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# 20

# Shell Mounds of the Farasan Islands, Saudi Arabia

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*The Farasan Islands preserve one of the largest concentrations of shell mounds in the Arabian Peninsula and one of the largest known anywhere in the world, with over 3000 recorded shell middens, ranging from surface scatters to numerous mounds up to 5 m in height. Excavations of two mounds in contrasting locations, together with sampling of other sites, suggests that the main period of mound accumulation occurred over a relatively short period of several hundred years between about 5500 and 5000 cal BP. The largest concentrations of mounds are around shallow marine bays which formerly provided extensive and productive habitats for molluscs, but which have subsequently become dry, sand-filled basins because of sediment accumulation and tectonic uplift. This is evidence for a shoreline environment that is highly dynamic, geomorphologically and ecologically, and this may account for the differential spatial and temporal distribution of shell middens, and also for variations in the composition of mollusc assemblages from sandy-shore to rocky-shore species. The internal structure and formation of the excavated mounds also shows significant variation, one being almost entirely a shell dump with little other material, the other showing considerable internal variation with hearths, dump areas, and numerous remains of fish bones and some land mammals. Later shell deposits associated with prehistoric and protohistoric potsherds are situated inland of the shoreline and are not mounded like the earlier deposits. Earlier shell mounds, if they existed, would now be submerged because of sea-level change, and underwater investigations are now under way to test this possibility. It remains unclear whether the known concentration of mounds represents an unusual concentration of activity because of the onset of increased aridity, which may have forced an intensification of marine exploitation, or is the continuation of an earlier pattern of shellgathering that is now obscured by sea-level rise.*

## Introduction

The Farasan Islands in the southern Red Sea comprise over 100 islands of varying size, dominated by the three major islands of Farasan Kabir, Saqid and Qumah (Figures 20.1 and 20.2). A brief visit by the Comprehensive Archaeological Survey Program of Saudi Arabia in the 1970s first brought the existence

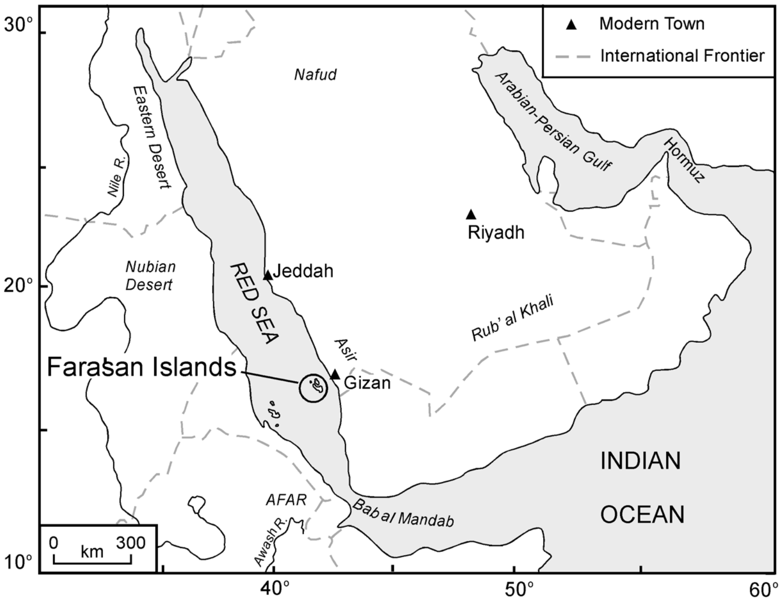



*Figure 20.1. Map of the Red Sea and the Arabian Peninsula showing the location of the Farasan Islands. Drawn by Geoff Bailey.*

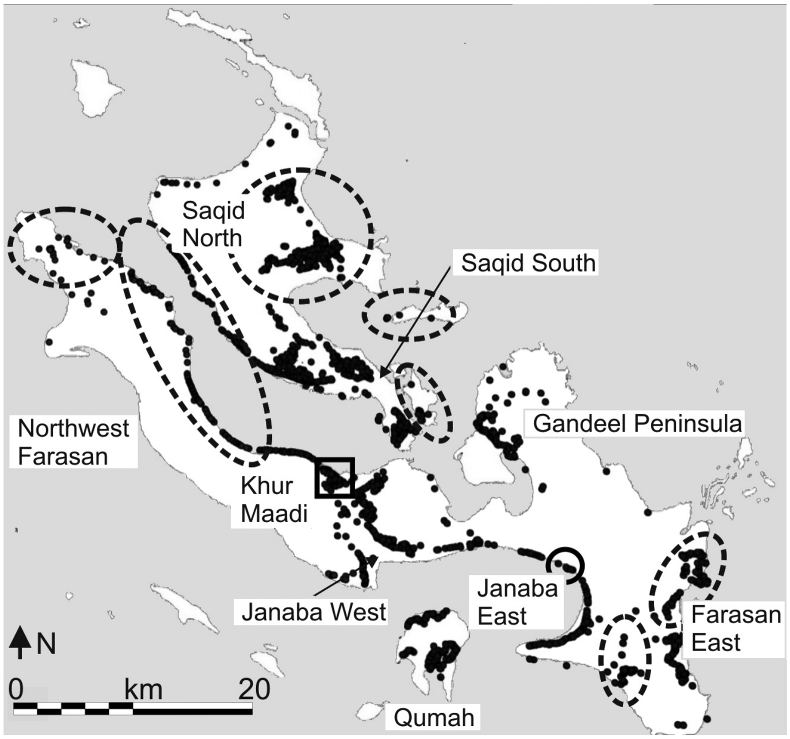



*Figure 20.2. Map of the Farasan Islands, showing the principal islands, the distribution of shell mounds, and other places mentioned in the text. Drawn by Matthew Meredith-Williams.*

of prehistoric archaeological material on the Islands to light, and referred to some radiocarbon dates taken from an excavation of a shell mound near Farasan town, but without further detail (Zarins et al., 1980). In the geological literature there is also reference to the 'shell banks' of the Farasan Islands, which implies that the shells were natural accumulations created by wave action (Jado and Zötl, 1984). However, the richness of this material was scarcely appreciated until we began systematic survey in 2006, which revealed the existence of one of the largest concentrations of shell mounds known anywhere in the world (Bailey et al., 2007a,b). Between 2006 and 2009, we conducted systematic survey and excavation on the Islands, demonstrating both the cultural origin of the shell mounds as middens representing food waste and other human activities, and also the extraordinary number and size of the sites, amounting in total to over 3000 recognisably discrete shell mounds, many of them very substantial deposits up to 5 m thick. Coastal sites, some of which might be described as shell mounds, have been recorded on the mainland coastlines of the Arabian Peninsula, some extending back to the 8th millennium BP, while others are clearly of much more recent age (Zarins et al., 1980; Edens and Wilkinson, 1998; Beech, 2004; Durrani, 2005).

