

WINDOWS ON OUR PAST

ARCHAEOLOGICAL RESEARCH IN OMAN
SEASONS 2012-2014

VOLUME 5

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The Rustaq-Batinah Archaeological Survey



Preliminary Report on the First Season 2013-14

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Executive Summary

The first season of the Rustaq-Batinah archaeological survey took place between the 17th December 2013 and the 17th January 2014. It is a collaborative project between Durham University, Sultan Qaboos University and the Ministry of Heritage and Culture, Sultanate of Oman. The project is funded principally by the Anglo-Omani Society.

The team consisted of 12 members, mostly made up of Durham University undergraduate and postgraduate students.

The aims of the project are to explore the Rustaq wilaya and in due course the area of the Batinah to the north towards the sea. The underlying argument being that the fertile Batinah has been a key area in Oman's history yet is notably under-explored from an archaeological perspective.

The project will aim to locate and record all archaeological surface remains in this area with two intentions: 1/ to provide a complete archive to the Ministry of Heritage and Culture to assist it with heritage management and preservation and 2/ to use the data as a basis to undertake a detailed scientific analysis of the ancient settlement history of the area.

The first season was highly successful. A large number (10,628) of surface artefacts and pottery were collected; 605 archaeological 'locii' were recorded; a number of small soundings were made to retrieve environmental evidence and some important trends have begun to emerge related to the development of settlement and agriculture in the area. A number of important archaeological sites were discovered and recorded for the first time.

Evidence of settlement dating to between 3800 BC and the 20th century AD was recorded including Bronze Age, Iron Age, early, middle and late Islamic material. Notably large amounts of evidence for Iron Age (1300-400 BC) settlement came to light as did evidence for the location of the early Islamic site of Manaqi, scene of the famous battle between the Omanis and the Abbasids in 939/940 AD.

The area has proven itself to be extremely rich in archaeological remains, despite the rapid development of modern Rustaq and surrounding areas in recent years. This is almost certainly due to the site's strategic location next to fertile agricultural land and on a key route.

The project is timely in that much of the more ephemeral evidence being recorded will almost certainly no longer be visible in ten year's time. A number of important sites that were threatened by destruction were reported to the Ministry and have now been formally protected.

INTRODUCTION AND BACKGROUND TO THE PROJECT

The Rustaq-Batinah Archaeological Survey (RBAS) has three key aims:

1. To locate and document archaeological sites in the Rustaq and Batinah region and to provide the documentation to the Ministry of Culture in order to assist them in their efforts to record and protect Oman's archaeological heritage.
2. To record and analyse the archaeological sites of the Rustaq and Batinah region within a broader historical framework in order to produce a clearer understanding of the development of settlement and society in ancient Oman.
3. To begin to explore and understand the archaeology of the Batinah region of Oman; the region with the greatest amount of agricultural land and population yet one of the least explored areas archaeologically.

The project is co-directed by Dr D Kennet from the Department of Archaeology at Durham University and Dr Nasser Said al-Jahwari at the Department of Archaeology, Sultan Qaboos University. The project is funded principally by the Anglo-Omani Society with support from Durham University, Sultan Qaboos University, the Omani Ministry of Culture and Carillion Alawi. Durham University provided financial support for undergraduate participation whilst Sultan Qaboos University provided a four-wheel drive vehicle and petrol as well as administrative support, the Ministry provided visas for the team as well as administrative support. Carillion Alawi provided help in kind including storage space for the project's equipment and finds.

The project aims to run for a number of years and to publish regular reports in academic journals as well as a final monograph. The first, 2013-14, season arrived in Oman on the 12th December went into the field on the 17th December 2013. It left the field on the 17th January and returned to the UK on the 18th January 2014. This gave a total of 25 field days not including one rest-day per week and a two-day weekend in the middle of the season. The team was made up of 12 members: Derek Kennet, Nasser Said al-Jahwari - co-directors; Will Deadman - GIS mapping specialist; Anne Mortimer - supervisor; Harry Munt – project historian; Mark Woolston-Houshold – kite photography specialist; Shiura Jaufar – MA participant; Rhian Ward, Mark Balfour, David Moger, Emma Hall, Sam Bithell – undergraduate participants.



Fig. 1: Part of the 2013-14 team in the field (from left to right Anne Mortimer, Dave Moger, Shiura Jaufar, Sam Bithell, Mark Balfour, Rhian Ward, Emma Hall).

Acknowledgements

The project is immensely grateful to its key supporter, the Anglo-Omani Society, and its staff especially Mr Duncan Allen, its chief executive. Without the support of the AOS the project simply would not exist. In addition the team would like to express their thanks to Mr Noel Guckian for his help and support from conception to realisation. Thanks are due to the Ministry of Heritage and Culture especially to the minister His Highness Sayyid Haitham bin Tariq Al Said and His Excellency Salim bin Mohammed Al Mahruqi, Undersecretary for Heritage Affairs for permission to carry out the work. Mr Sultan Al-Bakri, the Director of the Department of Excavations and Archaeological Studies has been extremely supportive and helpful; despite his very busy schedule he managed to visit the team twice and gave a lot of useful advice and help. Dr Abdullah Al-Kindi, Dean, College of Arts, SQU, helped to arrange SQU support for which he is gratefully thanked. The British ambassador, Jamie Bowden, has also been very kind and given much good advice, he also honoured the project with a personal visit during the season. Mr Andy Jones and his staff at Carillion Alawi in Muscat are to be thanked for their support and for helping the project out with very valuable storage space. The Department of Archaeology, Durham University has been very supportive in setting up and running the project.

Finally, the rest of the team, Shiura Jaufar, Rhian Ward, Mark Balfour, David Moger, Emma Hall, Sam Bithell, need to be thanked for their hard work and for putting up with sometimes difficult conditions and a tough work schedule; each of them has contributed to this report. The team would like to thank all of the local people who were so welcoming and helpful during the season, especially Mr Khalifa al-Ma'mari and Mr Ahmed al-Jahwari who guided the project to new sites and offered much appreciated coffee and rest during hard days in the field.

RUSTAQ AND THE BATINAH

The Missing History of the Batinah

It is the coastal strip and the alluvial section of the Batinah plain that have housed the greatest density of Oman's population in recent times. The obvious advantages of the relatively well-watered and fertile plain for agriculture and the marine resources of the coast are obviously the reasons for this. However, a look at a map of known archaeological sites in Oman makes clear the strange fact that there are practically no known archaeological sites in this area. There are a few possible reasons for this. The most obvious is that evidence of archaeological settlement has been buried by alluvial deposition but it is also possible that archaeological sites have been damaged or completely destroyed through the building and agricultural activities of the relatively recent populations that have inhabited this fertile region. This would be in contrast to the relatively good survival of archaeological sites in the more mountainous and less fertile interior zones of the country where populations have been less concentrated through history. The final possibility is that there was little or no ancient settlement along the Batinah – but this seems extremely unlikely.

If we accept that archaeological sites did exist along the Batinah but that they have been damaged or buried, this makes them much more difficult for archaeologists to find. In fact the normal techniques of archaeological survey (fieldwalking, satellite imagery) are not effective in such situations and alternative techniques need to be developed to elucidate the 'missing history of the Batinah'. Developing and implementing such techniques will be one of the key challenges of this project.

Fig. 2: The Batinah coastal outwash plain.

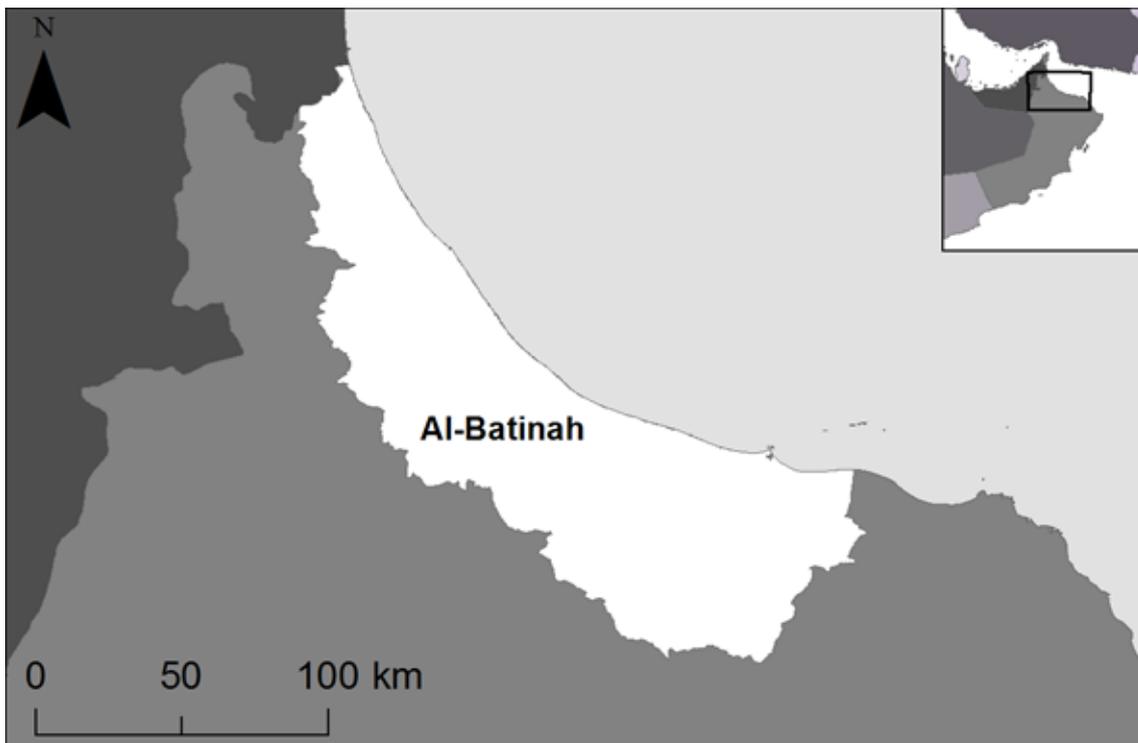




Fig. 3: Rustaq wilaya.

At the back of the Batinah plain along the foot of the mountains and in the wadi channels that intersect them the archaeological situation is different. Here there is no alluvial deposition to bury sites and there has been relatively little interference by later populations so that the archaeological record is still relatively well preserved. Rustaq itself falls into this zone. It is strange that, aside from some unpublished survey work by Prof Gerd Weisgerber in the 1970s, the Rustaq area is hardly explored from an archaeological perspective, despite its historical and cultural importance to Oman.

In the Rustaq area the project is able to implement more traditional methods of archaeological survey and these proved to be extremely effective in detecting a wealth of archaeological heritage that had previously been ignored or unrecorded.

Geography

Rustaq is located at the back of the southern end of the Batinah plain at the confluence of two major wadis that drain the eastern slopes of the Western Hajar mountains below Jabal Shams/ Jabal al-Sham – the Wadi Bani Auf and the Wadi al-Sahatan. This location is the reason that Rustaq has played such an important role throughout Oman's history – certainly for the whole of the Islamic period and possibly for much longer – as the wadis have given Rustaq access to both trade routes and water.

One of the aims of this project is to help clarify the nature and development of ancient settlement on the Batinah coast and for this reason the survey intends to cover not only the Wilaya of Rustaq but also the wilayat of Musanaah and Suwaiq which separate it from the sea. Together these three wilayat provide a full profile of the different terrains and environments to



Fig. 4: Topography of Rustaq wilaya.

be found in the Batinah from the long straight coast through the wide alluvial plain behind it onto the gravel outwash plain that slopes gently up towards the mountains and into the wadis that intersect the front of the Hajar mountains.

Archaeological Strategy

The project recorded all areas of archaeological interest as individual locii. A locus might be a small scatter of pottery, a grave, a feature such as a wall, a structure or an earthwork, an area where a sample was taken or where a test pit was dug. A second stage of interpretation involved merging the locii together into 'sites'. Some sites consist of only one locus whilst larger sites might consist of 10 or 20 or even more.

Locii were recorded using simple record forms, GPS UTM co-ordinates, cameras and field sketches. In the case of more complex or significant locii more accurate or detailed plans were made or pole camera photos or kite aerial photographs were taken (see section below). Pottery and other surface artefacts were collected where they were present and were later recorded and classified by ware, type and date in order to provide a chronology. Locii were then entered into ArcGIS to allow spatial analysis.

RUSTAQ PROJECT LOCATION RECORD

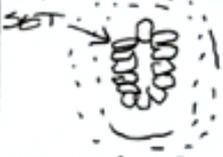
Toponym: <u>SARAKBAT (Hagun) Al Hoqin</u>		Loc. No. <u>092</u>
GPS Coords: <u>402 0534790 2604524</u>		<u>(B107)</u>
Location (Flat, mounded, hilly, wadi bed etc.): <u>flat</u>		
Description (include sketch): Tomb - SUB CIRCULAR ALIGNED NORTH-WEST/SOUTH EAST CHAMBER DOUBLE RING WALL TOMB WALL ^{WAS} CIRCULAR. INTERVAL BETWEEN 0.35m. WADI WALLS - CONSTRUCTION PREDOMINANTLY BLOCKS - LEST. SCRUB IN FILL BETWEEN WALLS - CHAMBER SOME VEGETATION - GRASS - STRAWS. CHAMBER VISIBLE - WALLING VISIBLE. STONES SET. CHAMBER - 1.70m x 0.50m.  TOMB 092 4.50 TO EAST OF TOMB 091 CONSIDERABLE AMOUNT OF TUMBLE SEE SKETCH PRO		
Type of location: pottery pick up area/ <u>structures</u> / surface finds/ other: <u>WORK AROUND GRAVE</u>		
Size. Length:	<u>3.90m</u>	Width: <u>3.95m</u>
Finds: no finds/ <u>pottery</u> / shell/ flint/ glass/ other:		
Type of collection: <u>unstructures</u> / systematic pottery/ timed:		
Other notes (name of local people, details of access etc.):		
Inside locus: <u>090</u>		
Contains locus:		
Photos: Black camera/ <u>White camera</u> / Pole camera		
Date:	<u>30.12.13.</u>	Initials: <u>DM/DB</u>

Fig. 5: An example of a completed locus recording form.

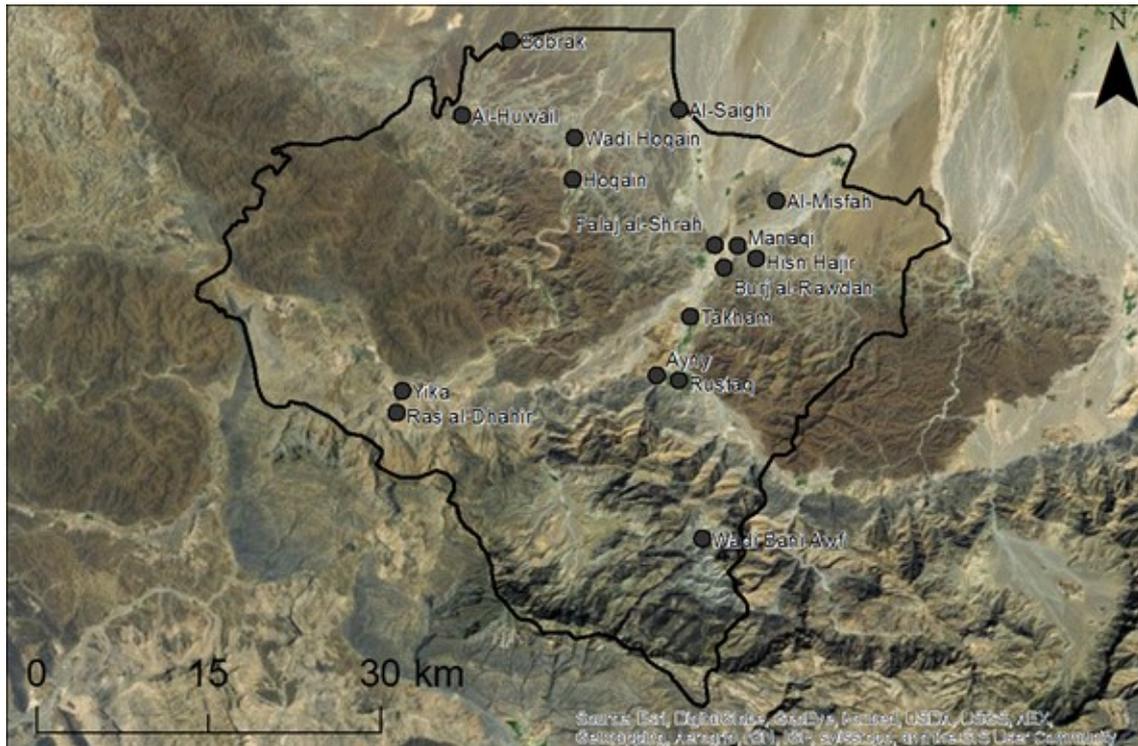


Fig. 6: Locations of the most significant sites located by the project in the 2013-14 season.

MAJOR ARCHAEOLOGICAL SITES

The methodology used by the project involved the recording of each archaeological area visited as a 'Locus'. However, a Locus does not necessarily indicate the presence of an ancient settlement or cemetery as Loci numbers were also given in any situation where a located record needed to be taken – for example a *falaj* shaft, a well, field walling, or a sedimentary section etc. Altogether 605 Loci numbers were allocated by the project and these indicate the wealth of archaeological evidence that covers the Omani landscape. Amongst the 605 Loci 13 major sites were defined and these are briefly described below and their locations are shown in Fig. 6 & Fig. 7.

Manaqi Iron Age Settlement

Loci: L001, L003-L010, L111-L116, L127-L152

Close to Falaj al-Sharah where the combined wadis Bani Auf and al-Sahatan leave the mountains and flow out on to the outwash plain of the Batinah an extensive Iron Age (1000-300 BC) site was located. The site is situated on the west side of the wadi basin on the low gravel terrace that is slowly being undercut by the wadi. It was a surprise to find such an extensive Iron Age site here that had never been located before but it makes perfect sense to find a key centre of Iron Age power here at a key geographical location.

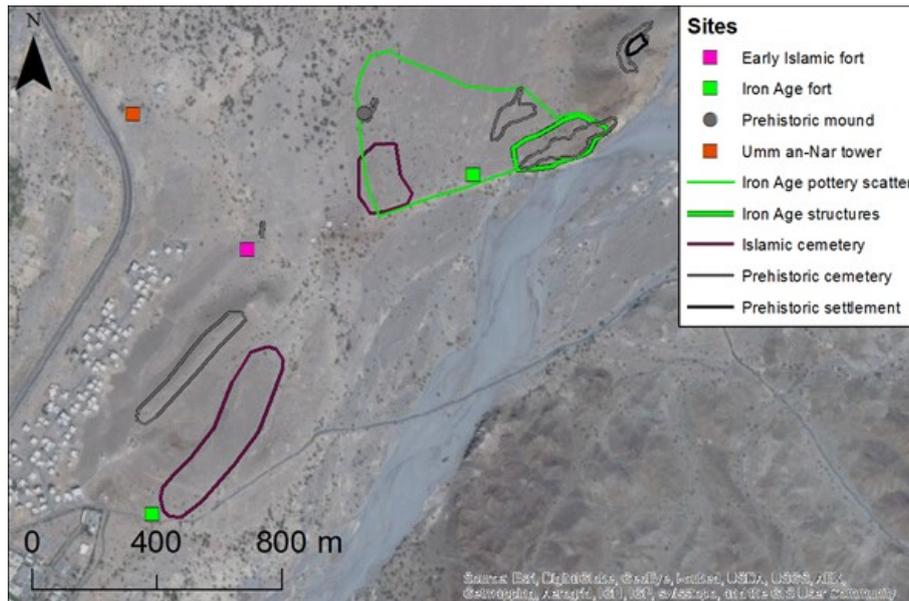


Fig. 9: A satellite image showing the extent of Manaqi Iron Age site (green line) and the location of the main areas.

The site is really extensive, measuring over 700m along the side of the wadi and a similar distance across. It consists of a dense area of Iron Age pottery and structures at the northeastern corner, the area that was dubbed ‘the citadel’ by the project team. Moving away from this is an extensive area of Iron Age tombs, settlement mounding and pottery scatters which are very dense in some places and rather thin in others.

At the southern extent of the site the square outline of a Iron Age fort was located measuring about 30m across. The southern wall of the fort has been eroded away by the wadi but the plan of the rest of the structure is still clearly visible on the surface. At the western extent of the site, where the flat terrace is cut by the gully of a smaller tributary wadi, a prominent mound is located which is also covered in Iron Age pottery and has traces of walls visible on the surface. The modern terrace on which the site is located has an extensive Islamic cemetery at its southern end but is currently being developed for new housing by Rustaq municipality. Manaqi is a major discovery. It had never been recorded by archaeologists before and makes an important contribution to our understanding of the Iron Age on the Batinah coast. It is one of the most extensive Iron Age sites known and seems to have been a major centre of power during the Iron Age.

Manaqi Early Islamic Settlement

Locii: L101-106, L110, L119, L120

To the immediate west of Manaqi Iron Age site an important early Islamic site came to light through systematic fieldwork. The site consists of a number of low-density scatters of 8th century turquoise glazed Islamic pottery of a type that is well known in the region (Fig. 12) and sherds of 12th/13th century glazed sgraffiatos.

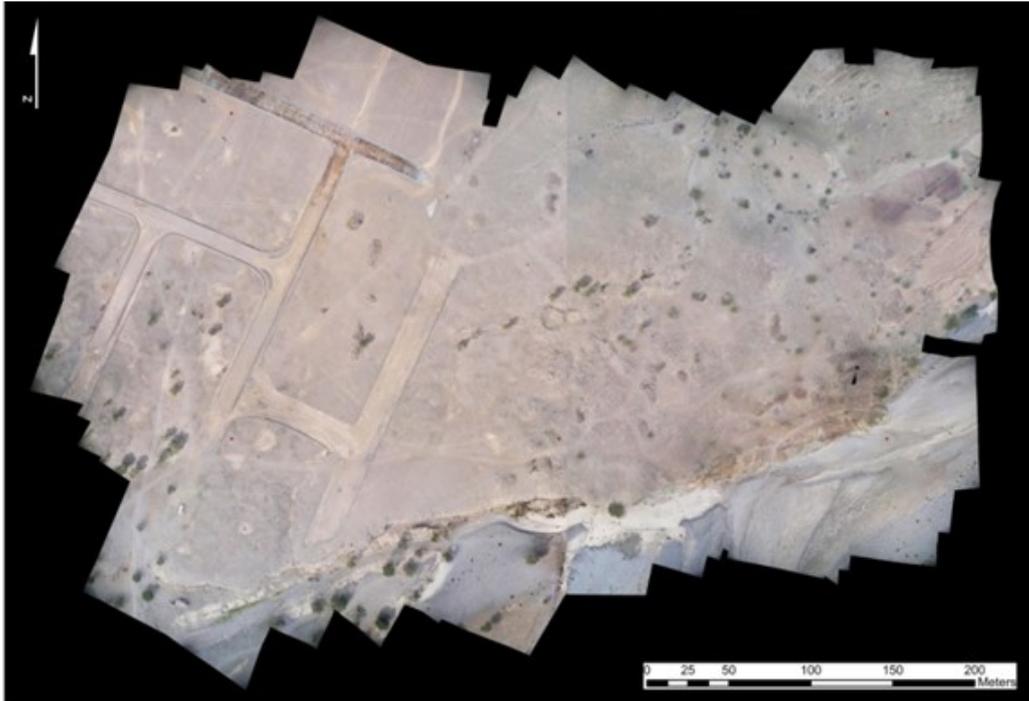


Fig. 10: A composite kite aerial photograph of the main archaeological area at Manaqi Iron Age site showing the newly-bulldozed roads crossing the terrace to the west (Photo M. Woolston-Houshold).

Fig. 11: Remains of a rectangular stone structure in the main part of the Iron Age site at Manaqi.





Fig. 12: Turquoise alkaline glazed pottery from the 8th century AD from the early Islamic site of Manaqi.

