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## Shell mounds of the Farasān Islands, Saudi Arabia

M.G.M. WILLIAMS

### Summary

The Farasān Islands lie in the southern Red Sea in Saudi Arabian waters. Recent work has detected the presence of over 1000 shell mounds dated to between 7000–2000 BP (Bailey *et al.* 2007), many of which are under threat of destruction as the islands become a focus for development driven by the tourist industry. The sites have been unprecedentedly preserved due to the aridity of the region. Work to investigate these unprovenanced deposits began with reconnaissance fieldwork in 2006 that first identified the mounds as having anthropogenic origins. Full-scale investigations followed in 2008 and 2009; these employed a number of techniques ranging from satellite image interpretation to geo-archaeology. Two key sites were chosen for excavation and detailed survey, revealing two contrasting site histories and differing modes of evolution. Efforts to disentangle the environmental and cultural signals between the sites have followed a number of lines of enquiry, including survey and excavation, geo-archaeology, a landscape survey, and laboratory analysis. Preliminary results reveal an intriguing story of temporal and spatial shell-mound evolution at both an inter- and intra-site scale. These research methods are being followed up with a comprehensive dating programme using a variety of dating techniques, a method that has rarely been attempted on this type of site. In this paper we present the preliminary results of this work.

**Keywords:** shell mound, shell midden, site evolution, Farasān Islands, coastal archaeology

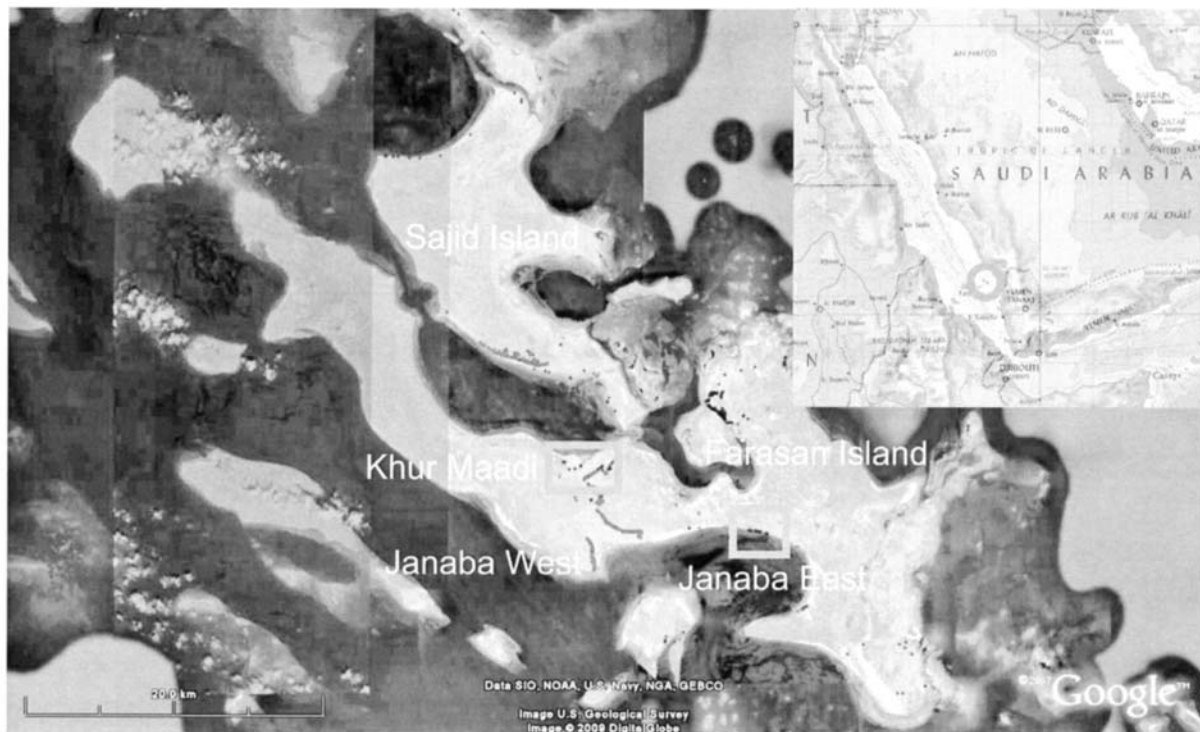
### Introduction

This paper deals with the shell mounds of the Farasān Islands (Jazā'ir Farāsan) — one element of the archaeological diversity on the archipelago — which were only recently recognized as having anthropogenic origins (Bailey *et al.* 2007). Until this time, their provenance was almost completely unknown, save for three radiocarbon dates (ranging between 5400 and 2410 cal BP) that had been obtained by separate projects whose focus was not always archaeological (Zarins, Al-Jawad Murad & Al-Yish 1981; Dabbagh, Hotzl & Schnier 1984; Bantan 1999). As a result, the locations from which the dating materials were obtained are vague, detailing only that they came from a “shell mound” in a broad geographic area. Shell sites have been found throughout the Red Sea and Arabian Peninsula (e.g. Biagi 1994; 2006; Edens & Wilkinson 1998; Durrani 2005; Vermeersch *et al.* 2005), but these deposits are often restricted, both in terms of size and concentration of sites. The Farasān Islands stand out because of the number and density of sites, and their state of preservation, which has benefited both from the arid environment and the low population density of the islands.