That such a large body of material could have escaped notice for so long compared to the well known concentrations of shell mounds in other parts of the world is due to the inaccessibility of the Islands, their designation until recently as a military area, the low density of the local human population, the lack of modern development, and the rarity of visiting archaeologists. The shell mounds represent an almost pristine distribution of material, with little of the damage or destruction so widely reported in other parts of the world. As such, they give an insight into what the distribution of shell mounds might have looked like in such regions before the ravages brought about by the developmental pressures of intensive agriculture and industrial civilization. They are also, perhaps, an indication of how much more material of a comparable nature may yet await discovery in other similarly inaccessible or under-explored coastal and island regions.

Our investigation of these sites took place as part of a wider project into the significance of coastal environments and marine resources in relation to recent debates about very early patterns of human dispersal out of Africa (Alsharekh and Bailey, in press). A key issue in this debate is the possible significance of marine food resources and seafaring in facilitating a rapid and primary dispersal from the African

*Figure 20.3. The JE0004 shell mound at Janaba, showing the cliff line with an undercut notch formed by marine erosion. Photo by Matthew Meredith-Williams.*

Rift across the southern end of the Red Sea, around the coastlines of the Arabian Peninsula, and thence to the Indian subcontinent and southern Asia, a process believed to have taken place at least 60,000 years ago and quite possibly 130,000 years ago or even earlier (Bailey et al., 2007a,b; Bailey, 2009; 2010; Lambeck et al., 2011; Alsharekh and Bailey, in press). The Farasan Island shell mounds, on current evidence, do not date back before about 6000 years ago, as is typical of large open-air shell mounds throughout other coastal regions of the world. Since this date coincides with the time when sea level was established at about the modern position, here, as elsewhere, this pattern raises some fundamental questions about the longer term history of human interest in marine resources:

(a) Are the shell mounds simply the first visible expression of coastal settlement and marine exploitation following cessation of the postglacial sea-level rise? In other words do they represent the most recent fragment of a much deeper history of human engagement with coastal environments and marine resources, most of which is now invisible, with similar and much earlier material now washed away or submerged by marine inundation?
(b) Alternatively, do the shell mounds represent a particular set of historical circumstances in the mid-Holocene without precedent, an expression of social, ecological, demographic and economic circumstances that are peculiar to their time and place? In other words, do they reflect a process of intensification on a scale not witnessed in earlier periods of prehistory?
(c) More generally, to what extent do the shell mounds represent a typical archaeological signature of the type that we might expect to be generated by any sustained human settlement in coastal regions?

Here, we set out what we currently know about the broad spatial and temporal distribution and contents of the Farasan shell mounds, and identify problems in need of further investigation.

## The Farasan Islands

The Farasan Islands are composed mainly of fossilised coral reefs, uplifted by salt-doming, that is by upward movement of Miocene evaporites (thick underlying salt deposits) (Macfadyen, 1930; Dabbagh et al., 1984). Deformation by salt tectonics has resulted in a complex onshore and offshore topography, with the oldest coral material reaching elevations of ~80 m above sea level in the northwest of Farasan

Kabir. Offshore, localised deformation of salt deposits has resulted in circular depressions several hundred metres deep.

Along many sections of coastline, the land surface comprises a gently sloping coral platform, which represents an ancient and now elevated coral terrace, and ends abruptly at the present-day shoreline, with undercutting of the coral bedrock by the chemical and physical action of seawater to form a low cliff behind the modern beach that is typically up to ~3 m above present sea level, although the height is variable in different parts of the Islands because of tectonic distortion. This coral platform was most likely created during the period of high sea level at about 125,000 to 130,000 years ago. The undercut notch visible today is the result of marine erosion during the past 6000 years. Many shell mounds are located directly above this shoreline feature (Figure 20.3).

Extensive accumulation of marine sand on some stretches of coastline in recent millennia means that many areas that were formerly shallow bays or shallow marine channels have now become filled with sand, extending the area of dry land seawards, and leaving the original shoreline and its undercut coral terrace marooned some distance inland. Recent tectonic movement is visible in the tilting and warping of this undercut terrace, and localised uplift has most probably contributed to the infilling and drying out of former shallow bays and channels. In other cases again, the original shoreline is difficult to discern because it has been subjected to local tectonic subsidence and masked by the accumulation of sand.

Annual rainfall today as elsewhere in the Red Sea coastal regions rarely exceeds 180 mm, and most of it occurs in the winter months, when a flush of green vegetation spreads more widely across the landscape (Edwards and Head, 1987). For the rest of the year, the landscape has the aspect of bare and barren coral, with occasional pockets of soil forming in valley bottoms in areas of higher relief. Vegetation in the dry season is mainly confined to areas where ground water is close to the surface. Concentrations of shrubs are particularly noticeable along the line of the many natural fissures and cracks in the coral bedrock created by tectonic deformation, and standing water is sometimes visible at a depth of about 3 m at the bottom of the larger and wider fissures. Isolated clumps of palm trees occur sporadically on flat coastal plains where former marine bays have filled with sediment to create dry land, but where water is present close to the surface. Springs also occasionally emerge at the shoreline at the base of wave-cut coral cliffs.