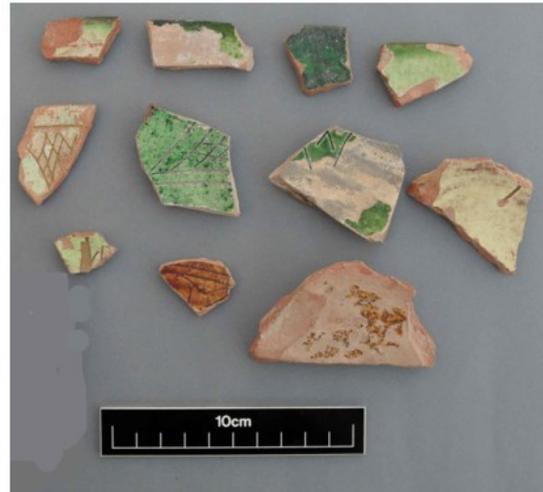


Fig. 13: Sgraffiato lead glazed pottery from the 12th-13th centuries AD from the early Islamic site of Manaqi.

The ceramic scatters extend for over a kilometre along an intersected flat interfluvium between two small tributary wadis. The greatest density of pottery was found in the central part of the site about 100m to the east of the stone structure (Fig. 14).

On a low ridge in the central part of the site a square stone-walled structure is still visible on the surface. It is covered with a fairly dense scatter of early and middle Islamic pottery. The structure is irregularly shaped and measures 22m by 16m. It seems to have an entrance on the east side and consists of a courtyard with two rooms against the south wall and a square structure around the entrance. There was also possibly an entrance in the middle of the north wall but it is impossible to be sure of this without excavation.

The walls are stone built, around 85cm thick and consist of two faces of undressed stone. There is no evidence of any corner towers, so it is probably sensible to interpret this as a courtyard house.

There are five Islamic cemeteries surrounding the settlement, one at each extremity of the site suggesting that they were related to the early Islamic occupation and were located on the fringes of the occupied area (Fig. 14). The most southerly cemetery incorporates the tomb of the 10th Ibadī Imam who was killed during the battle of Manaqi in the early 10th century (see historical section by Harry Munt).

The pottery found at the site suggests an occupation that might run from the 8th (possibly the 7th) century AD until the 13th century, although none of the well-known 'Hatched' or 'Style III' sgraffiato was found here, suggesting that the site was probably not densely occupied during the 11th century. This may have been a period of abandonment or a period of relatively low trade interaction.

As Harry Munt sets out in the historical section below, Manaqi is the location of a well-known 10th century battle and it is no surprise to find evidence of extensive early Islamic occupation here. Indeed, the question needs to be asked, was Manaqi the main focus of occupation in the Rustaq area during the early Islamic period? Based on the evidence that has so far been accumulated, it seems quite likely that it was.

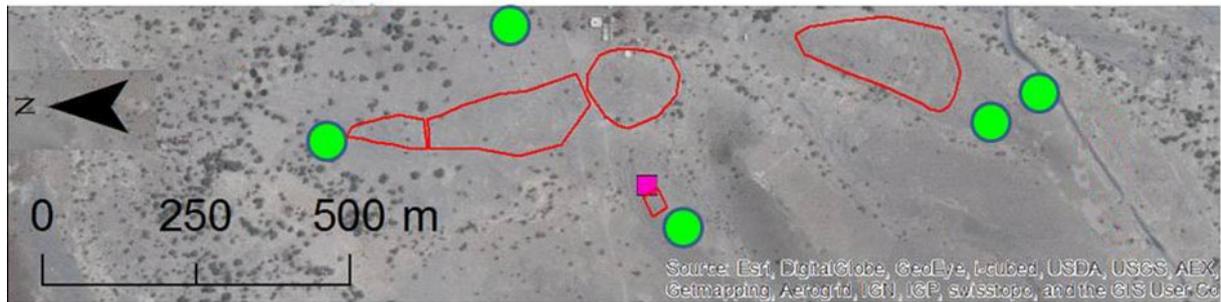


Fig. 14: Showing the extent of early Islamic pottery scatters (red outlines), cemeteries (green circles) and the stone structure (pink square) at early Islamic Manaqi.

This is one of the most extensive 8th century occupation sites that has ever been located in Oman. It is likely to make a significant contribution to our understanding of the early Islamic period in the region.

Manaqi Iron Age Honeycomb Cemetery

Locus: L053

On the flat ridges surrounding Manaqi a number of burial cairns are visible. Some of these proved to be Hafit period whilst others turned out to be Iron Age burials, which are quite distinct in their plan and construction. These are often located next to old Hafit cairns that have been robbed out, probably by the builders of the Iron Age tombs.

Fig. 15: Plan of the rectangular stone structure at Manaqi (L110).

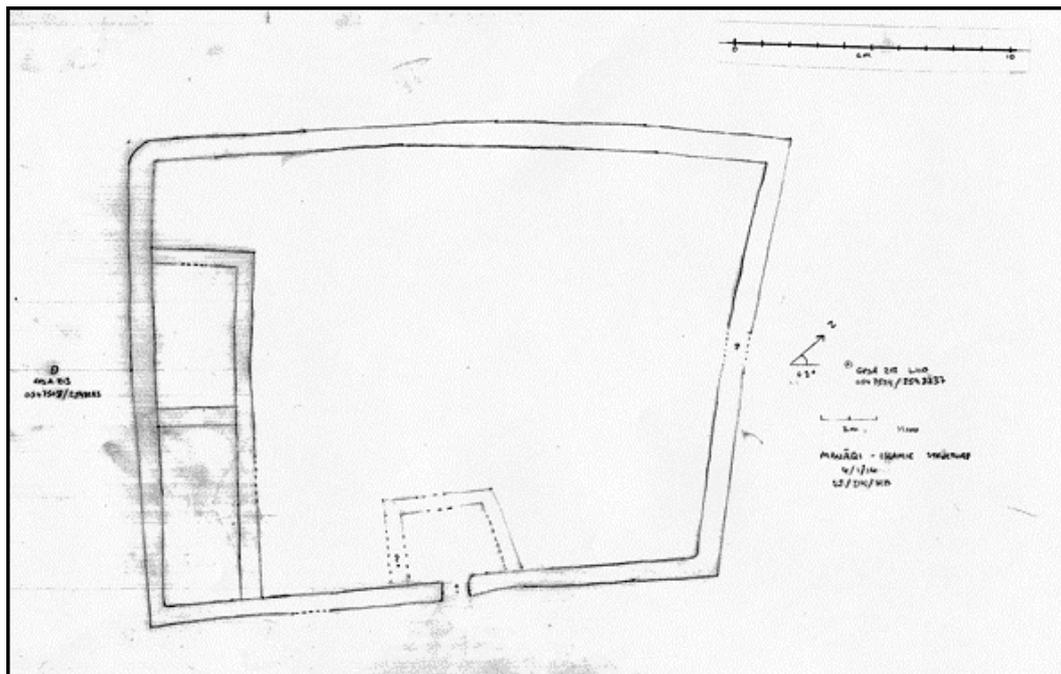




Fig. 16: View of the rectangular stone structure at Manaqi (L110) from the south.

Fig. 17: Composite kite aerial photography of an Iron Age 'honeycomb' cemetery above Manqi.





Fig. 18: View of the Umm al-Nar round tower at Falaj al-Shura from the northeast showing a wadi wall in the foreground resulting from run-off irrigated agriculture.

The Iron Age tombs consist of a stone-lined cist, either subterranean if the ground is suitable, or standing above ground if on rock, covered with slabs and surrounded by an oval or circular vertical wall – the gap between the outer wall and the cist being filled with gravel and cobbles. The whole was probably flat-topped and stood as a one-metre-high, circular or round structure.

In many cases, particularly in the later Iron Age it seems, such tombs were built immediately adjacent to each other in rows. Such practice leads eventually to the formation of what are known as ‘honeycomb’ cemeteries. Examples of these have been excavated at Bawsher near Muscat and has been dated to the Iron Age.

Falaj al-Shura Umm al-Nar Tower

Locii: L081, L082, L083, L084

Next to the main road heading out of Rustaq to the north the remains of an Umm al-Nar period (2500 -2000 BC) round tower are located. This structure was already known to the Ministry, having been discovered by Sultan al-Bakri some years before.

The structure consists of a 15m diameter circle of wadi boulders that are visible on the surface. The probably mark the foundation or the lowest courses of a circular tower typical of the Umm al-Nar period. To one side a rectangular 5x2m annexe is attached, possibly representing a later addition to the original tower. Tumble of similar stones on the slopes below the tower suggests that the walls were once built of further courses of stone.



Fig. 16: View of the rectangular stone structure at Manaqi (L110) from the south.

The tower is situated on a flat platform of wadi gravels that sit in the middle of a wide basin about 1km to the west of the Iron Age site of Manaqi , the location in relation to that site is shown in Fig. 9.

There is a low density scatter of 3rd millennium material around the tower. To the immediate south/east a recent bulldozing of later gravels has obscured the surfaces associated with the tower over an area about 10m wide.

Some scattered pottery and bone suggests that there may once have been domestic and/or funerary structures associated with the tower.

The area around the tower consists of alluvial deposits in the upper reaches of a small wadi. Field walls visible on the surface make it clear that the area has been used for run-off irrigation, but the date of the field systems and wadi walls is not clear.

A notable amount of low-fired clay nodules were found around this site. They appear to result from kiln or furnace lining and may be related to copper roasting or smelting. This is something that will need to be investigated in future seasons.

Round towers such as this are a common feature of the Omani archeological landscape. Almost 80 are known from northern Oman and the UAE. The presence of this tower here at a key location in the landscape controlling access into and out of a key wadi pass through the mountains is no surprise. It is hoped to investigate this structure and the fields surrounding it in more detail in future seasons.

is surrounded by a circle or oval of stones with a diameter of about 3.5m which probably mark the location of a low , vertical wall that contained a circular or ovular, flat topped, earth-filled structure that covered the cist and marked its location. However, there is considerable variation in the types of tombs found in this cemetery and horseshoe, keyhole and rectangular structures were also noted (Fig. 20).

The type of tomb described above is probably datable principally to the Wadi Suq and Late Bronze Age periods (2000-1300 BC) although its use may continue into the early Iron Age (1300-600BC) and beyond.

The location of this large cemetery here next to the modern village and opposite the remains of the older, mud-brick village and fort, next to the well-watered wadi and opposite the Iron Age hillfort describe below, suggests the existence of a substantial settled community here during the Bronze and Iron Ages continuing perhaps to modern times. However, preliminary survey around the village has so far failed to reveal any trace of this settlement, although it may come to light in future seasons when more intensive survey is used to investigate the area.

Fig. 21: Locus 203, an ovular shaped, semi-subterranean tomb in the Hawqain cemetery photographed from the pole camera.



Hawqain Iron Age hillfort

Locus: 341

Above the famous waterfalls opposite the extensive Bronze Age cemetery on the outskirts of the modern village of Hawqain the project located an Iron Age hillfort using satellite imagery. The fort is 80m long and about 40m wide at its widest point. It occupies a flat hilltop with steep slopes on all sides except the north east where they are a little gentler (although still presenting a considerable challenge to climb). The photograph and plan below (Fig. 23, Fig. 24) show the location and extent of the fort.

The plan shows that the fort is surrounded by a thick stone wall that still stands in some places to a meter and a half in height. The interior is largely empty of stone structures (wooden structures may once have stood here leaving no visible trace), although there are a number of small square structures built against the outer wall of the northern side of the fort. There is also a 5m wide square depression in the northern part of the fort that may have been a cistern.

One of the chief points of interest of this fort is the complex gateway structure at the north-east extent of the fort. Here where the slopes of the hill are at their most gentle, some effort has been taken to defend a double entrance way from attack. This may have been a second phase of construction although this will need to be clarified if the structure is excavated.

Below the gateway at the bottom of the steep slopes there are some indications that a pathway or staircase may once have led up to the fort, although this would need to be clarified by excavation.

Fig. 22: Satellite image showing the Hawqain area with the cemetery and Iron Age hillfort marked.

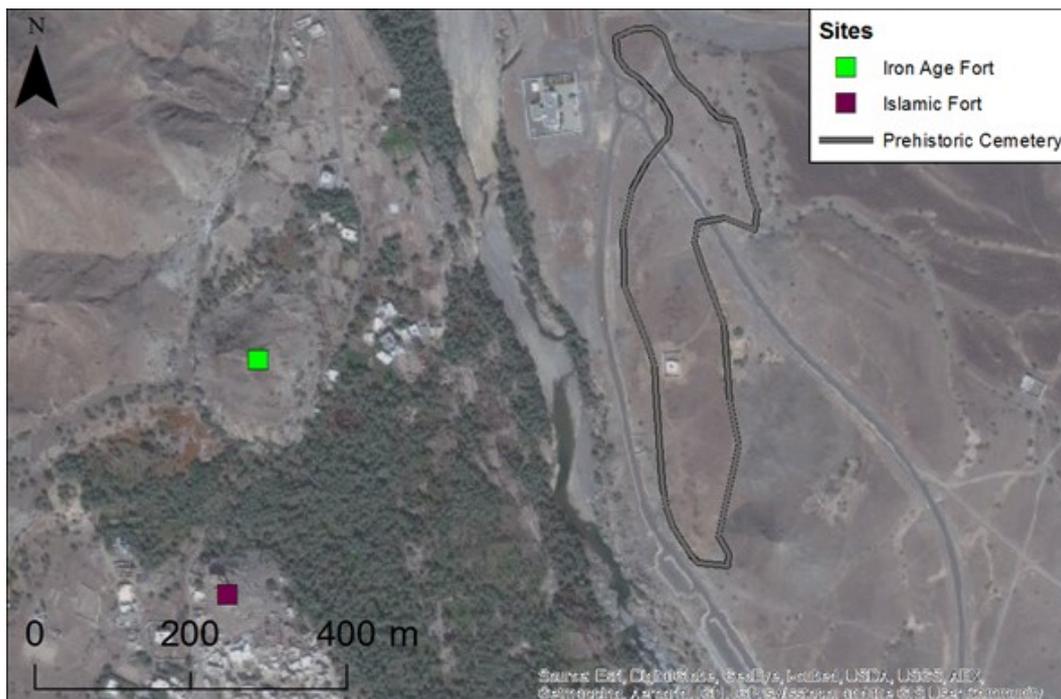
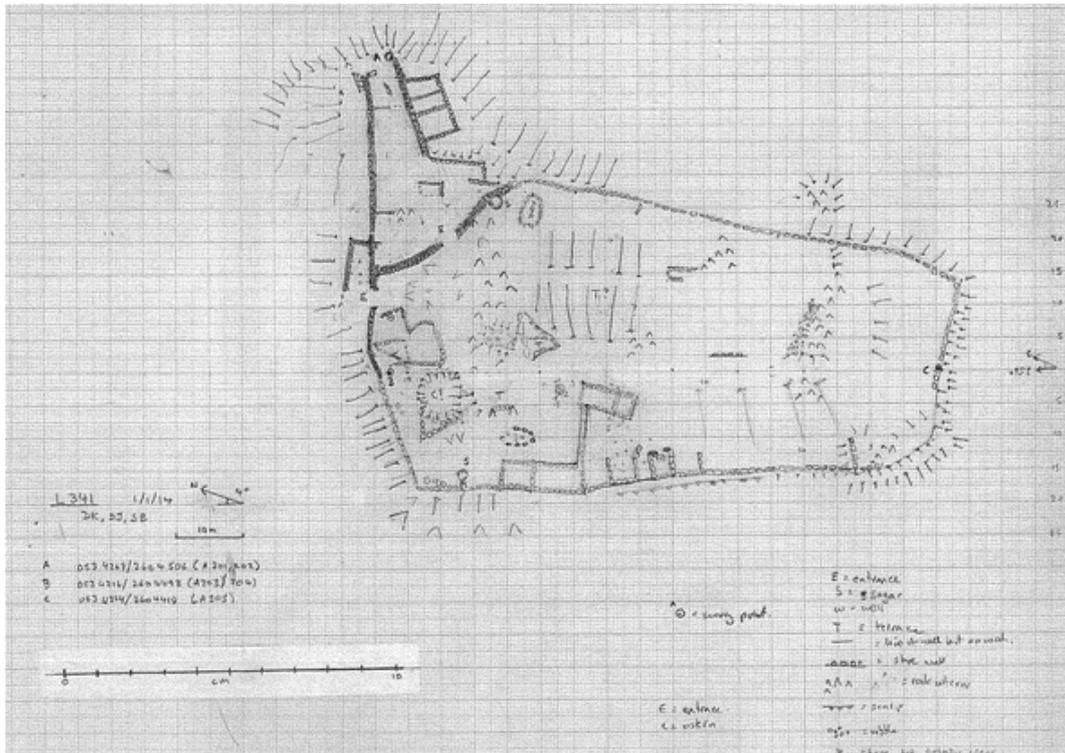




Fig. 23: A view of the Hawqain Iron Age hillfort from the Bronze and Iron Age cemetery to the east - the walls of the fort are visible at the top of the slope.

Fig. 24: A plan of the Hawqain Iron Age hillfort showing the complex defensive gateway to the north east.



Hillforts such as this are very much a feature of the Iron II period in the Oman Peninsula. A number of them are known, most famously the example at Lizq near to Samad, and some have been excavated. They appear to represent a period of conflict between Iron Age communities across the peninsula as population grew to the point where the exploitation of even quite marginal zones had become quite widespread. It is possible that they reflect the increased competition for resources such as water and cultivable land. They were probably used as sanctuaries rather than permanent residences; places where the community could retreat in times of attack or danger.

Hawqin Late Hafit Cemetery

Locus: 117

In the Wadi Hawqin about two kilometres to the north of the main village on the western terrace above the wadi channel at a place known as Tamr Abu Fudala the project came across a small but very significant cemetery consisting of four Hafit cairns and a number of later Iron Age burials.

The most significant aspect of this cemetery is the large size of the largest of the Hafit cairns, which is notably larger than the average size of these structures in this area and much larger than the other contemporary tombs in this cemetery. The structure still stands to a height of over two meters and has an outer diameter of 5.2m whilst the diameter of the internal corbelled chamber is 3.2m wide and the walls are 1m thick.

Fig. 25: Khalifa al-Ma'mari from Hawqain standing next to the largest of the late Hafit cairns at Tamr Abu Fudala in the Wadi Hawqain.



The Hafit period to which these cairns can be dated can be placed between about 3,200 and 2,500 BC (the early Bronze Age) and is generally thought to reflect the time when Mesopotamia lost control over its copper-producing colonies in the north Syria region and had to turn its attention to copper-rich areas of the 'southern sea' of which Magan (Oman) was certainly the most important. It is generally thought that the earlier Hafit tombs are those occupying ridges and prominent geographical localities whilst those located on the flat ground below ridges and close to cultivable or grazeable land are probably largely to be dated to the latter part of this period.

The fact that one of the tombs in the Tamr Abu Fudala cemetery is much larger than the others might suggest that the society that built and used these tombs was becoming more hierarchical with some individuals or families having access to greater resources and using them to express their higher status through the construction of larger funerary monuments.

A similar picture has emerged from two or three other sites noted by the project along the Batinah. It is possible that these developments, which would have happened during the latter centuries of the Hafit period, were in some way related to the eventual rise of the Umm an-Nar culture in about 2500 BC.

Al-Huwail Iron Age Settlement in the Wadi Haimli

Locus: L164

During a visit to the Wadi Haimli, which is right on the western extremity of the wilaya of Rustaq, project team members were taken by local resident Ahmed al-Jahwari to an extensive Iron Age site at a place known as Al-Huwail located on a terrace above the bed of the wadi but otherwise well hidden within the hilly landscape.

The site was measured at 208 metres long and about 80 metres wide. It is divided into a northern and southern section by a marked gully some 20m wide - there may even have been separate walls surrounding each section. The surface of the whole site is densely covered with Iron Age II and III pottery, including, in the southern section, some sherds of hand-made pottery that may be related to Magee's Iron I complex and may be datable to the very early Iron Age (1300-1000 BC). The southern section of the site has the remains of a late Islamic village built on top of the Iron Age remains. Here a number of small stone-built late Islamic houses still stand to a height of over one metre in some cases and are associated with a scatter of late

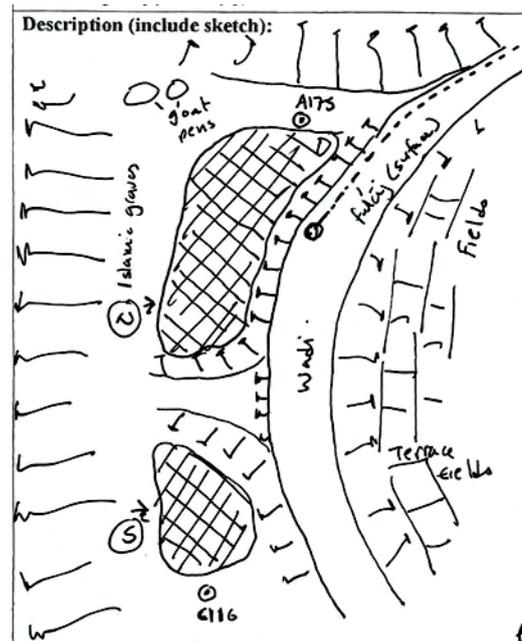


Fig. 26: Sketch plan of L164 (north is at the top). The cross hatching indicates the presence of dense, stone-built Iron Age architecture on the surface.



Fig. 27: View down onto Iron Age site L164 from the north. The site can be seen in the mid distance as a darker scatter of stones defined by car tracks on the low wadi terrace above the channel of the Wadi Haimli.

Islamic pottery. This settlement is probably to be associated with the Islamic cemetery that lies to the west of the site at the back of the wadi terrace.

Both the northern and southern sections of the site consist of a dense concentration of stone-built walls and stone collapse on the surface. Once a kite photograph has been obtained, it will be possible to map the location of the closely-packed, mostly-rectangular buildings and to establish a rough plan of the settlement. It seems likely that the northern section at least was surrounded by a stone-built defensive wall. Some of the walls visible on the surface are built in an unusual technique consisting of two rows of vertical-standing small boulders 40cm apart defining a thin fill of wadi cobbles and gravel (Fig. 29). These probably served as foundations for wooden or mud-brick structures as it is difficult to imagine such a thin wall standing to any height with any stability.

A surface *falaj* rises from below the terrace at the edge of the wadi channel and runs along the side of the wadi to a series of modern fields about two kilometres to the north. Recent enhancement of the spring where the channel rises makes it difficult to evaluate the antiquity of the channel. A modern village of some antiquity with a small date-palm grove exists on the opposite bank and a number of terrace fields (*awaba*) have recently been cut into the terrace directly opposite the site.

The Iron Age site has not yet been fully surveyed or recorded as there was only time for a preliminary visit during the first season, but there is no doubt that it is one of the best



Fig. 28: Sherds of hand-made Iron I pottery from L164 .

Fig. 29: View of one of the typical stone wall foundations visible on the surface of the site. The wall is about 40cm wide.

