

Biological remains at al-Madam (Sharjah, UAE) Archaeological, archaeobotanical and archaeozoological studies in an Iron Age farming-stockbreeding village

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Abstract: *The interdisciplinary study undertaken at al-Madam (Sharjah, UAE) since the mid-1990s has allowed an archaeological team from the Universidad Autónoma de Madrid to work together with geologists, topographers, archaeozoologists and archaeobotanists in order to shed light on Iron Age society in the Oman Peninsula. Thanks to field study and abundant laboratory evidence, we now know about the subsoil, natural resources, food and animals surrounding these human groups. Biological remains yielded from the archaeological record at al-Madam are really rich and permit us to study the diet and economy of a small Iron Age population and compare it with other communities in the Oman Peninsula during this period.*

Key words: Oman Peninsula; Iron Age; water collecting galleries; farming; stockbreeding; offering area

Introduction

Since the beginning of the 20th century the al-Madam region, located in the heart of the Oman Peninsula (**Figure 1**), has been transforming into a steppe with scattered trees occasionally interrupted by palm groves and cultivated areas irrigated by wells and water collecting galleries (called falaj/afaj). At present, the inhabitants of al-Madam are able to irrigate their crops thanks to a large water table that is, in fact, being over-exploited and that can be reached only with very strong water pumps. However in Antiquity this water table lay very near the surface and wells as well as afaj were in simultaneous use since the 1st millennium BC. Both water collecting methods allowed continuity for the crops established in this harsh environment as well as the establishment of the first permanent villages in the area, as has been shown by the “al-Madam Archaeological Project” undertaken by the Autónoma University of Madrid in the Emirate of Sharjah (UAE).

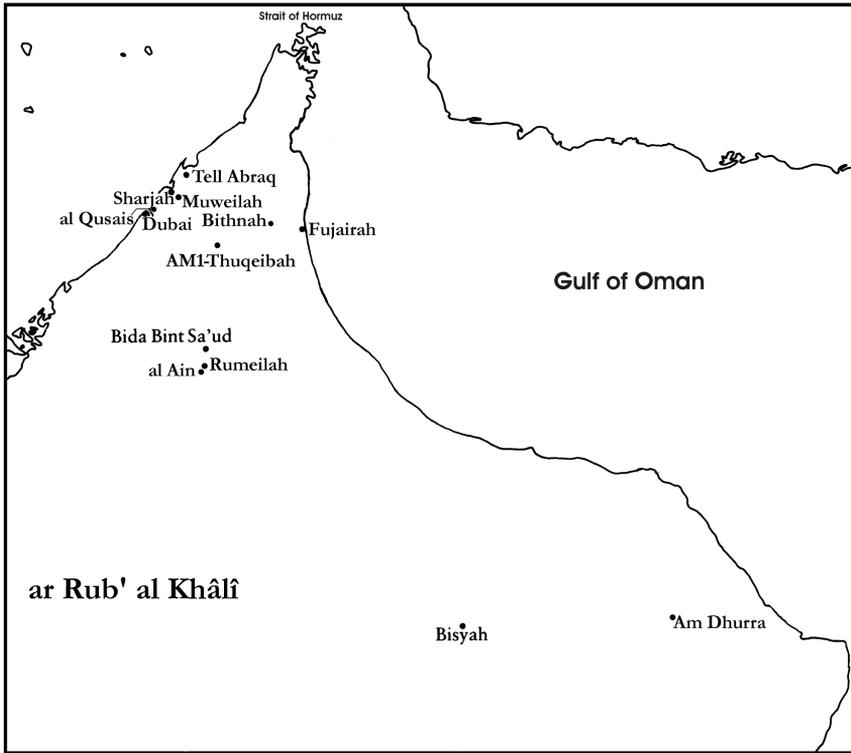


Figure 1. Map of the Oman Peninsula showing some of the most important Iron Age settlements. Drawing by M. Mañé, Spanish Archaeological Team.