Naturally-occurring resources include a sub-species of gazelle, *Gazella gazella farasani*, a rich inshore and intertidal marine environment with great variety of fish and marine molluscs, turtles and sea mammals, and migratory birds. These would have afforded an attractive variety of resources for non-agricultural people dependent on hunting, fishing and gathering.

## The archaeological context

The archaeological sequence is still known only in outline. The Comprehensive Survey Program of Saudi Arabia visited the Islands briefly in the late 1970's, and reported a number of upstanding remains made of blocks of coral or faroush (beach rock consisting of a cemented breccia comprising fragmented coral, shell and sand) and a small number of sites including shell middens in the vicinity of Janaba Bay and on the opposite island of Qumah. Discoveries included potsherds of the South Arabic Civilization dated to the first centuries AD, and some prehistoric material described as 'Neolithic' (Zarins et al., 1980). Some radiocarbon dates were obtained from sampling of shell mounds by visiting archaeologists and geologists, confirming radiocarbon ages as early as 5400 BP (Table 20.1).

Our more recent surveys have established the presence of large numbers of stone structures across the landscape. Ceramics are widely distributed either in association with these stone structures, or on extensive shell scatters that are situated some tens to hundreds of metres inland of the immediate shoreline. However, ceramics are absent from the larger shell mounds at the shore edge, which may indicate that they belong to an earlier period, or that they are of similar date to the other sites but lack ceramics because of their specialised function as shell dumps. The ceramics include Islamic and pre-Islamic material, and most probably include prehistoric material that is older than the period of the South Arabic Civilization. Evidence of Hellenistic and Roman material is also present.

| Lab No. | Provenance | Sample material | $^{13}C/^{12}C$ Ratio | Conventional radiocarbon age BP | Calibrated 2σ range cal BC | Calibrated 2σ Range cal BP |
|---|---|---|---|---|---|---|
| Beta-255383 | Top JE 0004 | Shell | +1.6 ‰ | 5010±50 | 3352–3646 | 5301–5595 |
| OxA-19587 | Base JE 0004 | Charcoal | –24.53 ‰ | 4709±31 | 3561–3632, 3492–3536, 3373–3469 | 5510–5581, 5441–5485, 5322–5418 |
| Beta-255385 | Top KM 1057 | Shell | +2.4 ‰ | 4880±50 | 3161–3566, 3130–3151 | 5110–5515, 5079–5100 |
| Beta-255384 | Base KM1057 | Shell | +1.3 ‰ | 4850±50 | 3097–3512 | 5046–5461 |
| Beta-255386 | Khur Maadi (KM1367) | Shell | +2.1 ‰ | 3580±50 | 1471–1851 | 3420–3800 |
| UCL-435 [1] | Janaba Bay | Shell | | 5400±200 | 3796–4686 | 5746–6636 |
| GX-10354 [2] | Farasan, Level 3 | Shell? | | 5235±225 | 3632–4547, 3536–3562 | 5582–6497, 5486–5512 |
| GX-10355 [2] | Farasan, Level 3 | Shell? | | 4810±170 | 3264–3969, 3102–3244 | 5214–5919, 5052–5194 |
| GX-10356 [2] | Farasan, Level 2 | Shell? | | 2410±100 | 356–796, 234–286 | 2306–2746, 2184–2236 |
| VRI-599 [3] | Farasan South | Shell? | | 4330±100 | 2340–2907 | 4289–4856 |

*Table 20.1. Radiocarbon dates from the Farasan Islands. Calibrated dates are based on the INTCAL04 dataset (Reimer et al. 2004). Additionally, shell dates have been corrected for a regional offset for the marine reservoir effect, using a figure of –100±50. This figure is based on shell-charcoal paired samples from JE0004. This compares with the reservoir correction of 110±38 produced by Southon et al. (2002). 1 Rashad Bantan, pers. comm. 2004, 2 Masry, 1990, 3 Felber, H. 1980, p. 112.*

## Shell mound characteristics

The shell mounds occur in a variety of shapes and sizes ranging from small surface scatters to quite large, conical mounds. The dominant species throughout is the small gastropod *Strombus fasciatus*. This species is typically found in shallow and well-sheltered sandy bays where the water is calm and sea grass is able to grow on the seabed. Our own observations show that in favoured conditions these shells occur in very large numbers, up to 50 live specimens per square metre, and can be easily scooped up in large numbers while wading in shallow water. A range of other bivalve and gastropod molluscan species is present in the mounds (Table 20.2), and the proportions of species show some variation in different areas according to local ecological conditions. But the dominant species in the great majority of sites is *S. fasciatus*.

### *Morphology*

Broadly three categories of shell mounds can be distinguished.

*Scatters*

These are concentrations of shells that appear to be little more than the thickness of one or a few shells and show no evidence of forming a deposit that rises significantly above the level of the surrounding surface. Scatters typically fall in the size range of 5–10 m in diameter and are usually roughly circular or oval in plan, though they may sometimes be more extensive.

*Low mounds*

These are mounded deposits that are less than 1 m thick but with more depth of deposit than that implied by a scatter. Typically the depth of deposit is estimated to be about 0.5 m. These deposits may be more or less circular or oval in plan and may vary considerably in their spatial

