several concepts for discussing the different material elements of nomadic societies. Although based on ethnography for the larger part, this work provides insight into the diversity of mobile strategies that can be employed and the fluidity of mobile groups in alternating between these strategies. First is his definition of the 'tent' as a broad category, highlighting that the distinction between the tent and the house can be blurry. It is defined as a "prefabricated structure consisting of a flexible covering and structural supports temporarily brought together to form an integrated architectural unit" (Cribb, 1991, p. 85). This covers a range of options from more temporary to the more permanent dwelling forms. Furthermore, he distinguishes the individual elements of the tent and its inventory among three axes, being fixed/mobile, durable/perishable, and valuable/expendable. For an assessment of the built environment the first axis is most relevant, and is translated into categories of 'fixtures' and 'portables' (Cribb, 1991, pp. 66-68, 84). The former are elements that are left at a site and are generally more durable, including floors, hearths, platforms, foundations, corrals, storage facilities, and sometimes walls. The latter are transported and therefore generally lighter and more ephemeral items, including the tent itself, and much of the inventory. Categorization into either of the types is determined by an object's material properties (mainly form/weight), whereby the lighter, more easily transportable items (that are also sufficiently valuable) are more likely to become portables. Here, the notion of 'smaller is better' for tents is relevant in situations where a higher degree of mobility is favored, due to transport and (de)construction needs (Steadman, 2015, p. 94). Based on the different ratios of fixtures and portables in a basic tent structure, Cribb provides a typology of seven different types which can be seen in Figure 13.

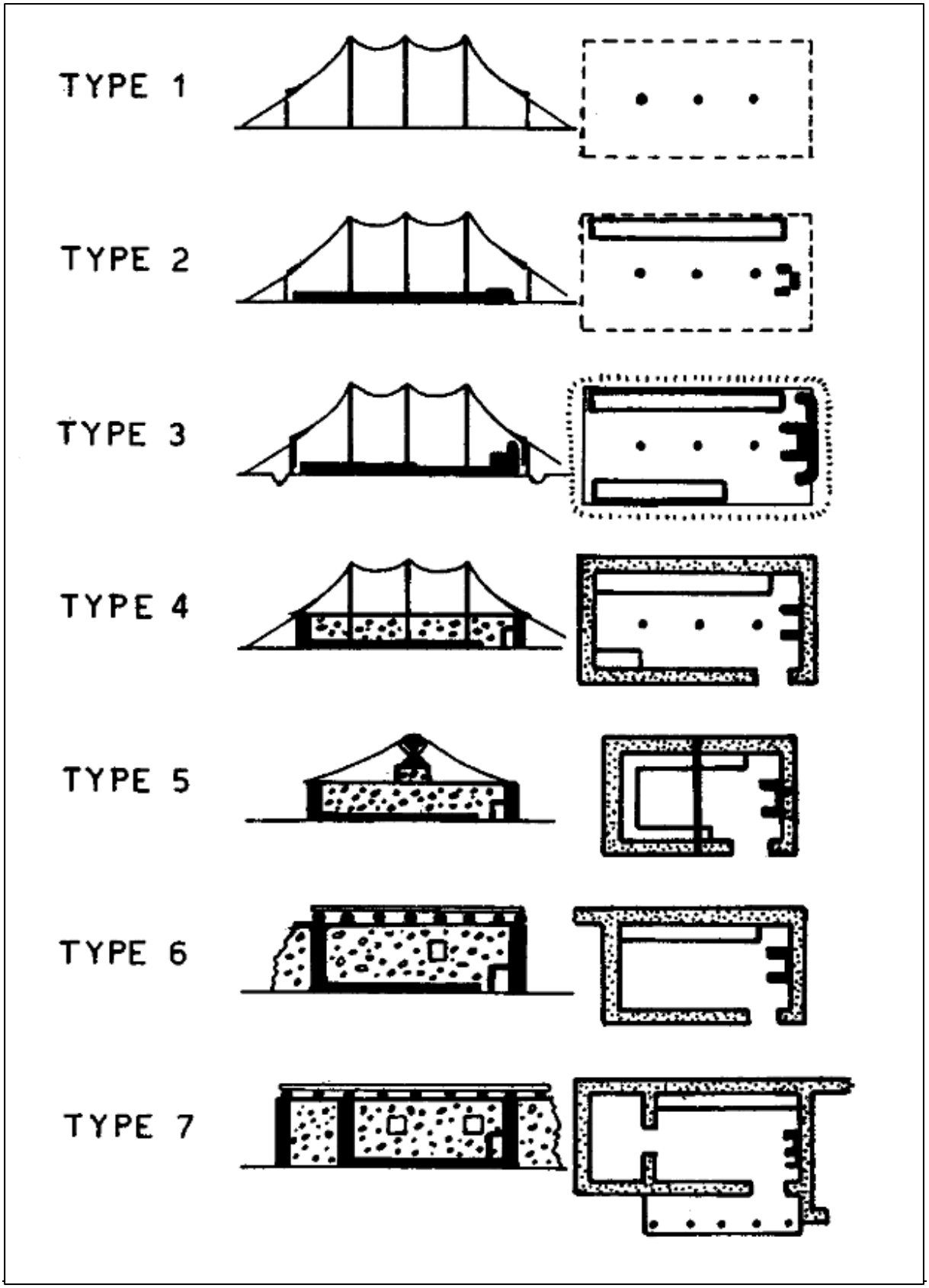

Figure 13: Cribb's typology of tent forms which varies with different degrees of seasonality (Cribb, 1991, p. 106, Figure 6.14).

Types one, two, and three are what is most commonly recognized as a 'tent', and have a lower, but progressively increasing number of fixtures. Whereas the first type represent the most basic form, even the most basic transit camps generally install several basic elements to form something more akin to type two. This includes a hearth, and a small platform for storage. Types four and five are the first with low, but substantial walls, and from number five the roof is suspended from the wall foundation, leaving no posthole traces in the center. Types six and seven are more permanent iterations, with six still having a portable roof superstructure, while seven becomes a form similar to permanent village dwellings (Cribb, 1991, pp. 105-107).

Although the above overview sees an increasing number of fixtures with every type, this should not be interpreted as an evolutionary scheme, but rather as an example of the diverse possibilities within the range of the tent. It is important not to take these as absolute types, at the risk that they, akin to the terminologies discussed before, become restrictive categories. Furthermore, the fluidity in strategies is important here, as one group could make use of structures belonging to different types over short periods of time. For example when a mobile group travels from the more permanent winter settlements consisting of type 7 structures with relatively more fixtures, to summer pastures, where perhaps tents more akin to types 4 and 5 are used, they might make use of tents of types 1 and 2 while in transit. Thus, when evidence of one type of tent can be recognized archaeologically, it is important not to restrict our view of the society to that single type of dwelling that happens to be preserved.

By applying these concepts from Cribbs' seminal work, the material manifestation of mobility in the archaeological record becomes visible as a range with on the one side forms of high transportability and few to no fixtures, which also leave fewer traces, and on the other side forms with many fixtures and hence a lower transportability, which leave more traces for us to study. Here, it is assumed that while strategies might have employed different forms of dwellings and settlement within this range, the higher amount of fixtures can in most cases be related to either a longer residence in these buildings, or a recurrent use of them due to the investment of energy and resources in these places. In the same way, the construction of more ephemeral structures will be taken to signal a less extended residence or a lesser intention to return to those places.

3.2.4 Mobility in the wider landscape

Now that the issue of the types of remains that are left by mobile groups has been discussed, it is useful to consider the environmental contexts in which these are situated. The different environments and landscapes in which settlement takes place have an influence on the types of residence and mobility of a society. Some landscapes afford certain features, but are seasonally restricted. For instance, in southeast Arabia locations along wadi beds can offer pastures to a pastoral society during the wet winter months. This can affect said society in that they seek the most resourceful locations and can change location often, consequently residing in highly transportable dwellings with few fixtures. In summer, when temperatures rise, the more steadily resourceful coastal environments might be sought out, where temperatures are also slightly lower. The coastal resources, concentrated mostly in the mangroves and the sea, are less prone to a change in location and could therefore have allowed for the creation of more sedentary sites in convenient locations,

where a large part of the year was spent when the weather conditions became critically dry and the landscapes barren.

As mentioned, the more permanent settlements generally hold more fixtures, which signal an investment of energy and resources. However, there is another dimension to this, being the social investment in a location through the construction of elements such as tombs and rock-art in the landscape. Specifically tombs represent social and ritual fixtures, which are visible through their monumentality, and can transform wider areas into landscapes that are tied to ancestry of those buried in the tombs. The cemeteries signal that a certain landscape was occupied more generally and their continued use and addition of new elements show that the ancestral ties to the landscape were significant to the communities inhabiting it (Frachetti, 2004, p. 411).

3.3 Summary

This chapter set out to review the main theories of why change occurred at the onset of the Wadi Suq period. It has touched upon several main strands of thinking involving environmental causes, network disintegration, combined models, and internal socio-political organization. Though these theories all appear insufficient as a holistic explanation, the resultant changes in Wadi Suq society remain in place. One important change, that in settlement, is often explained by a shifting degree of mobility. However, it has been pointed out that this concept is underdeveloped in the context of the Wadi Suq period in southeast Arabia, and should be unpacked and developed more in order to provide satisfactory explanations that reflect on all aspects of settlement. A framework by Wendrich and Barnard is adopted here, highlighting agency, fluidity, and social process in thinking about mobility, rather than using generalizing and restrictive terminologies. Furthermore, some remarks about the material remains left by mobile groups have been set out, including several terms that will facilitate the interpretation and discussion of the material record in relation to mobility.

Furthermore, it is recognized that different environments have different effects on types and configurations of mobility, which ranges from the more sedentary to the highly mobile, and is reflected in associated permanent elements defined as fixtures. These fixtures as physical remains may advocate to a substantial energy investment by a population in a location, which also indicates an intention to return to these places. In a social and ritual sense, cemeteries are an element that represent fixtures in a more metaphysical way.

Thus, it appears that settlement and construction can reveal clues about the different types of mobility employed by their builders. Generally, a larger amount of fixtures (physical and metaphysical) at the scale of the settlement, but also at the scale of the building can signal a higher degree of sedentism, while the lack thereof indicates a higher degree of mobility.

Chapter 4: Analysis of settlement data

In this chapter, all current data on Wadi Suq settlement will be reviewed. The first section will discuss the limitations of the available datasets and explain the selection and categorization that are made in this thesis. The second part will review the data itself, with specific attention to the details of construction in this period. By doing this, it aims to answer the question of how settlement and construction during the Wadi Suq period can be characterized across the Oman Peninsula on the basis of the information that exists for this subject at this time.

4.1 Limitations of the available settlement data

Although in recent years more sites containing Wadi Suq settlement traces have been discovered, much of the data (that is, if it is published) still sees limitation in research methodologies, but also in the very nature of the archaeological traces. Most of these issues have been pointed out by Righetti's (2015a, pp. 218-222) discussion on this topic, but will be reiterated and considered here as well before the sites are reviewed.

A first problem is that relatively continuous occupation of the same ecological niches in the landscapes of the peninsula. Chapter 2 made clear that this region is highly varied in terms of geography and the types and availability of resources. In many geographical zones, agricultural exploitation is hindered by insufficient water availability, extreme relief, or unsuitable soil properties. The few areas that are suitable for agricultural exploitation in terms of soil and rainfall, are further complicated by local relief and drainage conditions, generally pushing agricultural practices into specific niches within the landscape. For example, in the piedmont areas past and modern oases are preferentially situated on the banks of larger wadi's where there is enough space between the wadi channel and the hill slopes. Combined with the fact that climate has been relatively similar over the past 4000 years, these niches have been the focal points of settlement throughout history and occupations are often highly continuous in these places. One example is the Bat oasis, where the modern village and palm groves likely cover much of the area inhabited and cultivated in prehistory (Swerida, 2018, p. 67). The continuity of occupation here obscures a complete view of the past circumstances, as ancient settlement sites and associated activity areas are covered by modern villages and therefore remain inaccessible for research (Al-Jahwari, 2013, pp. 3-5).

A second limitation is that much information on Wadi Suq settlement and for the Bronze Age more generally, is based on survey data. First, there is the issue of when a find concentration is deemed representative of a site. While some project may take ceramic concentrations of 5 sherds per square meter to represent a 'site density', other may place this threshold higher, or require built remains of some sort to be present before calling a location an archaeological site. This may lead to the presence of more sites in one part of the region, surveyed by team A, while a team B might survey another part and finds less sites despite dealing with similar traces. Of course, this is a hypothetical case, but it illustrates the problems that may occur when there are methodological disjunctions between different project. Furthermore, there is the issue of unbalanced research coverage, whereby the northern peninsula has been surveyed more intensively than other areas. For example, the Batinah area of Oman has long been understudied, although more recent work is improving this

(e.g., Düring & Olijdam, 2015; Kennet et al., 2016). Not only is it important to consider which areas receive more attention, but also what we cannot see. Much archaeological sites have been destroyed over the last few decades, as economic development in the region has advanced the expansion of industry and urban areas. This is specifically pertinent in aforementioned Batinah (cf. Al-Belushi, 2015; Düring & Olijdam, 2015, p. 93; Hakro & Pandow, 2019) and furthers the skewed view that currently exists for Bronze Age settlement.

A last point lies in the nature of the archaeological traces. In the early decades of southeast Arabian archaeology, the discovery of Wadi Suq settlements was recurringly a by-product of projects aiming to investigate Umm an-Nar tower structures, such as at Hili 8 and Tell Abraq. In a similar way, Wadi Suq occupation can take the form of a continued occupation of the non-monumental structures of the Umm an-Nar whereby the settlement is altered minimally, like at Bat. At these locations, besides being harder to identify among the earlier constructions, the Wadi Suq period was not central to the investigations and was not prioritized in investigations. This is reinforced by the fact that Wadi Suq settlement is generally less well preserved than the Umm an-Nar remains, both due to the difference in the scale of the built remains and their stratigraphic position closer to the surface, and hence their higher sensitivity to erosion and other post-depositional processes.

4.2 Site selection and categorization

To construct a workable analysis, a selection of sites was made on the basis of their chronological scope and the nature of archaeological remains present. All sites with a Wadi Suq component in the occupational sequence and that have been published in some detail were selected. This includes sites that were established earlier, but were still occupied (transitional sites) or reoccupied in the Wadi Suq period, but also those sites that see their first occupation in the Wadi Suq period. Furthermore, a distinction was made on the basis of the nature of the remains present. While settlement sites are often related to a specifically domestic occupation, here it is defined more broadly as incorporating all sites that are not exclusively funerary in nature and hosting a wide range of activities that are not related to funerary activity. As such, this analysis will focus on settlement sites, which covers sites with a settlement character in addition to funerary evidence, an industrial character, or a monumental aspect, or to sites that center on one or any combination of these aspects.

The resultant selection of Wadi Suq settlement sites is further categorized into four broad categories (Table 2). First are the ‘tower sites’. These sites are characterized by the presence of a monumental tower structure, which in all cases was initially constructed during the Umm an-Nar period, but remained in use, in some way or another, into the Wadi Suq period. Again, this is not to say that these sites were (exclusively) domestic, but at the very least continued *activity* is attested there. The second group of sites under discussion are those that are defined as settlement sites. These are closer to the more traditional notion of domestic settlement sites, and are differentiated from the first group in the absence of monumental stone constructions. These sites are generally characterized by the presence of several smaller constructions that might have been home to small groups of people. At these sites, traces of production of different groups can be recognized, but the scale of activity does often not exceed what would be required for a ‘household’, or the needs of the

small groups of people residing at the site. In most cases, these sites can be related to the exploitation of resources of subsistence and likely facilitated the residence of groups of people for extended periods of time. The third category, the industrial sites, are characterized by their function as loci for copper extraction and processing at a scale surpassing household production. At these sites, it is possible that a settlement existed that supported the residence of a group of people that would conduct the industrial activity, although this is not attested in the single site that currently can be considered for this site type. The fourth type consists of sites that show evidence of recurrent, but temporary occupation. These are labelled 'temporary places', following the denomination by Weeks, Cable, Franke, et al. (2019). These sites do not have monumental constructions, evidence for sustaining larger groups over longer periods of time, or the processing or production of one specific resource beyond the household level. Instead, they are characterized by ephemeral traces of occupation, which can also be completely elusive, and by traces that highlight the shorter-term use of these sites, such as a stratigraphy that show distinct periods of abandonment in between layers of occupation. In total, 13 sites were selected for the current analysis, including four tower sites, six settlement sites, one industrial site, and two temporary places. Of these, three are newly settled or reoccupied in the Wadi Suq period, while nine represent a transitional occupation (Table 2).

Table 2: List of sites with their dating and assigned category.

Site	Chronological scope	Category
Tell Abraq	Transitional	Tower site
Al-Khutm	Transitional	Tower site
Hili 3/8	Transitional	Tower site
Kalba	Transitional	Tower site
Bat	Transitional	Settlement site
Nud Ziba, Khatt	Transitional	Settlement site
Ra's al-Hamra RH 10	Wadi Suq	Settlement site
Ra's al-Jinz RJ-1, RJ-2	Transitional*	Settlement site
Burj Huraiz	Transitional*	Settlement site
Khor Fakkan	Wadi Suq	Settlement site
Wadi Hilou	Transitional	Industrial site
Saruq al-Hadid	Transitional	Temporary place
Tawi Sa'id	Wadi Suq	Temporary place

*** Occupation is continuous, but at a different location than before**

Several sites that are often referenced as Wadi Suq sites, but that fall outside of the current selection warrant a brief discussion. The site of Shimal in Ra's al-Khaimah is oftentimes cited as an exemplary Wadi Suq site on the basis of the extensive funerary remains. However, no associated settlement was discovered, and the settlement that is known dates to the Late Bronze and Early Iron Ages (Velde, 1992, p. 106).

There are several mounded sites that have been ascribed a tentative Wadi Suq date, often based on the presence of only a few Wadi Suq sherds in association with them. However, as these locations have not been excavated, the resolution of information required for the current analysis is missing, and therefore these have been excluded. These sites include Bida'a, now known as Falayya in Ras al-Khaimah (Carter, 1997a, p. 70; Kennet et al., 2025, p. 394), Building IV at al-Khashbah (Döpper, 2021, p. 323), and the mound at Yanqul/As-Safri (Schreiber, 1998, pp. 29-30). Without more systematic investigation, it is hard to support their current designation as Wadi Suq sites.

The site of Maysar 1 is a large, industrial copper processing site convincingly dated to the Late Umm an-Nar. However, a radiocarbon date from house 1 has returned a date of 1920-1950 cal. BCE (Weisgerber, 1981, p. 251, Table 2). Carter further recognized that some of its walls resemble a Wadi Suq construction style of two rows of upturned slabs, and reports that a likely Late Bronze Age beaker was found (Carter, 1997a, p. 72). However, this evidence is too scant to attribute the site a substantial Wadi Suq phase and has therefore been left out of the scope of this thesis.

A last site that needs mention is al-Tikha in the southern Batinah, which comprises a substantial Umm an-Nar site for which a Wadi Suq occupation and restructuring is reported. However, for the moment this is based only on the presence of ceramic scatters at the sites, and a more detailed assessment of this particular aspect is not (yet) available (Deadman et al., 2022, p. 74).

Having discussed the deselected sites, the analysis of the selection will follow below. The review of these sites will form the basis for the comparative analysis in the later part of this thesis. For the locations of the sites that will be discussed, I refer to Figure 8. For each of the categories, a short introduction will be given, then the sites will be analyzed, followed by a discussion of the wider category.

4.3 Tower sites

Tower sites are here defined as sites that show evidence of monumental round platform structures, which are well-known features from the Umm an-Nar period. This category includes the sites of al-Khutm near the Bat oasis, Tell Abraq on the west coast of the UAE, Kalba on its east coast, and Hili 8, in the oasis belt zone. The last three are often regarded as some of the most characteristic sites for the Wadi Suq period, having been the loci where continuous stratigraphical sequences of the second millennium were first uncovered. To this day, there are only few sites that display distinct stratigraphical sequences, let alone sequences with much temporal depth. Therefore, it is important to keep in mind that while highly informative, these three sites represent only a single type of Wadi Suq occupation and as such are by no means illustrative of the entire range of settlement strategies employed in the second millennium. Moreover, there is particularly little known about these sites as settlements, as a result of the traditional focus on the central monumental building, rather than residence at these locations.

4.3.1 Al-Khutm

The tower of al-Khutm was excavated in three different instances. In 2009-2010 limited work was done by the ministry of heritage and tourism of the Sultanate of Oman. An Italian team investigated the site between 2015 and 2018 (Cocca et al., 2019; Bernardini et al., 2020) and again in 2022

(Cattani et al., 2024). The tower is positioned on top of a limestone ridge elevated above the surrounding alluvial plain, which allows for the tower itself to tower out 8 meters above it. The limestone bedrock naturally breaks into blocks, which have also been extensively incorporated into the structure of the tower, as well as surrounding features. Limestone outcrops oriented west-east have been used as a foundation for the tower structure (Figure 14; Cocca et al., 2019, pp. 86-87).

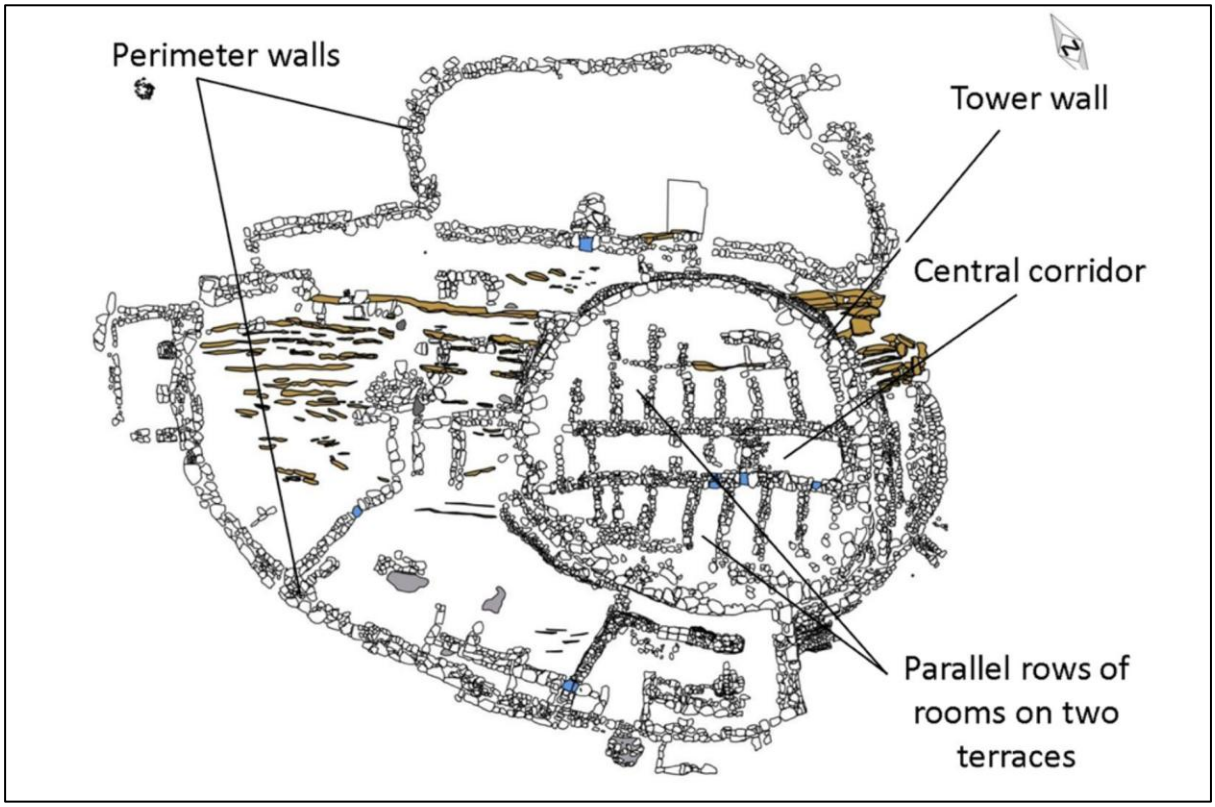

Figure 14: Plan of the complex at al-Khutm. The bedrock outcrops are indicated in yellow (Cocca et al., 2019, p. 88, Figure 4).

The tower of al-Khutm was constructed towards the end of the 3rd millennium BCE, and was in use from then until the first half of the 2nd millennium BCE (Cattani et al., 2024, pp. 28-30). As such, the tower saw a use-life spanning the late Umm an-Nar and Wadi Suq periods and fell out of use towards the Late Bronze Age. This chronological sequence is currently mostly based on the pottery retrieved from the different levels of occupation at the site, as results from ^{14}C-analysis are still anticipated (Cattani et al., 2024, p. 30). The tower itself measures 20 to 22 m in diameter and to its north, west, and south, a perimeter wall is constructed. To the western end, this wall becomes irregular as it adapts to the natural morphology of the bedrock. The area delimited by the perimeter wall is further partitioned into smaller areas by several walls. This suggests that the tower and its associated features should be seen as one larger complex (Cattani et al., 2024, p. 26; Cocca et al., 2019, p. 88).

The tower and perimeter wall, as well as several of the partitioning walls and associated flooring layers have been attributed to the Late Umm an-Nar on the basis of associated Umm an-Nar period fine ware pottery. During the Wadi Suq period, a second phase of construction saw the sealing off of the entire external area on the western side of the tower, creating a wide terrace. New walls were constructed with different orientations from those of previous phases. The authors describe this

construction phase as one of ‘constant alterations’ (Cocca et al., 2019, p. 89), emphasizing the iterative nature of the building process. No detailed documentation of the different construction phases is provided, however. On the basis of the ceramic assemblage and the stratigraphy, the authors ascribe not a residential function to the complex, but a function of storage and production of certain goods (Cocca et al., 2019, p. 94).

Access to the tower complex was provided by a threshold in the western part of the perimeter wall. A system of doorways would lead an observer through a ‘monumental ramp system’ of three succeeding stone terraces, up to the main tower. On top of the tower platform, a central well was present, as well as multiple rooms through which circulation was possible. The doorway in the northern part of the perimeter wall had been blocked at some point in time, forcing its users to the doorway on its western side (Cocca et al., 2019, p. 90; Figure 15).

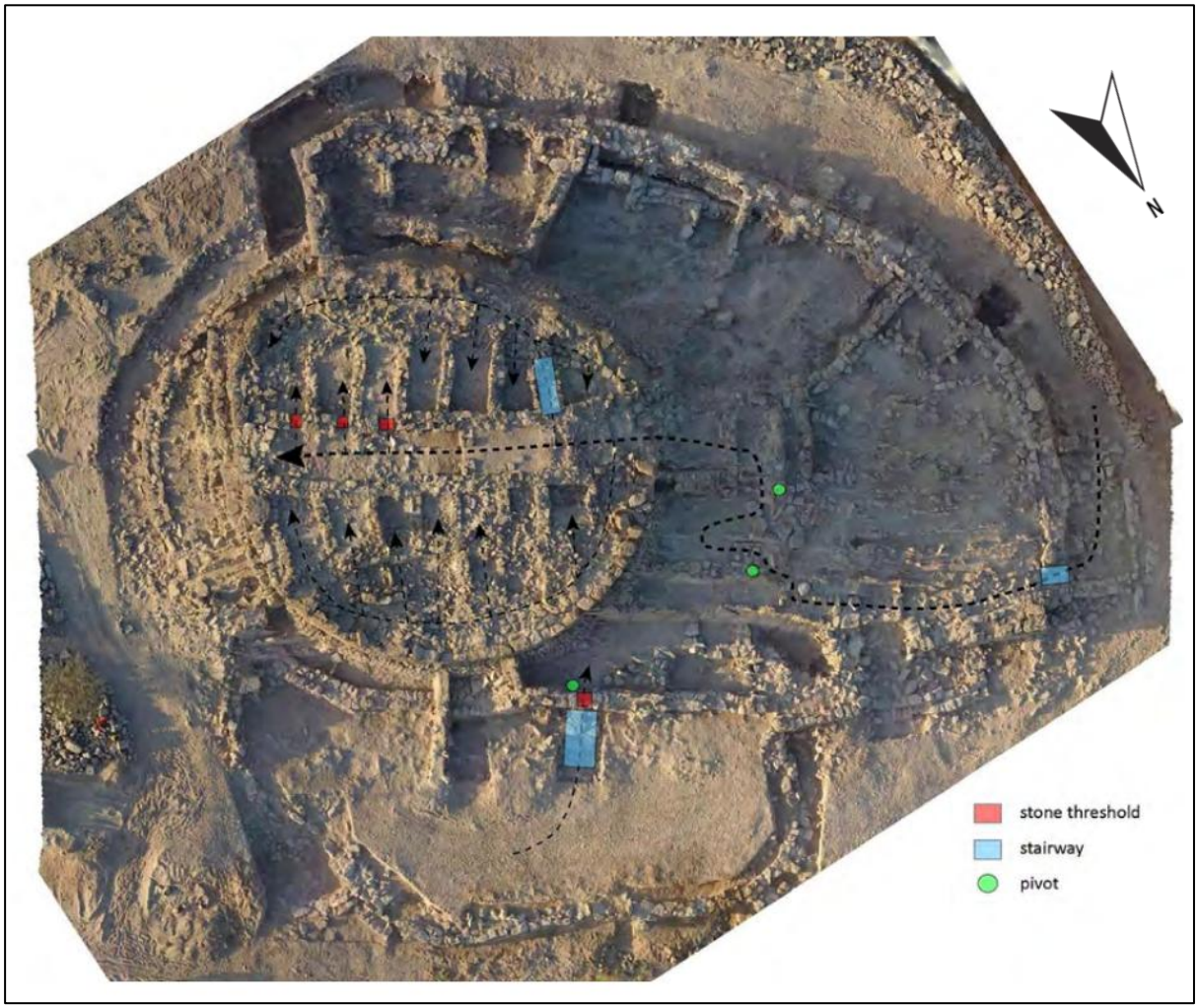

Figure 15:The complex of al-Khutm with proposed circulation routes. North arrow added (adapted from Cocca et al., 2019, p. 91, Figure 7).

The 2022 season exposed a 20 m long stretch along the southern perimeter wall. It showed that the perimeter wall is preserved to a height of 2,8 m, and furthermore, that there are additional structures on the exterior of the complex which show traces of different activities. A concentric space was marked by yet another wall, possibly representing a ‘buffer zone’. Activities in this area are

dated from the Late Umm an-Nar, through to different phases in the Wadi Suq period based on the pottery (Cattani et al., 2025, p. 28). A more detailed description of these structures and the activities taking place inside is not available at present.

Discussion

The excavators do not consider the tower as a residential building, but production and storage functions are proposed for the area within the perimeter wall. The construction of the tower is seen as a means for expressing the prestige of the community (Cocca et al., 2019, p. 94). In the published literature it is not indicated which walls are dated to which phase specifically. However, the general description of the construction activities in the respective periods does provide some information. The general layout of the complex was created in the Late Umm an-Nar period, consisting of the tower structure and the perimeter wall. Likely, several compartments were also created on the inside of the perimeter wall. The activities of the Wadi Suq builders at this site are expressed in the form of additions and alterations to the situation as it was created in the Umm an-Nar period. As mentioned, a large area to the west of the tower is covered with landfill, and new walls are added in different orientations from before. These activities remind us of the creation of terraces, as will also be discussed for other sites below. It is mentioned that construction was of an iterative nature at al-Khutm, perhaps indicating an organic, unplanned development of the site to accommodate to the changing needs of the communities using it.

4.3.2 Tell Abraq

The site of Tell Abraq is located on the Arabian Gulf coast in the northern UAE. The site is typed by a mound of ca. 1,8 ha in surface area, with the center, a smaller protrusion, rising to 10 m above sea level. It is currently located several kilometers away from the coastline, but is situated only 100 m from the Middle Holocene coastline (Magee et al., 2017, p. 209; Potts, 1990, p. 17). Although investigations have been focused on the mound itself, and recently also the areas around it, it has been proposed that this site, which rises above the otherwise flat coastal landscape, might have been the center of a larger complex of settlements along the coast (Magee et al., 2017, pp. 210-211). One related settlement could be identified in the site of Hamriya, at some 4 km to the southwest of Tell Abraq, which shows good evidence for occupation at least in the later part of the second and into the first millennium BCE (Magee et al., 2009). No such evidence exists for the Wadi Suq period as of yet, so it remains a tentative idea for this period.

After the first four seasons of excavations focused on the central mound, Potts estimated the site's extent at 4 ha (Potts, 1993, p. 117). However, Pott's project focused on the main mound, and more recent investigations have looked also at the surrounding areas. Based on this, the extent of the site is estimated to be minimally 6 ha (Magee et al., 2017, p. 210).

The main features of Tell Abraq

The excavations led by D.T. Potts between 1989 and 1998 investigated several trenches probing into the mound. They discovered that within the mound, two superimposed round structures exist (Figure 16). The lower building I represents the older construction, and is constructed with large unworked stones. A foundation of three courses was laid down first ('20' in Figure 16a), onto which

the main wall was built with an offset of 50 cm ('19' in Figure 16a). The discovery of Barbar City II red-ridged sherds associated with the building's foundation provides a *terminus post quem* of 2400-2200 BCE for its construction (Potts, 1990, pp. 23-25). Associated with the base of this wall, a concentration of burnt reed matting, burnt wood, and date stones were found abutting it on a presumed ancient surface. These finds provided consistent ^{14}C-dates of around 2139-2048 cal. BCE for the date stones and 2140-2036 cal. BCE for the reed matting (Potts, 1997, p. 66). In later work, a hearth in sterile sand at the base of tower returned a ^{14}C date of 2461-2199 cal. BCE (0.99) or 2159-2154 cal. BC (0.01). A ditch fill adjacent to the tower produced a date of 2130-2087 (0.07) or 2050-1881 cal. BCE (0.93) (Magee et al., 2017, pp. 212-214). From these radiocarbon dates, it appears that building I was constructed somewhere in the third quarter of the third millennium and at the latest around 2200 BCE. The reed matting, the ditch, and surface attest to the occupation of the structure in the subsequent centuries.

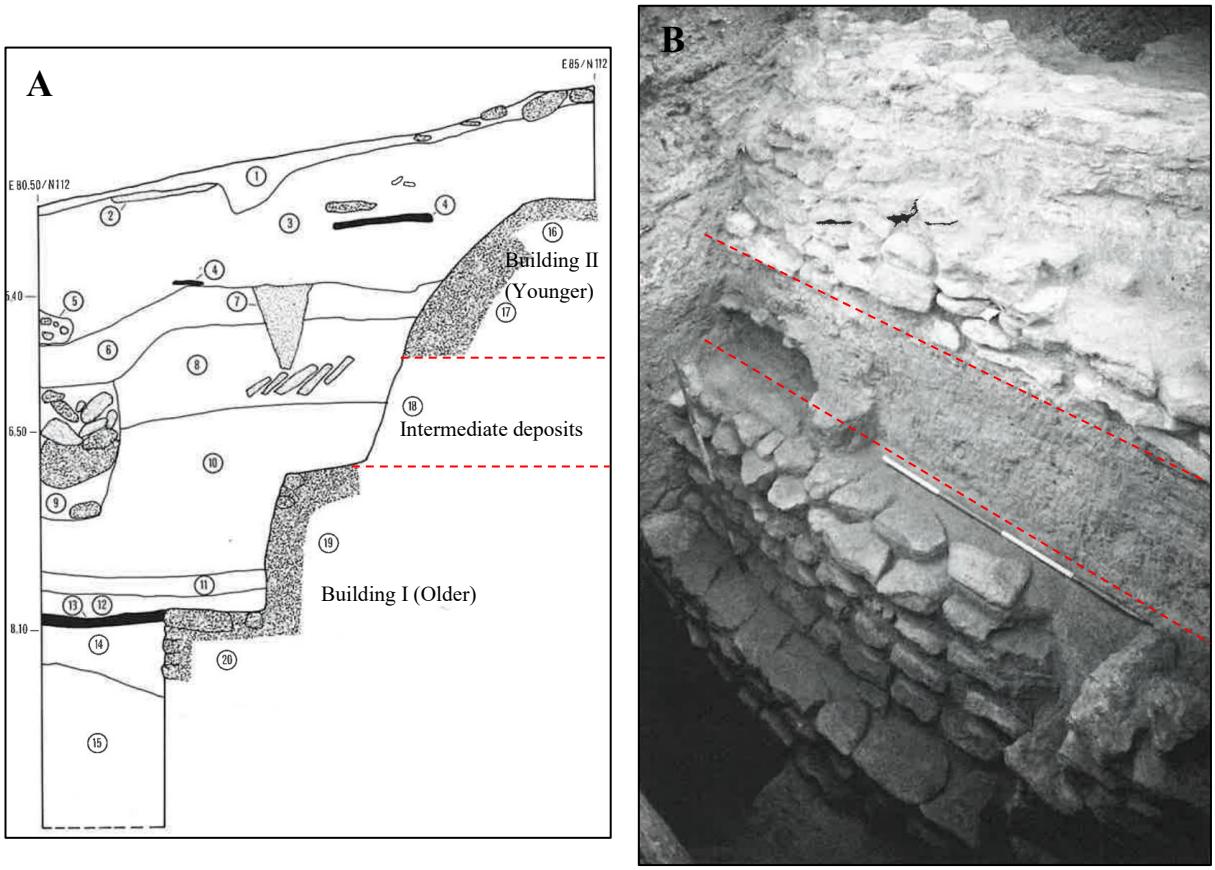

Figure 16: A) Tell Abraq north section drawing of the western exterior of the buildings and B) oblique photograph of the western face of the buildings, showing the superimposed walls (adapted from Potts, 1990, pp. 21-22, Figures 6 and 7).

In between the superimposed buildings an intermediate level of sand interspersed with fish bones was found. This level represents a phase between building I falling into disuse and the construction of building II. Many Wadi Suq sherds were retrieved from this level, although according to the author it is clear that this level is Umm an-Nar in date. (Potts, 1990, pp. 29-30). Building II represents a round tower structure similar to those known from other sites. It has an exterior of unworked stone and a massive system of mudbrick walling on its inside. The outer wall consists of 6 to 7 courses of stones, with 3 to 4 rows of flat stone slabs ('17' in Figure 16a) and the building was capped by soft calcareous

limestone derived from the nearby coast ('16' in Figure 16a). The mudbrick walls consist of an interior ring from which perpendicular walls radiate towards the center of the mound. In the western part of the site, the spaces in between these walls had a loose, homogeneous gravel fill devoid of artefacts on the western side (Potts, 1990, pp. 30-33), whereas in the northeastern part of the mound, a sandy fill with much Late Bronze Age pottery and intact fish bones was encountered. The state of these finds suggest that it concerns a trash deposit, and not an occupational level (Potts, 1991, p. 24). Based on a segment of the exterior wall in the northeastern section, the total diameter of building II was estimated at 40 meters (Potts, 1991, pp. 21-22), which is considerably larger than the average of 20-25 m for Umm an-Nar towers as was discussed in Chapter 2.

The Tomb

In the first season of excavation, the edge of a 'sugarlump' tomb was discovered in a trench 10 m to the west of the tower structure (Potts, 1990, pp. 53-55). In later seasons the tomb was investigated in detail. The tomb, dating to the 21st century BCE was sealed completely by the mound, allowing for its contents to be preserved to a high degree. Its thorough investigation has revealed much information on the Late Umm an-Nar demography, and the populations health, among others. It is thought that this tomb was contemporaneous with the first use of building II (for a summary see Potts, 2000, pp. 83-94).

The Late Umm an-Nar to Wadi Suq transition at Tell Abraq

It is likely that building II was constructed somewhere in the last quarter of the third millennium. Natural wind-blown and water-lain deposits cover the mudbrick walls, indicating a hiatus between the completion and initial use of the structure, and the subsequent Late Umm an-Nar reoccupation of the tower. Only a few features belonging to this period were found, consisting of two ovens, a pit, and a hearth. One of the ovens recalls the form of a traditional *tanoor* oven. Their close proximity to each other combined with their different morphologies suggests a functional differentiation. The pit held sherds of Late Umm an-Nar bowls reminiscent of domestic wares at Hili 8 (Potts, 1990, pp. 33-37). A fireplace, covered and preserved by later Iron Age constructions at the site, produced two weights that correspond with the Harappan metrological system (Potts, 1990, pp. 42-44).

Potts reports that Wadi Suq material was present in nearly all excavation trenches. In the trenches covering the area to the west of the buildings, the section shows a stratified sequence from the late third and the entire second millennium, bearing a great wealth of information on the different ceramic types and their development through time. These deposits are either the result of the accumulation of occupational debris, or of waste thrown down from an occupation on top of the circular structures. However, no clear features belonging to this period were unearthed, except for the corner of a well-built stone wall at some distance from the outer wall of the tower, which was ascribed a broader designation as 'second millennium' (Potts, 1990, pp. 56-59). In the stratigraphic sequence of squares OI and I directly adjacent to the buildings, Wadi Suq wares appear in the latest Umm an-Nar levels, and some distinct Umm an-Nar style wares still appear in Wadi Suq levels. Moreover, Barbar red-ridged wares also occur in levels of both periods (Potts, 1990, pp. 78-79). This signals a gradual transition between the periods in terms of the local and non-local pottery present at the site.

In the northeastern part of the site a Late Bronze Age enclosure wall of mudbrick and stone was found at some distance from the buildings. Inside the enclosure, occupation seems to have taken a more ephemeral form, likely consisting of wooden houses (*barastis*) or tents, as is clear from postholes and occupational pits (Potts, 1991, p. 36). However, these postholes have not been subject to a detailed assessment or reconstruction, leaving possibilities for the structures that were inhabited, as well as their spatial layouts, uninvestigated. Considering the lack of substantial building remains (other than the fortified tower) in the presence of a continuous stratigraphic sequence, it can be assumed that for the first half of the second millennium, occupation at Tell Abraq took a similar form.

Most finds in this area date to the Late Bronze Age (see Potts, 1991, pp. 57-69), often described by Potts simply as 'Wadi Suq', which complicates the reading of the excavation report. However, a small group of sherds was found in a trench on the eastern side on top of building II, that feature Umm an-Nar style decorations and Wadi Suq technical properties, such as paste quality and poor(er) firing. Furthermore, soft stone fragments of an early second millennium type were retrieved here as well (Potts, 1991, pp. 70-71). The sherds might signify a transitional ware between Umm an-Nar and Wadi Suq ceramics at Tell Abraq. As Potts notes, these finds suggest that the occupation of the tell was continuous throughout the second millennium (see Potts, 1991, p. 69), reinforcing the idea of a gradual transition which was already suggested based on ceramics from the western segment. A last important finding of Potts' investigations is that the tower was capped by a massive mudbrick structure in the second millennium. Besides a deep probe, this platform was not removed and likely still covers earlier evidence of occupation (Potts, 2000, p. 23).

Recent excavations at the south side of Tell Abraq have pointed out that the settlement extends beyond the central mound. Up to 60 m to the south, remains of a massive Late Bronze Age retaining wall and ditch set were discovered, and on the interior a series of terraces and ditches that formed the settlement area (Figure 17). It is not said that the settlement extended this far in earlier periods, but it does highlight that the areas surrounding the mound might still hold important clues about the site.

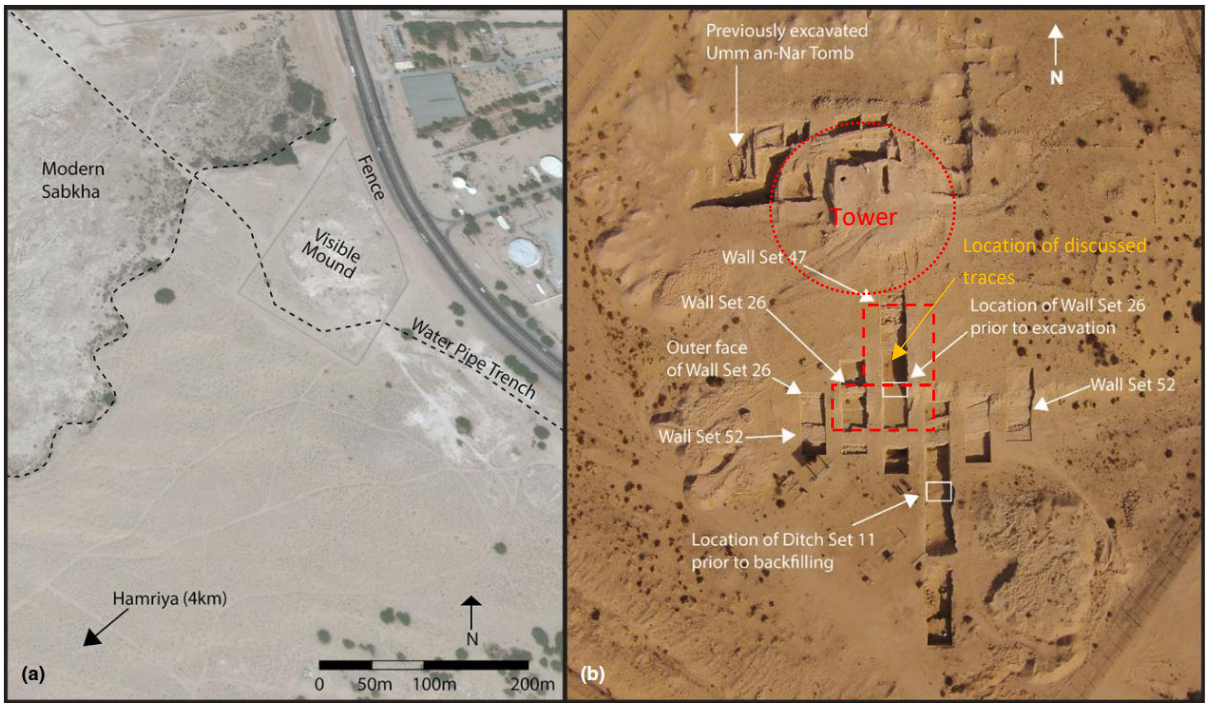

Figure 17: Satellite image and aerial photograph of Tell Abraq in 2015. The Wadi Suq occupation extends from the top of the mound, north of wall set 47, up until wall set 52, on terrace 4. Added annotations are in yellow and red (adapted from Magee et al., 2017, p. 210, Figure 2).

The recent excavations have again produced limited traces dating to the transitional period. However, there are three significant groups of features that lie adjacent to the Umm an-Nar tower wall. First are a basin, a wall, and a well together labelled set 31. These are located in the southern red square indicated in Figure 17. The well is 4 meters deep and shows lamination in the deepest parts, meaning it was exposed for longer period of time and contained standing water. Its infill contains Wadi Suq pottery, indicating that it likely stopped functioning in this period. Second are a series of hearths and pits along the southern slope of the mound, labelled set 15, and associated with features from before, but located in the adjacent trench. One hearth produced a date of 2045-1905 cal. BCE (0.91 probability). Therefore, sets 31 and 15 seem to roughly correspond with the final Umm an-Nar and early Wadi Suq periods. Third is set 14, a collection of deposits overlying set 15, but predating the earliest dated Late Bronze Age floor levels. Thus, these deposits represent the Middle an Late Wadi Suq periods. An oven is associated with these deposits, although clearly built before the deposits accumulated, and remaining in use into the Late Bronze Age (Magee et al., 2017, pp. 216-217). These traces are located on 'terrace 3', abutting the Umm an-Nar tower wall on its southern side, indicated in Figure 18 with the northern red square.

Figure 18: A) The floor and postholes of set 64 on top of the Umm an-Nar tower and B) Wadi Suq floor and postholes of set 14, with retaining wall set 26 adjacent to the Umm an-Nar tower wall to the south (Magee et al., 2017, pp. 219-220, Figures 11 and 13).

Terrace 2, located to the north of the Umm an-Nar tower wall (wall set 47), meaning it lies on top of the tower structure, revealed more Wadi Suq occupational traces. Excavations revealed three sets of floors (sets 64/62/60) from under a 'massive collapse' that is present both on the 'inside' and outside of the tower wall (terraces 2 and 3 respectively). This collapse layer sealing the floors is dated to 1628-1498 cal. BCE (probability 1.00). Floor set 64 was exposed and revealed numerous post holes that are linear or curvilinear in alignment and point to the former presence of '*areesh*' structures. However, a detailed assessment of the possible plans that these alignments might form is not given in the published literature. This bars a more detailed assessment of what types of constructions might have been built on these terraces as well as how they were organized spatially. A radiocarbon sample form this floor level produced a date of 1607-1582 (probability 0.08) or 1561-1432 cal. BCE (probability 0.92). Together with the date from the collapse, this provides a good *terminus ante quem* for the floor levels here, placing them in the Middle to Late Wadi Suq period, with the latest floor possibly dating in the very early Late Bronze Age. Future excavation of these floors will have to point out when they were in use exactly (Magee et al., 2017, pp. 217-218). The most recent investigations at Tell Abraq focus on an area to the east of the mound and have not produced results relevant to this thesis (Degli Eposti et al., 2023).