The surveys and excavations undertaken by our team in the al-Madam region since 1994 have traced a number of communities that have moved about on the al-Madam plain since the 2nd millennium BC and throughout the Iron Age. We know now that at least one or even several human groups established themselves in the southern part of al-Madam, by the modern hamlet of Thuqeibah, in the first quarter of the 1st millennium BC. These populations displayed a decidedly advanced knowledge of hydraulic and agricultural matters that indicated long-term experience.

The inhabitants of al-Madam must have continuously exploited their environment with great skill, because this would have been the only way of surviving in such hostile conditions. In order to understand the local exploitation of resources and the way of life of the inhabitants of the region during the Iron Age, our team undertook investigations in three sectors:

- Sector 1: The permanent village of al-Madam 1–Thuqeibah, has been studied since 1994 from an interdisciplinary perspective (Benoist et al. 1997; Córdoba et al. 1997; Córdoba & Mañé 2000; Córdoba 2003). The hamlet dates to the

Iron Age II and III (ca. 1100–400 BC) and is composed, as far as we know at the moment, of six dwellings, some of them linked by enclosure walls. In addition to this, the settlement has a communal well, as well as a mudbrick and material construction area (MWA), in which there is a second communal well (Córdoba 2006; del Cerro 2008).

- Sector 2: The falaj is a water collecting gallery located 2km to the east (Córdoba & del Cerro 2005). From the falaj, the inhabitants of al-Madam brought water to the village from a water table that was not located in the subsoil in the immediate vicinity. The excavations have brought to light information about this gallery, its depth, a section of its alley, as well as an area with an irrigation channel network (del Cerro & Córdoba 2012). In other words, this was the area where the water coming from the falaj reached the surface and was distributed among the cultivated fields.
- Sector 32: The area of Jebel Buhais, to the west of the al-Madam region, where the Spanish team has worked at an offering site located at the center of one of the most important funerary zones in the whole of the Oman peninsula (Córdoba et al. 1997; del Cerro 2010).

Accordingly, in this study attention is focused on those points in the region (al-Madam 1, 2 and 32) where a sufficient number of biological remains are available to permit sufficient reconstruction of the Iron Age society in the center of the Oman Peninsula, as ascertained through the information these kinds of archaeological remains provide.

Thuqeibah Village, al-Madam 1

The technique of the falaj appeared and was developed during the Iron Age II (ca. 1100–600 BC) in the Oman Peninsula. Since the early 1990s, it has been recognized that oases in the interior of Oman increased in size at the beginning of the 1st millennium BC and villages multiplied thanks to increasing agricultural resources. Thus several mainly agricultural settlements at Hili (sectors 2, 14, 17), Rumeilah or Qarnt Bint Saud fill the archaeological map of the contemporary oasis of al-Ain (Abu Dhabi), one of the biggest in the Oman Peninsula displaying a continuous occupation since at least the 3rd millennium BC (**Figure 1**).

Outside the al-Ain oasis, archaeologists looked for similar parameters: villages with an agricultural nature, created with the help of the falaj technique. But the excavations at the oasis of al-Madam show that the village of Sector 1–Thuqeibah is not a settlement devoted only to agriculture, as the pottery and the artifacts as well as the archeobotanical and archaeozoological registers indicate it was also an Iron Age farming-stockbreeding village (Córdoba 2003:173–180).

The architecture and pottery recorded at al-Madam differs in some ways from other farming villages. No store houses or large storage jars have come to light but rather medium sized jars located by the fireplaces, by the threshold of houses, near places where food was processed or craft activities took place have been identified (del Cerro 2012:291–306). In any case, these jars would have held water for various activities in the village. They were not used for storing grain or dates, something which is not documented anywhere at the settlement.

