

RESEARCH ARTICLE

# Late Islamic Mountain Villages at Suhaila, Hatta (Dubai): Survey and Excavation at Sites No. 1, 3, and 4

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## Abstract

Recent survey and excavations at Suhaila 1,3 and 4, carried out by the Dubai Culture and Arts Authority and Chronicle Heritage Arabia, have revealed that each of the sites show evidence of a Late Islamic Period occupation. Each of these settlements shared architectural grammar that included organization of space, construction techniques, and concepts of organization placed that took advantage of the local landscape in their development, including the implementation of falaj systems to support local agricultural potential. These sites are comparable to other recently investigated Late Islamic sites such as Qumayrah and Sahlat, which show connections to maritime trade networks. The results from the three Suhaila sites offer another case study that connects these remote agricultural sites in mountainous and rural zones to the broader coastal economy of the Gulf.

**Keywords:** Late Islamic Period, Settlements, Agriculture Terraces. Falaj, Julfar Ware, Omani Coins.

## 1. Introduction

The Suhaila 1, 3, and 4 heritage sites are located on the northeastern foot slopes of Jabal Qallat Sabba in the Hatta Valley (Figure 1). Hatta was historically known as Hajarain, an inland enclave of the Emirate of Dubai in the United Arab Emirates (UAE). Situated within the Northern Hajar Mountains, the area lies at the modern border between the UAE and Oman. The area receives low winter rainfall and experiences summer drought. It is classified as a hot desert climate (Bwh) characterized by high summer daytime temperatures that exceed 40 degrees Celsius

(°C). Rainfall fluctuates significantly throughout the year. The average annual rainfall is less than 100 millimeters (mm), with slightly higher amounts in the mountain regions of around 160-190 mm (Brown and Feulner 2023). The variation of elevation within the Project Area is generally between 200-750 m asl. The geomorphological landscape is marked by the Wadi Hatta valley and the northern Hajar Mountains, forming Harzburgite Terrane, which is characterized by diverse topography and prominent peaks such as Jabal Hatta (1,300 m asl), Jabal Abu Samasimah (550 m asl), Jabal Lishan (660 m asl), Jabal Qimah (610 m asl), and Jabal Ruwayshid (438 m asl).

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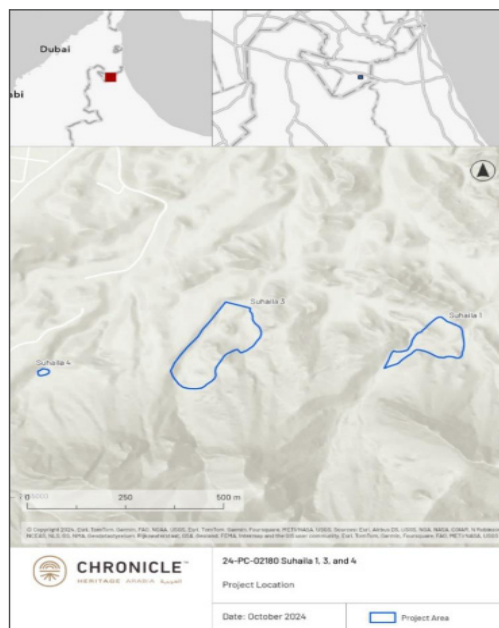


Figure 1. Map of Suhaila 1, 3, and 4 Project Areas.

Chronicle Heritage Arabia (CH Arabia) completed excavations, a topographic survey and established both permanent and temporary survey control stations across the Suhaila heritage landscape on behalf of the Dubai Culture and Arts Authority (DCAA). A program of excavation of six structures (Structures 7-12) at Suhaila 1, two structures (Structures 1-2) at Suhaila 3, and two structures (Structures 1-2) at Suhaila 4 documented their stratigraphic contexts and architectural features. The work in the domestic areas at Suhaila 1, 3, and 4 was complemented by test trench excavation at one of the Suhaila 3 agricultural terraces to document development of the water management features within the site. Further study by the DCAA into the scale and duration of human impacts on the landscape over the *longue durée* would add further value to our understanding of the wider Hatta archaeological landscape, raising important questions regarding sustainable landscape practices in arid and highland environments and their implications for long-term environmental management.

## 2. Archaeological Background

The local geomorphological landscape, marked by the Hatta Valley and the northern Hajar Mountains, has impacted the way the settlements of the Hatta Valley and regional settlements in similar environments have been studied and documented. The archaeological investigations in the interior regions in the southeast of the Arabian Peninsula have traditionally concentrated on oasis settlements such as Bat(Cable 2012; Cable & al-Jabri 2019: 15–31; Frifelt 1975: 359–424; Swerida *et al.* 2020: 202), Bisya/Salut(Avanzoni & Degli Esposti 2018: 9–17; Condoluci & Degli Esposti

2015; JEAN *et al.* 2023: 189–205; Sauvage *et al.* 2022: 529) ; Al-Khashbah, and Rustaq(Deadman *et al.* 2022: 49–84). The most significant oasis settlement in the region in the Islamic Period, and one which has been heavily investigated in recent years with archaeological survey and excavation, is al-Ain(al-Tikriti. 1981; Mery. 2011; Lombard. 1985; Power. 2015: 1–33). Surveys and excavations of these oasis sites have successfully depicted the dynamics of past socio-economic transformations and have presented the importance of oases as a geographical focus of past human activities in the Arabian Peninsula, spanning the Prehistoric to Modern epochs (Table 1). In contrast, the archaeological characteristics of sites in the piedmont and interior mountainous areas are only now beginning to be systematically investigated.

A team led by Taichi Kuronuma (Tokyo University) and colleagues in the 2022–2023 season surveyed the site of WTN07 on a wadi terrace and documented 123 Islamic graves, as well as one probable Wadi Suq tomb (Tomb 122)( Kuronuma *et al.* 2024: 104–118). The small terrace running along the river was a place for different activities over time, with most of the evidence related to the movement of people in the trans-Hajar region; the canyon can be considered a corridor connecting the Arabian Gulf with the Gulf of Oman. Archaeological remains of the Islamic Period were also discovered, as well as those of the Early Bronze and Iron Age in the terraces, on the hill slopes, and on an isolated plateau. These results suggest the presence of rich and diversified human activity in the canyon of Wadi Tanuf and in basins downstream(Kuronuma *et al.* 2024: 104–118).

**Table 1.** Regional Archaeological Chronology of the UAE

Epoch	Regional	Local
Late history (1000-1950 CE)	Late Islamic (1650-1950)	Late Islamic II (1800-1950 CE)
		Late Islamic I (1650-1800 CE)
	Middle Islamic (1000-1650 CE)	Middle Islamic III (1500-1650 CE)
		Middle Islamic II (1500-1650 CE)
Middle Islamic I (1000-1250 CE)		
Early historic (300 BCE–1000 CE)	Early Islamic (650-1000 CE)	Early Islamic II (800-1000 CE)
		Early Islamic I (650-800 CE)
	Late Antiquity (300-650 CE)	Late Sasanian (500-650 CE)
		Early Sasanian (300-500 CE)
	Classical Antiquity (300 BCE-300 CE)	PIR.D (150-300 CE)
		PIR.C (0-150 CE)
		PIR.B (150-0 BCE)
		PIR.A (300-150 BCE)
Protohistoric (3000-300 BCE)	Iron Age (1300-300 BCE)	Iron Age III (600-300 BCE)
		Iron Age II (1100-600 BCE)
		Iron Age I (1300-1100 BCE)
	Bronze Age (3000-1300 BCE)	Late Bronze Age (1600-1300 BCE)
		Wadi Suq (2000-1600 BCE)
		Umm al-Nar (2500-2000 BCE)
		Hafit (3000-2500 BCE)
Late Prehistoric (8000-3000 BCE)	Neolithic (8000-3000 BCE)	‘Dark millennium’ (4000-3000 BCE)
		Neolithic (8000-4000 BCE)
Early Prehistoric (200,000-40,000 BP)	Paleolithic (200,000-40,000 BP)	Paleolithic (200,000-40,000 BP)

**Note:** PIR abbreviation = *période préislamique récente*

**Source:** Data after Power et al. (2023: 273–291)

The Qumayrah Valley is between two of the larger oasis settlements, Bat and Hili, and served as a passageway through the Hajar mountains of northern Oman, connecting the Arabian Gulf and the Gulf of Oman. Archaeological excavation and survey have confirmed the presence in this valley of sites from prehistoric times to the Islamic Period. Since 2015, the Omani Polish Archaeological Mission (OPAM) from the Polish Centre of Mediterranean Archaeology, University of Warsaw (PCMA UW) and the Ministry of Heritage and Tourism (MoHT) of the Sultanate of Oman, have been surveying and excavating sites throughout the Qumayrah Valley. These studies identified archaeological remains from the Late Islamic Period (Szymczak & Iskra. 2024: 103–125).