Discussion

The site of Tell Abraq was clustered around the monumental, circular tower structure that was built of two superimposed structures, the construction of which dates to the last centuries of the third millennium BCE. In the Wadi Suq period, this structure was in continued use and was covered by a massive mudbrick platform. The Late Umm an-Nar ovens found on top of the structure indicate some domestic activity. Potts interpreted floor levels with many postholes dating to the Late Bronze Age as representing a settlement of ephemeral *barasti* structures. In more recent work, similarly, a series of

floors with superimposed levels of potholes dating to the Wadi Suq was revealed to the south of the tower structure. However, as no detailed analysis of these potholes is provided, no information on the types of structures, their organization in relation to one another, or their internal organization is available. For now, it is only possible to conclude that occupation, in some form, took place in buildings made of more ephemeral materials and positioned on terraces adjacent to the Umm an-Nar tower. However, it is hard to designate these traces as convincing evidence of a domestic settlement near the tower. Still much of the area surrounding the central mound remains uninvestigated, and it is possible that a settlement is situated further away and might also have existed of other building types, yet to be unearthed. This would provide a more coherent answer to the issue of deep, stratified, continuous deposits, with a paucity of substantial built remains.

4.3.3 Hili 8

The site of Hili is located in the al-Ayn region in the Emirate of Abu Dhabi. The site was excavated in eight campaigns between 1977 and 1984, under the direction of S. Cleuziou. During the second campaign, the site revealed evidence for a domestic occupation of the second millennium BCE, at that time the first of its kind (Righetti & Cleuziou, 2010).

The broader site of Hili contains several anthropogenic mounds in an area of approximately 10 hectares. The mound of Hili 8 measures 40 m in diameter and rises 1,5 m above the surrounding plain (Cleuziou, 1981, p. 279). The first phase at the site (period I) is dated to the late 4th millennium (the Hafit period) and saw the construction of a square mudbrick tower of ca. 16 m wide with rounded corners and walls of 1,6 m thick. It has an internal division into several rooms that were filled in with sterile sand at the time of construction, and a well in its centre. A ditch was dug around the tower as well. It is thought that the community lived on top of the platform, where several activity areas were found. The structure was extended towards the northeast at some point in the early third millennium (Cleuziou, 1982, p. 16).

In period II, which corresponds with the Umm an-Nar, seven different phases were recognized that involve different episodes of (re)construction and extensions focused on the tower structure. This resulted in the creation of two successive round towers over the Hafit structure, successively labelled building II and building I (Cleuziou, 1982).

Figure 19: The early Bronze Age mudbrick tower and settlement of Hili 8. Visible are the earliest round tower (Building III) and the remains of the second (Building II) around it, as well as ancillary buildings (Cleuziou & Tosi, 2020, p. 240, Figure 133).

period III is dates to the early second millennium BCE and presents a distinct Wadi Suq material assemblage. Building I, the last monumental structure built in the Late Umm an-Nar still existed and saw continued use over the transitional period. This is evident from Wadi Suq sherds that were found at the bottom of its central well, which was sealed off with a collapse layer of the upper parts of the structure from a later period. The Wadi Suq occupation is mainly evident in features adjacent to the building, which were partly constructed against its outer façade (Cleuziou, 1989, p. 71; Cleuziou & Tosi, 2020, p. 416). Most significant is a curvilinear enclosure wall of ca. 80 cm thick that abuts the tower in the southeastern part (Figure 20). The wall confines an area of about 25 m in diameter and was constructed with a stone base of two parallel rows of upstanding slabs, with a loose infill of stones. On top of this base, several courses of mudbrick were preserved. This construction type was recognized by Cleuziou to resemble walls of the Wadi Suq communal graves at the Shimal necropolis (Cleuziou, 1989, p. 72; Cleuziou & Tosi, 2020, p. 416). The wall incorporates several dressed ashlar stones that are likely re-used from an Umm an-Nar sugarlump-type collective tomb (Cleuziou, 1981, p. 280).

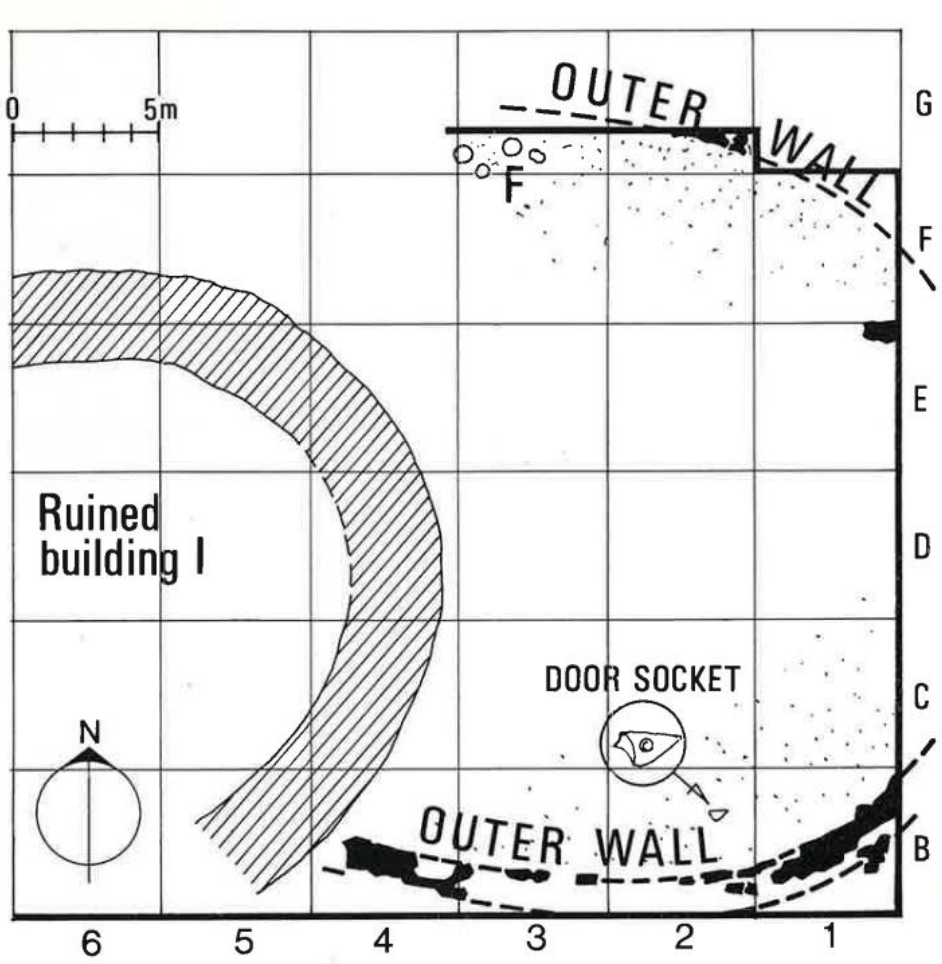

Figure 20: Plan of Hili period III (Cleuziou, 1979, p. 55, Figure 16)

Cleuziou imagines a layout of rectangular buildings inside the enclosure, with the open spaces in between being used for various domestic activities (Cleuziou & Tosi, 2020, p. 416). The evidence from this area consists of different features and structures. However, as these levels were positioned close to the surface, they were heavily disturbed by later stripping of the building materials, and by surface erosion. Still, several floor layers and rectilinear wall remains were found abutting the inner face of the enclosure wall. A reconstruction of the internal organization of the structures was not possible due to the poor state of preservation (Righetti, 2015b, p. 98), leaving us with only limited information about the spatial configuration of the construction located here.

Inside the area a door socket was found, which was associated with poorly preserved mudbrick *pisé* walls and a surface covered with ashes. In square C3, a fireplace was located that produced a ^{14}C date of 1990 (± 110 years) cal. BCE (Cleuziou, 1989, p. 72; Cleuziou & Tosi, 2020, p. 416). A total of six cylindrical kilns were dug into degraded mudbrick within the enclosure, with converging, plastered walls and diameters of ca. 60 cm. These are interpreted as traditional domestic ovens (*tanoor*). One of the ovens produced a ^{14}C date in the Middle to Late Umm an-Nar, but it is reported that this is likely derived from charcoal belonging to another, older oven underneath one of the six *tanoors* (Righetti, 2015b, pp. 98-99). These features attest to the domestic nature of the settlement within the enclosure. To the west of building I, remnants of a wall with a similar construction as the

enclosure wall were found, but with a worse preservation. It might be a continuation of the wall found in the eastern section, but this remains unclear (Cleuziou, 1989, p. 72).

Discussion

At Hili several patterns emerge. A continuous use is evident for the tower building I as well as its central well, which were constructed towards the end of the third millennium. During the Wadi Suq, activity is focused on an area to the east of the tower, where in previous periods extensions of the mudbrick platform were also devised, and which becomes an enclosed by a wall. The settlement might have expand beyond the enclosure wall, but these areas were outside the scope of the excavation projects. The curvilinear enclosure wall is constructed with two parallel rows of upstanding slabs, which is a construction type that might be particular to the Wadi Suq period. It is probable that the wall carried additional courses of mudbrick. Within the enclosure, the alignment of buildings appears to be rectangular. Regrettably, no internal organization could be reconstructed due to the poor state of preservation of the remains. However, a door socket, degraded pisé walling, and floors indicate that standing constructions were present in this area, and a predominantly domestic function is inferred from the presence of several *tanoors* spread over the entire area.

4.3.4 Kalba K4

Another mounded site is found at Kalba 4, one of several sites found around Khor Kalba on the east coast of the UAE. This area is characterized by the mangroves of Khor Kalba, an open coastal landscape, an area of *sabkha* (coastal salt flats) more inland which indicates a former lagoon environment, and stone and gravel plains closer to the Hajar Mountains (Figure 21; Eddisford & Phillips, 2009, p. 112).

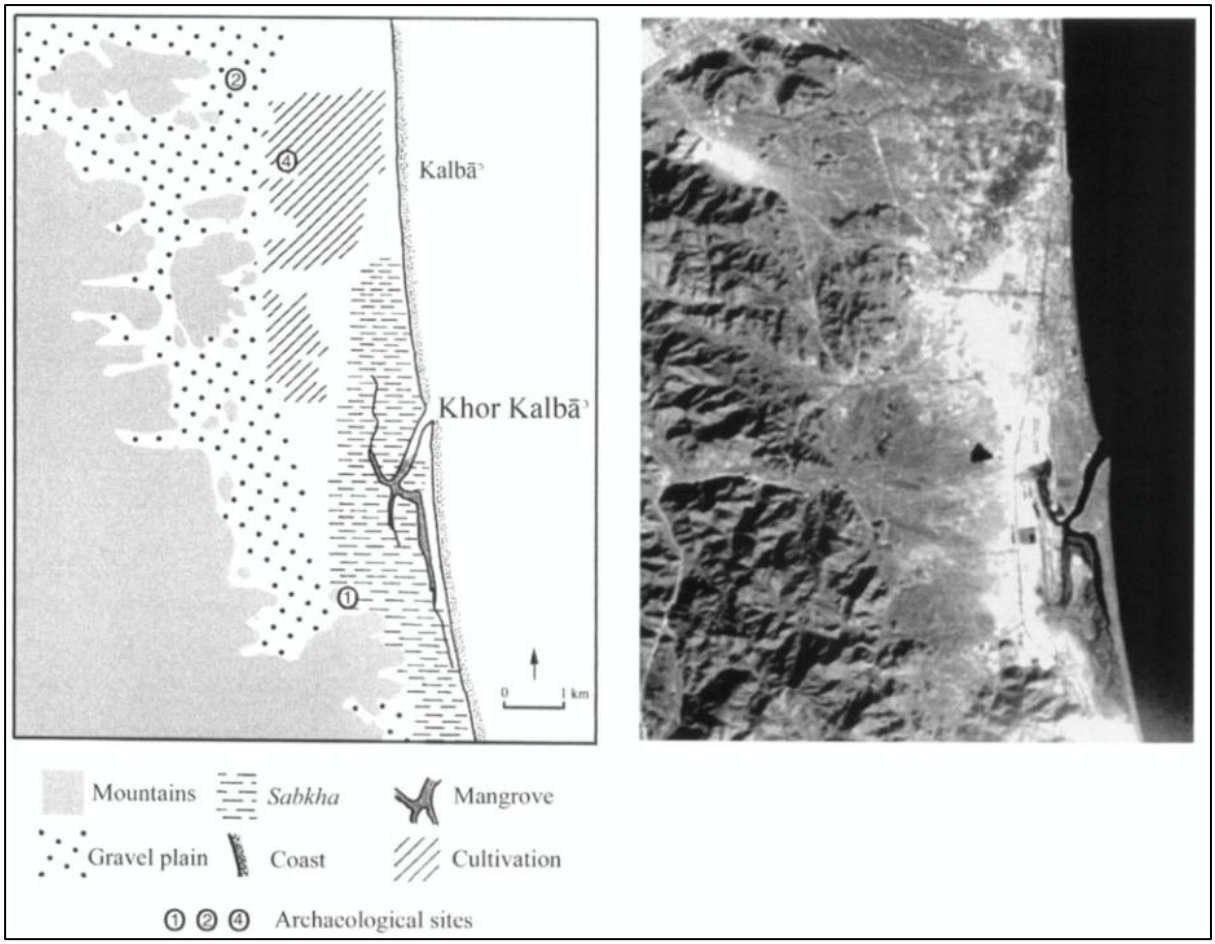

Figure 21: The area of Kalba and Khor Kalba (Eddisford & Phillips, 2009, p. 114, Figure 2)

The mound at Kalba 4 provides most information on settlement. It measures ca. 50 m in diameter and rises 2,5 m above the surrounding plain. Within the mound, remains dating from the Early Bronze Age continuously to the Iron Age have been found (Eddisford & Phillips, 2009, p. 115). The first detailed publication of the site described several sections excavated on the southern side of the mound (Figure 22) and was composed by Carter (1997a; 1997c), who focused on the Wadi Suq period remains. Since then, the mound has been subject to years of investigation by various research projects, which has resulted in a patchwork of information that covers all phases of occupation at the site.

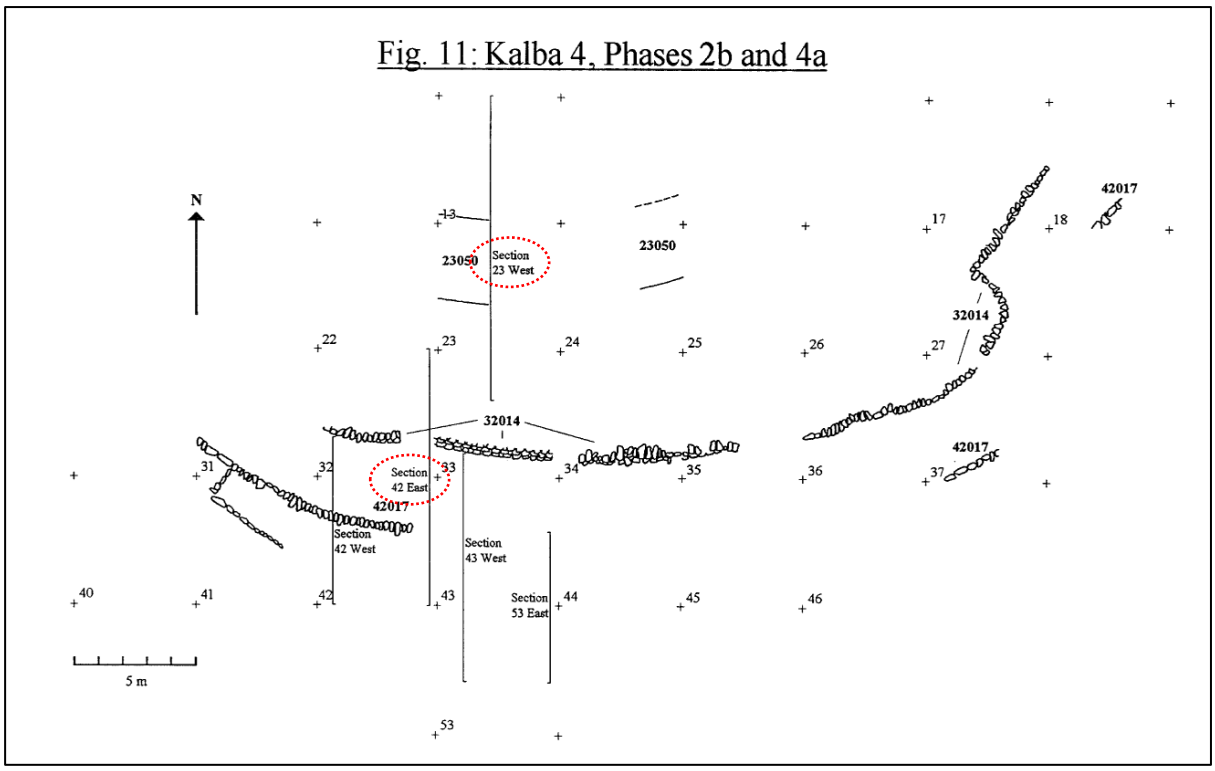

Figure 22: Plan of the southern side of Kalba that was investigated in the 1990s. Locations of the sections discussed are indicated in red (adapted from Carter, 1997b, p. 21, Figure 11).

According to Carter (1997c), the earliest period (phase 1) identified at the mound dates to the Umm an-Nar period. This phase is represented by several mudbrick walls and features found in a deep sounding and described in the western section of square 23 (Figure 23). One of the mudbrick walls (13020) had a Wadi Suq wall placed on top of it (feature 23050; Figure 23) somewhere in the first half of the second millennium, representing phase 2. This wall has been probed and was associated with an 'appreciable quantity' of Classic Wadi Suq pottery (Carter, 1997c, p. 92). The Classic Wadi Suq period is what Carter dates to the period between 2000-1600 BCE, which will henceforth be referred to as just the Wadi Suq period. It seems that to accommodate this structural addition, the underlying Umm an-Nar wall was cut to create a flat surface onto which rounded boulders were placed to form the interface of the Wadi Suq wall. Both walls are large constructions made of mudbricks, and it was proposed that the earlier wall represent an Umm an-Nar round tower (Carter, 1997a, pp. 129-131). The Wadi Suq wall was reinforced on its southern (external) side with a meter-thick layer of mudbrick which lies on top of a collapsed structure also dated to the Wadi Suq by Carter (Carter, 1997c, p. 92).

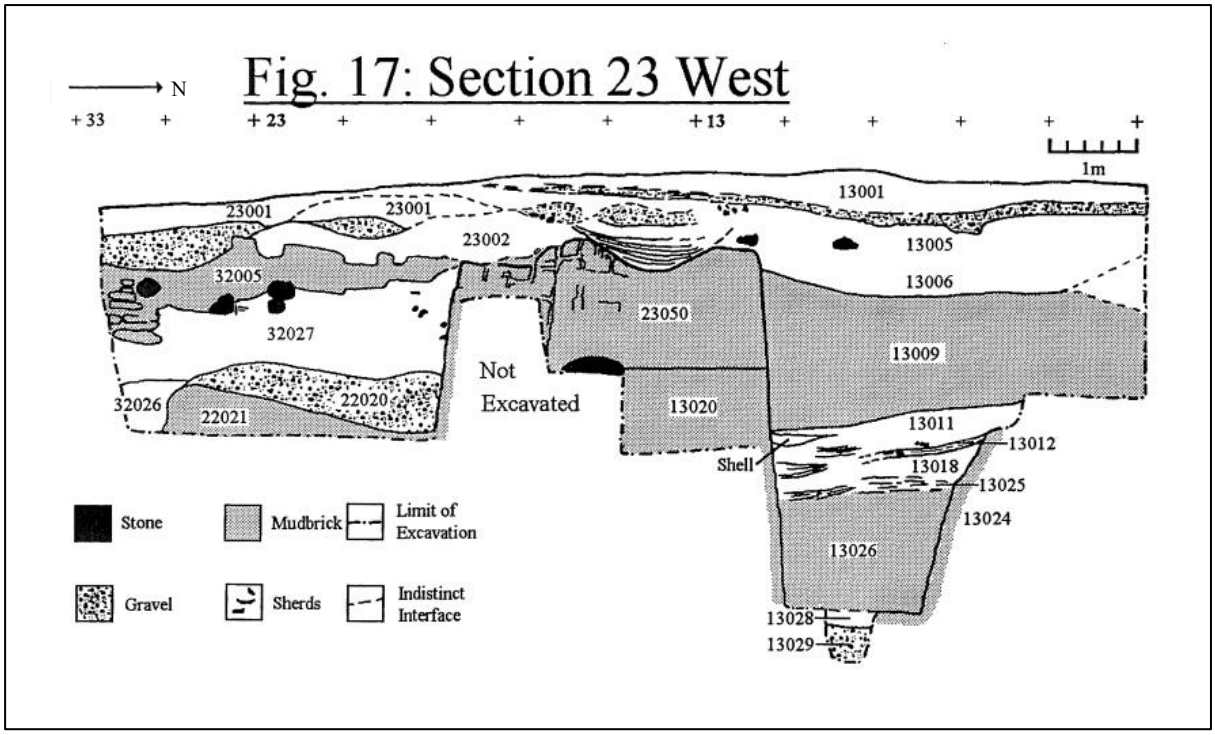

Figure 23: The western section of square 23. The north arrow has been inverted as it was the wrong way around (adapted from Carter, 1997b, p. 28, Figure 17).

On the inside of the tower wall, deposits were divided into two sub-phases. Phase 2a covers the transition from the Umm an-Nar to the Wadi Suq period. These deposits were overlying the Umm an-Nar mudbrick structure 13026 and topped by the phase 2b mudbrick feature 13009 (Figure 23), and held ceramic styles that do not strictly belong to either period, indicating that it is likely a transitional deposit. However, the layer that represents Umm an-Nar remains more distinctly (13024) is very thin, which suggests that the period between the construction of the Umm an-Nar wall and the Wadi Suq was very short (Carter, 1997a, p. 132). Phase 2b is represented by Wadi Suq wall 23050, the mudbrick feature 13009 abutting it on its interior, and layer 13006 on top of these. The mudbrick feature is interpreted as a capping or platform and was observed in multiple places on top of the mound (Carter, 1997a, p. 133).

Additional Wadi Suq period deposits were identified further south of the Wadi Suq wall, as can be seen in Figure 24. This concerns a buildup of sediments next to a wall that is erroneously labelled 23050[1], and above the Umm an-Nar deposit 22025.

These deposits are covered by a layer of mudbrick collapse (22021), and includes a group of hearths (32030). Approximately seven meters south of these deposits, a stone wall, possibly backed with mudbrick, and several associated layers also produced Wadi Suq ceramics (not displayed). This indicates that the Wadi Suq settlement might have extended significantly beyond the tower limits (Carter, 1997a, pp. 133-134).

[1] When comparing Figure 24 and Figure 26, it becomes clear that Wall 23050 in Figure 20 is the same wall as the 'Late Bronze Age' Wall in figure 22. This is confirmed in Figure 22, where it is visible that section 42 east does not extend to the tower wall, but does cut the Late Bronze Age wall.

In Carter's view, a massive mudbrick platform was built over the Umm an-Nar mudbrick foundations. This is likely contemporaneous with the mudbrick capping (13009 in Figure 23) laid over the structure. He proposes that the structure was built at this massive scale to either protect its users from regular flooding, or prevent that the underlying foundational deposits from earlier periods would slump and damage the wall. An overall great abundance of Wadi Suq pottery indicates an intensive occupation during this phase (Carter, 1997a, pp. 144-145).

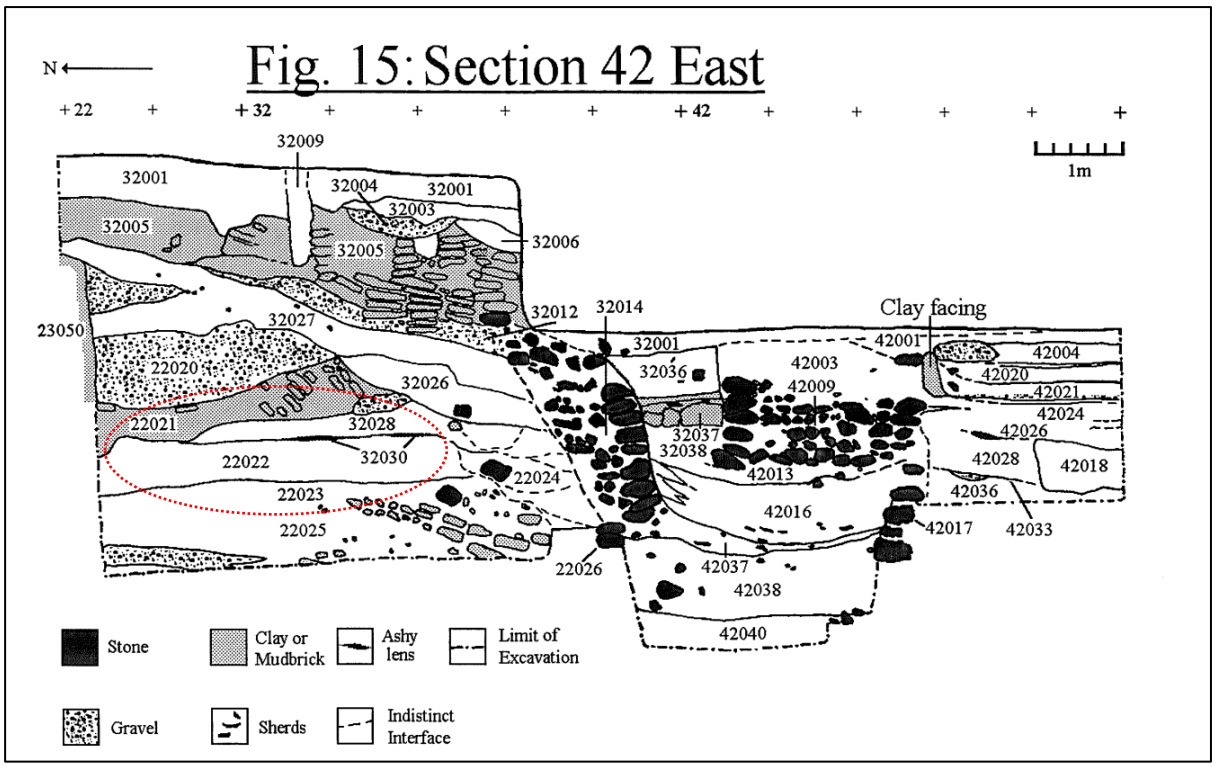

Figure 24: The eastern section of square 42. The Wadi Suq period deposits are encircled in red; note that the wall labelled 23050 is not the same as the identically labelled wall in Figure 13 (adapted from Carter, 1997b, p. 26, Figure 15).

After Carter's publications, much work was done at the site. Through ensuing years of excavation, a plan of the Umm an-Nar tower was revealed, which measured ca. 20 by 21 meters and has a stone-lined well in its center, adhering to the general conventions of Umm an-Nar tower building (Figure 25). The first tower structure resembles that of the earliest construction at Hili 8. It appears from the excavation results that the upper part of the tower indeed underwent rebuilding at some time in the second millennium (Eddisford & Phillips, 2009). In addition to the uncovering of the Umm an-Nar tower plan, the stratigraphy of the site was also explored to a deeper level and extended further to the north, as can be seen in Figure 25.

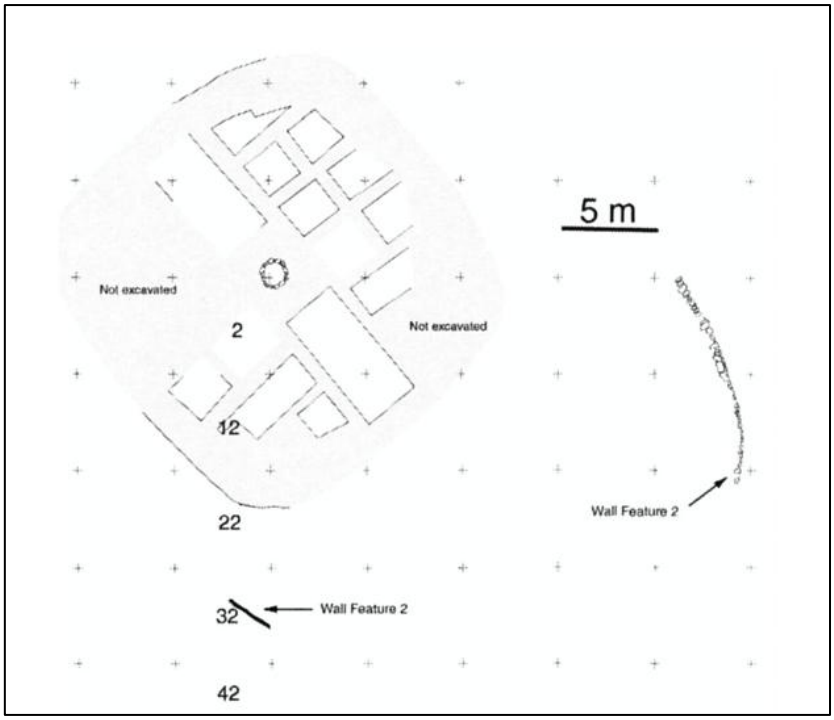

Figure 25: The reconstructed plan of the first mudbrick tower at Kalba (Eddisford & Phillips, 2009, p. 177, Figure 7).

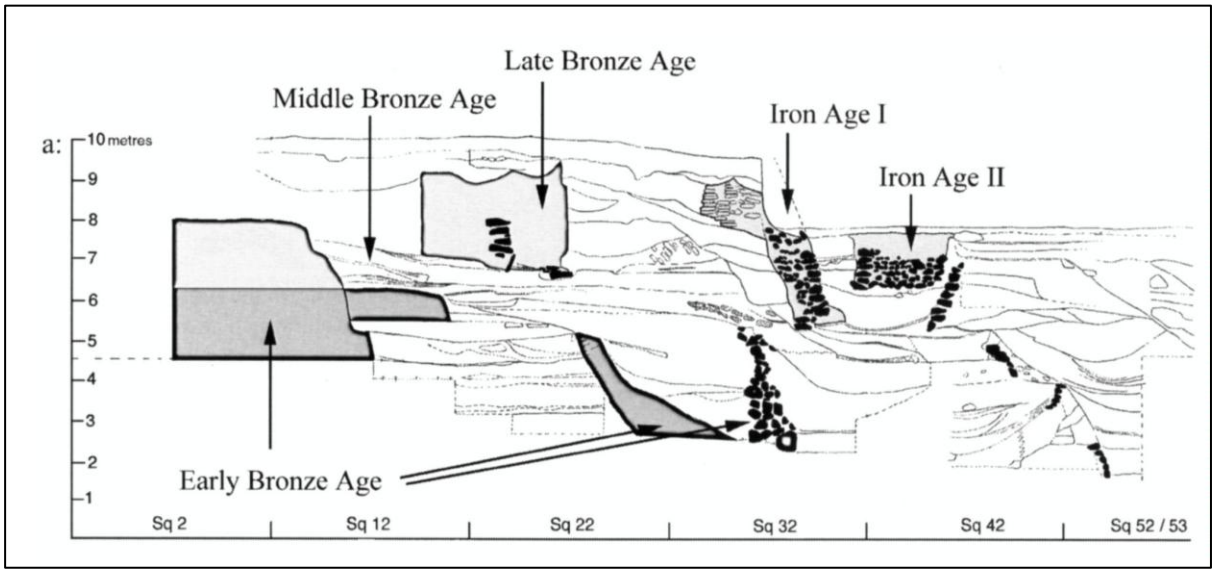

Figure 26: The stratigraphy of the site of Kalba K4 after deeper levels were revealed (adapted from Eddisford & Phillips, 2009, p. 116, Figure 6)

The sequence at Kalba can thus generally be described as follows: The upper part of the Umm an-Nar wall underwent rebuilding during the Wadi Suq period as a new, massive mudbrick construction was placed on top. In the Late Bronze Age, an additional wall was built around the earlier tower structure. This sequence is largely similar to that of Hili 8, building III, II, and I (Eddisford & Phillips, 2009, p. 115; Phillips & Mosseri-Marlio, 2002, p. 202; Lidour et al., 2023, p. 46). In recent work, a massive retaining wall was discovered to the east of the tower structure, which formed the base of the Umm an-Nar tower construction and is situated adjacent to a ditch of 3,5 m deep and 5,7 m wide (visible in Figure 26). These features are dated to the initial tower construction phase in the Early Bronze Age, and it is

thought that the ditch was already backfilled in this period. On top of the ditch fill, an area with cooking-related features was situated (Schwall & Brandl, 2023, pp. 149-150).

Schwall and Brandl have recently posed the idea that Kalba K4 functioned as an important node in the region, forming a place where resources derived from the Hajar mountains would be brought and processed further, possibly for the goal of trade. Evidence has shown that both soft stone vessels and metal artefacts were produced on-site (Schwall & Brandl, 2023, p. 153), the latter possibly made with ingots derived from the contemporary industrial site of Wadi Hilo (see below). This would have been facilitated by the site's favorable positioning in close proximity to a range of ecological niches, allowing it to maintain larger populations over time. Further, positioned between maritime and terrestrial routes, and as a possible gateway between routes running north and south along the Arabian Sea coast, it would have been a place where different movements intersected and interaction concentrated (Schwall & Brandl, 2023, pp. 153-154). However, as mentioned by Eddisford, the interconnected nature of Kalba K4 is mostly evident from the Early Bronze Age material assemblage, while he Wadi Suq material only includes a single Mesopotamian and seven Dilmun sherds despite its continuity as a major site (Eddisford, 2022, p. 45).

Discussion

Significant construction episodes dating to the Wadi Suq period are represented in the massive mudbrick wall and mudbrick capping placed on top of the Umm an-Nar tower at Kalba 4. The preparation of the Umm an-Nar wall by flattening it before the construction of the new wall shows that this building activity was well planned. These activities comprise a monumental undertaking that would have required copious amounts of collective labor from the population. If these activities are seen in conjunction with the massive Late Bronze Age wall built around the structure, it attest to the continuation of the tower building tradition into the second half of the second millennium.

Despite a continuous sequence at this site, and the monumental undertakings described above, a true settlement is completely absent here. There are no traces of substantial residences, and also any indications of lighter structures by means of postholes are lacking. The find of cooking-related features on top of the aforementioned ditch and retaining wall might be indicative of activities that would be typical of a domestic occupation at the site, but due to its isolated nature cannot be convincingly interpreted as such. Again, the presence of ample evidence for some sort activity, in the absence of a substantial settlement is striking. Perhaps a settlement is to be found further away from the mound, as has been proposed for other tower sites. For now, however, it cannot be said that these sites represent any sort of domestic function for the site. Whatever the function might have been, the rebuilding of the tower wall on top of the previous layout indicates a continuity in this function (Carter, 1997a, pp. 134-135).

4.3.5 Tower sites: Discussion

From the four tower sites discussed above several patterns emerge with regard to Wadi Suq settlement. At all sites, the tower structures were already in existence in some form at the beginning of the Wadi Suq period. The Wadi Suq population seems to have made continuous use of these buildings and their central wells. While remains of light structures are attested at Tell Abraq, and

eroded remains of a possible residential area at Hili, the sites do not display typical indications that they bore a domestic function. For al-Khutm, this is made explicit by its excavators, who propose a storage and production function for the tower site. With this interpretation, they likely capture some of a range of behaviors that might have been carried out at these sites. It remains unclear what the exact nature of these sites was in antiquity, and possibly investigations further removed from the central mounds will throw some light on this question.

Wadi Suq (re)constructions and alterations are evident at all sites. Most notably, Kalba sees the construction of a massive mudbrick wall on top of the earlier layout. At the same site, as well as at Tell Abraq, extensive mudbrick platforms are created over the top of the tower structures in the Wadi Suq period. Another, similar pattern is the creation of terraces adjacent to the tower structures. This is observed at al-Khutm, where a wide terrace is created over the area to the west of the tower, whereas at Tell Abraq recent investigations have uncovered a series of terraces and retaining walls radiating outwards from the tower, including one for which Wadi Suq occupation is substantiated. At Kalba, a series of occupational platforms were identified in the Early Bronze Age layers (Eddisford & Phillips, 2009, pp. 115-117), but no such constructions are mentioned for the following period. This platforming and terracing activity involved the construction of large mudbrick features, the movement of substantial volumes of sediment, and the creation of retaining walls. These projects would have involved a significant communal labor investment and specialist knowledge. At Hili 8 there is no mention of terracing or platform creation in the Wadi Suq. However, a continuous occupation over the transitional period is evident in a new domestic settlement adjacent to the tower and within an enclosure wall that is set against the tower wall.

On the platforms and terraces that were created, Wadi Suq populations built structures of ephemeral materials as shown by the layers of superimposed postholes at Tell Abraq. At al-Khutm, stone walls were constructed, and at Hili, structures are built with mudbricks. It is clear that occupation at these sites is not a squatter presence that makes opportunistic use of remains that were already present in the landscape. Rather, from the tower sites it seems that the built environment that existed at the onset of the Wadi Suq was adjusted to fit the needs of the communities residing there, sometimes prompting large-scale construction activity.

Although no entirely new towers are known from the Wadi Suq period, the tradition of the tower sites and the continued alteration of these structures continues well into the second millennium. At Kalba, the tower sequence is extended further into the Late Bronze Age, and overall the sequence of building and alterations mimics that of the site of Hili 8, despite their different environments and chronological timing.

Despite these sites often being characterized by the presence of a monumental tower (as is admittedly also done in this thesis), the exact extent of these sites remains undefined in most cases. At Kalba and Tell Abraq, recent investigations have revealed archaeological traces at significant distances away from the mounds, while at Hili 8 the excavations did not probe into the area outside of the enclosure wall. At all tower sites under discussion, the extent of the settlement is often seen as restricted, although this appears more as a reflection of the area that was exposed (and

preserved) than of the area that was in reality occupied. These sites may be more complex in their layout and internal organizations, something that should be considered and will hopefully be clarified in future research.

4.4 Settlement sites

The settlement sites consist of a group of sites that have more solid architecture and show the best evidence for domestic occupation, although limited craft and industrial activities also take place at these sites.

4.4.1 Bat

The site of Bat is located in the inner piedmont of Oman and is a typical piedmont oasis site. Bat consists of a Bronze Age archaeological landscape made up of multiple smaller sites spread out over ca. 400 ha in the Wadi al-Hijr Valley. The sites are monumental, as well as mortuary and domestic. In total, Bat has eight monumental round towers and one of the most extensive Umm an-Nar necropoles known today (Swerida, 2018, pp. 50-53; Swerida, 2022, p. 169). Domestic occupation is best known from the settlement slope and Al-Khafaji. The latter has produced only Umm an-Nar period evidence (Swerida & Thornton, 2019a, p. 168) and therefore falls outside of the scope of this thesis.

The Settlement Slope

The settlement slope consists of a cluster of building remains on the southern slope of a 500 m long hill at the northern edge of the wadi valley (Figure 27). At the western end of the hill, a Late Hafit to Early Umm an-Nar tower structure is located (tower 1156), which had already fallen out of use when the settlement was constructed. Rectilinear stone buildings are occupied throughout the Middle and Late Umm an-Nar period, and for one building (SS1), continued occupation and architectural alterations have been attested for the Wadi Suq period (see Kerr, 2016; Figure 28). Wadi Suq tombs also mark the hillcrest and the top of the tower monument (Williams & Gregoricka, 2016).

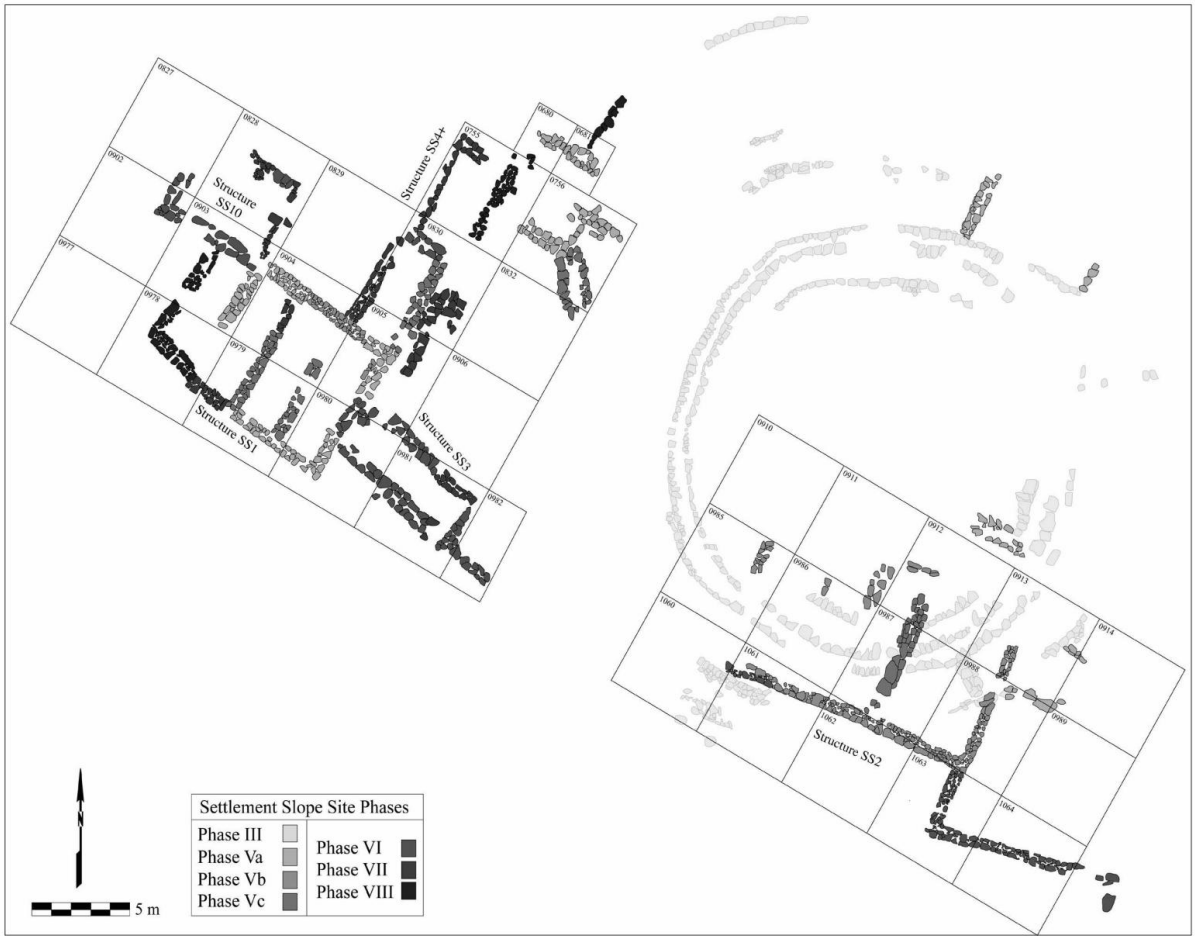

Figure 27: An overview of the archaeological complex at the Settlement Slope of Bat. The darker grey indicates younger phases of the structures (Swerida & Thornton, 2019b, p. 83, Figure 3).

Structure SS1

Excavations have focused on structure SS1. Through phases SS1-1 to SS1-4 (2500-2000 BCE), the Umm an-Nar building was gradually extended into a complex, with a possible metallurgical structure to the northwest (SS10) and an additional domestic unit to the southeast (SS3). SS1 was gradually partitioned and divided into three compartments (Swerida & Thornton, 2019b; Figure 28). This signifies an increasing specialized use and privatization of space and the definition of the household territory throughout the Umm an-Nar period, according to the excavators (Swerida & Thornton, 2019b, p. 107). In the last Umm an-Nar iteration of the building, it measures ca. 7 by 8 m and has two interior walls perpendicular to the southern wall that divide it into three separate spaces.

In phase SS1-5 (also phase VI; 2000-1900 BCE), which is dated to the early Wadi Suq period, activity continues. Wall 419b is built to extend the partitioning wall 419a, closing off the western part of SS1 from the eastern side (Figure 28). The entrance in the southwestern wall was also blocked off as wall 408a is built over it and on top of the Umm an-Nar wall foundations. Through these activities, SS1 is slightly extended and then divided into two distinct structures without an internal connection, which both measure ca. 5 by 6 m. To the west of wall 419, a floor surface was discovered with an associated hearth abutting wall 419b (Swerida & Thornton, 2019b, p. 91; Figure 29). From the floor several Wadi Suq ceramics were collected. A ^{14}C sample from the hearth produced a date of 1950-1770 cal. BC (2σ)

(Swerida & Thornton, 2019b, p. 91), providing a *terminus ante quem* for wall 419b. Walls 408a and 419b are classified as "type 2" walls, consisting of two rows of upturned slabs with a gravely infill (Figure 30). At SS1, this type of wall construction is convincingly associated with the Early Wadi Suq period and has also been recognized at Hili 8 in period III (Wadi Suq) contexts (Kerr, 2016, pp. 263-265) and at Shimal (Kerr, 2016, p. 176)

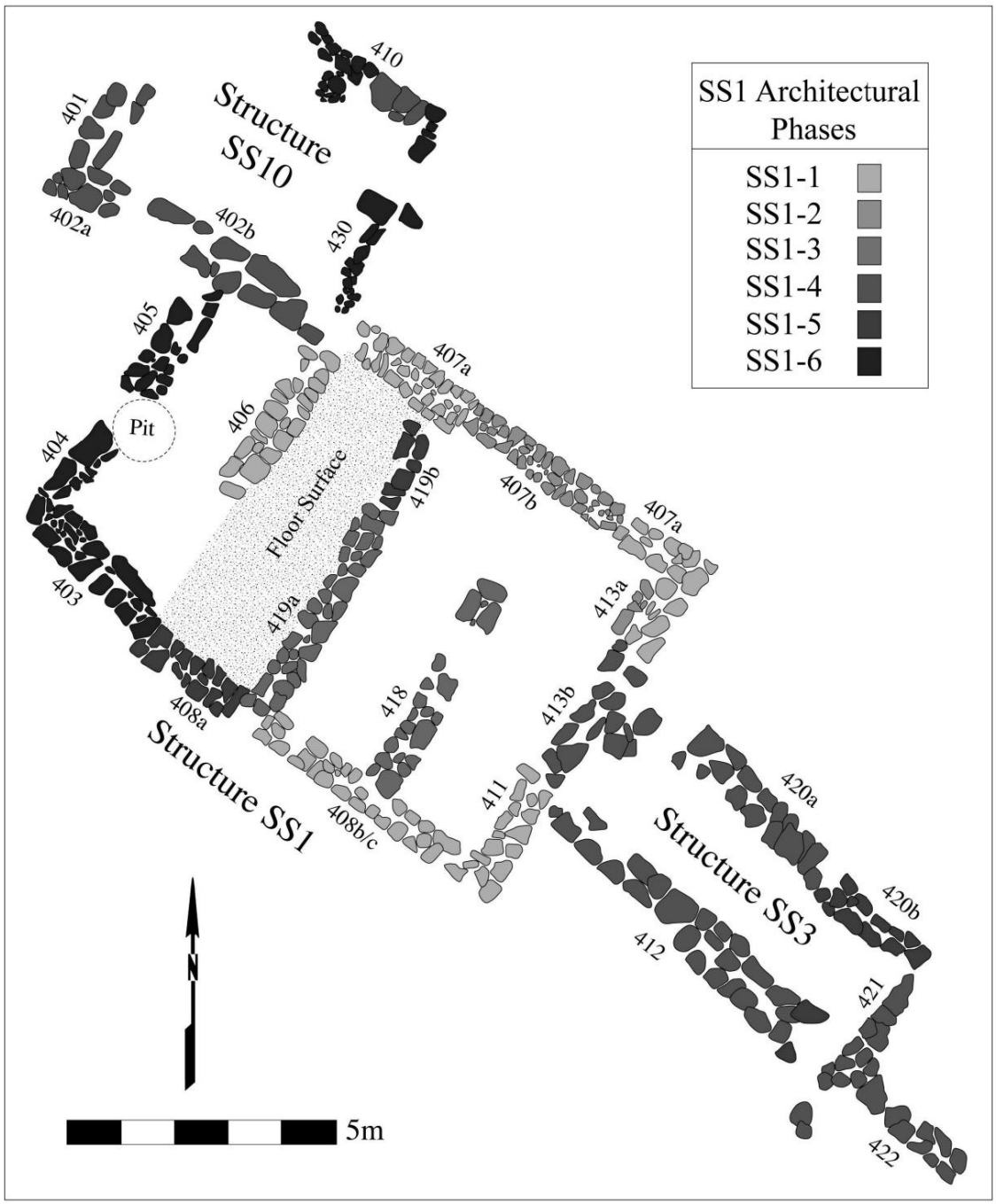

Figure 28: A detail of structure SS1 and SS3 and their respective building phases (Swerida & Thornton, 2019b, p. 90, Figure 10).

In phase SS1-6, or phase VII (1900-1600 BCE), dating to the Middle to Late Wadi Suq, walls 403, 404, 405 were built to extend the western structure. The walls are constructed with a variety of large undressed stones, up to 80 cm long, and roughly worked stones that could have been recycled from

the nearby tower structure, as well as smaller stones. Wall 403 rests directly on top of wall 408a from the previous phase, but has a slightly different orientation (Kerr, 2016, p. 112; Swerida & Thornton, 2019b, p. 91).

Figure 29: The hearth to the west of wall 419b (Kerr, 2016, p. 264, Figure 155).