A great variety of arrowheads typical of the Omani Iron Age, found in the village, indicate that hunting would have been very important for the inhabitants of al-Madam (Magee 1998:1–12). Furthermore, bronze blades, needles, awls and pins, probably used to make and repair fabric and carpets, as well as to work leather, appear across the whole sector. Thus, the range of activities performed in the village seems to have been even wider than at first presumed.

Besides hunting and textile production, the archaeological record of the settlement evidences directly or indirectly handling of grains and legumes. Direct information comes from a study of the earth collected from twenty stratigraphical units from hearths and fireplaces, which underwent flotation (Pena Chocarro 2003). From flotation screening three legume seeds, believed to have been collected rather than cultivated, were identified. The remainder of the plant material consisted of different types of charcoal. It is possible that most of the vegetable foods were consumed raw and so, as it has not been carbonized, it is unlikely that it would appear in the archaeological record (Pena Chocarro 2003).

Apart from this data, the artifacts found in the village tell us indirectly of the existence of cereals and possible other kinds of plant material. The number of artifacts used to process grains (hand mills, mortars, grinding stones) is so high that there is little doubt that grains were present and consumed.

In addition, the central sector of al-Madam has yielded a significant number of animal bones. Bones found inside houses are rare, but outside the dwellings there are real garbage dumps such as the ones documented by the southern wall of house H1 and at the eastern side of house H2. The artifacts and structures of al-Madam 1–Thuqeibah, suggest that inside the houses the inhabitants processed food and textiles and produced handicrafts but that cooking took place outside, in the space inside the enclosure walls that link the houses. There are a great number and variety of molluscs, as well as many fragmented animal bones, mostly found near those fireplaces, always outside the dwellings.

The faunal analysis (Liesau 1996) of these remains allowed us to identify some domestic and wild species (Table 1). The remains of caprinae comprise 39%, compared to 61% macrourungulates and mesourungulates. As for the wild fauna, hares, gazelles and remains of a desert fox or fennec (*Fennecus zerda*), the smallest of the canine family

and the best adapted to the extreme conditions of a desert with sand dunes, have all been documented.

Table 1. NISP values at al-Madam–Thuqeibah village (three phases) and at the offering area in Jebel Buhais (stone building and tombs) (Liesau 1996).

Taxon	Phase I		Phase II		Abandon- ment		Stone building		Tombs	
	n	%	n	%	n	%	n	%	n	%
Macro/Mesoungulate		0		0		0		0	1	8
Macroungulate		0	15	18	3	4	1	17	2	17
Mesoungulate		0	10	12	55	82	4	67	9	75
<i>Bos taurus</i>		0		0	1	1		0		0
<i>Ovis/Capra</i>	31	100	55	66	7	10	1	17		0
<i>Capra hircus</i>		0		0		0		0		0
<i>Gazella gazella</i>		0	1	1		0		0		0
Lagomorph		0		0	1	1		0		0
not identified		0	2	2		0		0		0
Total	31	100	83	100	67	100	6	100	12	100

The remains of ichthiofauna were small, although the consumption of common pandora (*Pagellus erythrinus*) and Red Sea bream (*Pagellus bogaraveo*) could be demonstrated along with a small number of fish remains that were impossible to identify. If the distance from the site to the coast (80km from the Indian Ocean and 70km from the Persian Gulf), is taken into consideration, these remains in themselves become significant. However, what is really striking is the quantity and variety of the molluscs found at the village (Table 2). Fifty marine species have been identified (Vásquez & Rosales 2006) as well as two fresh water species, probably related to the water-collection galleries in use at that time. Of all the marine species, the gastropod *Terebralia palustris* is the most common, as enormous quantities of this mollusc have been found inside and outside the dwellings. Among the bivalves, the most common are *Acrosterigma lacunosa* and *Callista florida*. Six mother-of-pearl shells (*Ostrea* sp) used as pigment containers, were also found as well as some gastropods (*Cypraea annula*, *Oliva tremulina*, *Oliva bulbosa* and *Conus textile*) worked into ornaments.

