

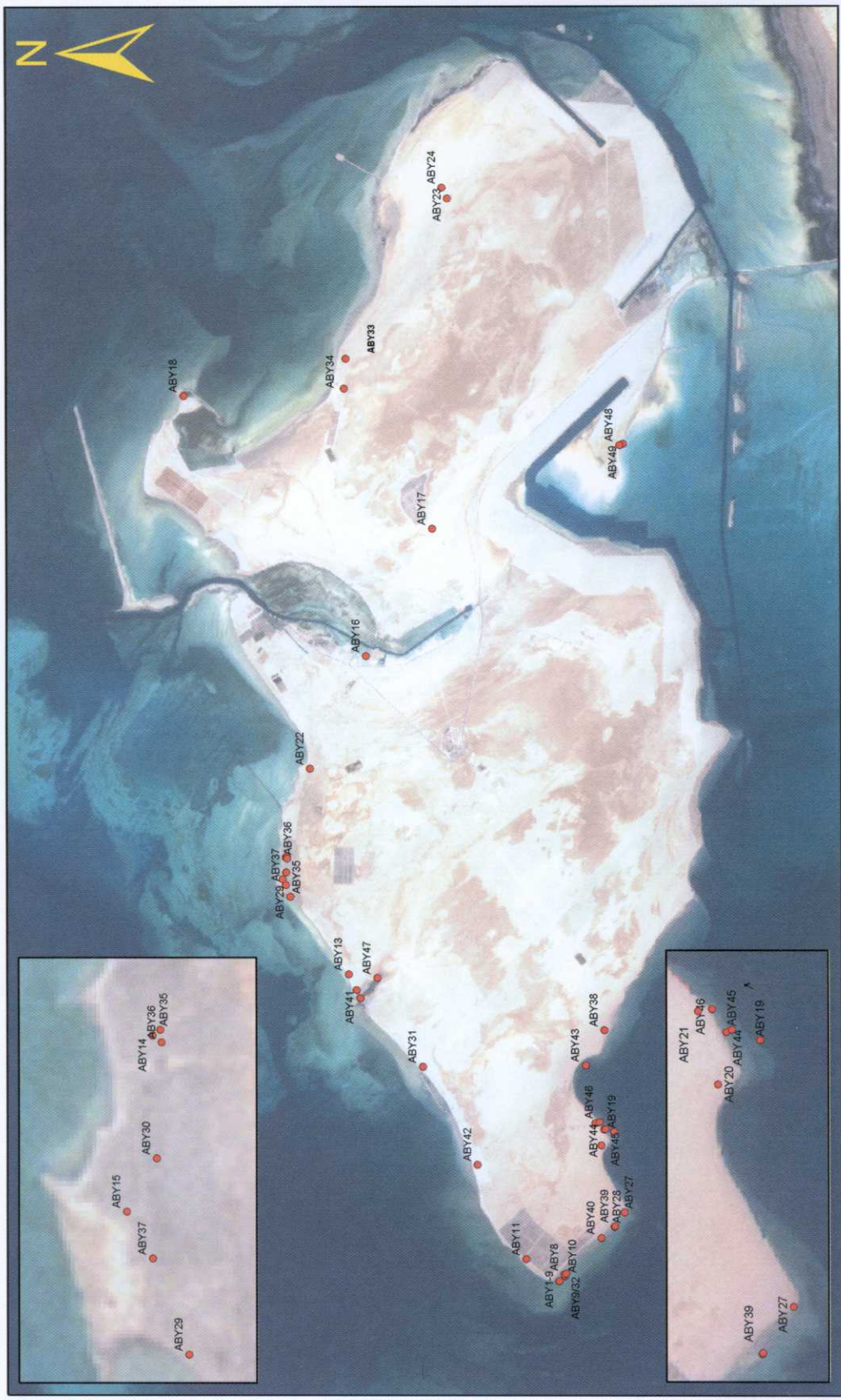
CHAPTER 2

THE ARCHAEOLOGY OF ABU AL ABYAD



BY: *PETER HELLYER AND DANIEL HULL*

Distribution of Archaeological Sites on Abu Al Abyad



Introduction

Investigations into the archaeology of Abu Al Abyad by the Abu Dhabi Islands Archaeological Survey, ADIAS, have shown that Man probably first settled on the island around 7,500 to 7,000 years ago during the Late Stone Age, at the very beginning of human settlement in the Emirates. Over fifty archaeological sites have so far been identified, and there are indications that the island has been occupied at several periods since then, with a particularly important phase during the Late Islamic period, covering the last 300-400 years, when it was a centre of the pearl fishing industry. Like many of the islands of Abu Dhabi, Abu Al Abyad was probably continuously occupied, perhaps seasonally, throughout the last 7,000 years, although further survey work, combined with excavations and scientific analysis of the finds, will be required in order to prove this. A summary gazetteer of the sites discovered so far is included at the end of the chapter.

Studies of the archaeology and history of Abu Al Abyad have been carried out using two very different techniques. Archaeological survey, excavation and analysis has provided much information on what is present on the ground, while this has been complemented by an examination of historical data to be found in old publications and the archives of the European powers whose navies were present in the region from the 16th Century onwards.

The earliest clearly recognisable historical references to Abu Al Abyad that have so far been traced by ADIAS date to the 1820s, and are related to the carrying out of hydrographic surveys by surveyors for the United English East India

Company and the Hydrographic Office of the (British) Royal Navy between 1821-1823. A description by Captain George Barnes Brucks of the Indian Navy, published posthumously in 1856 but based upon notes prepared in the 1820s, describes the island and the adjacent Khor al-Bazm as follows (Brucks 1856)

JAZEERAT BILLYAIRD

The northern point is in lat. 24 deg. 15' 40" N., long. 53 deg. 55' 40" E.; western point in lat. 24 deg. 8' 50" N., long. 55 deg. 43' 20" E. This island is situated on the southern side, at the upper part of Khore el Bezzim, and the northern part faces the sea. It is thirty-two miles in length and about seventy in circumference; is formed of low sandhills, except at the eastern end, where it is more rocky, and has several groves of mango trees.

KHORE EL BEZZIM

Khore el Bezzim is formed on the northern side by East India Company's Islands, and on the south by the mainland of Arabia and is forty miles deep from its entrance at Bezzim el Gurabee (Bazm Al Charbi) ... This place is said to have been one of the resorts of the pirates, and many of their boats were said to have been here at the time of the expedition (i.e. at the time of the British naval expedition against Ras al-Khaimah and other ports of the Qawasim in December 1819 and January 1820).

After passing this island (Jumaina), your soundings will be from four and a half to three fathoms, until you come to Jazeerat Billyaird, when it will not be prudent to go further, although you will carry three fathoms and two and a half near the island much further. If it is near low-water, a boat of moderate size cannot go through, but if high water, she will have six or seven feet water, and most probably get into the deep water between Billyaird and Saluly (Salahab)."

A map prepared by Brucks in 1830, and published in 1856 together with the descriptions cited above, clearly shows the island with its large creek, Khor Abu Al Abyad, entering from the north coast and nearly dividing the island in two, and depicting areas of raised ground inland from the coast.

The name Billyaird still survives, as Ra's Bilyard, the name of a small headland on the northeast coast of the island, adjacent to a small mangrove-lined creek and to the largest archaeological site on the island, ABY 13. A scatter of shells, mainly of pearl oyster *Pinctada radiata*, now reduced in size by recent development, it used to stretch for up to 3 kilometres along the shoreline east of the headland. It has been estimated that in excess of 50 million shells may once have been present (Hellyer *et al.*, 2001). This site was presumably in use, as a centre of the pearling industry, at the time that the 1820s survey work was undertaken, with the name being obtained from local guides.

Although referred to in only an imprecise way in the Brucks report, cited above, the mention of possible use of the Khor al-Bazm by local shipping around 1820 can be linked with the occupation at this time of the western tip of Abu Al Abyad, where numerous archaeological sites have been identified.

The island also appears with the name Billyaird on a map issued in 1832 by James Horsbrugh, Hydrographer to the East India Company, and based on the survey carried out by Brucks and colleagues from the Honorable Company Marine, the navy of the United English East India Company. (On his 1830 map, and in the description cited above, Brucks gave the name of The East India Company's Islands to the group of islands stretching from Jazeerat Jehmany (Jumana), just west of

Abu Al Abyad to Bazm al-Gharbi, while the Horsbrugh map also includes Abu Al Abyad in this group. A name of purely foreign origins, this failed to gain wide currency and, although it appears on British maps into the early 20th Century, it was never used locally and is now forgotten.

Curiously, neither in the Brucks description and map nor in the Horsbrugh map is there any indication of settlement on Abu Al Abyad, despite the fact that the survey expedition in 1821-23 certainly ventured into the Khor al-Bazm, and makes reference to the reputed use of the deep water of the Khor by local vessels. Evidence of settlement at this time is, however, widespread, and presumably Brucks and his colleagues, more interested in identifying areas that were safe for sailing ships than in recording coastal villages, simply failed to mention them.