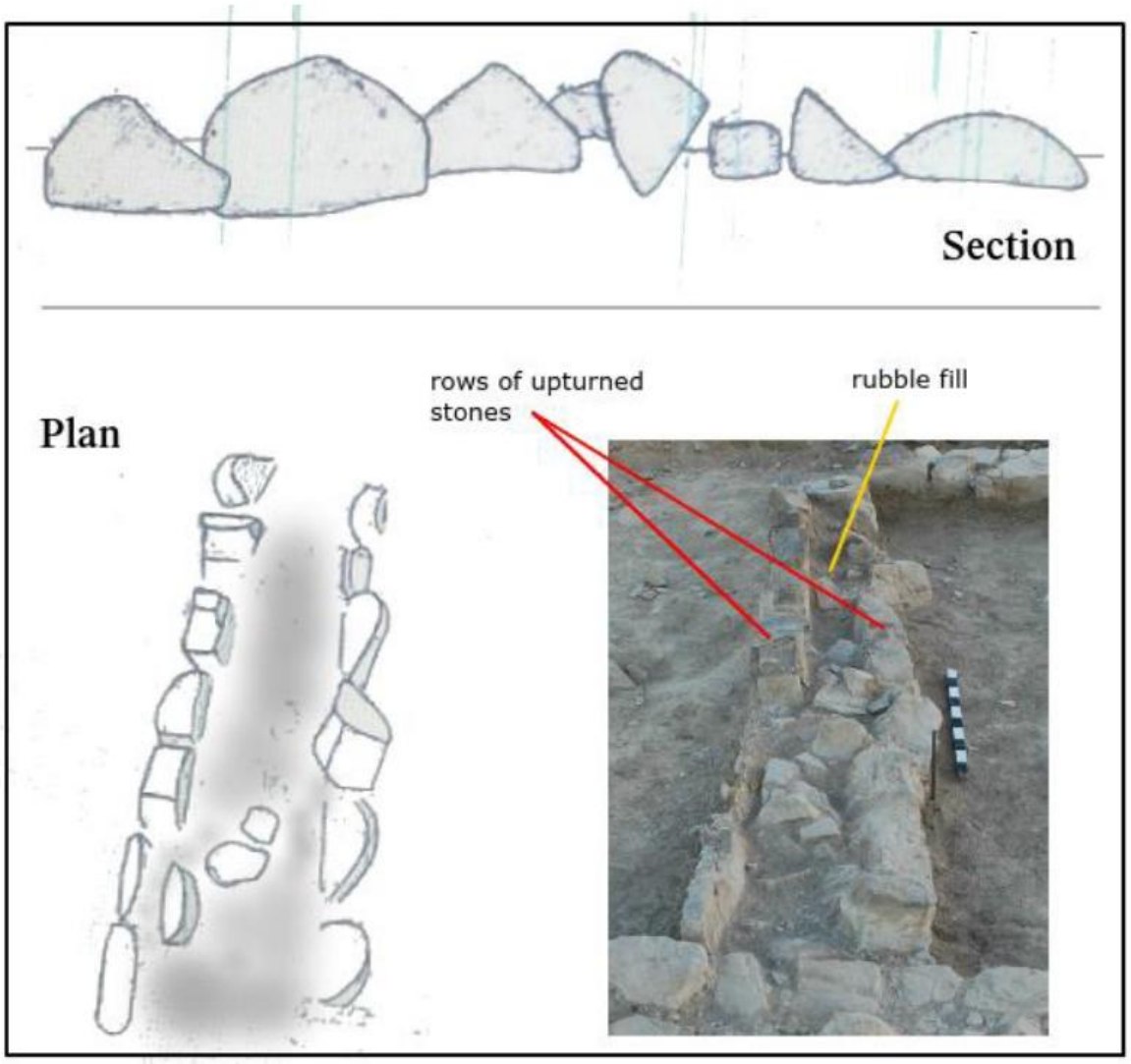

Figure 30: Kerr's 'Type 2' wall (Kerr, 2016, p. 94, Figure 47).

Structure SS2

Structure SS2 is another example of a likely residential building, and represent the largest of its sort on the settlement slope. However, as it is positioned over the late Hafit tower structure, it was largely disturbed during the Wadi Suq period when a platform was constructed over it. Likely, much of its building material was integrated in this platforming activity, and as a result of these disturbances little occupational contexts and internal features were recovered, which complicates reconstructing its layout (Swerida & Thornton, 2019b, pp. 93-94). As this structure was not restructured for occupation during the Wadi Suq, it does not directly inform on Wadi Suq settlement practices. Therefore, a detailed discussion of the structure will not add much to this study. However, it is interesting that in contrast to SS1, SS2 was not chosen for further occupation and instead is disturbed by activities during the Wadi Suq period.

Structure SS10 and area SS4+

Other areas that are worth mentioning are structure SS10 and area SS4+. At both locations, further evidence for Wadi Suq period constructions have been found. Structure SS10 abuts structure SS1 to

the northeast. This structure has been associated with metallurgical activities from its earliest levels, predating the construction of SS1. The first phase of this building matches late Umm an-Nar styles of SS1 (Phase V; Swerida & Thornton, 2019b, pp. 103-104). Early Wadi Suq (phase VI) occupation in SS10 is attested through a find scatter inside the structure but has no associated construction activity. The Middle to Late Wadi Suq is characterized by a series of repairs to one of the original walls of the structure (wall 410) in a new construction style. The repairs are made of loosely arranged small cobbles without any mortar. Wall 430, delineating the southeastern limit of the structure, is construction in similar fashion, though larger blocks are also incorporated here. No floor level was discovered associated with this phase, but based on the finds and comparisons with the other structures, this phase is related to the Middle Wadi Suq period. In a final construction phase, a Wadi Suq tomb was placed in the center of the structure, almost level with the earliest foundations of the structure. Although the last phase is dated to 1900-1600 BCE, this stratigraphical relation suggests the building was used only shortly before the tomb was constructed and the building likely fell out of use (Swerida & Thornton, 2019b, p. 104).

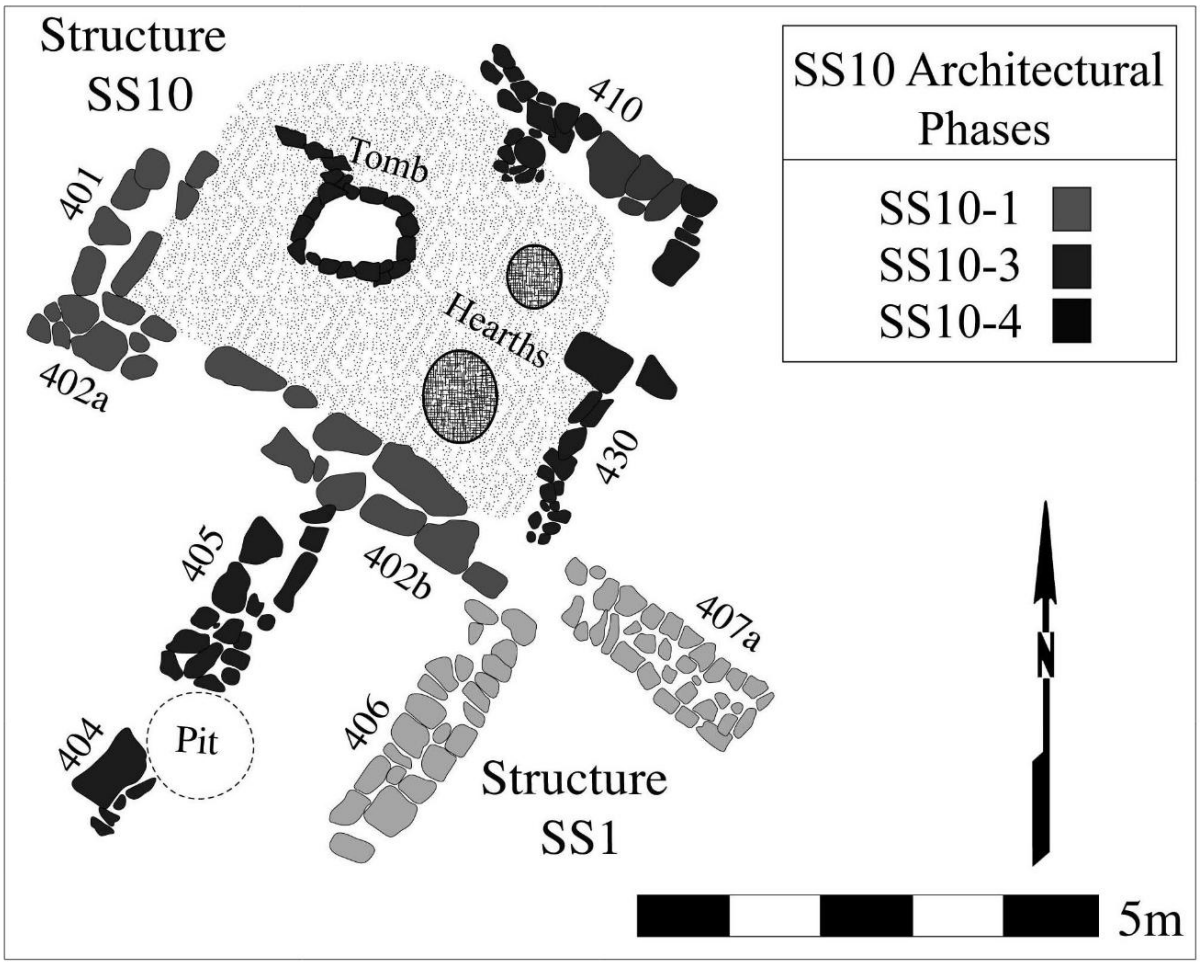

Figure 31: Structure SS10 (Swerida & Thornton, 2019b, p. 102, Figure 18).

Area SS4+, to the northeast of SS1, consists of a series of walls, pits, and surfaces that do not form any recognizable structures (Figure 32). However, several of the walls documented here show interesting stylistic parallels to Wadi Suq walls from the other structures Wall 409 is built in the 'Type

2’ style of parallel rows of upstanding slabs with a rubble fill. Interestingly, walls 417 and 431 show a construction style of one row of upstanding slabs parallel with a row of horizontal slabs. The authors propose that this style is transitional between the typical Phase V (Late Umm an-Nar) and Phase VI (Early Wadi Suq) styles. The presence of mudbrick fragments in the pits in this area suggests that some of the stone wall foundations carried a mudbrick superstructure at some point in time. Lastly, a floor level with an associated mortar and pestle was found in an enclosed space dated to Phase VI (Early Wadi Suq; Swerida & Thornton, 2019b, pp. 101-103).

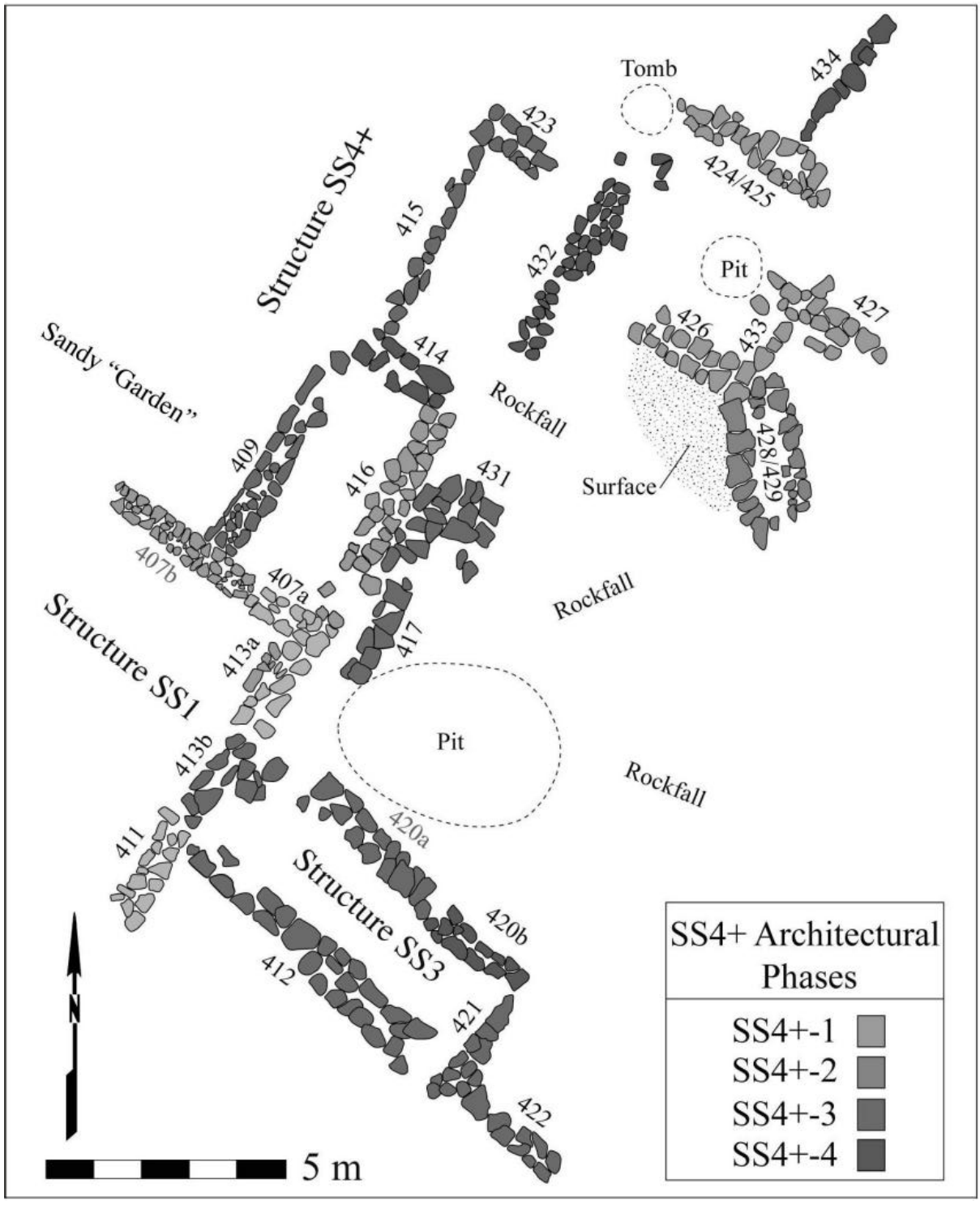

Figure 32: Area SS4+ of the settlement slope (Swerida & Thornton, 2019b, p. 98, Figure 15).

Discussion

In its final Umm an-Nar iteration, structure SS1 was a substantial building that was internally divided into three separate compartments. Possibly, this structure housed a nuclear family group, which Swerida and Thornton envisage as a group of three to six people (Swerida & Thornton, 2019b, p. 106). It is likely from the finds and features inside the structure that it held a domestic, residential function. Structure SS2 provides another possible example of a domestic structure. Regrettably, due

to it being disturbed in the Wadi Suq period, little can be sad about its internal organization or development, or what activities were carried out inside of it. Still, it is clear that it comprised a fairly large building, and that is why Swerida and Thornton hypothesize that it might have been home to a larger household group, an extended nuclear family, or a non-familial household (Swerida & Thornton, 2019b, p. 106).

In the Wadi Suq period, SS1 is divided into two separate, smaller units in the Early Wadi Suq. The gradual compartmentalization, which is still taken as a sign of increasing social complexity in the Umm an-Nar is for the Wadi Suq period done away by the authors as being "disrupted in the … Wadi Suq period …, during which architectural styles changed and preserved patterns of behavioral organization are less well-defined" (Swerida & Thornton, 2019b, p. 110). However, it could also be argued that the division of SS1 into two smaller units represents a continuation of the trend of compartmentalization, as it is a further privatization of domestic space, possibly the result of smaller nuclear units in the communities making use of the structure, or of the need to accommodate more individuals or household units in the same space as before.

Considering that SS2 was destructed in the Wadi Suq period for the creation of a platform over the late Hafit tower, it seems that the division of SS1 was not out of necessity for more housing space or total number of individual residential units. A choice was made to divide certain Umm an-Nar buildings into smaller units, while others were destroyed. This supports the idea that the Wadi Suq activity is a continuation of the developments observed during the Umm an-Nar, rather than a clear break with it. Still, the Wadi Suq developments transform the settlement slope into a new configuration, whereby some former buildings are further divided, while others are destroyed for the construction of a large platform feature. This can be interpreted as serving different needs for the community, in which the platforms might have become central.

The settlement slope likely continued having a domestic function into the Wadi Suq period, as attested by the mortar and pestle found on a surface in SS4+. Metallurgical activities are clear in SS10, although the use of this space may have been relatively short judging from the tomb constructed in its midst at a level similar to the wall foundations.

As for area SS4+, it provides some interesting insights with regards to Wadi Suq construction, but at the level of the wider settlement does not provide a whole lot of information due to its fragmented nature. It is difficult to associate different walls with each other, and it remains mostly unclear how they formed structures and what activities were carried out here.

In terms of construction, two distinct wall types have been observed for the Wadi Suq period at SS1. The Early Wadi Suq type 2 walls of parallel rows of upturned stones are also observed at Hili 8, and parallelled in funerary contexts at Shimal (see 4.3.3). A possible transitional wall type is recognized in walls 417 and 431 of area SS4+, as it has elements of type 2 walls but also of Late Umm an-Nar types. The type 5 walls constitutes less of a strictly defined construction style, and more of a looser use of available building material. Both the alignment and stone types incorporated can be described as 'irregular'.

4.4.2 Ra's al-Jinz

The site of Ra's al-Jinz is located in an embayment at ca. 1 km southwest of the eastern extremity of the Oman Peninsula, from which its name derives. Centrally within the embayment stands the 'central mesa', a tabular limestone plateau. This mesa is elevated ca. 35 m from the surrounding plain and measures 100 m wide and 270 m in length in a roughly rectangular form (Monchablon et al., 2003, p. 31; Figure 33). The site is a collection of different smaller archaeological sites spread over the mesa, the surrounding beach plain, and the cliffs, and include domestic as well as funerary contexts. The occupation at Ra's al-Jinz dates back to the fourth and perhaps the late fifth millennium BCE (Cleuziou & Tosi, 2020, p. 103) and was inhabited continuously, albeit in different locations, until the Iron Age (Cleuziou & Tosi, 2000, p. 19).

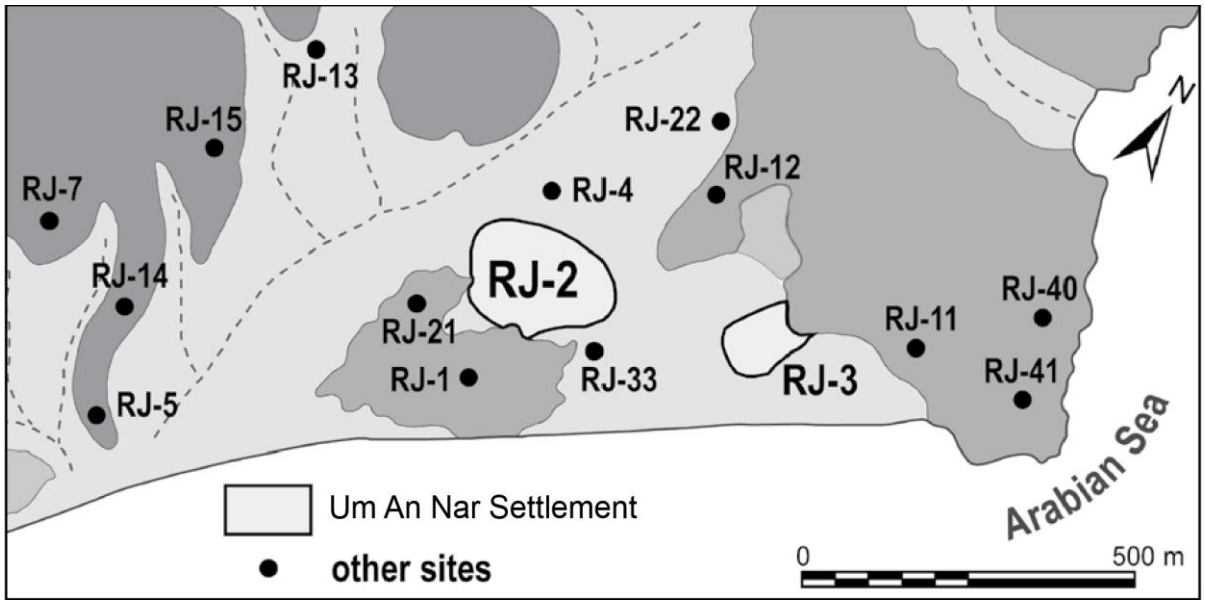

Figure 33: Map of the Ra's al-Jinz bay with the different sites indicated (adapted from Azzarà & De Rorre, 2019, p. 26, Figure 1).

Within this site, two locations are of particular interest to this thesis. First is RJ-2, a low mound at the foot of the central mesa, where Umm an-Nar settlement has been attested. The second location of interest is site RJ-1, located on the top of the central mesa, which includes traces from the Hafit and Umm an-Nar periods, and a settlement dating to the Wadi Suq period.

Ra's al-Jinz RJ-2

Ra's al-Jinz RJ-2 represents the main Middle to late Umm an-Nar settlement location at the site. Chronologically, it presents an occupation in three phases over the second half of the third millennium BCE. The phases are period II from 2600/2500 BCE until about 2300 BCE, period III from 2300 to 2100 BCE, and period IV at the very end of the Umm an-Nar period, between ca. 2150/2100-2000 BCE (Azzarà, 2009, pp. 1-2).

In periods II and III two compounds were constructed out of thin mudbricks interspersed with thick layers of sandy clay, with some walls receiving an additional stone lining. The northern building has rooms of varying sizes organized around a courtyard, while the building to the southeast is composed of at least two structures, each consisting of successions of rooms with similar layouts. Through

excavation some rooms within the buildings were ascribed functions pertaining to storage and the manufacture of domestic goods and ornamental items (Azzarà, 2009, p. 3). For the northern compound, it has been suggested that the phased extension of the structures represents a development from independent dwellings towards a more integrated layout that signals a higher socio-cultural integration within the community. The creation of the courtyard, a shared, but walled space, is here taken as the epitome of this development, as it transforms the system of circulation through the spaces (Azzarà, 2009, pp. 9-12). In the northwestern section of the compound, pyrotechnical installations were identified and related to copper working. The abundance of copper objects on the site, which are generally of a high quality, strengthen this interpretation (Azzarà, 2009, p. 12).

RJ-2 was initially investigated by the Joint Hadd Project in the 1980s and 1990s. In recent years, excavations have been resumed and focus on structures from period IV (Azzarà & De Rorre, 2018). This period, representing the final Umm an-Nar phase, saw the construction of two new buildings. These are building 4, to the west of the northern compound, and building 12 to its east (Figure 34). Building 12 is particularly relevant here. This structure was also organized around a courtyard, although significantly, it was here in place from the very first construction phase of the building (Azzarà & De Rorre, 2018, p. 15), reflecting a planned decision. The construction of the courtyard in building 12 represents and consolidates the higher socio-cultural integration that developed over periods II and III (Azzarà & De Rorre, 2018, p. 24),

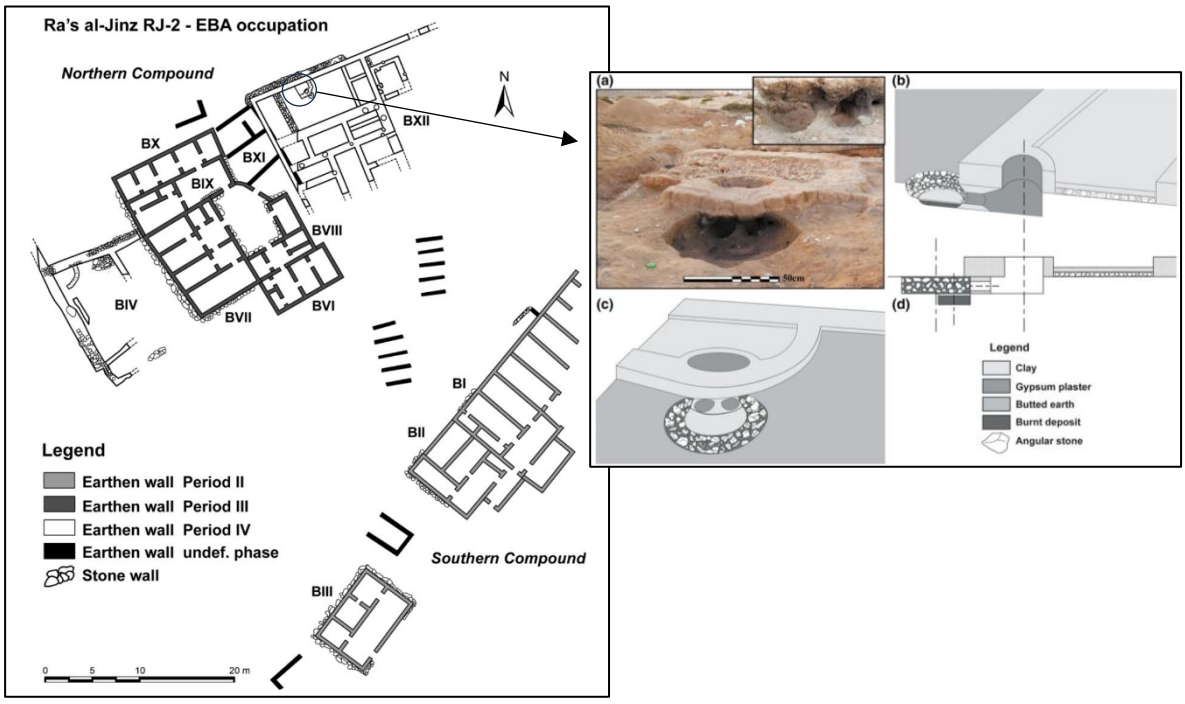

Figure 34: Ra's al-Jinz site RJ-2 plan with an inset of the food processing installation (adapted from Azzarà & De Rorre, 2018, pp. 12, 18, Figures 2 and 8)

Within the courtyard of building 12, an interesting installation of earth and stones was found, likely used for the purpose of food processing by means of smoke or heat (Figure 34). A similar feature was also identified in building 4 (Azzarà & De Rorre, p. 17). Azzarà and De Rorre relate this and other

evidence to the creation of a food surplus, which would have enabled the community to trade with inland sites for goods not available or produced locally. Additionally, it would have helped Rj-2's residents to avoid food uncertainty in their coastal setting where they would have relied heavily on marine resources (Azzarà & De Rorre, pp. 19-20). Furthermore, the installation might reflect the refinement of techniques for food preservation, assuming its increased efficiency compared to other, more simple methods (Azzarà & De Rorre, p. 20). Evidence for the processing of marine resources was also found on top of the mesa, on site RJ-1, where pits were likely utilized for smoking fish (see below), dated relatively to a period contemporaneous with the settlement at RJ-2. It can be imagined that this represents an earlier phase in the food processing industry of Ra's al-Jinz, where it took place removed from the settlement in open pits.

It has recently been confirmed that at RJ-3, another settlement was present that was contemporary to RJ-2. At this site, activities seem different from those at RJ-2, with little indication for activities related to the exploitation of marine resources. The different configuration in terms of built elements, which appear to be more ephemeral here than at RJ-2, points to a functionally different site (Azzarà & De Rorre, 2019; De Rorre et al., 2020).

Ra's al-Jinz RJ-1

Site RJ-1 on top of the central mesa was surveyed in the first season of investigations at Ra's al-Jinz, when 41 structures were found (Figure 35). It is reported that up to 70% of rocks used in the constructions were of the same limestone as the plateau, of which a minimal amount are dressed. This indicates that the stones were collected from the edges of the plateau and used *ad-hoc*. According to the surveyor, there is no clear 'architectonic' method of construction, but the defining factor of all structures is their curvilinear layout. The walls did not exceed 1,2 m in height, assuming that none of the collapse layers have been robbed for building material in more recent times. The dwellings were divided into four main types. Type A represents circular structures with a single room, and access provided by a break in the wall. Type B consists of circular structures with two straight or curved elements delimiting the entrance. Type C are circular structures with a second smaller structure built up against the first, with direct access from the outside only to the first. This type has a sub-type C1, where a additional semi-circular room is built up against the main room. Type D dwellings are multi-celled complexes, possibly aggregated over time. It is suggested that these are the true dwellings, where internal spaces in the compound would have allowed a distinction in function (Mariani, 1986, p. 39).

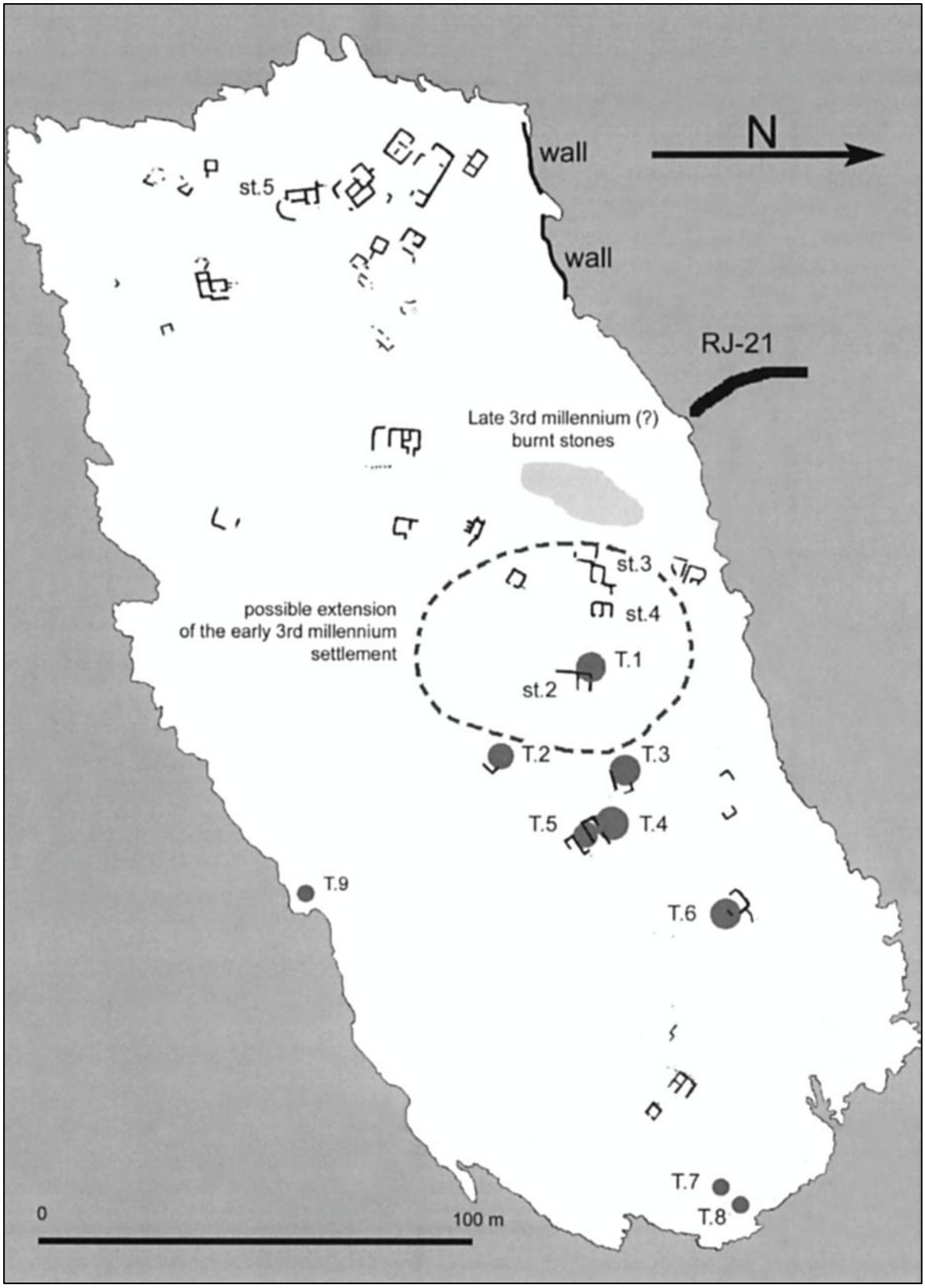

Figure 35: Overview of the central mesa in the embayment of Ra's al-Jinz, site RJ-1. Indicated are the structures surveyed by L. Mariani, and the locations of structures 2, 3, and 5, as well as the location of remains from other periods (Monchablon et al., 2003, p. 43, Figure 11).

Structure 5

In the second and third season of the Joint Hadd Project at Ra's al-Jinz, investigations at RJ-1 focused on the multi-celled structure 5. It consists of two rectangular rooms (5/2 and 5/3) and a semicircular courtyard (5; Figure 36). Within the structure, five hearts were found. Some consisted of burnt pebbles and limited amounts of charcoal, while others were dug into the bedrock. One of these hearths produced a ^{14}C date of 1895-1692 (1σ) cal. BCE, confirming its date in the Wadi Suq period (Biagi et al., 1989, pp. 19-20).

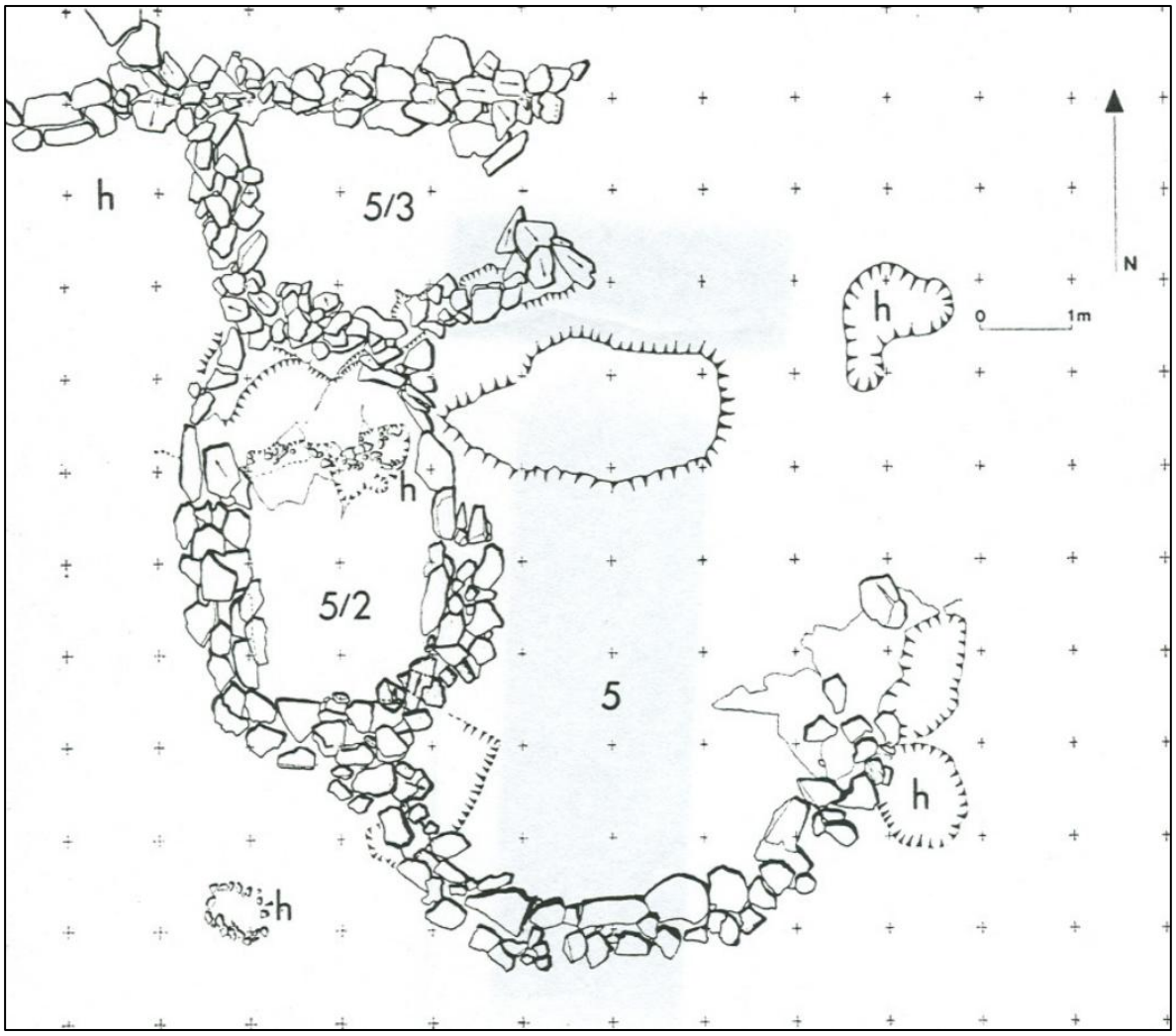

Figure 36: Structure 5 at Ra's al-Jinz site RJ-1 (adapted from Biagi et al., 1989, p. 21, Figure 2).

Inside the structure an occupational layer held many flints and faunal remains. Along the southern courtyard wall, mammal and fish bones were concentrated, in what was later dubbed a 'kitchen midden', implying the function of food preparation for this area. Mollusks were present all over the surface, perhaps discarded waste of a more incidental snack-like consumption by the structure's inhabitants. The shell assemblage consists for ca. 80% of *Mytilidae* shells (Mussels), ca. 15% of *Purpura persica* (a sea snail) and for smaller amounts of *Ostrea* (oysters) and *Balanus* (Barnacles). Various other species are found in smaller amounts. The mussels were likely used as food or as fishing bait, while the snails were likely consumed. The oysters probably formed a highly valued food, while the barnacles were likely accidentally collected and not consumed (Biagi et al., 1989, pp.23-30).

The structure 5/2 provided evidence for the processing of *Conus* shells into rings, with associated finds reflecting all the different stages of manufacture. One Wadi Suq sherd with a Harappan incised motif was also found here, as well as bronze fish hooks and stone beads. A bronze bracelet was found in the courtyard (Biagi, 1988, p. 5). The third room, structure 5/3, was devoid of finds (Biagi, 1990, p. 4).

Structure 3

On top of the mesa, additional structures were investigated between 1999 and 2002. The first structure was structure 3, which is situated in the central part of the mesa to the east of structure 5 (see Figure 35)[2]. The surface in and around the structure was deflated but still held 10 to 15 cm of deposits dating to Phase IV, or the Wadi Suq period. It is clear that similarly to structure 5, a *Conus* shell workshop was present in structure 3, albeit with more juvenile specimens (Monchablon et al., 2003, p. 34). The structure revealed deeper deposits dating to the early Bronze Age. The earliest layers, dating to the late 4th millennium had several postholes delimiting huts of 2-3 meter in diameter, and a hearth. Above this a layer with more postholes was dated to the first half of the 3rd millennium. Finally, a layer of dark ashes with many pits containing fish bones and burnt stones was interpreted as representing a period in which fish processing took place on top of the mesa, and was dated to the second half of the third millennium, roughly contemporary to phases II and III at RJ-2 (Monchablon et al., 2003, pp. 34-36).

Structure 2 / Tomb 1

Structure 2 was excavated 15 m to the east of structure 3 and consists of a rectangular (but still curvilinear) structure associated with a circular courtyard. Underneath lay a 5 cm dark sand ash layer. Below, the structure emerged into an almost perfect circular form of ca. 8 m in diameter. It became clear that the Wadi Suq house was built on top of an Umm an-Nar tomb (Monchablon et al., 2003, p. 36; Figure 37). The tomb is relatively dated to the third quarter of the third millennium, broadly contemporary with period II at RJ-2 at the foot of the mesa. The inner walls of the tomb had been used to construct walls of the Wadi Suq house. The floor appears to have been levelled with reddish clay from the Ra's al-Jinz embayment below, into which shallow pits were dug (Monchablon et al., 2003, pp. 37, 40).

[2] No detailed plan of this structure has been published to this author's knowledge.

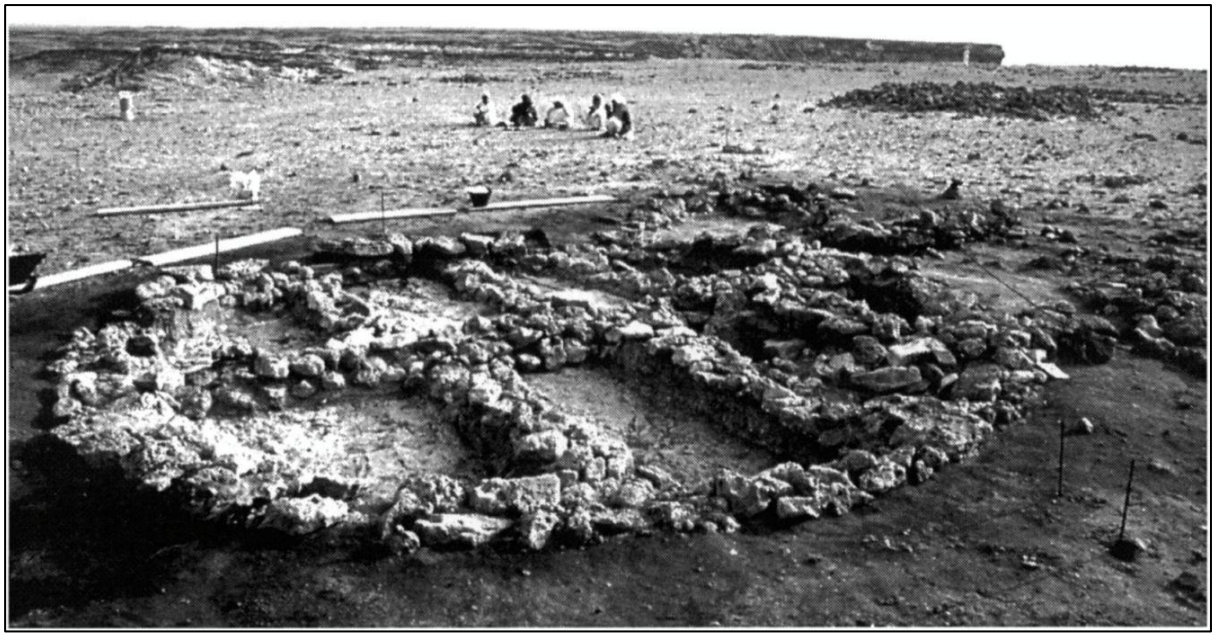

Figure 37: Tomb 1 at RJ-1 during excavation. On top of this tomb, structure 2 dating to the Wadi Suq period was situated. No plan of structure 2 is known to the author's knowledge (Monchablon et al., 2003, p. 38, Figure 8).

Ra's al-Jinz RJ-21

At the point of easiest access to the mesa, a small gully on the northeastern side is the location of a fortification wall of one meter thick that was preserved up to a height of 2 meters and is constructed out of stone (Figure 46). This was labelled site RJ-21. Against its inner face, a small sounding was made, where two meters of accumulated deposits were excavated that held turtle and fish bones, flint tool, and Wadi Suq pottery. Several curvilinear structures were found abutting the wall, although these were not excavated (Cleuziou & Tosi, 2020, p. 418).

Figure 38: Several curvilinear structures positioned against the inner face of the fortification wall of RJ-21 (Cleuziou & Tosi, 2020, p. 416, Figure 28).

Discussion

RJ-2 presents an elaborate site planned and built according to a system of measurement that was probably culturally transferred from one generation to the next, as it is further reinforced by the use of mudbricks and apparently tripartite patterns. It is likely that specialized builders were involved in creating these structures, in the sense of part-time and not full specialization of work (Azzarà, 2020, pp. 323-324).

At RJ-1, 41 structures are identified, of which only three structures have been investigated. Structures 3 and 2 show shallow Wadi Suq deposits due to deflation. The focus has shifted to the more intact Umm an-Nar deposits and remains buried underneath, such as Tomb 1. Structure 5 presents a good example of a dwelling on top of the mesa. Nevertheless, too few structures have been investigated to propose a categorization of 'true dwellings' based solely on the number and extent of cells (cf. Mariani, 1986, p. 39), and more research is needed to clarify this point. Generally, the buildings are made out of readily available, local material. Buildings show no signs of common technical elements other than the general curvilinear layout and the orientation of entrances to the north and east. Although it was initially expected that the circular structures would have revealed post-holes indicating an organic superstructure of wood or palm fronds (Mariani, 1986, p. 37), none related to the Wadi Suq period occupation are reported at any of the structures excavated. Cleuziou and Tosi (2020, p. 418) propose a view of these structures similar to traditional fishermen's shelters as they can still be observed in Dhofar, which are completely built up of stone, but have an organic roofing.

Construction at RJ-1 seems opportunistic, as a high proportion of locally available rock was used in the construction of these buildings. The fact that structure 2 was built over an earlier Umm an-Nar tomb could also support this idea. Monchablon et al. note that the tomb was likely already ruined by the time the Wadi Suq structure was built over it (Monchablon et al., 2003, p. 37), so it would have provided a concentration of suitable building material. Seeing the location on top of the mesa at 35 m above the surrounding plain, it is not hard to imagine that re-using locally available building materials would be preferred over carrying heavy materials up to the platform.

Ra's al-Jinz provides a highly interesting case for the Umm an-Nar to Wadi Suq transition. With settlement located at the foot of the mesa in the Umm an-Nar period consisting of planned buildings that have defined functional spaces and an increasing socio-cultural integration throughout the later third millennium, it provides a well-documented example of coastal Umm an-Nar habitation. With the Wadi Suq period, a break is clear. Settlement moves to the top of the mesa, possibly defended by a wall that restricted access at the easiest entrance to the platform. Household units lie more dispersed once again, signaling a socio-cultural disintegration that stands in stark contrast to what is observed at RJ-2. Craft production also moves back into the household sphere, as is evident in the *Conus* workshops in structures 5 and 3. It represents a completely different conceptual manifestation of how a settlement should ideally be organized. The specialized knowledge of house construction seems to have either disappeared, or was intentionally not applied in the new settlement.

4.4.3 Ra's al-Hamra

The site of Ra's al-Hamra on the Ja'alan coast is situated on top of a cape that forms the outermost extent of an uplifted limestone ridge which closes the Batinah coast on its eastern end (Figure 39). The site exists of ten different areas where evidence of hunter gatherer campsites were found, spanning from the Neolithic to the Bronze Age. The environs surrounding the cape offer a wide array of niches to be exploited by such groups. Six of the sites were already destroyed in the 1970s, and research at the remaining sites were conducted as rescue operations. Among the four remaining sites is RH-10, which shows an occupational sequence divided into three main periods interspersed with periods of abandonment of up to two millennia, and covers a period from the 7th to the 2nd millennium BCE (Santini, 1987, pp. 179-180; Biagi, 1984, p. 55).

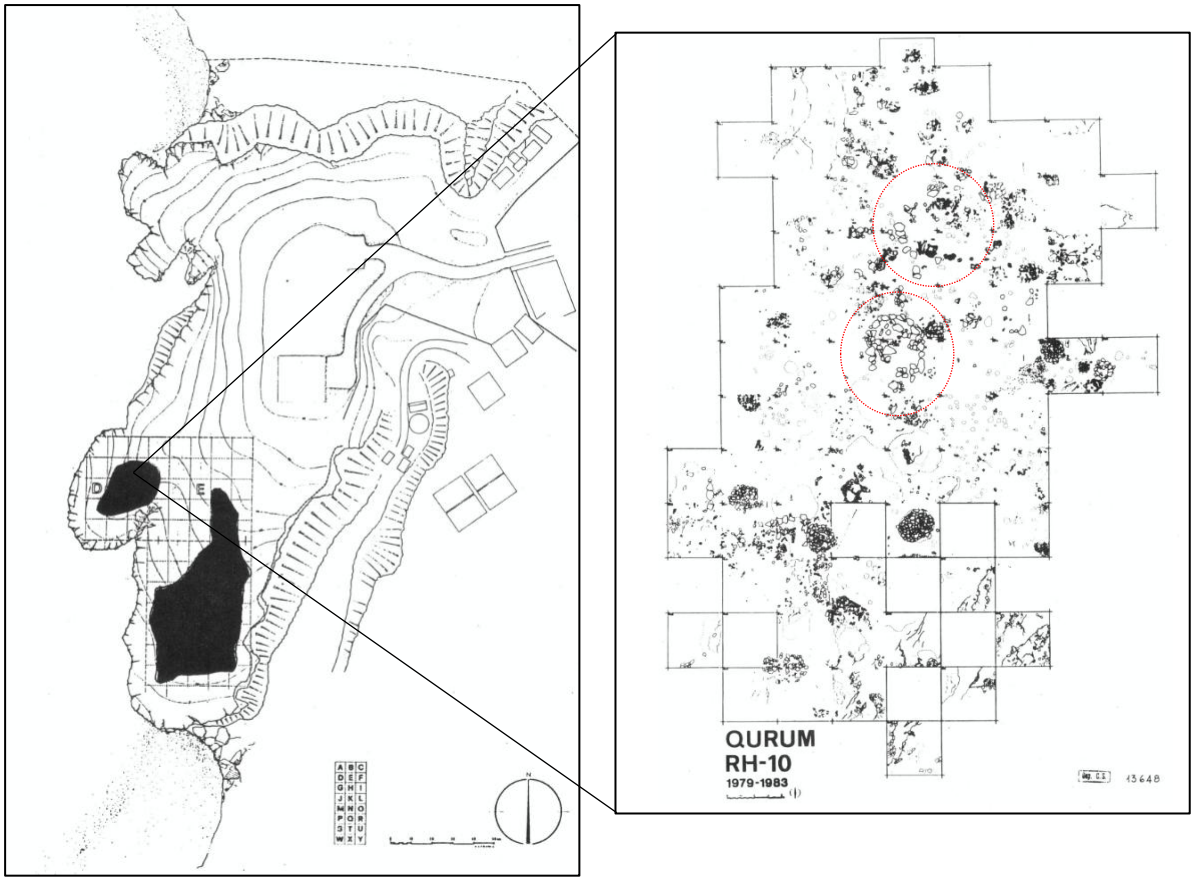

Figure 39: The location of the site of Ra's al-Hamra RH-10 (D) and a plan of the excavated area, with two horseshoe-shaped constructions highlighted inside the red circles (adapted from Santini, 1987, pp. 189-190, Figures 2 and 3).