The valley was also briefly surveyed by P. Costa in 1998 (Costa .2006: 139–149) and H. David-Cuny (Kennet. 2004: table 23). Costa described Islamic-period remains in the Qumayrah Valley: in Ayn Bani Sa’dah (at QA 3), in the neighboring deserted village of Al-’Aqayr, and in the village of Bilt at the northeastern end of the valley. In addition, there

are also the ruins of a walled village in Qumayrah inhabited until the 1970s, with other ruined buildings scattered widely outside the compound, with some apparently abandoned at an earlier date. Traces of temporary occupation with Late Islamic potsherds were also registered during OPAM surveys between Ayn Bani Sa’dah and Qumayrah. The Late Islamic remains at QA 3 partly cover, or dig into, the Umm an-Nar and Iron Age II layers. Six multi-room complexes (Units 4-9) were distinguished, which were of a roughly similar character, though differing in the state of preservation. A building constructed against an Umm an-Nar tower (Unit 10), complete with plaster and parts of roofing, is the latest structure at the site, probably only half a century old. Most of the pottery can be dated broadly to the Late Islamic II period, covering the nineteenth century and the first half (or more) of the twentieth. However, some of the attested types appear to belong to earlier periods: Julfar Ware cooking pots with a ridge surrounding the vessel resembling textile impressions are dated as early as the twelfth to the fifteenth/sixteenth CE

(Kennet. 2004: table 2). Khunj/Bahla Ware may have first appeared in the seventeenth century (Power & Sheehan. 2012) or even the fourteenth (Carter. 2011: 29).

These investigations of the settlements in the Hajar Mountains increasingly show evidence for a growth in agricultural development in these rural areas in the Late Islamic Period, during a time of pre-oil globalization. Carter has argued that coastal towns in southeastern Arabia felt the impact of globalization in this period (Carter.2012), but more recently Biezeveld and Düring (Biezeveld and Düring. 2020: 199–219) have shown evidence for increased globalization in the mountains and rural areas as well in Sohar, Oman. Like areas further to the north, this area functioned as a corridor linking al-Ain and the Buraymi Oases with the Omani coast. Excavations at Sahlat, inland from Sohar towards the Hajar Mountains in Oman, have shown evidence for a Late Islamic settlement linked to elaborate falaj systems. The hilltop village, including a mosque, multi-room domestic structures with small courtyards and sunken rooms alongside associated terrace walls and platforms, clearly recalls the architecture exhibited at the Suhaila sites as well as Islamic Village and Wadi Jeema in Hatta (Biezeveld & Düring 2020: 203). The material culture is also remarkably similar, with the same primary groups of local and imported ceramic wares, dated to the Late Islamic II. As at Suhaila 1, 3, and 4, Sahlat appears to have witnessed an increase in activity during the Late Islamic II, with connections to regional and maritime trade networks, and an increased investment in agricultural development and related hydraulic infrastructure. If the Polish surveys in Qumayrah are any indication, there are many such Late Islamic villages scattered throughout northern Hajar Mountains still to be investigated (Szymczak & Iskra 2024: 103–125).

As more becomes known of mountain villages, rural towns, and agricultural sectors of southeastern Arabia, the interconnectivity of these seemingly disparate centers becomes clearer. The settlements and agricultural areas of Suhaila may have initially appeared to be isolated villages or remote agricultural terrace systems disconnected from the oases, but they should increasingly be understood as part of a Late Islamic Period trend which showed considerable expansion in agricultural activity into the rural and mountainous zones, such as the Hajar Mountains.

### 2.1 Previous Investigations at Suhaila Sites

In recent years, the DCAA has surveyed numerous

sites throughout the foothills of the Hajar mountains, revealing sixteen Suhaila sites (Boraik *et al.*2021:1-4). These sites are typically characterized by collections of stone-built structures, often accompanied by agricultural terracing built into the wadi systems that drain from the mountains. In 2022, a topographic survey was carried out at the previously uninvestigated site of Suhaila 1, including test trench excavation in two of the documented structures. In 2023, Suhaila 3 and Suhaila 4 were surveyed, identifying multiple stone structures and agricultural terraces. Surface finds from Suhaila 3 were collected, consisting of pottery, metal objects, and shells. (Boraik *et al.*2021:45-48)

### 3. Suhaila 1

Suhaila 1 comprises a series of disparate stone structures, concentrated mainly to the north of the site, typically consisting of one to several rooms which integrate a courtyard space and a subterranean chamber accessed by staircase (Figure 2). The northern concentration of structures, mostly consisting of a single subterranean room, potentially formed a domestic quarter. Most of the structures at Suhaila 1 are preserved to the lowest of several stone courses. Additional architectural remains include low-lying walls probably utilized as pens or holding areas for livestock. To the northeast of the site, situated at the end of the row of domestic units, is a small stone mosque built into a shallow depression between two outcrops. Units to the southwest run up the eastern bank of a narrow but deep wadi. The building material throughout the site consists completely of local unworked stones which can be gathered from the surrounding wadis. The walls are typically faced with larger stones and filled with a rubble core composed of smaller stones and gravel, with a limited use of mud mortar throughout.

According to a local inhabitant interviewed during previous studies by the DCAA at Suhaila 1, (Boraik *et al.*2024:1-18) these structures were typically covered by a conically shaped roof composed of tree branches. The apparent courtyards were likely left open, and uncovered, for holding the livestock. Occasionally, a hearth can be found in one of these courtyards. Some of the discernable characteristics of these structures are the small niches integrated into the lower levels of the domestic room's walls. As part of this previous study, the site was extensively surveyed, and each individual room of the structures was identified with a unique number, totaling 33 rooms or structures.



**Figure 2.** Overview of architectural features at Suhaila 1.

The survey also produced a considerable amount of pottery. The materials from Suhaila 1 which were discovered during the DCAA survey in 2021 were studied and sorted by Chronical Team. The surveyed ceramic assemblage from Suhaila 1 appears to be dominated by Julfar Ware, including fragments of globular cook pots with red-maroon painted designs and pressed lug handles on the exterior. The assemblage also includes decoratively incised White Ware, typically comprising globular long necked jars. Plain White Ware sherds with incised decoration were also well represented at both sites. Less common but still well represented were the Late Islamic glaze wares, such as Khunj/Bahla Ware, Manganese Painted Ware, and the generic blue-green alkaline glaze ware which is ubiquitous throughout the region for much of the Islamic Period. East Asian porcelains, mostly coffee or teacup sherds and exhibiting simple green, blue, or red vegetative patterns, were also seen consistently across both sites. Overall, the material represents a typical assemblage of Late Islamic ceramics from the Gulf region, ranging in date from the sixteenth to nineteenth centuries CE (Power. 2015: 1–33; Priestman. 2020: 293–306).

Test trenches were placed in two buildings, Structure 6 and Structure 7. Structure 6 had already been identified as a mosque, and a 2 × 2-meter (m) trench investigated the mosque's foundations. The excavations in Structure 6 first investigated the surface layer to a depth of approximately 15 centimeters (cm). A variety of artifactual material including incised White Ware and porcelain sherds, a spent bullet casing, marine shells, and burned material were found from this initial layer, which was likely disturbed with collapsed materials and sediment. A surface layer was revealed beneath the first layer, associated with the stones of the foundation, beneath which only sterile sediment was noted.