As noted above, however, human settlement on Abu Al Abyad began long before the 19th Century, and goes many thousands of years back into the earliest days of Man in the Emirates. As a result of changes in sea levels and the formation of sabkha salt flats, the size and shape of the island is likely to have changed significantly over this period.

During the great Ice Ages, the climate of the UAE was very different to that of today. Geological and geomorphological studies have shown that during much of the Palaeolithic period (the Old Stone Age), which began around 250,000 years ago, the climate was probably characterised by extreme heat and aridity, and by very strong winds. Indeed, one leading archaeologist, Professor Dan Potts of the University of Sydney in Australia, has suggested that living in the Emirates during the

last glacial era would have been like "picknicking in a sandstorm for much of the year" (Potts, 1998a). Not surprisingly, no evidence has yet been found that Man was living in the UAE during this period, although Palaeolithic stone tools have been identified in the desert regions of Northern Saudi Arabia.

The expansion of the polar ice caps during the Ice Ages meant that the levels of the oceans fell and the Arabian Gulf would then have been simply a low-lying river basin, through which the Tigris and Euphrates rivers would have flowed to the Straits of Hormuz, emptying directly into the Indian Ocean.

At the peak of the last Ice Age, (otherwise known as the Last Glacial Maximum, LGM), around 21,000 to 18,000 years ago, the level of the oceans fell to around 120 metres below current sea levels (Teller *et al.*, 2000). The land that now comprises Abu Al Abyad would have been an area of raised uplands, looking to the north out over the "valley" of the Arabian Gulf, and, to the south, over a much narrower "valley" that is now represented by the deep channel of the Khor al Bazm that divides it from mainland Abu Dhabi.

At the end of that last Ice Age, as the polar icecaps gradually retreated and melted, the level of the oceans began to rise again, flooding the Arabian Gulf. The most rapid period of flooding, according to geological studies, seems to have been in the period from around 12,000 to 8,000 years ago (10,000 BC to 6,000 BC), while sea level reached a peak of between one and three metres above its present levels between 4,000 BC and 2,000 BC (Teller *et al.*, 2000). Abu Al Abyad would, by that stage, have become an island, although it has been suggested that it might still have been connected

to the mainland as late as 5,000 BC (Professor Graham Evans, *pers. comm.* August 2000).

Archaeological studies in the United Arab Emirates and in the rest of eastern Arabia have suggested that Man probably reached the UAE around 8,000 years ago, around 6,000 BC. Studies of climate changes in the region have suggested that this period would have coincided with what has been described as a "Climatic Optimum" or "Neolithic Wet Phase", when there was more rainfall. As a result, there would have been more animals and plants in the desert areas that could be hunted or collected for food. The low-lying areas in what is now the Arabian Gulf would, however, have been more attractive for early human settlers, and the oldest evidence of the presence of Man in the Emirates may well lie concealed beneath the sea.

As the level of the Gulf rose, the inhabitants of the low-lying areas now under the sea would have had to retreat inland, to higher ground. It has been estimated that the rates of advance of the sea fluctuated, sometimes exceeding 1.5 kilometres a year, certainly enough to persuade people living near the shoreline to move inland. Indeed, it has been suggested that distant memories of this period of rapid rises in sea levels may have been the origins of the legend of Noah's Ark and of the Babylonian Epic of Gilgamesh (Teller *et al.*, 2000).

While it is, of course, impossible to verify this suggestion, the earliest archaeological finds on the islands of Abu Dhabi, including Abu Al Abyad, suggest that occupation of the islands first began to take place between 5,500 BC and 5,000 BC, coinciding with one of the major phases of re-flooding of the Gulf. The oldest site yet identified

in the United Arab Emirates, on the island of Marawah, to the west of Abu Al Abyad, has been dated, through radiocarbon dating of charcoal from fireplaces, to around 5,500 BC. The site, on a prominent rocky headland, has yielded several hundred flint tools and artefacts, as well as pottery that had been imported from the Ubaid civilisation of early Mesopotamia.

Further west, the Abu Dhabi Islands Archaeological Survey has identified a village of the same period, with the same imported pottery from Mesopotamia, on the island of Dalma. Although Marawah, like Abu Al Abyad, might still have been connected to the mainland at this time, Dalma would already have been cut off by rising sea levels, and the settlement there represents, therefore, the earliest evidence of the tradition of maritime trade that forms such an important part of the heritage of the people of the Emirates.

It is from this period, around 7,000 years ago, that the earliest evidence of human occupation of Abu Al Abyad has been identified. During survey work in early 2001, a team from the Abu Dhabi Islands Archaeological Survey found a small site on the north coast of the island, just to the west of the large creek, Khor Abu Al Abyad, that nearly divides the island in two.

Lying on a raised outcrop of aeolianite (fossilised sand dune) close to the shore, the site, which has been given the Site Code of ABY 22, has produced a number of archaeological artefacts, including worked flint, probably used for tool-making, and several pieces of pottery, of the same Ubaid type that has also been found on Marawah and Dalma (Hellyer *et al.*, 2001).

A detailed investigation of the site has yet to be undertaken. On the basis of its location, however, and utilising information gained from other sites of the same period on other islands off the coastline of Abu Dhabi, it is possible to begin to paint a picture of the way in which these earliest inhabitants of Abu Al Abyad would have lived.

Because of its location close to the coastline, the inhabitants of the site would have looked out over the rising waters of the Arabian Gulf. Investigations of sites from the same period on Marawah and Dalma have shown that the people of the Late Stone Age made their living primarily from harvesting the resources of the sea, including fish, marine mammals, like dugongs *Dugong dugon*, (still common in the waters off Abu Al Abyad), and the occasional dolphin, *Delphinus* sp., and turtles. There are also indications from Dalma that the people of the time had also begun to collect pearl oysters, while at another site of the same period on the coastline of Umm al-Qaiwain a pearl has been found in a burial, suggesting that these early people collected pearls as well, even if there is no evidence that they were trading them with other communities in the Gulf.

Some of the fish bones collected from the Dalma site are of species which are only found in deep water, thus indicating that the people were using boats to venture out to sea, even if much of their strategy of food collection was based on harvesting resources close inshore. No evidence of the type of boat used in the Late Stone Age has yet been identified in the United Arab Emirates. It is possible, however, that they were simple dugout canoes made from the trunks of mangrove trees, of the type that was still in use by local fishermen until the middle of the 20th Century.

The existence of relations by sea with other communities in the Gulf, however, is proved by the discovery on Abu Al Abyad of imported Ubaid pottery sherds from southern Iraq. As already mentioned, similar pottery from Ubaid has also been identified on the islands of Ghagha, Dalma, Marawah and Al-Aryam, as well as at several sites on the coastline of the northern emirates. It has also been found in Qatar, Bahrain, eastern Saudi Arabia and Kuwait. Special chemical analysis has shown that at least some of the Ubaid pottery from the islands of Abu Dhabi was made of clay found only in the area of the town of Ubaid itself, proving the existence of the early trade route.

It is not yet possible to be certain of the way in which the pottery reached the Emirates, although it certainly came by sea to at least some of the islands of Abu Dhabi. One theory is that it was brought by traders from Ubaid who travelled down the Gulf to exchange products, like the pottery, for other goods from the local people, dried fish perhaps, or pearls. At any rate, boats capable of travelling down the Gulf certainly existed. During February 2001, excavations of a site from the same period in Kuwait, undertaken by a group of archaeologists that included two ADIAS specialists who have also worked on studies of the Abu Al Abyad material, found the remains of a boat, the oldest yet to be identified anywhere in the world (Dr. Robert Carter, *pers. comm.*, April 2001).

Besides exploiting the marine resources close at hand, the Late Stone Age people of Abu Al Abyad probably also had other sources of food. Excavation of the Dalma settlement has found bones of gazelles and the Arabian oryx, suggesting that they hunted these animals for part of their food. Date stones have also been found, the earli-

est evidence from anywhere in Arabia of people exploiting the date palm, which could also, of course, have provided wood, and, through its leaves, raw material for the construction of simple 'arish style houses.

Also found on Dalma were the remains of goats and sheep, proving that the Late Stone Age people of the Emirates had already begun to herd domestic animals, even if they supplemented their diet by fishing and hunting. Further investigation of Site ABY 22 on Abu Al Abyad, as well as of other sites on the island, may yet find evidence to prove the presence of sheep and goats on the island at this early date, while it is reasonable to assume that native animals like gazelles were also present.

The Late Stone Age in the Emirates came to an end around 3,500 BC, 5,500 years ago, and was succeeded by the Bronze Age, which lasted for over two thousand years, until 1300 BC. This was then succeeded by the Iron Age, which lasted for a thousand years, until 300 BC.