So called House H4

A structure called House H4 has been excavated in a second phase of the al-Madam archaeological project. This structure lies outside the houses forming the heart of the farming-stockbreeding village of Thuqeibah and about 200m northeast of them. House H4 has several occupation levels, but the earliest phase of the structure is the most striking bioarchaeologically, especially space R161, where a great number of

fireplaces where found, some of them very well built, cut into the natural rock and well preserved. However, none of the fireplaces display any connection with the structure as do the fireplaces found in the previously excavated houses. There is no evidence of handicraft activities or of activities related to food processing by the fireplaces of house H4. No animal bones were found although there were a large number of molluscs. Again the most important of these species is *Terebralia palustris* (88.4%), but there are also bivalves such as *Callista florida* (1.5%) and *Acrosterigma lacunosa* (0.48%) and gastropods such as *Mesalia opalina* (0.54%). In addition there are two mother-of-pearl shells (*Ostrea sp.*), but lacking any traces of pigment. The pincers of a crab from the mangroves by the nearest shore, probably from Kalba, on the Indian Ocean coast, were also identified.

If the molluscs from al-Madam are considered as a whole (Vásquez & Rosales 2006), it can be seen that the mangrove species are the most important ones (64.81%), especially *Terebralia palustris*, a species that is able to survive for long periods outside the water. This gastropod can survive in very dry conditions for several days, explaining its presence at al-Madam located 70km from both coasts, a location in the center of the Oman peninsula that does not lend itself to the likelihood of there being such a great presence of any kind of mollusc at the settlement. Besides *Terebralia* coming from the mangroves, the archaeological record at al-Madam has showed molluscs coming from sandy beaches (24.03%) and rocky coasts, although these latter ones appear in lower numbers (6.14%), which is quite logical, as this biotope is the most distant of all (Vásquez & Rosales 2006).

If the origin of the molluscs is ignored for the moment and we turn to a quantitative study of the remains, it can be seen that the Number of Identified Specimens

Table 2. List of mollusc taxa from Al-Madam. Asterisks indicate species used in ornaments (Vásquez & Rosales 2006).

<p>Gastropods: <i>Diodora rueppelli</i>; <i>Umboonium sp.</i>; <i>Nerita albicilla</i>; <i>Truncatella cf. marginata</i>; <i>Rhinoclavis kochi</i>; <i>Cerithidea cingulata</i>; <i>Terebralia palustris</i>; <i>Turritella fultoni</i>; <i>Mesalia opalina</i>; <i>Serpulorbis variabilis</i>; <i>Calyptraea edgariana</i>; <i>Cypraea annulus*</i>; <i>Cypraea grayana</i>; <i>Neverita didyma</i>; <i>Ficus gracilis</i>; <i>Epitonium irregulare</i>; <i>Hexaplex rileyi</i>; <i>Murex sp.</i>; <i>Thais bufo</i>; <i>Anachis donnae</i>; <i>Nassarius albescens gemmuliferus</i>; <i>Oliva tremulina*</i>; <i>Oliva bulbosa*</i>; <i>Conus lividus</i>; <i>Conus textile*</i>; <i>Architectonica perspectiva</i>; <i>Cassidula cf. labrella</i>.</p>
<p>Scaphopods: <i>Dentalium octangulatum</i>.</p>
<p>Bivalve: <i>Barbatia sp.</i>; <i>Anadara uropigimelana</i>; <i>Glycymeris cf. arabica</i>; <i>Brachidontes variabilis</i>; <i>Musculista senhousia</i>; <i>Pteria sp.</i>; <i>Pinctada margaritifera</i>; <i>Saccostrea cucullata</i>; <i>Ostrea sp.</i>; <i>Alectryonella crenulifera</i>; <i>Anomia cf. achaeus</i>; <i>Acrosterigma lacunosa</i>; <i>Macra lilacea</i>; <i>Solen sp.</i>; <i>Periglypta puerpera</i>; <i>Callista florida</i>; <i>Gafrarium pectinatum</i>; <i>Callista erycina</i>; <i>Dosinia contracta</i>; <i>Circe sp.</i>; <i>Dosinia alta</i>; <i>Protapes cor</i>.</p>