The Farasān Islands were formed as a result of the dynamic tectonic forces at work in the region: the islands

are a collection of uplifted coral terracing overlying salt domes (Bantan 1999). Where the salt has withdrawn, the overlying rock has subsided forming deep depressions, which are often circular, forming wide arcing bays on the islands (Fig. 1). The Farasān Islands are composed of nearly 250 islands of uplifted coral pavement, underlain by limestone, which has been uplifted and deformed.

During the mid-Holocene shell mounds start increasing in numbers across the globe (e.g. Bailey & Parkington 2009). In the broad majority of areas, sites were initiated around 6000 BP. However, there is some degree of variability and the first appearance of shell sites can be earlier or later (e.g. Milner, Craig & Bailey 2007). This would seem to reflect the stabilization in global sea levels at c.6000 BP, with earlier dates apparently corresponding to areas where local tectonic, eustatic, and isostatic influences have resulted in the raising of local shorelines at a greater rate than sea levels rise, thus preserving earlier sites. There is much debate surrounding this discrepancy, and whether shell mounds started accumulating as a response to changing climatic conditions, whereby coastal and marine resources became more intensively exploited, or whether their appearance is due to better archaeological visibility of the sites once sea levels had stabilized. In addition to this last point,



**FIGURE 1.** The location of the Farasān Islands, and the location of sites across the islands indicated by dots. Case study areas are shown by boxes.

as sea levels stabilized conditions may have been more conducive for the accumulation of larger mounds, since the shorelines would have been stable for longer. Shell sites persisted in many parts of the world for several thousand years, and indeed still accumulate today in some locations, for example the Saloum Delta, Senegal.

### Aims and objectives

The aim of the project is to investigate the spatial and temporal evolution of shell sites on the Farasān Islands, both at an inter- and intra-site scale. This translates into the basic research questions: “How do individual shell mounds grow?” and “What are the relationships between shell mounds in a group, and more widely between groups?” A key consideration for the study is why shell sites are of different sizes. A group of shell sites can be dominated by a large centrally located shell mound or mounds, which can be many times larger than the surrounding sites (e.g. Bailey & Parkington 2009; Gaspar 1998). This is a common phenomenon that occurs globally and various hypotheses have been proposed to explain the

emergence of these large central mounds: 1. that larger sites are an amalgamation of smaller sites; 2. that mounds of different sizes have different functions; and 3. that mounds of different size originate from different phases of mound building. This project will test these hypotheses at two sites on the islands, using a variety of methods detailed below.

### Methods of investigation

Data from previous research on the islands was consulted to determine areas of known archaeological potential (e.g. Zarins, Al-Jawad Murad & Al-Yish 1981; Dabbagh, Hotzl & Schnier 1984; Bantan 1999; Bailey *et al.* 2007). Of particular use were the GPS points collected by Bailey *et al.* (2007). When these were used in conjunction with high-resolution satellite images taken from Google Earth, they provided an excellent indication of the location of clusters of sites. The satellite images are of sufficiently high resolution to enable individual sites, as small as individual shell scatters, to be identified. Satellite image interpretation was a primary method for locating new

sites and assessing archaeological potential. The sites could easily be picked out as white stains (shell material) on a darker background (fossil coral terraces).

The fieldwork was broken down into three activities, survey, excavation, and geo-archaeological investigation. Initial work focused on surveying sites identified from the satellite images, first verifying and then surveying them. This included recording the dimensions and surface composition (shellfish species present) at each site, and allocating a GPS point. Certain groups of sites were deemed higher priority, and extra time was taken to survey accurately each individual mound using a differential GPS, which takes a sequence of closely spaced GPS points at 10 cm accuracy, to record the site in three dimensions.

Excavation formed the bulk of fieldwork activities, with two key sites being targeted for full-scale excavation. Where possible, transverse trenches were cut and excavated through the mounds to the full depth of the archaeological material. Several test-pitting programmes were also undertaken, both on sites surrounding the excavations and on other groups of shell mounds. These produced datable material, and recorded a snapshot of the internal structure of the sites in question. Test pitting involved excavating a trench of 50 cm<sup>3</sup> into a shell mound, from which a bulk sample of 15 cm<sup>3</sup> could be extracted and dating samples obtained. Finally geo-archaeological investigations were conducted to determine whether environmental and/or geo-morphological changes had influenced the formation of the adjacent shell mounds.