The Bronze Age, which saw the introduction of the use of metal to the UAE for the first time, based much of its prosperity on the mining of copper from outcrops in the Hajar Mountains, well inland from Abu Al Abyad. This copper was smelted and then exported by sea to Mesopotamia, with a major port from the period having been identified at Umm al-Nar, adjacent to Abu Dhabi island. This port flourished from around 2700 to 2200 BC. Little evidence of the Bronze Age has yet been found on islands west of Abu Dhabi, although there are tombs from the period on the island of Marawah and, probably, Sir Bani Yas, and Bronze Age pottery has been identified on several islands.

Around the middle of the Bronze Age, around 2,000 BC, the sabkha salt flats that now make up much of the coastline of the Emirate of Abu Dhabi, and are also present on the offshore islands, began to form (Evans *et al.*, 1969). Much of Abu Al Abyad today is made up of sabkha flats, which surround higher areas of rocky outcrops or *Qassar* (plural *Qasasir*) that may once have been small islands, and many of the archaeological sites on the island have been found on these higher areas.

Much of the eastern half of Abu Al Abyad was, indeed, inter-tidal until the 1970s, being inundated by very high tides until the construction of banks (bunds) around much of the island. Not surprisingly, no archaeological sites have been identified in these areas.

The Bronze Age was then followed, in around 1300 BC, by the Iron Age, which saw the first introduction of iron to the Emirates, and the development of major areas of settlement in the Northern Emirates.

Around 4000 BC, the wetter period known as the "Neolithic Wet Phase" or "Climatic Optimum" had come to an end, and a period of a harsher climate with less rainfall, similar to that which exists today, had begun. The native vegetation and wildlife that were present during the Late Stone Age would have gradually declined, making the deserts of Abu Dhabi and the islands less attractive for human settlement. While fishing activities certainly continued along the coast, the main areas of settlement appear to have been mainly on the edge of the mountains, where there were supplies of underground water available, and the pattern of settlement on the islands appears to have contracted.

So far, no definite evidence of occupation of Abu Al Abyad during the Bronze Age and the Iron Age has been identified, and there appear to be none of the large stone collective Bronze Age tombs of the type best known from the island of Umm al-Nar, adjacent to Abu Dhabi. Comparison of the archaeological sites on the island with sites known on other islands does suggest, however, that there perhaps were people living on Abu Al Abyad throughout this period.

Throughout the islands of Abu Dhabi, and, to a lesser extent, on the coast, archaeological survey work undertaken by ADIAS has identified numerous small rectangular, oval and circular fireplaces, made of slabs of stone inserted vertically into the ground. Many larger mounds, up to 2 metres in diameter and up to 50 cm. in height, with small stones blackened by fire on the surface, have also been identified. Many sites of this type have been found on Abu Al Abyad, particularly along the northern and south-western coastline. Among key sites are those that have been given the Site Code Numbers of ABY 7, ABY 8, ABY 25, ABY 26, ABY 27, ABY 28, ABY 33, ABY 39, ABY 44 and ABY 48.

Often, pottery from the Late pre-Islamic or Late Islamic periods has been found in the vicinity of these sites. This does not, however, indicate the age of the fireplaces themselves, however, since the inhabitants of the island, at any period, would always have used the locations that were most suitable, close to the coast and the offshore resources of food.

Several mounds of this type, as well as smaller fireplaces, have been excavated on the islands of Balghelam, east of Abu Dhabi island, Marawah, to the west of Abu Al Abyad, and on Rufayq, which



An unexcavated hearth (fireplace) from Site ABY 20. Such fireplaces on other UAE islands can date back to the Bronze Age (c. 2000 BC), although at this site only Late pre-Islamic and Late Islamic pottery has been found.

lies immediately to the east of Abu Al Abyad. The mounds proved to conceal large rectangular structures, as much as a metre and a half long by a metre wide and 80 centimetres deep, with thick deposits of charcoal and ash inside. The simple fireplaces were smaller, up to a metre in diameter.

Samples of charcoal from the excavated hearths and fireplaces have been subjected to radiocarbon dating in Britain and the United States, and have produced remarkable results.

Although all of the structures are fairly similar in terms of their construction, the analysis of the charcoal produced a wide range of dates. Some

is, as yet, impossible to be sure. Charcoal samples from a number of the hearths, at Sites ABY 7, ABY 8, ABY 26, ABY 28, ABY 33, ABY 44 and ABY 46, have been collected for radiocarbon dating. Results from testing of the first four samples, carried out in early 2002, produced much later dates (*see below*), and further work is required to determine whether or not some of these hearths or mounds are from the Bronze and Iron Ages.

Until around 300 BC, there is little in the written record that provides an insight into the way in which people lived in the southern Arabian Gulf. The earliest evidence of writing so far identified in the Emirates dates to the 7th or 8th Century BC, and comes from the middle Iron Age settlement of Muwailah, near Sharjah Airport. It comprises only three characters, in a now vanished pre-Arabic script, inscribed on the shoulder of a large storage jar, perhaps the name of its maker (Hellyer, 1998). Not until the Third Century BC is there any further evidence, provided by seals on fragments of imported amphorae from Greece and a gravestone with an inscription in a pre-Arabic script that have been uncovered at the site of Mileiha, near Dhaid.

Prior to that time, the only written records that can be interpreted have come from excavations of archaeological sites in Mesopotamia (present-day Iraq). The deciphering of Bronze Age tablets with cuneiform writing on them has provided information about trade between the ancient civilisations of Mesopotamia and a land known as Magan, now believed to be in the area of the UAE and Oman. References to the import of "fish eyes" have been interpreted as indicating pearls, while there are also references to the import of copper and diorite, a stone available in the Hajar Mountains that was used for making statues. There are, however, no

date from the middle of the Bronze Age, around 2,000 BC, others from the Iron Age, around 1000 to 600 BC, and yet others to the early centuries of the Christian era, around 200 AD. Excavation of two other hearths on the island of Balghelam produced pottery from the Barbar civilisation of Bahrain, around 2,000 BC, and from the middle of the Iron Age, around 1000 to 800 BC. Sherds of Barbar pottery have also been identified on Rufayq and Marawah, and, further to the west, on the islands of Ghagha and Sir Bani Yas.

It is probable that some of the fireplaces and small mounds on Abu Al Abyad also date to the middle of the Bronze Age and to the Iron Age, although it

descriptions of the land itself, or of its people.

In 325 BC, however, the Greek Emperor Alexander the Great, having reached the mouths of the Indus overland, sent a fleet commanded by a Cretan admiral, Nearchus, back along the coast to Susa, in Iran. According to Arrian, one of the leading contemporary historians of the campaigns of Alexander, Nearchus was charged with reconnoitering “the coast lying on the Ocean, and the inhabitants of the coast, and its anchorages, and its water supplies, and the manners and customs of the inhabitants, and what part of the coast was good for growing produce, and what part was bad” (Potts, 1998a).

Ignoring Alexander’s orders, Nearchus hugged the Iranian coastline, refusing to investigate the southern side of the Gulf, and much of the information he gathered has been lost, though tantalising fragments remain in the works of other Greek authors.

Not until the 1st Century AD does the Arabian Gulf begin to come more clearly into view, thanks to the survival of works like the Natural History written by the Roman Pliny the Elder, and the anonymous Periplus of the Erythraean Sea, written by a Greek from Alexandria. Pliny, who lived from 23-79 AD, described the lavish use of pearls in the imperial court of Rome, adding that “the most highly valued are those of the coast of Arabia, in the Gulf” (Billecocq, 1995), while the Periplus, probably written between 60-75 AD, refers to the pearling trade of a town called Omana, which has



A scatter of pearl oysters *Pinctada radiata*. Occupants of Abu Al Abyad derived much of their livelihood from the pearl trade.

Door have shown that the town was trading with India, to the East, and Rome, to the west, with purple dye, (from shellfish), dates and gold being among other exports (Potts, 1998b).

The *Periplus* refers to the presence on the Arabian side of the Gulf of a people called the Ichthyophagi, or “Fish-Eaters”, a description that would still have been fairly accurate half a century ago. Although there is no direct mention of Abu Al Abyad, or, indeed, any of the other southern Gulf islands in these records of the 1st Century AD, it is reasonable to assume that the description can be used to describe the way of life of the inhabitants of Abu Al Abyad. Catching fish, as they had done already for over 5,000 years, they were probably also engaged in harvesting pearls from the Gulf, in order to trade these with the Greek, and later, Parthian and Sasanian empires further up the Gulf.

While several coastal sites from the period from around 300 BC to 200 AD are known in the Northern Emirates, most important of which is Ad Door, little evidence has so far been discovered on the islands of Abu Dhabi.

Pottery and other finds on archaeological sites on the western islands of Ghagha and Yasat al-Uliya suggest that the islands of Abu Dhabi may well have been linked, at least peripherally, to the trading network of which Omana/Ad Door was a major emporium. It is probable, therefore, that the inhabitants of Abu Al Abyad in the 1st Century

been identified as the archaeological site of Ad Door, in Umm al-Qaiwain. Excavations at Ad

AD were also involved, at least through harvesting of pearls, and perhaps through other commercial contacts with passing shipping.