| Class | Family | Species | Common Name | Max Size mm | Habitat | JE 0004 | KM 1057 |
|---|---|---|---|---|---|---|---|
| **Bivalvia** | Anadarinae | *Anadara antiquata* (Linnaeus 1758) | Antique Ark | 100 | Shallow water with sandy substrate | R | – |
| | Anomiidae | Anomia species | | | | R | – |
| | Arcidae | *Arca avellana* (Lamarck 1819) | Hazelnut Ark | 40 | Low littoral and sub littoral. Bysally attached to coral and rock | C | R |
| | | *Arca ventricosa* (Lamarck 1819) | Ventricose Ark | 120 | In crevices of sub littoral rocks and coral | C | R |
| | | *Barbatia setigera* (Reeve 1844) | | 50 | Sub littoral. Bysally attached to rocks | R | – |
| | Carditoidea | *Cardites bicolor* Lamarck 1819) | | 55 | Offshore in coarse sand and gravels | R | – |
| | Cardiidae | *Beguina gubernaculum* (Reeve 1843) | Rudder Cardita | 50 | Bysally attached on hard substrate | C | R |
| | | *Fragum nivale (*Reeve 1845) | | 26 | Sand in shallow water | R | – |
| | | *Tridacna maxima* (Röding 1798) | Giant Clam | 400 | Shallow water on coral reefs | R | – |
| | Chamidae | *Chama reflexa* (Reeve 1846) | Jewel Box | 90 | Littoral (intertidal) to 30m depth, cemented to coral or rock substrate | A | C |
| | Mytilidae | *Mytilus species* | Mussel | | Bysall attachment to rock | | R |
| | | *Brachidontes variabilis* (Krauss 1848) | Mussel | 40 | Littoral. Bysally attached to coral and rock | C | R |
| | | *Modiolus ariculatus* (Krauss 1848) | | 70 | In crevices on rocky shores | R | – |
| | Ostreoidea | *Ostrea* species | Oyster | | Cemented to rock and coral | C | C |
| | Pectinidae | *Chlamys townsendi* (Sowerby 1865) | Scallop | 200 | Lower shore and below attached to or among rocks | – | R |
| | Pinnoidea | *Pinna* Species | Fan Shell | | Embedded in sand. Byssus attached to sediment particles | – | R |
| | Plicatulidae | *Plicatula plicata* (Linnaeus 1767) | Kittens Paw | 50 | Low littoral. Cemented to rocks and coral | A | R |
| | Pteriidae | *Pinctada species* | Pearl Oyster | 200 | Bysally attached to coral and rock | A | R |
| | | *Pinctada cf nigra* (Gould 1850) | Pearl Oyster | 50 | Most common at 5–25m. Bysally attached to coral and rock | A | R |
| | Spondylidae | *Spondylus marisrubri* (Röding 1798) | Thorny Oyster | 100 | Offshore. Cemented to rock and coral | C | R |
| | Tellinoidea | Tellinidae species | | | Wide range of habitats | R | R |
| | Veneroidea | Pitar Species | | | Offshore, deep water in mud | R | – |
| | | *Tapes deshayesi* (Sowerby 1852) | | 40 | Offshore | R | – |
| **Gastropoda** | Buccinidae | *Engina mendicaria* (Linnaeus 1758) | Striped Engina | 16 | Shallow tide pools | R | – |
| | Cerithhiidae | *Cerithium nodulosum adansonii* (Bruguière 1792) | Giant Knobbed Cerith | 60 | Intertidal in sand | R | R |
| | Conidae | Conus species | Cone Shell | | | C | R |
| | | *Conus ardisiaceus* (Kiner 1845) | | 35 | In sand under rocks and rock ledges | C | – |
| | | *Conus arentus* (Hwass 1792) | Sand-dusted Cone | 50 | Among coral and beached | C | – |
| | | *Conus erythraeensis* (Reeve 1843) | Red Sea Cone | 25 | Shallow water | R | – |
| | | *Conus textile* (Linnaeus 1758) | Textile Cone | 70 | Intertidal under rocks | R | – |
| | Cypraeidae | *Cyprea clandestina* (Linnaeus 1767) | Clandestine Cowrie | 18 | Under rocks and in rock crevices | R | – |
| | | *Cyprea turdis* (Lamarck 1810) | Thrush Cowrie | 30 | On dead coral and among muddy stones | R | – |
| | Fasciolariidae | *Pleuroploca trapezium* (Linnaeus 1758) | Horse Conch | 200 | Intertidal on sand to 6m depth | R | R |
| | | *Fusinus townsendi* (Melvill 1899) | | 70 | Offshore | | R |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Fissurellidae | *Submarginula subrugosa* (Theile 1916) | | 12 | Beached | R | – |
| | Melongenidae | *Volema paradisiaca* (Röding 1798) | Pear Melongena | | | | R |
| | | *Volema paradisiaca nodosa* (Lamarck 1822) | | 50 | Intertidal on sand | R | R |
| | Muricidae | Chicoreus Species | | | | C | R |
| | | *Chicoreus ramosus* (Linnaeus 1758) | Ramose Murex | 160 | On intertidal rocks and coral | C | R |
| | | *Rapana rapiformis* (Born 1778) | Turnip-shaped Rapa | 70 | Deep sub littoral, sandy substrate | R | – |
| | Nassariidae | *Nassarius (Nassarius) arcularia plicatus* (Röding 1798) | | 22 | Intertidal on sand | R | R |
| | | *Nassarius (Niotha) splendidulus* (Dunker 1846) | | | Offshore and intertidal | – | R |
| | Neritidae | *Nerita adenensis (Mienis 1978)* | | 18 | Intertidal on rocks | C | – |
| | | *Nerita albicilla* (Linnaeus 1758) | Ox-palate Nerite | 23 | Intertidal on rocks | C | – |
| | | *Nerita longii* (Récluz 1841) | | 30 | Intertidal on rocks | C | – |
| | | *Nerita polita orbignyana* (Récluz 1841) | | 18 | Intertidal on rocks | C | – |
| | | *Nerita textiles* (Gmelin 1791) | Textile Nerite | 35 | Intertidal on rocks | C | R |
| | Ocinebrinae | Ocinebrina Species | | | Offshore | R | – |
| | Ranellidae | *Gyrineum (Gyrineum) natator* (Röding 1798) | Tuberculate Gyre Triton | 30 | Offshore and intertidal on rocks | R | – |
| | Strombidae | *Strombus fasciatus* (Born 1778) | Lineated Conch | 65 | 1–3m depth in sheltered, sandy bays with fine sea weed | A | A |
| | | *Strombus (Tricornis) oldi* (Emerson 1965) | Old's Conch | 100 | In sand offshore and beached | R | – |
| | | *Strombus (Tricornis) tricornis* (Lightfoot 1786) | Three-knobbed Conch | 115 | Offshore in sand | R | R |
| | | *Tibia insulaechorab curta* (Sowerby 1842) | | 150 | Intertidal on sand | – | R |
| | Triphoridae | *Viriola corrugata* (Hinds 1843) | | 15 | Feeding on sponges | R | – |
| | Trochidae | *Trochus dentatus* (Forskål 1775) | Knobbed Topshell<br>Red Sea Topshell | 80 | Shallow sub tidal, sandy bottom | R | C |
| | | *Trochus (Infundibulops) erythreus* (Brocchi 1823) | Red Sea Top | 35 | Intertidal on rocks | R | – |
| | | *Trochus (Infundibulum) kochi* (Philippi 1884) | | 45 | Intertidal on rocks | R | – |
| | Turbinidae | Turbo species | Turban Shells | | Intertidal on rocks | R | R |