Two methods of dating have been utilized for this project: radiocarbon dating and amino-acid racemization dating (AAR). Radiocarbon dating was used to assess the time-depth of the two excavated sites, while AAR was employed both to assess further the stratigraphy of the two excavated sites and to assess the age of surrounding sites. AAR methodology followed that of Penkman *et al.* (2008) using the shellfish species *Strombus fasciatus*. This project demonstrated that the method works in this region, and could be used to distinguish between sites of different periods of shell-mound building activity (Demarchi *et al.*, in preparation). Radiocarbon dates were obtained from charcoal where possible, but due to the lack of appropriate dating material in the sites shell was often used. The most recent literature (and several experts) was consulted in order to select the best candidates for dating to minimize errors. *Chama reflexa*, which is a siphon feeder and grows at a depth of *c.* 5 m, was chosen.

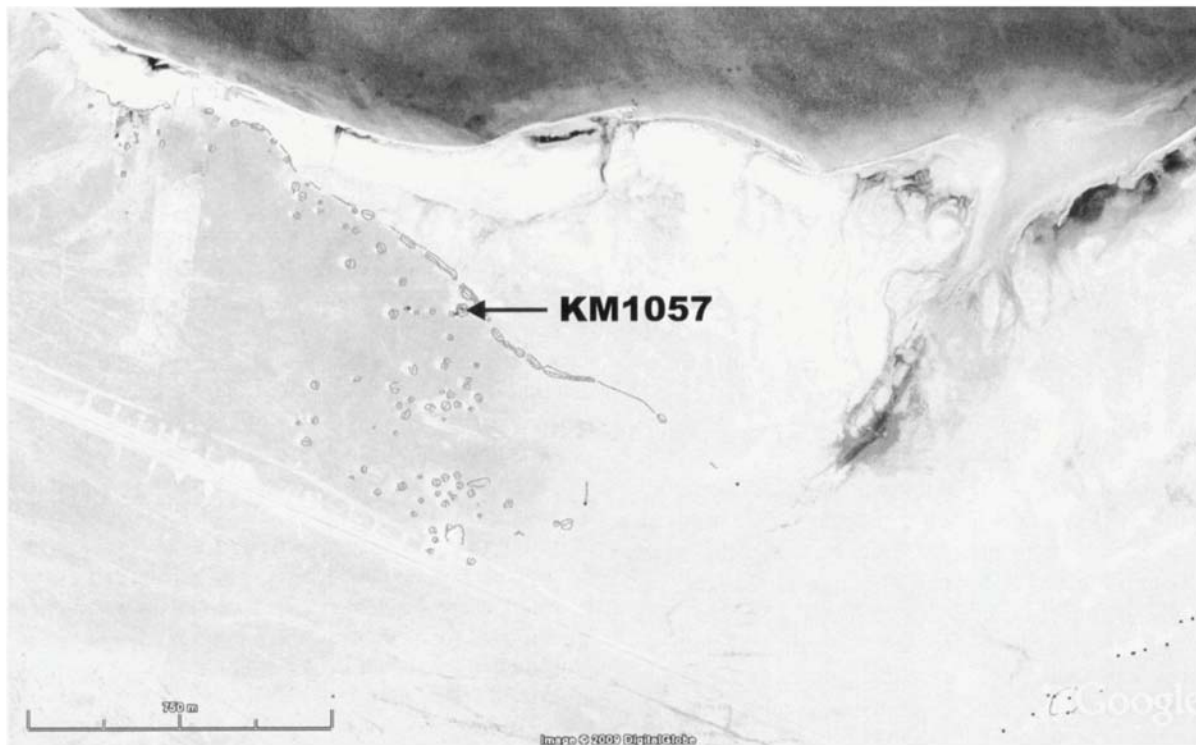
## Case studies

Fieldwork focused on the largest and most central islands of the Farasān archipelago, these being Farasān al-Kabīr (the largest island), Saquid (Sajīd), Qumah (Qumā<sup>3</sup>), and Zufāf, although no shell sites were located on Zufāf. This paper will focus on two case studies: Janābah East and Khawr al-Ma<sup>3</sup>ādī, both located on the main island, where the largest shell mound of the group was excavated in each study area (Fig. 1). The two areas were selected because of their vulnerability to destruction. The Khawr al-Ma<sup>3</sup>ādī sites have been extensively destroyed by extraction of material for the building industry. The Janābah East site is at high risk both of falling into the sea as a result of cliff undercutting, and also because of its location between a growing power station and water desalination plant, and a harbour. Excavating both sites allows a broader spectrum of the island's sites to be investigated, as well as ensuring that preservation by record can be accomplished. Investigating "at risk" sites also minimizes destruction and damage to sites where there is no imminent threat, preserving them for future generations.