Studies of sherds of pottery collected from the surface of several archaeological sites on the coast and islands of Abu Dhabi have shown that there is a clearly identifiable "early horizon" of pottery that dates to the first few centuries of the Christian era. Among these are a coastal site at Ra's Bilyaryar, near Shahama (Hellyer and King, 1999), and a site at Abu Dhabi International Airport, which has also produced pottery from the Bronze Age (De Cardi, 1997). On the islands of Abu Dhabi, pottery of the same period has also been found on Abu Dhabi itself, Marawah, Rufayq, Yasat al-Ulya and on Abu Al Abyad (Dr. Robert Carter, *pers. comm.* May 2001).

On Abu Al Abyad, as on the other islands, precise dating of the pottery is difficult, because the same shapes of pottery, made of the same material, continued to be made over a period of several hundred years. Much of it, particularly if it lacks coloured glaze, is simply described as being "Late pre-Islamic", and is dated to the centuries from the beginning of the Christian era to the coming of Islam to the Emirates, in around 630 AD.

Pottery of this type has so far been identified on at least four sites on Abu Al Abyad. These are at Site ABY 13, the long shell midden site on the north coast of the island, where it may be from the earlier part of the period, at Site ABY 20, on a rock outcrop of the south-west coast of the island, where the pottery can be directly compared to material found on Rufayq and Marawah, at Site ABY 33, on the north-east coast of the island, where some of the material may be slightly later, from the early Islamic period, and at ABY 44 (Dr.

Robert Carter, *pers. comm.* May 2001).

Each of these sites has also produced pottery from the Late Islamic period, suggesting that the sites were occupied, at least occasionally, over a period of as much as 2,000 years. Since all the sites are on or close to the coast, it is reasonable to assume that the Late pre-Islamic occupants of the area were following a lifestyle that was comparable, in many ways, to the lifestyle that continued to prevail until well into the 20th Century AD.

A continued involvement of the people in the pearling industry can be assumed from the presence of this early pottery at the large midden site of ABY 13, while the other sites, ABY 20, ABY 33 and ABY 44, are in locations that would have been suitable for fishing. So far, no signs of the construction of stone buildings at this period has been identified. There are, however, several features at ABY 33 (such as 33.8, 33.10, 33.20 and 33.12) which may be structures, as yet undated. Confirmation of the Late pre-Islamic occupation of Abu Al Abyad has, however, been obtained from radiocarbon dating of charcoal from a hearth on a complex of sites at the western end of the island, Sites ABY 1 to ABY 7. This produced a date of around 320 AD. Interestingly, as is seen from the Gazetteer of sites at the end of the chapter, all of the pottery from ABY 1 to ABY 7 was of Late Islamic date, indicating that not only did occupation of this particular area last over a very long period, but also that evidence of early occupation can often be recovered only through scientific tests, rather than from artefacts, like pottery, which are present on the surface of the sites.

The only clearly identifiable surviving stone buildings on Abu Al Abyad are mosques, dating to the Islamic period, although there are other prob-

able domestic structures at Sites ABY 1 and ABY 8, on the western tip of the island.

One probable reason for this is the fact that there appear to be no permanent freshwater springs on the island, although a possible infilled well exists at Site ABY 20. No evidence has yet been traced of freshwater springs in the seabed just offshore, which occur elsewhere, such as close to the islands of Bazm al-Gharbi, west of Marawah, and just off Ra's Ghurab, north-east of Abu Dhabi.

The inhabitants of Abu Al Abyad would, therefore, have been obliged either to bring their fresh water with them, a practice which continued until very recently, or to have relied upon milk from their domestic animals, or to have constructed special water catchment systems to trap the occasional winter rainfall.

Extensive water catchment systems, sometimes with large cisterns dug into the rock, have been identified by the Abu Dhabi Islands Archaeological Survey, ADIAS, on several of the islands of Abu Dhabi, including Al-Aryam, to the east, and Marawah, to the west, of Abu Al Abyad, but no such features have yet been identified on Abu Al Abyad. According to Ali Mattar al-Rumaithi, the current manager of the island, who spent much of his childhood on Abu Al Abyad around fifty years ago, however, there were some old "wells" or water catchment systems, not yet identified by the survey work. Such systems would, however, only have provided water during the winter months.

It seems probable, therefore, that during the Late pre-Islamic period, as well as during other periods, occupation of Abu Al Abyad may have been largely seasonal in nature, with people moving to

the island from the mainland, or from other islands, at times that were suitable for fishing or for pearling, rather than living there all the year round. This pattern certainly existed in the decades immediately before the commencement of the recent development that took place after the discovery of oil in Abu Dhabi.

While on the island, the people would have traded with passing shipping, perhaps exchanging fish and pearls for other items, and this may have been the source for some of the pottery that has been found.

The lifestyle would have been simple and hard, and there is little evidence from this period, or any other period, to suggest that the people of Abu Al Abyad had much in the way of luxuries. Staying in simple encampments, probably constructed of 'arish palm fronds that could be rolled up and moved from place to place, they probably had a lifestyle that was little different from that of the Ichthyophagi of several centuries earlier, or even from that of their Iron Age and Bronze Age ancestors. Certainly most of the Late pre-Islamic pottery that has been found is from simple vessels, like storage jars, suitable for keeping liquids, perhaps water.

Little is known of the political structure that existed during this period, in the last few hundred years before the revelation of the message of Islam to the Prophet Mohammed, and the arrival of the new faith in the UAE. The dominant power in the region was the Sasanian Empire of Persia, which had governors in Oman and a well-fortified base at Shimal, in Ra's al-Khaimah. No definite sign of their presence has, however, been identified on the islands of Abu Dhabi, and, following the arrival of Islam in the UAE, the Sasanians were swiftly

driven out, and their Empire collapsed in the face of an onslaught from Moslem Arab armies.

It has been proved, however, that at least some of the people of the UAE had adopted Christianity, for monasteries of the Nestorian Christian Church have been identified on the islands of Sir Bani Yas and Marawah. Among archaeological discoveries at these sites have been large stone buildings, with finely plastered decorations on their walls, as well as imported pottery from Iraq. No such sites have been identified on Abu Al Abyad, although it is certainly possible that monks from the Marawah monastery, less than forty kilometres to the west, might have visited Abu Al Abyad, while the inhabitants of Abu Al Abyad would certainly have known of the existence of the nearby Nestorian community.

At any rate, archaeological excavations at the Sir Bani Yas site have shown that the monastery was abandoned within a few decades of the arrival of Islam in the Emirates, while the monastery on Marawah may never have been completed. The old records of the Nestorian Church refer clearly to a wave of its followers peacefully converting to Islam. If ever there were Christians on Abu Al Abyad, they would, presumably, have been amongst those who swiftly adopted the new faith.

The history of the Early and Mid Islamic periods, from the 7th Century to the 10th Century AD, and then up to the 14th Century AD, is still very much a mystery as far as the islands of the Emirate of Abu Dhabi are concerned. A few isolated sherds of Mid-Islamic pottery and glass have been identified, on the site of the Abu Dhabi Golf and Equestrian Club, for example, (Carter, 2000), and at a site near the Bab oilfield (Bab 13) (King *et al.*, 1999), while a site from the 14th Century AD has

recently been identified at Ra's Ghumais, in the extreme west of Abu Dhabi, (ADIAS internal report) but there is little else to provide any indication as to the life of the people. There are also few sites from this period in the Northern Emirates, although there was a settlement at Jumeirah, in Dubai (Hellyer, 1998), continued occupation in Shimal, in Ra's al-Khaimah (Kennet, D. *pers. comm.* April 2001), and a small fort at Luluyyah, near Khor Fakkan (Sasaki and Sasaki, 2001).

Studies of the climate that existed at the time have provided no indication that the conditions of life in the UAE were any more difficult than the periods before or after this time, and occupation of the islands certainly would have continued. One reason for the lack of substantial evidence of occupation may have been the political turmoil that existed in the region at the time, which, in turn, would have affected the trade routes, and could have had a severe impact on settlements that were easily accessible, either by land or by sea.

Histories of the Early and Mid Islamic period, including a valuable history of Oman (Ibn Sirhan and Sirhan ibn Sa'id, 1984), show that over a period of several hundred years from around 700 AD onwards, there was a wave of invasions of the Emirates by armies and navies from the Abbasid Caliphate of Baghdad, as it sought to impose its control over the lands of the southern Gulf. In around 892, for example, forces led by Mohammed bin Nur, then the Abbasid Governor of Bahrain, invaded the Emirates, reaching deep inland to destroy the *falaj* water systems in Al Ain and occupying Ra's al-Khaimah and other parts of the Northern Emirates.

Offshore islands like Abu Al Abyad, with little in

the way of resources and occupied by simple fishing communities, would not have provided an attractive target for such invaders, but the ebb and flow of warfare in the region would certainly have had an effect upon their way of life.