*Table 20.2. Principal mollusc species. Species are listed in taxonomic order with information on general size range and habitat, and on their frequency within each mound: A: abundant; C: widely distributed but in small numbers; R: rare; – absent.*

dimensions, but they can also form linear-like features, following the line of the shoreline.

*Mounds*
These are deposits that are estimated to be at least 1 m thick. The tallest are 4–5 m high. Again these are broadly oval in plan.

The distinction between these categories is not sharp, and there are obvious difficulties in the field in distinguishing from surface indications alone whether a shell deposit is a scatter or a low mound. Nevertheless, they provide a useful proxy measure of the general concentration and distribution of shell deposits across the landscape. All three types of deposits usually occur as discrete features with a fairly well marked boundary between the shell deposits and the surrounding land surface. Some of the larger sites have an apron of shells that may grade into the surrounding surface, and in some places the mounds form an almost continuous row of mounded deposits extending for hundreds of metres along the shoreline.

A characteristic feature of the low mounds and scatters is that, notwithstanding the overall dominance of *S. fasciatus* shells, they often show a spatial segregation of shell species, with a central area composed predominantly of *S. fasciatus*, and a peripheral zone in which larger shell species, typically the large bivalves such as *Chama reflexa* and *Spondylus marisrubri*, or larger gastropod species of *Chicoreus* and *Pleuroploca*, are more common. This suggests a spatial patterning typical of the drop and toss zones described by Binford (1978) as occurring around a central hearth area, with smaller material dropped on the ground close to the hearth, and larger objects being thrown or cleared away to the peripheries (Williams, 2010). Similar variation is visible in the stratigraphic section of excavated mounds, as described below, and suggests that such variation may also have a temporal component as well as a spatial one, reflecting changes in the relative abundance of different mollusc species in a particular locality.

***Distribution***
We have produced an overall distribution of the sites and their varying characteristics through a combination of satellite imagery, ground survey on foot, and by four-wheel drive vehicle and boat (Figure 20.2). We have used GPS to record the locations of sites, and made observations on overall dimensions, shell species and other surface characteristics for all sites and areas visited on the ground.

Different types of shell mounds often occur together in close proximity, forming a cluster of deposits of different sizes, usually with the largest mounds on the immediate shoreline, and low mounds or shell scatters situated some distance inland. These clusters may represent a single, coherent settlement system involving the use of different locations for different activities, perhaps at different times of year, by the same group of people. The shell mounds might have been used as short term sites for the processing of large numbers of shellfish close to the source of supply during periods when conditions were especially favourable for shellgathering, and the sites further inland might represent the main areas of habitation, better suited to a range of local factors such as shelter and access to water supplies and terrestrial plants and animals. It is even possible that the shell mounds were reserved for use at certain times of year associated with the gathering together of people from a wider territory for ceremonies and feasting, with intensification of shellgathering to feed the larger numbers of people present on such occasions, as described for the Anbarra people of northern Australia (Meehan, 1982; Brockwell, chapter 25). People might thus have moved to and fro between different sites in response to a variety of practical and social factors.

An alternative possibility is that the mounds and the inland scatters refer to two or more different settlement strategies belonging to different time periods in the overall sequence of occupation of the Islands. On this interpretation, the mounds might represent an earlier period when settlement was focussed on the shoreline and on marine activities including intensive collection of molluscs, and the inland scatters might refer to a later period with a more diversified pattern of settlement and economy including more emphasis on hinterland as well as marine resources and less emphasis on the collection of shellfish.

The fact that potsherds are often present on these inland shell scatters but almost never in association with the shell mounds might be seen to support this idea of a chronological separation between a 'pre-ceramic' and a 'ceramic' phase of settlement on the Islands. However, the absence of potsherds on the shell mounds might equally well be due to the different nature of the activities carried out there, and does not necessarily have chronological implications. Only a comprehensive programme of dating will help to discriminate between these alternative hypotheses.

### *Geoarchaeological context*

The great majority of the shell mounds throughout the Islands are located on the seaward edge of a fossilised coral platform. This platform is the dominant land form, and the seaward edge typically forms a low cliff, which has been undercut by marine erosion to form a characteristic notch or undercut, above which the archaeological sites are located (Figure 20.3). This cliff line varies in height in different parts of the coastline as a result of localised tectonic warping. On some shorelines the cliff top is elevated as much as 4–5 m above the present beach line. Elsewhere the cliff edge is barely distinguishable as a break of slope at the shore edge, and has been smothered by the encroachment of sand.

The largest shell mounds and the largest clusters of shell middens are found around the edges of very shallow bays that would formerly have provided an extensive habitat for *S. fasciatus*, but which are now filled with sediment and transformed into a dry land environment often with sand dunes. These infilled sediments should provide a dateable record of environmental change, particularly the transition from marine to terrestrial conditions. By investigating these sediments and tying them in with the archaeology of the adjacent shell middens through dating, it should be possible to clarify the impact of environmental change on shellgathering activity.