The last period, period III, represents an occupation at the site that was dated through ^{14}C dating to 2140 – 1750 cal. BCE (Biagi, 1984, p. 57, Table 1). The site is characterized by postholes and pits dug through graves and deposits from the earlier periods, and stone-lined hearths during this period. Postholes and walls align in curvilinear arrangements and delineate horseshoe-shaped compounds. Interestingly, no ceramic material was found, while numerous metal finds and flaked and ground stone tools were attributed to period III (Santini, 1987, p. 180).

Discussion

Going from the single ^{14}C date provided, this site seems to fall in the transitional period. The general picture that emerges from the limited dataset is similar to that of RJ-1. Structures take the form of curvilinear cells built out of local rock. Here, however, relatively many copper and stone tool artefacts are found, while ceramics are wholly absent. Comparing this to RJ-1, it could be posed that both sites hold evidence for a population that was occupied with some sort of craft – *Conus* ring production at RJ-1, and stone tool making as well as small-scale copper processing at RH-10. Despite the general overview of how the structures were configured, the exact nature of occupation remains obscure.

4.4.4 Nud Ziba / Khatt

The site of Nud Ziba is located close to the village of Khatt in Ras al-Khaimah, UAE. It comprises a relatively large mounded site, akin to Tell Abraq (cf. Potts, 1990, p. 16), but is slightly smaller.

However, this site has not been subject to extensive excavation as is the case at the latter. Although this resembles the tower sites described above, no clear tower was identified, and therefore the site is discussed in this category. The 'tell' consists of two parts; a lower platform which rises 1-2 m and has a flat top, with a diameter of ca. 85 m, and an upper tell that is steeper and rises another 4 m, measuring ca. 45 m across (Kennet & Velde, 1995, p. 81). The upper tell had partially been bulldozed away in 1993, revealing a 15 m long and 4 m high section of the upper part, which was investigated by Kennet and Velde (1995). Besides early survey reports identifying the site, this publication remains the only available source for this site.

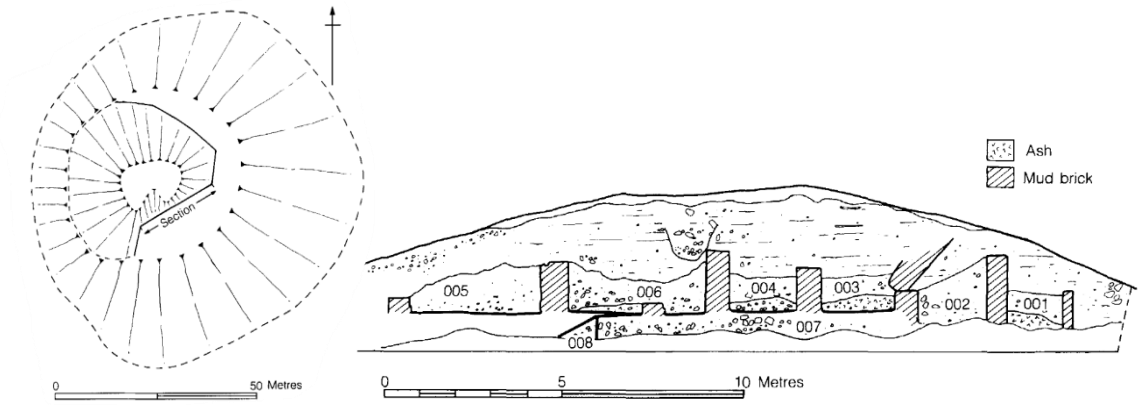

Figure 40: Plan and section of the mound of Nud Ziba (Kennet & Velde, 1995, pp. 83-84, Figures 3 and 5).

As can be seen in Figure 40, the section does not cut the middle of the upper mound, but is positioned several meters to the south in a southwest to northeast position. In the section several features emerged. The lowest is a deposit of silt, mudbrick rubble and gravel, with a levelled top (deposits 007 and 008). As these layers are devoid of finds, it is likely that they were deposited quite rapidly and deliberately, rather than accumulating from occupational activities over an extended timespan. Therefore, these features were interpretated as a platform. In the section, the platform measures 8 m wide, but taking into account the position of the section, it is likely that it is larger towards the middle of the mound. On top of this feature, seven mudbrick walls each measuring 60 cm wide were constructed, forming a total of six rooms of about 2 m wide each. Within these rooms, traces of burning were evident near the base of the walls, and deposits of ash, pottery, gravel, stones, and carbonized materials were present up to a height of 40 cm (Kennet & Velde, 1995, p. 83). Sherds from these deposits were unabraded and many could be joined with other sherds, indicating that the vessels were likely still intact and destroyed *in situ* (Kennet & Velde, 1995, p. 85). The deposits were sealed by lenses of fine silt and collapse material, indicating that the structure was abandoned for some time before being completely covered with aeolian deposits (Kennet & Velde, 1995, pp. 83-84).

Although the general layout of the building in section is reminiscent of the internal walls of monumental towers at Hili and Bat, the authors argue that this structure does not represent the same type of building. Here, the rooms continue over the edge of the 'platform' feature (007/008), indicating that it belongs to a different construction phase than (several of) the walls. It could still be possible that the walls follow the alignment of an older building phase that does belong to such a

tower structure (Kennet & Velde, 1995, p. 94), perhaps one that is still embedded in the lower mound.

According to the authors, the pottery assemblage reflects a very small timeframe dated to the first century of the second millennium (Kennet & Velde, 1995, p. 94). Carbonized material underwent ^{14}C analysis and returned a date of 2130-2075 or 2045-1885 (2σ), supporting this interpretation (Kennet & Velde, 1995, p. 85). Additionally, the finding of a Dilmun-period Sac-shaped jar rim and a socketed spearhead deriving from the interior fill further reinforce the dating of the structure in the Early Wadi Suq period (Kennet & Velde, 1995, p. 95).

Discussion

From the limited data presented, the authors interpret the features in the section as a Wadi Suq structure from the first century of the second millennium, which was abandoned after a fire broke out not long after it had been taken into use (Kennet & Velde, 1995, p. 94). If this interpretation is accepted as such, Nud Ziba, in addition to Kalba, represents another case where larger-scale constructions are evident in the Wadi Suq period. However, with its date in the earliest part of the second millennium, the site falls inside of the transitional period and therefore could also represent a last iteration of the Umm an-Nar practice. Of course it is still unclear what lies buried within the rest of the mound, and further research is needed to clarify the chronological sequence at the site.

4.4.5 Khor Fakkan

The site of Khor Fakkan is situated on several low hillslopes, labelled Jebels 1-4, in the port of Khor Fakkan at the eastern coast of the UAE, overlooking the Gulf of Oman. Due to the development of the port, large parts of the hills were already heavily disturbed when the site was discovered in the 1990s. The settlement is dated by Jasim (2000) to the second millennium. Based on pottery and soft stone finds from the site, this is specified as the 'classic' Wadi Suq, a period which the author confusingly dates to the second half of the second millennium (Jasim, 2000, p. 152). However, judging from parallels that are drawn with work by Carter, who dates the classic Wadi Suq to the first half of the second millennium, it seems that this is the period that is referred to. It is reported that all ceramics belong to this period (Jasim, 2000, p. 149).

Due to the location of the settlement on several hilltops, levelling and terracing activities were undertaken in antiquity to facilitate the construction of domestic structures. In total, 13 building are documented which vary in their complexity and form. Generally, the structures are made of stone and have a rectilinear plan, although some curvilinear walls are also recognized in some of the buildings. This could be explained by the local topography, as the terraces and walls follow the round contours of the hill. In terms building complexity, jebel 3 features structures that have a single room, two rooms, three rooms, four rooms, and in the case of H6, a structure consisting of eight rooms and which extends over several terraces (Figure 42). Jebel 2 features structures of 1 room and 4 rooms, and a structure that was possibly more extensive, but which is very poorly preserved. The structures of jebel 3 are visible in Figure 41. What Jasim calls complete units are described as existing of 4 to 5 rooms of various sizes. It is likely that most rooms were roofed with materials supported by poles, as is indicated by the presence of several post holes within and around the structures. Generally, the

postholes are 30 cm in diameter and reach depths of 40-50 cm, often surrounded by stones at surface level. It seems that relatively large posts were used at this site. The post holes were variously found in the middle of rooms, near the wall, or close to entrances, and occurred as single, doubles or triples – a consistent placement is thus absent. The floors were made of beaten earth and were littered with artefacts, including many mollusk shells (Jasim, 2000).

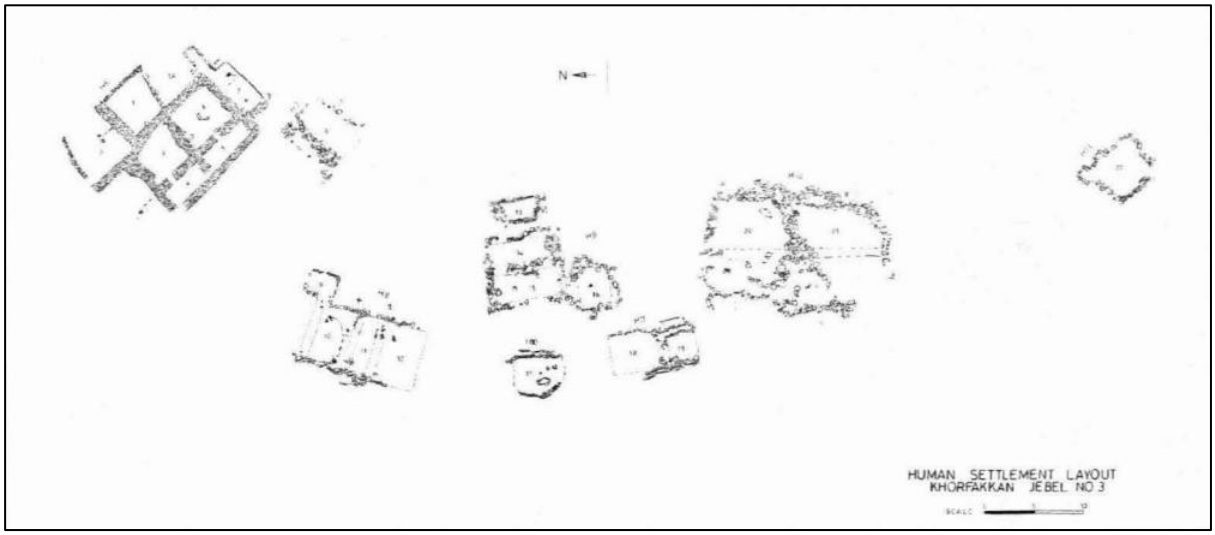

Figure 41: General plan of the structures on Jebel 3 (Jasim, 2000, p. 163, Figure 12).

The walls of the structures are built with local stones of varying sizes and shapes, which from the provided drawings and photographs appear to have been dressed only in some cases (Figure 43). The walls' construction style appears as quite irregular, while the overall layout shows the opposite (e.g., Figure 42). Walls are preserved to exceptional heights in several places, which is likely related to the fact that they also serve as retaining walls for the terraces that provided stability. Looking at building H6, the walls appear to be made with different shapes and sizes of stones that are only minimally dressed, while the overall plan of the structure is quite regular.

The find assemblages for the multi-roomed structures are reported for some of the buildings. At both jebel 2 and 3 these consist of combinations of pottery and grinding stones, pottery and steatite containers, or all three. The single-room structures are either devoid of finds or no mention is made of their contents.

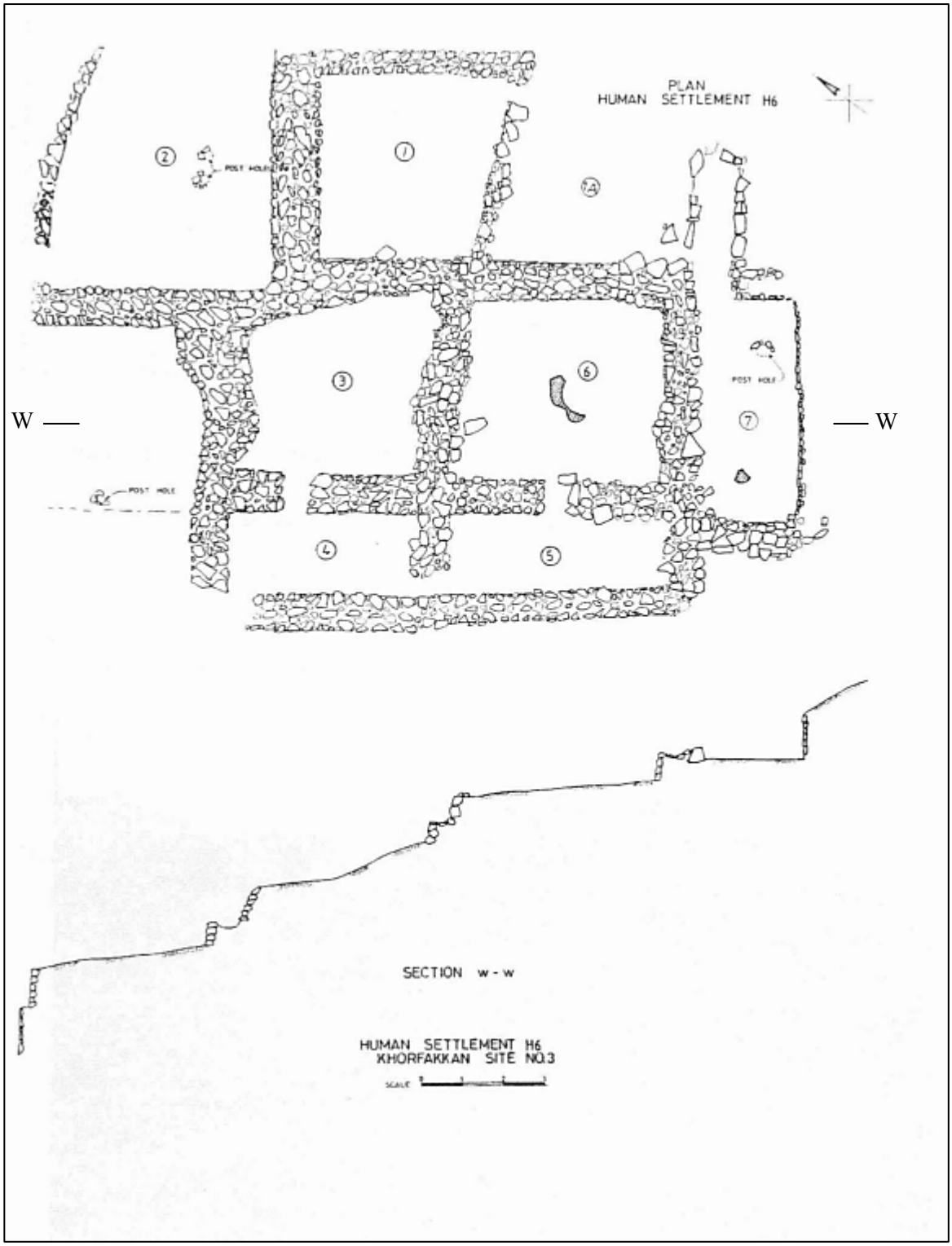

Figure 42: Plan of one building unit H6 on Jebel 3 at Khor Fakkan, with its section showing its stepped layout on the hillslope (adapted from Jasim, 2000, p. 164, Figure 14).

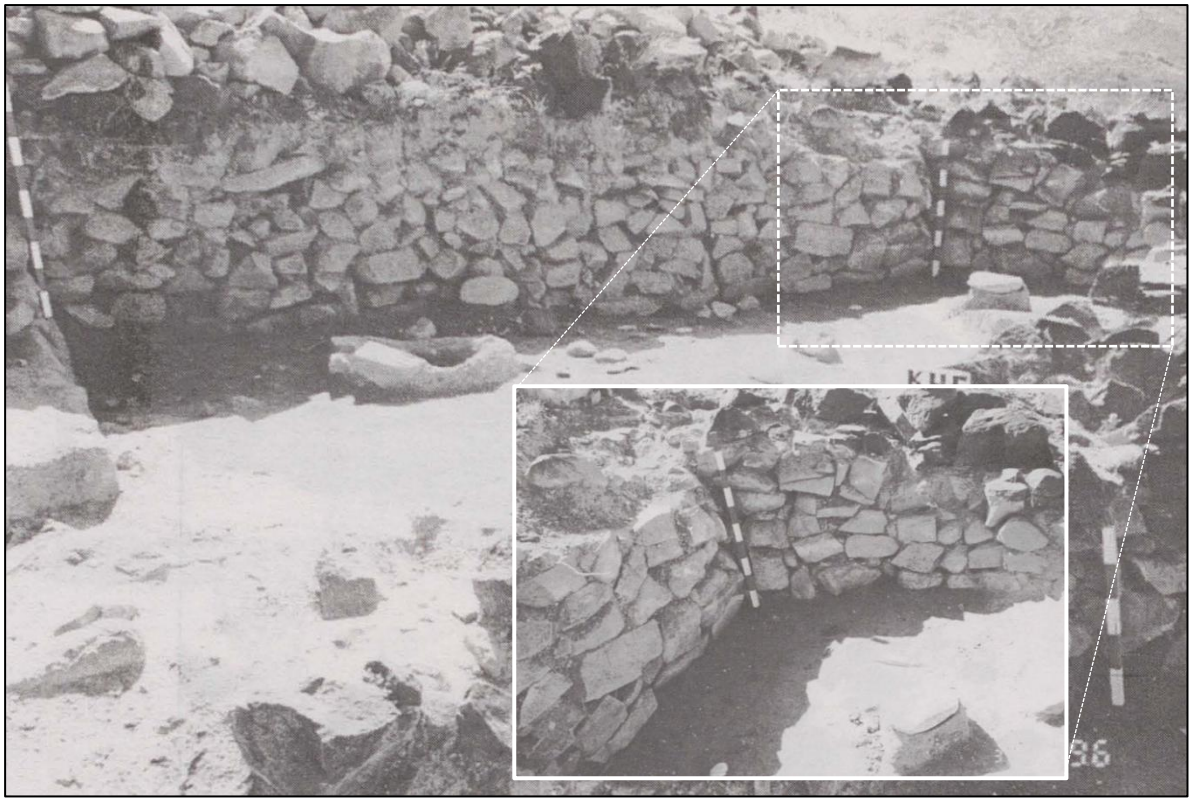

Figure 43: Walls of Room R.5 in structure H6 showing the irregular masonry preserved up to 1 m high. A basin is visible to the left of the inset (adapted from Jasim, 2000, pp. 165-166, Figures 15 and 17).

In terms of functional divisions of space, the largest building, H6, provides some insights. Rooms R.4 and R.5 both held fragments of a stone basin, in association with several grinding stones. In fact, basins were found in structures H2 and H3 on Jebel 2, and also in H9, H10, and H11 on Jebel 3. The basin features are suggested by Jasim to hold some form of liquid or as a storage facility for other goods (Jasim, 2000, p. 146). Apparently, these features were considered important enough to place them in almost half of the structures present. Their association with grinding tools in H6 shows that they might have been related to the processing of different foods. Room R.7 in building H6 contained a floor with an ash layer and several burnt stones, indicating that some fire-related activity was carried out here. Other structures held assemblages characterized by domestic coarse wares and soft stone vessels, like structures H8 and H13 (Jasim, 2000, pp. 148-149). The finding of stone slabs with grinding and incision marks indicates their function as working surfaces for cutting and grinding different materials (Jasim, 2000, p. 152). These traces all hint towards a domestic nature for the site, as well as a functional division of space.

Discussion

The site of Khor Fakkan might represent the most substantial Wadi Suq settlement that is known, with its many stone-built structures on terraced hillslopes in a coastal environment. This site is an example of a more regular settlement, where the structures form complex configurations of multiple rooms. The buildings are stone-built and incorporate sizable post holes bearing witness to the roof supports that were once in place. Still, some variation is evident. The walls vary in thickness and incorporate different sized stones judging from the provided drawings and photographs. Moreover,

the postholes that bear witness to the roof supports once in place, are not positioned consistently in the spaces where they are incorporated. It can be imagined that both these factors are due to the local terrain that is formed by the small hills the site is located on, which would require different constructional adaptations in different places.

Furthermore, we see terracing activity on these hillslopes, something also attested at several tower sites. However, at the tower sites the terraces are positioned over anthropogenic deposits, while here they are cut into the natural hillslope deposits. There is an interplay here where the local topography of the site was altered by cutting straight terrace walls into it, which also influenced the final house form. Interestingly, some of the structures consist of multiple rooms and show an integrated floor plan, where not all rooms could be accessed directly. Especially structure H6 displays a level of spatial complexity not attested in other domestic contexts discussed in this chapter, and based on the basins and grinding stones found in some rooms, and the room associated with the use of fire, it is possible that rooms were assigned distinct functions. As a whole, the different structures contain household assemblages consisting of grinding stones, domestic pottery and sometimes basins. The floors, made of compacted earth, held many shell remains, which indicates that snails formed a part of the diet of the site's population. It is not reported which types of shells it concerns at Khor Fakkan, but this mirrors the situation at the other coastal sites of Ra's al-Jinz RJ-1 and Ra's al Hamra RH-10.

The constructions at Khor Fakkan can be likened to those at the Late Bronze Age site of Masafi 5 in Fujairah, UAE. There, similarly, a relatively steep hillslope was occupied and terraces were cut and upheld by retaining walls. Occupation is attested on these terraces in the form of remains of rectilinear building layouts (Degli Esposti & Benoist, 2015). Considering that Khor Fakkan was also inhabited during the same time as Masafi, it is possible that the terraced occupations in this form become more favored towards the end of the Wadi Suq and into the Late Bronze Age.

Although it has been noted before that Jasim likely refers to the first half of the second millennium BCE by the 'classic' Wadi Suq, some confusion as to the exact chronology of the site remains. With regards to pottery, Jasim reports an abundance of plain coarse wares, but also painted Wadi Suq beakers and footed goblets (Jasim, 2000, pp. 149-150). Whereas the recent studies at Tell Abraq have attested the first type as a domestic ware for the entire second millennium BCE (Magee et al., 2017, p. 226), the second are typical of the Wadi Suq period (cf. Méry, 2000, pp. 253-254), and the last are a *leitfossil* for the Late Bronze Age (Magee et al., 2017, p. 228). Therefore, it is likely that the site was occupied throughout the entire millennium, but it is impossible to establish a clear phasing of the site on the basis of the published material.

4.4.6 Settlement sites: Discussion

The category of settlement sites present a significant amount of information on settlement in the Wadi Suq. However, logically most data derives from those sites that are published in the greatest detail, which here concern the sites of Bat and Ra's al-Jinz. Bat is particularly well-published and provides much detail on only a few structures. On the other hand, the site of Khor Fakkan presents many different structures, but has not been the subject of detailed investigations as it was excavated

during a rescue mission in only two seasons. This might create some biases in the overall characterization of these sites, and it must be considered that our current view of any of these sites is not at all set in stone.

The type of settlement at Ra's al-Jinz and Ra's al-Hamra are relatively similar during the Wadi Suq phase. Both see the creation of a new settlement consisting of curvilinear or horseshoe-shaped cells made of local beach rock. At RJ-1, the new settlement presents a clear break with the complex mudbrick structures of RJ-2 at the foot of the mesa. Another coastal site is found at Khor Fakkan, but in contrast, this site reveals a more complex settlement with multi-room curvilinear buildings with possibly a functional differentiation between rooms. It remains unclear, however, how much of what was documented can be attributed to the Wadi Suq period and what was built or altered in the Late Bronze Age. The site of Bat provides a different type of settlement. Here, occupation continued in the structures that were built during the Early Bronze Age, and the buildings are modified with elements that represent a distinct new construction style. The site of Nud Ziba presents a larger scale of construction on top of a mound. It appears that the site was connected with existing trade networks, but its exact nature remains elusive as only one section was investigated. This collection of sites reflect a high diversity in settlement strategies and a low degree of uniformity overall. From this collection, only a few similarities are apparent.

Construction-wise, the terracing activity at Khor Fakkan stands out as this is also recognized at some of the tower sites. However, the difference is that at Khor Fakkan the terraces are cut into the natural deposits of the hill it is positioned on, while at the tower sites the terraces are located on top of older, anthropogenic deposits. It is possible that the terraces, also recognized at the later site of Masafi 5, become more favored during the Late Bronze Age. Furthermore, at the site of Bat, several walls from the Wadi Suq phase are stylistically similar to the enclosure wall of Hili, being built of two rows of upstanding slabs with a rubble infill. This type was recognized by different authors as typical of this period, and also sees a parallel in the necropolis of Shimal. Another similarity in construction is that between the coastal sites of RJ-1 and RH-10, as mentioned above.

Further similarities are related to the subsistence strategies at the sites. At Khor Fakkan, RJ-1, and RH-10, the surface was littered with snail shells, indicating that this formed a significant part of the diet. For RJ-1 it is reported that it concerns mostly mussels, with some sea snails and oysters, and smaller amounts of various other species, while for the other two it is not specified. This shows that the inhabitants made good use of the resources of the coastal environment.

Differences between the sites are numerous. At Bat, a specialized copper working area was identified in SS10, while at the other sites no evidence for such household production or processing of metal was found. The only exception is RH-10, where dozens of copper fragments and objects were found, but not enough detail is provided to assess whether this is indicative of metal working at the site. Postholes are recognized at Khor Fakkan in different arrangements in relation to the stone foundations, but do not seem to feature prominently at the other settlement sites, even though they were also expected at RJ-1. They do occur in some of the tower sites.

Then there are differences in settlement location choice. Bat is an example where the Wadi Suq populations continually used the structures built during the preceding period and where settlement seems continuous. At Khor Fakkan and Ra's al-Hamra, the sites are newly settled locations or re-settled after a hiatus. For Nud Ziba, this is less clear, as it is unknown what still lies buried underneath the structures. At Ra's al-Jinz, however, there is a clear intentional break with the previous location of settlement, as well with the building tradition. Whereas the Umm an-Nar likely saw the construction of complex, integrated building layouts centered around a courtyard at the foot of the mesa, likely involving specialized builders, the Wadi Suq settlement on top of the limestone platform consists of ad-hoc constructions requiring significantly less specialized knowledge. This stands in contrast again with Khor Fakkan, where the new settlement arguably embodies a considerable degree of complexity in layout. This is not as complex as the structures of RJ-2, but nonetheless considerable.

4.5 Industrial sites

Industrial sites are sites where the primary function of the site is industrial production, here referring to the extraction and processing of copper ore. There is one site that shows a clear sequence from the Umm an-Nar to the Wadi Suq and meets these criteria: the site of Wadi Hilo.

4.5.1 Wadi Hilo

The site of Wadi Hilo is located at 350 m above sea level in the Hajar Mountains in the eastern part of the Emirate of Sharjah, UAE. The site lies on a gravel terrace that is cut by the al-Hilo river on its western edge (Kutterer, 2013, p. 29) and is geologically positioned amidst the Semail Ophiolite unit (see Chapter 3). Smaller outcrops that are rich in copper ores occur among the predominant gabbro layers and also shows sporadic signs of prehistoric mining activity (Kutterer, 2013, pp. 38-42). The local occurrence of copper paired with the ecological advantages form the *raison d'être* of this site (Kutterer, 2013, p. 48). The tower site of Kalba on the east coast of the UAE is located at ca. 16 km southwest as the crow flies, and would have been within reach of Wadi Hilo's occupants by foot following a wadi route leading southwards and then eastwards to the coast (Kutterer, 2013, p. 33).

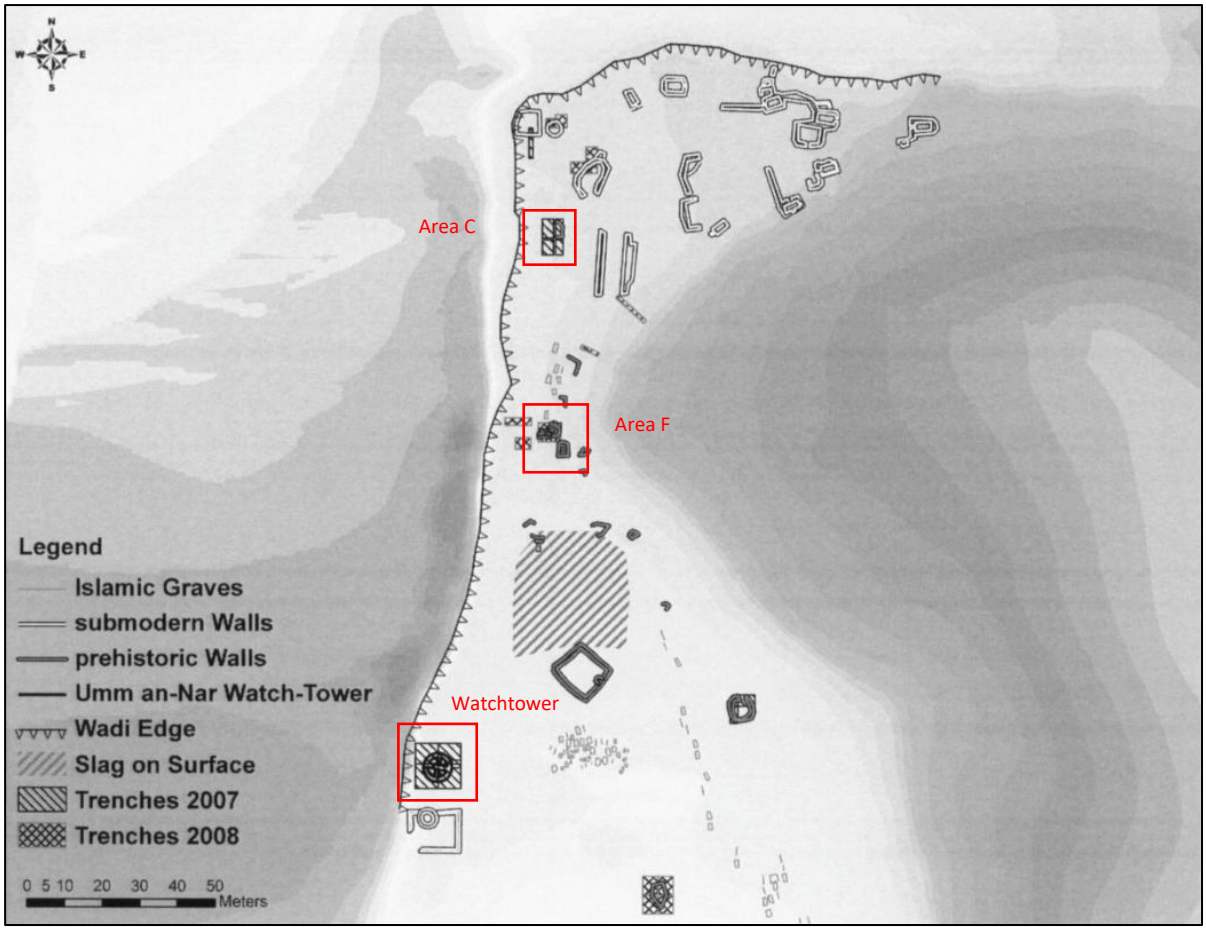

Figure 44: The site of Wadi Hilo. The areas discussed in the text are indicated (adapted from Kutterer & Jasim, 2009, p. 247, Figure 2).

The earliest evidence of copper working at the site stem from the Hafit period already. In the Umm an-Nar and Wadi Suq periods, large-scale copper production is thought to have taken place here. However, a distinct domestic settlement has not been found, despite the investigations covering a substantial area. The presence of a workshop building and monumental structures such as the 'watchtower' do indicate a permanent presence of people at the site according to Kutterer and it is suggested that they resided in wooden structures which were simply not preserved, or remain to be found (Kutterer, 2013, pp. 189-190).

Structure F

The workshop of structure F was partly excavated, exposing its northeastern corner and several rooms in its interior (Figure 45). In general, it seems that rooms 3 and 4 were the earliest constructions, to which first room 2 was added in the north, and then room 1 in the northeast, both of which abut the wall of room 3. Room 5 is the latest addition and overlies the walls of room 3 in the southeast.

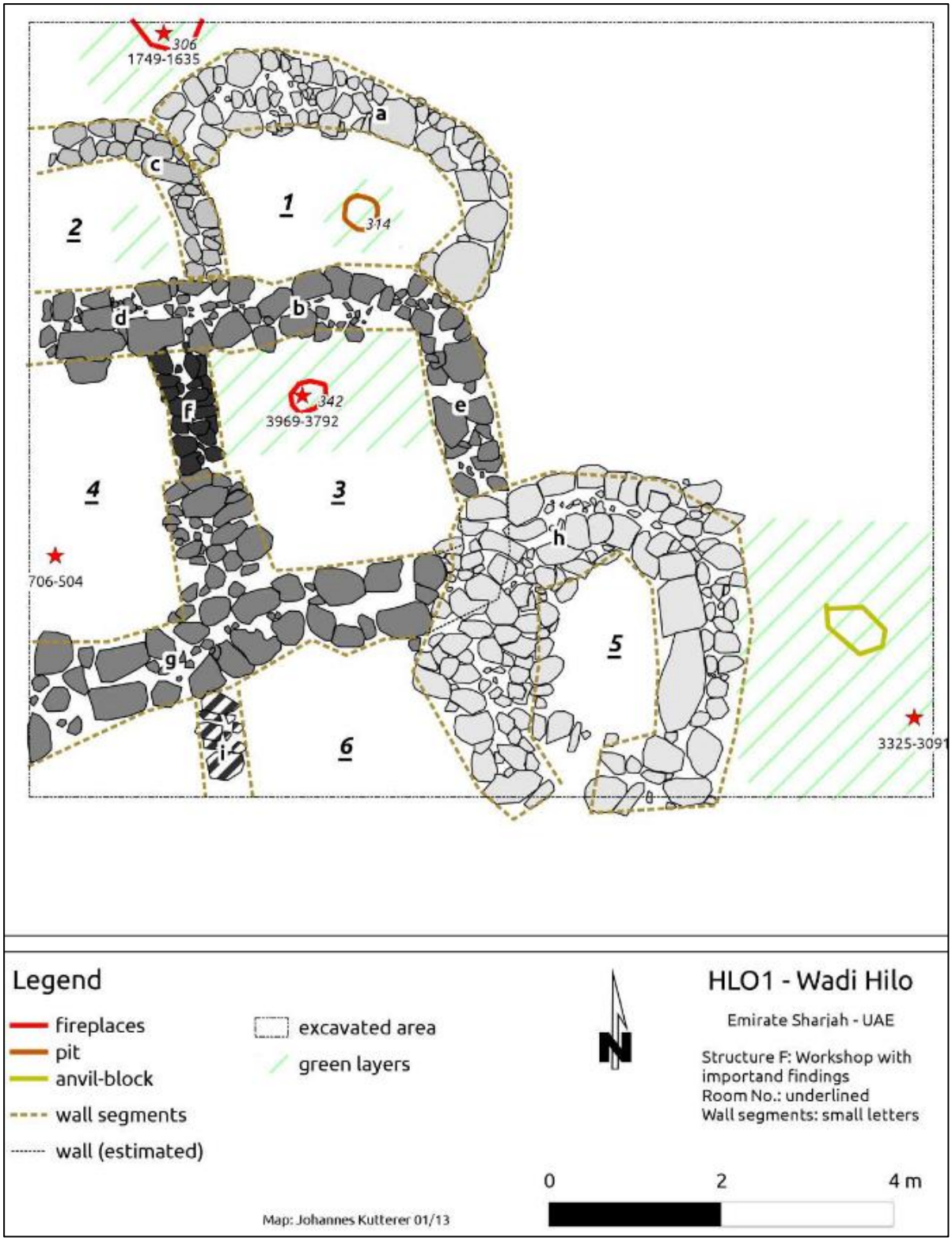

Figure 45: Plan of Structure F in Area F. The shades of grey indicate buildings phases, with the older constructions represented by darker shades (Kutterer, 2013, p. 52, Figure 5.1).

Inside and outside this structure several lenses with green discoloration were found, and represent so-called 'green carpets'. These occur in rooms 1, 2, and 3, to the north of the structure, and to the southwest of the structure. In the last location, an anvil stone is situated amidst the green carpet (Figure 45). These greenish floor layers indicate working areas where the pretreatment of copper

took place. Copper ore fragments and dust accumulated slowly as it fell onto the surface during the crushing of the ores (Kutterer, 2013, pp. 82-85).

Kutterer refrains from discussing the Umm an-Nar and Wadi Suq phases of the building separately, and instead refers to the Bronze Age more broadly (Kutterer, 2013, pp. 56-58). Elsewhere, it was described that the shallow depths of deposits do not allow for a reconstruction of use-phases, and general patterns are deduced from pottery finds only (Kutterer et al., 2013, p. 192). Judging from the pottery distributions (Kutterer, 2013, pp. 59-60, Figures 5.6 and 5.7), it seems that activity during the Umm an-Nar was spread out over the entire exposed area, whereas in the Wadi Suq it concentrated in the 'main workshop' areas composed of rooms 3 and 4, that comprise the first construction phases. One hearth to the north of the structure, which cuts into and thus postdates the green carpet around it, was dated to the Wadi Suq period (1749-1635 cal. BCE (1σ); Kutterer, 2013, pp. 58, 68). In room 1 a large plano-convex copper ingot was found at the base of the northern wall (Kutterer, 2013, p. 58), which on the basis of associated pottery in this area is likely to pre-date the Wadi Suq period.

Structure C

The other significant building remains from this site come from Area C, where another large multiroom structure was found (Figure 46). This building has been completely exposed. The northern half of the building is composed of three rooms that are more or less circular and measure between 1.9 and 4.2 m^2. The southern half of the building is delineated by walls in a rectangular plan, and is divided into two separate compartments by a wall in the middle (Kutterer, 2013, p. 70).

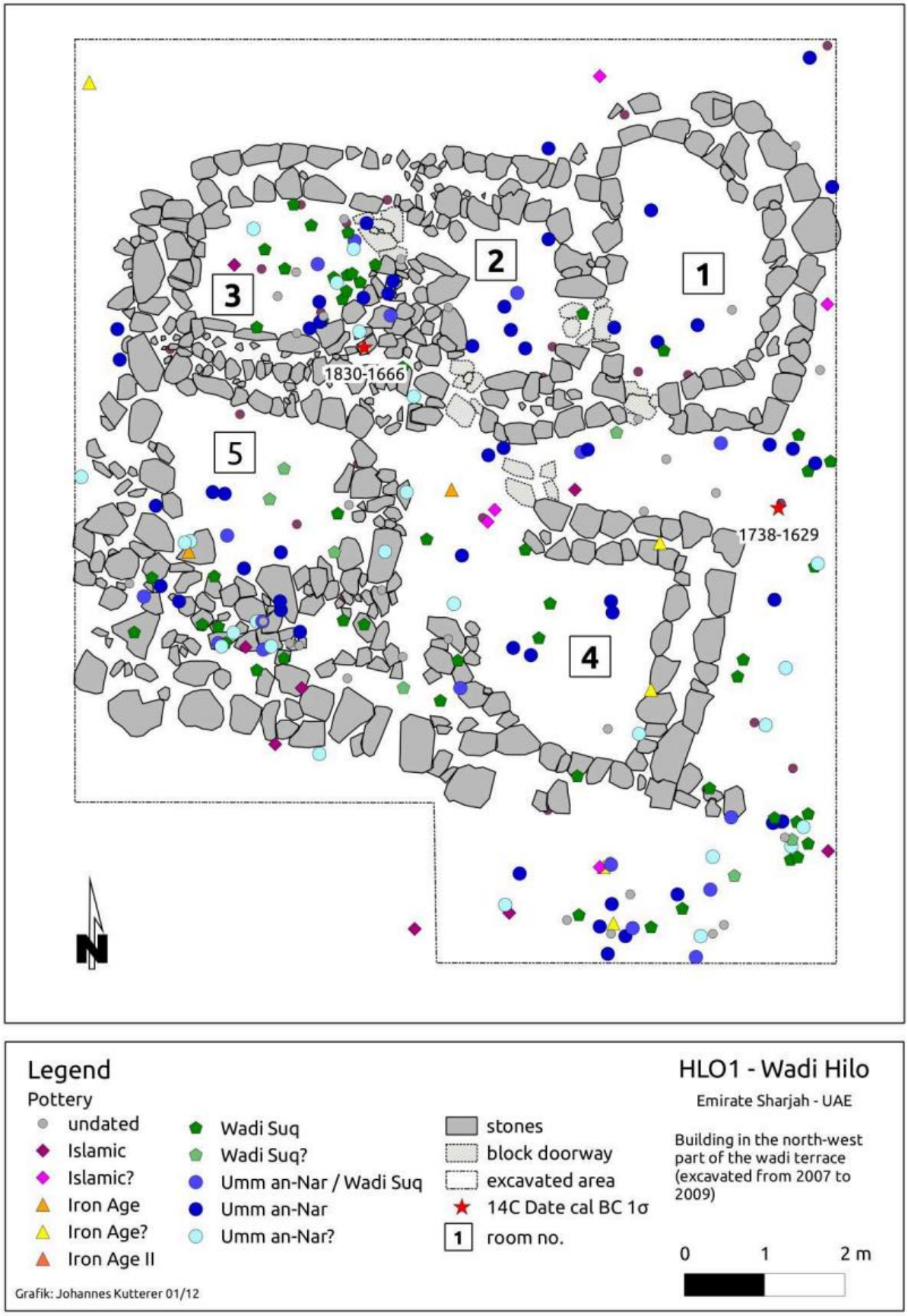

Figure 46: The structure in Area C (Kutterer, 2013, p. 71, Figure 5.17).

At the time of the earliest floor layer, room 1 in the northeast could be access from the central corridor, and was connected to room 2. In a subsequent phase, the surface of room 2 was raised, and likely, room 3 was constructed and attached to the west. The threshold between rooms 1 and 2 was also raised with flat stone slabs to match the new floor level there. The second floor represents a working surface, indicating the structure's function as a workshop in this phase. The raised segment in room 2 was used as the base of a furnace, as indicated by a preserved alignment of furnace wall fragments. The wall between rooms 2 and 3 was not well preserved, as it was likely taken down when room 3 was constructed and connected to room 2 at the time its floor was raised. The smaller size of stones used in the building of room 3 is interpreted by the author as a sign that it was indeed built later than the other walls of the compound. Inside room 3, a sandy floor was found that held mainly Wadi Suq pottery. Its southern wall is particularly interesting as it is constructed with three rows of stones, a construction style not seen anywhere else on this site and at other sites under consideration (Figure 47). Notably, the northern face of this wall is made of vertically upturned slabs (Kutterer, 2013, pp. 72-75).

Figure 47: The 3-row southern wall of room 3. Note the upstanding slabs on the northern face. (Kutterer, 2023, p. 77, Figure 5.24).

Rooms 4 an 5 in the southern half of the building are made with a rectangular layout. On the eastern side, a wall projects inward and delineates a corridor that likely represents the entrance to the building. Room 4 had a loamy floor level with Umm an-Nar and Wadi Suq pottery, whereas room 5 was relatively empty (Kutterer, 2013, p. 75).

The rectangular plan of the southern compartments represents different principles of construction, and is thought to be of a later date than the northern rooms, possibly associated with the

restructuring that occurs there. One radiocarbon date was retrieved from a mollusk shell inside a protrusion of the three-row wall between rooms 2 and 3, and returned a date of 1830-1666 (1σ) or 1901-1594 (2σ) cal. BCE, confirming the wall's dating in the Wadi Suq period (or, technically, thereafter). Another sample from ashy sediment just outside the entrance dates to 1738-1628 (1σ) or 1770-1534 (2σ) cal. BCE, and is thought to represent a time during which the structure was in use (Kutterer, 2013, p. 77).

The Watchtower

At the site, another notable feature is the watchtower. It has a circular plan with internal cross walling dividing the inner space into four segments. These compartments were filled with a mix of stones and slag, providing a solid foundation for a superstructure that may have functioned as a watchtower. Against the outside of the structure, an ashy pit was found that was dated to 1886-1692 (2σ), indicating that the tower was already in existence during the Wadi Suq period. The fill excavated from the inner compartments of the structure consisted of large quantities of stones and slag, which shows that the tower was filled when smelting activity had taken place at the site for some time already. However, a more precise dating than that the tower must have been constructed before the fire burned next to it is not possible with the current evidence (Kutterer, 2013, pp. 126-127).

Figure 48: The watchtower after its excavation (Kutterer, 2013, p. 128, Figure 5.58).

As shown, smelting and processing of copper at Wadi Hilo took place inside dedicated workshop areas, but outside processing areas are also known, such as the area to the south of structure F. Nevertheless, compared to other industrial sites, e.g., Maysar 1 of the Late Umm an-Nar (Weisgerber, 1980; 1981), copper processing at Wadi Hilo was at a significantly smaller scale.

Smelting activity was likely limited by the resources available in its mountainous context. At Maysar it is thought that industrial activity ceased at the site as there were simply no trees left to fuel the industry. At Wadi Hilo, evidence for smelting extends from the Hafit period to the Iron Age and attests to a more sustainable continued industrial practice over two millennia (Kutterer, 2013, p. 161).

Discussion

As this is the only site in its category, this discussion will serve as the general discussion for this site type. Hopefully, this category can be extended with new sites in the future. The site of Wadi Hilo presents an interesting case of a continuous Umm an-Nar to Wadi Suq presence at the site. Clearly, copper extraction and processing took place throughout both periods. Structures F and C appear as dedicated workshop areas for this purpose. During the Wadi Suq, structure C was repurposed to incorporate a furnace in its northern section. Walls constructed with upturned slabs have been recognized at the sites of Bat and Hili as a distinct Wadi Suq style. In building C, this construction style appears again. However, seeing that it is embedded in part of a wall in a structure that is otherwise built with double-faced walls, it is less convincing as a distinct Wadi Suq activity here.

The authors propose that the southern, rectilinear constructions of rooms 4 and 5 in building C are later additions after the northern, curvilinear rooms 1, 2, and 3 were restructured. Significantly, the switch between curvilinear and rectilinear building represents a change in building principles. Currently, only the northern, curvilinear compartments can be attributed a convincing Wadi Suq phase, leaving room for an interpretation where the southern, rectilinear compounds could also have been the earlier iteration of the building, after which it was restructured in the northern half. This would align better with similar shifts observed at other sites, such as Ra’s al-Jinz. Regrettably, the western wall was too eroded to provide any clarity on this matter, leaving this suggestion to the realm of speculation.

Finally, copper working is shown to have persisted from the Hafit period throughout the Bronze and until the Iron Age. A permanent occupation at the site in both phases is proposed, despite the lack of significant evidence thereof. Structure C in its earliest phase is suggested to represent a domestic quarter. If this were the case, and a group of people resided in the workshop buildings, it would not have accommodated a significant population. If occupation would have taken the form of wooden houses, it would be expected that over the course of two millennia this left significant traces in the form of postholes, accumulated debris, occupational surfaces, and various pits and hearths. Perhaps the users of this site resided in a different location, although the options for this in the mountainous environment are limited.

An alternative that could be considered is that habitation at Wadi Hilo was more intermittent and its population more mobile, leaving more ephemeral traces than a wooden settlement. Upon each revisit, the settlement location might have shifted, and as such no significant accumulation of occupational deposits and features would have occurred. In this scenario, the stone structures at the site would have been specialized workshop areas that were used during each visit to the site,

justifying their durability and representing the only permanent element at the site. The watchtower, assuming its functioning as such, similarly represents a more permanent element. These structures can also be considered as major 'fixtures' in the terminology of Cribb (1991; Chapter 3). These fixtures, despite their durability, do no necessarily have to be connected to a permanent occupation of the site, seeing that it was only required to function at times when people were, in fact, present there.

4.6 Temporary places

In recent years, a new type of site has emerged. Temporary places, following the term coined by Weeks, Cable, Franke, et al. (2019), are here defined as sites that show no sign of (semi-) permanent buildings and have a distinct stratigraphy that indicates an intermittent, but repeated occupation of these locations throughout extended periods of time. The sites that will be discussed in this category are Saruq al-Hadid, and Tawi Sa'id, the only such sites to date that have a Wadi Suq component.

4.6.1 Saruq al-Hadid

Saruq al-Hadid is located on the northern fringe of the Rub al-Khali desert in the southwest of the UAE. This site is situated in a barren, desert environment (Figure 49) within zone 3, and has a rare stratified record preserved in aeolian sediments within an active dune field. The sediments were likely protected by dense layers of Iron Age slag covering them and slowing down aeolian erosion (Herrmann et al., 2012, p. 50).