### Case study 1

The first case study reviewed here is the Khawr al-Ma<sup>3</sup>ādī group of sites (Fig. 2), located in the centre of Farasān Island. Initial observations of the distribution of shell sites for this area show that there are sites extending from the Khawr al-Ma<sup>3</sup>ādī right across the centre of the island to Janābah Bay West. This indicates that both the Khawr al-Ma<sup>3</sup>ādī and Janābah Bay West inlets were once joined by a narrow channel that divided the island into two. Both bays (and channel) have since been uplifted and in-filled with sediments; evidence for uplift comes from large fault lines visible in the coral platforms in addition to the raised topography in the centre of the island.

The study area is located at the mouth of the former Khawr al-Ma<sup>3</sup>ādī bay, on the transition from the former open coastline to the inner bay (Fig. 2). In-filling and uplift have resulted in the coastline prograding (or building up with sediment) to approximately 400 m further out from the palaeo-shoreline. The group of sites is dominated by two very close 3 m-high shell mounds at the junction of the former open coastline and the mouth of the bay. These two mounds are surrounded by a number of smaller shell mounds and scatters. There are two distinct shell-site distribution patterns: to the north-west the mounds form a linear pattern following the palaeo-shoreline. To the south, the mounds are apparently randomly distributed



**FIGURE 2.** The location of sites in the Khawr al-Ma'ādī group (circles denote the sites). The excavated mound designated KM1057.

within a broad north–south band. This band appears to represent the edge of the former bay, where a highly transitional shallow-water environment existed, reaching various levels in different years. Sites accumulating at the water's edge during lower stands would eventually form self-selecting dry sites when the water level was higher (e.g. Bailey, Chappell & Cribb 1994).

The large mound chosen for excavation was designated KM1057; the destruction to the site allowed a 3 m-deep section to be exposed through the centre of the unstable mound (Fig. 3). This section revealed an assemblage largely dominated by the shellfish *Strombus fasciatus* (Born, 1778, common name: Lineated conch), a species that today thrives in shallow sandy sub-tidal environments, where it grazes on seagrass. The large Khawr al-Ma'ādī bay would have provided the required habitat for this species; geo-archaeological investigations in this area have uncovered *in situ* fossil shell beds with a diverse range of species, including large numbers of *Strombus fasciatus*. The profile of the mound is interrupted in only two places, near the top and base by two discreet horizons dominated by the shellfish *Chama reflexa* (Reeve, 1846,

common name: Reflexed jewel box). This species grows on coral reefs, at depths of *c.* 5 m, where it cements itself onto the coral; at present this habitat is found *c.* 100 m off the present shoreline. Small quantities of fishbone were also found in the uppermost layer associated with the ash.

Two dates were obtained from the mound, both from the *Chama* layers. These were 4770±60 cal BP (BETA-255385) for the top and 4900±60 cal BP (BETA-255383) for the base (Fig. 4). These dates clearly show that the mound accumulated very rapidly, indeed the dates are so close together that they are within the margins of error of radiocarbon dating. No other features were found in the mound and there was a distinct absence of finds, those present being restricted to the limited numbers of fishbone.

### Case study 2

The second case study is from Janābah East (Fig. 1), where the coastal setting is in contrast to the Khawr al-Ma'ādī (Fig. 5). The coastline is open, and appears to have been stable since at least the initiation of shell-

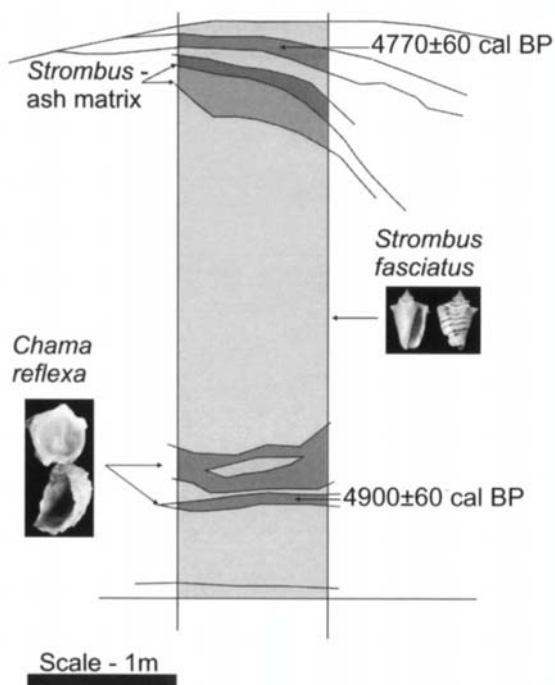


FIGURE 3. An annotated section drawing for site KM1057, excavated in the Khawr al-Ma ādi group.