The only evidence of the occupation of Abu Al Abyad during the Early and Mid Islamic periods comes from the Early Islamic period, from Sites ABY 20, on the south coast, and ABY 33, on the north coast. From both, a few pottery sherds have been recovered, with some of those from ABY 33 closely resembling 9th Century AD pottery from the site of Murwab, in Qatar. A radiocarbon date obtained from a hearth at ABY 33.11, however, has provided a date a little earlier, from around 735 AD, or the early part of the 8th Century. As noted earlier, ABY 33 has also produced pottery

from the Late pre-Islamic period, and presumably life remained more or less unchanged here for several centuries, except, perhaps for the need to run, or sail, for cover if an Abbasid fleet appeared over the horizon. There were, however, long periods of peace as well, during which a lifestyle dependent on fishing and on pearling would have continued. There is also evidence, from a book by one of the greatest of the Mid Islamic historians, al-Idrisi, of the emergence of a new form of trade between the Lower Gulf and Mesopotamia.

Born in Morocco in 1099, al-Idrisi compiled a major geography for the Norman King Roger the Second of Sicily, which contains an interesting description of the southern Gulf.

“These parts”, he wrote, “are full of chasms, sand-

banks and places which are difficult of access. They are known as the sea of Kithr (Qatar); there are a great number of desert islands frequented only by water or land birds, which gather there and leave their droppings. When the weather permits, these droppings are loaded into small craft and transported to Basra and other places, where they are sold for a very high price, since they are considered to be a powerful fertiliser for vines, date palms and in general for gardens” (Billecocq, 1995). The description of the islands is still applicable today to some of the remoter islands off the Abu Dhabi coastline, and the droppings would have been those produced by the Socotra Cormorant, *Phalacrocorax nigrogularis*, a seabird that is found almost exclusively in the southern Gulf, and nests in large colonies. Most of the colonies that still exist are to be found on islands in the far west of Abu Dhabi, or on remote offshore islands like Dayyina, but two smaller ones still survive on a small islet just north of Rufayq, immediately east of Abu Al Abyad, and another islet just north of Salahah, immediately to the west. In the past, there may well have been some on Abu Al Abyad itself. Indeed, one part of the extreme western tip of the island is known today as Ra's al-Lohar (the local name for the bird) (Ali Mattar al-Rumaithi, *pers.comm.*, January 2001).

It is, therefore, reasonable to assume that the inhabitants of Abu Al Abyad may also have been engaged in collecting cormorant guano to trade with passing ships, while they may also have eaten Socotra Cormorant eggs and young, once a traditional delicacy.

Further supplements to their diet would have been provided by the eggs of other seabirds, especially the White-cheeked tern, *Sterna repressa*, the Bridled tern, *Sterna anaethetus*, and the Lesser



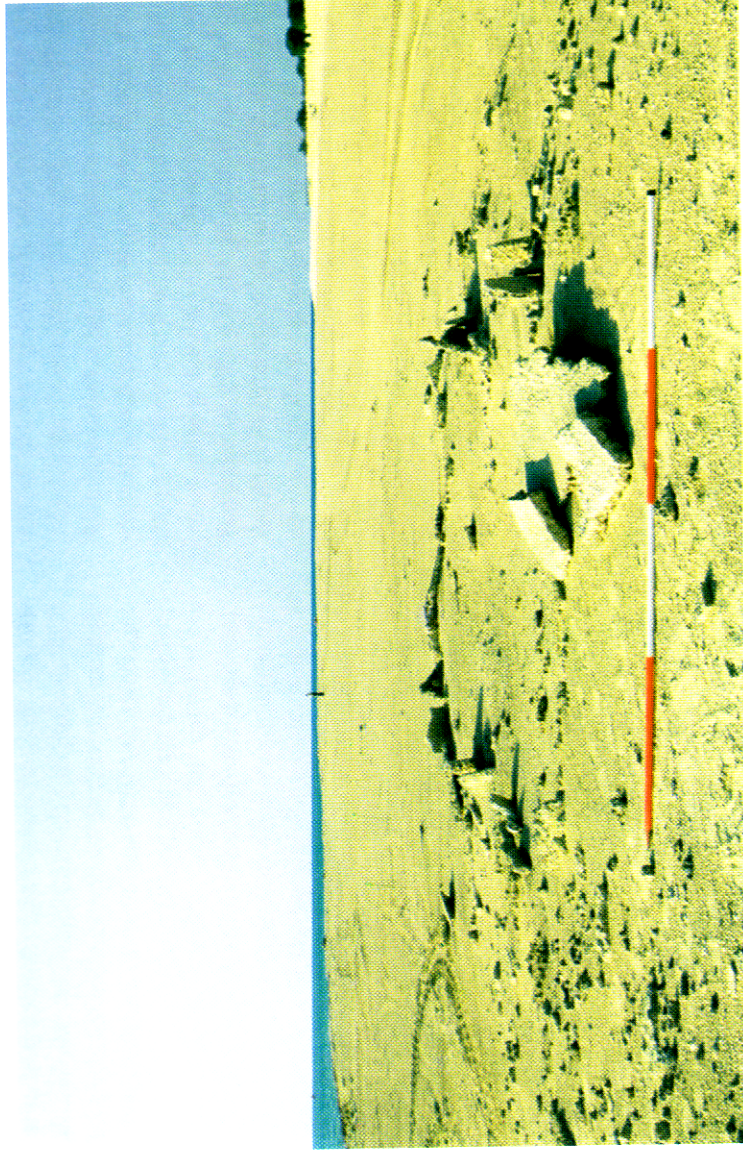
An excavated hearth from Site ABY 33. Radiocarbon dating of charcoal from this hearth produced a date of around 735 AD, in the Early Islamic period.

Crested tern, *Sterna benghalensis*, which still nest in large colonies on many offshore islands, as well as by eggs laid by the Hawksbill turtle *Eretmochelys imbricata* and the Green turtle *Chelonia mydas*, which formerly nested, and perhaps still nest, on the protected southern beaches of Abu Al Abyad. Certainly there is evidence from Late Islamic archaeological sites on the island, such as ABY 43, on the south-west coastline, that its former inhabitants used to catch turtles, perhaps as they crawled slowly up the beach to lay their eggs.

The process of collecting the eggs of seabirds and turtles, or their young, is well-documented in the recent history of the islands of Abu Dhabi (Aspinall, 1998). Indeed, the sustainable harvesting of such resources by coastal communities is known throughout the world. Long before the emergence of the concept of sustainable harvesting that is now part of worldwide consciousness about the environment, such coastal communities learned to limit the amount of what they collected, so that the colonies of seabirds or the turtles would breed successfully, and continue to survive. If they took too much, then the food resources would disappear. Thus the early inhabitants of Abu Al Abyad, like their fellows on other islands, adopted an environmentally-friendly approach that is, sadly, lacking in the Emirates of today.

From around the 14th or 15th Century AD, there appears to have been a marked increase in settlement on Abu Al Abyad, judging by the archaeological evidence that is so far available. Most of the pottery studied by ADIAS can be definitely ascribed to the last six hundred years or so.

A glazed sherd, from Site ABY 45, is of a type known as "Blue Speckled Ware", which has been



A collapsed structure from Site ABY 8, at the western tip of Abu Al Abyad

found at Luluyyah, near Khor Fakkan, in a late 13th/early 14th century context (Sasaki and Sasaki, 2001), and is known from Ra's al-Khaimah in 15th and early 16th century contexts. Although very rare on the islands of Abu Dhabi, a sherd of the same type has also been recovered by ADIAS from a site on the western coastline of Rufayq, immediately east of Abu Al Abyad. It is probable that more sherds of this type will be found on Abu Al Abyad as archaeological work continues.

From Site ABY 21, another pottery sherd with a green glaze is probably a copy of imported celadon from China, and has been ascribed a date

in around the 15th Century. Trade between the Arabian Gulf and China can be traced back as far as the beginning of the Christian era, 2000 years ago. During the heyday of the Kingdom of Hormuz, in the 13th to 15th Century, however, it expanded rapidly, and Chinese celadon from this period is commonly found at Julfar, in Ra's al-Khaimah, and at Luluyyah, near Khor Fakkan. The arrival of the Portuguese in the Gulf at the beginning of the 16th Century led initially to a disruption in the trade, but, as the Portuguese extended their sway to the Far East, the trade resumed, and celadon is also found in later contexts, both in the Northern Emirates, and on the islands of Sir Bani Yas and Dalma, to the west of Abu Al Abyad.

As noted earlier, the archaeological sites on Abu Al Abyad, lacking little evidence of stone buildings except for mosques, suggest that the population was transient, rather than settled, and the fishing communities on the island may well have been too poor to obtain the fine Chinese celadon wares found elsewhere in the UAE. The presence of locally-made imitations of celadon, however, does indicate that the people were, probably peripherally, linked to the great maritime trade network that spanned the Indian Ocean during this period.