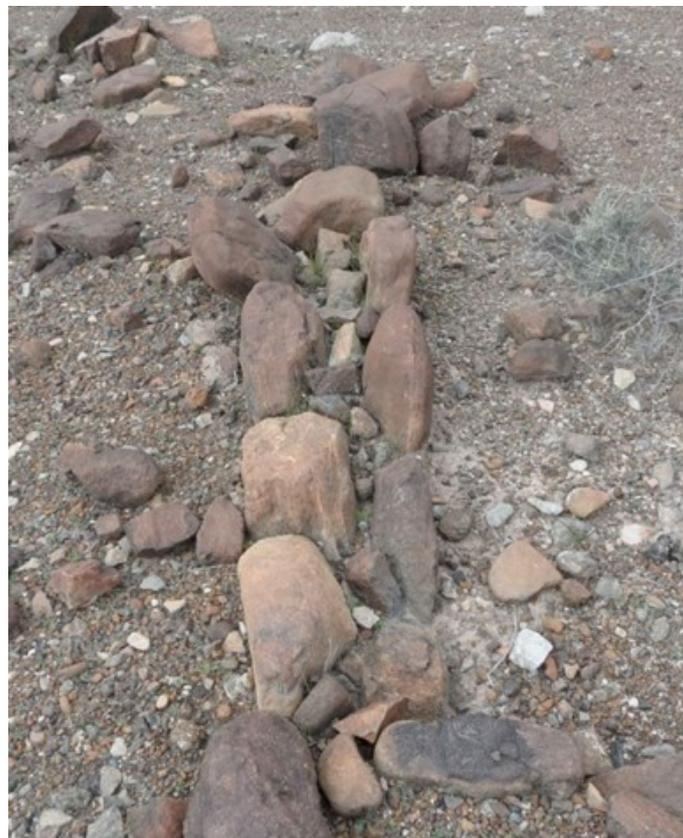




Fig. 28: Sherds of hand-made Iron I pottery from L164 .

preserved and most substantial Iron Age settlements encountered by the project. The site's location on the banks of a large wadi at the point where the wadi leaves the mountains and enters onto the outwash plain is similar to the contemporary site of Manaqi near Rustaq that is described above. It may be related to the control of trade and to the water supply that emerges from below the site.

Al-Jaruf/Takham Umm al-Nar

Locus: 650

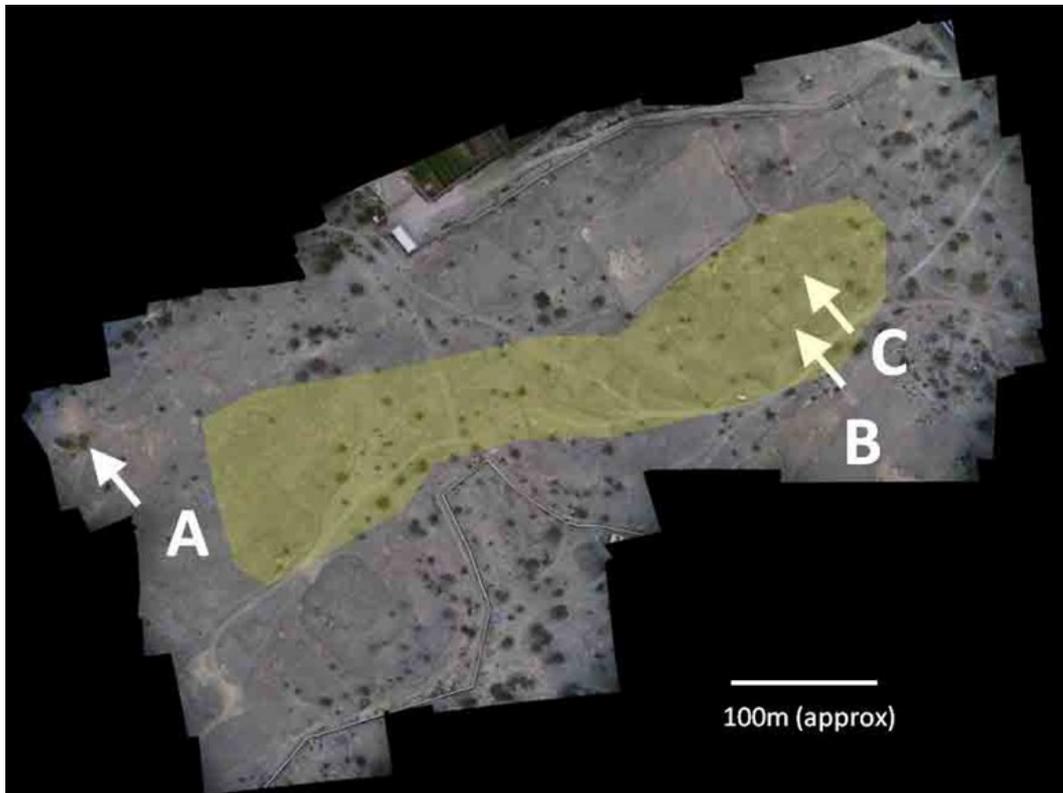
Note: This site is referred to as Takham in Fig. 6.

An extensive Umm al-Nar (2500-2000 BC) settlement was found one kilometre south of the confluence of the Wadis Bani Auf and al-Sahatan on the wadi terrace in between the two wadis on the banks of the Wadi Bani Auf. The site extends for about 700m in a north-south direction and about 200 metres (varies) east-west as a medium to low density scatter of 3rd-millennium pottery scattered amongst the remains of occasional stone structures preserved as outlines of manganese-patinated boulders on the cobble-strewn surface. Towards the northern extent of the site right against the edge of the wadi terrace a round tower was located. The tower's presence is indicated by a prominent mound with a diameter of about 20m surrounded by a circular double row of large wadi boulders visible on the surface and forming the foundation or lower courses of the tower's outer wall. A slight depression around the tower suggests that it might have been surrounded by a ditch and there are some indications, in the form of large boulders lying on the surface, that there may have been an annex on the north side. The tower itself had a diameter of about 17m.



Fig. 31: A 3rd-millennium wall visible on the surface at L650 (location 'C' in Fig. 32).

Fig. 32: Composite kite photograph of the Umm al-Nar site L650 at Al-Jaruf/Takham. The light yellow area indicates the main scatter of 3rd millennium pottery; A= round tower; B=square stone building approx. 12mx10m; C= rectangular stone building approx 6 m long. North is to the left. The main wadi channel of the Wadi Bani Auf runs along the top of the image and is just visible above the round tower (A). Further stone structures are visible on the surface to the southeast of B & C .



The
was



site

Fig. 33: Kite photograph showing two 3rd millennium stone structures visible on the ground (B & C in Fig. 32). The lower square structure measures c 12x10 m whilst the upper rectangular structure measures c 6x5m.

located during the final days of the first season and has not yet been fully explored or recorded. Nonetheless it is already clear that it forms an important addition to our knowledge of the distribution of the Umm al-Nar culture along the back of the Batinah - where an increasing number of Umm al-Nar round towers and settlements is now coming to light in an area which was recently thought to contain very few. This site brings to two the number of Umm al-Nar towers known in the immediate vicinity of Rustaq and begins to suggest that the site had a prominence in the 3rd millennium BC equivalent to its importance in the medieval period.

The area in which the site is located is one that is currently slated for development. The Ministry was informed about the existence of this site and immediate steps were taken to protect it by Mr Sultan al-Bakri.

Al-Saighi Prehistoric Cemetery

Locus: L345

At the small hamlet of Al-Saighi, next to the road between Rustaq and Hawqain, the project located a small prehistoric cemetery measuring about 150 by 80 metres long consisting of about 10 cairn burials built of rounded wadi cobbles and small boulders, most of which were dark



Fig. 34: A view of the cemetery at Al-Saighi with the walls of the rectangular building visible on the surface in the foreground.

brown in colour although some white stones appear to have been deliberately selected to be part of some of the cairns. The date of the cairns looks to be possibly early Bronze Age but the associated pottery is Iron Age which probably indicates that to be the date of their construction. The cemetery is located on a wadi terrace immediately to the north of the wadi channel close to an area where a small date palm grove is currently cultivated.

In the middle of the cemetery the remains of a rectangular stone building measuring approximately 12x8m are visible underneath two of the cairn burials. The walls are built of single rows of wadi cobbles and the plan is a simple rectangle divided into four long thin rooms. The plan of the building can be confidently reconstructed as a section of each of the walls is preserved, although none of them is completely preserved.

A brief survey revealed no associated settlement of any period in the immediate vicinity, although it is likely that such existed but that it was quite ephemeral in nature and has been removed by erosion.

This is an interesting cemetery and site, not only because of the rectangular building underlying the tombs but also because it is so-far the only substantial Iron Age cemetery that has been found some distance in front of the mountains on the outwash plain. Once its date has been more firmly established it is likely to be useful in future analysis of the distribution of prehistoric settlements on the plain. The juxtaposition of the tombs and the underlying building tells an interesting story, and one perhaps mirrored at Manaqi where structures of the Iron II period appear to be overlain by tombs of the later Iron Age or Samad period.



Fig. 35: Composite pole camera photograph showing the remains of the rectangular stone building 12x8m at Al-Saighi (outline in red) with two presumably late Iron Age cairn tombs built on top of its remains.

Yiqa Settlement and Cemetery

Locus: L072 (rectangular building), L073/L381 cemetery, L086 (round tower), L087 (enclosure wall), L088 (settlement, pottery scatter), L089 (rectangular structure), L241-247, L252-259, L281-300, L382-400, L412-420, L649 (tombs).

Yiqa is a small modern village in the mountains behind Rustaq. The remains of a recent village nestle against the rocky sides of a steep wadi gully surrounded by precipitous mountains. A series of well-watered terrace fields are located in the bottom and on the terraced edges of the wadi gully and support an abundance of date palms and other crops. The modern village has now moved its focus to the northern side of the wadi close to the main road.

An Umm al-Nar round tower and settlement is known to exist near to the old village of Yiqa on the south side of the wadi, having been discovered by Mr Sultan al-Bakri a few years ago. On the other side of the wadi at the western end of the modern village of Yiqa there is a large prehistoric cemetery (L073/L381) consisting of 73 tombs. In addition, further structures



Fig. 36: Annotated satellite image showing the layout of the site at Yiqā.

along the edge of the wadi terrace and close to the fields and date palm groves in the wadi channel suggest that this was once the site of an extensive 3rd millennium settlement and that it continued to have significance into the Iron Age and later. The project visited the site to record the existing structures and to examine the surrounding features.

The Umm al-Nar round tower (L086) is the most prominent archaeological feature of the site. It is situated on the edge of the present wadi terrace and is currently being eroded by the wadi. The tower is 20.6 metres in diameter and is built from substantial rectangular blocks of rock measuring up to one metre in length in some cases. It has a small rectangular annex on its east side. Although there is practically no Umm al-Nar pottery to be found on the surface here, it seems certain that this is a 3rd millennium structure to judge by parallels elsewhere in the region. The tower is surrounded by a much cruder circular wall (L087) which has a row of rectangular rooms built against it on its inner side. This wall sits within a wider scatter of Iron Age pottery (L088).

To the east of the tower a low-density scatter of 3rd-millennium pottery is associated with a few stone buildings, the plans of which are visible on the surface. One such (L072) is shown in Fig. 41 and Fig. 42. This structure is quite irregularly laid out. It is roughly rectangular and measures 11.5 by 8.7m and is oriented roughly with the entrance towards 65°. The building has an unusual plan consisting of three 'concentric' rectangles each with its entrance aligned roughly towards the east. It is difficult to imagine a domestic function for this building and it seems very likely that it may have had a cultic purpose. The dating seems likely to be 3rd millennium due to the predominance of 3rd millennium pottery in this area, but it could be Iron Age as there is also a considerable amount of evidence of Iron Age activity at the site.



Fig. 37: View of Yiqā from the north showing the location of the Umm al-Nar round tower and the associated scatter of 3rd millennium pottery (in red).

Fig. 38: Composite pole-camera oblique photograph of the Umm al-Nar round tower and the associated Iron Age wall surrounding it from the east.



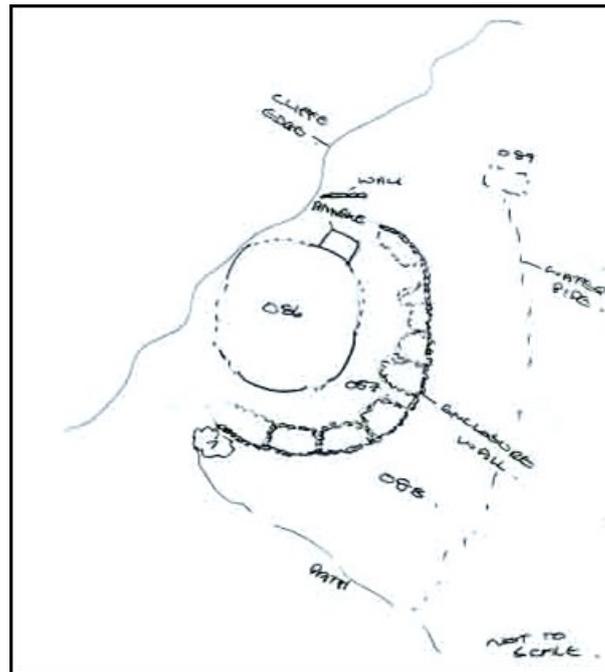
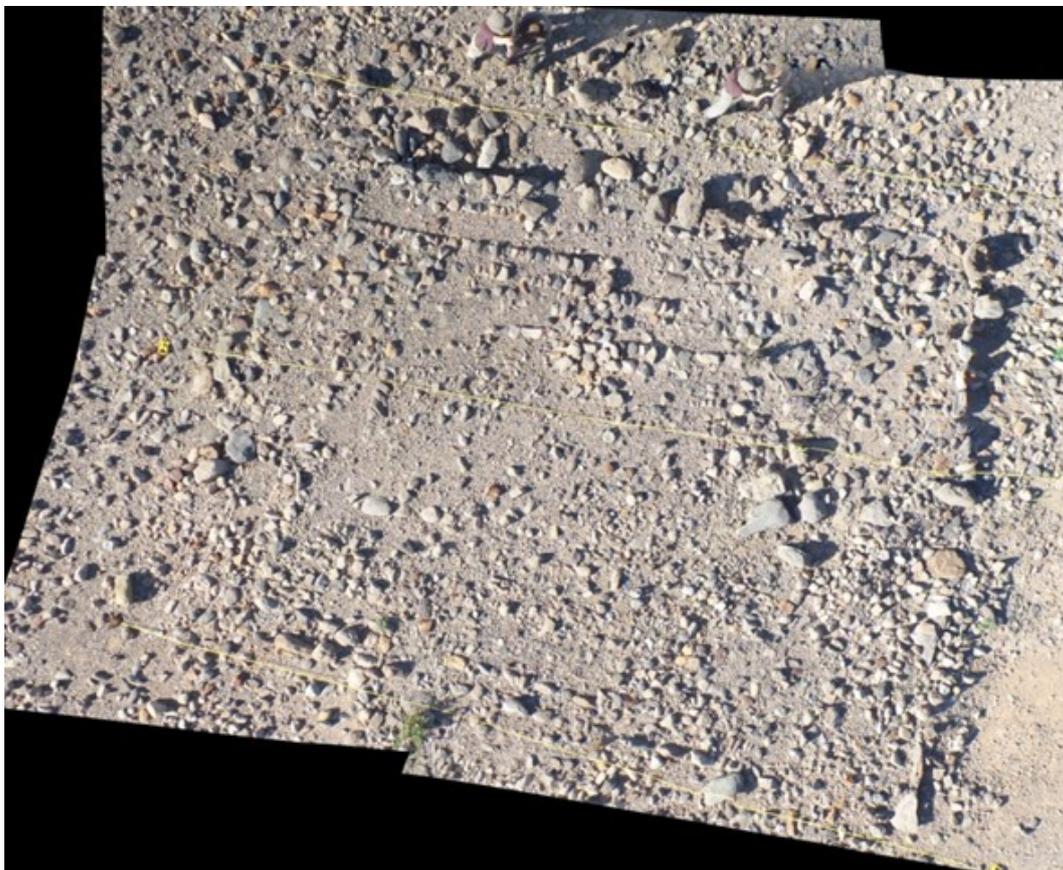


Fig. 39: Plan of the Umm al-Nar tower at Yika (L086) and surrounding structures.

Fig. 40: Composite pole-camera photograph of the possible 3rd-millennium structure (L072) in Yiqia settlement.



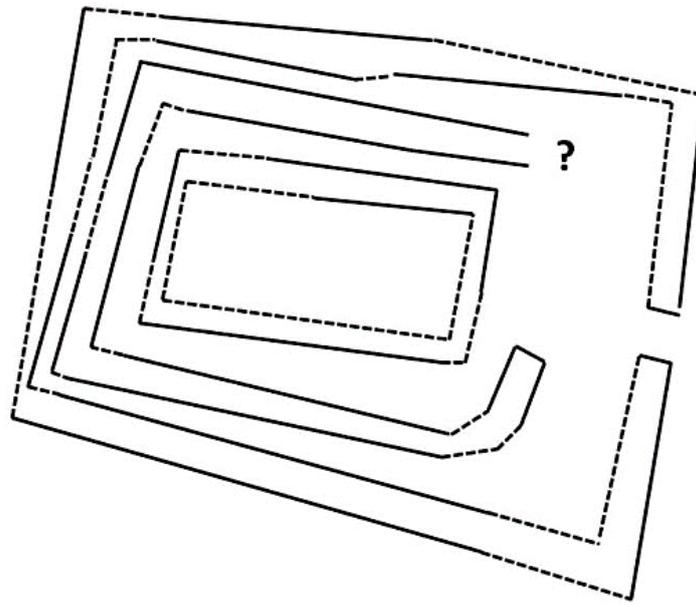
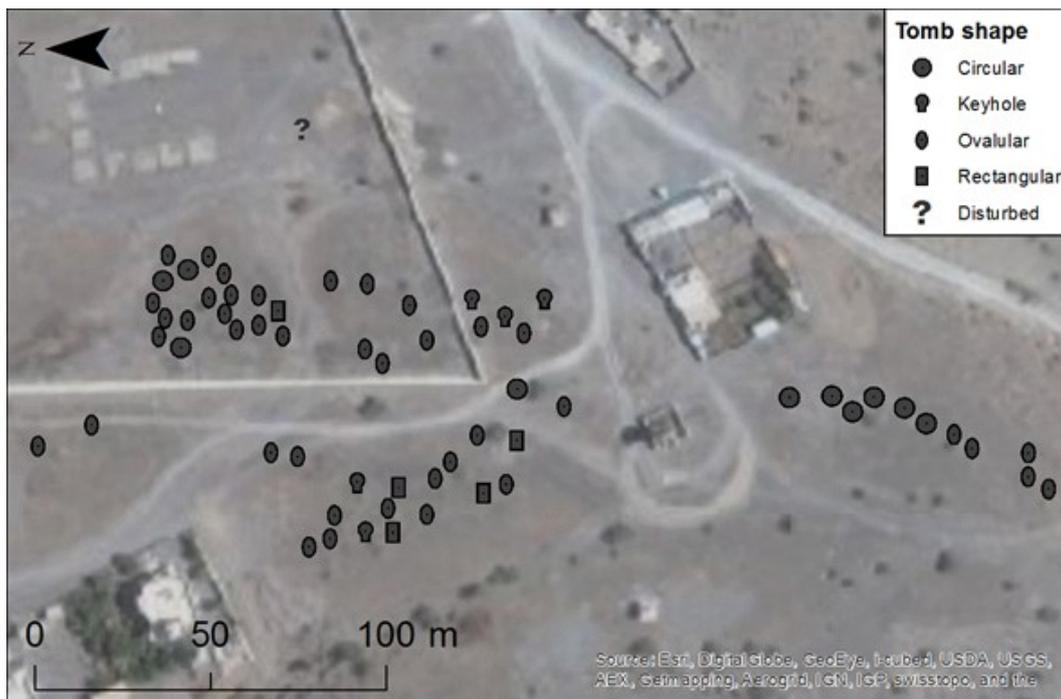


Fig. 41: Sketch plan of the possible 3rd-millennium structure (L072) in Yiqā settlement (north is to the top, max. length 11.8m).

Fig. 42: An annotated satellite image showing the prehistoric cemetery at Yiqā the wall of the school yard be seen in the top left quarter of the picture.



On the north side of the wadi to the west of the modern village of Yiqā there exists a prehistoric cemetery consisting of over 70 tombs (Fig. 42). These are scattered about on either side of the modern road and inside the yard of the school that is located on a sharp bend in the road. One of the tombs is clearly Umm al-Nar in date to judge by its plan and construction and the dressed white ‘sugar lumps’ on its outer face. The others seem to be mostly later Bronze Age and Iron Age although some are indeterminate. One or two appear to be semi-subterranean tombs similar to those known from the Wadi al-Qawr in the UAE and other sites.

A more recent defensive structure sits on the rocks above the cemetery. In addition there are other locations within the village area where archaeological remains are evident on the surface. A full investigation and recording of these will be made in future seasons.

Al-Kasfah - Rustaq Hot Springs and Iron Age Field Systems

Locii: L014-L017, L020-L040, L042-L046, L153-L156

The area around the hot springs in Rustaq, known as Aini or al-Kasfah springs, contains some important archaeological evidence.

The area around the springs has been built-up and constantly in use throughout history, this includes an 18th century sur, which itself includes amongst its three circular corner towers one that has a diameter of 17m and which may be of considerably greater antiquity. Modern construction has destroyed or concealed evidence of earlier occupation making it very difficult

Fig. 43: Annotated satellite image showing Pottery-pickup areas around the hot springs in Rustaq (red outlines). The purple dot on the left shows the location of the modern springs, the dot on the right shows the location of Rustaq fort.

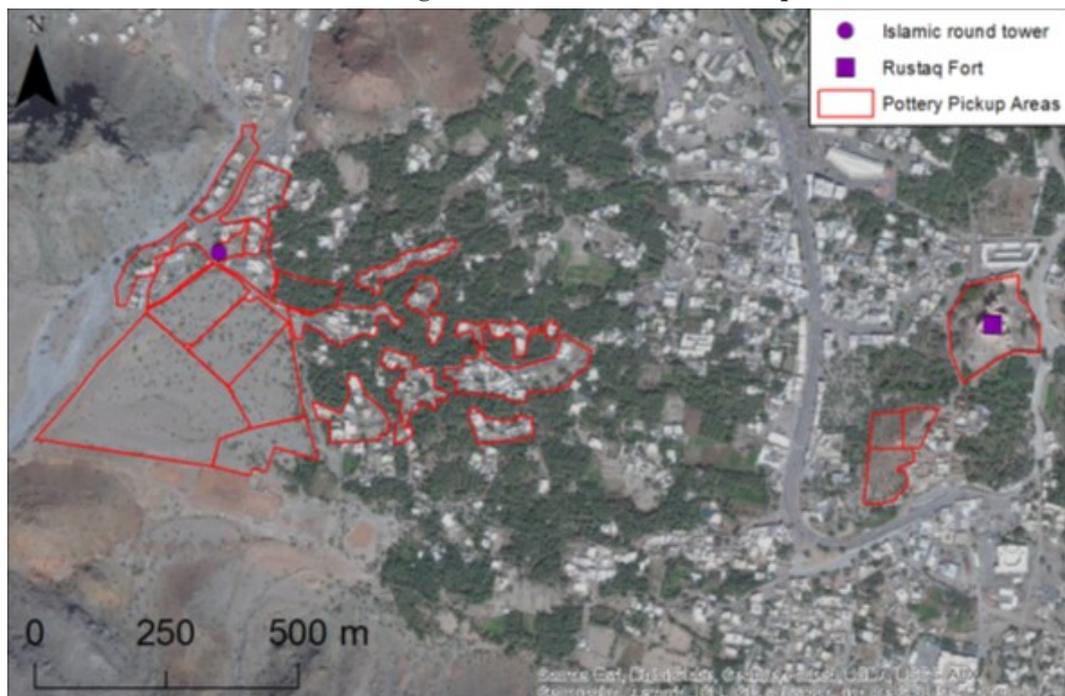




Fig. 44: Project team member Emma Hall standing next to the partial remains of a circular stone structure which was associated with a number of sherds of Umm al-Nar pottery.

to reconstruct the history of activity in the area. However, working in and around the modern and recent buildings, cemeteries and date palm groves, the project undertook careful surface pottery collections and inspections in the hope that at least a few sherds of each period of activity will have survived.

This work was organised by dividing the area into ‘Pottery-pickup areas’ using satellite imagery (Fig. 43). As can be seen from the image, all areas that are not built up or cultivated (and some that are) were searched by the team. In some cases, with the approval of local residents, it was also possible to venture into modern cemeteries.