Geoarchaeological investigations in the form of trenches were initiated in the sediment infill of three shallow bays; these were located in the Gandeel Peninsula, Janaba West and the Khur Maadi. All of these investigations revealed the presence of a transition from shallow sandy subtidal environments through to terrestrial sediments. The Khur Maadi trench had an intact fossil shell bed with an in-situ assemblage of shellfish including an abundance of *S. fasciatus*. Investigations therefore focused on the Khur Maadi and were expanded to include a program of augering to determine the extent and nature of deposits in the bay, and to establish whether the cessation of shell gathering and mound formation was linked to a decline in shellfish productivity associated with the infilling of the bay.

## Excavations at Janaba and Khur Maadi

Two sites have so far been excavated, and were selected because of their contrasting coastal settings, and evidence of recent damage and the threat of future destruction by encroaching industrial activity.

### *Janaba East (JE0004)*

This site is on a small but prominent headland, characterized by a 2–3 m high cliff adjacent to inshore waters with a depth of 0.5–1 m (Figure 20.3). The mound is one of a small group of eight sites distributed in a line along the cliff top. Limited tectonic warping appears to have occurred here, since the cliff is well developed and undercut by up to 4 m, and may have been uplifted in relation to local sea level since the site was formed, meaning that, at the time when the site was occupied, access to the shoreline and its molluscan resources would have been easier.

The mound itself is an irregular oval shape approximately 25 m × 20 m in area and 2 m deep (Figure 20.4). In 2006 a narrow step trench was excavated down the southern flank of the site (Bailey et al., 2007), demonstrating highly stratified deposits with alternating layers of clean shell and ashy deposits. Excavations continued in 2008 and 2009, exposing a continuous section through the mound to the full depth of the deposits (Figure 20.5).

From the section it is clear that the site is comprised of two halves with contrasting compositions and formation histories. To the south is a series of hearths alternating with layers of clean *S. fasciatus*. These appear to represent episodes of shellfish processing centred on a hearth, the position of which shifted little over time. To the north there are thick layers dominated by the larger gastropods *Chicoreus ramosus* and *Pleuroploca trapezium*. This area of the site appears to represent episodes of dumping, although discrete layers and lenses of *S. fasciatus* hint at intermittent in situ activities. Numerous fish bone fragments were recovered

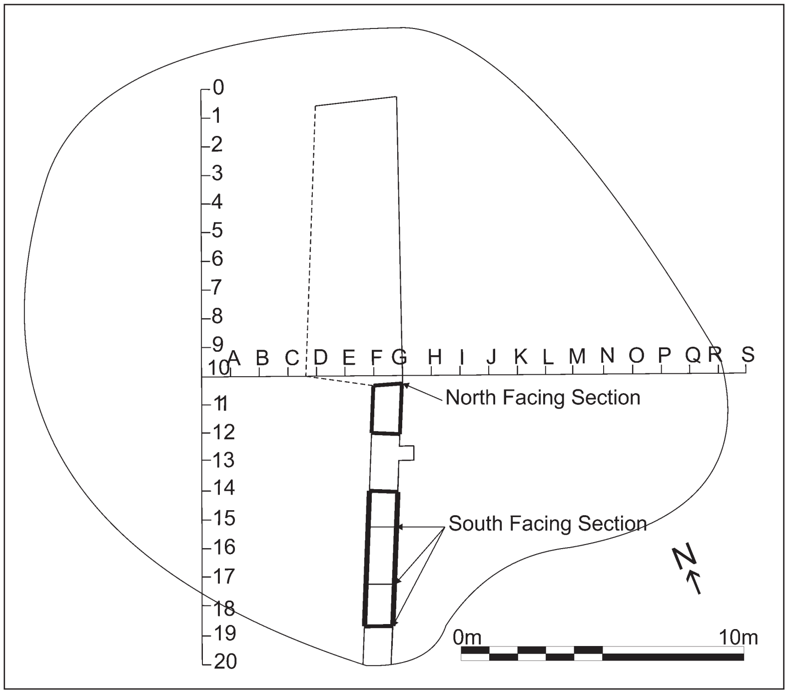



*Figure 20.4. Plan of JE0004 shell mound, showing excavation trenches. Drawn by Matthew Meredith-Williams.*

*Figure 20.5. Section through the JE0004 shell mound. Drawn by Matthew Meredith-Williams*

from the site, particularly around hearths. These represent small fish, perhaps no more than 10 cm in length, suggesting net capture, and preliminary identification indicates the presence of Myliobatidea, (eagle ray), Serranidea (groupers), Sparidea (sea bream), Scaridae (parrot fish) and Chondricthyes sp. (probably from the ray family). Also recovered were a small number of mammal bones of gazelle and some unidentified plant seeds. These suggest a broader economy exploiting both terrestrial and marine resources. Radiocarbon samples recovered from the base and top of the section in the centre of the site give dates of 5595–5301 cal BP for the top and 5581–5510 cal BP for the base, suggesting rapid accumulation within the limits of radiocarbon dating (Table 20.1).