Structure 7, approximately 14.5 m southwest of Structure 6, was interpreted as part of a domestic quarter. The excavations in Structure 7 removed

layers of alluvial sediment that accumulated during seasonal rainfall events and descended to a gravel surface layer. In the corner of the room associated with this surface the excavations revealed a hearth built of worn cobblestones.

#### 4. Suhaila 3

Suhaila 3, like Suhaila 1, is susceptible to flash flood damage, erosion, and other weather events impacting the archaeology of the site. Suhaila 3 is a sprawling site characterized by isolated clusters of architectural remains, all in the vicinity of a large series of stone-built agricultural terraces which run down along one of the primary wadis from the mountains. The structures are like those of Suhaila 1 in both design and state of preservation. The agricultural terraces are still preserved, in part, along with some of the hydraulic channel systems that helped in the distribution of water throughout the area. Suhaila 3 is the most exposed of the sites, as it is situated in a popular recreational area, near a parking lot, pond, and meeting area. The proximity of the architecture remains to the path that leaves the structures exposed to vandalism or misuse.

Previous work at the site focused on the documentation of all extant architectural features, noting their dimensions, preservation status, and interpreted function. Additionally, a survey of artifactual material from across the site identified a wide range of ceramic types, marine shells and metal objects all with an estimated nineteenth century provenance.

#### 5. Suhaila 4

The westernmost of the three sites, Suhaila 4 is also the most remote. It is better protected from flooding or vandalism because of its location, down in a wadi with a greater frequency of trees, and less exposed to the nearby bike trails. However, the buildup of organic material from the trees has covered much of the structural remains, which are largely preserved only to their foundational levels. Previous work at the site

focused on the documentation of all extant architectural features, noting their dimensions, preservation status, and interpreted function. The structures surveyed and numbered at Suhaila 4 are built on a steep slope along the wadi bed in a construction style also seen at Suhaila 1 and 3. The structures at Suhaila 4 were not exposed to the same types of human or natural risks that were identified at Suhaila 1 and 3. Despite its greater protection, however, Suhaila 4 was inundated with organic material and required a greater amount of cleaning to reveal the full extent of the structures of interest.

## 6. Methodology

### 6.1 Topographic and Pedestrian Survey

CH Arabia established a base network of permanent survey control points across the Project Area to support high-precision recording of surveyed features. Using a ZEB Horizon hand-held laser scanner a laser scanning survey of the entirety of the Suhaila 1, 3, and 4 sites was undertaken coupled with detailed photogrammetric recording of the excavated structures. The topographic survey involved the site mapping of Suhaila 1, 3, and 4 (to accurately map, document, and describe the individual elements, features, and objects on the site), site location (locating the elements, features, and objects of the site within GIS), and site description and assessment (a detailed description provided for all

identified elements, features, and objects of the site). A pedestrian survey was also carried out at Suhaila 4 to collect any surface finds in the site boundary prior to the excavation of the structures there.

### 6.2 Excavation

CH Arabia performed archaeological investigations within Suhaila 1, 3, and 4 involving full excavation of structures to the floor level, with some targeted investigation of wall foundations as test probes. Excavation was conducted by two archaeologists supervising a foreman and seven workers. Excavation of a 5 × 3 m test trench (the location of which was chosen in consultation with the DCAA), was also carried out on the third terrace of Suhaila 3, where partial channel structures were visible at surface level.

### 6.3 Excavation Results

#### 6.3.1 Suhaila 1

##### *General Overview*

Following the topographic survey, the CH Arabia team began clearing vegetation from the site. The primary goal was to remove obstructions that could hinder the ability to identify and work on the underlying structures. This phase was successfully completed, with all significant vegetation cleared around the targeted structures (Figure 3).



**Figure 3.** Workers prepare the site for excavation at Suhaila 1.

The site comprises 16 structures. The area of investigation focused on six named structures (7-12), all constituent components of one connected building.

The results suggest the structure was domestic in nature, with well-defined living spaces and specialized activity areas (Table 2).

**Table 2.** Suhaila 1 Structural Measurements

Structure	Living Floor Area (m <sup>2</sup> )	Wall Height (m)	Wall Thickness (m)
7	5.45	0.47-0.91	0.83-1.53
8	26.52	1.11-1.48	1.12-1.41
9	6.68	0.33-0.66	0.99-1.31
10	8.00	0.35-0.66	0.78-1.39
11	20.11	0.38-0.81	0.98-1.14
12	4.63	0.29-0.58	0.40-1.23

Overall, the construction technique and spatial organization documented at Suhaila 1 is remarkably consistent with the findings in Suhaila 3 and 4, suggesting a unified architectural tradition across the Suhaila heritage landscape. The presence of similar quadrangular structures associated with burning activities across these sites indicates standardized domestic practices.

*Excavation Overview*

The initial focus at Suhaila 1 was on three structures, 7, 8, and 9 (Figure 4). Following the removal of the surface layer (SH1.001), all material from the key stratigraphic units was carefully sieved to ensure no small artifacts or ecofacts were missed during excavation. In Structure 7, after removing the surface layer, a floor (SH1.024) with a rectangular hearth feature (SH1.027) was identified in the southeast corner of the structure (Figure 5). The hearth contained an ash deposit (SH1.028), which was fully sampled for flotation analysis. A notable observation was the significant reddening of the walls around the hearth feature, which displayed a thick layer of burnt clay. Structure 8 was excavated to a depth of about 10-15 cm, revealing SH1.026. No features were noted within the structure. The excavations in Structure 9

identified a similar hearth feature to that identified in Structure 7. Following the removal of the upper layers above a floor (SH1.030) a rectangular hearth feature (SH1.029) was documented along the western wall of the structure (Figure 6). On the floor, an Omani coin (SH-1/80) and fragments of colored glass (SH-1/75) were found in situ. Further excavation within the structure noted evidence for a second floor (SH1.031) above SH1.030. This suggests that the structure was reconfigured after the deposition of the coin, which provides an excellent *terminus ante quem* for dating activity within the site. Like Structure 8, the excavations in Structures 10 and 11 did not yield any architectural features. Excavations of the outbuilding, Structure 12, identified a hearth feature (SH1.047) which contained the remains of a shelf against a wall. This offers guidance for the interpretation of the other hearth features where the stone fills alongside the wall are absent, as in Structure 7.

The discovery of the Omani coin (SH1.030), provides a temporal anchor for at least one occupation phase, while the architectural features and construction techniques suggest continued occupation and modification of the spaces over time, until probably the end of the twentieth century.

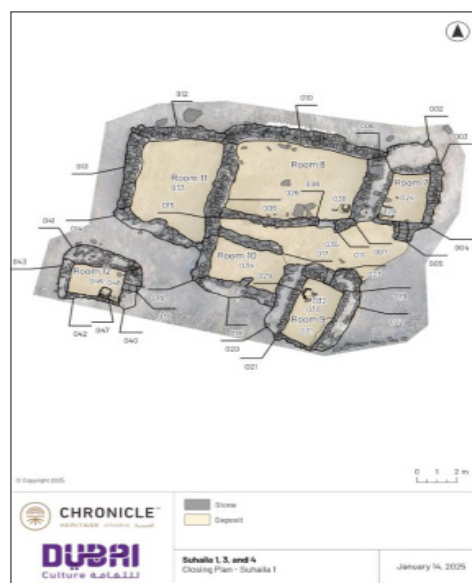


Figure 4. Closing plan for Suhaila 1.



Figure 5. Hearth Feature (SH1.S027)



**Figure 6.** *Hearth feature SH1.029.*

### *Structural Details*

#### *Structure 7*

Structure 7 is a rectangular space delimited by wall I.STR07 SU002 to the north, wall I.STR07 SU003 to the east, wall I.STR07 SU004 to the south, and

wall I.STR07 SU006 to the west. An entrance to the structure (I.STR07 SU005) was built into wall I.STR07 SU004. The floor (I.STR07 SU0024) was not excavated. Within the floor a hearth (I.STR07 SU027) was placed with an ash fill (I.STR07 SU028).