The hope of finding evidence of ancient activity was not misplaced. A good deal of evidence was collected and observed, including sherds of Umm al-Nar and Iron Age pottery, the latter in some abundance, as well as a few sherds of early Islamic pottery. Some partially-preserved stone structures were also observed tucked in behind compound walls, sometimes buried by modern dumping or overgrown with vegetation. One particularly interesting example is shown in Fig. 44, where Locus 030 consists of a double-faced curved wall over a metre wide with an outer face of large boulders, an inner face of cobbles and a pebble-and-gravel fill. This seems to have once formed part of a large oval or circular structure and may indicate the existence of a small 3rd millennium round tower.

In addition a number of ancient and half-buried stone field walls were found on the surface in and to the south of the extensive modern cemetery that occupies the flat open area immediately to the south of the springs. An example, L034, is shown in Fig. 45 but there are many similar. The construction, length and arrangement of these walls suggests that they once formed part of an extensive field system that was possibly irrigated by water from the springs. It



Fig. 45: Locus 034, a possible Iron Age field wall located at the periphery of the modern cemetery.

is not possible to date the walls with any certainty but the considerable amount of Iron Age pottery that was found scattered across the area (the most abundant of any period) strongly suggests that they might be datable to that time (1300-300 BC). If so, this might give some indication of the first period at which the water of the springs was first exploited for irrigation.

Part of the aims of next-year's season will be to map these walls and to try to obtain some evidence with which to establish their date. This would normally be done by excavating slit trenches over the walls and taking organic material such as shells from the soil below the stones. Although the archaeological remains around the Al-Kasfah springs are not well preserved they are important. Generally speaking, areas that have remained important foci of settlement generally have more poorly preserved remains. If archaeologists focus only on well-preserved sites they introduce a significant possible bias into their analysis of their work.

The al-Kasfah hot springs area will certainly be a focus of further investigation and documentation in future seasons.

Hisn Hajr – an Abandoned Seventeenth Century Village

Locus: L076

A number of abandoned or semi-abandoned villages were located across the survey area. These will be recorded by the project as they are important sources of information about the later development of the area and the chronology of the later Islamic period. They can also give important comparative information on the layout and use of field systems, *aflaj* and other irrigation systems.



Fig. 46: A general view of the village of Hisn Hajr from the north showing the *falaj*-irrigated field systems in the wadi bed below the fort which gives the village its name. The remains of stone houses are visible on the lower slopes to the left.

Fig. 47: Field sketch consisting of an annotated satellite image of Hisn Hajr showing key buildings and general layout of the village.

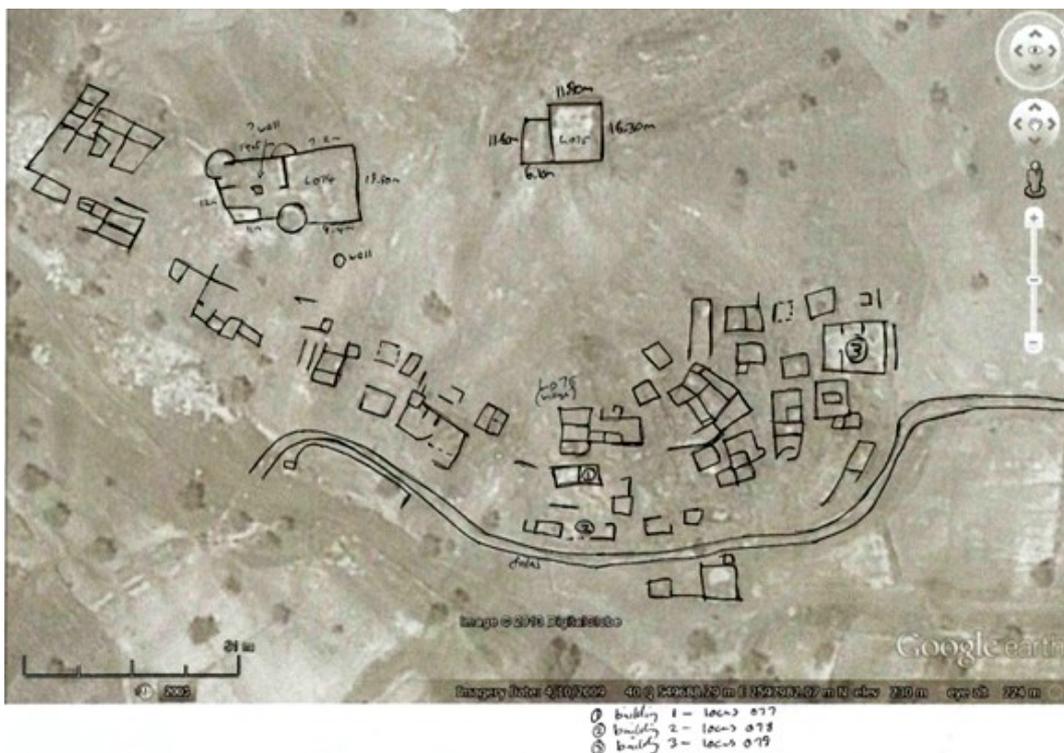




Fig. 48: Kite aerial photograph of the late Hafit cemetery at Homid. The 12 burial cairns are clearly visible as is the size differentiation between the smaller 11 and the larger one at the top right (Photo MWH).

One such in close proximity to Rustaq is Hisn Hajr located on the eastern bank of the Wadi Bani Auf (Fig. 46, Fig. 47). This village is very well preserved. It spreads along a fairly steep rocky slope above some extensive *falaj*-irrigated field systems in the wadi bed below. Numerous houses as well as a fort (which gives the village its name) and a number of other structures are clearly visible on the surface. The pottery picked up from the surface suggests that the village was abandoned less than 100 years ago. This village presents the project with an excellent example to describe and record the traditional way of life in the region up to modern times and provides useful comparative material with which better to understand the ancient evidence.

SITES BEYOND RUSTAQ WILAYA

Hamid

As part of the project's work a number of sites were visited beyond the wilaya of Rustaq in order to assist the Ministry or colleagues from Sultan Qaboos University in recording sites. One such site is the Hafit cemetery at Homid in the Khaburah wilaya.

Hamid is located in a wadi in the middle of the Batinah outwash plain. At this point the wadi broadens out to be several hundred metres wide providing potential grazing or agricultural land. A modern Bedouin village is located about half a kilometre to the north. A number of older Hafit cairns line the ridges on the skyline but the key point of interest is a group of 12



Fig. 49: A team member standing next to the largest burial cairn.

Fig. 50: View of the interior of the larger burial cairn showing the size of the corbelled chamber – which is clearly in imminent danger of collapse.



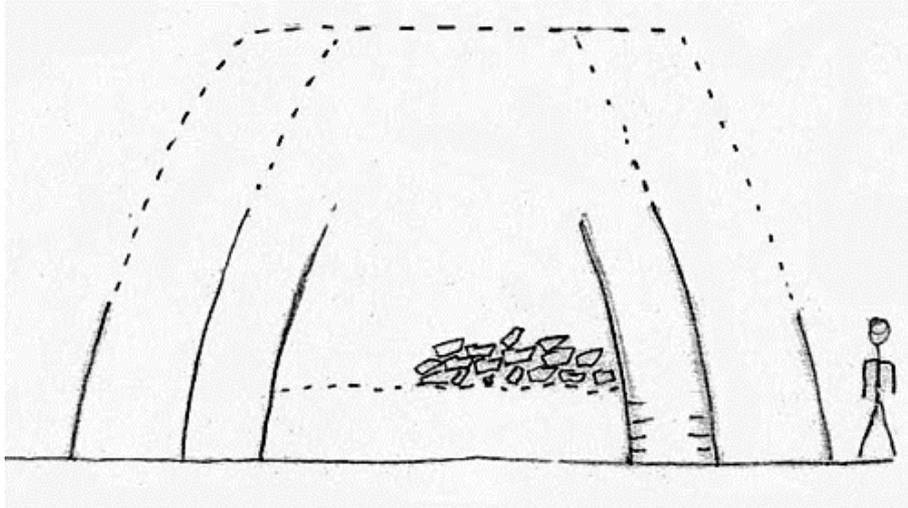


Fig. 45: Locus 034, a possible Iron Age field wall located at the periphery of the modern cemetery.

much larger Hafit cairns clustered together on a low terrace in the middle of the wadi (Fig. 48). Conventionally Hafit cairns that are not located in higher, more visible locations but are found on the plains at the base of hills are found to be later in the Hafit period, towards the beginning of the Umm al-Nar period – that is to say towards the middle of the 3rd millennium BC.

This group of tombs is interesting because eight of the tombs are roughly the same size but one of them is clearly much larger and more prominent. Indeed, it is, to the knowledge of the project, the largest Hafit cairn yet recorded with an outside diameter at ground level of 10 metres.

The large cairn consists of two phases of construction, the initial phase, which was of a cruder masonry consisting of roughly squared rocks that had been picked up from the wadi floor and a second phase where the stones appear to have been crudely dressed creating a wall of much better quality (Fig. 49, Fig. 50, Fig. 51). Indeed, it looks to all intents and purposes, like the wall of an Umm al-Nar tomb. The tomb is certainly Hafit though, as there are no internal walls and the nature and quality of the corbelling is very much Hafit in nature.

The cairn is probably a transitional Hafit/Umm al-Nar tomb and can probably be dated to around 2500 BC on that basis. The significance of this tomb is not so much its absolute size – although that is certainly interesting – but the fact that it is clearly and deliberately much bigger than the rest of the tombs in the small cemetery. Might this indicate that it was the tomb of a high-status individual or family? This seems highly likely and it is important because up to now there is no clear evidence of social stratification in the Hafit period, all the evidence that is available suggests a largely egalitarian society without complex social differentiation. Does the cemetery at Homid indicate that Hafit society was, on the Batinah at least, beginning to develop into a more complex differentiated society by the middle of the 3rd millennium? If so, the same conclusion might be drawn from the Wadi Hawqayn cemetery located by the project and described above. In that case too, one of the Hafit cairns was notably larger than the others in the cemetery, although it was only about half the size of the Hamid example.

REPORT ON VISIT BY PROJECT HISTORIAN

Harry Munt

The area covered by the modern administrative region (*wilāya*) of Rustaq (Ar. al-Rustāq) is of great importance in the history of Oman in late antiquity and throughout the Islamic period until modern times. Its history and the history of its better known rulers and scholars have certainly not been ignored, neither by pre-modern Omani scholars nor by modern historians of northern Oman in the Islamic period, although historians of late antiquity and Islamic history more broadly have generally paid far less attention to the history of the Omani Batinah (Ar. al-Bāṭina) province. My participation in this project surveying the historical and archaeological sites of the *wilāya* of Rustaq is to ensure that this history that can be found in the literary sources is brought into play alongside the abundant archaeological material being found by the survey team of archaeologists. Such an aim requires me to get to grips as firmly as possible with the local Omani historiographical traditions and to build a case for their importance for both local history and for some key research questions in Islamic Arabic history and historiography more broadly.

In order to make a start towards achieving these aims, it was very important that I join the survey team in Rustaq for a short while to gain a better understanding of the materials and remains that they were finding, as well as to spend some time in Muscat meeting local Omani historians and undertaking some initial research in the manuscript and archives department (Ar. Dār al-Makḥṭūṭāt wa-al-Wathā'iq) of the Ministry of Heritage and Culture (Ar. Wizārat al-Turāth wa-al-Thaqāfa). I was in Oman from 30 December 2013 to 11 January 2014; most of this time was spent in Rustaq with the survey team, but I also spent one day at the beginning and three days at the end undertaking research in Muscat.

During my time in Rustaq I was able to visit a number of sites being surveyed by the team of archaeologists from Durham, including: the fort and some late Islamic structures in central Rustaq; the famous hot springs at 'Ayn al-Kasfa; the remains of some late Islamic mud-brick structures in the suburbs of Rustaq; the sites of the Iron Age and early Islamic settlements at Manāqī; the pre-Islamic tombs at al-Hawqain (Ar. al-Ḥawqayn); a number of the famous *aflāj* (sing. *falaḡ*) in the area north of Rustaq down to the late Islamic fort at al-Ḥazm; a probable Sasanian fort south of Saham (Ar. Ṣaḥm; this is potentially a particularly important discovery for the late antique history of the region); and the famous port of Sohar (Ar. Ṣuḥār). I learned a huge amount from these visits about how archaeological surveys work and this is knowledge that I will certainly be able to integrate into my future research on Oman's late antique and Islamic history. I also hope that the team was able to benefit in some way from my being there to try to ascertain some local traditions about some of the sites from people in Rustaq and from my research into the history of some of these sites in the Arabic sources. For example, I was able to discover that quite an important battle is thought to have been fought at the early Islamic settlement of Manāqī in the early 10th century (in ca. 939 or 940), at which one of the Ibādī *imāms* of Oman—Abū al-Qāsim Sa'īd b. 'Abd Allāh b. Muḥammad b. Maḥbūb—was killed trying to enforce his authority in the Rustaq area. Fortuitously, we then discovered a

relatively recent grave for this imām at the southern edge of the huge Islamic cemetery at Manāqī. (Who knows, for the time being, if this grave was constructed over an older one? It would be great if work during this project could confirm this.)

I also had a very productive time undertaking research with the manuscripts and meeting some local scholars in Muscat. I was able with Derek Kennet to meet twice (once in Muscat and then again later in Rustaq) with Abdurrahman Al Salimi, an Omani historian of the country's early Islamic history who now works in the Ministry of Endowments and Islamic Affairs (Ar. *Wizārat al-Awqāf wa-al-Shu'ūn al-Islāmiyya*). I was also able to spend two days at the manuscript department of the Ministry of Heritage and Culture, where I consulted the catalogues of the collection and met with the department head of manuscripts registration, Mohammed bin Fael bin Ali Al Tarshi. Perhaps most importantly, I was able to spend a morning looking at digital copies of four manuscripts in their collection (which numbers well over 2,000 in total) and to get my own digital copies of two of them. One of these was a relatively late but potentially useful local history of the important scholars and *imāms* of Oman (Ms. no. 2424); the other was a late but nonetheless significant copy of al-'Awtabī's (wr. ca. mid-4th/10th century) very important *Kitāb al-Ansāb* (Ms. 1858), a genealogical history of Arab tribes with a heavy focus on Oman's late pre-Islamic and early Islamic history. [There is more on the significance of this work below.] Thanks to funding from this project I was also able, before I came out to Oman and with Derek Kennet's help, to obtain another, earlier manuscript of this important work from Durham's University Library (Ms. Or. Arab. 20).

My meetings in the Ministry of Heritage and Culture in Oman and at the Omani Literary Society (Ar. *al-Muntadī al-Adabī*) in the Ghubra district of Muscat also helped me to get copies of a number of recent editions of significant texts and books by current Omani scholars which are difficult to access in the UK. These include: (a) the second volume of the relatively recent 4th printing of Muḥammad Iḥsān al-Naṣṣ's two-volume edition of al-'Awtabī's *Kitāb al-Ansāb*, based on two manuscripts only, published in 2006 by the Ministry of Heritage and Culture, as well as an electronic copy of the complete work; (b) the complete seven-volume set of Muḥammad Ḥabīb Ṣāliḥ's and Maḥmūd b. Mubārak al-Sulaymī's very recent new edition of Sirḥān b. Sa'īd al-Izkawī's (d. ca. 1728) late but significant historical work, the *Kashf al-ghumma al-jāmi' li-akhbār al-umma*, published by the Ministry of Heritage and Culture in 2012; (c) a relatively recent edition of an important early work on Ibādī political thought and Oman's early Islamic history, Abū al-Mu'thir al-Ṣalt b. Khamīs al-Kharūṣī's (wr. late 9th or early 10th century) *Kitāb al-Aḥdāth wa-al-ṣifāt*, edited by Jāsīm Yāsīn Muḥammad al-Darwīsh and published by the Ministry of Heritage and Culture in 1996; (d) the 3rd edition of a modern local history of Rustaq, al-Rustāq *'abr al-ta'rikh*, published by the Omani Literary Society in 2013.

I foresee that my involvement with this project will focus on two main research objectives. First of all, there is the obvious aspect of using the Arabic historiographical sources to help in the interpretation of the archaeological material recorded by the survey team. The most useful sources for this research are, of course, the local Omani histories, but the famous universal histories (such as those by al-Ṭabarī [d. 923] and Ibn al-Athīr [d. 1233]) also have some interesting material, as do some of the well-known 9th- and 10th-century geographers writing in Arabic (such as al-Iṣṭakhrī [wr. early-to-mid 10th century], Ibn Ḥawqal [wr. mid-10th century], and al-Muqaddasī [wr. late 10th century]). Such collaboration between archaeologists and

historians is sorely needed at the present state of research into the history of the pre-modern Arabian Peninsula.

Secondly, I intend to demonstrate the significance of Omani Arabic historiographical works in the field of Islamic history and historiography more broadly. Most of the best known surveys of Arabic and Islamic historiography almost totally ignore works produced in Oman; these works are in general only used by historians of Oman. There are some exceptions, but these usually occur where the Omani sources have something to say about more general or more famous aspects of the history of the early caliphate. In a sense, this neglect of Omani Arabic sources outside of the circles of historians of Oman itself is understandable, but it is nonetheless regrettable because the Omani works actually have a great deal to add to our understanding of the development of Arabic historiography more broadly, as well as having interesting material which can nuance studies of more broad, Middle East-wide historical events, personalities and trends. I will end this brief report by giving some examples of what I mean here.

Regarding the study of the emergence and development of Arabic historiography, the Omani sources have a great deal to add to the story. Several sources could be discussed in this regard, but here it suffices to mention al-ʿAwtabī's *Kitāb al-Ansāb*. This genealogically-organised history, which it now seems was probably written in the mid-to-late 10th century and not by the more famous author of the same name of the early 12th century, is a very detailed and valuable source, not only for Omani history but also for the fact that it presents a rather different perspective on the course of early Islamic history than that arrived at during the 9th and early 10th centuries by the universal Sunni historians of the central Islamic lands, most famously the aforementioned al-Ṭabarī. Local historians throughout the Islamic world can provide such nuancing and al-ʿAwtabī's work is no exception; it is actually potentially even more useful in this regard since much of its focus is on a region and communities in which Sunnism and recognition of central caliphal authority were not widespread. It is regrettable that, to date and as far as I am aware, no critical edition of this work which has made use of as many of the available manuscripts as possible has been published. This is why I have considered it important to start to gather as many of the extant manuscripts as possible for my own research (so far, as mentioned above, I have got copies of those in Durham and Muscat; I hope to get copies of further manuscripts in the near future). A critical edition of this text together with an English translation is an obvious desideratum.

Regarding the use of Omani historical sources to shed further light on more general trends observed in pre-modern Islamic history, it has been generally accepted that they are extremely useful for the history of Kharijism, especially in its Ibādī form (that which over the 8th century came to be prevalent in the interior of Oman). Their significance does, however, extend beyond this. One example can suffice for now: it is commonly understood—generally correctly—that over the late 9th and early 10th centuries, the authority and power of the Abbasid caliphs in Samarra and Baghdad was gradually weakened and they lost control of ever more provinces to local potentates. Oman offers an interesting exception to this trend; whereas during their heyday (i.e. during the 8th and early-to-mid 9th centuries) the Abbasid caliphs and their representatives had had great difficulty in enforcing their authority over Oman, especially over the interior in areas like Nizwa and Rustaq (but also in the coastal areas of the Batinah,



Fig. 52: Inscription recorded by the project from the mausoleum of the Ibadi Imams in the centre of old Rustaq.

such as Sohar), it was in the late 9th century that a commander called Muḥammad b. Thawr/Būr actually conquered Oman from his base in al-Baḥrayn (i.e. northeast Arabia, roughly speaking the modern eastern regions of Saudi Arabia, Bahrain and Qatar) in the name of the Abbasid caliphs. This is an important exception to the generally observed trend; it is, of course, possible that Muḥammad b. Thawr/Būr was really acting on his own and that this endeavour had little to do with the Abbasid administration in Iraq, but such events in Oman's history with wider ramifications should be investigated in more detail. This project offers a very useful opportunity to do so.

Finally, there is the interesting question of how closely the archaeological evidence from the Rustaq/Batinah survey will match up with the literary evidence gleaned from sources such as al-'Awtabī's *Kitāb al-Ansāb* and other works written in Oman and elsewhere. Research to date seems to indicate an anomaly here, especially for the late antique period, with some interpretations of the literary data jarring with the current knowledge of the region's archaeological history. Part of my role in this project will be to see if a more critical reading of the Omani historiographical sources, in line with more general trends in the modern study of early Islamic history more broadly, will help to narrow the current disjuncture in research between the literary and archaeological evidence. This is further evidence of the dire need at the moment for better collaborative work between historians and archaeologists interested in the pre-modern history of the Arabian Peninsula, something which this Rustaq/Batinah survey project admirably encourages.

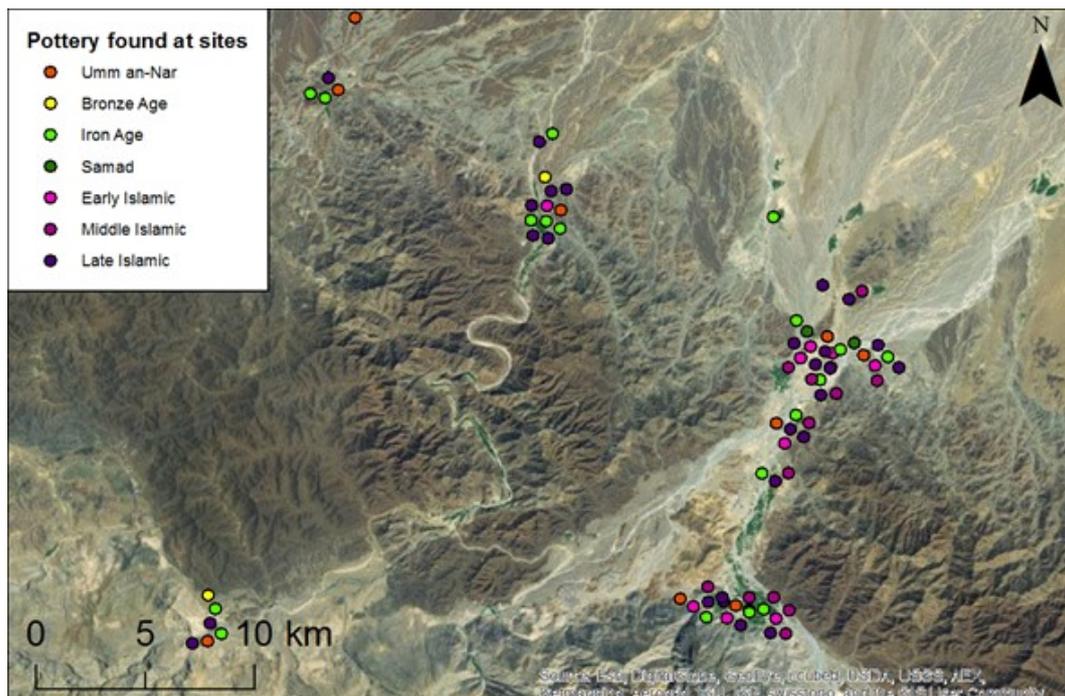
DISCUSSION – TRENDS IN ANCIENT SETTLEMENT

As with almost all archaeological projects, pottery was the most abundant artefact collected. A total of 10,628 sherds were collected from the surface and subjected to a preliminary classification. The pottery is the most important dating evidence available to the project and is key to providing a chronology of the sites located. It is discussed and listed in Appendix III.

Fig. 53 shows the broad distribution of pottery across the study area. This makes clear that the collections come from four key locations – most notably 1/Falaj al-Sharah/Manqi area; 2/old Rustaq; 3/ Hawqain and 4/ Yiqā. Aside from these areas, much of the landscape is not yet represented by surface collection. This is because the project still needs to implement a programme of systematic sampling to explore such areas and to correct possible biases in the data collection. Until this has been done, it would be unwise to give too much significance to patterns of distribution that might be discernible in Fig. 53. Nonetheless, as a preliminary step towards identifying trends in settlement, the pottery that was collected during the first season has also been subjected to a preliminary analysis.