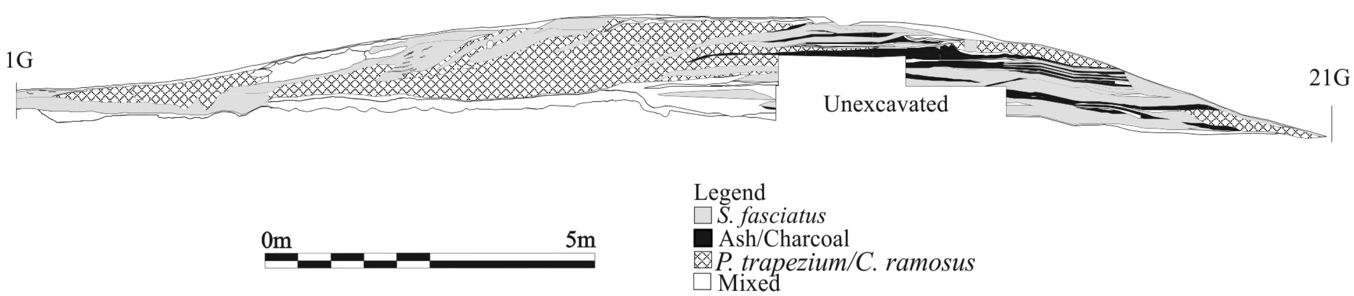
***Khur Maadi (KM1057)***

In the Khur Maadi Bay, a large shell mound, circular in plan, 30 m in diameter, and 3 m high, was targeted, taking advantage of an unstable section already exposed through the mound at the deepest point by bulldozing activity. The site is located at the mouth of a former bay which has since been uplifted and infilled, with the modern coastline now c. 400 m away. The site is part of a large group of 112 sites on the western side of the bay; these are distributed in linear fashion along the cliff line forming the inner edge of the original bay before infilling with sand, and in a more dispersed or clustered pattern extending inland from the cliff line (Figure 20.6). The KM1057 site sits at the junction between these two configurations.

A 1 m-wide stepped section was exposed through the mound at its deepest point (it was too unstable to risk extending wider). The section is dominated by layers of *S. fasciatus* (Figure 20.7). Most are clean shell with very little other material incorporated into them. The exception to this is near the top of the section where there are two layers of *S. fasciatus* with an ash matrix. There are also five thinner layers containing shells of *Chama reflexa* and *Spondylus marisrubri* near the top and the base of the section. This site appears to have been an intensive processing site for *S. fasciatus* with little other type of activity. Radiocarbon dates from the uppermost and lowermost layers yielded overlapping dates of 5515–5110 (5100–5079) cal BP for the top and 5461–5046 cal BP for the lower sample (Table 20.1), suggesting rapid accumulation as at the Janaba site.

***Discussion***

The two sites are markedly different in terms of their stratigraphy, formation processes, and local shoreline setting. JE0004 appears to have been used for a variety of activities, the



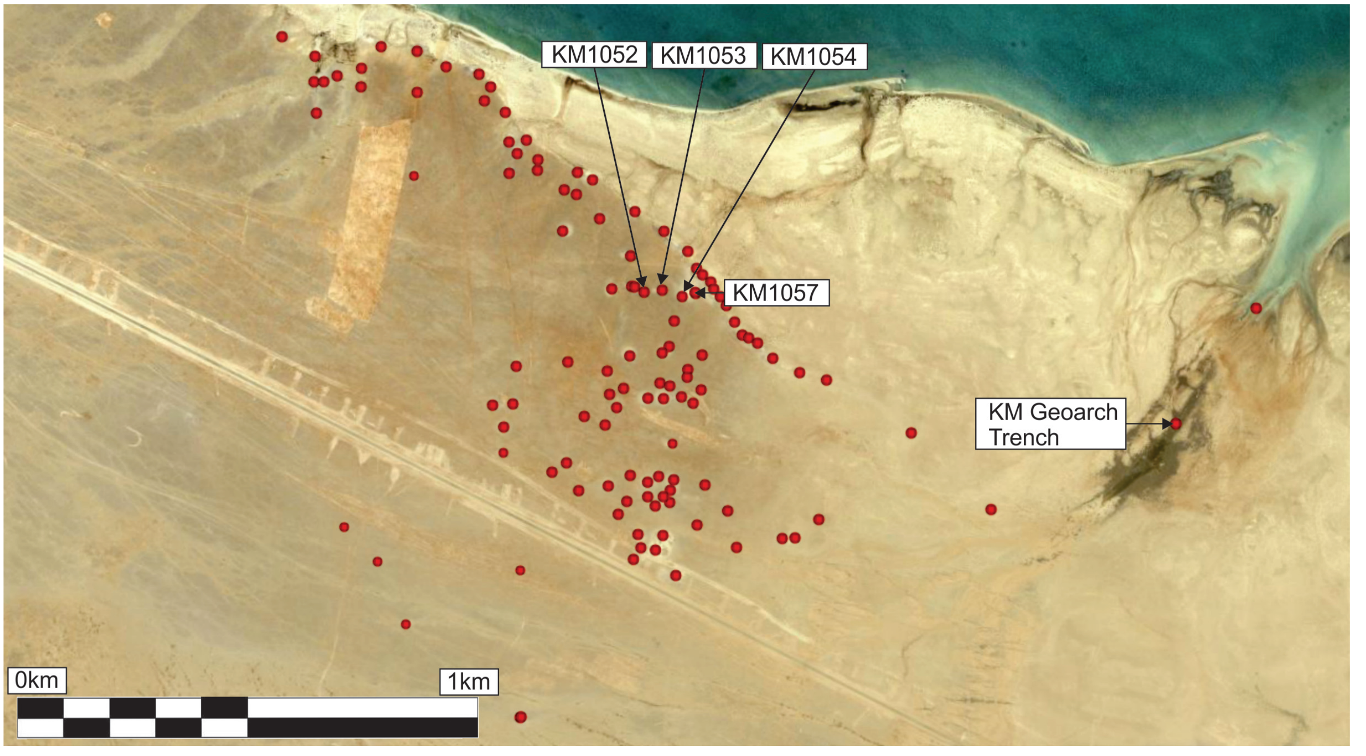



*Figure 20.6, Distribution of shell mounds in Khur Maadi Bay, with site locations superimposed on a Google Earth image. Compiled by Matthew Meredith-Williams.*

most prominent being intensive processing of shellfish, first with an initial focus on *S. fasciatus*, which later changed to *C. ramosus* and *P. trapezium*. These activities were centred on a hearth (or hearths) located in the centre and southern areas of the site. KM1057 appears to have been a specialised processing site for *S. fasciatus*, with very few other species present, or evidence of other activities. Both sites are conical shell mounds, and both result from intensive shellfish processing despite the other differences between them. Both sites also appear to have been the result of a short period of intensive shell gathering, as evidenced by the radiocarbon dates.