They certainly would have had something to offer: the pearls harvested from the pearl oyster beds that lie off the north-west coast of the island. The major archaeological site at ABY 13, with its millions of pearl oyster shells, is so large that it suggests continued exploitation of pearl oysters over a very long period. While much of the pottery collected from this site can be assigned a date in the 18th or 19th Century AD, some is probably of 16th Century date, perhaps earlier.

Pearls from the Arabian Gulf were being exported to Europe long before the arrival of the Portuguese in the area at the beginning of the 16th Century, with merchants from Venice travelling overland and then down the Gulf to Hormuz and, probably, the port-town of Julfar in Ra's al-Khaimah to purchase pearls from local merchants. While the Venetians were eventually supplanted by the Portuguese, and then the Dutch and the

British, this took some time to happen, and in the 1580s, Gasparo Balbi, Court Jeweller to the Serene Republic of Venice, made a lengthy journey down the Gulf and away to the Far East to investigate the trade routes.

In a book he published in 1590, he gives a list of islands in the southern Arabian Gulf, including Sir

ment on the island at the time. At any rate, it is probable that pearls collected off Abu Al Abyad made their way by sea to the main pearl markets, at Dalma and Ra's al-Khaimah, and then away to the courts of Europe, even if not much in the way of luxuries reached the people of Abu Al Abyad in return.

With more and more involvement by the great European maritime powers in the Gulf, more details about the area began to appear on early charts and maps, in particular those made by Dutch sea captains. A map published in 1570 by the cartographer Abraham Ortelius of Amsterdam clearly shows the presence of islands in the lower Gulf, although none can be identified with Abu Al Abyad (Al-Qasimi, 1996).

The existence of large areas of pearl banks off the coast of the southern Gulf is also shown in maps from the 16th Century AD onwards, although without any clear definition of their location. The shallow waters of the lower Gulf probably encouraged foreign shipping to avoid the area, keeping to the deeper waters offshore and closer to the Iranian side, until they came near the mouth of the Gulf and were able to venture inshore to ports like Julfar. It has been suggested by one local authority on the mapping of the Gulf, Sharjah Ruler and UAE Supreme Council member Dr. Sheikh Sultan bin Mohammed al-Qasimi, that "The Portuguese never improved on the level of accuracy (in mapping) they had achieved in the 1560s. The Dutch and English who came after



The remains of a structure at Site ABY 25, on the south coast. This was an area of extensive settlement in the Late Islamic period

Beni Ast (Sir Bani Yas), Daas (Das), Delmephalmas (Dalma) and Zerecho (Zirku) (Slot, 1993). None of the names in the list, which he probably obtained from local sailors or merchants, resembles Abu Al Abyad, which may be an indication that there was no important settle-

them used larger ships and so had to avoid the shallow Arabian coast of the Gulf." (Al-Qasimi, 1999).

Indeed, despite the fact that European navies first entered the Gulf in the early 16th Century AD, it was not until the time of the survey by Brucks and his colleagues in the 1820s that the Qatar peninsula begins to appear on the published charts, although it was known, at least to the Portuguese, much earlier, and the name of Qatar itself is marked on earlier maps as a town, rather than as a peninsula.

Despite the description of the waters around Abu Al Abyad made by Captain George Brucks and his colleagues in the 1820s, it is apparent that little was known of the island, or of adjacent islands, to British representatives in the Arabian Gulf until well into the 20th Century. It is only referred to in passing, and inaccurately, in the well-known Gazetteer of the Persian Gulf, Oman and Central Arabia compiled by J.G. Lorimer at the beginning of the century.

Under the title Salali, the relevant extract from the Gazetteer reads:

"A long island or chain of islands off the coast of Dhafrah in Trucial Oman; it begins 25 miles south-west of Abu Dhabi Town, and extends some 30 miles, parallel to the mainland and at a short distance from it. If we regard the group as one island, the land being practically contiguous at low water, we may say that the east end is called Salali, the middle Abu Al Abyad and the west end Miqaishit. The extreme western end is called Ras Miqaishit" (Lorimer, 1908).

Salali is the island of Salahah, actually to the west of Abu Al Abyad, while Ra's Muqaishit is a prominent headland on the south-western coast of Abu Al Abyad, close to the western tip.

Since Abu Al Abyad is, by far, the largest of the islands of Abu Dhabi, it is remarkable that at this relatively late date, it was still clearly unknown to the British, and this may be an indication that it was only occupied seasonally.

Existing archaeological evidence suggests that the occupation of Abu Al Abyad expanded dramatically around the beginning of the Late Islamic period, although it has to be remembered that the areas most suitable for settlement probably continued to be occupied, with earlier evidence being obscured. Certainly the archaeological surveys carried out by ADIAS have identified sites dating from around the 16th Century onwards in almost all of the suitable coastal areas of the island.

Two radiocarbon dates obtained from hearths at ABY 46 have produced dates from around 1680 AD and 1770 AD.

This expansion of activity on the island may, in part, have been connected with a sudden growth in the pearling industry, to meet demand from new markets opening up in Europe. A Map of Pearl Diving Areas in the Gulf, prepared in 1938, and on display in the Sheikh Saeed House in Dubai, shows eight sites on Abu Al Abyad, which may be temporary coastal pearling settlements. There are three on the south coast, (around ABY 25, 26, 38 and 43, called Ra's Manazil), three on the south west coast, (around ABY 1 to 7, 8 and 9, called Ra's al-Lulwa), one on the western side of the central north coast (around ABY 14, 15, 29, 30, 35, 36 and 37, called Qassar al Mauthaq), and one very

large area marked on either side of the current jetty, some of which may be represented by Sites ABY 48 and 49, Qassar bu Taj, with other areas probably obliterated during construction of the jetty.

The industry was to continue to thrive until after the First World War, when first the Japanese invention of the cultured pearl and then the global economic depression of the 1930s dealt it a mortal blow. Shortly after the end of the Second World War, the industry came to an end, after a period of around 7,000 years.

In particular, occupation in the Late Islamic period appears to have been concentrated on the north coast, both east and west of Khor Abu Al Abyad, at the western tip of the island, and on much of the southern coastline. For the most part, such sites are on areas of slightly raised rocky ground, (*Qasasir*), usually fairly close to the beach. Some, like Sites ABY 10, ABY 11 and ABY 12, two of which have now disappeared as a result of recent development, are simple shell middens, perhaps indicating occasional use by pearl fishermen who came ashore to open their harvest.

Many, however, indicate a much more substantial degree of use. These include extensive scatters of pottery, fireplaces (some of which may be Late Islamic), graves, as at ABY 9, and mosques built of local stone, sometimes just a simple outline, as at ABY 15.1, ABY 29, ABY 35 and ABY 36, and some of a more substantial construction, such as that at ABY 48, where the *mihrab* survives to a height of 1.3 metres.

Some of the sites consist of only one or two small features, but others, like the ABY 1 to ABY 7 complex, ABY 8, ABY 33 and ABY 48, have sev-



The *qibla* of an outline mosque at Site ABY 35, on the north coast.

eral features, including the remains of stone buildings at ABY 1 and ABY 8, which, if, of the same date, indicate a more extensive type of occupation, perhaps a site that was used by one family group over many years. Indeed, this type of regular re-use of a suitable area continued until relatively recently, according to Ali Mattar al-Rumaithi, who, as noted, spent much of his childhood on the island (Ali Mattar al-Rumaithi, *pers. comm.*, January 2001).



The *qibla* and west-facing wall of an outline mosque at Site ABY 15, one of several such mosques on the north coast of the island.

Abu Al Abyad, constructing their houses of *‘arish*. The only stone structures then in use were the outline mosques.

The population was primarily of the Rumaithat sub-section of the Bani Yas tribal confederation, although there were also a few families of the Al Bu Mehair. Khor Abu Al Abyad was also used by fishermen and pearl divers from the Hawamil, Qubaisat, Qamzan and Sudan sub-sections as a shelter in times of hard weather. They would also use such periods of enforced idleness to maintain their boats.

Also at this time, the inhabitants of the island still used pottery extensively, with Ali Mattar indicating that some was of local (UAE) manufacture, with other vessels being imported from Oman, Iran and Iraq, with a little from India. Some of this is present in the ceramic collections.

Ali Mattar al-Rumaithi and Darwish al-Rumaithi (a resident of Marawah), have described to ADIAS a transhumant way of life in the late pre-oil era, with occupants of the islands and coasts of Abu Dhabi moving from place to place, depending on the time of the year and the nature of available resources. Very few islands had permanent communities, with Dalima, the Ghagha group of islands to the west, and Abu Dhabi island, and some of its neighbours to the east, such as Sadiyah, being the key exceptions.

Interestingly, apart from those sites which display use and a change of activity through time (especially Sites ABY 1 to ABY 7, ABY 8 and ABY 9/32, all on the western tip of the island), pearl oyster middens are rarely found alongside hearths. At sites where large numbers of hearths suggest long term camping activity, such as at Sites ABY

At this time (c. 1950), occupation of Abu Al Abyad was primarily confined to the shorelines, especially where there were *Qasasir* adjoining the coast. Occupation was concentrated in the south-west and the north coasts, as well as the western tip of the island, although there was also some usage of the eastern shores of the central khor, Khor Abu Al Abyad.