The chart in Fig. 54 shows the pottery assemblage broken down into a rough working chronology. This chart makes clear that Iron Age pottery is by far the most abundant collected during the first season whereas other periods, such as the 2nd millennium, Samad, 9th century (Samarra) and 14th/15th century material is only present in very low quantities. Although it is possible that some of these conclusions will be changed once a more precise pottery classification has been developed and once a more systematic collection of pottery is made from across a fully representative range of locii and sites, it is also likely that the very broadest trends – eg the pre-eminence of Iron Age and late Islamic pottery – as well as some of the other key

Fig. 53: Map showing the distribution of pottery from key sites across the study area.



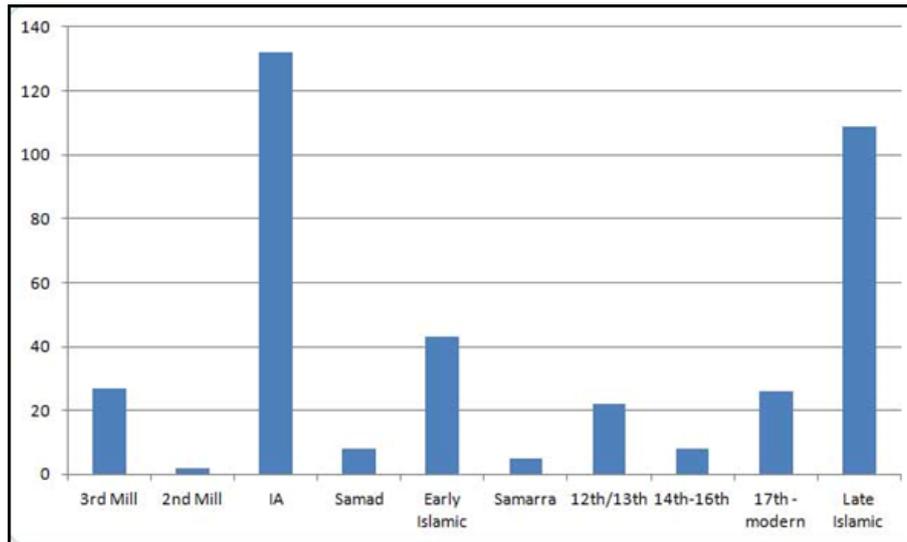


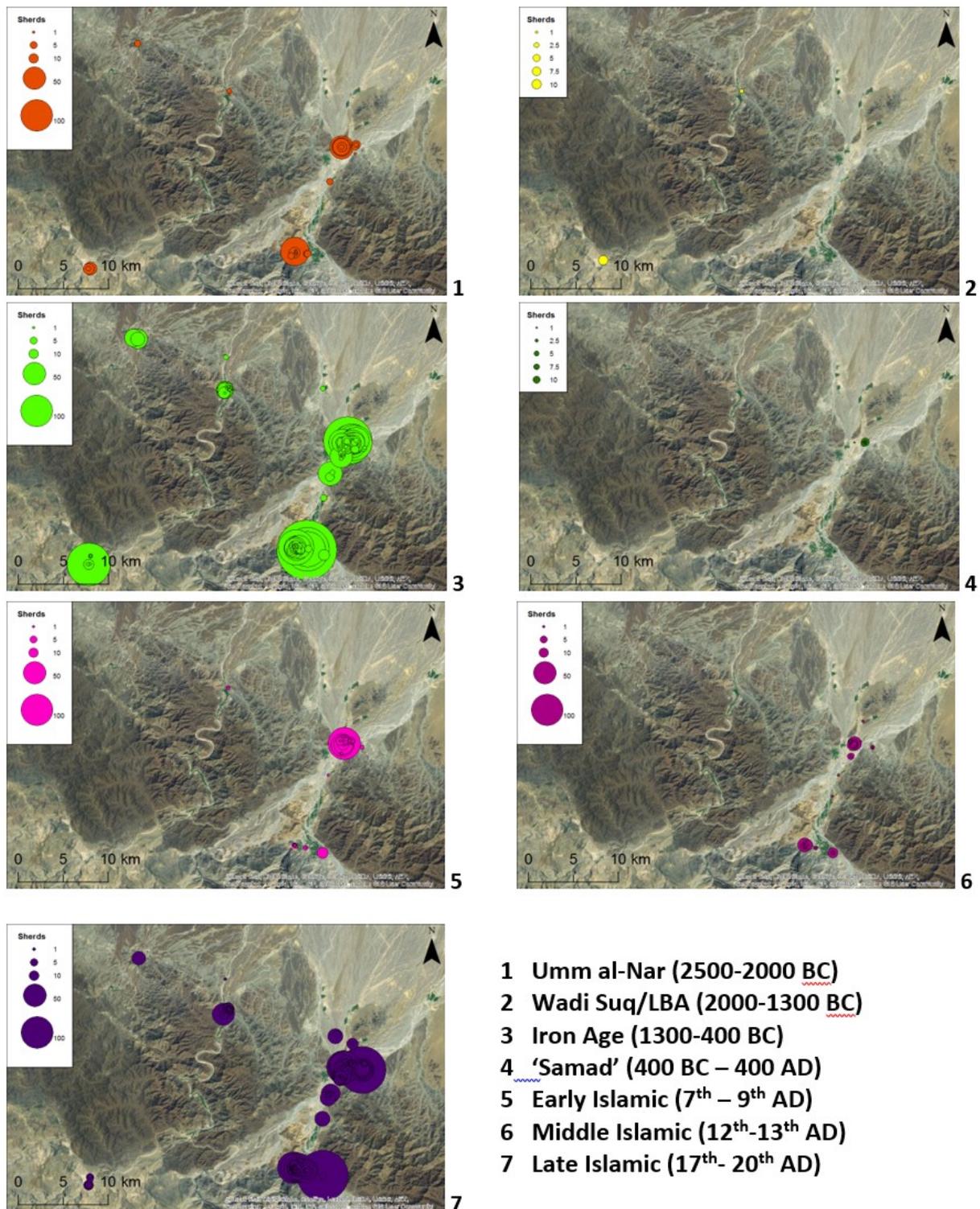
Fig. 54: Graph summarising the chronology of the surface pottery collected during the first season.

trends, such as the high levels of 3rd millennium, early Islamic and 12/13th pottery, will turn out to be broadly correct. The analysis shown in Fig. 55 shows this same information spatially. Whilst it is still too early to place too much emphasis on these results, they do suggest that the methodology employed by the survey might be capable of identifying trends in the location of settlement. It is certainly notable that the Iron Age material, as well as being the most abundant overall, also has the strongest relative presence in the Rustaq area between the key areas of work: old Rustaq on the one hand the Falaj al-Shurah/Manaqi area on another and the sites more deeply buried in the mountains such as Yiqā as a third. If this does turn out to be the case, it will raise some interesting questions about why it might have been that the focus of settlement might alter in this way, but this is a question that must be left until more data has been collected and analysed and clearer definitions have been devised for the pottery assemblage.

Pre-3200 BC

So far only a few fragments of flint are the only possible evidence of activity and settlement relating to the Neolithic or to the famous ‘dark millennium’ (3800-3200 BC) during which it has been argued there was relatively little human activity over much of Eastern Arabia. The one or two sites that have been located will need to be carefully studied in future seasons and specially targeted surveys will have to be employed. The reason that little material of this period has so far come to light is because systematic survey and survey specifically targeted at such settlement has not been employed.

Hafit period (3200-2500 BC)



- 1 Umm al-Nar (2500-2000 BC)
- 2 Wadi Suq/LBA (2000-1300 BC)
- 3 Iron Age (1300-400 BC)
- 4 'Samad' (400 BC – 400 AD)
- 5 Early Islamic (7th – 9th AD)
- 6 Middle Islamic (12th-13th AD)
- 7 Late Islamic (17th- 20th AD)

Fig. 55: Distribution of pottery picked up by the project by period. Note: there is no material from the 10th-11th centuries AD and only five sherds from the 14th-16th centuries AD. (Images by WD).

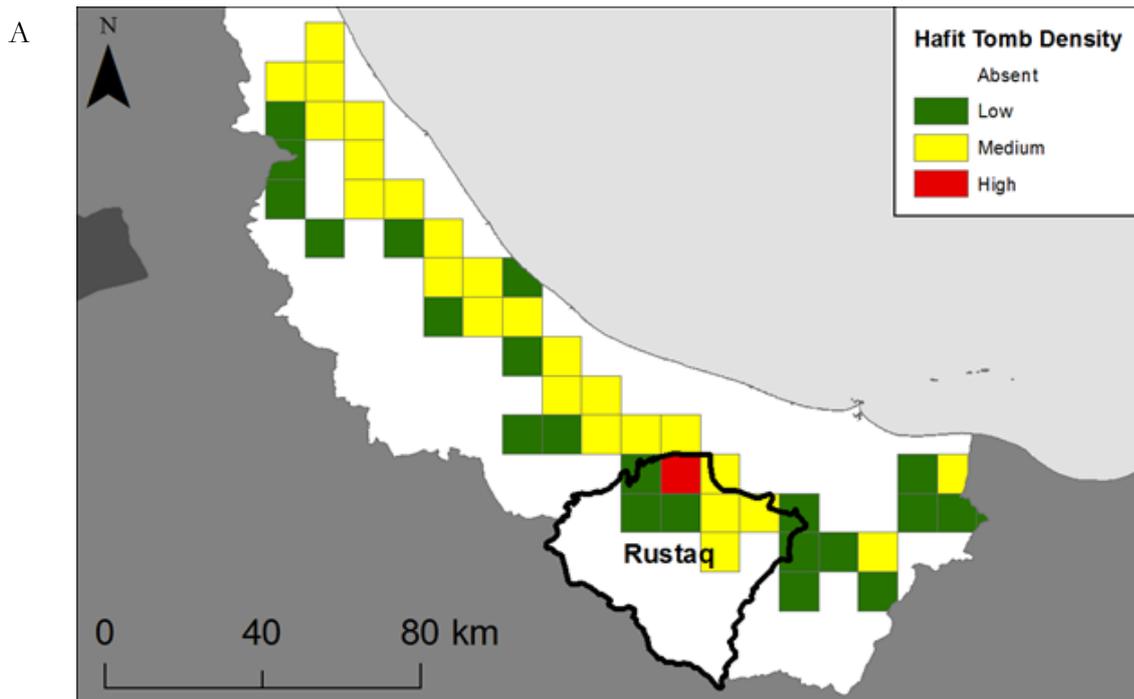


Fig. 56: Map showing the density of Hafit cairns across the Batinah plain (compiled from analysis of satellite imagery by WD).

wealth of funerary monuments dated to this period has been recorded by the project. These consist of cairns located on prominent locations such as ridge and hilltops but also, in many cases, at the foot of slopes and on the plains or wadi terraces below.

These cairns are a well-known feature of the Hafit period and are relatively easy to identify, although there can be confusion with later Bronze Age and Iron Age burials. Evidence of settlement is more difficult to identify. The sites at Wadi Hawqain and Hamid are both examples of later Hafit burials and both demonstrate evidence of possible emerging social stratification in the form of a single large burial surrounded by a number of smaller examples of roughly the same size.

The relatively low numbers of Hafit cairns in the immediate vicinity of Rustaq was immediately noted by the project. This can be contrasted with the dense band of cairns that appears to run across the Batinah plain as identified by W. Deadman as part of his on-going PhD work (Fig. 56). The contrast is inescapable and is difficult to explain, especially when the abundant water supply that exists in the Rustaq basin is considered. There are a number of possible reasons for this, the most likely seems to be that before the springs at Rustaq were enhanced by human intervention, the water from them escaped into the gravel fills of the wadi basin and contributed to a much higher water table out on the plain that fed fairly dense vegetation that served as excellent fodder for the flocks and herds of the nomadic creators of these tombs. This is the 'hydrological' theory, there are others. Contributing to this debate is one of the research questions that underlies the project. W. Deadman's work on the Desert Surface Survey (see Sub-Project 1 below) is intended to give a clearer insight into the mode of life of the Hafit people and some insight into their economy and subsistence strategy.

Umm al-Nar period (2500-2000 BC)

The Umm al-Nar period is perhaps one of the best known of Oman's ancient periods due to its distinctive mortuary architecture as well as the round towers that dominate many key sites such as Bat and Bisya. Three round towers were already known in the Rustaq wilaya when the project arrived, thanks to the work of Mr Sultan al-Bakri. Two of these (Falaj al-Shura and Yiqā) were investigated in some detail –work which will continue in future seasons – and a new Umm al-Nar site was discovered at al-Jaruf, close to the centre of modern Rustaq, with its own round tower. It seems likely that the number of round towers will increase in future seasons, indeed L030, close to the al-Kasfah hot springs in Rustaq, may be the remains of a small round tower. This is important because until very recently many scholars were discussing the idea of the Umm al-Nar culture being predominantly a culture of the western side of the Jabal Akhdar where most of the known towers are concentrated. It is now becoming clear that this is simply a function of the lack of systematic field work on the eastern side of the mountains – a conclusion that is borne out by the recent work of Nasser al-Jahwari further north at Sahm on the Batinah coast.

One interesting feature of the Umm al-Nar finds is the low number of Umm al-Nar tombs that has come to light. Indeed, only one certain tomb was located at Yiqā. The reason for this is not certain, although it seems most likely to be linked to survival, it is also possible that there was a different relationship between settlement and tomb in this region compared to other parts of the peninsula.

In future seasons it is hoped to investigate some of the 3rd millennium buildings whose plans are so clearly visible on the surface at sites such as al-Jaruf and Yiqā.

Wadi Suq (2000-1600 BC) & Late Bronze age (1600-1300 BC)

The relative lack of occupational evidence related to this period is an old theme in Omani archaeology, having first been brought to attention by S. Cleuziou in his now famous 1981 paper. The work of the present project has done little to change this, no certain settlement evidence has yet been identified, despite the fact that numerous subterranean tombs of the Wadi Suq/LBA period have been identified at sites such as Hawqain, Yiqā and probably Manaqi. However, this may change as work on a more detailed ceramic ware series progresses. Part of the problem at the moment is the difficulty of identifying coarse wares that can be confidently assigned to this period.

Iron age (1300-400 BC)

Discoveries dating to the Iron Age, especially the Iron II and III periods dominated this season. Iron Age pottery made up over 48% of the pottery picked up by project team members this

season and 71% of all locii from which pottery was collected yielded pottery from this period. Although this is partly due to the concerted effort to collect material from areas of Manaqi Iron Age site that are threatened by destruction, this cannot account for all of the material. It is quite clear that the Iron Age was a period of large-scale activity across the survey area and beyond. As so little of the Batinah has been systematically surveyed, it is not possible to know if this is typical of the whole coastal plain, or whether it is specific to Rustaq.

The variety of Iron Age settlements is also notable, the extensive settlement of Manaqi on the banks of the Wadi Bani Auf is of a scale and density that must be close to urban, yet is undefended. On the other hand hilltop forts such as Hawqain are small and largely empty of occupation yet are heavily defended. Yet again, the wadi settlement of Al-Huwaili is densely built up, defended and closely associated with a possible trade route. Eventual analysis of these sites will certainly provide new insights into the nature of Iron Age settlement.

But it is not only the large sites that are key, it is also the almost ubiquitous presence of Iron Age pottery and the countless small settlement sites of this period that provide the most convincing evidence for a boom in population and cultivation at this time.

It has been argued that the Iron II (1000-600 BC) period especially was a period of intensive population growth and this has been attributed to the development of *falaj* technology at this time that allowed the cultivation of previously un-cultivable areas (e.g. Magee 2007). Certainly the evidence from Rustaq confirms the idea of a period of growth and widespread activity, but it also provokes the question – was it *falaj* irrigation that allowed the growth in population, or was it the extra demand caused by a growing population that provoked the need for new irrigation technology? It seems that the dataset collected by the project, with large numbers of *aflaj* and runoff irrigation systems in close association with Iron Age settlement, is ideally suited to contributing to this debate (see below Sub-Project III).

Samad/Early Historic (400? BC – 400 AD)

The Samad period is still a rather enigmatic period in the Oman Peninsula. It has been largely defined by the work of Paul Yule (2001), yet his initial dating of the period has tended to obscure the true significance of this cultural assemblage which is quite distinctive and well defined and now seems to be reliably dated to the period from the end of the Iron Age (400/300 BC) to about the 4th century AD. However, this period – which is known as the Hellenistic, Parthian and early Sasanian period in Iran – is much more obviously a continuation of the late Iron Age in this part of the Oman Peninsula where contact with the international traditions of Iran, the Mediterranean and the Indian Ocean are less obvious.

For the time being, little Samad-period material has been identified in the assemblage. However, this is almost certain due, in part at least, to the unfamiliarity of the project researchers with the wares and fabrics, which can be quite localised. There is little doubt that many of the honeycomb tombs identified by the project, for example at Manaqi, are to be dated to this period. Further insights into the Samad period can certainly be expected as the project develops.

Post-Samad ('Sasanian') to Early Islamic (c 400 – 8th AD)

The Sasanian period is a problematic period in the Oman Peninsula. Initially identified as a period of maximum growth and agricultural activity by J.C. Wilkinson in his 1977 book *Water and Tribal Settlement*, this interpretation has now been called into doubt (Kennet 2007).

The period is significant as it is the predecessor to the Islamization of Oman and may hold the key to many questions about the precise process of Islamization and the reasons behind it. Rustaq is a particularly important location as it is mentioned in a lot of medieval Islamic literature as having been a focal point of activity at this time. Indeed, the name 'Rustaq' is probably a Farsi name and refers to an administrative centre of the Sasanian empire. Local traditions also attribute the construction of the oldest tower of Rustaq fort to the Sasanians.

So far, no definite evidence of Sasanian period has been located by the survey, although it is possible that some is to be found mixed in with the material from the early Islamic sites that have come to light. All that can be said is that the Sasanian period was not a vibrant period of dense human activity, otherwise it would have left a similarly abundant 'footprint' to the Iron II period. However, whilst visiting the survey area at Sahm currently being worked on by Dr Nasser al-Jahwari a fort of the Sasanian period was identified. The material from this structure will make it easier for the project to identify whatever Sasanian sites do exist in the study area.

Early Islamic (7th/8th AD)

The later 7th and 8th centuries is a period of increasing activity across Eastern Arabia. Sites spring up at this time across a broad area from Kuwait (e.g. Kadhima, Al-Qusur) to Eastern Saudi Arabia and the Oman Peninsula (e.g. Dahrán region, Hulaylah). It is therefore no surprise that material of this period was found to be relatively abundant in the study area, particularly in and around Rustaq and Falaj al-Shura. The extensive site of Manaqi will certainly repay more detailed study, including possible soundings, and will help to shed light on this still quite poorly understood but very important period of Oman's Islamic history.

Samarran Abbasid (9th & 10th centuries AD)

In the first three decades of the 9th century a new series of polychrome glaze wares was introduced, possibly inspired by the import of Chinese Tang porcelains. These very distinctive wares make it easy for the archaeologist to recognise them and they rarely go unnoticed if they are present. These wares are the 'type fossils' of the period of great maritime trade expansion under the Abbasid Caliphs – this is the time of Harun al-Rashid and Sinbad the Sailor, Siraf and Suhar and the development of the independent Ibadi tradition in Oman.

A fair amount of this material of this period was found by the project on a few sites – 2.7% of all locii yielded such pottery compared to over 23% for the preceding period. Interestingly, the introduction of these wares seems to signal the beginning of a period of

abandonment and change, with many early Islamic sites that were occupied during the 8th century dwindling or ceasing to be occupied altogether. To some degree these changes may have been caused by the increasing insecurity and uncertainty over Abbasid control of the region. Nonetheless it is certainly a surprise to find so little material of this period compared to what has been found on other sites in Oman, along the Batinah and in the hinterland of Suhar and it seems that further work will be required before a fuller understanding this period is possible.

11-13th centuries

Two key glazed wares are the 'type fossils' of this period: Hatched sgraffiato for the 11th century and monochrome sgraffiatos for the 12th/13th centuries. The first was once called the 'type fossil of decline' at Suhar by A. Williamson as it seems to represent the time when that city contracted notably from the great 8th -10th trading city that it had once been. Indeed, not a single sherd of hatched sgraffiato came to light on the survey and the ware was notably absent from the Manaqi early Islamic site despite the fact that earlier and later pottery was found. The 12th/13th century monochrome sgraffiatos by contrast, were found at 22 locations (18.8%) suggesting a reasonable presence of settlement in the area at this time.

These results need to be balanced against the fact that no local coarse wares have yet been identified for either of these periods, which means that their identification depends only on the glazed wares, which are in effect, exotic imported wares. Their occurrence and percentage cannot therefore reasonably be compared with other periods.

Certainly there is enough evidence to suggest that there were relatively low levels of activity in the 12th/13th century but that the period is represented. It is certain that more material will come to light in future seasons.

14th – 16th centuries

One of the great surprises of this season is the almost complete absence of material dated to the 14th to 16th centuries. This is a period that is normally represented by a wealth of archaeological evidence such as imported Chinese Longquan celadons and a range of Islamic glazed wares in most of the lower Gulf and parts of northern Oman. This was the period of Hormuzi dominance of the Gulf and Gulf trade and Hormuz's close links with Qalhat might be expected to have led to an increase in economic activity on the Batinah. Instead the lack of evidence suggests that the Batinah played little or no part in the Hormuzi 'boom' and remained outside the sphere of growing Indian Ocean trade at this time.

17th – early 20th century/Late Islamic

In contrast the preceding period, the last four centuries are well represented in the material picked up by the project, having been found in 109 locii (58%) and making up almost 42%

sherds. This is second only to the Iron Age, although it must be remembered that systematic sampling has not yet been carried out – when it is these figures are likely to change in favour of the later Islamic period.

Sites of this period include modern or pre-modern villages, forts, aswar and agricultural areas. The material collected is enough to show that the latter four centuries have been a period of relative growth and abundant population in respect to long-term historical trends. Why this should be is not yet clear. This period has also left a wealth of architectural evidence in the form of buildings – some of which are still in use.

GENERAL CONCLUSIONS & THEMES

The brief discussion presented above serves to illustrate the sorts of trends that the project hopes to be able to isolate and analyse and in some cases hopefully understand.

Taking a broader perspective on the results of the first season, a number of issues emerge that are likely to become research themes as the project progresses:

- The late Hafit appears to be quite different in this area than elsewhere in the peninsula with larger tombs and a more obvious differentiation in status. Is this really the case and if so, what does it mean and what caused it? What sorts of transformations occurred throughout the early to late Hafit period?
- The Umm al-Nar is quite well represented in the survey area with four round towers and a fair amount of pottery. However, the lack of the distinctive tombs is notable – was there perhaps a different relationship between tombs and settlement in this period on the Batinah?
- The Wadi Suq and LBA are problematic here as they are in much of the southern part of the peninsula. Whilst tombs appear to be quite abundant, locating settlements of this period and isolating coarse wares that can serve as reliable indicators will be a challenge.
- The ubiquitous presence of Iron II suggests that this period was one of high levels of population and activity. In what way is this related to *falaj* irrigation? Is it, as some have suggested, a direct result of this new technology? Or is the introduction of the new technology a knock-on effect of the increased demand created by the growing population?
- The Samad period, here as elsewhere, appears to have been one of abandonment and fragmentation – another period, like the Wadi Suq/LBA, of reasonably abundant burial monuments but little evidence of settlement.
- The marked presence of early Islamic settlement is encouraging. Where was this settlement located, what was its economic base and what degree of continuity is there between settlements of this time and modern settlement?
- The almost complete lack of 14th – 16th material is notable and surprising, especially given its predominance in other parts of the peninsula. Is this correct? If so, what happened during this period?
- The re-intensification of settlement in the 17th century seems to be a major theme of the survey. Is this correct and if so, what caused it?

- The settlement history of this area, as in so many areas in eastern Arabia, seems to be one of boom and bust – of a fluctuation between abundant settlement evidence and periods where only funerary monuments are detectable. Is this an archaeological mirage? If not, what cause it? Is it environmental or is it related to human strategies?