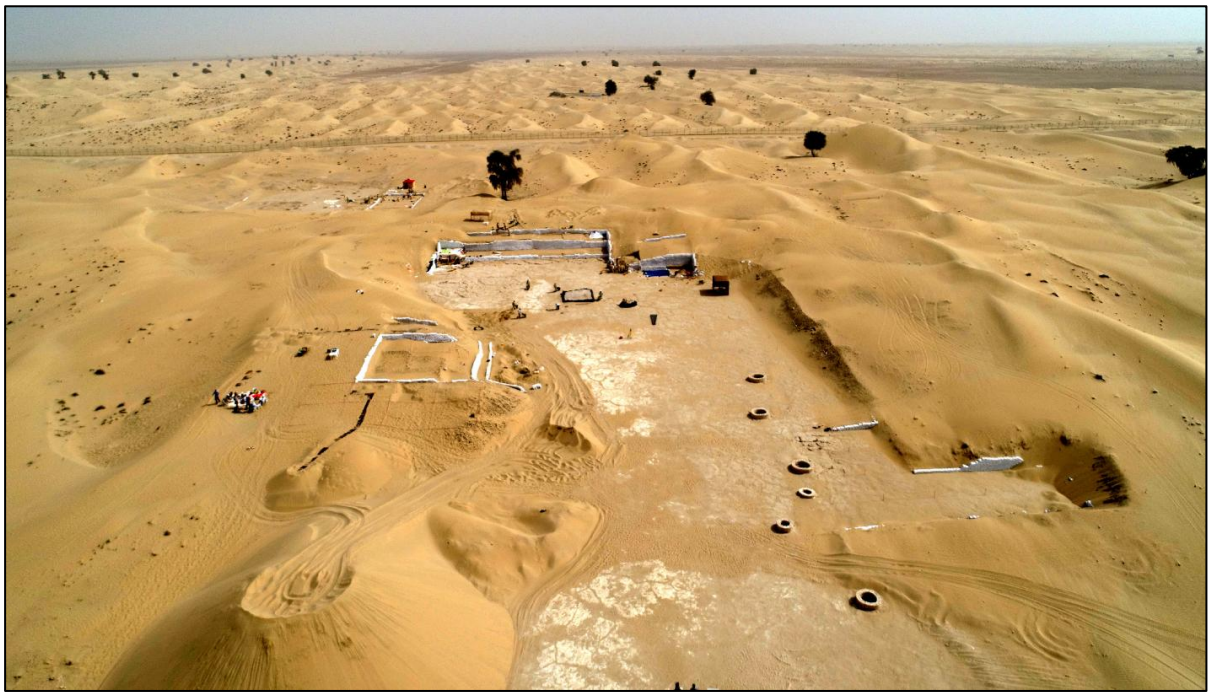

Figure 49: Oblique aerial view of the site of Saruq al-Hadid in its desertic environment (Barnáldez-Sánchez et al., 2024, p. 195, Figure 2).

The sand of the dune field rests on a gypsum pavement, which indicates that the area was an inland salt flat, or *sabkha*, at some point, which must have formed when the water table was still within

reach of the sediments accreted by it (Herrmann et al., 2012, pp. 51-52). Two stratigraphical units identified by the excavations are relevant to the current analysis, comprising horizons V and IV.

Horizon V is the deepest level at the site and likely dates to the Late Umm an-Nar and Early Wadi Suq periods. For this horizon, an extensive ^{14}C dating program has resulted in eight dates in the early centuries of the second millennium BCE. However, the presence of characteristic Umm an-Nar orange sandy ware sherds may indicate a possible Late Umm an-Nar presence at the site, or the continuation of production of this type into the Wadi Suq period (Karacic et al., 2018, p. 25; Weeks, Cable, Karacic, et al., 2019, pp. 1059-1061). It is thus safe to say that this represents a transitional deposit.

The features of horizon V consist of hearths, postholes, and pits. 21 postholes outline an ovoid structure of ca. 5 x 3 m, which likely consisted of wood and textiles (Figure 50). Numerous hearths, small basins, and cup-like features were also found. The hearths are often stone-lined and relatively small (ca. 50 cm in diameter), with the larger hearths being dug directly into the gypsum. One hearth in the upper part of the horizon produced a concentration of date seeds. In this level, traces of domesticated, wild, and marine animal consumption were attested, although at a reduced scale compared to the following horizon (Weeks et al., 2017, pp. 36, 38; Weeks, Cable, Franke, et al., 2019, p. 164).

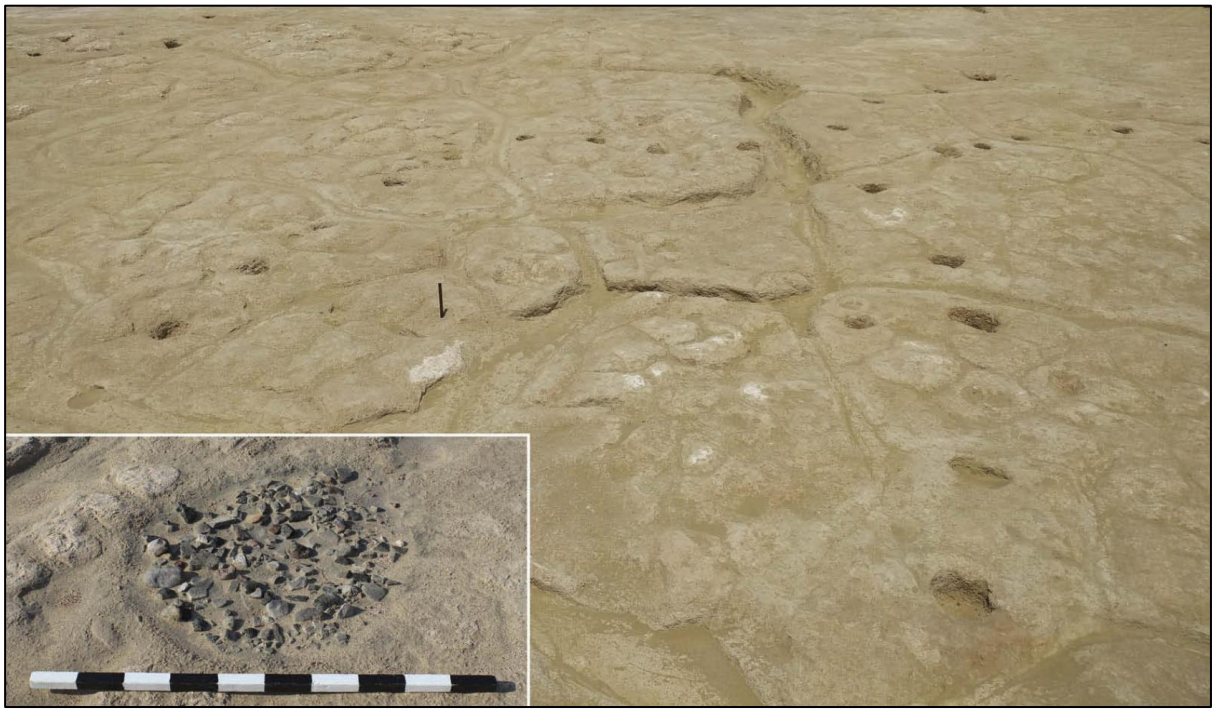

Figure 50: Bronze Age features cut into the bedrock at the site of Saruq al-Hadid, Horizon V (Weeks, Cable, Franke, et al., 2019, p. 163, Figure 4).

In horizon IV this pattern continues, although the quantity of fragmented and burnt faunal remains increases drastically. It consists of a dense midden deposit of which the lower half is likely of Wadi Suq date, and the upper half stems from the Late Bronze Age. Thirteen ^{14}C dates show that the midden accumulated between ca. 1800-1400 BCE. The midden is up to 1,5 m thick, and covers an

area of ca. 20 x 20 m (Roberts et al., 2018, p. 122, Table 2; Weeks, Cable, Karacic, et al., 2019, pp. 1059-1061).

The midden has produced a wealth of information. Archeozoological traces include skeletal material from camelids, oryxes, gazelles, and sheep/goats. 26% of the studied fragments carried tracing of burning and/or butchering. Lagomorph, rodent, and reptile remains were also found, and also showed signs of burning and/or butchery. Fragments of ostrich shell have also been identified. Based on the faunal remains, the horizon IV midden seems to be composed of waste from human consumption of hunted wild species and herded domesticates (Weeks et al., 2017, p. 40), particularly indicated by butchering marks at the epiphyses of meat-bearing elements (Roberts et al, 2018, p. 123). Interestingly, except the domesticates most of these animals and would occur in coastal environments during the Bronze Age, the closest such niche being located at a distance of 40 km from Saruq al-Hadid (Bernáldez-Sánches et al., 2024, p. 200). Additionally, marine resources were also derived from the midden, including different species of saltwater fish that were transported to the site in complete form (Weeks et al., 2017, p. 41). The presence of marine resources at the site, and their sparse representation in faunal assemblages of other sites highlights the question of why this is so variable and the exact extent of the inland movement of these resources remains unknown (Roberts et al., 2019, p. 195).

Archaeobotanical traces were also represented, including charred date seeds and a cereal grain. Based on botanical material found at the site, it is likely that in the past there was an acacia woodland providing fuelwood, with smaller sand-binding shrubs, which together also provided fodder for the domesticates attested in the zoological analysis and indicate the presence of subsurface freshwater (Weeks et al., 2017, pp. 38-40). In addition, several wells of 2 to 3 m deep were found that date to the Late Wadi Suq and are thus contemporary to horizon IV. The end of their use is not precisely determined, but their presence reinforces the idea that water was accessible close to the surface (Weeks, Cable, Franke, et al., 2019, pp. 166, 171). Additionally, it has been proposed that these inland desert areas were a mosaic of microclimates, some of which could have allowed for the intermittent presence of shallow surface water at interdune locations (Herrmann, 2012, p. 140; Weeks et al., 2017, p. 56). This would also have attracted wild animals that could then have been hunted by the site's part-time residents, explaining the abundance of the wild animal remains discovered. Still, it remains improbable that sufficient water resources were present to grow plant foods locally, and these were likely imported from oasis sites (Weeks et al., 2017, pp. 39-40).

A final interesting finding from the site is that horizon IV shows evidence that lithic artefacts from chert were reduced on-site for the creation of refined microliths, attesting to a distinct Bronze Age flaking industry. This is significant as lithic artefacts and debris are rare in most of the other Bronze Age settlements (Moore et al., 2022, p. 6, 32).

The deposits at Saruq al-Hadid seem to have accumulated through regular rounds of feasting, the waste of which was thrown into the midden area. The deposits also indicate periods of disuse, as the they seem to be deflated and show lenses of wind-blown sand (Weeks et al., 2017, p. 36; Weeks, Cable, Franke, et al., 2019, pp. 164-165). The site therefore likely saw periodical habitation over an

extended duration, at times when it formed a suitable location for hunting and keeping herds due to the episodic availability of water and vegetation (Karacic et al., 2018, pp. 29-30). Possibly, it was only one part of a community that settled at this site during part of the year, a model akin to Bernbeck's idea of multi-sited communities (cf. Weeks, Cable, Franke, et al., 2019, p. 175).

Discussion

Saruq al-Hadid does not provide much data in terms of built elements that can aid in the assessment of characteristics for Wadi Suq construction. The evidence for settlement, here in the form of postholes is only mentioned to have formed a singular structure of ovoid shape. As at other sites where these traces occur, they are not subjected to a more detailed analysis and therefore make an assessment of residence at the site impossivle. However, as a site it provides an alternative model to more sedentary lifeways in oases or coastal areas. The midden deposits show that the site was visited repeatedly, but with periods of disuse in between. This suggests that groups of people travelled to the site at a certain interval, perhaps seasonally, and implies that part of the population was more mobile. The presence of marine resources and plant foods that were brought to Saruq al-Hadid from coastal and oasis environments, show that the communities coming to the site were well-integrated and maintained contacts with, or were part of, communities at these respective niches.

4.6.2 Tawi Sa'id

Taw Said is situated on the northern edge of the Sharqiya sands, in zone 3. The site was initially investigated by Beatrice de Cardi, who suggested it could signify a temporary campsite of mobile communities. Whereas de Cardi found an outline of mudbrick platforms connected by parallel walls of 1m thick and ca. 2,5 m apart, none of these walls were found back when the site was reinvestigated in 2018. Possibly, these walls were natural soil discolorations, or have completely degraded since (Döpper et al., 2018, pp. 1-4).

During the renewed investigations, no other traces of substantial constructions were found. However, large quantities of early Wadi Suq pottery were retrieved from surface survey, as well as metal objects, a carnelian bead and two stamp seals signaling that this site was integrated into the regional trading network during the Wadi Suq period (Döpper et al., 2018, p. 78; Döpper, 2021, p. 322).

The Wadi Suq ceramics make up a substantial part of the almost 1800 diagnostic sherds found, and are mainly clustered in the central part of the site (Figure 51). The predominant form is the beaker or cup. The ceramics display technical and decorative aspects reminiscent of Umm an-Nar types, such as decorations of horizontal lines, or curvy lines in between horizontal lines. Because of these traits, it is suggested in the absence of absolute dating that the Wadi Suq component of the site dates to the very start of the period (Döpper et al., 2021, pp. 22-25). Copper items found at the site include alloy needles, rings, pins, and plates, although none of these can be convincingly attributed to the Wadi Suq phase. However, the copper slags and prills are most densely concentrated in the same area as where Wadi Suq pottery is most represented in the central part of the site (Döpper et al., 2021, p. 71). On the basis of this spatial correlation, it is likely that some copper processing also occurred at the site during the Wadi Suq period. The only ingot fragment discovered at Tawi Sa'id, however, is of

the planoconvex type that is securely attested in Umm an-Nar and Iron Age contexts, whereas the only known Wadi Suq ingot is of pyramidal shape (Döpper et al., 2021, pp. 71-74). Due to the general absence of substantial Umm an-Nar and Iron Age finds here, this fragment could indicate that such planoconvex ingots were also cast in the second millennium. Regrettably, insufficient chronological evidence bars such an interpretation for the time being.

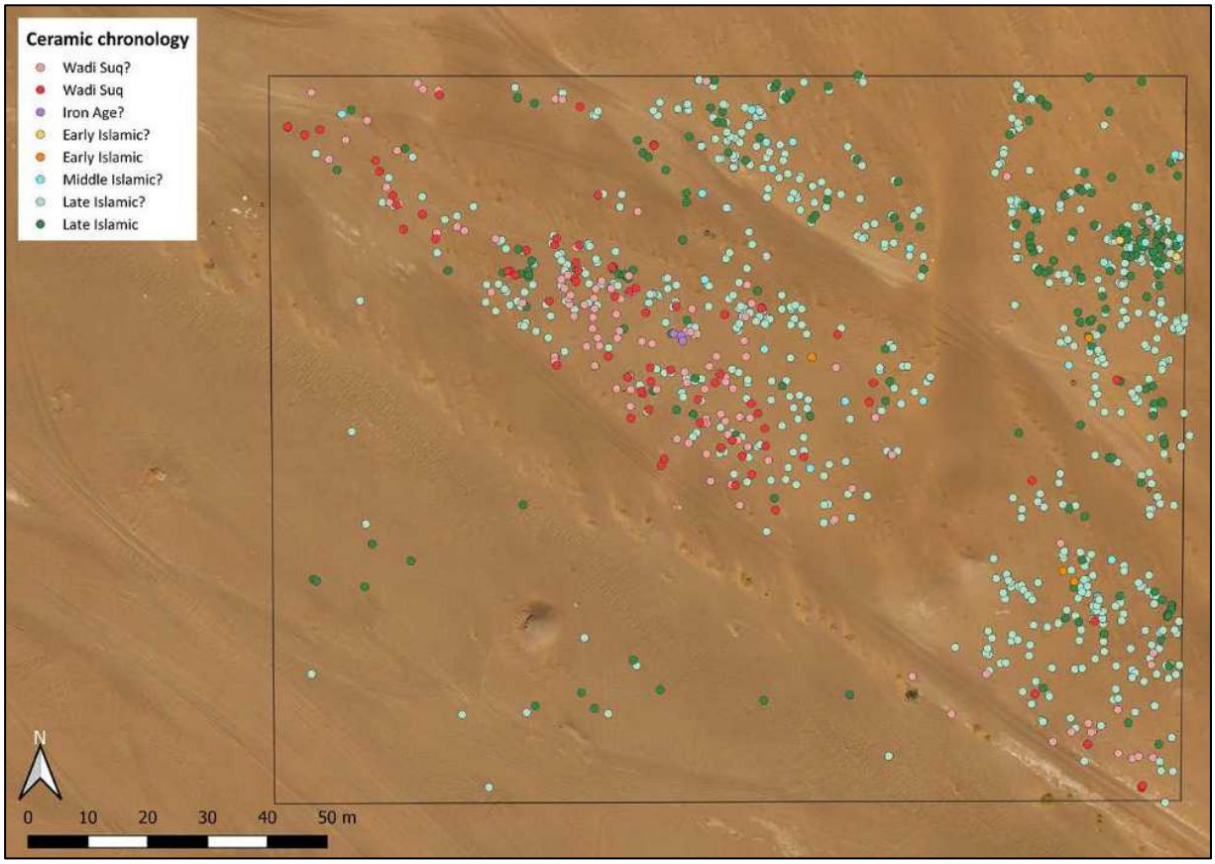

Figure 51: The site of Tawi Sa'id and the pottery distribution by period resulting from the 2018 survey (Döpper et al., 2018, p. 29, Figure 20).

Another interesting category of finds are the lithics. 336 artefacts were found, mostly in conjunction with the Wadi Suq ceramic concentration in the central part of the site. Still, due to the general lack of knowledge on Bronze Age lithic industries, it is problematic to correlate these lithics simply with the associated pottery on the surface. No reduction clusters were found on-site, and the distance between finds was relatively high, limiting the qualitative value of the assemblage as a whole (Döpper et al., 2018, pp. 30-31). What can be said about this assemblage, is that it shows an industry focused on flake production with minimal preparation to create ad-hoc tools (Döpper et al., 2018, p. 36).

A last category that is highlighted are grinding stones. Seven pieces of grinding stones are found in the study area. However, little is known about these artefact types from Wadi Suq contexts, besides the fact that they have been found in clear domestic contexts (Döpper et al., 2018, pp. 56-58). Other find categories include shell, which was abundantly present at the site, but likely the result of activities in the Islamic period, soft stone fragments, a stamp seal of Wadi Suq date, and beads in different stages of manufacture (Döpper et al., 2018, pp. 43-59). These finds indicate both the

integration of the site in regional trade networks, and that craft activities probably took place here to some degree.

On the basis of the survey results, Döpper concludes, in concord with de Cardi's original idea, that the site was regularly visited by mobile groups. It is suggested that these places at the edge of the desert, would lend themselves well for small-scale copper recycling due to the presence of dry shrubs and strong winds (Döpper et al., 2018, pp. 77-78; Döpper, 2020, pp. 23-24).

Discussion

Wadi Suq activity is focused on the central part of the site, as indicated by the pottery scatter, and overlaps largely with the locations of the ground stone tools, flint artefacts, metal objects, and crucible fragments (Döpper et al., 2018, p. 77).

Due to the sites ample evidence of pottery in the absence of building remains of any sort, it can be argued that Tawi Sa'id, like Saruq al-Hadid, is a location where occupation took place in the form of structures of perishable materials. Although a sound stratigraphical sequence is lacking here, the character and location of the site are significantly similar to those at Saruq al-Hadid. It can be imagined that the location of Tawi Sa'id provided a similar favorable niche where every so often more surface water was present, as well as the vegetation associated with it.

As a site that would have had more favorable conditions periodically, the activities taking place at Tawi Sa'id would also be explained. The grinding stones indicate domestic residence to some capacity, and the beads and copper attest to some extent of craft production. The copper processing evidence is particularly abundant. The resources required for an optimal processing and recycling of copper objects, fuel and wind, would have been present here and are suggested to have been an important factor in the location choice.

4.6.3 Temporary places: Discussion

The temporary places presented here provide quite similar cases of occupation in inland desert environments, despite being located at opposite ends of the Oman Peninsula. At both, there is no evidence for a year-round occupation of the site, and the sites themselves are mainly identified through accumulated waste deposits only. It is possible that intermittent habitation at the site was supported by a relatively high water availability in the form of shallow sub-surface water or as shallow interdunal pools. This would also have supported a higher intensity of vegetation and wildlife, which furthered the sites as attractive locations for seasonal settlement. As such, the sites present an alternative to the dominant idea of settled life as oasis farmers and coastal dwellers that exists for the Bronze Age. Still, from the artefacts and ecofacts found, it is clear that the people residing here stood in contact with communities occupying those niches.

Evidence for craft production is present at these sites, and at Tawi Sa'id traces of copper processing are additionally observed. Such traces are attested at Saruq al-Hadid only from its Iron Age phase and it is therefore unlikely that this site was initially settled for this purpose.

Over the last decades, more similar sites have been found that in inland desert environments. These include the sites of al-Ashoosh (Contreras et al., 2016) and as-Safa (see references in Weeks et al., 2017), which respectively date to the Umm an-Nar period and Iron Age. These sites were excluded here as they lack a Wadi Suq component, but this does illustrate the continuity and relative abundance of this site type. Perhaps more of these sites were once present in the desert landscapes of the Rub al-Khali and the Sharqiya Sands, but have by now been hidden by aeolian processes or otherwise. It does warrant further investigation of these environments, which have traditionally been overlooked in surveys.

4.7 Sites in the Sohar Hinterland

Several Wadi Suq sites were identified by the Wadi al-Jizzi Archaeological project over the past decade. These sites are located in wadi valleys in the hinterland of the modern city of Sohar, in the Batinah of Oman. These sites consist of Site 2, Site 84, and Site 66/73. While sites 2 and 66/73 most likely belong to the settlement site category, site 84 is better categorized as a temporary place site. As these sites will form the case study, their discussion is reserved for the following chapter.

4.8 Characterizing Wadi Suq settlement

Having reviewed all substantial settlement evidence for the Wadi Suq that is available to date, a characterization of the overall settlement of this period can be approached. From the tower sites, a relatively coherent picture emerges, whereby the tower structures, which were in all cases already present at the start of the second millennium, were continually used, and altered to fit to the needs of the Wadi Suq populations. In some cases, this went paired with large scale alterations to the structures. Overall, the nature of occupation at these sites is elusive. It is unlikely that a domestic occupation was in place at the towers, or at least not in the direct vicinity of the central structures or mounds. For al-Khutm, it is made explicit that it was not a domestic site, and that other activities occurred there.

The settlement sites provide a less coherent picture. While at the Settlement Slope of Bat, structures are in continuous use over the transitional period, the site of Ra's al-Jinz shows a clear and distinct break with the Umm an-Nar settlement and building traditions. A shift is observed from very regular Umm an-Nar rectilinear architecture to more haphazardly arranged curvilinear structures during the Wadi Suq. Ra's al-Hamra and Khor Fakkan are witness to entirely new, or re-occupied settlements in the second millennium BCE. Nud Ziba presents a case where substantial constructions seem to be undertaken, although the exact archaeological context for this activity is absent and requires more investigation.

The sole industrial site discussed here shows that smelting activity continued into the Wadi Suq period, possibly due to the environmental context at Wadi Hilo restraining production and thus resulting in a more sustainable practice than at other copper smelting sites. Different workshops are constructed out of stone, although the phasing is again rather fuzzy and clear indications of Wadi Suq building are scant. However, it seems that at least the restructuring of the northern part of structure C into a workshop align chronologically with the Wadi Suq phase, as indicated by ceramics and radiocarbon dating. The creation of an additional workshop area might indicate that production

picked up in this period. No domestic settlement has been found at the site as of yet. It is possible that the type of habitation here is less visible archaeologically due to the degree of mobility, the nature of the remains, or both. Alternatively, the workshops could have been inhabited by a group of limited number.

From the different sites in these first three groups, some Wadi Suq characteristics for the built environment can be distilled. First is the construction of walls of two rows of upturned slabs with a rubble infill, which likely carried a superstructure of mudbricks, as is clear from the remains from Hili 8. Variations of this type were found at Bat, where a possible transitional style is evident, and possibly at Wadi Hilo, although here it is unlikely that it represents a distinct Wadi Suq element. Furthermore, the building of mudbrick platforms over tower structures is a recurrent theme, as well as the creation of terraces, either by depositing sediments or by cutting into hillslopes. These activities of considerable magnitude created surfaces upon which Wadi Suq settlement, in all its forms, could manifest itself.

A relatively large range of building types are being constructed during the Wadi Suq. In most of the sites reviewed, it is likely that complete structures or large parts of them were created with ephemeral materials. This is clear from numerous postholes found, and often an interpretation is given that considers forms like *barasti* structures or huts of palm fronds. However, as very little attention is given to this type of trace, it is for now impossible to reconstruct a more precise configuration of the ephemeral buildings and more options should be considered in light of the high variety in house structure that can occur in a more mobile society. These different forms can hold different implications for the lifestyle of a population, including the exact degree of mobility. In other sites, curvilinear walls are built with locally available rock to form single or multi-celled structures. Yet other arrangements consist of rectangular building of mudbricks, or of stone-built layouts that also likely carried an ephemeral superstructure. It is thus clear that a myriad of options were available to the Wadi Suq house builder, including both forms that were rooted in what was known before and forms that clearly broke with earlier traditions.

The temporary sites offer an alternative site type to the others, that are often presumed to be inhabited quite permanently. Here, seasonal visitations were likely paired with the consumption of hunted animals, and herding. At the sites, limited craft production was conducted, and the inhabitants brought along resources that were procured in niches at the coast and in oasis sites.

In sum, Wadi Suq settlement took on many different forms and came to variable expression in different environments. Despite the decrease in total occupied settlements when compared to the preceding period, substantial settlements are still inhabited, be it as a continuation of the settlements that were already present or in new locations. The settlements consist of simple buildings of different forms and configurations, made of locally available stone, mudbrick, or ephemeral materials that have not been preserved interchangeably. A higher degree of mobility of the population is evident in those sites that see a more short-term but persistent occupation, of which two have been identified in the desert environments of southeast Arabia. Substantial activity at the monumental tower sites indicates a continuation of the behaviors that were likely carried out

there in the Umm an-Nar, but clear domestic occupation can not be convincingly associated with them.

Chapter 5: The Sohar Hinterlands and Burj Huraiz

This chapter aims to characterize settlement and construction in the Sohar hinterland by assessing primary data sources produced during the Wadi al-Jizzi Archaeological Project (WAJAP). The sites that will be discussed have already been published in some detail (see Düring & Olijdam, 2015; Düring et al., 2019; de Vreeze et al., 2020; Olijdam et al., 2025). However, in the current analysis, the scope of investigation lies on the built remains and the transition from the Late Umm an-Nar to Wadi Suq periods specifically. Therefore, information from these papers will be supplemented with data from various (unpublished) WAJAP resources, such as trench reports, digital documentation, specialist reports, and the project database. Where necessary, references will be included to the various reports.

Some of the data was collected by the author during the 2024 field season, mostly pertaining to digital measurement data in the form of Shapefile (.SHP) documents and 3D photogrammetry models of various features created with picture from motion software (Agisoft Metashape Professional, version 1.8.5). These data are analyzed with an open-source GIS platform (QGIS 3.42). Images were captured with a UAV (DJI Mavic mini) and a handheld DSLR camera. The photogrammetry procedure was in accordance with best-practices as outlined by Sapirstein and Murray (2017). These two additional data sources will aid in a more detailed discussion of the built remains at the site, as it allows for precise measurements of the different features that were unearthed in a post-excavation setting. This will facilitate an in-depth discussion of the archaeological traces, which will then be compared to patterns observed in the wider region in the subsequent chapter.

This chapter will first introduce the Wadi al-Jizzi Archaeological Project, then discuss which sites and remains discovered and excavated by the project are relevant to the current research, and finally describe and analyze these archaeological traces in high detail.

5.1 The Wadi al-Jizzi Archaeological Project

The Wadi al-Jizzi Project commenced in 2014 and carried out annual survey campaigns until 2018, totaling 5 seasons. After a short hiatus, the project returned in 2023 and 2024 for small-scale focused excavation in order to gain a better understanding of the chronology and context of Site 73, which comprised a settlement with both Umm an-Nar and Wadi Suq components.

The project focused on an area in the hinterland of Sohar, mainly following major Wadi corridors inside which occupation clustered during prehistory (Figure 52). Particularly the confluence of freshwater and copper resources in the Hajar al-Gharbi foothills made the area an attractive location for settlement in the past. The aim of the project was to document an extensive archaeological landscape in the Batinah region of Oman, which was until then still under-investigated compared to other regions of southeast Arabia. Moreover, as Oman is in the process of modernization, many sites in this region were destroyed or under severe threat of developments in agriculture and industry, urban expansion, hydrological management and the exploitation of natural resources (Düring & Olijdam, 2015, pp. 95-96).

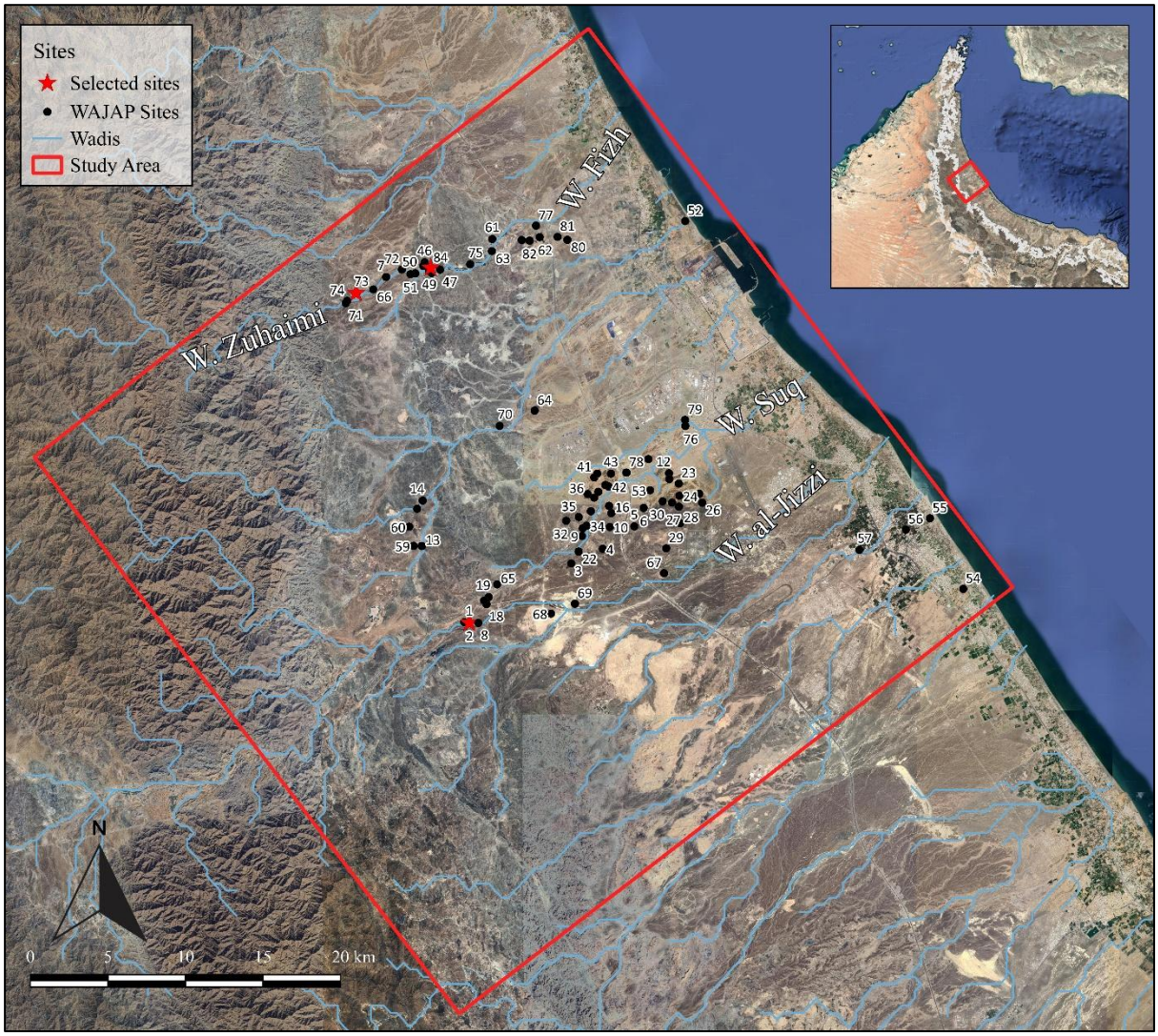

Figure 52: An overview of the study area in the Batinah region of Oman, showing the study area, selected sites, and the sites discovered during the WAJAP surveys. The inset shows the location of the study are in southeast Arabia (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

The study area falls within geographical Zone 5, the Batinah region of Oman, in which different terrain types are located. Broadly speaking, there are the foothills of the Hajar mountains in the west, and alluvial Wadi terraces of gravel towards the coast in the east (see Chapter 3 for a more detailed description). It is at the interface of the terraces and the piedmont zones that the selected sites are located.

5.2 The Surveys (2014-2018)

The project conducted five seasons of survey work between 2014 and 2018, and identified a total of 84 sites dating from the Early Bronze Age to the Islamic period. Relevant to the current thesis are the sites belonging to the (Late) Umm an-Nar to Wadi Suq transitional period, as well as sites that hold traces of Wadi Suq settlement. There are a total of three locations that fall within these criteria: sites 2, 84, and the complex of sites 66 and 73, which are all located in wadi valleys (see Figure 1). The first

two comprise smaller sites, whereas the latter is a collection of settlements, a field system, and a cemetery dating to the Umm an-Nar, Wadi Suq, and Islamic period.

5.2.1 Site 2

Site 2 is located in the upper Wadi al-Jizzi valley and consists of several stone-constructed buildings of which the lower courses are still visible at surface level. The site borders the wadi almost directly and sits on its northern bank. Furthermore, the site is located ca. 16 km west of the Wadi Suq cemetery that was investigated by Karen Frifelt (1975) and where the Middle Bronze Age was first recognized as a distinct archaeological culture. The site is comprised of about nine structures, which align in a linear pattern.

Generally, the structures are built with large stone blocks set directly on the surface, although smaller stones are also incorporated. The walls are ca. 60 cm thick and there is no use of mortar. The structures align on a linear axis running southwest to the northeast, parallel to the slope of the terrain (Düring & Olijdam, 2015, pp. 98-99).

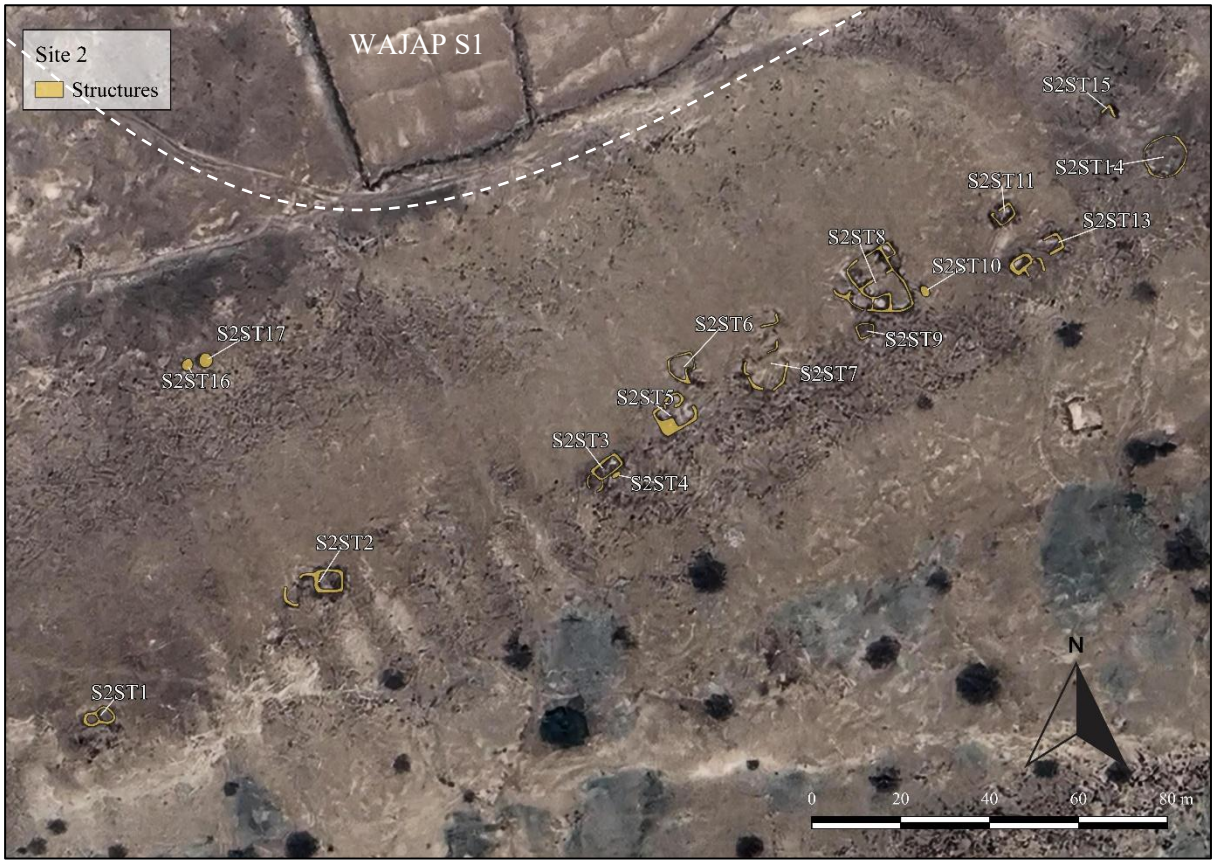

Figure 53: Overview of WAJAP site 2. (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

The structures at S2 provide a unique case. To facilitate an analysis, structures 2, 3, 5, and 8 are discussed in more detail as these seem to represent domestic units (Figure 54). The first two structures are rectangular configurations with a single curvilinear attachment. Structure 5 appears as a more complex configuration of the same model, where multiple rectangular and curvilinear elements are combined. Structure 8 is the most sophisticated of all as a result of its size and internal

layout. It consists of a main space that is somewhat rectangular and contains an internal wall that divides it into at least two separate rooms. On the western side, an annex was added consisting of a further two rooms, and to the northeast another room of ca. 2 by 2,5 m is situated. The structures have not been excavated and their phasing and exact layout could not be retrieved from the surface remains. In general, construction is relatively neat, with building in distinct layers. In several buildings, large stones of 70-80 cm in length were used, and flat surfaces were lined up with the inner or outer face of the buildings.

As Düring and Botan mention in their analysis of the site, all but the largest structure could classify as workshops or simple domestic units, while the structure 8 compound may have functioned to house different smaller ephemeral structures inside its cells or could have contained animals and functioned as a corral (Düring & Botan, 2018, p. 24). However, despite a mention that it might concern a Wadi Suq settlement, they approach it as an example of Umm an-Nar settlement. In doing so, a division between smaller structures and compounds of over 100 m^2 is made, with the latter being designated a function as described before as an animal pen or base for ephemeral structures. This distinction is certainly valid for the Umm an-Nar buildings at large, where the structures with larger surfaces generally contain larger open courtyard spaces. However, here this does not seem to be the case, as this structure is largely subdivided into smaller spaces. This is especially relevant if the northern outside wall and the dividing wall in the center of the largest space were disturbed by the channel streams that are visible in Figure 54 and these walls are revealed to connect rather than being interrupted. To clarify this, however, excavation would be required.

Figure 54: Detailed view of structures 2, 3, 5, and 8 at site 2 (Figure by Ruben Hartman, background: WAJAP).

In addition to these units, several additional structures are present in the settlement, including several potential burial cairns. For most structures it is hard, if not impossible to determine their exact function. However, for structures 6, 7, and 14 a function as corral could be proposed because of two reasons. First, because the structures are rather large in area and therefore roofing them would have been less easy, and second, because they all lack clearly defined rooms (similar to the courtyards at s73; see Düring et al., 2019, p. 118).

If Site 2 were to be considered an Umm an-Nar hamlet, it would represent a significant deviation from the period's general building style, which relies heavily on rectilinear configurations (see Chapter 5.1). This supports the hypothesis that we are dealing with a transitional or early Wadi Suq settlement (cf. Düring & Olijdam, 2015, p. 99). The combination of rectilinear and curvilinear configurations is known from different Wadi Suq contexts (e.g., Wadi Hilo, RJ-1) as discussed in the previous chapter. The linear arrangement of the structure is likely the product of the position of the settlement along a similarly linear slope. However, it is also possible that part of the original settlement was destroyed when an extensive field system (WAJAP Site 1) was created upslope to the north of the site during the Islamic period. The modular unit at Site 2 consist of rectangular rooms of approximately 6 by 4 m, which is in many cases extended by an annex and in some cases integrated in more complex plans.

As a whole, the settlement has up to 5 or 6 small structures that likely represent simple domestic units. Structure 8 could be a domestic structure, but could also have functioned to contain animals, although this is less likely if the three corrals on site are also considered. As such it probably housed a small community of at most a few dozen people. In accordance with what Düring and Botan have stated, this community likely did not require formal public spaces, such as streets, courts, and towers, due to their limited size. Its inhabitants most likely held livestock, and maybe also practiced a form of agriculture, and might have inhabited the settlement on a more seasonal basis (Düring & Botan, 2018, p. 24). The structures remind of the workshops at Wadi Hilo, where a similar combination of rectilinear and curvilinear building is evident. Construction wise, the settlement mimics that of Ra's al-Jinz RJ-1, with its dry-stone masonry and in some cases, curvilinear arrangements. The site thus displays elements also observed at other Wadi Suq sites. However, alike most of RJ-1, this site remains unexcavated and a much more detailed assessment is for now not possible.

5.2.2 Site 84

Site 84 is located along a side wadi of the Wadi Fizh some 2 km upstream from the namesake village. It consists of a concentration of artefacts on a steep hillslope where small terrace walls were constructed, forming terraces of 1 to 1,5 m wide. The concentration of finds consists mainly of ceramic sherds, generally dating to the Late Wadi Suq or early Late Bronze Age; the site is dated to between 1700 and 1600 BCE. The motivations behind the location choice remain enigmatic. The vessels, mostly storage wares, give some indication as to the function of the site: a secluded location used to store the goods of local communities which might have been absent for larger parts of the year (de Vreeze et al., 2020). Such a function aligns well with a strategy sometimes employed by pastoralists to overcome the issue of 'economies of scale', which means that mobile populations did

not have access to technologies that require the use of large or heavy utensils or objects. Through strategies of caching, more mobile populations are able to make use of technologies requiring tools or objects not easily transported over long distances due to their weight or fragility. These technologies include storage, for which we have good evidence here, but can also extend to processing of resources with larger or fragile tools (Eerkens, 2003, p. 735). Site 84 can thus be interpreted as a site with a storage function through a caching strategy employed by mobile groups in the later Wadi Suq or early Late Bronze Age in the Batinah. These strategies did not only allow such groups to make use of certain technologies, but also invariably tied them to these locations, warranting their return in some sort of mobility cycle.

Figure 55: Oblique view of the steep slope that hosts site 84 (adapted from de Vreeze et al., 2020, p. 144, Figure 2).

De Vreeze et al. draw a comparison with the sites of Masafi 5, Khor Fakkan, and Shimal (de Vreeze et al., 2020, p. 153). These sites are comparable to Site 84 in terms of their construction and use of terrace walls, although the terraces are generally wider and also involve the construction of buildings of different complexities (see Chapter 5.6.5 for Khor Fakkan; for the others see Degli Esposti & Benoist, 2015; Vogt & Franke-Vogt, 1987). The sites have a later date, with Khor Fakkan spanning the Wadi Suq and Late Bronze Age, while Masafi 5 and the Shimal settlement date to the Late Bronze Age. Site 84 thus aligns well with these other, possibly contemporary settlements in its use of terracing as a construction style, although at a reduced scale and perhaps for different purposes.

In terms of function, it is tempting to match the site to the temporary places as they are described in chapter 5, as these are also linked to intermittent visitation and a higher mobility of its users. However, looking at the characteristics Site 84 does not display any signs of extended, intermittent residence as is clear for the temporary places, nor is there evidence for any activity other than storage at site 84. The main characteristic that they have in common is their adaptation to lifeways that are more mobile. In terms of function, Site 84 may be seen as representing a separate category

in its own right. De Vreeze et al. link the site to a model of multi-sited communities (de Vreeze et al., 2020, p. 152) as described by Bernbeck (2008) and proposed for southwest Arabia by Weeks, Cable, Franke (2019). This is a model of mobility where a community occupies a network of ites that see ephemeral or focal use. In this setting, focal sites may become ephemeral after the main occupation shifts to a new focal location, which might have been occupied by an ephemeral encampment before. It accounts for multiple, smaller scale movements as well as larger-scale mobility over the longer term. Smaller-scale mobility is employed in search of new potential settlement locations and for revisiting previous, abandoned settlement locations. In such a configuration, it could be imagined how a site like this would function as one such ephemeral site node in a larger network of sites functioning to facilitate different types of mobility.

5.2.3 Site 66/73 – Burj Huraiz

Sites 66 and 73 are located several kilometers upstream from site 84. The sites are situated on the north bank of the Wadi al-Zahaimi on a relatively flat alluvial terrain and stretch out over an area of ca. 2 km in length. This location is fed by multiple smaller wadi systems, which would have provided access to water resources in the past, which likely forms one of the main reasons why settlements were constructed here in the past. The sites comprise a series of settlements and features that date to the Umm an-Nar and Wadi Suq, as well as the transitional period between these periods. The Wadi Suq buildings also saw limited reoccupation in the Iron Age I period. There is a hiatus from the 1st millennium BCE until the area was reoccupied in the Islamic period and a field system was created which was irrigated through a *qanat* (Düring et al., 2019, p. 115; Olijdam et al., 2025, pp. 186-187). In recent years, the site was named after the main Islamic hamlet and its field system, and is now known as Burj Huraiz (Olijdam et al., 2025, p. 185).

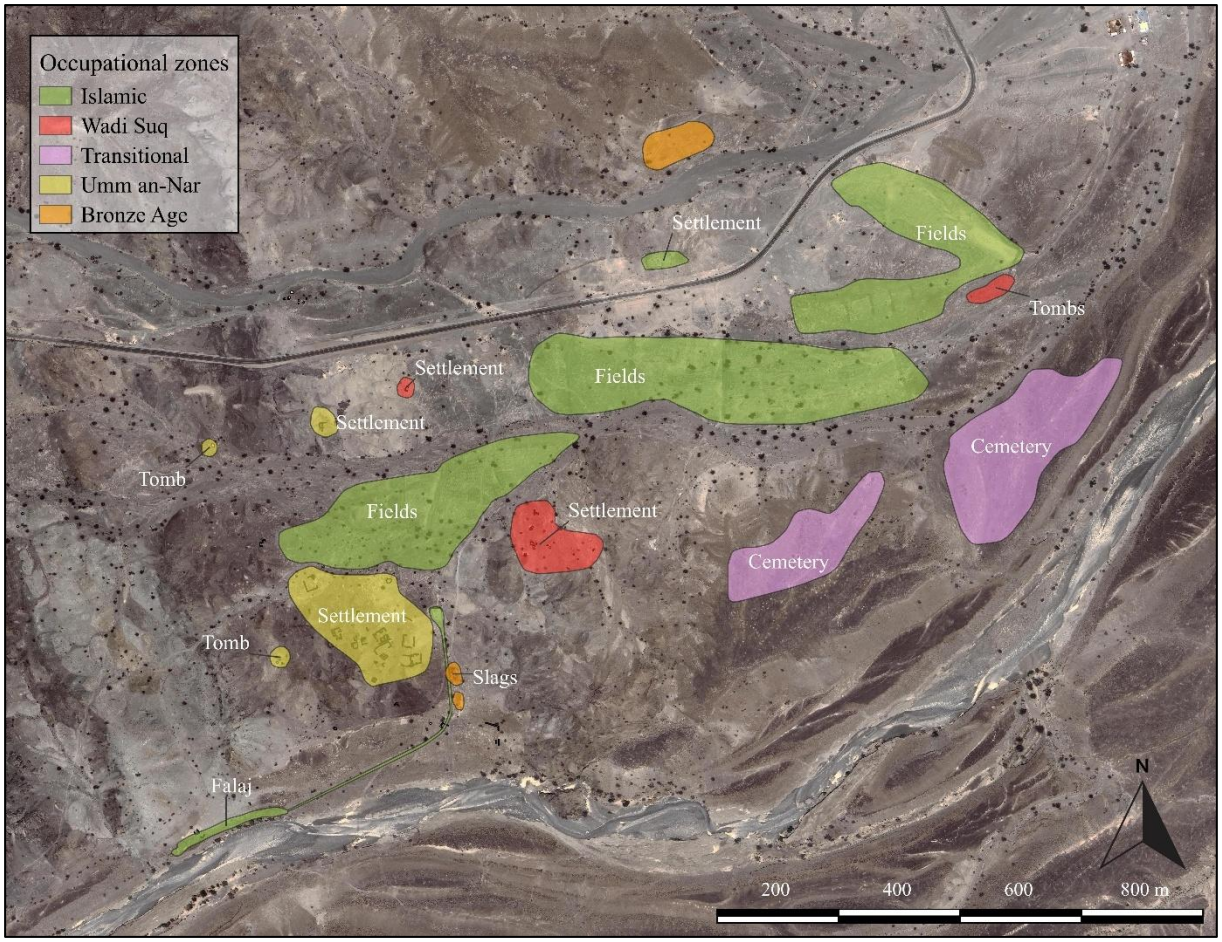

Figure 56: Overview of Burj Huraiz with the different zones of occupation (Figure by Ruben Hartman based on Olijdam et al., 2025, p. 185, Figure 1; background: Google satellite (Landsat / Copernicus Data SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

The Islamic period

Before discussing the prehistoric remains, several notable Islamic features require mention as they are important to create a complete overview of the archaeological landscape. The Islamic site of Burj Huraiz consists of an Islamic tower house placed on top of a walled and terraced hilltop, overlooking the modern road cutting the site from east to west. Surrounding the hill and on its flanks, sunken buildings are situated. To the west of the hill a small Islamic cemetery is situated with ca. 17 graves. To the south of the road, large areas are covered by an abandoned Islamic field system. These fields were irrigated by a *qanat* which tapped freshwater aquifers of the Wadi al-Zahaimi further upstream and transported this by channel to the fields of Burj Huraiz. The channel comes into the site from the southwest, and further west several *qanat* shafts are still present (Düring et al., 2019, p. 115).