At this time, 20 to 30 families regularly used

46, ABY 48 & ABY 49, no such middens have yet been located. It may be, therefore, that temporary encampments were generally not in the same places as those used for processing of pearl oyster. The only notable exception to this is Site ABY 15, which has a mosque, a possible hearth and a large midden.

An alternative interpretation is that the sites with hearths, but without associated middens, may be of earlier date. Radiocarbon dating of samples from groups of hearths without associated middens on the islands of Marawah, Rufayq and Balghelam has produced the early dates referred to above. This hypothesis can be confirmed only through the carrying out of radiocarbon dating on further samples from the Abu Al Abyad hearths.

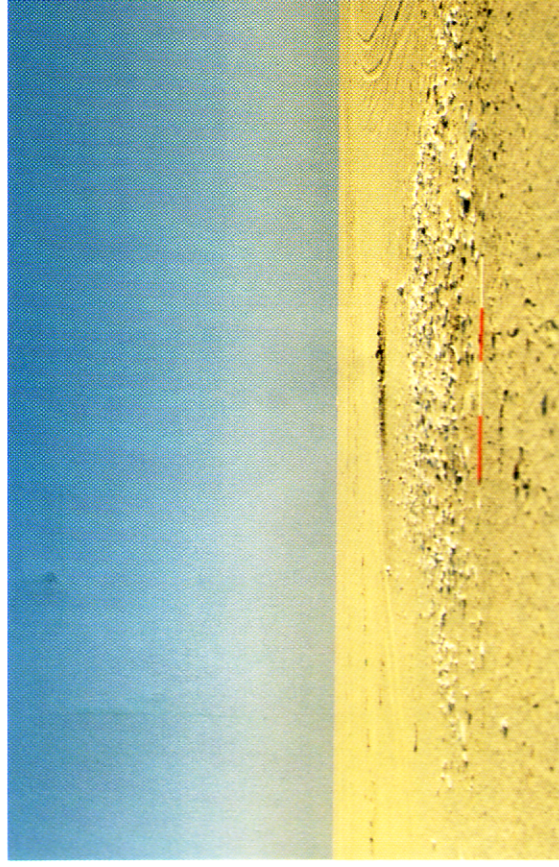
Although no permanent settlement has yet been found on Abu Al Abyad, certain areas of the island

suggest that occupation at any one time may have lasted for a considerable period. The bay along the north coast with Sites ABY 14, ABY 15, ABY 29, ABY 35 and ABY 36, for example, has four outline mosques along the shoreline. Each is well built, and suggests a careful investment of time and energy, perhaps by different families with different mosque building traditions. This evidence, along with the presence of various marine animal butchery sites, suggests that some temporary settlements were not exclusively associated with the pearling industry.

Indeed, at Sites ABY 14, ABY 21 and ABY 43, remains of dugong, shark *Carcharhinus* sp. (yaruor), dolphin *Delphinus* sp., stingray *Dasyatis uarnak* (fitr-lakhma), parrot fish, turtle and perhaps grouper *Epinephelus tauvina* (hamour) are present, as are edible shellfish such as *Hexaplex kuesterianus*, spiny oyster *Spondylus marisrubri*,

winged oyster *Pteria macroptera* and smaller bivalves resembling cockles. The pearl oyster *Pinctada radiata* is also edible. It seems that communities using Abu Al Abyad were highly adapted to the harvesting of the marine resources around them. Indeed bones of only one land-based mammal, a caprovid (goat or sheep), has thus far been found associated with an archaeological site on the island.

Some of the wide range of marine activity may have been carried out using nets and wicker traps (indeed, some of the potsherds may have been reused as net weights), but it seems probable that most was conducted from boats. At least four probable man-made jetties have been located, two at Site ABY 30, and at Sites ABY 41 and ABY 42, with a further possible structure at Site ABY 18. All of these are at least 10m long, and so would have been well suited to the mooring of tradition-



A midden of dugong and turtle bones at Site ABY 43, on the south-west coast. These species were important sources of food for the island's inhabitants.



A small jetty at Site ABY 41, on the north coast. These were used as harbours for fishing boats or for shelter from high seas until the beginning of the oil era.

al boats such as *houre*, *baggarah* and larger fishing vessels.

It seems, therefore, that Abu Al Abyad formed a significant part of what was actually a broader annual migratory pattern during the Late Islamic period. During the pearling season, up to four months of the summer would be spent at sea with occasional breaks, subject to the weather. Fishing was primarily carried out in the winter, while there were occasional summer visits to the interior, to Liwa and Al Ain, to trade in fish caught and dried on the islands. Journeys were also made to the western island of Dalma to sell pearls, the proceeds being used to obtain other items (Ali Mattar al-Rumaithi, *pers. comm.*, January 2001).

The development of recent years that followed the discovery of oil in Abu Dhabi in the late 1950s and the accession of President His Highness Sheikh Zayed bin Sultan al-Nahyan as Ruler of Abu Dhabi in 1966 has brought great changes to Abu Al Abyad, as, indeed, it has done to the rest of the United Arab Emirates. Prior to that development, however, it is probable that life on Abu Al Abyad, as on the other offshore islands of Abu Dhabi, remained little changed over thousands of years. Innovations like the introduction of copper, bronze and iron, the expansion of maritime trade, the arrival of Islam and the appearance of the European navies would, of course, have had their effect. To a considerable extent, however, the people of the islands of Abu Dhabi evolved very early on a way of life that permitted them to survive on meagre resources and in an unremittingly harsh climate. Once it had evolved, that way of life, essentially a co-existence between Man and Nature, served them well generation after generation until the middle of the 20th Century.

Summarised Gazetteer of Archaeological Sites on Abu Al Abyad

(This summarised Gazetteer should not be interpreted as a complete list of archaeological sites on Abu Al Abyad. It represents simply a listing of those sites identified up to the end of May 2001).

Sites ABY 1 to ABY 7

GPS: N 24.16457

E 53.62277

A group of sites on the western tip of Abu Al Abyad. A number of Late Islamic graves are also present in this general area, as well as hearths, one of which has been dated to around 320 AD, although no pottery from that Late pre-Islamic period has so far been identified.

Site ABY 1

Late Islamic/Recent: Fishing Village:

Remains of a fishing village, with the *faroush* walls of one building still visible and *in situ*. Other remains include shells of cockle sp., *Hexaplex kuesterianus*, pearl oyster *Pinctada radiata* (pearl oyster) and *Asaphis violescens*, as well as ribs of Dugong *Dugong dugon*.

Site ABY 2

Late Islamic/Recent: Late Islamic Pottery Scatter

A small pottery scatter.

Site ABY 3

Late Islamic/Recent: Cairns/Middens

A number of small middens/mounds, with turtle and fish bones and cockle shells.

Site ABY 4

Late Islamic/Recent: Pottery Scatter

A small pottery scatter close to **Site ABY 3**. This site is close to the middens with turtle and fish bones (**Site ABY-3**, above).

Site ABY 5

Late Islamic: Shell Midden/Pottery

Similar to **Site ABY 4**.

Site ABY 6

Late Islamic: Shell midden with pottery

Similar to **Site ABY 4**.

Site ABY 7

Late Islamic: Shell midden

A midden of around 2 metres in diameter, dominated by Pearl oyster *Pinctada radiata* (pearl oyster).

Site ABY 8

GPS: N 24.16331

E 53.62467

Late Islamic/Recent: Settlement

This site is on the north-west tip of the island, c.20 - 25m east of the easternmost edge of **Sites ABY -1-7**. Like **Site ABY 17**, **Site ABY -8** occupies a strip running along the beach very close to the beach shelf and includes a collapsed stone building, several middens, mainly of *Pinctada radiata* shells, and Late Islamic pottery, some possibly of 16th/17th Century date.

Site ABY 9

GPS: N 24.16290

E 53.62497

Graves and pearl oyster processing area

This site is located at the northwest tip of the island, near **Sites ABY- 1-7 & 8**. It is c.50m east of **ABY- 8**, and stretches along the beach for c.100m, occupying a strip c.50m wide north / south. At least 5, and perhaps as many as 10, graves are present. The site has also been used as a *Pinctada radiata* processing area.

Site ABY 10

GPS: N 24.16316
E 53.62414

Shell middens

Now destroyed, this site included two middens on the edge of the shoreline, both dominated by shells of *Pinctada radiata*.

Site ABY 11

GPS: N 24.17322
E 53.62905

Shell middens

A small group of middens on the north shore, dominated by shells of pearl oyster, *Pinctada radiata*.

Site ABY 12

GPS: N 24.21748
E 53.70581

Shell middens

Now destroyed, this site was a group of shell middens on the north coast of the island.