SECTION II: SUB-PROJECTS

Within the broader scope of the project, a number of ‘sub-projects’ were defined, each of which is run by a team member as part of a PhD, MA or BA study or as some other external study. So far, four such projects have been defined:

1. Desert Surface Survey (WD)
2. Al-Batinah Express Highway Construction Phase 3 (WD & DK)
3. *Falaj* Survey (DM)
4. Prehistoric Tomb typology (EH)

SUB-PROJECT 1: DESERT SURFACE SURVEY

William Deadman

It has long been noted that although Hafit tombs are found in significant numbers across much of the northern Oman Peninsula, virtually no concrete evidence for contemporary settlement has yet been uncovered. Although there is debate regarding the economic strategies utilised in Hafit society, it has been suggested that the population was made up of semi-nomadic herders and migrated between geographical areas with their animals, driven by the availability of seasonal resources. Until now little effort has been made to locate the remains of Hafit settlements, whether sedentary villages or nomadic camps, through systematic survey. During

Fig. 57: Area examined during the Desert Surface Survey.

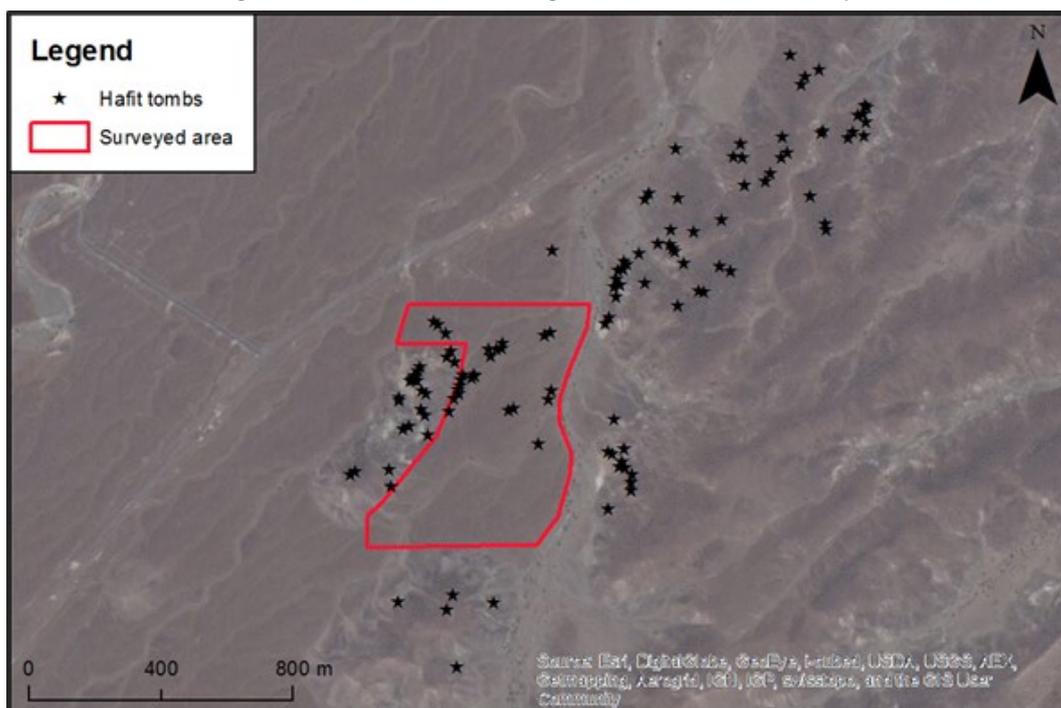




Fig. 58: Four person transect line.

the 2013/14 season of the Rustaq Survey Project an attempt was made to methodically investigate a significant area of the desert surface, intending to discover structural remains that could be dated to the late fourth and early third millennia BC.

An area on the border of the wilayat of Rustaq and Suwaiq, several kilometres north of the village of Buraik, was selected for survey. At this site, the landscape forms a natural bowl, with elevated areas on three sides, on which dozens of Hafit tombs are distributed. The exact survey area was delimited by the topography – a patch of relatively level ground between hills on two sides and a large wadi gully on the third. The extent of last boundary was dictated by the time available for survey.

In approximately two and a half days an area of c. 700 x 550 m, measuring 30 hectares, was surveyed in minute detail. The entire area was walked in ten metre transects, with four people forming a 40m line directed by pre-programmed GPS points. Two others walked behind, collecting locus indicators dropped by the transect walkers (small water bottles spray-painted white), logging the GPS coordinates and writing brief notes about each feature. A significant proportion of the available time was spent training transect walkers and honing the methodology – in future survey more than 20 hectares could easily be covered each day by an experienced unit.

Despite the large number and significant variety in the structures recorded, and the large area surveyed, very few artefacts were found. The assemblage consisted mainly of a small collection of low quality chert objects that could include manufactured flakes, cores and debitage. Only thirteen potsherds were recovered, one a finely-levigated and well-fired red-slipped redware that could date to the third or second millennia. The remaining twelve sherds were of a coarse Islamic redware, all found at the same location and originating from the same vessel. This stark scarcity of pottery over such a large area so rich in structural remains strongly suggests that the features date from a largely or completely aceramic period – i.e. during or prior to the early third millennium.

More than 340 loci were logged during the survey, with a great variety of features being recorded. These were classified into distinct classes to aid interpretation of the data.

Absence Feature	Artefact Findspot	Curved Structure	Funerary Structure	Lithic Scatter	Rectangular Structure	Stone Feature
'hut circle' devoid of large stones	chert tool	rough circular structure	4 th millennium grave?	chalk scatter	stone wall	hearth
line of 'hut-circles'	chert flake	curved wall	Islamic grave?	chert debitage scatter	stone wall corner	stone pile
large band devoid of large stones	chert core	rough stone semi-circle	square subterranean grave?	chert and chalk scatter	square structure	small square platform
	potsherd	stone hut-circle with hearth			rectangular structure	rough stone ring

Table 1: Typical examples of features recorded in survey by class.

Fig. 59: features recorded during the survey, by class.

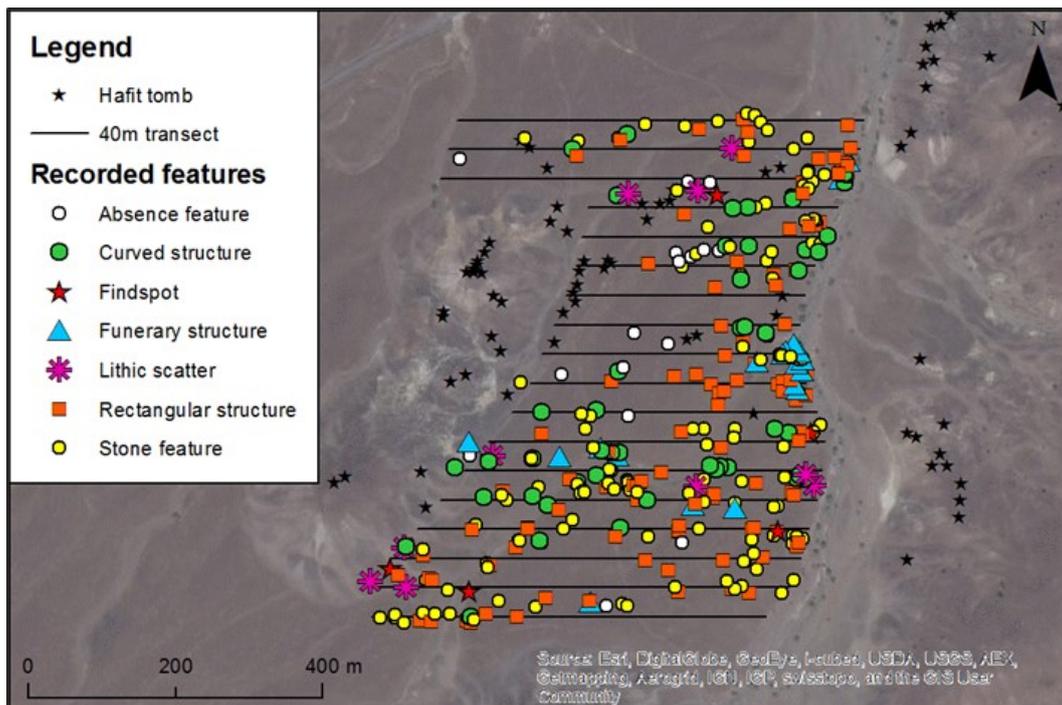




Fig. 60: Route of Phase 3 of the Al-Batinah Expressway.

While a proportion of these will likely prove to be the result of natural site formation processes (especially animal activity and fluvial imbrication), a significant proportion were firmly identified as human-built structures.

Such a large number of apparently aceramic structures warrants further investigation – the next stage of fieldwork will consist of revisiting these features, recording them in greater detail and constructing a more considered and detailed typology. In future seasons, the best preserved examples will be assessed for excavation.

SUB-PROJECT 2: THE AL-BATINAH EXPRESS HIGHWAY PHASE 3

William Deadman, Derek Kennet, Khamis al-Awfi

A survey of the archaeological remains threatened by the construction of the third phase of the Al-Batinah Expressway was undertaken on behalf of the Ministry of Heritage and Culture. Fieldwork was carried out on the 7th and 8th of January 2014 by members of the project, accompanied by Khamis Nasser al-Awfi and representatives from Simplex – Konstruktor.

Sites discovered along, or near, to the route of the Expressway were recorded, consisting of GPS coordinates, photographs and a brief description. A remote-sensing survey of the threatened area was also conducted using Google Earth imagery to complement and facilitate the fieldwork.

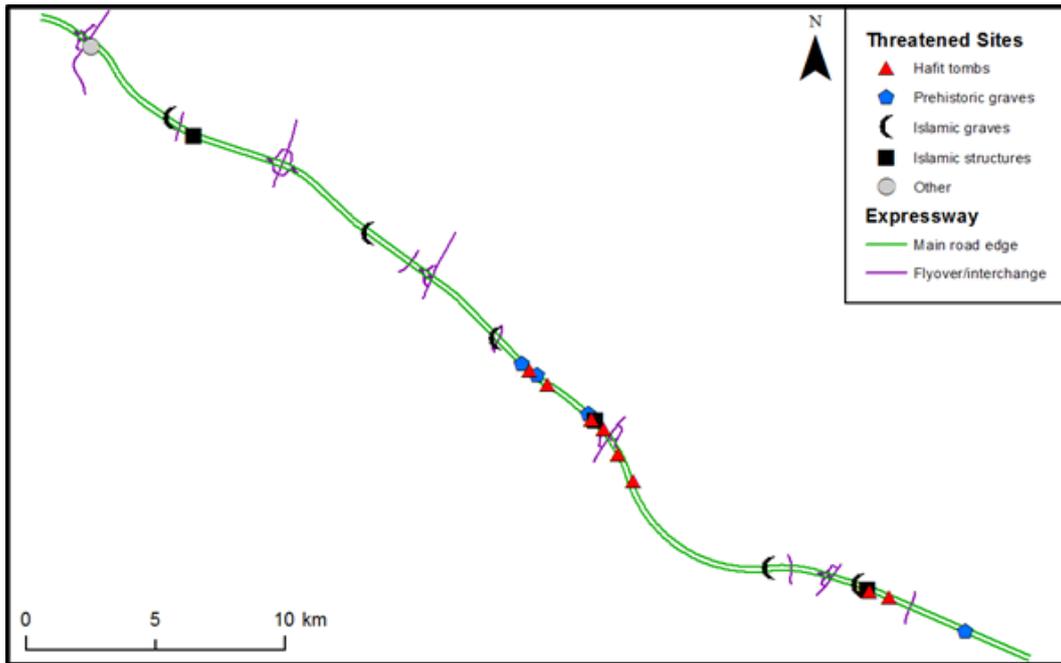
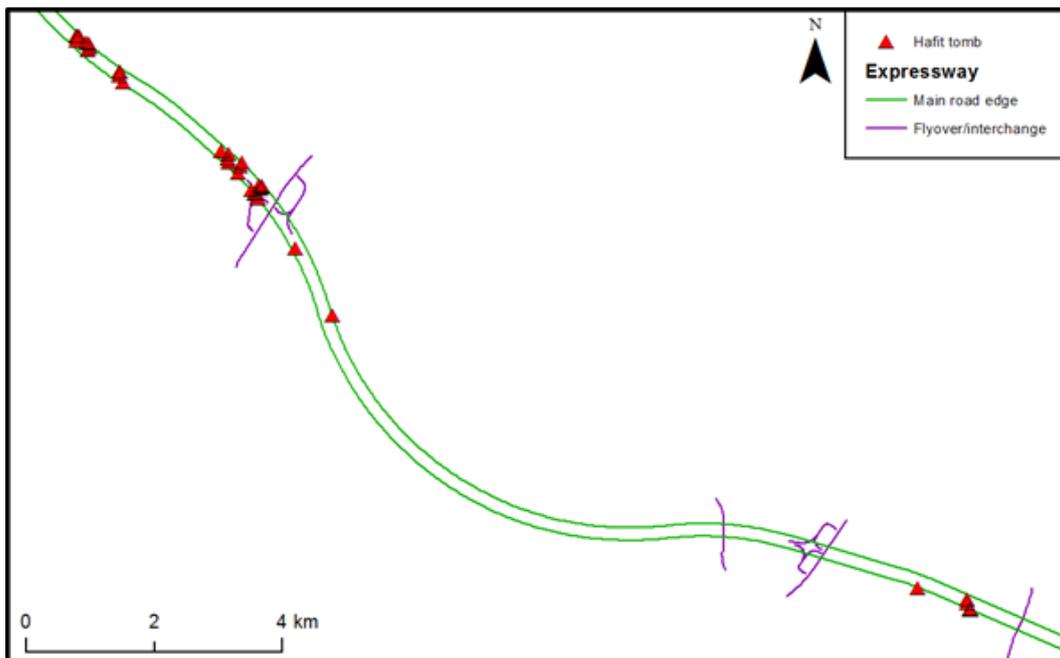


Fig. 61: Archaeological sites threatened by the Expressway.

Fig. 62: Hafit tombs threatened by road construction .



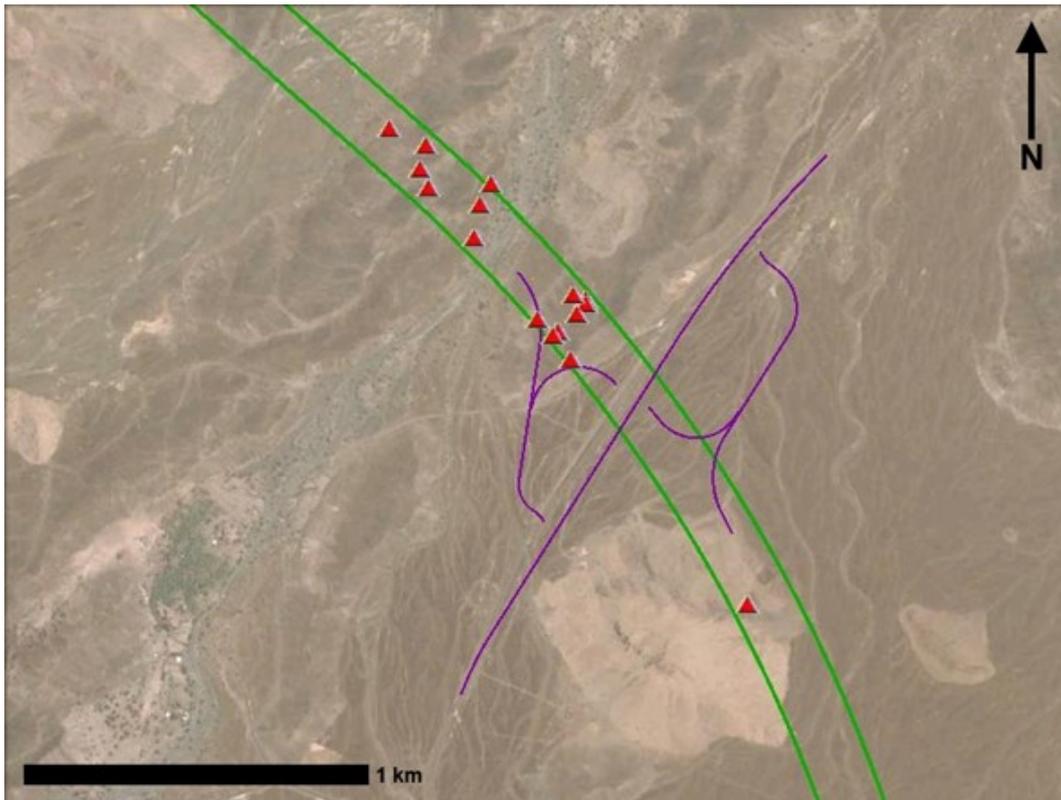


Fig. 63: Seventeen Hafit tombs around the eastern interchange of the Expressway.

Results

A significant number of archaeological sites will be destroyed by the construction of the motorway and will require further investigation; at least a representative sample should undergo rescue excavation. The majority of these are Hafit tombs, although other prehistoric tombs, and Islamic graves and settlement structures are also to be found within, or very close to, the course of the Expressway.

Hafit tombs

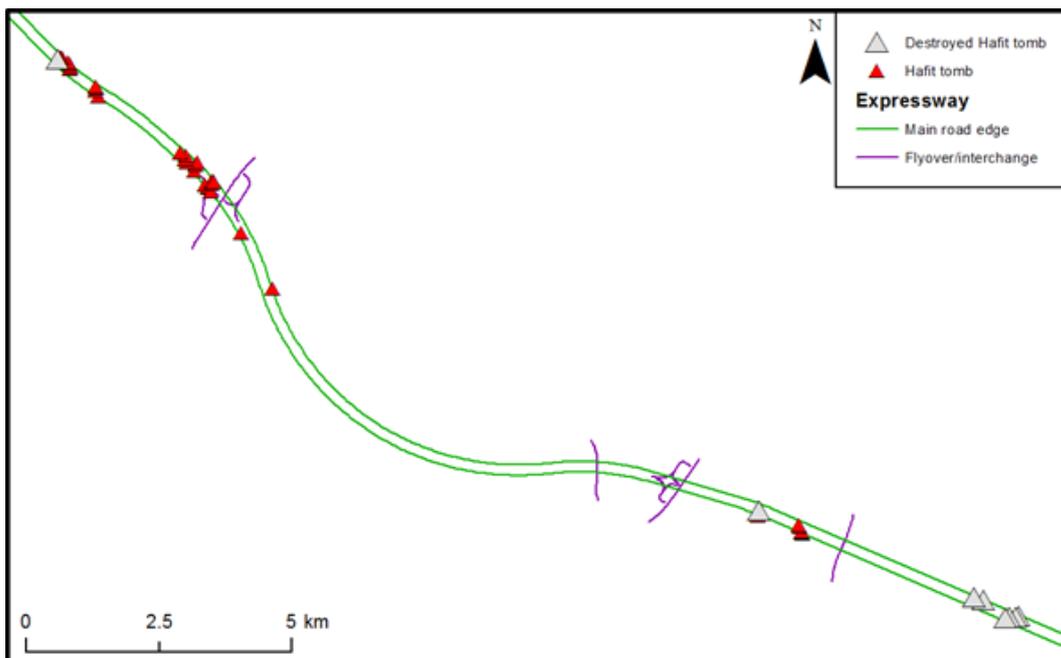
Hafit tombs are found in three major concentrations in the eastern half of the Expressway route. A total of thirty-six structures lie inside or within 10 metres of the path of the road. This count does not include other nearby tombs that may be damaged during the construction of the Expressway, or those at the very eastern end of the route that have already been destroyed.

A number of these are very well preserved and could be made a priority for rescue excavation or further investigation. The results of the remote sensing survey suggest that a significant number of Hafit tombs have already been destroyed in the early phases of construction; this is supported by reports from Khamis al-Awfi who saw a number of these structures before they were bulldozed. Approximately eight Hafit tombs have been lost, seven from two sites at the eastern side of the Expressway route where construction work is already progressing, and one in the centre of the survey area which was disturbed by the digging of a pit carried out to assess the hills for blasting.



Fig. 64: Well preserved Hafit tomb at the eastern interchange.

Fig. 65: Location of destroyed Hafit tombs.



Prehistoric Tombs

A number of tombs were identified as pre-Islamic, but could not be dated with complete certainty. Seven of these structures were recorded, all but one lies between the eastern interchange and the next flyover to the west; they are located in similar areas, and often amongst, Hafit tombs. The one exception is in the eastern section of the Expressway path, located near the destroyed Hafit structures.

The prehistoric tombs vary in form. One large, circular tomb built of rock located below a ridge of Hafit tombs could possibly date to a transitional phase between the Hafit and Umm an-Nar periods. A long and thin rock-built tomb next to this structure has no clear parallel, except perhaps a very small Shimal-type Wadi Suq tomb. Two oval tombs on ridges near a Hafit cemetery could also date to the Wadi Suq period – one has a rock wall and was filled with small rocks and gravel, the other was filled with larger stones.

Two multi-chambered tombs with rock and gravel walls can be compared to the Bawshar Honeycomb structures, and therefore may date to the Iron Age. A short section of visible wall, and loose gravel near to a group of Hafit tombs may possibly suggest a semi-subterranean tomb, but this identification is tentative.

Islamic Graves

Numerous Islamic graves and cemeteries threatened by the construction of the Expressway were noted, and should perhaps be brought to the attention of the appropriate religious authorities. Four Islamic funerary sites were discovered, distributed evenly along the course of the road. Two of these sites consist of only a small group of probable graves, the other sites are more substantial with c. 18-20 and 20-40 graves, the latter being badly defined and likely very old.

Settlement Remains

Settlement remains, most likely from the Islamic period, were recorded at three locations in the survey area, and may merit further investigation.

Islamic Settlement Structure Remains

At the westernmost of these, two small ruined square structures were found in close proximity; both lacked diagnostic pottery. A sub-rectangular platform was discovered at the eastern interchange, very near to several Hafit tombs and measuring 6 x 9 metres. Finally, a small campsite yielding Late Islamic pottery was recorded by a small wadi; the remains of stone structures suggest it may have consisted of c. 4 huts.

The westernmost site threatened by the construction of the Expressway is al-wedemah, a huge white monolith, and a traditional meeting place for local people. The main stone is strictly outside of the path of the road, but it is extremely close, and some of the subsidiary white rocks will be destroyed. If the course of the Expressway cannot be shifted, then the feature should be recorded in its present state.

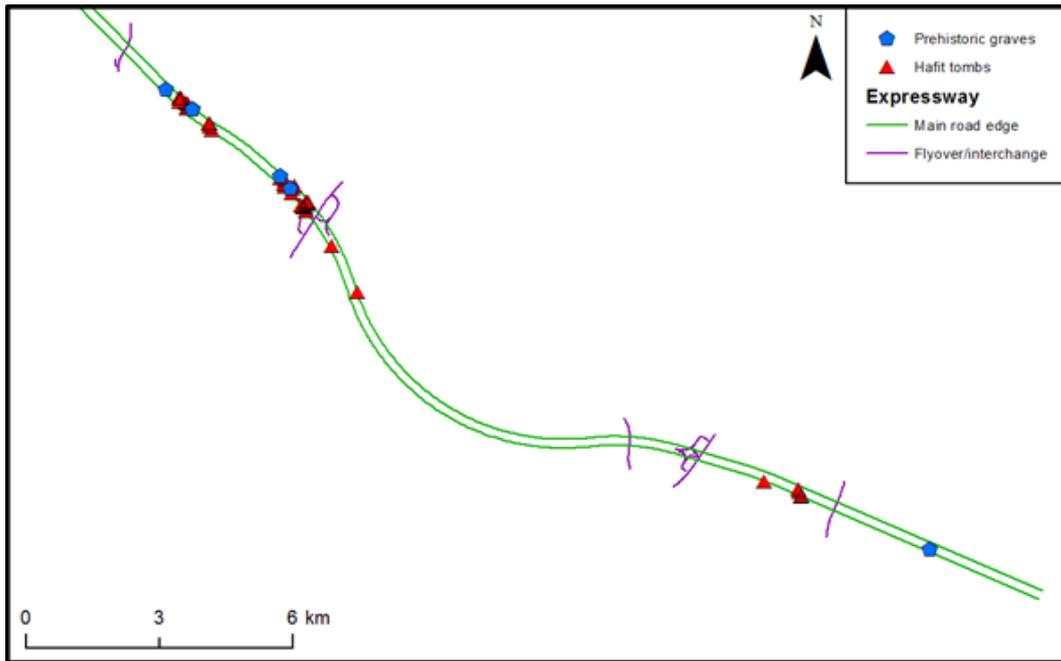


Fig. 66: Location of prehistoric tombs.