mound building activities, as evidenced by a well-developed undercutting of the cliff. There are eight sites in the group, all of which are located on the cliff top, and the majority of which are low mounds and scatters. The site chosen for excavation, designated JE0004, is the largest and most centrally located mound of the group, at c.1.5 m high, and 20 m across (Fig. 6); it is located on a small but prominent headland that offers excellent

visibility across the surrounding bay. This part of the cliff has also experienced the most undercutting, in places reaching up to c.4 m. Offshore is a c.150 m-wide sub-tidal shelf with an average depth of c.1 m; there are patches of sand on which seagrass grows and *Strombus fasciatus* can be found. After this the depth drops off in a series of short shelves to a depth of c.12 m.

A transverse trench was opened up across the centre of the site, exposing a 20 m-long section, to a maximum depth of 1.5 m at the deepest point. The mound presents a complex stratigraphy, and is split into two distinct depositional units, to the north (inland) and south (seaward) (Fig. 6). The northern side was dominated by inter-fingering layers of larger shells with layers of clean *Strombus*, which would seem to represent dumping activities. The species composition of large shell layers varies, with some layers being almost exclusively made up of *Chicoreus virgineus* (Röding, 1798, common name: Virgin murex) and *Pleuroploca gigantea* (Kiener, 1840, common name: Horse conch), while others are composed predominantly of *Spondylus marisrubri* (Röding, 1798, common name: thorny/spiny oysters) and *Chama reflexa*. Sparsely interspersed in these are layers that contain a mixture of the above species, and some layers that contain an abundance of ash or ash and clean *Strombus*. On the south side were alternating layers of hearth deposits and clean *Strombus*, which may represent the occupation (or processing) side of the site. In addition, several small but steep-sided cuts were observed in this area of the mound, which might tentatively be interpreted as post holes.

When this configuration is compared to the characteristics of some of the shell scatters, a similar pattern can be seen, which can be interpreted in terms

Site	Horizon	Lab Code	Material	<sup>14</sup> C (‰)	Age (yr BP)	Adjusted for local Marine Reservoir Effect	Age Cal. BC (yr) 2 σ
JE0004	Top	OxA-19587	Charcoal	-24.53	4709±31		3632–3561
JE0004	Base	BETA-255384	Shell ( <i>Chama reflexa</i> )	1.3	4850±50	4740±60	3270–2880
KM1057	Top	BETA-255385	Shell ( <i>Chama reflexa</i> )	2.4	4880±50	4770±60	3300–2900
KM1057	Base	BETA-255383	Shell ( <i>Chama reflexa</i> )	1.6	5010±50	4900±60	3380–3080

FIGURE 4. Radiocarbon dates.