The Umm an-Nar period

The Umm an-Nar settlement comprises about 20 buildings. These structures are for the most part clustered in the southwestern part of the site, but several structures lie farther away from the cluster (see Figure 56). The buildings do not follow a similar orientation, and the layout and size of the buildings differs amongst them. Most buildings are located on sloping terrain, while some are positioned on flatter areas. Others are constructed near the crest of low hills, such as St11 and St33 (Figure 57).

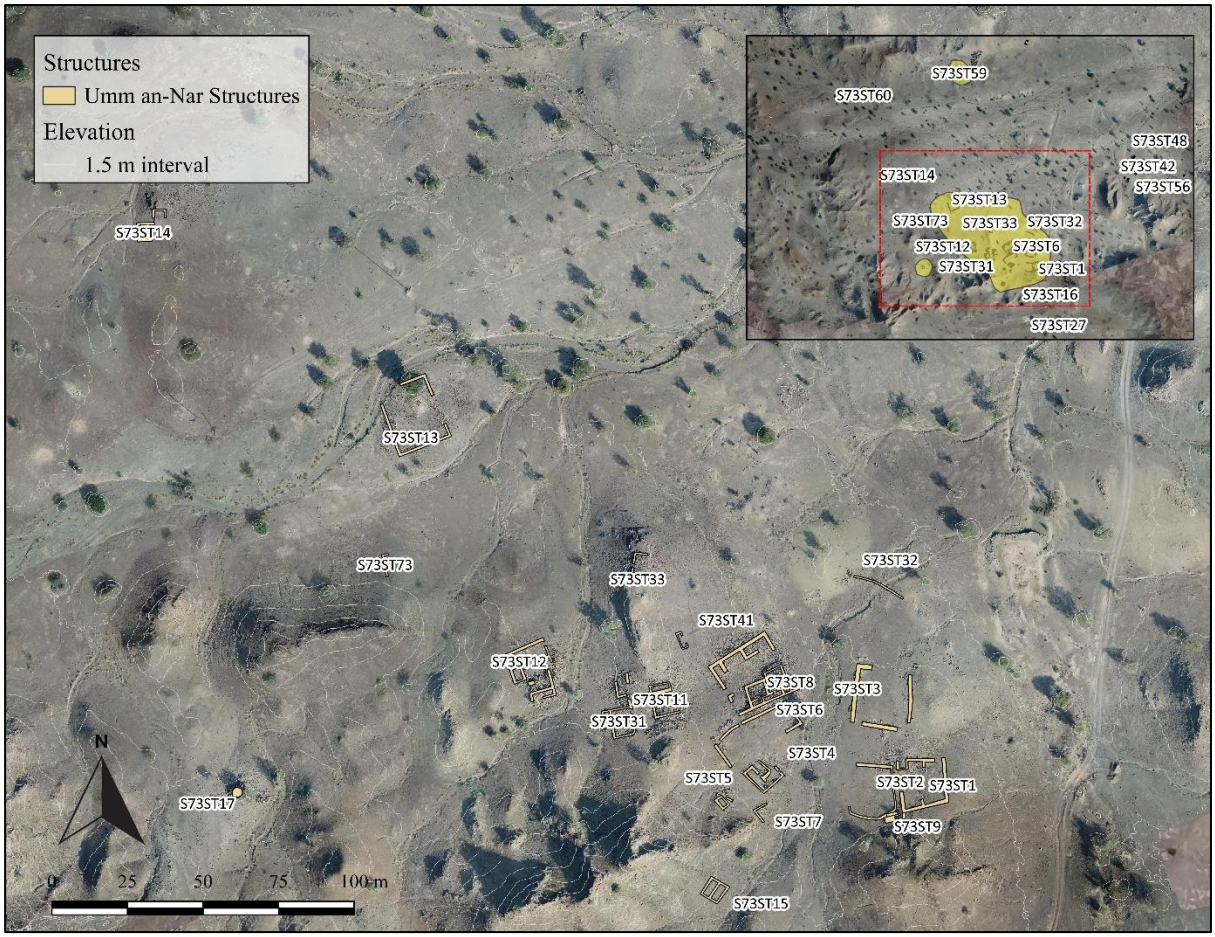

Figure 57: Overview of the main cluster of Umm an-Nar structures at S73 (Figure by Ruben Hartman, background: WAJAP).

Generally, the walls of the buildings are double faced and measure between 0.7 to 1.0 m in width. As mentioned, building size varies significantly, with some measuring around 5 by 5 meters, while others measure 20 by 20 meters. The Umm an-Nar buildings have before been assorted into a typology of small buildings, large buildings, and compounds, based on their size which increases with every category (Olijdam et al., 2025, p. 188). This sorting can be seen in Figure 58, where some structures that do not allow for a representative measurement of their approximate dimensions have been excluded, e.g., structures for which only one wall has been located. The buildings in this period have an average area of ca. 155 m^2. Looking at the different categories, this comes down to ca. 33 m^2 for small buildings, ca. 140 m^2 for large buildings, and ca. 350 m^2 for the compounds.

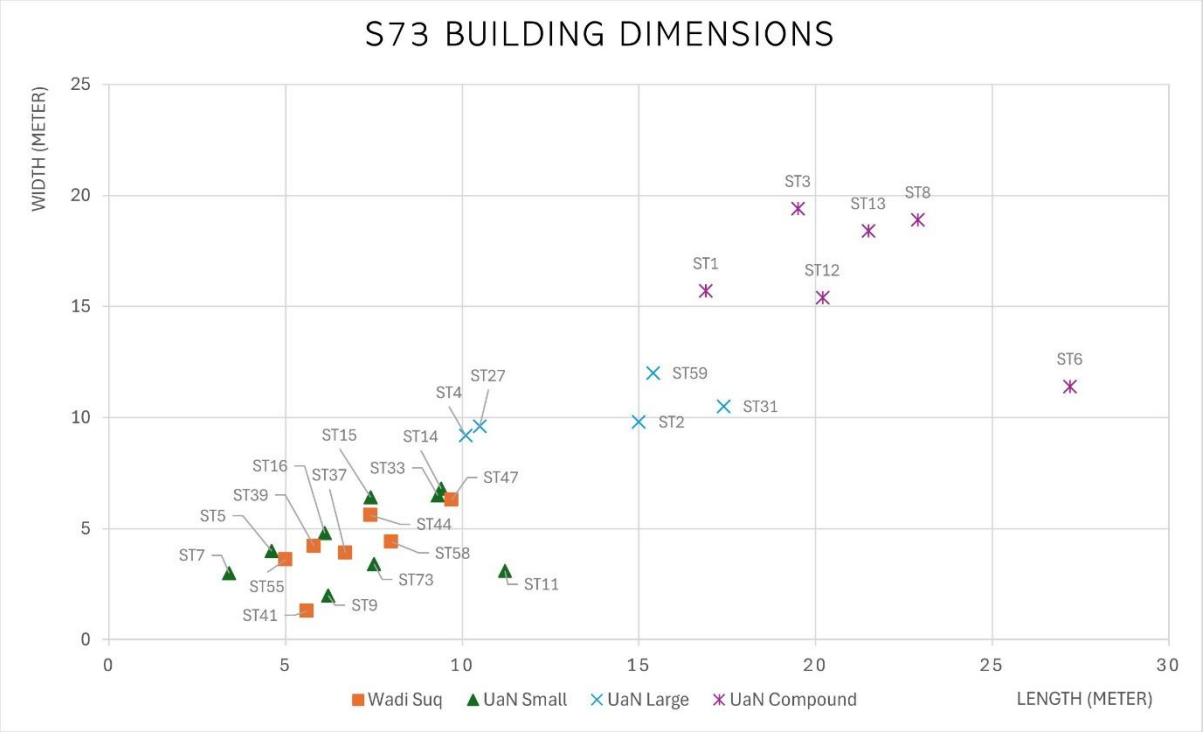

Figure 58: The Umm an-Nar and Wadi Suq structures at S73 plotted against their width and length in meters (adapted from Olijdam et al., 2025, p. 188, Figure 4).

It has further been postulated that the compounds were not roofed due to their sheer size, but functioned like open courtyard structures (Düring et al., 2019, p. 118). Alternatively, an interpretation of corrals can be proposed here, which could be expected if mixed agriculture and pastoralism was practiced. This is in line with the interpretation of other Umm an-Nar settlements in the Sohar hinterlands (Düring & Botan, 2018, p. 24). Excavation of these structures would clarify their structures, which for now remains speculative. For the small and large buildings a domestic function would be most obvious.

Due to a lack of collapse stones near the structures it was initially thought that the walls in the Umm an-Nar settlement were not much higher in prehistory than they are today (Düring et al., 2019, p. 118). However, the excavation of two Umm an-Nar structures has revealed a significant depth of deposits which were characterized by thick layers of wall collapse, revising this idea. It is now thought that the stone walls might have stood up to the height of stature of a prehistoric person of ca. 1,7 m tall (Olijdam et al., 2025, p. 186). To the west and northwest of the cluster two tombs are located. Although they remain unexcavated, the surface features suggest they are subterranean collective tombs (Düring et al., 2019). All in all, the, the Umm an-Nar settlement consists of a clustered settlement with differentiated building forms and sizes, which may suggest that the buildings also were host to different activities.

The Wadi Suq settlement

Similar to the Umm an-Nar settlement, the Wadi Suq settlement consists of one concentration of structures with several isolated buildings at some distance to the north of it. However, the Wadi Suq settlement is much smaller in size and quantity of the buildings. It is situated 250 m to the northeast

of the Umm an-Nar settlement, and is separated from it by a low hill ridge. It is likely that this hill obscured a direct line of sight between the two centers of settlement, while the terrain does allow for a good observation over the terrain to the north that is cut by several minor wadis today. It is likely that here agricultural fields were positioned, the remnants of those from Islamic times still well visible from the air today. The Umm an-Nar settlement looks out over the western section of these fields, while the Wadi Suq settlement is so positioned to have a better view over the eastern section of the fields. Perhaps the settlement shifted due east, as new fields were cultivated in the Wadi Suq, possibly as the previously worked fields had silted up, or had their mineral content extracted. This is reinforced by the knowledge that the Islamic fields to the northeast of the Wadi Suq hamlet produced a background noise of Wadi Suq ceramics during the survey (Olijdam et al., 2025, p. 196).

The Wadi Suq structures are generally much smaller than the Umm an-Nar counterparts. The main cluster of buildings comprises four to five rectangular buildings that measure around 6 x 3 m and mostly consist of a single rooms. The walls measure on average only 40 cm wide, and are constructed with smaller stones than the buildings of the Umm an-Nar settlement. Around the structures, significant amounts of *Terebralia palustris* shells and large hearth features were found (Düring et al., 2019, p. 125). The structures display much less variation in their size, and have an average area of ca. 27 m^2, comparable to the category of small buildings from the Umm an-Nar settlement (see Figure 58). As the buildings are smaller, they also proved harder to reconstruct in their totality based on the survey data. Many of the structures are therefore in a very fragmented state and the true dimensions may still deviate from the general overview given above. This also complicates an exact description of the settlement for now.

Figure 59: Overview of the Wadi Suq settlement at S73 (Figure by Ruben Hartman, background: WAJAP).

The settlement as a whole represents a collection of likely domestic structures located on and near to sloping terrain, with one dispersed unit (STR58) situated about 300 m to the northwest in flat, open terrain. In between these two locations with building traces lie the field systems that date to the Islamic age, but which were possibly also in use in earlier times. Again, no clear orientations are seen in the buildings. In total, five buildings can be discerned in the Wadi Suq settlement, with a possible sixth structure for which only a corner has been documented during survey. Similar to what was argued for Site 2, this settlement likely comprised a small community of a few dozen people. In contrast with said site the evidence for pastoralism, mainly through the presence of corrals, is less obvious here.

The transitional cemetery

To the east of the Wadi Suq hamlet, a cemetery is located consisting of approximately 170 tombs spread over an upper (western) and lower (eastern) terrace. This cemetery is dated to the transition between the Umm an-Nar and Wadi Suq periods based on the ceramics collected during survey, and the similarity of the tombs and their clustering in alignments to those at the cemetery of ‘Asimah, which also dates to the transition between the 3rd to the 2nd millennium (Düring et al., 2019, p. 120; Vogt, 1994, p. 99). From the survey, relatively few finds have been retrieved which could mean that

the cemetery has not been looted and is still well preserved. Pottery was found in the form of domestic types, which were often found directly east of the tombs – a pattern that has been linked to post-funerary activities (Düring et al., 2019, p. 121).

5.3 The Excavations (2023-2024)

In the winters of 2023 and 2024, WAJAP returned to Burj Huraiz in order to conduct focused excavations of several structures so that a better picture of the chronology and context of the site could emerge. In the Umm an-Nar settlement, structures 4 and 33 were excavated by opening two trenches of 5 by 10 meters for each. In the core of the Wadi Suq settlement, structures 37, 44, and 39 were excavated, while the outlier structure 58 to the north of the main cluster was also excavated. Due to their smaller size, these structures were exposed in single trenches of 5 by 10 meters.

5.3.1 The Umm an-Nar Settlement

Structures 4 and 33 are both located in the Umm an-Nar settlement nucleus. Although they approach each other in size, structure 4 measures towards the smaller end of the large structures, while structure 33 is among the larger small structures. Both buildings were excavated in two trenches of 5 by 10 meters and in one season; structure 33 was excavated in 2023, and structure 4 in 2024. Both represent structures of a size that appears feasible as a domestic configuration, being of sufficient to house multiple individuals, but small enough for effective roofing to be installed.

Structure 33 (AO18)

Structure 33 is located on the ridge of a small hill and can be seen in Figure 60. Its western wall sits roughly on the hillcrest, while the rest of the building rests on the eastern slope of the hill. By opening two trenches, most of the building was exposed, except for its southern exterior wall. The structure is rectangular in form and is partially dug into the bedrock to varying depths. On its interior, there are two walls, of which one runs parallel to the northern exterior wall and separates the building into a northern and southern space. The other is positioned perpendicular to the northern wall and divides part of the northern space into two compartments. It runs only until the middle of the northern space, keeping the compartments connected through a relatively large, open space which might have functioned as a courtyard. No clear entrances were discovered during the excavations, and it is thought that these were positioned at a higher level than is preserved (Düring, 2023, p. 9; Olijdam et al., 2025, p. 186).

Figure 60: Detailed overview of trench AO18 with Umm an-Nar structure 33 (Figure by Ruben Hartman, background: WAJAP).

The walls are preserved to a height of 60 cm and were constructed with a mixture of larger boulders which were lined out so that their flat face created a flat wall face, and smaller cobbles that functioned as a wall filling. Flat slate was interspersed in the masonry to provide additional cohesion to the construction. Extensive collapse deposits of up to 50 cm deep indicate the structure was considerably higher in its initial state. Further, due to its position on top of a hill, the material could not have derived from elsewhere (Düring, 2023, p. 10). Large amounts of silty loam were used as a mortar, which held an abundance of land snail shells of the species *Melanoides tuberculata* and *Zootecus insularis* as is clear from the collapse layers and the *in situ* wall fill. As the *Melanoides* are an aquatic species, and *Zootecus* prefers moist soils (Schmitt et al., 2024, pp. 4-5), they indicate that the loamy mortar derives from sediments that were under influence of low-flow or standing water. The most obvious provenance for such sediments would be the nearby fields, which would have received the most constant water supply on site by means of the system of smaller wadis running through it.

This also indicates that these fields must have been well-watered in the Bronze Age, and hints at the possibility that they were in use for agricultural purposes at this time.

About 500 of the 600 sherds found were determined to be Umm an-Nar styles, while only 12 Wadi Suq sherds were found. The rest of the sherd were not determinable. Several sherds that were found in concentrations in between the collapse layers could later be fitted together, indicating that complete vessels were suspended from the ground at the time of collapse (Olijdam et al., 2025, p. 186; Figure 61). In addition to the smaller gastropods, only 11 fragments of *Terebralia* were retrieved from this trench. Further, two valves of the *Anadara* shell species held colored substances that were revealed as malachite and goethite, possible cosmetics (Olijdam et al., 2025, p. 192). Lastly, about 200 fish vertebra and 20 other fish bones were retrieved from this trench, all deriving from household refuse contexts (van Litsenburg, 2023).

Figure 61: Sherds in between the collapse layers of structure 33 (Photograph by Bleda Düring).

Structure 4 (AS25)

Structure 4, excavated in 2024, is located at 70 m to the southeast of structure 33 on slightly flatter terrain at the foot of another hill. Its construction can be considered very neat. The walls are made of larger boulders of which the flat sides are aligned to form the wall face, although there is some variation in the use of materials. There are three courses that form straight lines. Inside the wall fill, bedrock chunks were found. As well as ceramic sherds. As a whole, the structure forms an L-shape and is divided in a long western chamber measuring ca. 9,5 by 4 m, and a smaller eastern chamber of 6,5 by 3 m (Vermaes, 2024, p. 4). In the southwestern wall, opening into the western chamber, a

doorway was found which was clearly delimited by a large threshold stone. The bottom of this stone was floating ca. 20 cm above the interior surface.

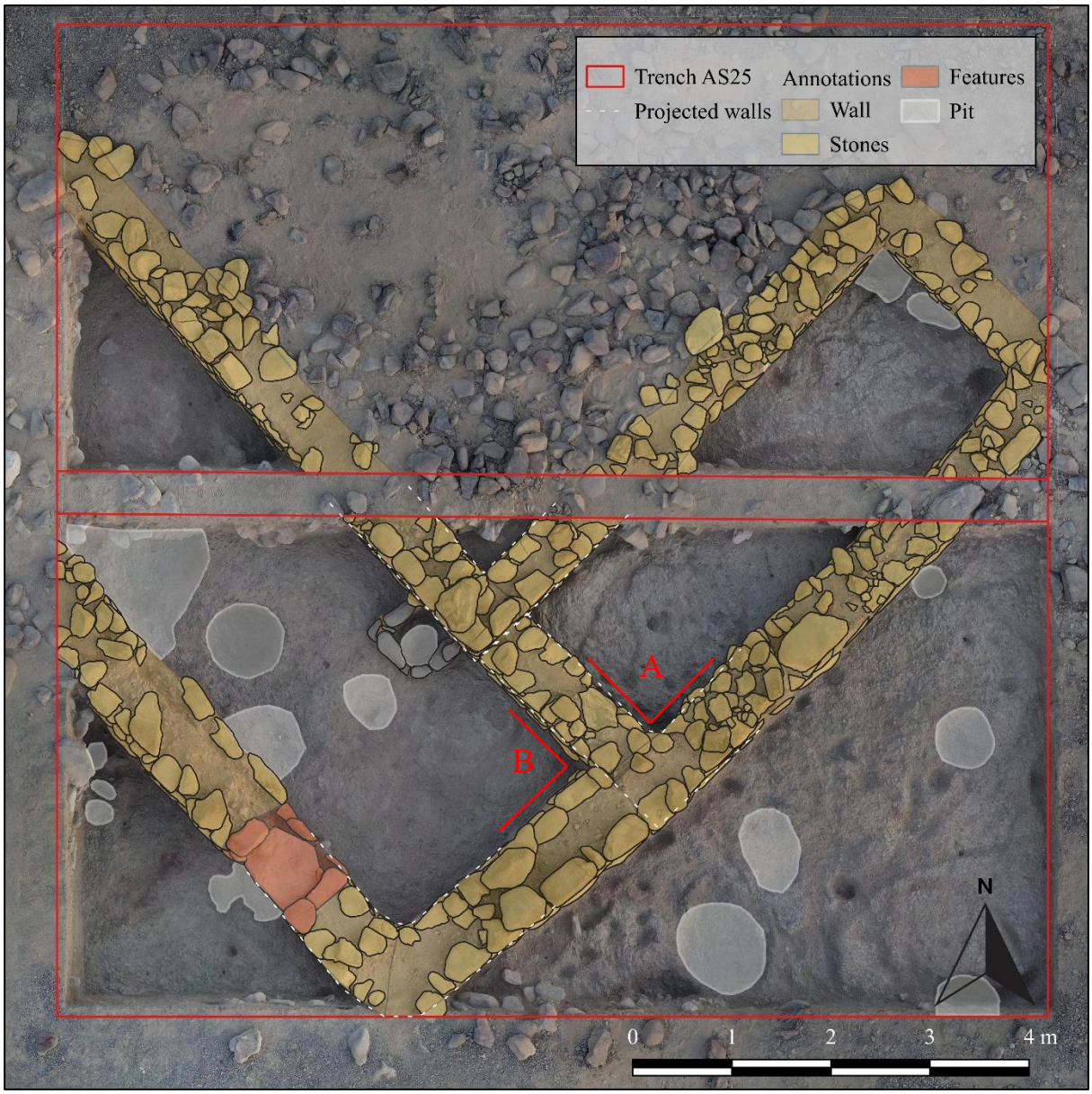

Figure 62: Detailed overview of trench AS25 with Umm an-Nar structure 4. The red lines indicate the perspectives visible in Figure 63 (Figure by Ruben Hartman, background: WAJAP).

None of the walls appear to have formed uninterrupted joints in the corners, except for the corners between the southwestern and southeastern walls of the western chamber, and those of the eastern chamber. This complicates the phasing of the building. Three groups of walls were identified in the field that appeared to have been contemporaneous by the excavators, each corresponding to one of the corners highlighted in (Figure 62). The articulation of the western and eastern chambers, as well as the interior corner of the eastern chamber are visible in Figure 63. It remains unclear which part of the building was built first, and perhaps part of the building that could clarify this remains buried.

Figure 63: Detail of the walls in structure 4. A) shows the articulation of the southwestern (right) and southeastern (left) walls of the eastern chamber. B) shows the articulation of the southeastern wall of the western chamber (right) and the southwestern wall of the eastern chamber (left) (3D model created by Ruben Hartman).

In the western chamber, the bedrock was flattened to form a floor, while in the eastern chamber there was no modification of the bedrock surface. The western segment also held several features, including several pits, among which also a very round, deep pit, as well as a stone-built silo feature. On top of the bedrock, clear occupational layers were found which had denser find concentrations consisting of various material categories (Vermaes, 2024, p. 4).

A total of 18 pits were discovered inside and mostly outside the structure. These often filled with angular stones but held not much else in terms of finds, indicating that they were likely used for cooking in vessels or smoking meats and fish. They did produce charcoal, which was sampled for radiocarbon dating in several cases, and which consistently dated to the last quarter of the third millennium (Olijdam et al., 2025, p. 189).

In this trench, 637 pottery sherds were collected of which 513 are of Umm an-Nar date. This is similar to the ceramics from structure 33. In addition, 16 wares were identified that date to the Late Umm an-Nar to Wadi Suq transition, and 42 sherds were determined as Wadi Suq. This is in accord with the ^{14}C dates from this structure, as well as the overall dating of the site to the transition from the Umm an-Nar to Wadi Suq. A total of 265 find lots held shell material. Of these, 150 were of either *Melanoides* or *Zootecus* species, shells that were again also abundant in the collapse layers. About 259 fragments of *Terebralia* were found, amounting a minimum of 105 individual specimens and a total weight of 532 grams. Finally, two marine fish species were identified from two fragments in this trench's faunal assemblage (van Litsenburg, 2024).

Umm an-Nar settlement at Burj Huraiz

The excavation of the Umm an-Nar structures at Burj Huraiz have made clear that we are dealing with substantial stone-built units that are preserved up to 60 cm and were likely much higher in antiquity. It has even been proposed that the stone walls were of sufficient height to accommodate people with a stature of 1,7 m tall without the need for an organic superstructure (Olijdam et al., 2025, p. 186). The construction of these buildings is neat, although variation in techniques and styles are visible even between the wall of the same structure. This might indicate that different people worked on these constructions (Olijdam et al., 2025, p. 189), who likely adjusted the structures to fit their changing needs over a period of multiple generations. The recurrent use of soils deriving from wet or moist environments indicates the existence of local knowledge with respect to the procurement of building materials.

The presence of semi-complete vessels in between collapse layers, indicates that these objects were likely still intact at the moment of collapse and that the buildings were not completely cleared out before they were abandoned. Still, no complete inventories were preserved within the buildings, so it unlikely that the buildings were left in a hurry.

The diet of the Umm an-Nar settlement remains obscure. Ample fish remains were identified in AO18, and evidence for two different species was found in AS25. Marine components likely comprised part of the diet, but is is hard to say exactly how much. The inhabitants of the site might have visited the coast themselves, or retrieved these resources via trade interactions. Further, a single Ziziphus stone fragment was identified in one of the Umm an-Nar structures. Although edible, this single specimen might also have been transported to the site by accident and does not provide any indication that these were either tilled or that they made up part of the past diet (Bakels, 2024).

5.3.2 The Wadi Suq Settlement

In total, four of the Wadi Suq structures were excavated. Structures 37 and 44 were excavated in 2023, while 58 and 39 were excavated in 2024. The author of this thesis was involved in the excavation of the latter two. Three of the structures (37, 39, and 44) are located in the cluster of settlement in the southeast of site 73, while structure 58 is located to the north of the Islamic field system and lies at some distance from the cluster (Figure 59). In all Wadi Suq trenches, younger sherds were found during excavated and initially given an Islamic dating. Later, detailed pottery analysis pointed out that almost all of these sherds bear an early Iron Age date.

Structure 37 (BP08)

The exterior of structure 37 measures ca. 6,0 by 3,5 m, with a minimum interior dimension of 4,8 by 2,5 m (Figure 64). During the excavation, three walls were exposed. The eastern and southern wall display similar masonry styles, incorporating stones that are 20-40 cm in size. They are made of a relatively neat double-faced masonry, and the stones are aligned with their flat sides to form the wall face. The western is fundamentally different, being built with a more random arrangement of stones that have variable orientations and sizes. In the middle of the structure, a scatter of wadi pebbles is situated that appears to form an elongated feature running west to east across the building.

Figure 64: Detailed overview of trench BP08 with Wadi Suq structure 37 (Figure by Ruben Hartman, background: WAJAP).

Due to the differences in construction, the western wall is considered a later addition to the structure, of which the eastern and southern walls form the remains of the first iteration. Based on the ceramic assemblage from this trench, it is likely that this wall dates to the Iron Age I (Düring, 2023). There were no traces that an older western wall ever existed before the Iron Age I construction in this area. Based on the masonry style, the feature in the middle is likewise deemed an Iron Age addition. It is possible that using locally available collapse and wall stones, the Iron Age occupants rearranged the structure into a smaller, square-shaped enclosure over the northern half of the structure. The exact extent of the Wadi Suq building to its west is unknown as the western wall is missing, but it is unlikely that it reached much farther than the Iron Age wall. The southern wall gives an indication of the structure's minimum width, measuring 3,5 m.

577 pottery fragments were identified. 324 of these date to the Wadi Suq, 214 to the Iron Age I, and 17 were of Umm an-Nar date. The remaining sherds could not be classified. This highlights that besides good evidence for a Wadi Suq occupation, a high degree of Iron Age activity is evident here. It is reported that nearly every contexts had an inmixing of this material (Olijdam, 2023). No secure Wadi Suq contexts were therefore found with the exception of the eastern wall. Of the Wadi Suq assemblage, there are 112 table wares, 77 fine wares, 69 storage wares, and 6 kitchen wares. This

indicates a domestic function for the building, with an emphasis on food consumption. Furthermore, large amounts of *Terebralia* were found in this trench, with a total count of 1497 fragments, from which a minimum of 262 individual specimens was counted. The total weight of the shells was almost 4,3 kg.

Trench BP08 held particularly many ground stone tools, a total of 52, of which 48 had a grinding function. Although most of these were found in secondary contexts, they still provide a proxy measure for agricultural activity at the site.

Structure 44 (BQ04)

Structure 44 measures 6 by 4,2 m and is visible in Figure 65. Measuring the exact contours of this building is complicated by the fact that it is cut into the bedrock on its eastern end. The inside of the structure is rectangular, measuring ca. 5,6 by 2,4 m and was entirely within the limits of the arbitrary trench. Before excavation of the interior could be completed, a younger cairn overlying the structure on its northwestern side was excavated and removed, and held no significant finds.

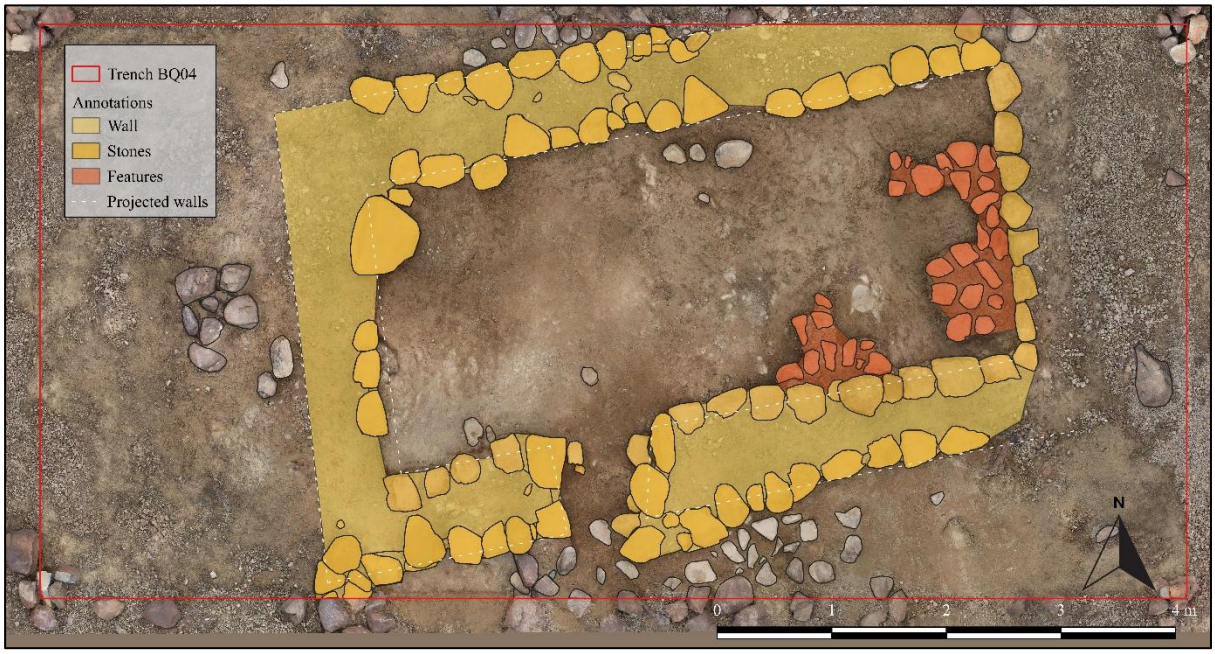

Figure 65: Detailed overview of trench BQ04 with Wadi Suq structure 44 (Figure by Ruben Hartman, background: WAJAP).

The northern and southern walls are again constructed in the double-face technique, although the masonry is less orderly than that of the east wall in BP08. The southern wall does not have a consistent width, and becomes wider from the east (0,8 m) to the west (1,2 m) as it culminates in a clearly delimited doorway that is ca. 0,7 m wide. The eastern wall consists of one row of stones forming the inner face, and is embedded in the bedrock. Extrapolating the north and south walls, it is possible that the western wall once also formed a double-faced wall. Itis likely that many stones from this wall were repurposed for the cairn that was set over it. The walls all display similar sized stones and relatively consistent style, and are likely all contemporaneous. Inside, two possible features were located, which were not completely investigated during fieldwork. In the west, against the wall, a pit was excavated that contained shell fragments and a grinding stone. No clear floor level was found,

while the bedrock inside the structure was very uneven. Possibly, the floor was evened out using organic materials that have now disintegrated or were removed.

In total, 187 sherds were found in this trench. 151 are dated to the Wadi Suq, 9 to the Umm an-Nar, and 20 to the Iron Age I, with the remaining sherds being indeterminable. This emphasizes the more pristine character of the Wadi Suq contexts in this building compared to structure 37. Among the sherds, 62 could be recognized as table wares, 33 as storage wares, 28 as kitchen wares, and 23 as fine wares. Although Iron Age sherds were present in the upper layers, their prevalence decreased with depth, and the last units above the bedrock were completely devoid of this material. Again much shell material was found, and in particular *Terebralia*. About 1550 fragments were collected, weighing slightly over 2,8 kg and amounting to a minimum of 177 individual specimens.

Structure 39 (BQ06)

Structure 39 measures ca. 6,3 by 4,0 m. Generally, the walls all displayed the double faced technique with a rubble and mud infill. The western wall was the best preserved and has a fairly constant thickness of ca. 0,9 m. The northern wall is thinner on its western end (ca. 0,7 m) and becomes wider towards the east (ca. 1,0 m). However, from two soundings on the outside and inside of this wall it was found that the interior wall face slanted down, causing the apparent widening of the wall. The terrain slopes upward towards the northeast where on the exterior only a single course of stones is preserved, which was set into the bedrock directly.

Figure 66: Detailed overview of trench BQ06 with Wadi Suq structure 39 (Figure by Ruben Hartman, background: WAJAP).

The southern wall is thicker (ca. 1,15 m) and also widens towards the east (ca. 1,45 m). Again, it is likely that the interior face of the wall slanted inwards. The widening of both the north and south walls together give the interior space a 'keyhole' shape. However, negating the collapse on either side, it is more likely that the form was rectangular as is observed in the other Wadi Suq buildings. A possible doorway was found in the southeastern part of the building, but was not completely

exposed due to a lack of time. The interior dimensions can be reconstructed based on the intact parts of the wall and measures ca. 4,7 by 2,3 m. The eastern wall fell just outside of the trench and was not exposed entirely. During excavation, many collapse stones were removed from the interior and exterior of the building, although these stones together would only amount to one or two additional courses on top of the preserved walls. The masonry style matches that of structure 44, as both are using a similar variety of relatively small, unworked wadi pebbles and are less neat than the eastern wall of BP08.

Figure 67: Oblique view of structure 39 looking south. The sounding on the exterior of the northern wall is visible on the left (Photograph by Ruben Hartman). Inset: Detail of the masonry of the western wall. Up to four courses were preserved, which decreased to one towards the east (upslope) (Photograph by Bleda Düring).

In this trench, a piece of clay with the impression of a wooden stick was found, which suggests that a superstructure made of these materials could have been carried by the stone wall foundation (Düring, 2023; Olijdam et al., 2025, p. 195; Figure 68). No clear floor was constructed, nor were occupational levels or clear features found. It is likely that the building's inhabitants lived on a bedrock surface that was modified. About a third of the interior bedrock surface was disturbed due to the root system of a tree that was growing in the northwestern corner of the building, which added to the fragmentary nature of the evidence. On the exterior of the western wall, a large pit was situated which contained both Wadi Suq and Iron Age material. A second pit was cut through it, and undercut the wall. Inside, remains of a goat were found, in addition to fish and shell remains. However, its dating remains unclear.

Figure 68: The clay fragment with an impression of a wooden stick (adapted from Olijdam et al., 2025, p. 194, Figure 11).

In total, 314 pottery sherds were found in this trench. Of these, 256 were Wadi Suq sherds. Only 2 Umm an-Nar sherds were found, and 1 which could be either. 35 sherds of Iron Age I or II date were found as well; the remaining sherds were indeterminable. This indicates that the contexts were relatively devoid of later disturbance except for a small Iron Age component. Of the Wadi Suq assemblage, 105 sherds were table wares, while fine (n=45), kitchen (*n*=54), and storage wares (*n*=51) were represented more or less equally. There is again an emphasis on consumption here, although the comparatively high numbers of storage and kitchen wares suggests more cooking and storage-related activities might have taken place here.

Comparatively fewer shell remains were retrieved from this trench *Terebralia* was collected in only two loci, amounting to a total of 461 fragments, a minimum of 72 individual specimens, and a total weight of 644 grams.

Structure 58 (AV61)

The northern half of structure 58 was exposed in trench AV61 as can be seen in Figure 69. It measures roughly 7,0 by 3,3 m, but as the southern wall falls outside of the trench and is not clearly distinguishable at the surface level, this is only a crude approximation of the building's length. The northern wall is exposed completely, the eastern wall for the largest part, and a small part of the western wall. The positioning of the trench was chosen to gain a better understanding of the exterior areas of the structure. The interior measures at least 4,5 m long and 2,0 m wide.

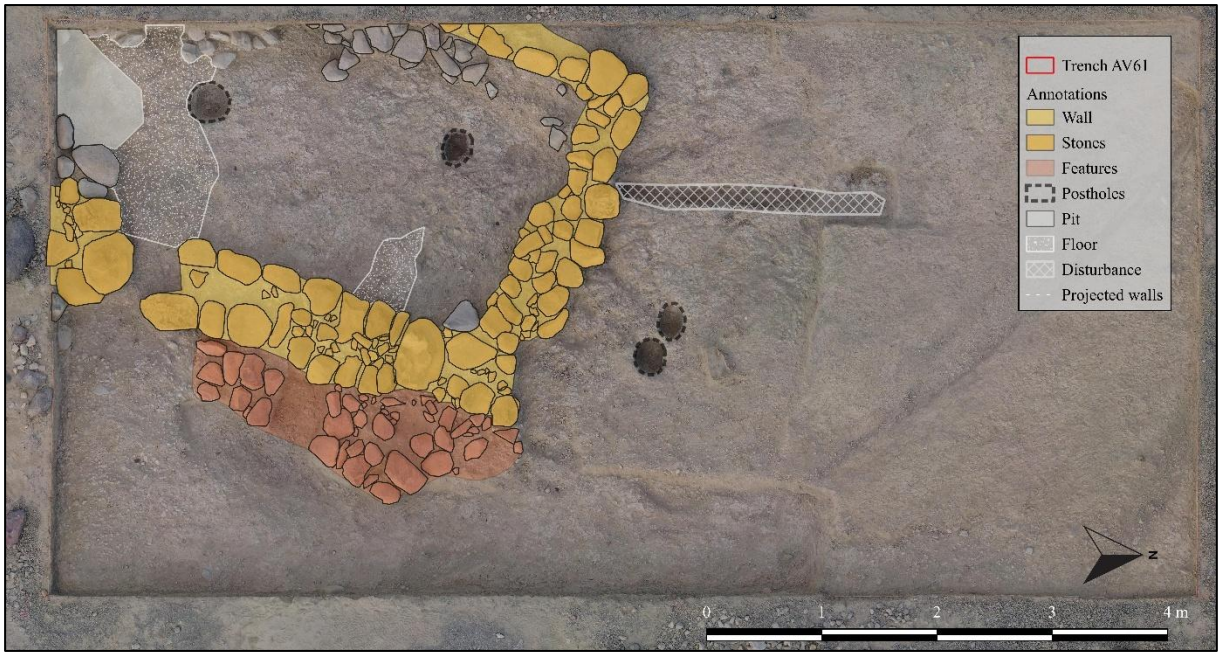

Figure 69: Detailed overview of trench AV61 with Wadi Suq structure 58 (Figure by Ruben Hartman, background: WAJAP).

The eastern wall roughly follows a double-faced technique with a rubble and mud core, although the parallel rows of stones are substituted by larger boulders that span the width of the wall in some places. This wall is about 0,8 m wide. The northern wall seems to break with the double-faced technique and shows two rows of stones placed closer together, while one segment shows an alignment of three rows of stones. The double row is 0,4 m and the triple row 0,6 m in width. The western wall was excavated only in part, and it seems that only the interior face is exposed. It was not possible to determine the width of the wall. It is clear, however, that this wall, alike the northern wall, deviates from a neat double-faced building technique as it lacks the rubble and mud core, and possibly an exterior row of stones.

Figure 70: Detail of the stones abutting the presumed inner face of the western wall of structure 58. It is clear that these stones do form part of the wall (3D model created by Ruben Hartman).

All walls were set on a thick layer of loam mortar, which was likely placed to even out differences in the bedrock onto which the structure was built. As a result, the wall 'floats' above the bedrock

surface that was likely modified and used as a living surface. Up to two courses of stones were preserved *in situ*, and considering the collapse, the walls likely did not exceed four courses. The absence of any substantial remains again suggests that these walls functioned as a foundation for a light superstructure, akin to that proposed for structure 39.

In the southern part of the eastern wall a gap was excavated. However, it is unlikely that this represents a doorway, as no stones are placed on the sides of the opening to demarcate the side of the entrance. Considering the rather disorganized masonry style, it is possible that part of the wall was mistaken for collapse and removed.

Several interesting features were discovered in this trench. First are two fragmentary interior surfaces consisting of a small pebbled area and an area of compacted clay along the eastern wall. The latter is likely associated with the last use-phase of the building as it is later than the pebbled surface. Outside of the gap in the wall, an area was characterized by densely packed cobbles and might have formed an outside activity area. Second, a low platform was constructed abutting the exterior of the eastern wall and just north of the cobbled surface. Some stones are missing in the figure, as a section was dug through this feature to clarify its relation to the wall. On the interior of the structure, a pit cuts the bedrock in the southwestern corner, although it seems that the full extent of the pit continues to the south outside the trench. Another pit was situated next to the northern wall, which could be dated to the Wadi Suq period based on ceramics.

Figure 71: Oblique aerial photo of structure 58 from the southwest. This figure shows the platform feature before it was sectioned (Photograph by Ruben Hartman).

Four postholes were found in this trench. Two are located inside the structure and when aligned display a slightly different alignment from the structure's central axis, a difference of ca. 5 degrees. The northern posthole is slightly ovoid and measures 30 by 27 cm and is 27 cm deep, while the other, more rounded posthole is situated ca. 2,1 m to the south and has a diameter of ca. 35 cm and a

depth of 29 cm. The exterior postholes are located north of the northern wall and were dug directly next to each other. They are both slightly ovoid and remain separated by a thin baulk of soil. The measurements are ca. 36 by 24 cm for the western, and ca. 34 by 28 cm for the eastern one. They are 22 and 23 cm deep respectively. The fills of the postholes did not hold indisputable evidence as to their exact dating, but considering their location and the fact that periods other than the Wadi Suq are not significantly represented in this trench, it can be assumed that they and the structure are contemporary. Overall, the postholes are relatively similar with diameters around 30 cm and depths between 20 and 30 cm. Their size indicates that they could have held larger beams. If this were the case, it would be feasible that a more considerable superstructure was in place than the lighter iterations proposed for the structures discussed above. One could think of a *barasti* style hut with a stone foundation, although a larger number of postholes would be expected around the perimeter of the structure in this scenario. Alternatively, it could comprise a building akin to tent types 4 and 5 as were mentioned in Chapter 3, in which case the walls must have been built up quite considerably. A parallel can be drawn to the site of Khor Fakkan, where similar postholes were found. These have comparable diameters, but generally reach deeper (40-50 cm; Chapter 5.6.5) and would occur as singles, doubles, or even triples. The positioning of multiple postholes close together is thus a pattern recurring at both sites and might indicate that some sort of heavier roofing was held up by it. For structure 58, it is possible that roofing was extended over part of the exterior area to the north of the structure.

In this trench,136 pottery sherds were found.116 of these date to the Wadi Suq period, with 2 sherds specifically identified as late Wadi Suq types. Only 3 Umm an-Nar and 4 Iron Age I and II were collected. This highlights, even more so than in BQ04 and BQ06, that the contexts were minimally disturbed by activity from other periods. The Wadi Suq can be subdivided into 77 table wares, 26 fine wares and small numbers of kitchen, cooking, and storage wares. This again is indicative of domestic activity taking place in and around the structure, with an emphasis on food consumption

In terms of *Terebralia* consumption, AV61 produced the most material. In total, nearly 4000 fragments were collected, which amount to a minimum 751 individuals specimens and a total weight of ca. 8,4 kg.

Other finds from this trench include a fragment of furnace lining, and several hammer and pounding stones. These indicate that crushing and re-melting of copper slags took place here. Additionally, a Wadi Suq soft-stone lid and a bronze earring were found in AV61 in the eastern exterior area. The latter was likely lost by its owner and never found back, as it is a very small artefact.

Wadi Suq construction and settlement at Burj Huraiz

The excavated Wadi Suq structures are all rectangular buildings and measure on average 6,3 by 3,8 m. Although generally the buildings adhere to double-faced walling, there are some clear differences in masonry between the buildings. Structure 37 displays the most regular and well aligned masonry in its single Wadi Suq wall. Structures 39 and 44 are similar to this, but are built less neatly. Structure 58, which held the most pristine Wadi Suq context (with 85% of the ceramics assemblage dating to this period) diverges from this pattern and has more jumbled masonry in comparison. However, the

presence of postholes, possible floors, and multiple features at this location indicate a different construction style, and perhaps building type altogether.

The stone walls likely did not exceed four to five courses and would have facilitated the anchoring of a lighter, organic superstructure. Indications for one type of superstructure derive from structure 39 where an impression of a wooden stick in clay was found. There was no substantial buildup of occupational deposits inside any of the structures, and substantial features and installations are also absent. One explanation for this could be that activities were carried out outside of the structures in the Wadi Suq period, where also most finds were found (Olijdam et al., 2025, p. 193).

Structures 37 and 58 did not show signs for an undisputable doorway, while that in structure 39 and the potential doorway in structure 44 are both located in the southern wall. From a practical viewpoint, it is possible that this side of the buildings, which almost faces the hills directly southeast of the structures, would be shielded most from dominant winds at the site.

The higher proportion of kitchen and storage wares compared to table and fine wares in structures 39 and 44 may indicating an emphasis on the production and storage of food resources, whereas in structures 37 and 58, where proportionally more table and fine wares were attested, the emphasis seems to be more on food consumption. However, these differences in ware The ceramic fabrics represent a continuation of Umm an-Nar household types, highlighting continuity at the site (Olijdam et al., 2025, pp. 194-195, 197).

In terms of subsistence, it is likely that some agricultural products were processed in the Wadi Suq settlement due to the grinding stones found in the trenches. Furthermore, few fish remains were retrieved from the excavations. Instead, it appears that large amounts of *Terebralia palustris*, or the giant mangrove whelk, were consumed at the site. This species is found in mangrove habitats at the coast, the closest of which is situated near the town of Liwa at 20 km distance from Burj Huraiz. Copper processing was likely done in small quantities, as there is only evidence for a household scale activity from structure 58.

5.4 The site perspective at Burj Huraiz

5.4.1 Building types and settlement layout

From the combination of the survey and excavation data, it is clear that there is a fundamental change in building types from stone-built structures in the Umm an-Nar to organic structures on a stone foundation in the Wadi Suq. The Umm an-Nar settlement displays more diversity in structure size and form, which implies a higher differentiation in functional spaces in the settlement. This might explain why little evidence for copper working were found in the excavated structures, as metallurgical activity is more likely to have taken place in designated spaces. The Wadi Suq structures are less varied and relatively small, although this does not have to mean ‘simpler’. A small, but well-built structure would still require more skill and energy to construct and maintain than a large, but simple structure such as a corral. Still the notion that the Wadi Suq buildings are uniform, small, and have a light superstructure indicates they were more transportable, or at the least more easy to deconstruct and set up again. This aligns well with the ‘smaller is better’ norm for tents, due to the

need for transport and repeated (de)construction mentioned in Chapter 3. This does not guarantee that its users were mobile, but it certainly makes a higher degree of mobility possible. In terms of function, it is likely that the excavated buildings from both periods represent basic domestic units based on their features and inventories. In the Umm an-Nar, it is likely that more functional differentiation was made between individual buildings based on sizes and forms, while in the Wadi Suq this is less evident. However, structure 58 deviated from the general construction style of the Wadi Suq structures, having different walls, and several different fixtures such as floor segments, post holes, and a platform feature. This structure displays a higher level of elaboration, although it is unlikely that it held a significantly different function than any of the other Wadi Suq buildings. Furthermore, the structures in both settlements are not aligned around some central feature or a public spaces such as a street or central court. It is likely that these were not deemed necessary in light of the relatively small size of the settlements. The buildings do not indicate to have been left in a hurry, as they were emptied carefully upon their abandonment and most finds consist of household refuse. Still, some of the retrieved objects might have been lost in antiquity, such as the earring retrieved from AV61.

Several continuities between the different settlement are clear, however. Double-faced walls are present in all buildings, and the small gastropods *Zootecus insularis* and *Melanoides tuberculata* were ubiquitous throughout the excavated layers of both periods, deriving from the mud mortar between the wall. This might indicate that technical knowledge was passed down from one period to the next, such as knowledge on where to find certain resources and how to use them.

Comparing the structures to the different tent types as described in Chapter 3, a similarity between the Wadi Suq remains and the type 4 or type 5 tents as defined by Cribb may be noticed. Structure 58 could resemble something closer to type 4 based on the postholes present inside the structure, while the other Wadi Suq buildings resemble type 5 without postholes. Cribb notes that for these types, more fixtures are present in the form of platforms, hearths, and wickerwork screens, which can be substantiated only for structure 58, and that in plan these structures resemble a permanent dwelling (Cribb, 1991, p. 105). Structures 37, 44, and 39 do not feature post holes inside the plan of the structure, and for these it can be suggested that the foundations supported a type of barrel-vaulted tent, which are also known to have been constructed using palm fronds (Cribb, 1991, pp. 88-89). Such tents use concentric ribs to support an (organic) covering, but do not necessarily make use of a central pole, thus leaving no potholes in the interior of the structure. Examples of such tents are known ethnographically and include the Alaçık tent depicted in Figure 72. Fitting such a tent model into the data presented here, it can be proposed that the different ribs could have been lodged into the low wall foundations, evidence of which is absent as these upper courses have collapsed over time, or were robbed as building material for other constructions in later times. In such a scenario, the stick impression in clay may indicate that (part of) the structure was covered with clay to provide more shelter from the wind. Certainly, the Alaçık tent is only one of many types of superstructures that can be imagined for the rectangular Wadi Suq foundations and should not be taken as the definite model for these structures. Nevertheless, this gives a good impression of what kind of structure these populations constructed.