**Figure 7.** *Overview of Structure 8 from the south.*

#### *Structure 8*

Structure 8 is a rectangular space delimited by wall I.STR08 SU010 to the north, wall I.STR07 SU006 to the east, walls I.STR08 SU007 and I.STR08 SU008 to the south, and wall I.STR08 SU009 to the west (Figure 7). An entrance to the structure (I.STR08 SU011) was built into walls I.STR08 SU007 and I.STR08 SU008 which appear continuously under the entrance. The floor (I.STR08 SU026) was not excavated. Within the floor a cut for a hearth (I.STR08 SU038) was placed with an ash fill (I.STR08 SU045).

#### *Structure 9*

Structure 9 is a rectangular space delimited by wall I.STR09 SU019 to the north, wall I.STR07 SU022 to the east, wall I.STR09 SU021 to the south, and wall I.STR09 SU020 to the west. An entrance to the structure (I.STR09 SU023) was built into wall I.STR09 SU019. Multiple floors were identified (I.STR09 SU025, I.STR09 SU030, I.STR09 SU031); the lower two floors were not excavated. Within floor I.STR09 SU030 a cut for a hearth (I.STR09 SU029) was placed with an ash fill (I.STR09 SU032).



**Figure 8.** *Overview of Structure 10 from the east.*

### Structure 10

Structure 10 is a rectangular space delimited by wall I.STR10 SU017 to the north, wall I.STR10 SU018 to the south, and wall I.STR10 SU016 to the west (Figure 8). The floor (I.STR10 SU034) was not excavated.

### Structure 11

Structure 11 is a rectangular space delimited by wall I.STR08 SU010 to the north, walls I.STR10 SU015, I.STR08 SU009, and I.STR10 SU016 to the east, walls I.STR1 to the south, and wall I.STR11 SU013 to the west. The floor (I.STR11 SU033) was not excavated.

### Structure 12

Structure 12 is a rectangular space delimited by wall I.STR12 SU041 to the north, wall I.STR12 SU040 to the east, wall I.STR12 SU042 to the south, and wall I.STR12 SU043 to the west (Figure 9). An entrance to the structure (I.STR12 SU039) was built into wall I.STR12 SU040. Two floor deposits were identified, one as the upper floor (I.STR12 SU0044), and underneath a lower floor (I.STR12 SU0046) that was not excavated. Within I.STR12 SU0046 a hearth (I.STR12 SU0047) was placed with an ash fill (I.STR12 SU0048).



Figure 9. Overview of Structure 12 showing the hearth (I.STR12 SU047).

## 6.3.2 Suhaila 3

### General Overview

The primary excavation area at Suhaila 3 included two structures, Structures 1 and 2, located toward the eastern site boundary, as well as a secondary excavation of a trench in the agricultural terraces in the southern

part of the site (Figure 10). Structure 1 consists of four rooms (A-D), while Structure 2 comprises six rooms (A-F) arranged in a northwest-southeast orientation. The 5 × 3 m trench was excavated on the third terrace, part of a larger system of agricultural terraces on the northern foot slopes of a substantial hill within an area of extensive colluvial deposition.



Figure 10. Map of Suhaila 3.

### Excavation Overview

The initial focus of excavation was on Structure 2, which was divided into six distinct rooms (A-F) (Table 3). Following the excavations in Structure 2, cleaning operations were conducted in the area surrounding

Structure 1, which was divided into four rooms (A-D). On November 11, 2024, a 5 × 3 m trench was placed in one of the agricultural trenches to delineate water management features at the site.

**Table 3.** *Suhaila 3 Structural Measurements*

Structure	Room	Living Floor Area (m <sup>2</sup> )	Wall Height (m)	Wall Thickness (m)
1	A	24	0.40-0.80	0.30-0.40
1	B	4	0.20-0.30	0.20-0.30
1	C	3	0.20-0.50	0.30-0.50
1	D	10	0.40	0.40
2	A	23	0.64-1.42	0.40-0.94
2	B	5	0.03-0.99	0.30-0.55
2	C	1	0.37-0.95	0.65-2.50
2	D	18	0.23	0.60
2	E	4	0.01-0.65	1.60-2.12
2	F	11	0.25-0.62	0.20-0.75

*Structure 1*

The area around Structure 1 was cleaned to facilitate the collection of all surface archaeological material and assigned names for the features within the structure, dividing it into four rooms (A-D). Excavations within the structure revealed living floors in all the rooms just beneath the surface. In the southwest corner of Room A, a single course enclosure contained a collapse fill (SH3.045) (Figure 11). The function of this feature is unclear and requires further investigation. Beneath the surface layer in Room B a hearth feature (SH3.052) was noted in the southern corner of the room and a sample was taken from the ashy fill (SH3.053) for flotation analysis. The excavations in rooms C and D did not reveal any features beneath the surface layer.

*Structure 2*

The excavation within Structure 2 focused on the removal of collapsed debris and identifying living floors for the rooms (Figure 12). Before breaking ground, seven ground control points were placed, and thorough documentation of the area was undertaken using photogrammetry. The surface layer within the structure was very shallow (2-3 cm), which allowed for a very efficient excavation process but also meant that few archaeological materials were identified in situ. Walls within the structure are preserved to approximately 90 cm in height. The only feature identified within the rooms was a hearth area, SH3.025, located near the entry to the easternmost room, Room B. The hearth was noted for the presence of charcoal and other organic materials, of which samples were taken.



**Figure 11.** *Closing plan of Structure 1 at Suhaila 3.*

*Trench 1*

The trench was located on the third terrace (SH3.056), part of a larger group of agricultural terraces. The terraces, which were recorded during the geoarchaeological survey, were placed on the

northern foot slopes of a substantial hill within an area of extensive colluvial deposition. At the base of the terrace wall (SH3.056) a surface irrigation channel was identified during the initial survey (SH3.057) (Figure 13). A 5 × 3 m trench was established here

to understand the relationship of this channel and the terrace wall and associated fills. Four contexts were recorded in this trench. Context SH3.055, a compacted reddish brown silt loam with occasional small pebbles and shells, was the first context uncovered. Underlying this was context SH3.058, a thin (5 cm) silt

loam context with occasional pebble inclusions. This deposit was likely deposited by fluvial runoff from the terrace forming part of the stone lined irrigation channel (SH3.057). Underlying this was another silt loam context (SH3.059), interpreted as a compacted natural deposit forming the main terrace fill.



**Figure 12.** Closing plan of Structure 2 at Suhaila 3.

Contexts SH3.055, SH3.058 and SH3.059 were bulk sampled for archaeobotanical analysis. Due to the compacted nature and thickness of the contexts, no

OSL samples could be obtained. Alternatively, any suitable organics recovered from the bulk samples may be considered for further <sup>14</sup>C dating.



**Figure 13.** Trench 1 with the channel running through its center.

### Structural Details

#### Structure 1

Within Structure 1, Room A is an ovoid space delimited by walls III.STR1 SU031, III.STR1 SU032 and III.STR1 SU033. Two walls (III.STR1 SU044, III.STR1 SU045) appear to be later additions within the room (Figure 30). The floor (III.STR1 SU046) was not excavated. Room B is a rectangular space delimited by walls III.STR1 SU034, III.STR1 SU035 and III.STR1 SU036. In the southeast III.STR1 SU065 flanks each side of the entrance to Room B (III.STR1 SU037). III.STR1 SU047 is the living floor of Room B, which was cut into by a hearth (III.STR1 SU052) with an ash fill (III.STR1 SU053). Room C is a rectangular space delimited by walls III.STR1 SU041, III.STR1 SU042

and III.STR1 SU043. The entrance to Room C is in the northeast (III.STR1 SU038). III.STR1 SU048 is the living floor of Room C, which was covered by a layer of hardened collapse (III.STR1 SU049) that was roughly from the period of abandonment. Room D is a rectangular space between the other three rooms delimited by walls III.STR1 SU033, III.STR1 SU039 and III.STR1 SU040. III.STR1 SU050 is the living floor of Room D.