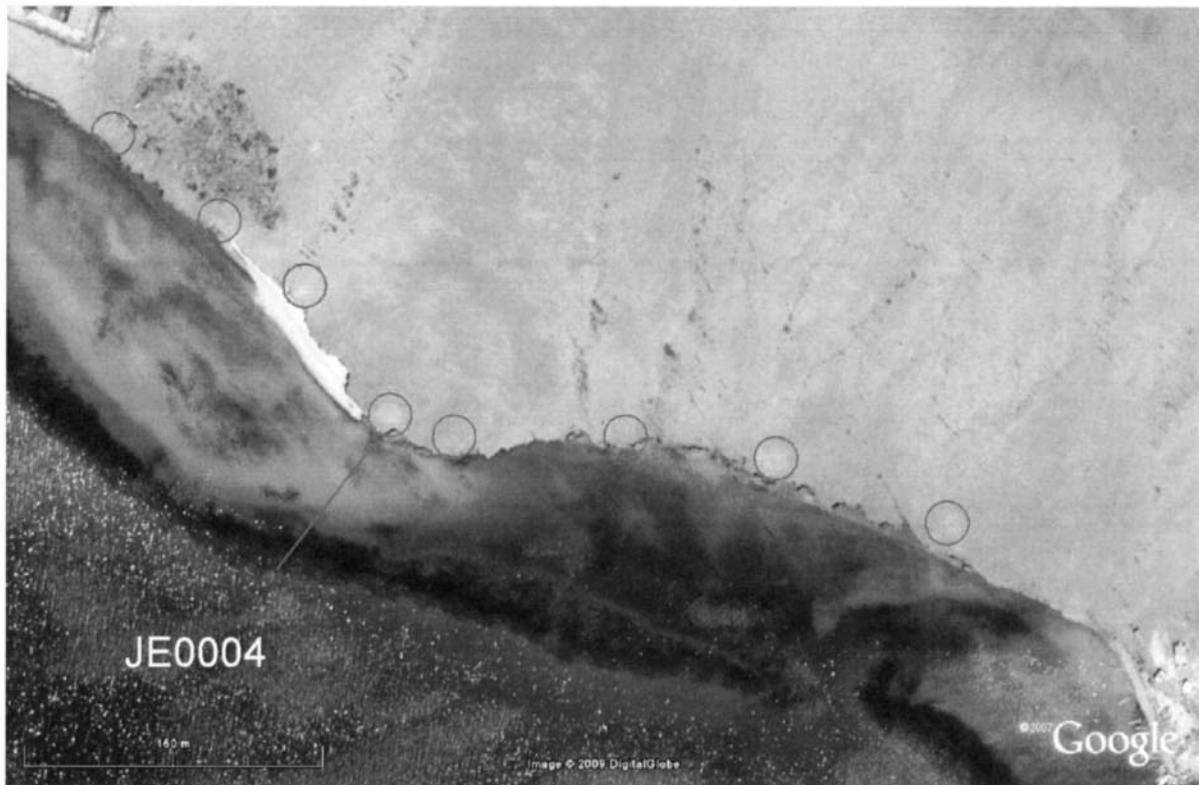


FIGURE 5. The location of the Janābah East group (circles denote the sites). The excavated mound designated JE0004.

of the “drop” and “toss” zone model (Binford 1978). This model describes how a group might sit about a focal point, normally a hearth, while eating or performing other activities, disposing of waste products in a manner whereby larger items (in this case the larger shells) are discarded by throwing them a certain distance over the camp fire, or over the shoulder. Smaller waste items (such as smaller shells) are dropped around the immediate area in which the group is sitting. This results in a very distinctive pattern of deposition (Fig. 7).

Two dates were obtained from the deepest part of the site,  $4740 \pm 60$  cal BP (BETA-255384) from the base, and  $4709 \pm 31$  cal BP (OxA-19587) from the top (Fig. 4). These dates show a rapid accumulation rate for the site, being within the margin of error for radiocarbon dating, indicating that the site was used intensively over a relatively short period of time. There is also evidence for erosion at the site, and loss of material from the uppermost part of the mound; this evidence comes both from the coastal erosion and the steep nature of the coastal side of the mound, indicating that sections have been lost to

the sea. Here a number of layers within the mound end abruptly at the surface mound where they appear to have been truncated.

## Discussion

The two case studies make for an interesting comparative study, both because of their contrasting coastal settings, and because of the difference of internal features. From the distribution of sites, it is clear that the coastal setting influences where shell sites are situated. Where there is an open, straight coastline, mounds accumulate along the edge of the shore in a linear distribution. There is some variation on this, where some smaller sites, mainly scatters, are set back a little from the main distribution, but the largest sites are situated at the water's edge. This pattern is clearly seen at both sites, to the north-west of the Khawr al-Ma'ādī and over the entirety of Janābah East. The transitory nature of the interior of the Khawr al-Ma'ādī bay has resulted in an apparently random distribution of sites, with both mounds and scatters densely packed into a