Fig. 67: Rock and gravel filled prehistoric tomb – possibly of the Wadi Suq period.



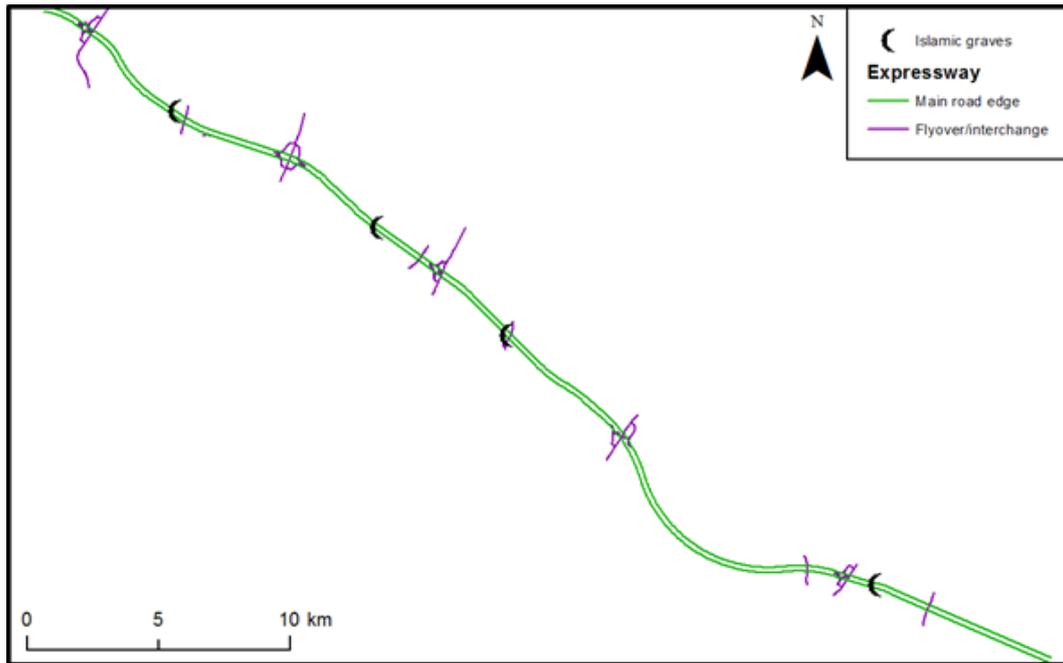


Fig. 68: Location of Islamic grave sites.

Fig. 69: Location of Islamic settlement structure remains.

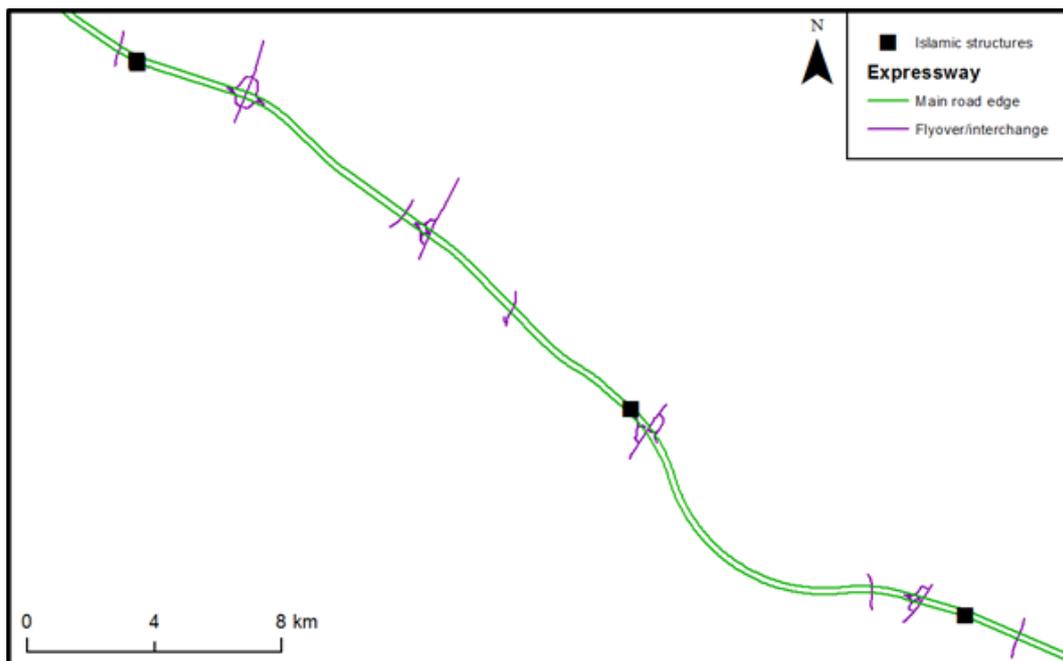
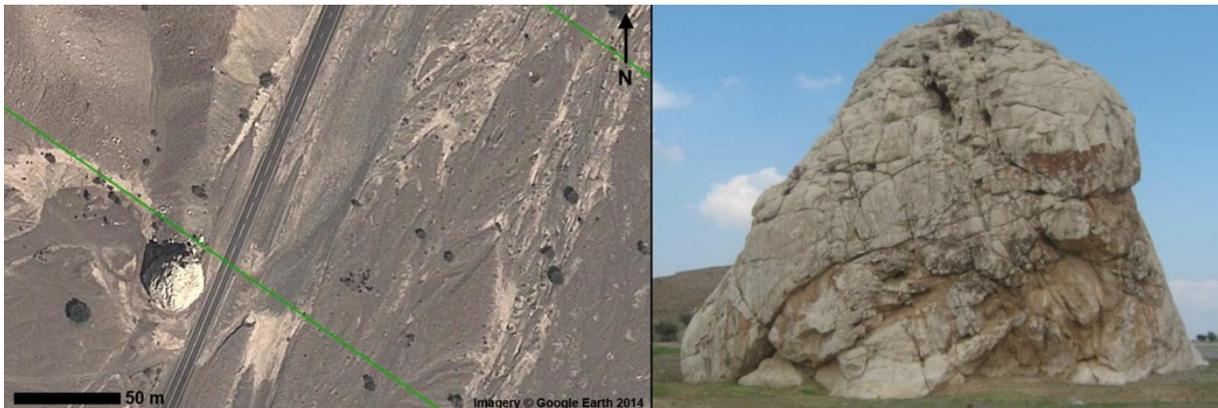




Fig. 70: Six by nine metre sub-rectangular platform.

Fig. 71: Meeting stone at the very edge of the path of the Expressway.



SUB-PROJECT 3: AFLAJ AND FIELD SYSTEMS

David Moger

This section reports on a preliminary study of the *falaj* and related agricultural systems in and around Rustaq. Satellite and ground survey was carried out during the course of the season and a number of *falaj* systems were recorded (Fig. 72).

There are three types of *falaj* system in use in Oman: the Ghayli *falaj*, 'Ayni *falaj* and Da'udi *falaj*:

1. **Ghayli *falaj*:** A Ghayli *falaj* is supplied with water from a wadi flow at or just below the surface of the wadi bed. Sluices are then used to divert the flow. The water flow is highly variable and is dependant on recent rainfall and runoff and sometimes stops all together. Therefore it is used mainly for seasonal crops such as wheat and cotton.
2. **'Ayni *falaj*:** An 'Ayni *falaj* draws its water from one or more springs which occur where groundwater meets the surface. The source area acts as a collector well, after which the water is guided along the surface in water channels. They generally have a high yield (depending on the spring). It is from this *falaj* system that the suburb of Rustaq known as 'Ayni takes its name as the spring acts as the primary source of water for supplying the surrounding date palms.
3. **Da'udi *falaj*:** The Da'udi *falaj* is of the same design as the qanat systems of Syria and Iran. Tunnels are dug with well shafts every so often along the system. The wells tap into the groundwater at high elevation and then the tunnel channels the water downhill towards it area of use. We must be careful however as in Oman, qanat can also mean channel or canal. It is sometimes used for the tunnel transporting water in the Da'udi *falaj* but is not applied to the *falaj* system as a whole.

***Aflaj* systems in the Rustaq Area**

There are a number of *falaj* systems in the wider Rustaq area of Oman. The majority of the ones explored by the project are Da'udi *falaj*. Fig. 73 shows a map of the major systems in the area as recorded by Alexander Gibb during a water resources survey in 1974 (Gibb 1976). The majority of these systems are still visible today although several of them have fallen out of use since the survey was conducted.

The satellite images in this report show the visible *falaj* "donuts" (the up cast from the well shafts). Many are easy to spot on the imagery, however where there is dense vegetation growing up along their edges, they are obscured and are difficult to confirm without physically checking. The majority of the systems here have been confirmed on the ground.

The *falaj* that supplies the majority of the Rustaq date palms is situated to the west of the town in the suburb of 'Ayni. This spring is a hot spring which is used by the locals for washing and bathing. There is an Islamic Sur close by which would have been used to protect and con-

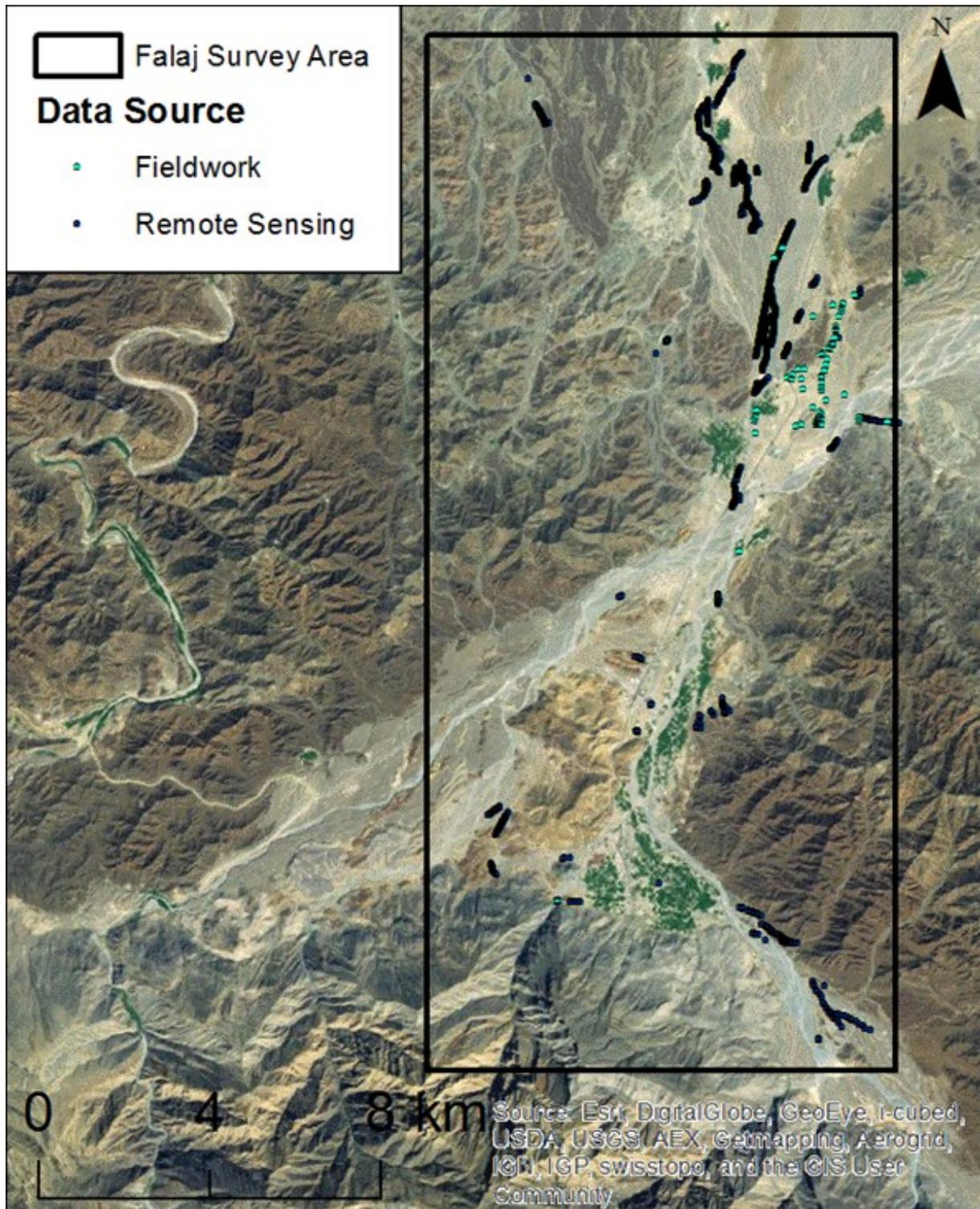


Fig. 72: Location of recorded *falaj* systems in the *falaj* survey area. The majority were located through analysis of satellite imagery, but some (those in light blue) do not show up on the imagery but were located by field survey.

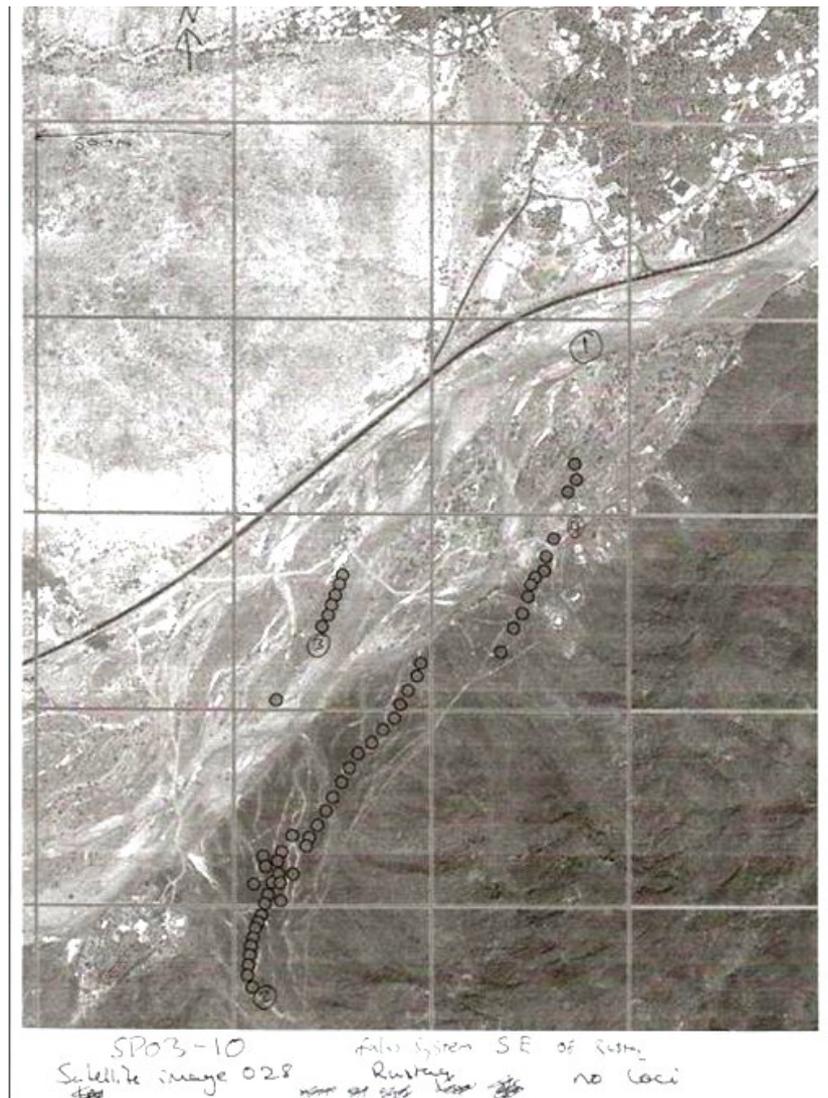


Fig. 74: The *falaj* system to the south of Rustaq from Gibb's survey .

but not connected up as of that time. This system also allows us to see a specific type of well shaft construction technique where the up cast material surrounding the shaft has been reinforced with some stone construction (Fig. 75). This occurs in a few places around Rustaq but usual construction technique appears to be to simply leave the up-cast material around the well once dug with no further action taken.

Fig. 76 shows the path of a *falaj* system to the South West of Rustaq which supplies the southern edge of the town. This system exploits a spring in the mountains just to the west of Rustaq. The source lies under L604 which is a probably small Islamic farmstead site with possible earlier Wadi Suq tombs. As in the suburb of 'Ayni, this is a hot spring. At No. 4 on the map the *falaj* donuts are replaced by a modern pipeline which runs above and under ground along a small wadi channel. It is possible that before the *falaj* system was put in place that the area was partially irrigated by a Ghayli *falaj* system using this channel to funnel the water to the south of the town.



Fig. 75: A stone-reinforced up-cast mound around a *falaj* shaft .

Falaj al Shrah

Falaj al Shrah is an area just to the north of Rustaq further down on the plains below the mountains. Here we see the end of a disused *falaj* system (Fig. 77) which once ran approximately 4km to the north. It would have supplied an area of date palm groves. However, the *falaj* is no longer in use and the local people now exploit two springs in the centre of the village using modern water pumps to irrigate the land.

Manaqi

The site of Manaqi is a very large Iron age settlement with accompanying field systems. It is the only site around Rustaq where we see both Ghayli and Da'udi *falaj* systems in close proximity. Fig. 78 shows a satellite image of the north of the site and the Da'udi donuts running away to the north. This whole area was covered in field systems both ancient and modern, although all were out of use at the time of visiting. No. 10 on the map (L582) shows the site at which the project dug a section across one of the *falaj* donuts (Fig. 79). We were able to obtain some shell samples from several Gastropods which were probably *Melanooides tuberculatus*. The species is known for burrowing however they do not always dig very deep and so can still be relied upon fairly well for dating. The C14 dates from this section came back as 8th-5th centuries BC (see table below). This is compatible with the dates suggested by pottery pickups around the main

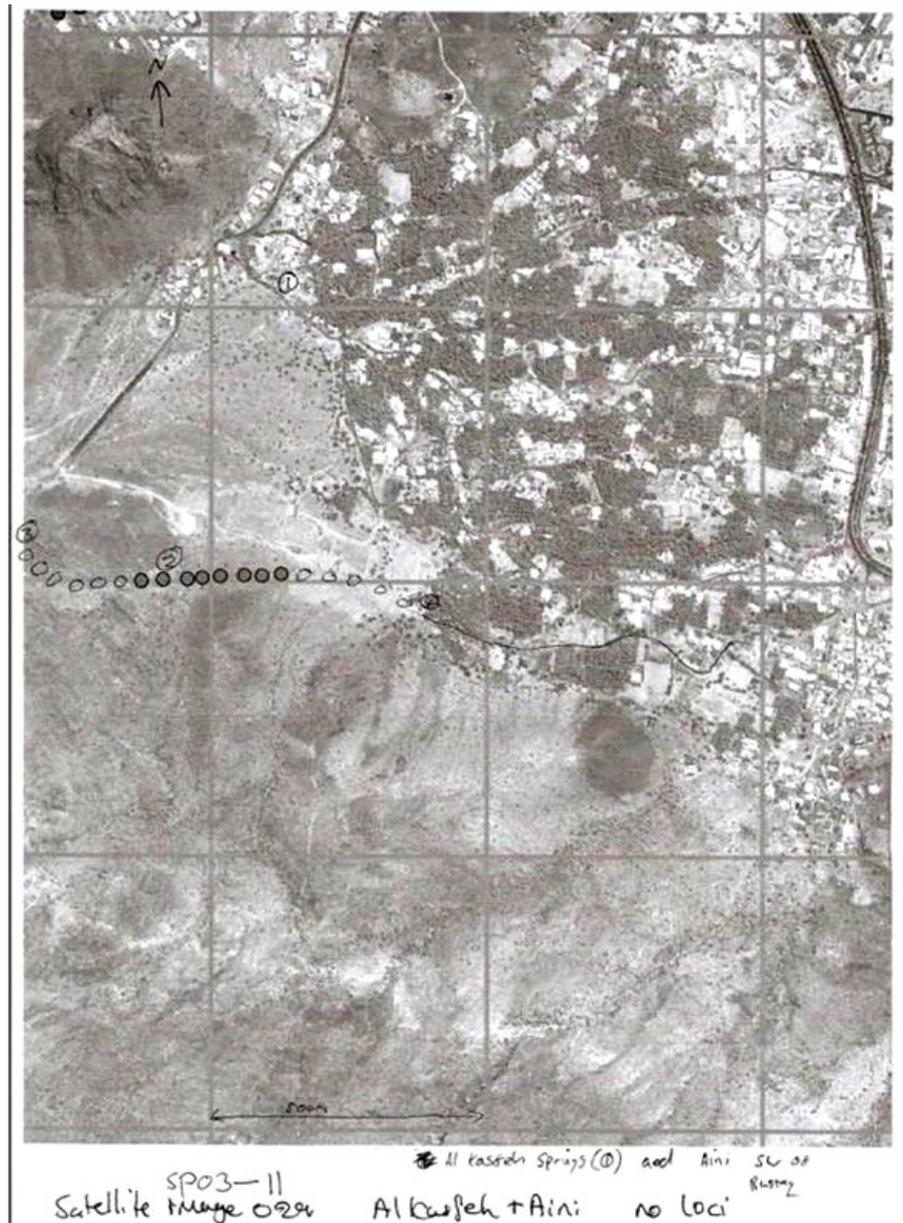


Fig. 76: Satellite image showing the path of a *falaj* system to the southwest of Rustaq which supplies the southern edge of the town .

settlement a short distance to the south and suggests that *falaj* construction went on in the late Iron Age or some time shortly afterwards in this area. Further shells were taken from the lowest levels of alluvium build up to the south and returned dates between 2890 and 2670 BC (see table below). Given that this species (*Melanoides tuberculatus*) requires a very wet environment, it seems certain that irrigated agriculture of some sort was taking place at this time. The only question is over the ‘old carbon’ problem, that may cause the dates to be too old. In any case, the dates suggest that the area has been cultivated since the 3rd millennium.



Fig. 77: Satellite image showing *falaj* systems in the area of Falaj al Shrah, just to the north of Rustaq .

Beta – 372302: 2 SIGMA CALIBRATION: **Cal BC 700 to 700** (Cal BP 2650 to 2650) AND **Cal BC 540 to 530** (Cal BP 2490 to 2480) **Cal BC 520 to 400** (Cal BP 2470 to 2350)

Beta – 372301: 2 SIGMA CALIBRATION: **Cal BC 2890 to 2840** (Cal BP 4840 to 4790) AND **Cal BC 2810 to 2670** (Cal BP 4760 to 4620)

AMS dates from the Manaqi area

Fig. 78: Satellite image of the north of Manaqi showing the Da’udi donuts running to north



manaqi area 1
 SPO3-02 satellite image 037 Manaqi no loc 7



Fig. 79: Excavated section at L582 through a *falaj* donut in the Manqi area .

Fig. 80 is a map of the field systems to the north of Manaqi. No. 1 represents a fairly modern field system with narrow water channels which appears to have been created using a bulldozer. Nos 2 and 3 are possibly much earlier field systems where some Iron Age pottery was found just below the surface. Ideally in the future, a section needs to be dug across several of these field walls to look for further dating evidence. These fields have possible stone-lined water channels (Fig. 81) which were probably irrigated using run-off from the surrounding area. No. 4 also shows a more modern field system with a possible relationship with the modern house to the south of it. No. 7 is a Umm an-Nar tower. It is interesting that there are possible field walls (No. 5) running around the outside of it which could suggest that there were some contemporary field systems which have now been almost completely destroyed.