(NISP) is 5,424 and the Minimum Number of Individuals (MNI) is 717, while the percent contribution of the main taxa based on the NISP comprised 91.74% *Terebralia palustris*, 1.05% *Callista florida* and 0.48% *Acrosterigma lacunosa*. On the basis of MNI 64.3% belongs to *Terebralia palustris*, 6% to *Callista florida* and 3.07% to *Acrosterigma lacunosa*. However, there are still significant numbers of other mollusc species such as *Mesalia opalina*, *Callista erycina*, *Conus lividus* and *Ostrea sp.* (Vásquez & Rosales 2006).

Irrigation Channel Network Area, al-Madam 2

A geomagnetic survey made in 2009 within sector 2 of the al-Madam plain discovered what could be the course of a water collecting gallery that approached the village from the east. Putting together the information yielded by the surveys with magnetic and ground penetrating radar, undertaken at the same time, it was decided to open a small trench in an area where it had always been supposed crops would have been cultivated in antiquity, the same that would have been exploited by the inhabitants of the village of al-Madam 1–Thuqeibah in the Iron Age. The channel that was found was nothing other than the outflow of the water collecting gallery partly excavated some years ago (Córdoba & del Cerro 2005). Iron Age II-III potsherds never before connected with the falaj were found within the channel and established a connection with the village. During February 2012, several extensions of the trench showed the existence of secondary channels that formed a sort of irrigation channel network (del Cerro & Córdoba 2012). Those secondary channels connected the main one (i.e the outflow of the falaj) with what could have been ponds, cultivated areas and a great number of tree pits. In all channels we found molluscs (*Thiaridae*), which suggest the continuous presence of fresh water; clean and always moving water, water that would have never been stagnant. Most of the shells were collected in the main channel or by its outflow into the secondary channels, in places where there would have been a slow but continuous flow of clean water. In addition to these very small molluscs two date stones and several examples of *Terebralia palustris* were discovered. These finds could be used to date the structure. H.P. Uerpmann and B. Kromer examined the samples at Tübingen University and dated the remains using the particle accelerator at Mannheim. The date obtained is 3337 ± 27 BP (MAMS 14003). After calibration with the marine calibration curve, the snail was living with 68% probability between 1065 and 882 BC, with 95% probability between 1160 and 808 BC.

Accepting the error margin that can be ascribed to the *Terebralia* samples, the fact is the irrigation channel network area can be attributed to Iron Age II-III, the pottery collected in the area supports this dating and also points to Iron Age II-III as the time the structure was in use.

AM 32. Jebel al-Buhais necropolis

The plain of al-Madam is interrupted on the west by the Jebel Buhais, a mountain that protects the al-Madam oasis and keeps it safe from the advance of the last dunes of the great Arabian Desert. Furthermore, the Jebel Buhais contains the largest funerary area of the United Arab Emirates, in use since 5000 BC until 200 AD (Jasim 2009, 2012). At the center of the mountain lies a stone building that overlooks the plain of al-Madam. This area was excavated by a French-Spanish mission in the mid 1990s (Córdoba et al. 1997). Surprisingly, this building could not be clearly dated to the Iron Age (one of the most prolific periods of funerary use) although the previous surveys had suggested this dating.

Nevertheless at the foot of the promontory where the stone building stands, the French-Spanish team found a concentration of nine small tombs that can now be identified as an offering area. They were located on a small rocky platform at the base of the promontory. Almost all of these “graves” had been looted but the pottery, the beads, the softstone fragments and the arrowheads that were found pointed to the Iron Age for this remarkable discovery (del Cerro 2010:41–45) (Figure 2).