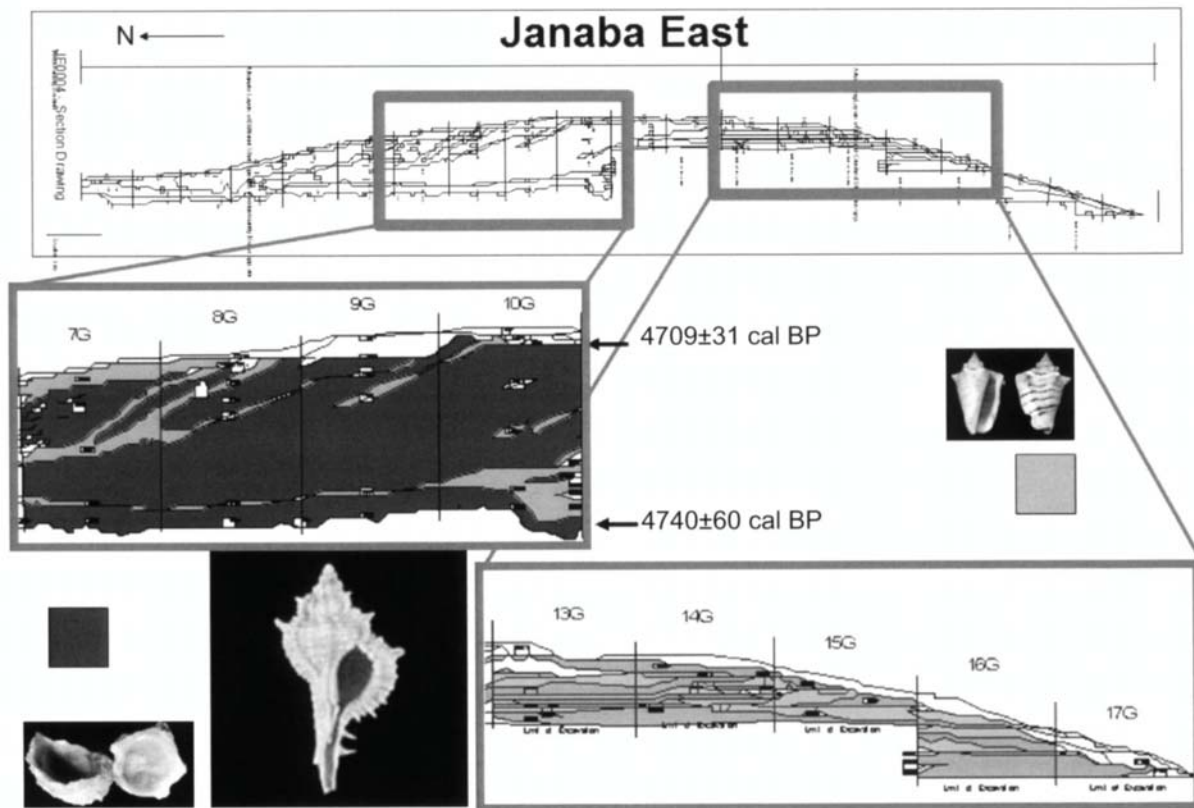


FIGURE 6. An annotated section drawing of site JE0004, excavated in the Janābah East group.

wide band between what were presumably the upper and lower limits of seasonal fluctuations in the water level of the bay. The larger sites are likely to have become self-selecting sites (e.g. Bailey, Chappell & Cribb 1994) during higher stands of water, since they would have presented dry islands on which to process and presumably consume the gathered food. Ethnographic studies have shown that shell mounds often accumulate at the nearest convenient location to the shell beds where the shells are gathered (e.g. Bird *et al.* 2002; Meehan 1982; Thomas 2007). This is primarily due to the bulky nature of shellfish, which acts as a limiting factor on the distance people are likely to carry the unshelled molluscs. Once the meat is removed from the bulky shells, it is often transported over longer distances, but the need to gather more food in the near future often results in camps being located at these sites with the incorporation of other non-shell (often terrestrial) material into the site. The differences in composition between the two sites might be related to this aspect, and reflect the activities taking place. The Khawr al-Ma'ādī site contained very little other material apart from the

*Strombus*, *Chama*, and the restricted ash matrix. However the Janābah East site contained concentrations of fish and mammal bone, indicating a wider variety of activities. This might indicate that the Khawr al-Ma'ādī site was used almost exclusively for processing the shells, either before transport or before consumption, as there is evidence only for a limited range of activities at the site. In contrast the Janābah East site might well have been a “home base”, being used for a much wider variety of activities, in addition to the processing of shellfish. The presence of possible post holes would strengthen this theory.

The question of why these two sites grew to become the largest sites in their respective groups is multifaceted. They have markedly different patterns of development, although both seem to have originated from a single point, and not from an amalgamation of smaller sites as one hypothesis suggests. The activities at each site have had a large influence on their formation and the size of the sites relative to each other is perhaps a reflection of this. It may be that changing resource exploitation strategies over time are responsible, since the Khawr al-Ma'ādī site