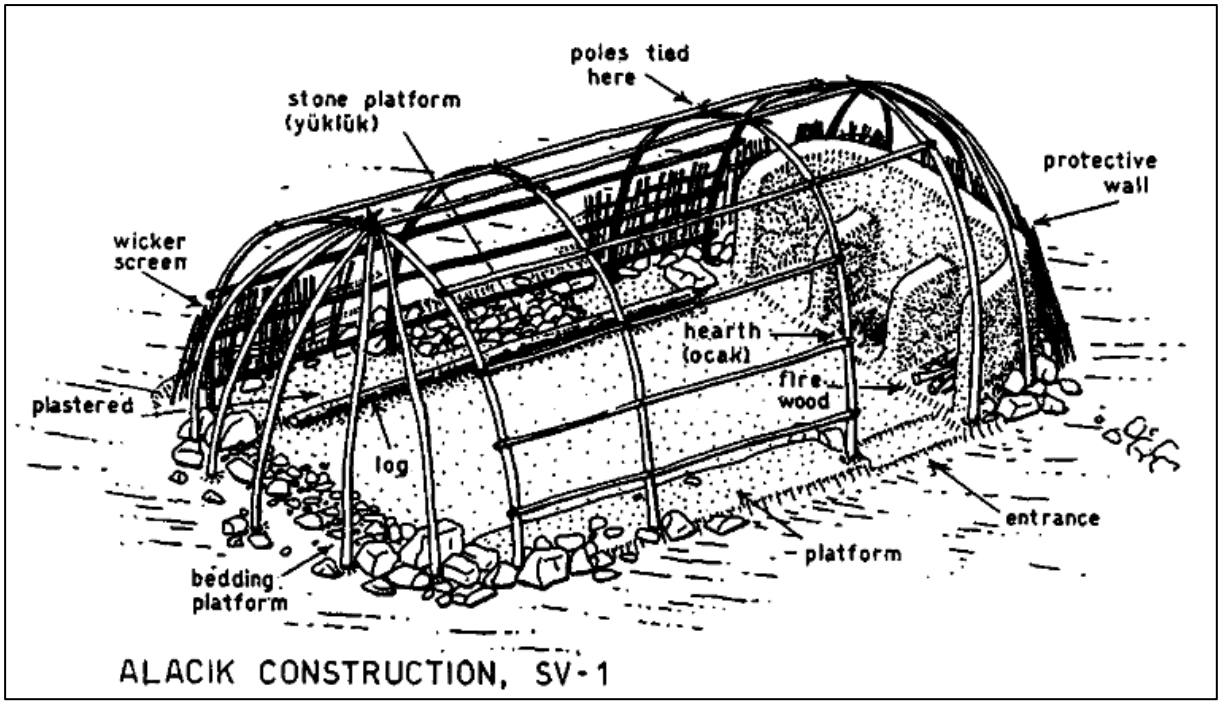

Figure 72: An example of a barrel-vaulted tent construction, the Alacık tent (adapted from Cribb, 1991, p. 90, Figure 6.5).

5.4.2 Settlement location

In addition to the change in structures, the settlement location also shifts. Based on the ceramic assemblages and the presence of a transitional cemetery, it is clear that the site of Burj Huraiz was occupied continuously between the Umm an-Nar and Wadi Suq. Although the modification and re-use of older structures is attested at several other Wadi Suq sites (e.g., at Bat, Tell Abraq, Hili, and Kalba), this does not occur at Burj Huraiz. Instead, the population here made a deliberate decision to construct a completely new settlement (Olijdam et al., 2025, p. 198) at 300 meters to the northeast of the previous settlement.

From this location shift it seems that the previous settlement location did not suffice anymore. There are no signs that the environmental context between the two settlement locations are different. In contrast, the locations are very similar geographically, as both are located on the lower slopes of local hills which are situated to the south and southwest of the settlement. As mentioned before, this possibly shielded the settlement from dominant winds. Additionally, both settlements were situated so that there was good visibility of a large segment of the plain directly north.

If the locations are physically similar, alternative motivations for the settlement shift need to be considered. If it is accepted that a new, more mobile lifestyle was adopted by the population of Burj Huraiz, they likely required a new settlement that was better adapted to this lifestyle than the stone-built Umm an-Nar structures which were not portable and likely required a large amount of maintenance. Since a virtually similar location was available in close proximity, the population likely opted for building completely new structures that were better adapted to the new lifestyle, over remodeling the unwieldy stone buildings. Based on relatively limited evidence for transitional or Wadi Suq ceramics in the Umm an-Nar assemblages, it is likely that the switch to a more mobile existence was made over a short period of time. Of course, it is possible that other Umm an-Nar

buildings that were still in use at the start of the Wadi Suq, and therefore indicate a more gradual transition to higher mobility remain unexcavated.

5.4.3 Continuity of occupation

Having established the differences in construction styles as well as a motivation for the shift in settlement, it remains remarkable that the site of Burj Huraiz remained occupied despite the higher mobility. The ties to this site are particularly evident in the fact that significant efforts were made in the construction of these buildings, such as the levelling of the bedrock, the construction of the walls, and in the case of structure 58, the platform and postholes. The investment in these structures shows the intention of the mobile population to come back to this site, and specifically to the same locations within the landscape upon returning. This intention is materialized in the ceramic assemblage of building 39, which spans over two to three centuries of the Wadi Suq period (Olijdam et al., 2025, p. 196). It is additionally reflected in the continued construction of tombs in the transitional cemetery as well as at other locations in the landscape. These funerary structures likely tied different kinship groups to this location in social terms, and warranted their return either for rituals of ancestor commemoration or for rituals of burial at this site. However, in addition to this social 'resource', it is likely that another critical resource was present at the site that did not only motivate the revisitation of the site, but also the prolonged residence there.

One possible resource exploited at the site is copper, for which limited evidence was found in structure 58. In the excavated Umm an-Nar structures, no indications of copper working were found. However, as mentioned, a workshop area might still be remaining among the unexcavated structures, or was practiced in an off-site area as there was more spatial demarcation between functional areas. The slag heaps situated in close proximity to the Umm an-Nar settlement reinforce this argument. However, these can only be given a broad determination as 'Bronze Age', and their size suggest that only limited metallurgical activity would have taken place at the site over an extended period (Olijdam et al., 2025, p. 192). Furthermore, the sheer amount of *Terebralia* shells brought to the site from the coast indicate that the site was not inhabited for resources that would involve the direct consumption of subsistence resources, such as wild animal resources, or the gathering of specific plant nutrients. An alternative is that a longer-term subsistence strategy was practiced at the site. Grinding stones were present in all excavated trenches, and especially numerous in BP08, forming a consistent source of indirect evidence for the processing of plant resources. At the site, a caching strategy may have been employed whereby these often heavy stone tools were left behind at the site when the population moved elsewhere. In addition to what was described before, the success of caching strategies is dependent on a high predictability of resources as well as a low risk of theft or breakage when leaving them unattended (Eerkens, 2003, p. 735). As such, the presence of the large amounts of grinding stones not only provides indirect evidence of the processing of plant remains, but also signals that the resources processed with these tools must have been relatively predictable.

During the Umm an-Nar, conditions are thought to have been wetter overall, and perhaps a year-round cultivation of crops could be sustained at the site based on precipitation and surface runoff

water. Still, for the Wadi Suq this remains a more problematic a proposition. To investigate this option an analysis of the site's hydrological properties was conducted.

5.4.4 Hydrology

The hydrological properties of the site were investigated using the QGIS geographic information system software (QGIS 3.40.4). A raster DSM of the site of Burj Huraiz with a resolution of 0,06 m per pixel was utilized for this purpose. A DSM, or digital surface model records the elevation of the surface including the tops of any objects present on the surface. At Burj Huraiz, this mainly concerns acacia vegetation scattered throughout the plain. In order to investigate the hydrological properties of the site, first a drainage model was created. To do so, the modeling approach as set out by Harrower (2010, p. 1449) was followed, who describes a methodology in a similar environment to the study area.

As elevation models often contain anomalies in the form of depressions, which are known as sinks, a pre-processing step was taken to 'fill' these sinks, straightening the depression in the raster file. Then, flow directions for each pixel were calculated by comparing the elevation value to its surrounding values. From the flow direction model, a Strahler order model was created, which accrues pixels with similar flow directions into larger streams. The streams that connect, and are of a similar magnitude, are adjoined to form a stream of a higher magnitude. By visualizing the resultant lines, an impression of the general drainage in an area can be created. In Figure 73 this model is visualized, and supplemented with polylines which were annotated by following the larger wadi channels at the site visible in the orthomosaic of the site. As the elevation differences are quite subtle at this site, it was hard to derive clear streams from the Strahler Order algorithm. To solve this, the annotated channel was 'burned' into the DSM, which means that the elevation values coinciding with this line were lowered by a set amount, which was 2 m in this case. For the current purposes, the model as presented below is sufficient, and it is beyond the scope here to create a hyper-naturalistic drainage model.

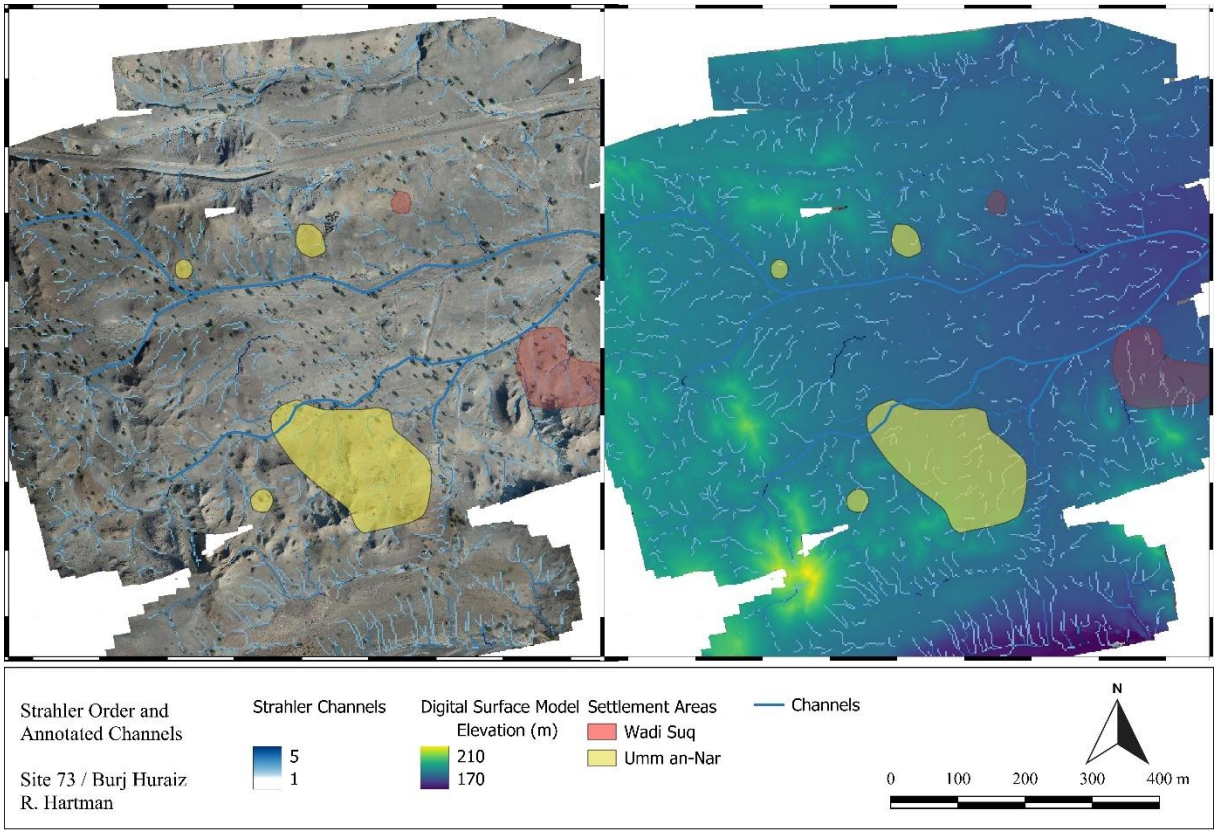

Figure 73: Hydrological model of Burj Huraiz. The thicker blue lines were annotated, while the thin blue lines are derived from the Strahler Order algorithm on a filled DSM (Figure by Ruben Hartman, background: WAJAP).

Looking at Figure 73, it seems that higher elevations to the north, west, and south create a convergence of multiple smaller streams in the central plain of the site, which is relatively flat and has a lower elevation in general. With the remarkable flatness of this part (a slope of only 2% over ca. 750 m), flow rates would be relatively low and water can accumulate in this part, especially when precipitation rates are not as high. The main wadi channel of the Wadi Zahaimi is visible at the southern extreme of the modeled area, but is separated from the central area by low hills. Therefore, it is suggested that this area functioned like a basin, retaining water for longer periods after episodes of precipitation. This is supported by the high amounts of *Zootecus* and *Melanoides* shells as observed in the mud mortar of the structures which require, as described in chapter 5.3.1, low-flow or standing water for their survival.

Interestingly, it is this central part of the site that also overlaps with the location of Islamic field system. Its potential for agricultural production was thus also recognized in this period, although it should be remarked that it was also irrigated by a *qanat* in this period. If it is assumed that the landscape was relatively similar during the Bronze Age, it might be possible that the hydrological properties allowed for (small-scale) agricultural production on the basis of precipitation and runoff water, which was retained in this part of the site.

Both settlements cluster to the south of the fields, with some outliers to its north. The area itself is devoid of structures. This could be due to several reasons, not unimportantly that the soil in this area could have been too wet for settlement, or that the area was, as mentioned above, used for

agricultural purposes. It is also possible that it was settled, but remains have been destroyed by erosion and later Islamic activity (cf. Olijdam et al., 2025, p. 192).

One limitation of this theory is that the model is produced based on modern terrain data, which is likely not fully representative of the ancient landscape. One important issue in this regard is that the central area could have been levelled in preparation of its use as an Islamic field system and therefore holds the favorable hydrological conditions. Despite this, the local topography, with higher elevations due to hills in the north, west, and southern parts of the site would have still directed water towards the central area, also when the surface there had slightly more relief.

Still, this remains a theory, and to substantiate these claims a thorough investigation of the central area of this site would be required. This could involve LiDAR mapping of the area, to create a true surface model without the vegetation that would then be more suitable for creating the drainage model. Furthermore, soil geochemical investigations could inform on land use, and test trenching in this area could inform on the stratigraphy of these locations as well as geophysical properties of the sediments.

The theory presented here is admittedly a very ecological approach to the question of why this site remained in use, and other possibilities can be that there was a social impetus to return. Considering the notion of social fixtures as outlined in Chapter 3.2.4, the transitional cemetery is most likely to have functioned as a sort of social fixture of the site, signaling both an investment of resources and energy, but also by transforming the landscape at large into one tied by ancestry through their monumentality and visibility. In the same sense, the older Umm an-Nar settlement that was abandoned in during the Wadi Suq period might have been functioning along a similar line as a social fixture.

5.4.5 Mobility at Burj Huraiz

As set out in Chapter 3, Wendrich & Barnard have provided a framework for thinking about mobility to gain a more detailed understanding of how it came to expression in a population (Wendrich & Barnard, 2008, p. 9). Considering that the climate has been relatively stable over the past 4000 years as well as the hydrological properties of the site as set out above, several remarks can be made about the mobility of the Wadi Suq population at Burj Huraiz, by assessing the key aspects of moment, movement, motivation, and segment.

First the moment of mobility is considered, focusing on when mobility was undertaken, and for how long the periods of movement and immobility lasted. In terms of the period of movement, it is likely that the population returned to Burj Huraiz during periods of relatively higher rainfall, which means during the winter months**.** The length of movement periods, and length of stay at the site may have been variable, depending on the varying weather conditions, or on the time required to perform the activities undertaken at the site. From an archaeological standpoint, there is insufficient chronological resolution to make a clear statements about this. Still, considering that the structures are not fully ephemeral, but include fixtures at least in the form of a stone foundation, it is likely that the period of stay was longer than at, for example, transit sites. The mobility pattern could have been repeated annually, as a return to the site would have occurred with the changing seasons. The

pottery from structure 39 indicates a temporal span of two to three centuries, indicating that the population revisited the site over an extended period and that the mobility pattern was relatively stable. In terms of variability of mobility, it is unclear if they revisited the site strictly every year, or travelled to or remained elsewhere in periods of drought.

Second is the movement, or the act of moving in itself, focusing on the range and pattern of movement. It is unknown how these populations moved, and how far they would move, how long this would take, and whether they moved to and from the same locations every time. To investigate this, more clues about other site types, like transit sites, would be required. However, it is likely that when this population moved to the site under study, this was a relatively fixed element in their wider mobile repertoire. The low walls, and in the case of structure 58, the platform and floors thus represent fixtures that would be left in place for use in the next period of occupation, be it over a seasonal, yearly, or more extended timespan. As such, they materialized the intention of the group to return to these locations, as is also evident in the extended ceramic sequence of building 39.

The motivation of mobility is the third aspect, focusing on the purpose behind the movement, or the 'why' of mobility. At Burj Huraiz, part of the answer might lie in the activities undertaken at the site, including small-scale copper processing and agricultural activities, which could have formed key motivations for consistent return to this place. However, additional aspects can be considered, for instance the transitional cemetery which transformed the site into a socially elaborated space and might have formed a social factor linking the population to this location. In terms of external factors, climate change may have ultimately resulted in the shift to higher mobility. Burj Huraiz could have formed a niche where its specific hydrological properties allowed the Umm an-Nar residents to stay for a while longer after climate change had set in. At some point, year-round agriculture did not suffice to sustain a more settled way of life, and more mobility was adopted as an adaptation to new conditions. The attitude of the population itself towards this new, mobile lifestyle is impossible to grasp archaeologically. However, on a more speculative basis it is likely that the Wadi Suq population was differentiated from their Umm an-Nar ancestors in terms of identity, as they would have identified less with a specific location, and more with a range of environment types, and a completely different way of living.

The last aspect is segment, which focuses on the 'who' of mobility. Based on the evidence from Burj Huraiz, the segment of the population that participated in these movements was likely the complete group, as only those structures were discovered that are considered more portable in the Wadi Suq part of the site. Still, it is possible that part of the population remained mobile, while another part settled down from some time. In this way, the population would be able to exploit multiple niches synchronously. It is also possible that within the larger frame of population-wide mobility, specific segments practiced variable, smaller-scale mobility. For example, from the large quantities of *Terebralia* shell fragments it can be inferred that some movement occurred for the purpose of collecting these. As this resource does not have an extended shelf-life, it is likely that these had to be consumed relatively shortly after their procurement. The fact that the shells were brought to the site and discarded there, also indicate they were processed at the site, and not at the coast from where they derive. Considering the sheer amount of shell refuse at the site, it is viable that these resources

had to be collected in repeated cycles of collection and consumption, which would also involve cycles of mobility from the site to the coast and vice versa. This mobility would have functioned at a smaller scale, likely involved a specific segment of the population, lasted for short periods at a time, and were repeated over some time. Furthermore, the mobility would have had a limited range, as the coast sits at 20 km from the site, although it is unlikely that the full cycle of travel, collection of resources, and travel back would have been undertaken within one day's length. This would also have been more flexible mobility, perhaps taking advantage of different niches each time for procuring this resource. This specific cycle of movement was possibly a new feature of the Wadi Suq period, as the Umm an-Nar contexts are devoid of significant *Terebralia* assemblages. It is likely that this repeated cycle of short-term mobility reinforced the mobile identity of (parts of) the Wadi Suq population as suggested before. There is also the possibility that this resource was traded with other groups that travelled from the coast to Burj Huraiz, in which case the mobility described above with all its implications would be relevant to these populations who travelled from the coast inland, and back.

5.5 Summary

This chapter has presented the data of the Wadi al-Jizzi Archaeological Project case study sites. From the survey, sites 3 and 84 provide cases of possible Wadi Suq sites. Site 3 is a smaller Wadi Suq site and shows a relatively diverse array of building types, which also display a considerable amount of constructional complexity. Site 84 is a later Wadi Suq site existing of terraces where goods were stored, possibly as their owners were away on a seasonal basis.

Sites 73 and 66 comprise the transitional complex of Burj Huraiz, and provided more detailed information as excavations were undertaken there. The Umm an-Nar and Wadi Suq settlements are clearly different in extent as well as types and forms of buildings. The Wadi Suq buildings seem to indicate a lesser degree of permanence while being located in a similar environmental setting. Both held predominantly domestic assemblages. A higher mobility for the Wadi Suq population at this site seems to be substantiated, as is seen in the construction of lighter, possibly more portable buildings. Despite this higher degree of mobility, the site remained occupied, and the considerable energy investment in the loci of habitation, i.e., the structures themselves, signal an intention by its builders to return to the same place. This intention is echoed in the continued use of the cemetery in the southeast of the site. The recurring occupation of the site was likely due to the presence of some critical resource. Based on hydrological modeling, it was suggested that this resource relates to the central part of the site, which would have provided favorable hydrological conditions allowing for either some scale of agriculture, or for comparatively rich pasturages. In addition to this, it is likely that several social fixtures also anchored the population to this site through ancestral ties.

In terms of mobility, the population at Burj Huraiz shifted to a more mobile lifestyle in the Wadi Suq. While not all specifics of the configuration of a more mobile lifestyle can be inferred from the remains excavated, several clues are still present. Despite climatic change rendering year-round occupation at the site unsustainable, the hydrological properties of the site remained a significant motivation for why the populations returned. It is likely that they resided here during the months when precipitation was most probable, i.e., in winter. The length of stay at the site might have

depended on activities such as small-scale agriculture, while small-scale copper working was also done there. It is clear that this site was consistently visited for several centuries, judging by the ceramics from one of the structures. Furthermore, upon return, the same locations were occupied, which was materialized in the different fixtures left at the site. The new lifestyle and higher mobility could have affected the populations identity, which was now focused on movement and a wider range of environments. At a smaller scale, the quantity of evidence for mangrove whelk, or *Terebralia* consumption provides an indication that repeated cycles of smaller scale (affecting a smaller part of the population and occurring over shorter time-spans and distances) were also undertaken among the population, possibly further reinforcing their new identity.

Chapter 6: Towards an understanding of Wadi Suq settlement and mobility through built remains

The current study has set out to compare Wadi Suq settlement from the Sohar hinterlands with evidence for Wadi Suq settlement deriving from the wider region of southeast Arabia. Furthermore, in doing so, the degree of mobility among Wadi Suq populations would be assessed on the basis of settlement remains. In order to reach this goal, first it was investigated how mobility can be inferred from the built environment and assemblages. Second, the general character of Wadi Suq settlement and construction was analyzed from available published material. Third, the case study sites of the WAJAP were analyzed to assess their general character. The aim of this study was to investigate the nature of settlement in the Wadi Suq period, how it changed over the transition from the Umm an-Nar to the Wadi Suq, and what this reveals about the degree of mobility among the subject populations.

6.1 Wadi Suq settlement

From the review of settlement evidence for the Wadi Suq period, the sites were categorized into tower sites, settlement sites, industrial sites, and temporary places. The tower sites are designated based on the presence of a monumental tower structure. In the Wadi Suq period, activity at these sites is represented by a remodeling of the tower structure, possibly to fit the new needs of the populations residing there. Often, the central well of these structures remains in use. Recurrent activities at these sites include the creation of mudbrick platforms, terracing activities, or the construction of new, monumental features. Some of the tower sites display settlement evidence in the form of ephemeral structures for which only postholes now remain.

The settlement sites show clear evidence of settlement, but lack a central monumental element. Here, construction concerns the remodeling of earlier buildings, like at Bat, or of significant new constructions, as is the case at Khor Fakkan, Ra’s al-Jinz, and possibly Nud Ziba. At Ra’s al-Jinz the new settlement is located very close to where the Umm an-Nar settlement was positioned. Buildings are varied in form and size. At Ra’s al-Hamra and Ra’s al-Jinz, curvilinear, horseshoe-shaped structures are built out of local stones. At Khor Fakkan, elaborate multi-room rectilinear structures are built on a terraced hillslope, also incorporating posts. At Bat, only a limited extension and alteration of the Umm an-Nar stone buildings occurs, in a less robust construction and deviating from overall building conventions applied before. It is also the only settlement site with traces of copper working. At sites nearby the coast, shell waste is found abundantly, indicating the exploitation of coastal resources.

The sole industrial site of Wadi Hilo shows continuous activity throughout the Wadi Suq period. The stone-built workshop buildings C and F are extended and both incorporate rectilinear as well as curvilinear elements. Although the workshops are substantial stone constructions, no settlement has been found in association with this site.

The temporary places of Saruq al-Hadid and Tawi Sa’id are inland desert sites that are mostly characterized by waste deposits. Tawi Sa'id is completely devoid of construction, while at Saruq al-

Hadid limited evidence is found, in the form of one arrangement of postholes forming an ovoid shape of 5 by 3 m. It is possible that occupation of these sites was enabled by favorable local conditions, although it seems that residence here was limited to short periods of time.

6.1.1 The Sohar hinterlands

In the Sohar hinterland, Wadi Suq sites 3, 73, and 84 were analyzed for this study. While site 3 represents a limited settlement of several buildings arranged in a linear fashion, it displays diversity in building forms, as well as some complexity in construction. This is especially materialized in one elaborate multi-celled building. Site 84, consisting of terraces on a steep hill in a relatively secluded area, likely facilitated a caching strategy, allowing for the storage of goods and potentially tools while their users were away.

The main evidence for settlement comes from the site of Burj Huraiz where an Umm an-Nar and Wadi Suq settlement are located in similar niches in close proximity to each other. These settlements present a significant shift in building types and construction styles, while also displaying continuity in technical knowledge and ceramic assemblages. The Wadi Suq settlement facilitated a more mobile lifestyle, as the structures likely were more portable. Still, populations consistently returned to this site, likely due to its hydrological properties, and possibly also to perform small-scale copper processing, and due to the ancestral ties with the landscape that were manifested in the transitional cemetery.

6.2 Understanding Wadi Suq settlement

To understand Wadi Suq settlement, it is important to compare and relate the settlement sites reviewed in earlier chapters. The locations of the different types of sites are represented in Figure 74.

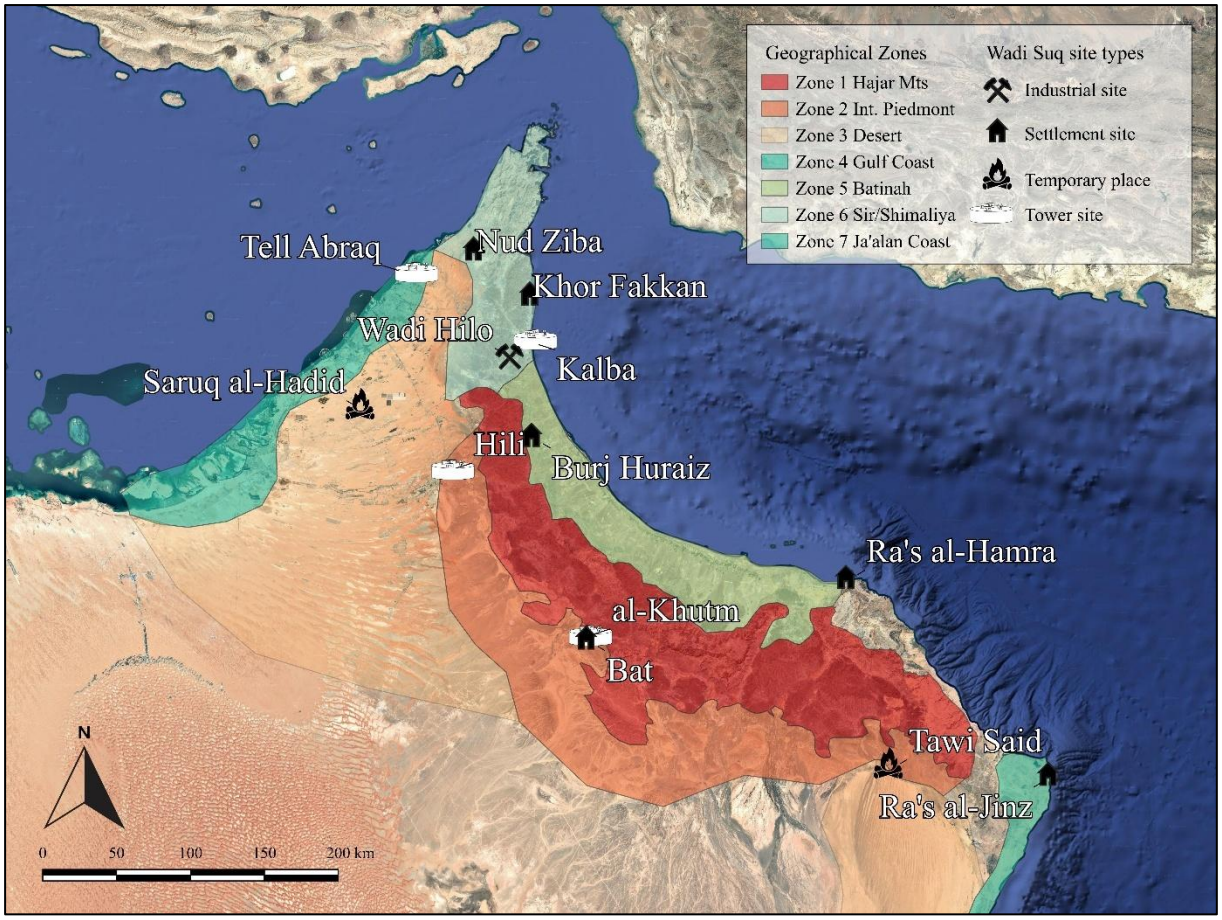

Figure 74: Overview of the different sites, sorted by their type, in relation to the different geographic zones defined in Chapter 2 (Figure by Ruben Hartman, background: Google satellite (Landsat / Copernicus Data; SIO, NOAAA, U.S. Navy, NGA, GEBCO). Imagery date: 1/1/2021).

6.2.1 Interpreting settlement

It is likely that the settlement sites, of which currently few have been significantly investigated to receive a designation as such, formed the basis of Wadi Suq society. It is important to note that settlement here does not designate sedentary settlement, but that it recognizes a degree of mobility among its users that may vary from site to site, and from time to time based on the needs of the populations. This is highlighted among the settlement sites identified in this study, as they are far from a uniform category. It seems that different building types were employed in construction during the Wadi Suq, including structures that were horseshoe-shaped, rectangular, or combined elements of both, structures that consist of a single room, or multiple rooms, structures that indicate a higher portability as well as structures with a higher numbers of fixtures that would have lowered the mobility of the buildings overall, but would nonetheless be suitable to more mobile lifestyles.

In addition to building types, construction methods are also variable, something that can be contrasted with the Umm an-Nar period for which construction was relatively consistent, with recurrent rectilinear forms and a focus on compounds with courtyards. In the Wadi Suq, stone construction ranges from very irregular construction styles, sometimes appearing as not much more than a opportunistic collection of locally available material thrown together to form some sort of boundary, to relatively neat double-faced walling with a rubble and mud core, making use of mortar.

In several cases, these likely functioned as a solid foundation of an otherwise organic superstructure, which is further reinforced by the general absence of large amounts of collapse stones. Wall foundations are sometimes combined with central posts that were lodged in single, double, or triple postholes to support a presumed roof structure, like at Khor Fakkan and structure 58 at Burj Huraiz. Extending this comparison beyond the settlement sites, this variation seems to be a hallmark of Wadi Suq construction. At the site of Saruq al-Hadid and Tell Abraq arrangements of postholes indicate that structures entirely made of more ephemeral materials were in use for at least some of the Wadi Suq period. Possibly, postholes remain to be discovered at other sites, especially those where ample Wadi Suq activity goes paired with a lack of occupational evidence, such as at Wadi Hilo, Kalba, Tawi Sa'id, and al-Khutm. For the latter, it is also viable that occupation was centered around the nearby settlement slope at Bat, where evidence for continuous use of Umm an-Nar structures is present. Walls with two parallel rows of upstanding slabs were recognized at Bat, Hili, and an alternative form possibly at Wadi Hilo. For the first two, it is possible that some knowledge on construction was shared between the builders at the sites, or that the same individual or group of builders were involved, considering the distance between the sites. However, examining this element in light of the wider context of Wadi Suq construction, it seems that it does not presents a quintessential characteristic, or 'diagnostic' element of second millennium construction, as Kerr proposes (Kerr, 2016, p. 281), beyond those sites where they are observed. Instead, it can be considered as one element within the variable building repertoire of this period.

The settlement sites display a relatively even distribution throughout the peninsula. In the southeast, settlement sites are attested at the coast, and the only settlement on the interior of the Hajar mountains (zone 2) is located at Bat. This overview excludes potential Wadi Suq sites, for example those at al-Khashbah, Maysar, and Yanqul/as-Safri, which provide some clues for a Wadi Suq presence, but are currently not convincingly associated with a major occupation or activity at the sites.

6.2.2 The tower sites

The tower sites form a slightly more coherent category than the settlement sites in terms of activity. At all four sites, relatively much activity is evident, as well as a continuous use of the central wells of the structures. This is interesting, as in most cases substantial and coherent evidence for a domestic occupation is absent. However, this could also be the product of a research focus on the central mounds in these sites, with the associated settlements still remaining to be found.

At Kalba, domestic activity has been attested for the Umm an-Nar period, and is assumed to be continuous based on the reconstruction of the monumental tower wall, which would imply a continuity in the site's function. However, most substantial evidence consists of a monumental construction. At Tell Abraq, terraces with postholes indicate ephemeral constructions next to and on top of the main tower. Deep stratified occupational waste deposits on the outside of the tower wall, as well as the presence of several ovens seem to point to residential activity. Still, little information is provided from which a more detailed configuration of settlement can be reconstructed. Al-Khutm displays no evidence for settlement and the excavators emphasize a storage and production function for the site. The site of Hili has an enclosed area that might have contained rectangular mudbrick

structures. Regrettably, the poor preservation in this area restricts a coherent reconstruction of its layout. It is mentioned, however, that a domestic function can be assumed for this area on the basis of several excavated and dated ovens. Similar to the settlement sites, construction at the tower sites varies. Large scale constructions are undertaken at Tell Abraq, where several terraces and a massive mudbrick platform covering the tower are built. Kalba shows monumental construction in the form of a well-built massive mudbrick wall over the earlier Umm an-Nar tower wall, which also indicates a significant degree of planning and technical knowledge. At al-Khutm, the area west of the tower is covered by a terrace, and some walls are constructed that alter the layout from the Late Umm an-Nar. These changes are likely made to fit the changing needs of the Wadi Suq community, or in the case of Kalba, the continued needs.

The distribution of the discussed tower sites ranges from Bat northwards, all the way to zone 6. However, it is possible that additional tower sites are located at al-Khashbah and Yanqul/As-Safri, which would extend the distribution of this site type by some 150 km to the southeast. However, more thorough investigations of these sites are first needed to confirm their dating to the Wadi Suq period. From the distribution of sites, it is clear that the tower sites usually lie relatively close to settlement sites. Perhaps the geographical proximity reflects some sort of social connection between the sites.

6.2.3 The 'other' sites

The industrial site of Wadi Hilo has evidence of two workshop buildings as well as a watchtower. Construction here is of a mixed form, combining rectilinear and curvilinear elements, with several episodes of modification and extension. It is possible that these restructurings are parallel to the different time periods the site covers from the Hafit to the Iron Age. Due to the lack of a domestic element at the site, it is suggested that the stone buildings here represent substantial fixtures that were abandoned for part of the year, and that the site was thus not permanently occupied. This would fit better with a model where the population adopted a higher degree of mobility, as the site is not situated in the most favorable environment in terms of subsistence resources. It is possible that the site was re-visited, perhaps by different groups, over a longer timescale, and only when a need for copper resources arose. For now, this is the only Wadi Suq period site of its kind, and it remains unclear whether this interpretation can be extended to similar sites until more are discovered.

The temporary places offer evidence of intermittent, but recurrent occupation of the sites. It is possible that these sites might have functioned like waystations, offering rest as groups were travelling from and to other sites or environments where resources could be exploited and collected. In such an interpretation, due to its recurrent use as such, it could have offered its users a familiar environment to return to when traveling over distances greater than one day away from where the rest of their community resided. An example of such groups could be the groups who travelled from Burj Huraiz to the coast to gather mangrove resources. Of the discussed sites, Tawi Sa'id might have held such a function between locations in the interior piedmont and the Ja'alan coast, while Saruq al-Hadid is positioned between the northern part of the oasis belt and the Gulf coast.

These two site categories remain more marginal in this system due to their elusiveness. It is simply unclear how these sites would have functioned in terms of what part of society used them, when they were used, and for how long they were used. For the temporary places, beyond the function proposed here, the exact function of these sites is relatively unclear and hard to reconstruct in much detail.

6.2.4 Mobility in the Wadi Suq

Approaching the entire settlement system from the framework of mobility, an attempt can be made to relate the different sites. The settlement sites likely provided the recurrent loci of habitation for the majority of the population, as well as a basis from where other modes of mobility could be employed. The tower sites, which currently do not provide sufficient evidence to support a domestic function can also be considered in this regard. It is possible that movements converged at these monumental locations and that they provided a meeting place for different mobile groups, representing segments of the population they were part of. These interactions could have facilitated the exchange of ideas as well as decorative styles for artefacts made of pottery, softstone, and metal. This suggestion extends a theory proposed by de Vreeze (2016) who related collective ritual at burial monuments the cemeteries of the northern peninsula to such social exchanges.

The fact that at Tell Abraq ample evidence for postholes is found, which might indicate that lighter structures were situated on the terraces next to the by then platform-covered tower, could indicate that we are dealing with more portable structures. This would support this theory of the towers as gathering places. However, a more detailed study of these post-holes and their arrangements would be required to shed more light on this.

The argument for the temporary places as transit sites and the industrial sites as intermittently occupied is outlined above, and both would fit well in the idea of wider mobility, as they represent sites suited to such a system of persistent movement. In such a configuration, it is possible that some of the sites of the tower, industrial, or temporary place types were locations that were visited or used by different groups of people. At the very least, we should move away from models where static populations are envisioned to reside at one site.

6.2.5 The Sohar hinterland

So, how does the Sohar hinterland fit into this wider settlement model? Burj Huraiz is interpreted as a settlement site that was first settled in the Umm an-Nar period, possibly due to its hydrological properties, facilitating agricultural practices. During the Wadi Suq, a new settlement was built as the site became occupied for part of the year, and the population required a new constructions to accommodate this lifestyle. It has been argued that although the fields could not support a year-round residence at the site, it remained a crucial resource prompting the Wadi Suq population to keep coming back. Occupation of the site was therefore likely in the winter months. From the construction style and ceramic repertoires, it appears that technical knowledge was passed down among the populations from both periods, suggesting it was indeed the same population as before coming back to the site. Additional activities, possibly undertaken in a more leisurely way, or at least not as the main reason for stay at this site, included copper working and the processing of different

food resources. Another factor that might have contributed to the continued return of the mobile population to this place could be the transitional cemetery and other tombs in the landscape. Part of the population residing here likely also undertook mobility cycles involving smaller distances and shorter periods of movement. The proposed mobility to and from the coast to procure additional subsistence resources could have formed one of these cycles, while another such cycle could have revolved around the exchange of goods, whereby both cycles concerned different moments, movements, motivations, and segments.

As for site 3 it is mostly unclear what type of activities were undertaken at the site. The buildings and their construction, being more complex and diverse in layout, suggest that its residents might have been less mobile than their neighbors at Burj Huraiz as these structures had a lower portability. The motivation for a possibly longer-term residence here is hard to investigate with the current data.

Site 84, located in the Wadi al-Jizzi corridor, shows signs of a high degree of mobility of its builders, who seemingly used the site to employ a caching strategy. Unfortunately, both the geographic and chronological remoteness of this site to the other Wadi Suq sites found in the Sohar hinterland restricts a link from being made between them. So while site 3 and Burj Huraiz do not align in terms of presumed function and the degree of mobility of their inhabitants, and 84 cannot be related to either of these sites, it is hard to imagine that these sites formed some sort of settlement system. Therefore the Wadi Suq sites in the study area are best seen in isolation from each other. As Burj Huraiz is investigated in most detail, this sites provides the best attempt at relating it to the wider system of settlements as described in the previous section.

6.2.6 Positioning Burj Huraiz in the wider region

In order to do so, it is first useful to compare the site with the other sites reviewed in this thesis to look for similarities that can indicate broader parallels in function, its users and the motivations for why the site remained in use. Several similarities may be noticed. Compared to the situation at Ra's al-Jinz, the shift in settlement location settlement location at the start of the Wadi Suq in spite of an earlier, Umm an-Nar settlement being located nearby appears as a very similar development. At Burj Huraiz, it has been argued that this shift was instigated by a change in lifeways which would have required different construction forms. A similar trend may be observed for Ra's al-Jinz, although there the new settlement is not located in an environment identical as the one from before, but rather moves to the top of the central mesa in the embayment. Seeing the form and height of the walls at RJ-1, it could be suggested that the stone foundations here too functioned as a foundation for an organic superstructure, although clear indications for this in the form of postholes or otherwise have not been attested at the few structures that were excavated. Due to its location on top of a rock outcrop, and the presence of a wall near the entrance of the platform, it could be suggested that the shift at RJ-1 was not only out of the need for new buildings that were better adapted to a certain lifestyle, but also for defensive purposes. It is likely that the Wadi Suq population continued using this site for the range of coastal resources available near the site. While Burj Huraiz is similar in the shift in settlement, as well as the possible motivation for its continued use, the sites differ in settlement structure, construction types, and the resource types that could be exploited in their respective environments.

A second parallel that is recognized is that of the household-scale copper industry. It is attested at Bat in a slightly more specialized way, as it seems to have been allocated to a specialized structure. Possible evidence for copper working is also retrieved from Ra's al-Hamra. At Burj Huraiz, the slag heaps and small metal fragments in the trenches indicate this activity. It is possible that this feature extends more broadly, and that it formed a consistent feature for most sites considering that much evidence of copper artefacts are retrieved from Wadi Suq tombs (Chapter 2.5.4), and that it is simply not found or recognized at every site locations.

Based on the arrangement of postholes at Saruq al-Hadid, it can be inferred that the dimensions of the structure once set up there measured ca. 5 by 3 m. Such a dimension aligns with the general layout of the Wadi Suq structures at Burj Huraiz, and can be imagined to have formed something akin to a barrel-vaulted tent. However, this is based only, quite literally, on a collection of holes in the ground, and additional context for this structure is not provided as significant fixtures are lacking. Therefore, this remains a very speculative comparison.

Another similarity is the presence of many shell remains within settlement contexts. This is attested at Ra's al-Jinz 1, where mainly mussels, but also oysters and sea snails were consumed, at Khor Fakkan and Ra's al-Hamra, where many shell remains are reported but it is not specified which species were found, and at Burj Huraiz. Significantly, Burj Huraiz is the only site among these four that is not located in a coastal zone. The abundance of *Terebralia* at this site might indicate a site-specific activity in the Wadi Suq, where cycles of short-distance mobility were repeatedly employed to procure this resource from niches at the coast. Perhaps, this type of mobility formed an important marker of identity among the population of this site.

A last parallel that can be drawn concerns the use of postholes in structure 58 at Burj Huraiz and buildings at Khor Fakkan. In both instances, the postholes are arranged in small groups and as singles and placed irregularly within the structures, likely to support some sort of roofing. Seeing the vast difference in the physical properties of the sites, it is clear that the postholes were part of significantly different structure types. As such, they only count as a recurrent element of construction, and not as a parallel development of a broader structure type.

From this short overview, it is clear that the different elements and developments at Burj Huraiz that can be recognized at other Wadi Suq sites only existed as isolated elements in those sites, which are on the whole completely different site types situated in different environments. This underlines the variety among the sites themselves, which all appear to have unique characteristics and likely were established as a response to the demands of specific populations, as well as the local availability of resources and the physical environment that demanded certain adaptations from the population in return. A tiered model, where sites can be categorized according to standardized settlement types is therefore unfeasible as this would be too reductive for the observed Wadi Suq settlements. The categorization in this study was therefore not intended for the creation of rigid types for system analysis, but rather to discuss the sites according to broader similarities and differences.

The variety highlighted above possibly resulted from the higher degree of mobility in this period. Instead of concentrating the objects, structure types, and procured resources required for the activities undertaken during a year-round residence in one place, they were spread out over different sites that would be visited in different periods throughout the yearly, monthly, seasonal, or multi-year mobility cycle, and which saw occupation for different lengths of time, and perhaps by different parts of society, for different reasons and goals. Activities were carried out at different locations at different times.

Burj Huraiz can be recognized as one form among the wider array of unique settlement sites, with its own particular combination of resources, activities, construction forms, and mobility patterns. In the wider system, Burj Huraiz is suggested to have formed a refuge during the winter months, when a population that was likely tied to the Umm an-Nar population residing at the site before, and who now resided in the transitional cemetery as ancestors, kept returning to this site where their ancestors were buried. They would have a link to this site, but also to other sites, which to them perhaps were newly exploited niches, such as the coastal niches from where mangrove whelks were retrieved. At Burj Huraiz, relatively elaborate structures were constructed with building techniques passed down from earlier periods, as represented in the different fixtures left at the site. These would have been more easily maintained when adhering to a more mobile lifestyle than the large buildings from the Umm an-Nar, while still offering relatively well-constructed dwellings to reside in over the winter months. For summer, a change to more portable dwellings can be imagined, involving lighter, more ephemeral tents, although it is hard to pin down what the group's exact mobility pattern was besides spending some part of their time at Burj Huraiz and venturing out to the coast in even shorter cycles of movement.

6.3 Limitations of this research

Intentional and unintentional limitations of this study are recognized in the methodology and theoretical framework, and in the representativity of the selected sample.

In terms of methodology and theoretic frame, the current research is positioned within a framework focused on mobility through the study of built remains. In creating such a focus, other aspects are overshadowed. For instance, a society's belief system, social connections, and trade interactions can also contribute to determining what types of structures a society builds, what foods are eaten, and where they dwell. However, considering that mobility is often referred as a main driver of change in the Wadi Suq period, without providing more detailed inquiries of how mobility is configured within these societies, a mobility-oriented approach was long due and provides a new perspective on the observed changes in the Wadi Suq. A next step could be to integrate the perspective garnered here with the other aspects mentioned above, to further contextualize these findings.

A second limitation implicit in the methodology is that the focus on built remains obscures a more detailed, bottom-up approach that considers individual strategies and agency. However, to assess changes over a broad range of sites and material categories would require first, specialist knowledge that the author is currently not in the possession of, and second, an equal availability of high-resolution datasets that are lacking for most sites.

Further limitations are inherent to the sample selected for this study. Several of the limitations are the product of unintentional selection. As this study incorporates much data from prior research, it follows the similar pattern of research bias that currently exists in the region of southeast Arabia, with a focus on certain subregions and types of archaeological remains. Furthermore, it is highly likely that many sites are as of yet undiscovered, especially for the industrial and temporary place site types, or have been destroyed in recent decades due to fast-paced economic development in Oman and the UAE. Hence, there is also a bias towards those sites that have been preserved better and are more visible.

In terms of the deliberate sample selection, there is admittedly a relatively narrow chronological scope for the sites. Including sites from the Late Umm an-Nar and the Late Bronze Age could provided more context for several of the development discussed for the Wadi Suq, but this would have made the current study significantly larger, and hence exceeded the scope this thesis. Furthermore, and partly for the same reason, the numerous funerary sites of the Wadi Suq were left outside of consideration. On the one hand, this provides a refreshing perspective on Wadi Suq settlement and on which areas were exploited, as this is often highly skewed by the cemeteries in the north of the peninsula. On the other hand, it must be recognized that the non-funerary sites can likely not be considered in isolation from their funerary counterparts and that some sort of relation between these categories existed in the Middle Bronze Age.

Considering these limitations to the sample, it is unlikely that the sites that are currently known and are incorporated in this study accurately represent Wadi Suq settlement as it existed between ca. 4000 – 3600 years ago. The question is whether a satisfactory representation of this will ever be reached, and it is likely, considering the very nature of archaeological evidence, that the answer to this question will remain a negative one. However, as archaeoligsts, we must strive to make the best of our imperfect datasets to approach a reconstruction of the deeper past, and in doing so, highlighting the resilience and ingenuity of the ancestors. By making these contributions, we aim to discover new pieces in the larger puzzle that is the human story.

Chapter 7: Conclusion

This thesis has set out to re-examine Wadi Suq settlement from the perspective of mobility, by recognizing mobility not only as an absolute, restrictive explanation for sudden changes in demography, but by acknowledging the variability and fluidity in mobility strategies. In order to investigate this element, the focus was put on the archaeological remains of the built environment, as the places that were inhabited by populations reflect several things about their lifestyles. To guide this research, several research questions were defined that focused on how mobility may be inferred from built remains, how Wadi Suq settlement can be characterized more generally, and how a specific set of sites from the hinterland of Sohar fits into this wider characterization.

In this frame, a comparative analysis of Wadi Suq (2000-1600 BCE) settlement sites was conducted, with a special focus on the built environment. In doing so, an idea of the relative mobility of this society was gauged. It was found that the sites of this period belonged to four general categories, comprising of settlement sites, tower sites, industrial sites, and temporary places. At these sites, construction seems to be highly variable, making use of locally available materials and different techniques.