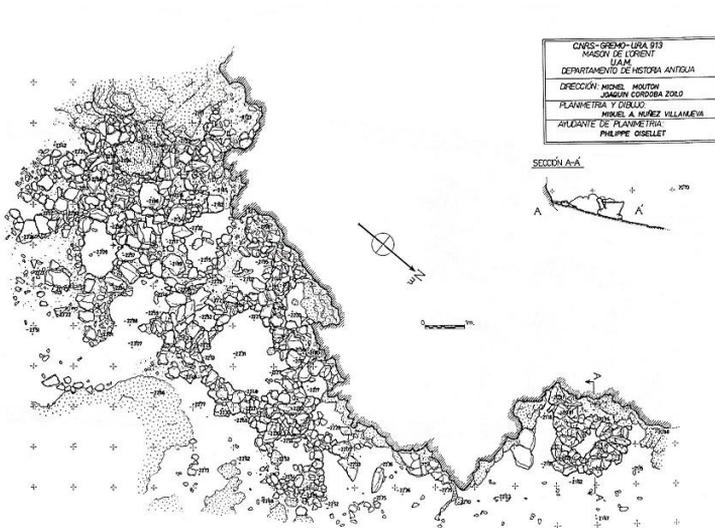


Figure 2. Al-Madam 32. Offering area located on a small rocky platform at the base of the central promontory of Jebel Buhais. Drawing by M.A. Nuñez, Spanish Archaeological Team.

The bones found in this offering site were very badly preserved, probably due to the characteristics of the soil, the extreme temperatures and the looting of the so called “tombs”. At first sight, we were struck by the singularity of this area. However, the analysis afterwards in the laboratory (Liesau 1996) confirmed our impression: not

a single human remain could be identified among the bone remains that had been collected. The long bones belonged for the most part to infantile and juvenile caprinae. There are no remains of skulls, vertebrae or teeth, although there is a single goat (*Capra sp.*) horn core. Even in the only tomb (T 35) that had not been looted, no human bones could be documented. The cover was intact and there was a “small burial” containing the same kind of artifacts including: potsherds and softstone fragments, arrowheads and necklace beads, but not one human bone or traces of cremation. These “graves” must really be cenotaphs or offering sites where parts of the offered animals were deposited (García Lenberg & del Cerro 1996:222). The pottery of this undisturbed cenotaph T35 indicates a late Iron Age II horizon with small carinated bowls made of a sandy, common-fine ware with a very thin light red to brown slip, as well as a small number of small-medium slightly carinated bowls of common ware (one of them was burnt). The appearance of a few fragments of burnished slip ware, typical ware of Iron Age III in Oman, allows us to date this offering area to the transition from Iron Age II to III, ca. 650–600 BC.

The bones from the cenotaphs do not seem to be food remains, as the animals had not been processed. It seems they were first butchered in another place and arranged at the cenotaph as part of a ritual that could have been accompanied by libations or ritual drinking on the basis of the pottery found there. A single case tells us about the use of fire as one of the bigger bowls is burned. Altogether 75% of the bones come from caprinae (goat, sheep) and 17% from camelidae (*Camelus dromedarius*); the remaining 8% were identified as macro/mesoungulate as it was impossible to say any more due to the bad preservation of the remains. Other species that were found in the dwelling area in al-Madam 1, such as gazelle (*Gazella arabica*) or hare (*Lepus capensis*) do not appear among the funerary fauna of Jebel Buhais. We also have no ichthiofauna or malacofauna (except those shells transformed into beads, but no molluscs for eating) (Table 1).

Excavations around this offering area undertaken by the General Direction of Antiquities of the Emirate of Sharjah (Jasim 2000), have documented temporary settlements used by a population that would have moved near the jebel regularly in order to bury their dead or to build and repair the graves holding their deceased. In the Iron Age completely new tombs were built and tombs from the 2nd millennium BC were reused. In both cases, these human groups would have dedicated part of their time to address their deceased through a ritual that until now had not been documented in the Oman Peninsula during the Iron Age.