#### Structure 2

Within Structure 2, Room A is a rectangular space delimited by walls III.STR2 SU002, III.STR2 SU003, and III.STR2 SU004 (Figure 31). The entrance to Room A (III.STR2 SU012) divides Room A from Room F. III.STR2 SU018 is the living floor of Room

A. Room B is a rectangular space delimited by III.STR2 SU005, III.STR2 SU006 and III.STR2 SU009. The entrance (III.STR2 SU008) was placed between III.STR2 SU009 and III.STR2 SU007 and leads to Rooms C and D. A hearth (III.STR2 SU025) was built into the living floor (III.STR2 SU019) and contained an ashy deposit (III.STR2 SU026). Rooms C and D are delimited by III.STR2 SU004, III.STR2 SU009 and III.STR2 SU011 to form a rectangular courtyard with an internal partition wall III.STR2 SU010. A series of deposits (III.STR2 SU020, III.STR2 SU021, III.STR2 SU022) are likely the same context but recorded differently according to their spatial layout within the structure. Room E is a rectangular outbuilding delimited by III.STR2 SU013, III.STR2 SU014, III.STR2 SU015, and III.STR2 SU016. The

entrance (III.STR2 SU027) was placed within wall III.STR2 SU016. The walking floor (III.STR2 SU024) contained a cut (III.STR2 SU061) in which an ashy deposit (III.STR2 SU023) was noted. Room F is a rectangular space delimited by III.STR2 SU028, III.STR2 SU029 and connected to Room A via entrance III.STR2 SU012. The walking floor of Room F is III.STR2 SU030.

### 6.3.3 Suhaila 4

#### General Overview

The structures investigated at Suhaila 4 consist of structures 1 and 2, situated down the wadi as part of a series of architectural remains preserved in the central part of at the site (Table 4).

**Table 4.** *Suhaila 4 Structural Measurements*

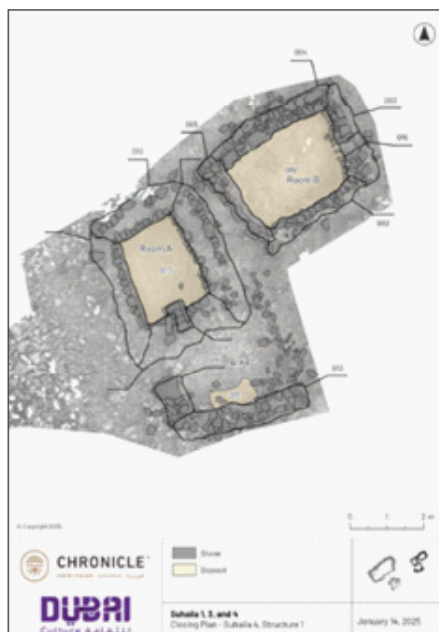
Structure	Room	Living Floor Area (m <sup>2</sup> )	Wall Height (m)	Wall Thickness (m)
1	A	5	0.23-0.65	0.70-1.15
1	B	7	0.20-0.50	0.60-0.80
1	C	N/A	0.61-1.01	0.81-0.84
2	A	5	0.60-1.25	0.56-1.82
2	B	39	0.20-0.97	0.87-1.90

#### Excavation Overview

The activities at Suhaila 4 began with clearing vegetation from the site area and removing the superficial collapse layer, consisting of loose stones, at structures 1 and 2. This process helped to clarify the walls and limits of the structures. Two main structures were excavated. Structure 1 shows additional architectural features including a staircase

integration, while Structure 2 consists of two rooms (A and B) with distinct architectural features.

Structure 1 is divided into 3 rooms (A-C) (Figure 14). Structure 2 is divided into 2 rooms (A-B) (Figure 15). The structures at Suhaila 4 were covered with a much greater degree of superficial collapse compared to the other two sites, on account of their position in the wadi.



**Figure 14.** *Closing plan of Structure 1 at Suhaila 4.*



**Figure 15.** Closing plan of Structure 2 at Suhaila 4.

### Structure 1

The excavations of Structure 1 indicate that the three rooms (A-C) that make up the structure were likely built over multiple construction phases to meet the changing needs of the site's inhabitants (Figure 16). Room A is the most substantial construction. It possesses thick walls (80-90 cm) and staircase access (SH4.017) that interfaces directly with the floor (SH4.020). The walls of Room B are less substantial compared to Room A. The absence of artifacts within the room during excavations suggests that the room

was deliberately maintained or cleared up before abandonment. The floor for Room B (SH4.019) was at a different elevation compared to the floor of Room A. The different construction techniques, different floor elevation, and entrance on a different axis compared to Room A suggests that Room B belongs to a different construction phase. Room C consists of two walls (SH4.013, SH4.014) that form an external enclosure to the entrance of Room A. The construction of the walls and the absence of evidence for a complete enclosure suggest that the two walls functioned as a windbreak or other form of shelter.



**Figure 16.** Suhaila 4, Structure 1, Room A following excavation.

### Structure 2

The excavations in Structure 2 were divided between two rooms (A and B) (Figure 17). Room A appears to be a domestic unit in which a hearth (SH4.042) was placed within the floor (SH4.033). Within the hearth three deposits (SH4.036, SH4.040, SH4.043) were noted, indicating the repeated use of the structure over time. The careful sieving of this context yielded several ceramic sherds (SH.4/16) and bronze fragments

(SH.4/12), but the most significant find was an Omani coin (SH.4/14). The in-situ position of the coin was recorded with the total station. Room B, to the north of Room A, is an elongated structure that has recently functioned as an animal pen as noted by the presence of dung (SH4.031). Some pottery fragments were recovered during the excavation of SH4.031, though in sparse quantities (SH.4/09; SH.4/11). Beneath SH4.031 is a sterile firm, compact layer on which the

walls were constructed. In one part of the room there was evidence for a small hearth (SH4.032), based on the relatively dense presence of charcoal. Charcoal

samples were taken from SH4.032 for the purpose of dating the floor.



**Figure 17.** Overview of Structure 2 at Suhaila 4 from the north.

### Structural Details

#### Structure 1

Room A of Structure 1 is a rectangular space delimited by walls IV.STR1 SU008, IV.STR1 SU009, IV.STR1 SU010 and IV.STR1 SU011. The entrance (IV.STR1 SU017) was placed in IV.STR1 SU008 and consists of four steps leading down to a sunken floor (IV.STR1 SU020). A hardened collapse layer (IV.STR1 SU018) was removed from above the floor during excavation. Room B of Structure 1 is a rectangular space delimited by walls IV.STR1 SU002, IV.STR1 SU003, IV.STR1 SU004, and IV.STR1 SU005. The entrance (IV.STR1 SU016) was placed in the eastern wall (IV.STR1 SU003). The floor (IV.STR1 SU019) of Room B was identified under a layer of collapse (IV.STR1 SU007) that contained frequent wall debris. Room or Area C consists of two walls IV.STR1 SU013 and IV.STR1 SU014 that were likely places as a wind shelter around the entrance to Room A. The walls were built over the floor deposit IV.STR1 SU006 which is similar to the rock layer noted in other parts of the site.

#### Structure 2

Room A of Structure 2 is a rectangular space delimited by walls IV.STR2 SU026, IV.STR2 SU028, IV.STR2 SU029 and IV.STR2 SU030. The entrance (IV.STR2 SU027) was placed in IV.STR2 SU026 on the north side of the room. Built into the floor (IV.STR2 SU033) was a hearth feature (IV.STR2 SU042) which contained multiple fills (IV.STR2 SU043, IV.STR2 SU040) (Figure 18). Above the IV.STR2 SU042 was a blocking fill (IV.STR2 SU036) used to cover the hearth, and IV.STR2 SU012 is the collapse layer that was removed to reveal the floors. Room B is a large rectangular space delimited by IV.STR2 SU021, IV.STR2 SU022, IV.STR2 SU023, and IV.STR2 SU024. Above the lowest deposit (IV.STR2 SU034) there is evidence for an isolated burning event from a concentration of charcoal (IV.STR2 SU032). A leveling surface (IV.STR2 SU035) was added to IV.STR2 SU034 in the northwest corner of Room B. Above IV.STR2 SU034 and IV.STR2 SU035 is a deposit layer (IV.STR2 SU031) characterized by animal dung which was sealed by a collapse layer, IV.STR2 SU025



**Figure 18.** The hearth SU042

## 7. Material Remains

### 7.1 Ceramics

Overall, the evidence from the ceramic finds from Suhaila 1, 3, and 4, generally corresponds with the Late Islamic II material culture of Hatta in particular, and eastern Arabian sites in the UAE and Oman in general. Based on the evidence of the Julfar Ware types, the White Ware jars, and the Glaze Ware and Porcelain classes, the ceramics assemblages largely appear to date to a range from the eighteenth to the twentieth century CE or the Late Islamic II, with potentially earlier material found in limited numbers, as early as the fourteenth or fifteenth century CE at Suhaila 3. If earlier occupation did occur, most of the material certainly tends to indicate a somewhat later period of more intensive occupation. Indeed, the radiocarbon results correspond strongly with the ceramic assemblage ranges, as they largely appear to come from the nineteenth century. Given the nature of these sites in a more rural mountainous setting, it is not implausible that seasonal or temporary occupation occurred to accommodate the grazing of animals or agricultural productivity of the terrace systems. This might explain the relatively low amount of material culture finds, in comparison with sites like Islamic Village or Wadi Jeema, spanning a period of several hundred years.