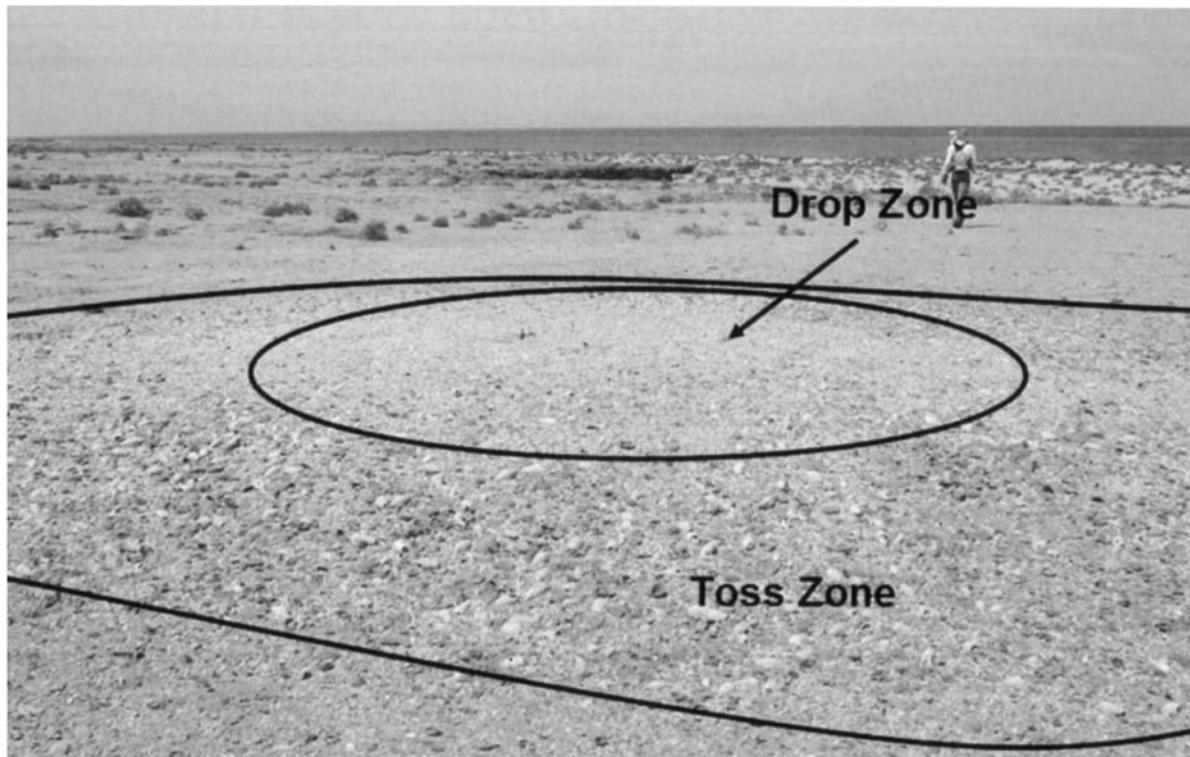


FIGURE 7. A shell scatter showing the “toss and drop zone” pattern.

closely predates Janābah East (if the radiocarbon dates are taken at face value). This difference in timings might also be indicative of changing environmental factors having ecological implications, with more accessible shell beds becoming unproductive, forcing the exploitation of harder-to-access resources. The primary reason for their dominant size would seem to be location, which would appear to be primarily responsible for their large size. It may be that the locations lent themselves to longer occupation, whether a larger area could be accessed using the sites as a base, or whether the better visibility and transport opportunities resulted in more frequent visits to the sites. Janābah East offers a good potential for fishing, and displays a greater diversity of activities taking place at the site. It is uncertain what opportunities would have been available in the Khawr al-Ma‘ādī. The more limited assemblage found at the Khawr al-Ma‘ādī site may well be specific to the activities carried out on the excavated mound, rather than a representation of the available resources. Analysis of material from the surrounding mounds obtained during test pitting may well uncover a broader assemblage in these surrounding sites.

## Conclusions

The most obvious difference between the sites is their internal structure and composition. This can be interpreted as a reflection of the activities taking place on each mound. It can therefore be said with some confidence that the formation of a mound is linked both to the exploitation strategies and the activities associated with each site. That different activities were taking place at both sites might be linked to the age of the mounds and the fact that they come from two different phases of mound-building activity. However, it might also be a product of different exploitation strategies being employed to deal with the different coastal settings of each site. Perhaps it is a result of both, or of environmental change impacting on shell-bed productivity and forcing the exploitation of more inaccessible coastline. Certainly at Janābah East there is no obvious sign of environmental change, yet the site went out of use. Could this be indicative of over-exploitation? The dates of the two sites are (within the uncertainties of radiocarbon dating) very close, and may even overlap. This suggests that both sites result from the

same phase of shell-mound building activity, or at least two phases which closely follow one another.

These sites do stand out because of their positioning in prominent locations on the coastline. Location is likely to be influential in the emergence of large centrally located shell mounds, at least in this area. Any conclusions regarding a link between mound composition and mound size will have to wait for the analysis of test pit material from the surrounding mounds, together with information from the dating programme.

The dating of the sites falls within the broad chronology of shell-bearing sites as outlined by Bailey *et al.* (2007). On a broader timescale these sites fall close to the onset of more arid conditions in the region (e.g. Arz *et al.* 2003), which occurred between 6000–5500 BP. These sites might represent an intensification of coastal resource exploitation, as aridity forced people to find alternative food sources. It is also around this time (c.6000 BP) that sea levels stabilized at their present levels, which might also have influenced the degree to which coastal resources

were exploited. Certainly the location of the sites over 40 km from the mainland suggests that these people were already coastally adapted, and capable of making voyages far out to sea. Broadly contemporaneous shell-bearing sites demonstrating similar qualities to the Janābah East site have been found on the adjacent mainland near Jizān (e.g. Zarins, Al-Jawad Murad & Al-Yish 1981). How much contact they had with the mainland is debatable, but seasonal movements between the Farasān Islands and the mainland cannot be ruled out.

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