The hypothesis is put forward here that the sites fit into a model of high mobility habitation, whereby the settlement sites provide most evidence of constituting the loci of habitation, facilitating longer periods of stay and sustaining larger groups of people. The tower sites are proposed as loci of engagement between different groups, although possibly these also housed specific groups over longer periods of time. This is indicated by the presence of collective tombs and relatively high amount of fixtures. The industrial site discussed appears as an intermittently, although consistently visited site where activity returned as it was demanded for the purposes of the own population, and possibly beyond for exchange goals. The temporary places are interpreted as places of familiarity, where groups in transit could return to when being away from their momentary base camp where the rest of their associated population resided. The fluidity of mobility strategies is of essence here, and it is likely that these peoples resided in different types of structures, during different times in their mobility cycles.

In this model, the site of Burj Huraiz is situated as one of the settlement sites. Despite the change to higher mobility among the population in the Wadi Suq period, this location was consistently visited due to its facilitating of agricultural practice for part of the year. While there, the population engaged in copper working, plant processing, possibly trade, and smaller cycles of recurrent mobility for the continued procurement of resources located farther away.

Although the current study is limited in its methodology and representativity, it has provided a new perspective on the Wadi Suq that focuses on settlement, rather than funerary evidence over a larger geographical area. In doing so, it was highlighted that these populations were active communities that adapted to their changing surroundings not by fading into an existence of marginality as pastoral nomads, but by adopting new lifeways that are continuous developments from the more settled modes from before. These new lifestyles likely combined different subsistence strategies as well as types of mobility.

Further research is required into the topic of Wadi Suq settlement to gain a more complete understanding of these societies, including at the sites that have been excavated before. Reports of Wadi Suq contexts are often left unanalyzed. For example, when postholes are found, these are rarely investigated to reconstruct general occupational units. One route that could be taken in this regard, is to analyze these traces in more detail. By focusing on the peculiarities of these features, rather than dismissing them simply as 'postholes' or 'ephemeral features', and looking into their size, depth, the way they were dug, and their arrangements, much more information can be found about the exact configurations of the ephemeral structures that once were established in these places. It could provide new insights into whether smaller or larger poles were used to support the structure, whether these structures contained more or less features, or fixtures, and so inform better on the exact types of mobility employed by different populations.

A further recommendation is that the study of the Wadi Suq must be balanced more towards the study of the settlements, rather than the much more numerous cemeteries. Due to the monumentality of the latter, and the lack of monumentality in the former, a bias in research has emerged that is highly occupied with the locations and details of the funerary landscapes. In some cases these are used as a proxy to reconstruct the landscapes of the living, with population numbers being derived from these sites and analysis taking place at a large geographical scale. By focusing more on settlement, more precise estimations of the population inhabiting the sites can be made, which provides a more accurate view than that from cemeteries that have high counts of individuals interred there as the result of these locations being in prolonged use.

Specifically for the site of Burj Huraiz, further paleoenvironmental investigations might provide more clarity with regard to the hydrological theory as proposed in Chapter 5. If this does not hold, other motivations for why this site was revisited over a longer period must be sought.

Finally, as this thesis has demonstrated, it is pertinent that future work considers Wadi Suq society as more mobile to begin with, rather than using this concept as an explanatory device for sudden changes in settlement and overall lifestyle. As was highlighted in this thesis, the concept of mobility should be approached as a fluid concept that sees differential expression among different groups, in different environments, at different times. This will provide a clearer picture of how such lifestyles were organized at the population level and provide information on the resilience of communities as well as their adaptation to their changing environments, both temporally and geographically.

Abstract

The Wadi Suq period (2000-1600 BCE) of southeast Arabia has long been regarded as a period of collapse, abandonment, and transformations. Specifically in the realm of settlement, a sharp decline is observed both in number and scope when compared with the preceding period. This change is oftentimes explained in terms of network collapse, climatic upheavals, a combination of these two, or in terms of social tensions among the populations of the region themselves. As a reaction to these proposed changes, it has been suggested that the populations adopted a more mobile lifestyle, though which it became easier to exploit multiple resourceful environments in a model where different subsistence strategies could be combined. However, these theories are based on a limited understanding of Wadi Suq settlement, which is due to several reasons. Only few sites of this period are known, and when known, they are often insufficiently investigated to determine whether a shift in lifestyle did indeed occur. Furthermore, many of the sites are studied in isolation and are not compared to other sites or contextualized in a wider geographic picture, or they have been studied superficially as they were part of survey projects that focus on the identification and mapping of many sites at the same time in a wide geographical area. When the sites have been subject to more intensive investigations, they are often not published in much detail. This study has reviewed all current archaeological evidence for Wadi Suq settlement available to the author, by analyzing the relevant excavation reports or all relevant published material with the goal of creating a comparative framework and characterizing Wadi Suq settlement over the wider area of southeast Arabia. In doing so, a special attention was given to the identification of material traces that might signal a mobile configuration of the societies inhabiting these places. Finally, this wider view of Wadi Suq settlement has been applied to a case study in the hinterland of Sohar in the Batinah of Oman, an area for which little data about the Wadi Suq is currently available. By comparing three case study sites with the other Wadi Suq sites in terms of their qualitative properties on multiple scales (region, site, building), the case study sites were contextualized in the wider model of Wadi Suq period settlement in terms of landscape, site configurations, construction styles, and mobility. It was found that Wadi Suq settlement can be categorized into categories of settlement sites, tower sites, industrial sites, and temporary places, and that these sites interacted dynamically with each other along different scales of sedentism and mobility, the resources exploited, and the stylistic and technological ideas that were shared among them on the subjects of material culture and construction. The case study sites feature in this model as another variation in a highly varied settlement style that was adapted to the diverse environments encountered in southeast Arabia, showing similarities with several sites in construction, subsistence, and overall activities carried out while also displaying unique attributes in terms of the types of mobility that were employed by the community, as the motivation for recurrent visitation which seems to lie with particular hydrological conditions as well as a social anchoring through ancestral ties as seen in monumental funerary constructions. It is recommended that future work takes the mobility of populations in this period as aa starting point for analysis and that settlement remains are emphasized more to gain a more accurate understanding of the Wadi Suq period at large.

Bibliography

Abulibdeh, A., Al-Awadhi, T., Al-Nasiri, N., Al-Buloshi, A., & Abdelghani, M. (2021). Spatiotemporal mapping of groundwater salinity in Al-Batinah, Oman. *Groundwater for Sustainable Development*, *12*, 100551. https://doi.org/10.1016/j.gsd.2021.100551

Al-Barwani, A. (2014). Water Resources Management Practices in the Sultanate Oman. Third International Conference on Water Resources and Environmental Management (GIWEH), Antalya, Turkey.

Al-Belushi, M. A. K. (2015). Archaeology and Development in the GCC States. *Journal of Arabian Studies*, *5*(1), 37–66. https://doi.org/10.1080/21534764.2015.1057398

Al-Hemoud, A., Al-Dashti, H., Al-Saleh, A., Petrov, P., Malek, M., Elhamoud, E., Al-Khafaji, S., Li, J., Koutrakis, P., Doronzo, D., & Middleton, N. (2022). Dust storm 'hot spots' and Transport Pathways Affecting the Arabian Peninsula. *Journal of Atmospheric and Solar-Terrestrial Physics*, *238–239*, 105932. https://doi.org/10.1016/j.jastp.2022.105932

Al-Jahwari, N. S. (2009). The agricultural basis of Umm an-Nar society in the northern Oman peninsula (2500–2000 BC). Arabian Archaeology and Epigraphy, 20(2), 122–133. https://doi.org/10.1111/j.1600-0471.2009.00315.x

Al-Jahwari, N. S. (2013). *Settlement patterns, development and cultural change in the northern Oman Peninsula. A multi-tiered approach to the analysis of long-term settlement trends.* BAR Publishing.

Arz, H. W., Lamy, F., & Pätzold, J. (2006). A pronounced dry event recorded around 4.2 ka in brine sediments from the northern Red Sea. *Quaternary Research*, *66*(3), 432–441. https://doi.org/10.1016/j.yqres.2006.05.006

Azzarà, V. M. (2009). Domestic architecture at the Early Bronze Age sites HD-6 and RJ-2 (Ja'alan, Sultanate of Oman). *Proceedings of the Seminar for Arabian Studies*, *39*, 1–16.

Azzarà, V. M., & De Rorre, A. P. (2018). Socio-cultural innovations of the final Umm an-Nar period (c.2100–2000 BCE) in the Oman peninsula: New insights from Ra's al-Jinz RJ-2. *Arabian Archaeology and Epigraphy*, *29*(1), 10–26. https://doi.org/10.1111/aae.12095

Bakels, C. C. (2024). *Botanical results of the WAJAP 2023 and 2024 campaigns* [WAJAP Internal Report]. Leiden University.

Berger, J.-F., Davtian, G., & Cleuziou, S. (2005). Évolution paléogéographique du Ja'alan (Oman) à l'Holocène moyen: Impact sur l'évolution des paléomilieux littoraux et les stratégies d'adaptation des communautés humaines. *Paléorient*, *31*(1), 46–63.

Bernardini, F., Vinci, G., Prokop, D., Barro Savonuzzi, L., De Min, A., Lenaz, D., Princivalle, F., Cocca, E., Kasztovszky, Z., Szilágyi, V., Harsányi, I., Tuniz, C., & Cattani, M. (2020). A multi-analytical study of Bronze Age pottery from the UNESCO site of Al-Khutm (Bat, Oman). *Archaeological and Anthropological Sciences*, *12*(8), 1–22. https://doi.org/10.1007/s12520-020-01099-x

Bernbeck, R. (2008). An archaeology of multisited communities. In H. Barnard & W. Wendrich, *The archaeology of mobility: Old world and new world nomadism* (pp. 43–77). Cotsen Institute of Archaeology.

Biagi, P. (1988). The excavations of structure 5 at RJ-1. In S. Cleuziou & M. Tosi (Eds.), *The Joint Hadd Project. Summary report on the second season, November 1986—January 1987* (pp. 5–10). IsMEO.

Biagi, P. (1990). Excavations at RJ-1, structure 5. Autumn 1987 campaign. In S. Cleuziou, J. Reade, & M. Tosi (Eds.), *The Joint Hadd Project. Summary report on the third season, October 1987—February 1988* (pp. 4–10). IsMEO.

Biagi, P., Jones, D. A., & Nisbet, R. (1989). A preliminary report on the excavation of structure 5 at Ra's al-Junayz 1 (Sultanate of Oman). *Rivista Di Archeologia*, *XII*, 19–30.

Biagi, P., Torke, W., Tosi, M., & Uerpmann, H.-P. (1984). Qurum: A case study of coastal archaeology in Northern Oman. *World Archaeology*, *16*(1), 43–61.

Bieliński, P., Pieńkowska, A., Białowarczuk, M., Kiersnowski, H., Bukowski, K., & Lenarczyk, S. (2023). Patterns of pre-Islamic settlement in the Qumayrah microregion, northern Oman: First results of an archaeological and geological survey. *Arabian Archaeology and Epigraphy*, *34*(S1), S22–S38. https://doi.org/10.1111/aae.12226

Carolin, S. A., Walker, R. T., Day, C. C., Ersek, V., Sloan, R. A., Dee, M. W., Talebian, M., & Henderson, G. M. (2019). Precise timing of abrupt increase in dust activity in the Middle East coincident with 4.2 ka social change. *Proceedings of the National Academy of Sciences*, *116*(1), 67–72. https://doi.org/10.1073/pnas.1808103115

Carter, R. (1997a). *Defining the Late Bronze Age in Southeast Arabia: Ceramic evolution and settlement during the second millennium BC (Vol. I)* [Unpublished doctoral dissertation]. University College London.

Carter, R. (1997b). *Defining the Late Bronze Age in Southeast Arabia: Ceramic evolution and settlement during the second millennium BC (Vol. II)* [Unpublished doctoral dissertation]. University College London.

Carter, R. (1997c). The Wadi Suq period in south-east Arabia: A reappraisal in the light of excavations at Kalba, UAE. *Proceedings of the Seminar for Arabian Studies*, *27*, 87–98.

Carter, R. A. (2003). Restructuring Bronze Age trade. Bahrain, southeast Arabia and the copper question. In H. Crawford (Ed.), *The archaeology of Bahrain. The British contribution* (pp. 31–63).

Cattani, M., Barchiesi, F., Cavazzuti, C., & Cocca, E. (2025). Bologna University Project in the Sultanate of Oman (2023): Fieldwork activities at Al Khutm and Ras Al Hadd. *Athar – Bulletin of Archaeological Research in the Sultanate of Oman*, *1*, 26–35.

Cleuziou, S. (1979). The second and third season of excavations at Hili 8. *Archaeology in the United Arab Emirates*, *2/3*, 30–69.

Cleuziou, S. (1981). Oman Peninsula in the early second millennium B.C. In H. Härtel (Ed.), *South Asian Archaeology 1979: Papers from the fifth international conference of the association of south Asian archaeologists in western Europe held in the Museum für Indische Kunst der staatlichen Museen Preussischer Kulturbesitz Berlin* (pp. 279–293). Dietrich Reimer Verlag.

Cleuziou, S., & Costantini, L. (1980). Premiers éléments sur l'agriculture protohistorique de l'Arabie orientale. *Paléorient*, *6*, 245–251.

Cleuziou, S., & Tosi, M. (2000). Ra's al-Jinz and the prehistoric coastal cultures of the Ja'alan. *Journal of Oman Studies*, *11*, 19–73.

Cleuziou, S., & Tosi, M. (2007). *In the shadow of the ancestors: The prehistoric foundations of the Early Arabian civilization in Oman* (Second expanded edition.). Archaeopress Archaeology.

Cleuziou, S., & Tosi, M. (2020). *In the shadow of the ancestors: The prehistoric foundations of the Early Arabian civilization in Oman* (D. Frenez & R. Garba, Eds.; 2nd edition). Archaeopress Archaeology.

Cocca, E., Vinci, G., Cattani, M., Armigliato, A., Di Michele, A., Bianchi, M., & Gennuso, I. (2019). Al-Khutm Project 2017/2018: A Bronze Age monumental tower (Bat, Oman). *Proceedings of the Seminar for Arabian Studies*, *49*, 85–96.

Contreras, F., Carcacer, N., Thomas, J., Koljic, D., Murray, M., Bukhash, R. M., Abbar, S. O. A., Boraik, M., & Zein, H. M. (2016). Al-Ashoosh: A third-millennium BC desert settlement in the United Arab Emirates. *Antiquity*, *90*(354), e3. https://doi.org/10.15184/aqy.2016.219

Cookson, E., Hill, D. J., & Lawrence, D. (2019). Impacts of long term climate change during the collapse of the Akkadian Empire. *Journal of Archaeological Science*, *106*, 1–9. https://doi.org/10.1016/j.jas.2019.03.009

Cowan, G. (2002). *Nomadology in architecture: Ephemerality, movement and collaboration* [Unpublished MA Thesis]. University of Adelaide.

Crawford, H. (1996). Dilmun, victim of world recession. *Proceedings of the Seminar for Arabian Studies*, *26*, 13–22.

Cribb, R. (1991). *Nomads in Archaeology*. Cambridge University Press. https://doi.org/10.1017/CBO9780511552205

Cullen, H., Demenocal, P., Hemming, S., Hemming, G., Brown, F., Guilderson, T., & Sirocko, F. (2000). Climate change and the collapse of the Akkadian Empire: Evidence from the deep sea. *Geology*, *28*, 379. https://doi.org/10.1130/0091-7613(2000)028%253C0379:CCATCO%253E2.3.CO;2

De Rorre, A. P., Berger, J.-F., Delfino, M., Kenoyer, J. M., Maini, E., & Azzarà, V. M. (2020). The Ras al-Jinz reloaded: Resuming excavations at the edge of Arabia. *Proceedings of the Seminar for Arabian Studies*, *50*, 109–126.

de Vreeze, M. (2016). The social significance of ceramic change at the start of the Wadi Suq period. Rethinking ceramic continuity and change based on recent evidence from the tombs at Qarn al-Ḥarf. *Proceedings of the Seminar for Arabian Studies*, *46*, 63–79.

de Vreeze, M., Düring, B. S., & Olijdam, E. (2020). New light on the late Wadi Suq period from the Ṣuhār hinterlands. *Proceedings of the Seminar for Arabian Studies*, *50*, 141–155. https://hdl.handle.net/1887/3159875

de Vreeze, M., Kennet, D., & Deadman, W. M. (2024). Karstic aquifers and climate refugia: A preliminary outline history of water-management strategy in Bronze and Iron Age southeast Arabia. *Open Quaternary*, *10*(5), 1–16. https://doi.org/10.5334/%20oq.144

Deadman, W. M. (2014). Investigating the orientation of Hafit tomb entrances in Wādīʿ Andām, Oman. *Proceedings of the Seminar for Arabian Studies*, *44*, 139–151.

Deadman, W. M. (2017). *Early Bronze Age society in Eastern Arabia: An analysis of the funerary archaeology of the Hafit period (3,200-2,500 BC) in the Northern Oman Peninsula with special reference to the Al-Batinah region* [Unpublished doctoral dissertation]. Durham University. https://etheses.dur.ac.uk/12367/

Deadman, W. M., Kennet, D., de Vreeze, M., & Al-Jahwari, N. S. (2022). The nature of third-millennium settlement: The example of al-Tikha (Rustaq) an Umm an-Nar site on the Batinah coast of Oman. *Arabian Archaeology and Epigraphy*, *33*(1), 49–84. https://doi.org/10.1111/aae.12218

Degli Esposti, M., & Benoist, A. (2015). More on Masafi ancestors: The Late Bronze Age site of Masafi-5. *Proceedings of the Seminar for Arabian Studies*, *45*, 57–73.

Degli Esposti, M., Borgi, F., Pellegrino, M. P., & Kannouma, R. H. (2023). Another side to the story: Preliminary results from the renewed excavations on the eastern flank of Tell Abraq (2021-2022). In P. E. Fadi, M. Gannon, K. A. Shohof, & T. A. Ghoul (Eds.), *Advances in UAE Archaeology* (pp. 183–208). Archaeopress. https://doi.org/10.2307/jj.14638142.13

Döpper, S. (2020). Der Wadi Suq-zeitliche Siedlungsplatz von Tawi Said im Zentraloman: Bericht über den Survey 2018. *Mitteilungen der Deutschen Orient-Gesellschaft zu Berlin*, *152*, 5–27.

Döpper, S. (2021). The Middle and Late Bronze Age in Central Oman: New Insights from Tawi Said, Al-Mudhairib and the Wilayat al-Mudhaybi. *Arabian Archaeology and Epigraphy*, *32*(S1), 313–327. https://doi.org/10.1111/aae.12181

Döpper, S. (2022). Walk the line: The 2020 field season of the Al-Mudhaybi Regional Survey. *Proceedings of the Seminar for Arabian Studies*, *51*, 157–167.

Döpper, S. (2023). Survey methods and biases in the Al-Mudhaybi Regional Survey, Sultanate of Oman. *Arabian Archaeology and Epigraphy*, *34*(S1), S39–S50. https://doi.org/10.1111/aae.12224

Döpper, S. (Ed.). (2018). *Beyond tombs and towers. Domestic Architecutre of the Umm an-Nar period in eastern Arabia*. Harrassowitz Verlag.

Döpper, S., Biezeveld, I., Maiorano, M. P., & Kluge, J. (2018). *The 2018 archaeological survey at Tawi Said, Sultanate of Oman*. Archaeopress. https://doi.org/10.2307/jj.14416281

Döpper, S., Kluge, J., & Maiorano, M. P. (2023). The Al-Mudhaybi Regional Survey: Field seasons 2021 and 2022. *Proceedings of the Seminar for Arabian Studies*, *52*, 107–120.

Düring, B. S. (2022). Beyond dots with dates: A landscape approach to the Sohar hinterlands. *Arabian Archaeology and Epigraphy*, *33*(1), 170–177. https://doi.org/10.1111/aae.12219

Düring, B. S. (2023). *Wadi al Jizzi Archaeological Project 2023 – Interim Report Season 7* [WAJAP Internal Report]. Wadi al-Jizzi Archaeological Project.

Düring, B. S., & Botan, S. A. (2018). The Early Bronze Age settlements of the Sohar hinterlands: Scratching the surface. In S. Döpper (Ed.), *Beyond tombs and towers. Domestic Architecutre of the Umm an-Nar period in eastern Arabia* (pp. 17–27). Harrassowitz Verlag.

Düring, B. S., & Olijdam, E. (2015). Revisiting the Ṣuḥār hinterlands: The Wādī al Jīzī Archaeological Project. *Proceedings of the Seminar of Arabian Studies*, *45*, 93–106.

During, B. S., Botan, S. A., Olijdam, E., & Aal, J. H. J. M. (2019). The Bronze Age cultural landscape of Wadi al-Zahaimi. *Proceedings of the Seminar for Arabian Studies.*, *49*, 115–127.

Eddisford, D. (2022). Exchange networks of the Early Bronze Age Gulf: The imported ceramics from Kalba 4 (United Arab Emirates). *Arabian Archaeology and Epigraphy*, *33*(1), 23–48. https://doi.org/10.1111/aae.12208

Eddisford, D., & Phillips, C. (2009). Kalba' in the third millennium (Emirate of Sharjah, UAE). *Proceedings of the Seminar for Arabian Studies*, *39*, 111–124.

Edens, C. (1992). Dynamics of Trade in the Ancient Mesopotamian "World System." *American Anthropologist*, *94*(1), 118–139. https://doi.org/10.1525/aa.1992.94.1.02a00070

Eerkens, J. W. (2003). Residential mobility and pottery use in the western Great Basin. *Current Anthropology*, *44*(5), 728–738. https://doi.org/10.1086/379262

Fleitmann, D., Burns, S. J., Mudelsee, M., Neff, U., Kramers, J., Mangini, A., & Matter, A. (2003). Holocene forcing of the Indian Monsoon recorded in a stalagmite from southern Oman. *Science*, *300*(5626), 1737–1739. https://doi.org/10.1126/science.1083130

Frenez, D. (2020). Cross-cultural trade and socio-technical developments In the Oman Peninsula during the Bronze Age, ca. 3200 to 1600 BC. *Ocnus. Quaderni Della Scuola Di Specializzazione in Beni Archeologici*, *27*, 7–47. https://doi.org/10.12876/OCNUS2702

Frachetti, M. D. (2004). *Bronze Age pastoral landscapes of Eurasia and the nature of social interaction in the mountain steppe zone of eastern Kazakhstan* [Unpublished doctoral dissertation]. University of Pennsylvania.

Frachetti, M. D. (2008). Variability and dynamic landscapes of mobile pastoralism in ethnography and prehistory. In H. Barnard & W. Wendrich, *The archaeology of mobility: Old world and new world nomadism* (pp. 366–396). Cotsen Institute of Archaeology.

Frifelt, K. (1975). On prehistoric settlement and chronology of the Oman Peninsula. *East and West*, *25*(3/4), 359–424.

Giardino, C. (2019). *Magan – The land of copper: Prehistoric metallurgy of Oman*. Archaeopress Archaeology.

Giesche, A., Staubwasser, M., Petrie, C. A., & Hodell, D. A. (2019). Indian winter and summer monsoon strength over the 4.2 ka BP event in foraminifer isotope records from the Indus River delta in the Arabian Sea. *Climate of the Past*, *15*(1), 73–90. https://doi.org/10.5194/cp-15-73-2019

Giraud, J. (2010). Early Bronze Age graves and graveyards in the in eastern Ja'alan (Sultanate of Oman): An assessment of the social rules working in the evolution of a funerary landscape. In D. Kennet (Ed.), *Death and Burial in Arabia and Beyond: Multidisciplinary Perspectives* (pp. 71–84). Archaeopress.

Gregoricka, L. A. (2011). *Mobility, exchange, and tomb membership in Bronze Age Arabia: A biogeochemical investigation* [Unpublished doctoral dissertation]. The Ohio State University.

Gregoricka, L. A. (2013). Geographic origins and dietary transitions during the Bronze Age in the Oman Peninsula. *American Journal of Physical Anthropology*, *152*(3), 353–369. https://doi.org/10.1002/ajpa.22360

Gregoricka, L. A. (2016). Human response to climate change during the Umm an-Nar/Wadi Suq transition in the United Arab Emirates. *International Journal of Osteoarchaeology*, *26*(2), 211–220. https://doi.org/10.1002/oa.2409

Hakro, A. N., & Pandow, B. A. (2019). Development and diversification: A case study of the Sultanate of Oman. In A. N. Hakro (Ed.), *Oman in the 21st century: Issues and challenges*. Nova.

Halfman, J., Jacobson, D., Cannella, C., Haberyan, K., & Finney, B. (1992). Fossil diatoms and the mid to late Holocene paleolimnology of Lake Turkana, Kenya: A reconnaissance study. *Journal of Paleolimnology*, *7*, 23–35. https://doi.org/10.1007/BF00197029

Hamdan, M., Hassan, F., Flower, R. J., & Ebrahim, E. (2015). Climate and collapse of Egyptian Old Kingdom: A geoarchaeological approach. In G. Capriotti (Ed.), *Archaeology and Environment. Understanding the Past to Design the Future: A multidisciplinary Approach. Proceedings of the International Workshop "Italian Days in Aswan", 16th-18th November 2013* (pp. 37–48). CNR Edizioni.

Hammer, E. (2025). *The archaeology of pastoralism, mobility, and society: Beyond the grass paradigm*. Cambridge University Press. https://doi.org/10.1017/9781009561709

Harrower, M. J. (2010). Geographic Information Systems (GIS) hydrological modeling in archaeology: An example from the origins of irrigation in Southwest Arabia (Yemen). *Journal of Archaeological Science*, *37*(7), 1447–1452. https://doi.org/10.1016/j.jas.2010.01.004

Herrmann, J. T., Casana, J., & Qandil, H. S. (2012). A sequence of inland desert settlement in the Oman peninsula: 2008–2009 excavations at Saruq al-Hadid, Dubai, UAE. *Arabian Archaeology and Epigraphy*, *23*(1), 50–69. https://doi.org/10.1111/j.1600-0471.2011.00349.x

Jasim, S. A. (2000). Second millennium settlement at Khor Fakkan the Emirate of Sharjah, UAE. *ResearchGate*. https://doi.org/10.15366/isimu2000.3.007

Kennet, D., & Velde, C. (1995). Third and early second-millennium occupation at Nud Ziba, Khatt (UAE). *Arabian Archaeology and Epigraphy*.

Kennet, D., Caine, A., Hilton, A., Weeks, L., & Velde, C. (2025). *Southeast Arabia at the dawn of the second millennium. The Bronze Age collective graves of Qarn al-Harf, Ras al-Khaimah (UAE).* Oxbow Books.

Kennet, D., Deadman, W. M., & Al-Jahwari, N. S. (2016). The Rustaq-Batinah Archaeological Survey. *Proceedings of the Seminar for Arabian Studies*, *46*, 155–168.

Kerr, A. D. R. (2016). *A house complex in Bronze Age Arabia: A study of "Umm an-Nar" and "Wadi Suq" domestic architecture at the settlement slope, Bat (Oman)* [Unpublished master's thesis, Durham University]. https://etheses.dur.ac.uk/11730/

Krom, M., Stanley, J.-D., Cliff, R., & Woodward, J. (2002). Nile River sediment fluctuations over the past 7000 yr and their key role in sapropel development. *Geology*, *30*. https://doi.org/10.1130/0091-7613(2002)030%253C0071:NRSFOT%253E2.0.CO;2

Kuronuma, T., Miki, T., & Kondo, Y. (2023). Archaeological surveys of a canyon and floodplain in the Tanūf District, North-Central Oman: Optimised methodology and applications. *Arabian Archaeology and Epigraphy*, *34*(S1), S85–S105. https://doi.org/10.1111/aae.12220

Kutterer, J. (2013). *The archaeological site HLO1. A Bronze Age copper mining and smelting site in the Emirate of Sharjah (U.A.E.)* [Unpublished doctoral dissertation]. Eberhard-Karls-Universität Tübingen.

Kutterer, J., Neureiter, C., & Jasim, S. (2013). Second report on the copper smelting site HLO1 in Wadi al-Hilo (Sharjah, UAE). *Proceedings of the Seminar for Arabian Studies*, *43*, 185–196.

Lemcke, G., & Sturm, M. (1997). δ18O and trace element measurements as proxy for the reconstruction of climate changes at Lake Van (Turkey): Preliminary results. *Third Millennium BC Climate Change and Old World Collapse*, 653–678.

Lidour, K., Beech, M. J., Eddisford, D., Phillips, C. S., Schwall, C., & Jasim, S. A. (2023). A Bronze to Iron Age fishing economy at Kalbāʾ 4 (Emirate of Sharjah, United Arab Emirates). *Arabian Archaeology and Epigraphy*, *34*(1), 44–62. https://doi.org/10.1111/aae.12227

Lindauer, S., Santos, G. M., Steinhof, A., Yousif, E., Phillips, C., Jasim, S. A., Uerpmann, H.-P., & Hinderer, M. (2017). The local marine reservoir effect at Kalba (UAE) between the Neolithic and Bronze Age: An indicator of sea level and climate changes. *Quaternary Geochronology*, *42*, 105–116. https://doi.org/10.1016/j.quageo.2017.09.003

Magee, P. (2014). *The Archaeology of Prehistoric Arabia: Adaptation and Social Formation from the Neolithic to the Iron Age*. Cambridge University Press. https://doi.org/10.1017/CBO9781139016667

Magee, P. (2014). *The archaeology of Prehistoric Arabia: Adaptation and social formation from the Neolithic to the Iron Age*. Cambridge University Press. https://doi.org/10.1017/CBO9781139016667

Magee, P., Händel, M., Karacic, S., Uerpmann, M., & Uerpmann, H.-P. (2017). Tell Abraq during the second and first millennia BC: Site layout, spatial organisation, and economy. *Arabian Archaeology and Epigraphy*, *28*(2), 209–237. https://doi.org/10.1111/aae.12103

Magee, P., Uerpmann, H.-P., Uerpmann, M., Jasim, S. A., Händel, M., Barber, D., Fritz, C., & Hammer, E. (2009). Multi-disciplinary research on the past human ecology of the east Arabian coast: Excavations at Hamriya and Tell Abraq (Emirate of Sharjah, United Arab Emirates). *Arabian Archaeology and Epigraphy*, *20*(1), 18–29. https://doi.org/10.1111/j.1600-0471.2008.00304.x

Mariani, L. (1986). Surface study of settlement site RJ-1. In S. Cleuziou & M. Tosi (Eds.), *The Joint Hadd Project. Summary report on the first season December 1985* (pp. 36–41). IsMEO.

McKay, N. P., Kaufman, D. S., Arcusa, S. H., Kolus, H. R., Edge, D. C., Erb, M. P., Hancock, C. L., Routson, C. C., Żarczyński, M., Marshall, L. P., Roberts, G. K., & Telles, F. (2024). The 4.2 ka event is not remarkable in the context of Holocene climate variability. *Nature Communications*, *15*, 6555. https://doi.org/10.1038/s41467-024-50886-w

Méry, S. C. (2000). *Les céramiques d'Oman et l'Asie moyenne. Une archéologie des échanges à l'âge du Bronze*. CNRS Editions.

Miki, T., Kuronuma, T., MacDonald, B. L., Glascock, M. D., & Kondo, Y. (2024). Petrographic and geochemical analyses of pottery from Wadi Tanuf, Oman: Approaching pottery production in south-eastern Arabia during the second and first millennia BCE. *Archaeometry*, *66*(6), 1236–1254. https://doi.org/10.1111/arcm.12974

Monchablon, C., Crassard, R., Munoz, O., Guy, H., Bruley-chabot, G., & Cleuziou, S. (2003). Excavations at Raʾs al-Jinz RJ-1: Stratigraphy without tells. *Proceedings of the Seminar for Arabian Studies*, *33*, 31–47.

Mortimer, A. (2016). Excavations at tower 1156. In C. P. Thornton, C. M. Cable, & G. L. Possehl (Eds.), *The Bronze Age Towers at Bat, Sultanate of Oman: Research by the Bat Archaeological Project, 2007-12* (pp. 123–154). University of Pennsylvania Museum of Archaeology and Anthropology. https://doi.org/10.2307/j.ctv2t4ct6

Munoz, O. (2017). Transition to agriculture in South-Eastern Arabia: Insights from oral conditions. *American Journal of Physical Anthropology*, *164*(4), 702–719. https://doi.org/10.1002/ajpa.23307

Munoz, O. (2019). Promoting group identity and equality by merging the dead. Increasing complexity in mortuary practices from the Late Neolithic to the Early Bronze Age in the Oman Peninsula and their social implications. In K. D. Williams & L. A. Gregoricka, *Mortuary and Bioarchaeological Perspectives on Bronze Age Arabia*. University Press of Florida.

Olijdam, E. (2023). *WAJAP excavation season 2023: BP08 final report* [WAJAP Internal Report]. Wadi al-Jizzi Archaeological Project.

Olijdam, E., Düring, B. S., De Vreeze, M., & van Litsenburg, Z. (2025). A rural perspective on the Umm an-Nar and Wadi Suq periods from Burj Huraiz. *Proceedings of the Seminar for Arabian Studies*, *54*, 183–200.

Parker, A. G., & Goudie, A. S. (2008). Geomorphological and palaeoenvironmental investigations in the southeastern Arabian Gulf region and the implication for the archaeology of the region. *Geomorphology*, *101*(3), 458–470. https://doi.org/10.1016/j.geomorph.2007.04.028

Parker, A. G., Goudie, A. S., Stokes, S., White, K., Hodson, M. J., Manning, M., & Kennet, D. (2006). A record of Holocene climate change from lake geochemical analyses in southeastern Arabia. *Quaternary Research*, *66*(3), 465–476. https://doi.org/10.1016/j.yqres.2006.07.001

Pennington, B. T., Hamdan, M. A., Pears, B. R., & Sameh, H. I. (2019). Aridification of the Egyptian Sahara 5000–4000 cal BP revealed from x-ray fluorescence analysis of Nile Delta sediments at Kom al-Ahmer/Kom Wasit. *Quaternary International*, *514*, 108–118. https://doi.org/10.1016/j.quaint.2019.01.015

Petraglia, M. D., Groucutt, H. S., Guagnin, M., Breeze, P. S., & Boivin, N. (2020). Human responses to climate and ecosystem change in ancient Arabia. *Proceedings of the National Academy of Sciences*, *117*(15), 8263–8270. https://doi.org/10.1073/pnas.1920211117

Phillips, C. S., & Mosseri-Marlio, C. E. (2002). Sustaining change: The emerging picture of the Neolithic to Iron Age subsistence economy at Kalba, Sharjah Emirate, UAE. In H. Buitenhuis, A. M. Choyke, M. Mashkour, & A. H. Al-Shiyab (Eds.), *Archaeozoology of the Near East V. Proceedings of the fifth international symposium on the archaeozoology of southwestern Asia and adjacent areas* (pp. 195–210). Center for Archaeological Research and Consultancy.

Phillips, C., & Simpson, S. J. (2018). Introduction. In C. S. Phillips & S. J. Simpson, *Softstone: Approaches to the study of chlorite and calcite vessels in the Middle East and Central Asia from prehistory to the present* (2935354; Vol. 20). Archaeopress Archaeology.

Potts, D. T. (1991). *Further excavations at Tell Abraq: The 1990 season*. Munksgaard.

Potts, D. T. (1993). Rethinking some aspects of trade in the Arabian Gulf. *World Archaeology*, *24*(3), 423–440.

Potts, D. T. (1997). Rewriting the Late Prehistory of South-Eastern Arabia: A reply to Jocelyn Orchard. *Iraq*, *59*, 63–71. https://doi.org/10.2307/4200436

Potts, D. T. (2000). *Ancient Magan: The secrets of Tell Abraq*. Trident Press.

Potts, D. T. (2001). Before the Emirates: An Archaeological and historical account of developments in the region c. 5000 BC to 676 AD. *United Arab Emirates: A New Perspective*, 28–69.

Potts, D. T. (with Dalongville, R., & Prieur, A.). (1990). *A prehistoric mound in the Emirate of Umm al-Qaiwain, U.A.E.: Excavations at Tell Abraq in 1989*. Munksgaard.

Prasad, S., Anoop, A., Riedel, N., Sarkar, S., Menzel, P., Basavaiah, N., Krishnan, R., Fuller, D., Plessen, B., Gaye, B., Röhl, U., Wilkes, H., Sachse, D., Sawant, R., Wiesner, M. G., & Stebich, M. (2014). Prolonged monsoon droughts and links to Indo-Pacific warm pool: A Holocene record from Lonar Lake, central India. *Earth and Planetary Science Letters*, *391*, 171–182. https://doi.org/10.1016/j.epsl.2014.01.043

Righetti, S. (2015a). *Les cultures du Wadi Suq et de Shimal dans la péninsule omanaise au deuxième millénaire avant notre ère: Évolution des sociétés du Bronze Moyen et du Bronze Récent (Vol. I - Texte)* [Unpublished doctoral dissertation]. Paris 1 Sorbonne. https://theses.fr/2015PA010713

Righetti, S. (2015b). *Les cultures du Wadi Suq et de Shimal dans la péninsule omanaise au deuxième millénaire avant notre ère: Évolution des sociétés du Bronze Moyen et du Bronze Récent (Vol. II - Illustrations et notice des sites)* [Unpublished doctoral dissertation]. Paris 1 Sorbonne. https://theses.fr/2015PA010713

Righetti, S., & Cleuziou, S. (2010). The Wādī Sūq pottery: A typological study of the pottery assemblage at Hili 8 (UAE). *Proceedings of the Seminar for Arabian Studies*, *40*, 283–291.

Roberts, J., Weeks, L., Cable, C., Fillios, M., Aali, Y. Y. al, Radwan, M. B., & Zein, H. (2018). The role of wild terrestrial animals in late prehistoric societies of south-eastern Arabia: New insights from Saruq al-Hadid. *Arabian Archaeology and Epigraphy*, *29*(2), 115–134. https://doi.org/10.1111/aae.12112

Roberts, J., Weeks, L., Fillios, M., Cable, C., Carter, M., al Aali, Y. Y., Radwan, M. B., & Zein, H. (2019). The exploitation of marine resources at Saruq al-Hadid: Insights into the movement of people and resources in Bronze and Iron Age south-eastern Arabia. *Arabian Archaeology and Epigraphy*, *30*(2), 179–198. https://doi.org/10.1111/aae.12137

Rosen, S. A. (1992). Nomads in archaeology: A response to Finkelstein and Perevolotsky. *Bulletin of the American Schools of Oriental Research*, *287*, 75–85. https://doi.org/10.2307/1357141

Santini, G. (1987). Site Rh-10 at Qurum and a preliminary analysis of its cemetery: An essay in stratigraphic discontinuity. *Proceedings of the Seminar for Arabian Studies*, *17*, 179–198.

Sapirstein, P., & Murray, S. (2017). Establishing best practices for photogrammetric recording during archaeological fieldwork. *Journal of Field Archaeology*, *42*(4), 337–350.

Schmidt, C., & Döpper, S. (2016). Umm an-Nar pottery assemblages from Bat and al-Zeba and their functional contexts. *Proceedings of the Seminar for Arabian Studies*, *46*, 247–261.

Schmitt, K. E., Beuzen-Waller, T., Schmidt, C., Proctor, L., Lindauer, S., Gey, C. J., Pietsch, D., & Schöne, B. R. (2024). *Melanoides tuberculata* and *Zootecus insularis* gastropod shells provide a snapshot into past hydroclimatic conditions of arid environments: New perspectives from Oman. *Palaeogeography, Palaeoclimatology, Palaeoecology*, *655*, 112542. https://doi.org/10.1016/j.palaeo.2024.112542

Schreiber, J. (1998). *Die Siedlungsarchitektur auf der Halbinsel Oman vom 3. Bis zur Mitte des 1. Jtsd. V. Chr.* Ugarit-Verlag.

Schwall, C., & Brandl, M. (2023). Kalba: Main results of the renewed fieldwork during the campaigns of 2019-2022. In P. E. Fadi, M. Gannon, K. A. Shohof, & T. A. Ghoul (Eds.), *Advances in UAE Archaeology* (pp. 147–156). Archaeopress. https://doi.org/10.2307/jj.14638142.11

Schwall, C., & Jasim, S. A. (2020). Assessing Kalba: New fieldwork at a Bronze Age coastal site on the Gulf of Oman (Emirate of Sharjah, UAE). *Proceedings of the Seminar for Arabian Studies*, *50*, 321–332.

Schwall, C., Börner, M., Brandl, M., David-Cuny, H., Blattner, D., Ostmann, F., & Horesj, B. (2023). *Report on the 2023 Austrian Archaeological Expedition at Kalba (K4)* (Annual Sharjah Archaeology, pp. 8–18). Sharjah Archaeology Authority - Govt. of Sharjah.

Staubwasser, M., Sirocko, F., Grootes, P. M., & Segl, M. (2003). Climate change at the 4.2 ka BP termination of the Indus valley civilization and Holocene south Asian monsoon variability. *Geophysical Research Letters*, *30*(8). https://doi.org/10.1029/2002GL016822

Steadman, S. R. (2015). *Archaeology of domestic architecture and the human use of space*. Left Coast Press.

Swerida, J. L. (2018). Bat and the Umm an-Nar settlement tradition. In S. Döpper (Ed.), *Beyond tombs and towers. Domestic Architecture of the Umm an-Nar Period in eastern Arabia* (pp. 51–69). Harrassowitz Verlag.

Swerida, J. L. (2022). House, household, and the Umm an-Nar: Structure SS1 at the UNESCO World Heritage Site of Bat, Sultanate of Oman. In L. Battini, A. Brody, & S. R. Steadman (Eds.), *No place like home: Ancient Near Eastern houses and households* (pp. 164–180). Archaeopress Archaeology.

Swerida, J. L., & Thornton, C. (2019). al-Khafaji reinterpreted: New insights on Umm an-Nar monuments and settlement from Bat, Oman. *Arabian Archaeology and Epigraphy*, *30*(2), 157–172. https://doi.org/10.1111/aae.12131

Swerida, J., & Jean, M. (2025). Pottery making in the first oases: Comparison between Bat and Bisya domestic and tower assemblages. *Arabian Archaeology and Epigraphy*, *36*(1). https://doi.org/10.1111/aae.12270

Swerida, J., & Thornton, C. (2019). Um An Nar architecture & society at the Bat settlement slope, Sultanate of Oman. *The Journal of Oman Studies*, *20*, 78–111.

Tengberg, M. (2012). Beginnings and early history of date palm garden cultivation in the Middle East. *Journal of Arid Environments*, *86*, 139–147. https://doi.org/10.1016/j.jaridenv.2011.11.022

Tengberg, M. (2016). Appendix I. Archaeobotanical studies at Bat. A short summary and recommendations. In C. Thornton, C. M. Cable, & G. L. Possehl (Eds.), *The Bronze Age towers at Bat, Sultanate of Oman: Research by the Bat Archaeological Project, 2007-12* (pp. 263–268). University of Pennsylvania Press. https://doi.org/10.9783/9781934536070

Thornton, C. P., & Ghazal, R. O. (2016). Typological and chronological consideration of the ceramics at Bat, Oman. In C. Thornton, C. M. Cable, & G. L. Possehl (Eds.), *The Bronze Age towers at Bat, Sultanate of Oman: Research by the Bat Archaeological Project, 2007-12* (pp. 179–216). University of Pennsylvania Press. https://doi.org/10.9783/9781934536070

Tosi, M. (1975). Notes on the Distribution and Exploitation of Natural Resources in Ancient Oman. *Journal of Oman Studies*, *1*, 187–206.

Uerpmann, H.-P., & Uerpmann, M. (2002). The appearance of domestic camel in South-East Arabia. *Journal of Oman Studies*, *12*, 235–260.

van Litsenburg, Z. (2023). *Faunal report WAJAP 2023 site 73* [WAJAP Internal Report]. Wadi al-Jizzi Archaeological Project.

van Litsenburg, Z. (2024). *Zooarchaeology report – Wadi al Jizzi Archaeological Project 2024* [WAJAP Internal Report]. Wadi al-Jizzi Archaeological Project.

Velde, C. (1992). *Die spätbronzezeitliche und früheisenzeitliche Sieldlung und ihre Keramik in Shimal/Ras al-Khaimah (Vereinigte Arabische Emirate)* [M.A. Thesis]. Universität Göttingen.

Velde, C. (2003). Wadi Suq and Late Bronze Age in the Oman Peninsula. In D. T. Potts, A.-N. Hassan, & P. Hellyer (Eds.), *Archaeology of the United Arab Emirates: Proceedings of the first international conference on the archaeology of the U.A.E.* Trident Press.

Velde, C. (2018). The question of workshops and chronology in the Wadi Suq period. In C. S. Phillips & S. J. Simpson, *Softstone: Approaches to the study of chlorite and calcite vessels in the Middle East and Central Asia from prehistory to the present* (Vol. 20). Archaeopress Archaeology.

Vermaes, A. (2024). *Summary trench AS25* [WAJAP Internal Report]. Wadi al-Jizzi Archaeological Project.

Vogt, B. (1994). Asimah: An account of a two months rescue excavation in the mountains of Ras al-Khaimah, United Arab Emirates.

Vogt, B., & Franke-Vogt, U. (Eds.). (1987). Shimal 1985/1986. Excavations of the German Archaeological Mission in Ras al-Khaimah, U.A.E. – A preliminary report. Dietrich Reimer Verlag.

Watanabe, T. K., Watanabe, T., Yamazaki, A., & Pfeiffer, M. (2019). Oman corals suggest that a stronger winter shamal season caused the Akkadian Empire (Mesopotamia) collapse. *Geology*, *47*(12), 1141–1145. https://doi.org/10.1130/G46604.1

Weeks, L. (2003). *Early metallurgy of the Persian Gulf* (Vol. 2). Brill.

Weeks, L., Cable, C. M., Franke, K. A., Karacic, S., Newton, C., Roberts, J., Stepanov, I., McRae, I. K., Moore, M. W., David-Cuny, H., Aali, Y. Y. A., Boraik, M., & Zein, H. M. (2019). Saruq al-Hadid: A persistent temporary place in late prehistoric Arabia. World Archaeology, 51(1), 157–182.

Weeks, L., Cable, C. M., Karacic, S., Franke, K. A., Price, D. M., Newton, C., Roberts, J., Ali, Y. Y. A., Boraik, M., & Zein, H. (2019). Dating persistent short-term human activity in a complex depositional environment: Late Prehistoric occupation at Saruq al-Hadid, Dubai. *Radiocarbon*, *61*(4), 1041–1075. https://doi.org/10.1017/RDC.2019.39

Weeks, L., Cable, C., Franke, K., Newton, C., Karacic, S., Roberts, J., Stepanov, I., David-Cuny, H., Price, D., Bukhash, R. M., Radwan, M. B., & Zein, H. (2017). Recent archaeological research at Saruq al-Hadid, Dubai, UAE. *Arabian Archaeology and Epigraphy*, *28*(1), 31–60. https://doi.org/10.1111/aae.12082

Weisgerber, G. (1980). ... und Kupfer in Oman. Das Oman-Projekt des Deutschen Bergbau-Museums. *Der Anschnitt*, *32*(2–3), 62–110.

Weisgerber, G. (1981). Mehr als Kupfer in Oman. Ergebnisse der Expedition 1981. *Der Anschnitt*, *33*(5/6), 174–263.

Weiss, H. (2017). 4.2 ka BP megadrought and the Akkadian collapse. In H. Weiss (Ed.), *Megadrought and collapse: From early Agriculture to Angkor* (p. 0). Oxford University Press. https://doi.org/10.1093/oso/9780199329199.003.0004

Wendrich, W., & Barnard, H. (2008). The archaeology of mobility: Definitions and research approaches. In H. Barnard & W. Wendrich, The archaeology of mobility: Old world and new world nomadism (pp. 1–24). Cotsen Institute of Archaeology.

Willcox, G. (1995). Some plant impressions from Umm an-Nar Island. In K. Frifelt (Ed.), *The Island of Umm an-Nar, Vol. 2. The Third Millenium Settlement* (pp. 257–259). Aarhus University Press.

Willcox, G., & Tengberg, M. (1995). Preliminary report on the archaeobotanical investigations at Tell Abraq with special attention to chaff impressions in mud brick. *Arabian Archaeology and Epigraphy*, *6*(2), 129–138. https://doi.org/10.1111/aae.1995.6.2.129

Williams, K. D. (2023). *Landscapes of death: Early Bronze Age tombs and mortuary rituals on the Oman Peninsula*. Archaeopress. https://doi.org/10.2307/jj.15136059.5

Williams, K. D., & Gregoricka, L. A. (2016). Appendix V. Excavation of the Wadi Suq tombs at Tower 1156. In C. Thornton, C. M. Cable, & G. L. Possehl (Eds.), *The Bronze Age towers at Bat, Sultanate of Oman: Research by the Bat Archaeological Project, 2007-12* (pp. 303–308). University of Pennsylvania Press. https://doi.org/10.9783/9781934536070

Younes, M. A., & Bakry, A. (2022). The 4.2 ka BP climate event in Egypt: Integration of archaeological, geoarchaeological, and bioarchaeological evidence. *African Archaeological Review*, *39*(3), 315–344. https://doi.org/10.1007/s10437-022-09487-5

Zhao, X., Liu, Y., Salem, A., Marks, L., Welc, F., Sun, Q., Jiang, J., Chen, J., & Chen, Z. (2017). Migration of the Intertropical Convergence Zone in North Africa during the Holocene: Evidence from variations in quartz grain roundness in the lower Nile valley, Egypt. *Quaternary International*, *449*, 22–28. https://doi.org/10.1016/j.quaint.2017.06.036