The Suhaila assemblage also compares remarkably well with data from excavations at nearby Sahlat in Oman. Investigations at the late Islamic Village of Sahlat, marked by similar building methods and types (sunken rooms in domestic units, platforms and open enclosures, mosques, and associated hydraulic management systems situated nearby), produced a

ceramic assemblage dominated by Julfar or related coarse ware sherds, White Wares with incised surface treatment, and lesser but significant proportions of Glaze Wares such as KBH or MPW and East Asian porcelain imports (Btezeveld & During, 2020: 203.) This evidence suggests a considerable degree of communication not only between these rural or mountain villages and the coastal ports or larger oasis settlements, but also with one another, towards the creation of a shared regional material culture. The evidence also raises questions of what was truly local or imported, as the great quantity of Julfar or White Ware types in these mountain villages could also be indicative of local ceramic industries which reflected and responded to the popular wares of ceramic industries in places like Bahla or Ras al-Khaimah in southeast Arabia or, for that matter, Iranian, Yemeni or Far Eastern production centers whose products appear to have infiltrated the region heavily in this period. (Figure 19).

The assemblage is remarkably concise in the types of vessels and their function. It seems that water was transported and stored in large White Ware jugs, maybe produced in Iran or perhaps closer, in Oman. Their method of production was very different from the partially handmade Julfar Ware cookers, closed and globular, undoubtedly for heating liquids and meals. For coffee or tea products, the preference appears to have been small, white porcelain cups with red, green, blue or yellow floral patterns on the exterior, imported from East Asia. An occasional storage jar or glazed bowl or jug may have also been found in one of the structures, but for the most part, the vessels used in Suhaila seem to have been restricted to this modest assemblage.



Figure 19. Examples of pottery sherds from Suhaila

### 7.2 Small Finds

While ceramics constituted most of the finds during excavations and survey at Suhaila sites, faunal remains, glass and metal objects were also uncovered, collected, and documented. In the excavations at

Suhaila 1, several fragments of glass were found, along with some small poorly preserved fragments of metal. Bullet casings from the twentieth century were also found in significant numbers. (Figure 20) One finds of note for its chronological information from Suhaila 1

is the Omani 1/4 Anna coin (SH.1/80). Dated to 1315 AH/1897-1898 CE and minted in Muscat, the coin was found in the south room of Structure 9, near wall SU021. The obverse clearly shows the date and ruler

“Fessul bin Turkee Imam of Muscat and Oman,” while the reverse includes the standard Arabic inscription naming the same Faisal bin Turki (r. 1888–1913 CE), Sultan of Oman and Muscat (Figure 21).



**Figure 20.** *Bullet casing*



**Figure 21.** *coin from Oman*

In this period northern Oman was under British control as a protectorate, and the 1/4 Anna represented 1/16 the value of a Rupee, the contemporary currency used in British-ruled India (Chalmers. 1893:339). The chronological information provided by the coin relates well to the general corpus of material found throughout Suhaila, such as Late Islamic ceramics or bullet casings.

The finds from Suhaila also include some glass shards, metal objects, and an example of a worked stone object. The metal objects are poorly corroded, but one notable find was a small metal key (SH-3/32) in Structure 1, which could have functioned to lock furniture within the house, or fixtures of the house themselves.

Like the ceramics, finds in Suhaila 4 were relatively minimal. Several metal and glass objects were uncovered but appear to be very recent. One notable exception was a coin, like the one found at Suhaila 1. While the coin (SH.4/14) is corroded, the reverse still preserves the upper register of the inscription naming the same Faisal bin Turki. Thus, the coin is almost certainly an Omani 1/4 Anna like the one recovered from Suhaila 1, and datable to the end of

the nineteenth and beginning of the twentieth century CE based on regnal dates of the Sultan.

Overall, small finds were minimal at the Suhaila sites. The remains overwhelmingly point to domestic occupation, with metal objects and glass shards which could have been associated with the structures themselves, and bullet casings from the structures' occupants. The exceptional numismatic finds relate to the late nineteenth and early twentieth century CE and reflect the relationship between these villages and the coastal economy of nearby Oman and Muscat. The Suhaila villages were clearly impacted by the progressively globalized trade during this period, which increasingly included European markets in addition to the trade networks with East Asia and within the Gulf, which had already characterized the long-distance trade of the region for some time. The small amount of shell, imported ceramics, and Omani coins provide some evidence for the mobility of the inhabitants of this area, which undoubtedly had connections to the surrounding region. From a chronological perspective, excavated ceramics and coins indicate the investigated stone structures at the Suhaila sites pre-date the nineteenth century CE, with

potential activity at the site extending as far back as the fourteenth or fifteenth centuries CE. However, most of the material culture can be associated with the Late Islamic II, generally the eighteenth to twentieth centuries CE, which is also consistent with the radiocarbon results presented below in Section 7.6. Perhaps Suhaila 3 and 4 were occupied slightly prior to or during the earlier end of time that range, and Suhaila 1 slightly later, with substantial occupation or activity likely concentrated there during the twentieth century CE.

### 7.3 Faunal Remains

Little information could be gleaned from the animal bone assemblages recovered from Suhaila 1 and Suhaila 3. The surviving animal bone suggests that burial conditions at the site are not favorable for the preservation of bone. The few identified specimens provide evidence for the consumption of lamb/mutton and chicken at the site, both of which have formed a focus for animal husbandry and human diet in this area in the past.

The marine mollusk shells do not provide definitive evidence for the specific role of shellfish or marine mollusk shells at the site; they do not appear to be associated with the consumption of shellfish, the production of shell artifacts, or the use of bivalve shells as containers. They do attest to trade connections and/or direct connections with the coast, most likely that located to the east, on the northeast coast of Oman. However, while it is possible that the shells represent items collected and curated by individuals living at and/or visiting Hatta or are brought and deposited incidentally alongside other resources from the coast,

the assemblages are not of sufficient size to comment further; in consequence, the presence of marine shells at the Hatta sites is not well understood at this time.

### 7.4 Archaeobotanical Remains

The Suhaila plant assemblages support a reliance of locally gathered firewood for fueling the domestic fireplaces that dominate the sample dataset (twice the floor contexts), though it is possible that dung fuel was used to a greater extent at Suhaila 1. There is limited evidence for agricultural crop presence in the form of *Hordeum* spp. grains at Suhaila 3, and likely crop processing debris at the same site. The gastropod and scarabid assemblages may present an opportunity for enhanced landscape ecology study as they reflect a diversity (at least one terrestrial and one freshwater taxon) and common observation in the on-site samples that may support a potential proxy for macro remains in the terrace sediments. For the terrace sediment, macro botanical evidence was absent. Future work is possible with the remaining subsamples of the flotation for microanalysis.

## 8. Radiocarbon Analysis

During the excavations at Suhaila 1, 3 and 4, CH Arabia collected radiocarbon samples primarily from deposits within the site: floors and hearths. Three essays were submitted for analysis, one from each site. The results of the analysis were relatively homogenous, with radiocarbon ages reported to be between 100 and 150 bp (Figure 22). However, calibration issues make it difficult to use the radiocarbon data precisely, with potentially calibrated dates ranging from the seventeenth century to the present.