Conclusions

The inhabitants of Thuqeibah seem to have wisely combined agriculture and stock-breeding. They would have raised small herds and cultivated an area that was not

very large (but successful thanks to the falaj technique). However, it would not have produced a significant allowed surplus of grain or dates, as the remains of storage silos have not been found. Their diet was varied: dairy products, some meat, mainly lamb (but also hare or fox have been found in the garbage dumps located close to the dwellings), legumes, dates, cereals, molluscs, some fish and maybe some sort of vegetable or fruit that was eaten raw and has left no clear trace.

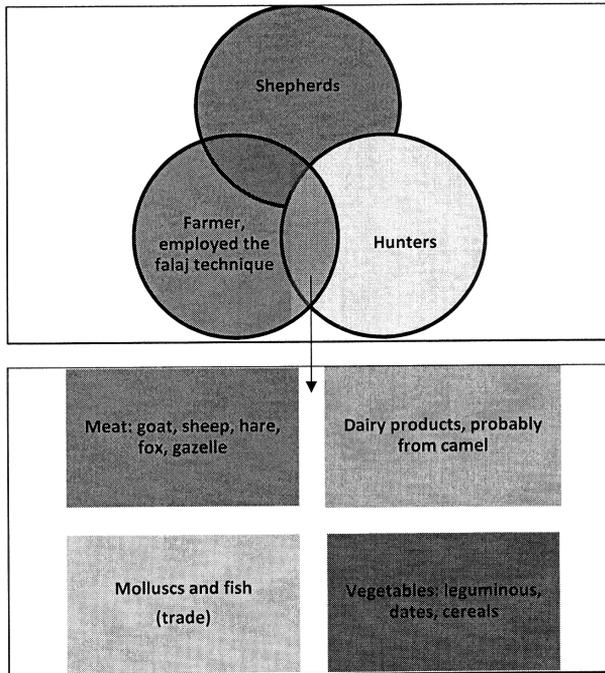


Figure 3. Economic activities documented at al-Madam 1–Thuqeibah reflected in the archaeological record.

In this diet, the consumption of marine molluscs is really most striking. The quantity of species is so high that al-Madam–Thuqeibah appears like a settlement located by the coast or near a mangrove, area although it is actually situated in the center of the Oman peninsula and separated from the Gulf shore by abundant dune formations and from the Indian Ocean by the enormous mountains of the Jebel al-Hajjar. Al-Madam actually has a privileged location, anchored in the ancestral routes that link the large oasis of the north and south of the Oman peninsula. One of the few routes where the al-Hajjar Mountains can be crossed ends here as well: wadi al-Qwar permitted east to west traffic in goods and persons. Thus, the village of Thuqeibah was completely integrated in Iron Age culture, although its location outside the big

oasis prevented archaeologists from recognizing this fact at the beginning of this investigation (**Figure 3**).

Only three kilometers to the west, the funerary zone of the Jebel Buhais tells us about the coexistence of human groups and animals. The latter provided the population with food during the preparation of the burials and the construction of the tombs, although part of that fauna and/or products derived from it was also deposited at offering sites, located quite near the graves. During their stay at the foot of the jebel, these human groups would have transformed stones, metals and shells into artifacts they would later leave in the tombs and at the offering sites. They would also have hunted as shown by the arrowheads found by the Sharjah Emirate team outside the graves. The animals killed during these hunts would only have been consumed as food, as no remains of wild fauna have been documented inside the cenotaphs. Their meat would have been cooked and processed at the camp itself, based on the presence of the fireplaces found there.

The inhabitants of al-Madam combined stock-breeding, agriculture, hunting and exchange with the coast and that some of all those goods they enjoyed ended as part of their funerary rituals. Thankfully all of the activities have been preserved due to a really exceptional archaeological record.

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