Based on these two excavated sites alone, the evidence suggests that exploitation of marine molluscs was a sudden burst of relatively short-lived activity. If these sites are representative of a wider pattern, then there are two possible types of explanation. The first is that this episode of mound formation coincides with short-lived windows of ecological opportunity, when unusually extensive and favourable habitats existed in shallow bays for the molluscs in question, particularly for *S. fasciatus*. This is possible at Khur Maadi, where the shallow bay in front of the mounded sites is now filled with sand deposits. However, coring of the sediment sequence in the bay demonstrates that *S. fasciatus* beds were still present for about 1000 years after cessation of shell accumulation at

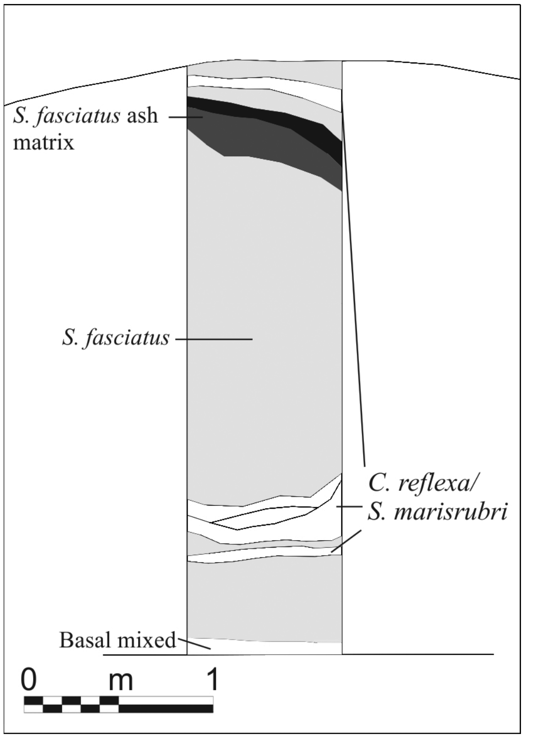



*Figure 20.7. Section through the KM1057 shell mound. Drawn by Matthew Meredith-Williams.*

KM1057 (Table 20.1). Of course it may be that the shell beds disappeared earlier in the immediate vicinity of KM1057, or that shell beds declined more widely across the bay without fully disappearing until a later date. Without more extensive dating of sediment samples in the bay, ecological change cannot be ruled out as the key factor in the cessation of shell accumulation.

At JE0004, the question of ecological change is less clear. A shallow bay still exists immediately in front of the site, but *S. fasciatus* molluscs, though present, are not abundant in the locality today. *S. fasciatus* beds grow best on sandy substrates in very calm conditions. Even a slight change in exposure and increase in wave action can remove an otherwise favourable habitat. The change in species dominance visible in the section, from layers dominated by *S. fasciatus* to layers dominated by *C. ramosus* and *P. trapezium*, indicates a shift, later in the history of site use, to greater reliance on gastropod species that are typically found on rocky, or rocky and sandy substrates, respectively. Another possibility at this site is that it was abandoned as a suitable location for mollusc consumption because relative sea level change made the shoreline less easily accessible.

An alternative possibility is that sites were abandoned, not because of changing ecological conditions but because of cultural factors. This might have involved a change of settlement focus, with abandonment of locations close to the shore for sites a short way inland and the disposal of shells in a more dispersed pattern without the focussed accumulation of shells into large mounds. An additional possibility that should not be excluded is that the whole basis of subsistence activity shifted away from an emphasis on marine molluscs, or perhaps their total abandonment in favour of other food resources.

In all these cases, a more extensive dating programme will be needed to distinguish between these various hypotheses.

## Conclusions

The sites on the Farasan Islands offer a unique insight into the development of an intensive coastal exploitation economy. The presence of sites of all sizes from scatters to large mounds is something which is rare in the archaeological record in other parts of the world, since smaller sites are commonly less visible, with taphonomic processes taking their toll. The excavations and dates suggest an intensive burst of activity, with two different modes of subsistence and site formation: one a broader economy targeting both marine and terrestrial resources at JE0004, and at the other a more specialised form of activity targeting the collection and processing of *S. fasciatus* at KM1057. There is evidence for local change in the shoreline and offshore features at both sites, with extensive palaeoshorelines and infilling of former bays around Khur Maadi, and a change in species composition at JE0004, both of which attest to the highly dynamic nature of the local shoreline geomorphology and ecology.

Perhaps the biggest uncertainty in assessing the longer-term history of settlement on the islands is what happened before the establishment of modern sea level about 6000 years ago, following the eustatic sea level rise at the end of the last glaciation. We have already carried out underwater explorations using shallow-diving and deep-diving techniques, and have established that palaeoshorelines are present underwater at a variety of depths showing the typical undercut notch that is visible along modern shorelines (Bailey et al., 2007a,b; Bailey, 2011; Alsharekh and Bailey, in press). However, we have not yet found unequivocal evidence of shell deposits similar to those visible on the modern shoreline. This may be due to a variety of reasons.

The first and most obvious is factors of differential preservation and discovery. It may be that we have not yet carried out sufficiently extensive underwater exploration to identify submerged sites, or that shell mounds undergo erosion and dispersal during the course of inundation, so that the remaining shell traces are difficult to identify as evidence of past human activity.

A second possibility is that the windows of ecological and geological opportunity that create shallow bays, extensive shell beds, and hence the possibility of large shell mounds, were much rarer during a period of rising sea level between 16,000 and 6000 years ago than during the period of relatively stable sea level that became established in the mid-Holocene.

The final possibility is that the shell mounds do indeed attest to an intensification of human interest in intensive exploitation of marine resources on a much greater scale than at any previous period. We know that the onset of widespread aridity in the southern Arabian Peninsula from about 6000 years ago onwards resulted in the abandonment of settlements over large areas of the hinterland (Parker, 2009; Carter, 2010), and this in its turn may have forced a more intensive exploitation of marine resources at the coast edge and exploration of offshore islands.

New investigations on land and underwater in the Farasan Region are currently in progress and should help to clarify the relative influence of these different processes and the complex interplay between them.

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