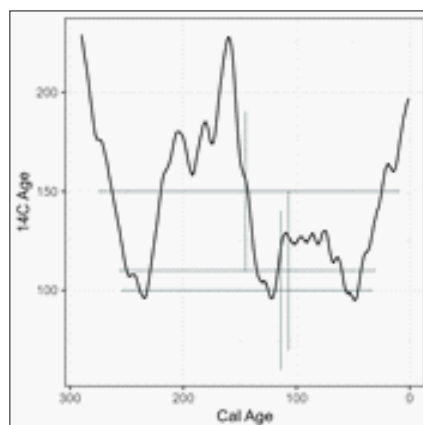


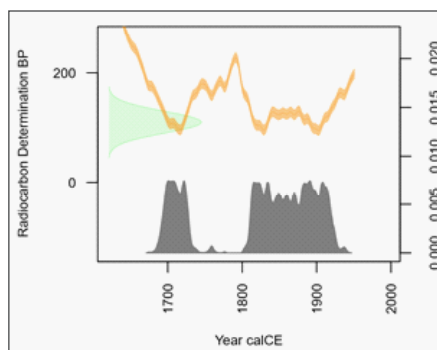
Figure 22. Plot of the Suhaila radiocarbon samples against the calibration curve.

The radiocarbon age for the samples tested from Suhaila 1, 3 and 4 range from 100 to 150 BP (UGAMS-74317, UGAMS-74318, UGAMS-74319) with an error of 20 years (Figure 50 through Figure 52). Due to the variability of the calibration curve those samples, when taken together, have high

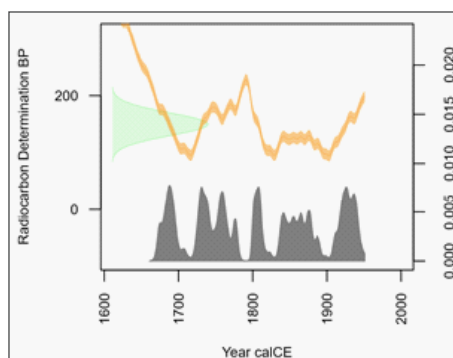
probability percentages at the  $1\sigma$  level between 1678 calibrated CE (calCE)–1941 calCE with some breaks in between (Table 5). The wide range of probability is a result of a flattening of the calibration after 1700 CE because of changes in the relative quantity of  $^{14}\text{C}$  in the atmosphere during the Industrial Revolution.

**Table 5.** Table of Radiocarbon Dates from Excavations in Suhaila 1, 3, and 4

Sample No.	Sample No.	14C Age (BP)	Percent Modern Carbon	Calibrated Date (CE)	Probability Range
UGAMS-74317	SH4.20	100 ± 20	98.71 ± 0.26	1697-1723 (1σ)	22.7%
				1813-1835	19.7%
				1880-1912	26.2%
				1693-1726(2σ)	25.8%
				1811-1918	69.6%
UGAMS-74318	SH3.60	150 ± 20	98.19 ± 0.27	1678-1694 (1σ)	10.7%
				1725-1741	10.8%
				1751-1764	8.2%
				1774-1776	1.3%
				1799-1811	8.5%
				1838-1845	3.7%
				1851-1858	3.4%
				1861-1866	2.8%
				1872-1878	3.4%
				1916-1941	16.6%
				1669-1701 (2σ)	15.2%
				1704-1707	0.5%
				1721-1780	28.0%
				1797-1815	9.9%
				1833-1890	21.9%
1907-1947	20.4%				
UGAMS-74319	SH1.59	110 ± 20	98.69 ± 0.27	1695-1724 (1σ)	21%
				1812-1837	7.9%
				1846-1850	3.0%
				1859-1860	1.2%
				1867-1871	3.0%
				1879-1900	15.2%
				1903-1915	8.8%
				1689-1728 (2σ)	24.9%
1809-1923	70.6%				



**Figure 23.** Radiocarbon date from SH1.59 calibrated.



**Figure 24.** Radiocarbon date from SH3.60 calibrated.

## 9. Interpretation

The excavations at Suhaila 1, 3, and 4 identified several common elements between the three sites. These common elements include shared architectural features, general organizational concepts as noted in their functional use of space, and similar construction techniques. Buildings were organized with rooms around a central courtyard. Many of the rooms surrounding the courtyard contained a hearth installation which was created by cutting into the floor and placing stones in a rectangular structure. These hearths were built into the walking floors, which were generally prepared using similar methods. Although floors were not excavated when encountered, in some buildings there was evidence for multiple walking floors, suggesting that many of the structures were remodeled over time.

The structures were all constructed using similar wall building techniques adapted to the natural topography, where walls are cut into barks and are formed through the placement of a double wall with a gravel fill. Finally, the entrances to the rooms followed a very similar architectural style with a standardized dimension (0.8 × 0.4 m). In rooms that are interpreted to have served a domestic function, hearths were typically located near the entrance. The stone-lined hearths were built with an approximately 20 cm buffer between the cut for the hearth and the nearest wall. The buffer consisted of stones that likely could have been used as a shelf.

The ceramic assemblage from Suhaila 1, 3, and 4 generally corresponds to the Late Islamic material culture of Hatta in particular, and eastern Arabian sites in the UAE and Oman in general. Based on the evidence of the Julfar Ware types, the White Ware jars, and the Glaze Ware and Porcelain classes, the ceramics assemblages largely appear to date to a range from the eighteenth to the twentieth century CE or the Late Islamic II, with potentially earlier material found in limited numbers, as early as the fourteenth or fifteenth century CE at Suhaila 3. The data from the radiocarbon analysis supports that the assemblages are most likely from more recent periods. This is further supported by the two coins Omani 1/4 Anna coins that were found during excavation (SH.1/80, SH.4/14). The exceptional numismatic finds relate to the late nineteenth and early twentieth century CE and reflect the relationship between these villages and the coastal economy of nearby Oman and Muscat.

The faunal remains generally support the connection between the occupants of Suhaila 1, 3, and 4 and

the coast. The marine mollusk shells do not provide definitive evidence for the specific role of shellfish or marine mollusk shells at the site; but they do attest to trade connections and/or direct communications with the coast, most likely that located to the east, on the northeast coast of Oman. The few identified faunal bone specimens provide evidence for the consumption of lamb/mutton and chicken at the site, both reflecting the kind of animal husbandry likely to be expected there. The low stone enclosures found attached to many of the domestic structures across the Suhaila sites likely facilitated the penning of sheep, goats, or chickens.

The eventual abandonment of terraces may have been caused by a combination of increased aridity and shifting land-use practices during the mid to late-Holocene. Paleoenvironmental records from the region suggest extreme arid events in northern Oman during this period (Fleitmarin *et al.* 2022: 1317–1321; Fleitmann & Matter. 2009: 633–642). The construction of terraces and water management features may have been a response to this enhanced aridity and climate variability (Harrower *et al.* 2012: 131–138). This is further supported by a dated paleoenvironmental record from similar depositional environments containing a continuous sequence of alluvial, colluvial, and aeolian sediments located near agricultural terraces (Urban & Buerkeri. 2009: 296–305).

The vegetation surrounding the terraces at Suhaila 3 further supports environmental change and adaptation to mountainous regions. In similar contexts, the presence of drought-resistant species such as *Ephedra ciliata* (Urban & Buerkeri. 2009: 296–305), and open juniper woodlands typically found at altitudes of 2,000 m (Ghazanfar. 1992; 1998: 241–264), suggests increasing aridity over the last six millennia. The introduction of irrigation techniques, such as the falaj system (Costa. 1983: 273–295), supported agriculture during periods of limited rainfall and environmental degradation. Despite this, human activities such as overland trade, fuelwood harvesting, and intensified agricultural practices put pressure on the landscape and likely contributed to long-term landscape changes (Dabrowski *et al.* 2021: 104512).