Fig. 82 shows a plan of the field systems to the south of Manaqi. Here we can see what is possibly a Ghayli *falaj* system, where channels have been built to funnel water from the surrounding hills and wadi area into the field systems. The inhabitants have used the natural topography of the area to aid the irrigation. No. 2 on the map represents natural mounds in the landscape which have been terraced to direct the flow of water. A section was dug across a field wall (Fig. 83) at L428 close to No. 5 and more gastropod samples were taken. They were sourced from the upper and lower levels of alluvium which have built up behind the field wall. The dates on



Fig. 80: Satellite image showing the field systems to the north of Manaqi .



Fig. 81: Stone-lined water channels in the Manaqi area .

Fig. 82: Annotated satellite image showing the field systems to the south of Manaqi .





Fig. 83: A section excavated across a field wall at L428 to collect C14 samples .

Fig. 84: Further field walls along the edge of the cliff face and right under the main part of the Iron Age settlement at Manaqi.



SUB-PROJECT 4: THE TOMBS AT MANAQI, HAWQAIN AND YIKA: A COMPARATIVE STUDY

Emma Hall

General Background

During the 2013-2014 season of the Rustaq Batinah Project, three major tomb sites were discovered and their structures recorded. Manaqi, Hawqain and Yika appear to be multi period sites, with evidence of stone robbing apparent at all sites (Figure 1). The tomb types and the survival of the structures varied from site to site, but similarities in form could be detected between the sites. A tomb was defined as a distinguishable structure or its remains, which could contain multiple chambers and walls within an outer wall.

Recording the Tombs

Over the fieldwork season, a tomb recording strategy evolved from the basic locus recording sheets. The data collected for each tomb included:

- Number of Chambers Visible: an internal area or areas, perhaps divided by internal walls, which may include cysts or the remains of cysts (for example capping stones or in-filled depressions).
- Orientation: the main axis of the tomb along its length. The orientation of the interior chamber(s), if different, is recorded separately.

Fig. 82: Annotated satellite image showing the field systems to the south of Manaqi .



- Length: the length of the tomb or structure, recorded in metres.
- Width: the width of the tomb or structure, recorded in metres.
- Finds: finds recovered from the tombs and their surrounding area, including pottery, shell, flint and other miscellaneous finds. Collections may be systematic, unstructured or timed collections.
- Shape: the shape of the outer wall of the tomb or structure. Examples recorded include circular, rectangular, ovular, keyhole and figure-of-eight shaped tombs.
- Outer Wall – Composition: recording the presence of an outer wall and its construction materials, such as angular blocks and wadi cobbles.
- Inner Wall – Composition: recording the composition of the inner wall or walls, if present, using the same material categories as when recording the outer wall.
- Wall Fill – Composition: recording the presence of wall fill material, if visible, which could include gravel, pebbles or small wadi cobbles.
- Central/Chamber Fill: if visible, the central fill of the structures can include a range of materials from silt and grass to large wadi cobbles and capping stones.
- Chamber Shape: the shape of the visible chambers. Common shapes include rectangular and ovular chambers.
- Chamber Dimensions: the measurements of the chambers, recorded in metres.
- Notes: other information about the tomb, if applicable, including:
 - The presence of vegetation, including grass, bushes and trees.
 - Any slippage, including its extent in metres and its direction.
 - The height of any remaining stonework in courses.
 - The interval between walls, measured in centimetres.
 - Any other features, such as the presence of capping stones, adjoining structures, modern disturbance and the height of corbelling.

Each tomb was sketched, with some being drawn in more detail or planned to scale. Structures that were incomplete (for example having sections missing) were mostly recorded, but those that consisted of less than two visible sides or had no obvious shape were often left, as it was not clear if they were tombs or natural rock formations.

Each tomb was also examined for finds, but the collection methods used at each site varied. At Manaqi, pottery was only collected from selected tombs due to the abundance of pottery and the commonality of the visible sherds: tombs which had examples of sherds rarely seen elsewhere on the site were often searched, with at least one tomb of each category undergoing a collection. At Hawqain and Yika, all pottery was collected as there were far fewer visible surface sherds. Other types of finds, such as shells and miscellaneous finds, were collected from all tombs that underwent a pottery pickup. Although this variation may skew the

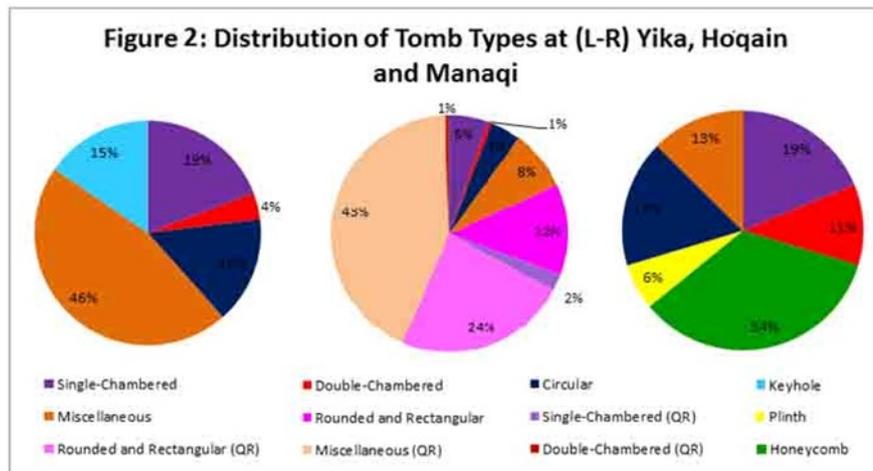


Fig. 86: A comparison of the tomb types identified using the typology established during the 2013-2014 field season. 'QR' stands for 'Quick Recording', which was only used at Hawqain due to the large number of tombs visible.

results, collecting all visible finds from every tomb at Manaqi would have been highly impractical. However, by choosing tombs displaying differing sherds, a large sample of pottery types was collected and may provide more conclusive information about activity at the site compared to the limited data set gathered at Yika and Hawqain.

Initial Findings

In total, 27 tombs were recorded at Yika, with 64 tombs recorded at Manaqi and 170 at Hawqain. The tombs were then split into eight groups depending on their shape and dimensions:

1. Single-Chambered: one visible chamber.
2. Double-Chambered: two visible chambers.
3. Honeycomb: tombs that have at least three visible chambers.
4. Plinth: tombs of varying shape and with varying numbers of chambers that are positioned on a square raised area, which may be supported by terracing in order to artificially raise it above the natural ground level.
5. Circular: tombs with a single chamber and often distinct inner and outer walls that are almost perfectly round.
6. Miscellaneous: tombs or structures that bear little relation to the other five categories.
7. Keyhole: rounded tombs with a rectangular end, in the same shape as a keyhole.
8. Rounded and Rectangular: rounded tombs with a rectangular burial chamber.

The majority of these categories were seen at all sites, with Honeycomb tombs being the most numerous at Manaqi. Yika's cemetery contained several Keyhole tombs and the majority of tombs at Hawqain fall into the Rounded and Rectangular category. The cemeteries all contain

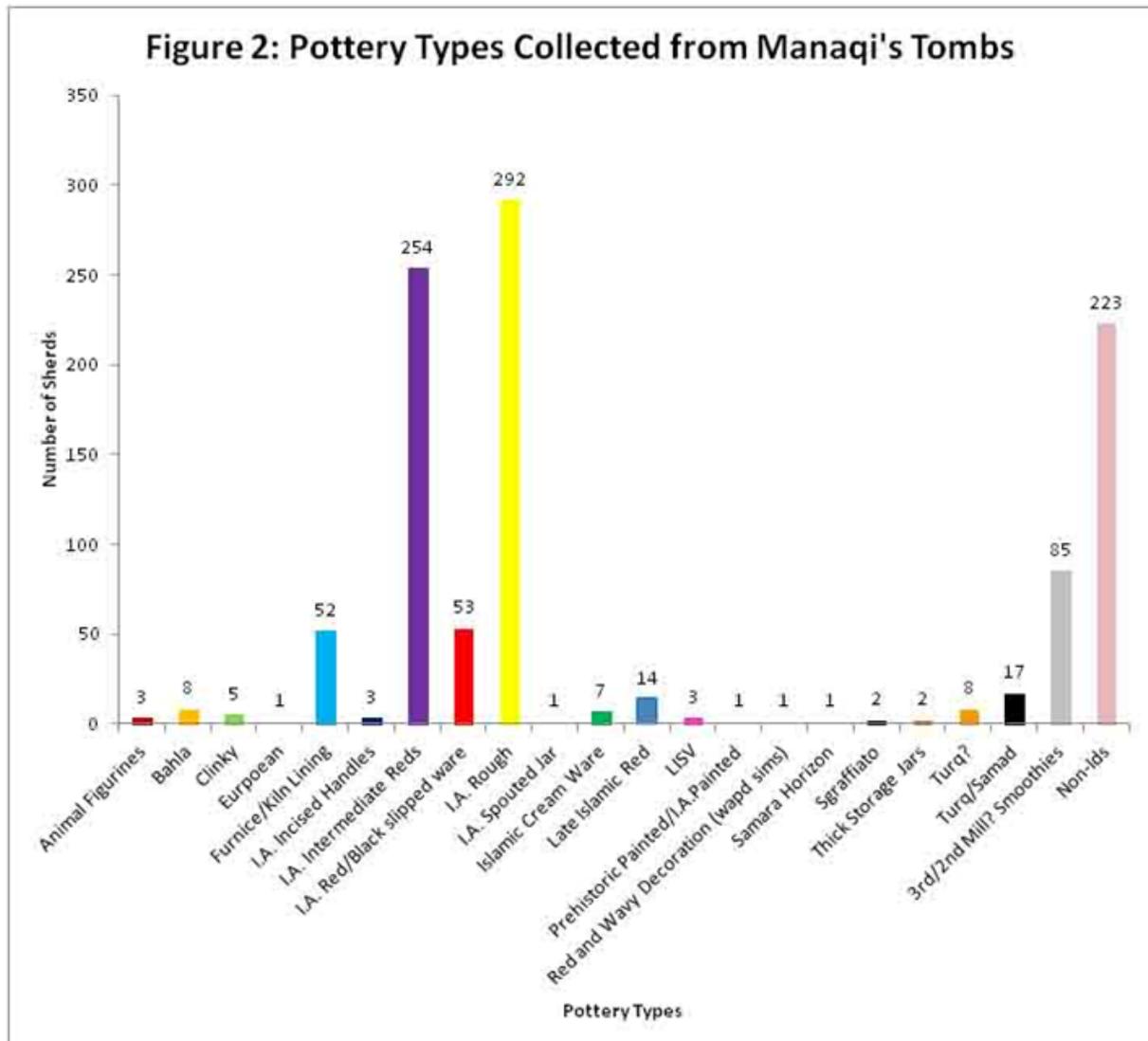


Fig. 87: The sherds collected from the Manaqi tombs. The range of types collected suggest that the site was used from the third millennium BCE to the Late Islamic period, with a particular focus occurring during the Iron Age due to the highest quantity of sherds belonging to this time .

Single-Chambered, Circular and Miscellaneous tombs, suggesting some unity across the sites, but the variations between the three require further study to determine the significance of the differences (Figure 2). The Miscellaneous category could also be refined if further work was undertaken on the structures that have been affected by slippage and stone robbing.

Pottery samples taken from the three cemeteries provide a range of dates. The Manaqi tombs had the most visible surface sherds (1,086 in total), resulting in a range of pottery types being collected (Figure 2). The lack of pottery sherds from the Hawqain and Yika tombs, from which 185 and five sherds were found respectively, could suggest a different use of pottery in funerary contexts at these sites. Although different collection methods were used at the sites (see above), the sherds gathered provide a range of data which could be used to date the cemeteries when fully analysed. The distribution of the pottery could also be mapped in the future to discover whether certain areas were utilised at different times.

Conclusions

The size of the cemeteries at Hawqain, Yika and Manaqi suggests that they were significant burial places during Oman's early history. Further work to determine the dating of the tombs through improving the pottery typology and perhaps excavation could help explain the wider importance of these Batinah cemeteries

SECTION III: APPENDICES

Appendix I: Methodology

Appendix Ia: Regional Survey

The regional survey approach taken by the project is new to Oman. In the past ground surveys carried out on foot have been predominantly ‘oasis’ focussed or have been vehicle based and have recorded only the most visible sites such as monuments and tombs. Both of these approaches have severe limitations which have prevented them from gaining a full picture of the development of Oman’s human landscape.

‘Oasis’ survey (as favoured by Gaube etc) sets the ‘oasis’ (by which is meant an area of date-palm cultivation) as the basic unit of human occupation and subdivision of the countryside and the basic unit of archaeological analysis. However, it is not established that this is the case. It is quite possible – or even likely – that in some periods larger units of political organisation existed meaning that centres of control might not have existed in all ‘oasis’. It is also possible that some units of human activity were not linked to oasis. By taking a broader regional approach this survey will be in a position to analyse larger units – to think beyond the somewhat artificial unit of the ‘oasis’.

The survey work was divided into a number of levels:

1. Investigation of satellite images. This allowed the recording of large and obvious sites where there is a structural element visible on the surface.
2. Investigation of published literature and discussions with local residents and Ministry employees. This allowed the project to locate sites that are already known.
3. Vehicle exploration. Covering large tracts of countryside rapidly in a vehicle looking for obvious signs of archaeological sites or stopping to investigate rapidly areas that look like they may have harboured settlement or other types of human activity. This can be a highly effective method of finding large sites, but it has the disadvantage that, not being based on a systematic approach, the results can be biased towards certain types of sites or sites of certain periods. This can lead to misleading interpretations and problems if quantitative analysis of the results is used.
4. Systematic exploration. A series of carefully defined study areas will be selected and they will be investigated systematically on foot. All types of archaeological evidence will be recorded down the smallest details of a few sherds or flints. In general large assemblages of pottery are collected where it is present (Pottery-pickup areas) so that periods of activity that have left only minimal traces can be detected (see al-Jahwari & Kennet 2008).

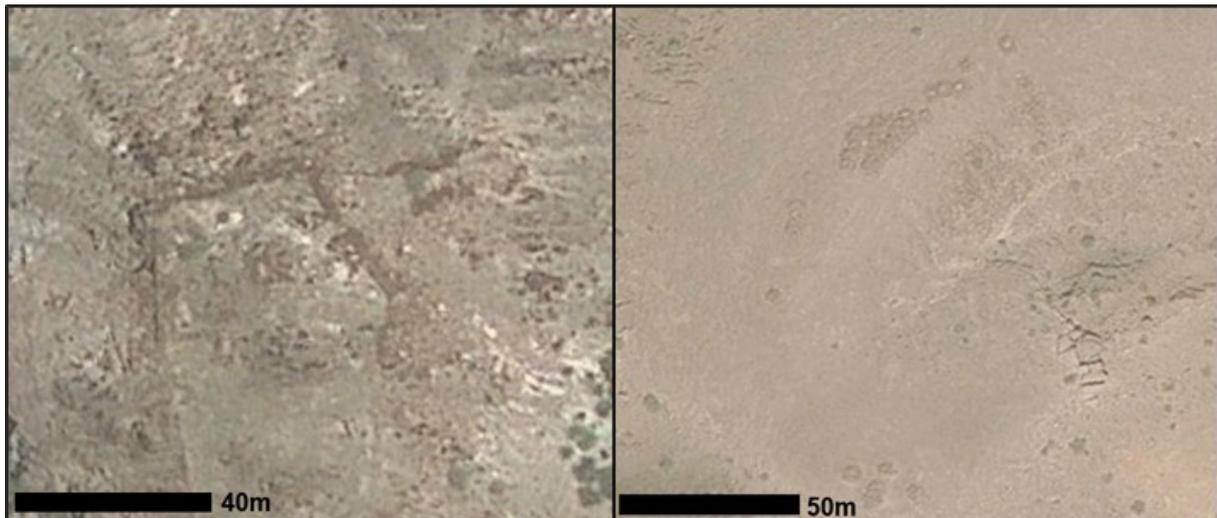


Fig. 88: Hawqain Iron Age hillfort and Manaqi prehistoric cemetery - imagery ©) Google Earth 2014.

5. Lower Batinah exploration. Part of the project's aims are to explore the whole landscape rather than specific geographical zones. Key to this is the alluvial and coastal areas of the Batinah that are today amongst the most populous and widely cultivated in the country but which are amongst the least explored archaeologically. Problems of alluvial burial and later disturbance by human populations makes this zone very difficult to work in from an archaeological perspective. Settlements have either been badly damaged or buried or some of both. From the second season new techniques of investigation will be systematically employed in these areas in an attempt to sketch out a reliable picture of how this part of the country developed through time, how it compares to other zones of occupation and how it interacted with other areas.

Detected sites were all recorded at a basic level. A more detailed level of recording (eg planning, detailed surface pickups, sounding, kite photography, pole-camera photography etc) was then applied to sites that were deemed of sufficient interest in that they were either good examples of a particular type of site or unique examples of activity of a particular type or date.

Appendix Ib: GIS and Remote Sensing Strategy and Data Collection

William Deadman

GIS and remote sensing have been instrumental during the opening season of the Rustaq and Batinah Survey Project, having been used for primary data collection; producing supporting material for field survey; data management and in training Durham undergraduates for their own research.

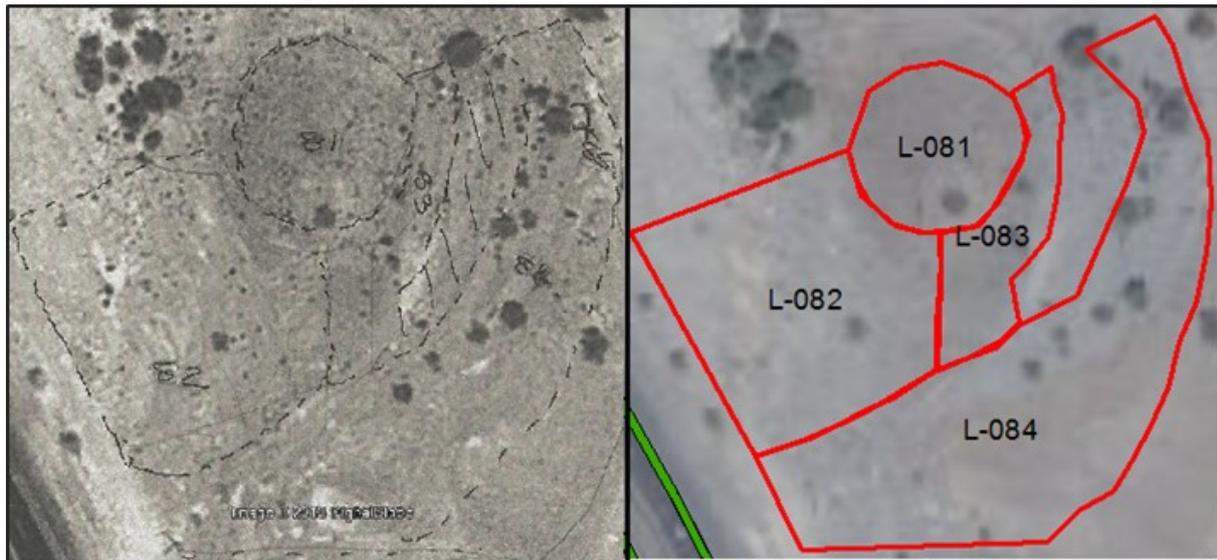


Fig. 89: Annotated map and digitised GIS version of Falaj ash-Shrah pottery pickup areas.

Preliminary survey

Before fieldwork commenced a remote sensing survey – making use of freely available Google Earth satellite imagery – was conducted on a 450 km² area around the town of Rustaq. This early data collection phase identified a significant number of the project's key sites including Manaqi; Hawqain; Hisn Hajir and Misfah. As yet, only a quarter of the wilaya has been surveyed using remote sensing – it is a vital tool and an important part of our strategy for prospection in future seasons.

As well as identifying the presence of key sites, the preliminary remote sensing survey also first alerted the project to the lack of Hafit tombs in the area immediately around the town of Rustaq. Their concentration in the northern half of the wilaya is an unexpected discovery that we hope to explain as our research continues in future seasons.

Ground survey support

GIS and remote sensing resources have proved to be an important tool in supporting ground survey in the field. Maps and satellite imagery were prepared and printed before visiting sites and areas of study on the ground, and were annotated to show archaeological features and site and loci boundaries. Without a stable internet connection, satellite imagery received from Digital Globe as part of a grant for this project was especially useful. After annotation, these plans were digitised in a GIS environment to facilitate data storage, management, analysis and presentation. This stage was particularly important for pottery pickup areas, where often loci boundaries were chosen arbitrarily and did not relate to visible archaeological structures.

Data management

A total of five handheld GPS units were utilised during field survey in the 2013/14 season. Periodically, the waypoints from each device were backed-up onto a computer, converted into a GIS-compatible format using DNR-GPS software, and edited within ArcMap 10.2. Loci

numbers were added when possible, as well as preliminary observations regarding the archaeological features discovered, and their possible date. This allowed the data to be presented and analysed graphically as the season progressed, and minimised the chance of significant data loss.

Student training and research

One of the five undergraduate students on the project was trained in the basic operation of remote sensing and GIS software. Following training, he went on to survey an 18x19km area for evidence of *falaj* irrigation, recording more than 30 irrigation systems made up of 1000 access shafts remotely, and a further 60 shafts and numerous field systems during ground-truthing fieldwork. This will not only further the projects aims in mapping the use of the landscape over time and dovetail with other studies at Durham University examining the history of *aflaj* in the region, but will provide the foundational skills and data necessary for the student to undertake his own dissertation research in the Sultanate of Oman.

Appendix Ic: Kite & Pole Aerial Photography

Mark Woolston-Houshold

The aerial photography for Rustaq and the Bartina region of Oman was achieved by two main methods. For higher level plan-view images, recorded at an approximate altitude of around 100m, composite images were produced by the use of KAP (Kite Aerial Photography) and combined together in Agisoft PhotoScan. For example, 70 - 100 pictures were taken using an interval timer set at a rate of one image every 20 sec with the kite and camera being controlled at a walking pace and following a grid pattern to cover a complete ground surface area of around 250m square. The grid for this technique was created on the move using a hand held GPS with the main consideration for calculations being the wind direction which would determine the starting point location. For areas larger than 250m x250m the same technique was used and then repeated with adjoining referenced with the use of ground control points (GCP's) located on the corner of each area to form a square. Further stitching of these larger images together was achieved by georeferencing them to a relevant grid created in ESRI ArcMap. By recording the position of each GCP by GPS spatial accuracy for these images could also be achieved by the use of referencing images over the relevant data frame projection, which for this region is UTM 40 Q. For these images a Lumix GX-1 16 mp camera was used and set to record in JPEG format.

Lower level plan view images taken at a height of under 10m were achieved with the use of a camera attached to an extendable pole. For these images a Samsung Wifi 800 16 mp camera was used and again images were recorded in JPEG format and taken as either single shots or in multiple groups to be later mosaiced using Agisoft Photoscan. The shutter release for this camera was controlled using a compatible Samsung Wifi tablet giving the ability to frame the image and then capture as required. For multiple images a rough grid was predetermined on the ground surface, measured in paces and approximating points at roughly 6m x 4m. Any greater



Fig. 91: Example of an oblique kite aerial photograph of the Sasanian fort at Sahm (Photo MWH, courtesy Nasser al-Jahwari).

Fig. 92: The pole camera being used to record Iron Age burials at Manaqi.





Fig. 93: Example pole photograph of a tomb (Locus 67) at Hawqain; the tomb has a diameter of 4m.

accuracy was not required as the mosaicing process only required an approximate overlap of 20% or more across images to produce accurate results. With the use of either kites or poles oblique images of sites were also effectively obtained and depending on the area to be described single shot image or panoramic mosaics were created as required. For panoramic images Autopano Giga was the stitching program used.