## 10. Conclusions and Future Research

The surveys and excavations at Suhaila 1, 3 and 4 offer important data about the occupation of this part of the Hatta Valley during the eighteenth to the twentieth century CE. The remarkable consistency in architectural style and building layout suggests that the populations that occupied these sites were generally

consistent. All of the structures were organized around a courtyard with stone lined hearths built and placed in a similar style in domestic rooms across the sites. The small finds and faunal remains highlight that these sites were connected to the broader regional economy of the Omani coast. The sparse quantity of durable material remains, like ceramics, suggests that these sites were seasonally occupied by pastoralists that would have taken advantage of seasonal rain while managing their herds.

To further our understanding of the establishment, utilization, and abandonment of terraces and water management systems in the Hatta archaeological landscape, a robust chronology of the deposits is required. Scientific dating of sedimentary sequences associated with agriculture would provide a direct link to the cultural phases in the region. Furthermore, paleoenvironmental studies incorporating pollen and other environmental proxies from the Suhaila heritage sites would provide a detailed local record of landscape change, providing further insights into human-environment interactions in the past.

## 11. References

- al-Tikriti W.Y. 1981. *Reconsideration of the late fourth and third millennium BC in the Arabian Gulf, with special reference to the United Arab Emirates*. Doctoral dissertation, Cambridge: University of Cambridge.
- Avanzini A. & Degli Esposti M. 2018. Introduction. Pages 9–17 in A. Avanzini & M. Degli Esposti (eds.) *Husn Salut and the Iron Age of Southeast Arabia. Excavations of the Italian Mission to Oman 2004–2014*. Rome: L'Erma' di Bretschneider.
- Biezeveld I. & Düring B.S. 2020. Pre-oil globalization in a rural community: the Late Islamic village of Sahlāt in the Şuḥār region. *Journal of Islamic Archaeology* 7/2: 199–219.
- Boraik, M., Zein, H. Safi, J., 2021. Report on the Archaeological Survey and Excavation at Suhaila1 Site, (Hatta, Dubai), Dubai Municipality, 1-66
- Brown G. & Feulner G.R. 2023. The vegetation of the United Arab Emirates and ecosystem management issues. Pages 121–159 in J. A. Burt (ed.) *A Natural History of the Emirates*. Cham: Springer Nature.
- Cable C.M. & al-Jabri S. 2019. The Wadi al-Hijr (Sultanate of Oman) in the third millennium BC. *Arabian Archaeology and Epigraphy* 30/1: 15–31.
- Carter R. 2011. *Ceramics of the Qatar National Museum*. Oxford: Oxford Brookes University.
- Carter R.A. 2012. *Sea of pearls: Arabia, Persia, and the industry that shaped the Gulf*. London: Arabian Publishing.
- Chalmers R. 1893. *A history of currency in the British Colonies*. London: Eyre and Spottiswoode.
- Condoluci C. & Degli Esposti M. 2015. *High places in Oman. The IMTO excavations of Bronze and Iron Age remains on Jabal Salut*. Rome: L'Erma' di Bretschneider.
- Costa P. 1983. Notes on traditional hydraulics and agriculture in Oman. *World Archaeology* 14/3: 273–295.
- Costa P. 2006. Dank archaeological project: a preliminary report. *Proceedings of the Seminar for Arabian Studies* 36: 139–149.
- Dabrowski V., Bouchaud C., Tengberg M., Zazzo A., & Priestman S. 2021. Archaeobotanical analysis of food and fuel procurement from Fulayj fort (Oman, 5th–8th c. CE) including the earliest secure evidence for sorghum in Eastern Arabia. *Journal of Arid Environments* 190: 104512.
- David H. 2002. Soft stone mining evidence in the Oman peninsula and its relation to Mesopotamia. *Essays on the Late Prehistory of the Arabian Peninsula, Serie orientale* 93: 317–335.
- 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.
- Fleitmann D. & Matter A. 2009. The speleothem record of climate variability in Southern Arabia. *Comptes Rendus. Géoscience* 341/8–9: 633–642.
- Fleitmann D., Haldon J., Bradley R.S., Burns S.J., Cheng H., Edwards R.L., Raible C.C., Jacobson M., & Matter A. 2022. Droughts and societal change: The environmental context for the emergence of Islam in late Antique Arabia. *Science* 376/6599: 1317–1321.
- Frifelt K. 1975. On prehistoric settlement and chronology of the Oman Peninsula. *East and West* 25/3/4: 359–424.
- Ghazanfar S.A. 1998. Plants of economic importance. Pages 241–264 in *Vegetation of the Arabian Peninsula*. Dordrecht: Springer Netherlands.
- Ghazanfar S.A.D. of B. 1992. *An annotated catalogue of the vascular plants of Oman and their vernacular names*. Meise: National Botanic Garden of Belgium.
- Harrower M.J., Oches E.A., & McCorrison J. 2012. Hydro-geospatial analysis of ancient pastoral/agro-pastoral landscapes along Wadi Sana (Yemen). *Journal of Arid Environments* 86: 131–138.

22. Jean M., Sauvage M., Munoz O., Castéja V. de., Mespoulet T., Pinot J., & Rointru K. 2023. The Early Bronze Age in the Hajar oases: new investigations of the settlement, funerary and monumental site of al-Dhabi 2 (Bisya, Oman). *Proceedings of the Seminar for Arabian Studies* 52: 189–205.
23. Kennet D. 2004. *Sasanian and Islamic pottery from Ras al-Khaimah: classification, chronology and analysis of trade in the Western Indian Ocean*. Oxford: British Archaeological Reports (BAR) Publishing.
24. Kuronuma T., Tanabe K., Miki T., & Kondo Y. 2024. Tombs and landscapes in a canyon of the al-Ḥajar mountains: results of the surveys at WTN07 in the Tanūf District (North-Central Oman), 2022–2023. *Proceedings of the Seminar for Arabian Studies* 53: 104–118.
25. Lombard P. 1985. *L'arabie orientale à l'Âge de Fer*. Doctoral dissertation, Paris: University of Paris.
26. Méry S. 2011. Avant-propos. in S. Cleuziou, S. Méry, & B. Vogt (eds.) *Protohistoire de l'oasis d'al-Ain, Travaux de la Mission archéologique française à Abou Dhabi (Émirats arabes unis). Les sépultures de l'âge du Bronze*. Oxford: Archaeopress
27. Power T. & Sheehan P. 2012. The origin & development of the oasis landscape of al-'Ain (UAE). *Proceedings of the Seminar for Arabian Studies* 42: 291–308.
28. Power T. 2015. A first ceramic chronology for the Late Islamic Arabian Gulf. *Journal of Islamic Archaeology* 2/1: 1–33.
29. Power T., Degli Esposti M., Hoyland R., & Kannouma R. 2023. Human–environment interactions in the United Arab Emirates: an archaeological perspective. *Proceedings of the Seminar for Arabian Studies* 52: 273–291.
30. Priestman S.M.N. 2020. Late Islamic ceramic distribution networks in the gulf: new evidence from Jazīrat al-Ḥamrā' in Ras al-Khaimah. *Proceedings of the Seminar for Arabian Studies* 50: 293–306.
31. Sauvage M., Jean M., Castéja V. de., Munoz O., Beshkani A., Pinot J., Mespoulet T., Rointru K., & Kim S. 2022. Recherches sur l'oasis de Bisya (Oman central) du Paléolithique au Bronze ancien: les travaux de la mission archéologique française en Oman central en 2022. *Bulletin de la Société préhistorique française* 119/3: 529.
32. Schmidt C., Döpfer S., Kluge J., Petrella S., Ochs U., Kirchhoff N., & Walter M. 2021. Die Entstehung komplexer Siedlungen im Zentraloman: Archäologische Untersuchungen zur Siedlungsgeschichte von Al-Khashbah. Oxford: Archaeopress
33. Swerida J., Dollarhide E.N., & Jensen R. 2020. Survey and settlement: preliminary results of the Bat Archaeological Project's 2019 field season. *Journal of Oman Studies* 21: 82–101.
34. Szymczak A. & Iskra M. 2024. An Iron Age village in the Hajjar Mountains of Northern Oman: QA 21 in the Qumayrā microregion. *Arabian Archaeology and Epigraphy* 1: 103–125.
35. Urban B. & Buerkert A. 2009. Palaeoecological analysis of a Late Quaternary sediment profile in northern Oman. *Journal of Arid Environments* 73/3: 296–305.