Site ABY 13

GPS: N 24.21958
E 53.71025

Shell middens with Mid and Late Islamic pottery

This site extends along the whole length of a beach in a shallow curving bay on the north side of the island. Although affected by the creation of a track along the coast, it survives to a length of around 2 kilometres, and 10 to 20 metres in breadth, and was probably used over a period of several centuries.

Most of the site comprises surface scatters of shells, mainly of the pearl oysterearl oyster, *Pinctada radiata*, although there was some evidence of small mounds, indicative of a longer period of use, at the north-east end of the site.

Site ABY 14

GPS: N 24.23601
E 53.74361

Shell middens with Late Islamic pottery

Like Sites ABY 15, 29, 30, 35 and 36, this site is located on a narrow strip of land between a plantation of trees and the coast on the north side of the island, c.4.5km north-east of the *khor* which runs inland for c.1.5km. It is immediately north of the track from Site ABY 35.

It comprises two large mounds with a mixture of very recent domestic waste and apparently older material on their surface. At least 12 different Late Islamic pottery wares are present, while molluscs in the midden include shells of *Hexaplex kuesterianus*, *Pinctada radiata*, *Spondylus marisrubri*, *Murex scolopax* and *Pteria macroptera*. Bones of Dugong *Dugong dugon*, Dolphin *Delphinus* sp. and Green Turtle *Chelonia mydas* were also identified on the surface of the mound.

Site ABY 15

GPS: N 24.23683
E 53.73745

Mosque, hearths and shell middens

This site is located, in common with Sites ABY14, 29, 30, 35 and 36, on a narrow strip of land between a plantation of trees and the coast, on the north side of the island, c.4.5km north-east of Khor Abu Al Abyad. It includes an outline mosque, a hearth and *Pinctada radiata* middens, with some *Hexaplex kuesterianus* and Late Islamic pottery sherds.

Site ABY 16

GPS: N 24.21502
E 53.80132

Shell midden

This site is located on an outcrop of land inside Khor Abu Al Abyad, the site of a thriving, and now protected, Crab Plover *Dromas ardeola* colony. It is a small shell scatter, dominated by *Pinctada radiata* shells. A number of *Hexaplex kuesterianus* shells were found on a part of the bank away from the main shell scatter.

Site ABY 17

GPS: N 24.19779
E 53.83771

Flint site

This site is located c.4km east-south-east of Site ABY 16, on top of a small, rocky *qassar*. Two pieces of introduced flint, one possibly worked, were the only finds.

Site ABY 18

GPS: N 24.26262
E 53.87556

Structure, hearth and middens

This site is located on the farthest, northern tip of the island, on the peninsula east of Khor Abu Al Abyad. It includes a sparse scatter of *Pinctada radiata* shells, an extensive scatter of Late Islamic pottery, a hearth and an adjacent rock-built jetty.

Site ABY 19

GPS: N 24.15037
E 53.66541

Shell midden & Late Islamic pottery

This site is located on the south-west coast of the island, between Sites ABY- 43 & 20, on a *qassar* which rises to a height of c.4-5m above high water mark, but is gently sloping on its landward side. It comprises a small scatter of shells of pearl oyster *Pinctada radiata* with associated Late Islamic pottery.

Site ABY 20

GPS: N 24.15372
E 53.66160

Well and cairns with Late Islamic and Late pre-Islamic pottery

This site is located on a *qassar* on the south-west coast of the island, 70-100m north of Site ABY- 44, and roughly in between Sites ABY- 19 & 21. It is c.120m inland. It includes a depression identified by Ali Mantar al Rumaithi as an infilled well, once used by the Rumaithi. North of the *qassar* are two small stone cairns and a small pottery scatter is in the vicinity.

Site ABY 21

GPS: N 24.15530
E 53.66787

Structures, middens, dugong butchery site, Late Islamic and possible earlier pottery

This site is located c.500m east of **Site ABY- 20**, just north of the eastern end of **Site ABY- 46** and c.100m inland. It comprises two structures and a scatter of Late Islamic potsherds. These structures, made of *faroush* slabs, are about 30m apart, and stand on very slight elevations c.0.4m high. The westernmost, the largest, consists of a series of *faroush* slabs, end-set into the ground so that they stand to a height of 0.9m, and forming a circle with a diameter of 3 m. An opening, 1.5m wide, is present on the north side of the structure. Both may be mosques. A small butchery site for dugongs *Dugong dugon* and turtles and a *Pinctada radiata* midden are nearby.

A small triangular flint scraper was collected close to this site.

Site ABY 22

GPS: N 24.22967
E 53.76897

Flint working site (Late Stone Age), Ubaid pottery

This site is on the north coast of the island, on a c.100m long and 8 - 10m wide aeolianite outcrop running parallel, and immediately next, to the shore. Over 30 pieces of worked flint were collected, as well as several sherds of unpainted pottery, probably of Ubaid date, c. 7000 years old, were collected. This is the oldest site yet identified on Abu Al Abyad.

Site ABY 23

GPS: N 24.19365
E 53.93197

Structure

This site is located 10m from the western foot of the outcrop of Jebel Yarib, in the south east of the island.

and the highest point on Abu Al Abyad. It consists of a single feature, composed of piled aeolianite slabs c. 0.7 x 0.4 x 0.4m derived directly from the adjacent *jebel*.

The feature is triangular in elevation, reaching a height of c. 1.2m, measuring c.2.5m long by c.1.0m wide, aligned approximately north-east / south-west.

Site ABY 24

GPS: N 24.19509
E 53.93510

Structures

The site is located on flat sand c.300 m southeast of Jebel Yarib, over 2km from the north coast and, as such, is the most inland and isolated of all the Abu Al Abyad sites discovered so far. Present are two stone structures and several small mounds, although no pottery or other material is present to permit dating.

Site ABY 25

GPS N 24.14704
E 53.70192

Structures, Late Islamic pottery, middens, mounds, possible graves

The site lies on the south coast, centred on an aeolianite outcrop situated c.20m from the beach, and measuring c.30m east to west and c.70m north-south. It includes two stone structures, at least six small mounds, over 20 middens, mainly of *Pinctada radiata*, and several possible graves. Late Islamic pottery is present.

Site ABY25 appears to be an important pearling station centred around the structures on the outcrop. The large concentrations of *P. radiata* imply specialised exploitations either intensively, or over considerable periods of time. The associated graves, if that is what they are, suggest an establishment that was in operation for a long duration.

Site ABY 26

GPS N 24.15263
E 53.68919

Shell middens, hearths, middens, Late Islamic pottery and possible graves

This site is located on the south side of the island and consists of a series of 14 *Pinctada radiata* and 5 *Hexaplex kuesterianus* middens, several hearths, small mounds and possible graves covering an area c.200m east to west and c.100m north to south. Within this area, there appear to be three distinct zones of activity. Late Islamic pottery is present.

Site ABY 27

GPS: N 24.14767
E 53.64247

Mounds, Late Islamic pottery

This site is located on the south-west side of the island c.150m from the sea, covering an area 30m east-west and 20m north-south. There are at least six slightly raised features, Late Islamic pottery and many fragments of bone, which has the density typical of dugong *Dugong dugon*.

Site ABY 28

GPS: N 24.15018
E 53.63837

Hearths

This site is located on the south-west coast within an area c.100 m east / west and c.30m north / south, following the curve of the edge of the beach shelf. At least nine hearths or probable hearths are present, indicating an area of food-processing. One sample of charcoal was taken for dating. No pottery is present.

Site ABY 29

GPS: N 24.23484
E 53.73245

Mosque

This site is located on the north side of the island, on the same small headland as **Sites ABY 14, 15, 30, 35 & 36**. It is c.300m west of **Site ABY 15**, and is situated close to a west facing bay. It is an outline mosque, con-

structed of both slabs (c.1.0 x 0.5 x 0.2m) and smaller pieces (c.0.4 x 0.4 x 0.1m) of local limestone. These form a *qibla* wall of around c.7m, with a *mihrab* slightly north of centre c.1.0m wide and c.1.0m deep.

Site ABY 30

GPS: West - N 24.23588
E 53.73931
East - N 24.23551
E 53.74094

Jetties / harbour

This site is located c.0.5km east of Site ABY 29, and is roughly halfway between Site ABY 14 and Site ABY 15. It consists of two lengths of arranged, locally-derived stones, around 80 metres apart and each extending from natural outcrops on the shoreline out into the sea for c.20m. They are each c.1.0m wide, around 3-5 courses high (c.1.0 m in elevation). Ali Mattar al-Runaithi remembers such types of sites being used as jetties for small local craft.

Site ABY 31

GPS: N 24.20026
E 53.68384

Shell midden

This is located close to the shore on the north side of the island, c.1km west of Site ABY 13. It is a mixed shell midden, c.3 x 3m with an elevation of no more than c.0.2m, predominantly composed of *Pinctada* shells, but also includes *Hexaplex kuesterianus* and occasional small bivalves and spiny oyster *Spondylus marisrubra*.

Site ABY 32

This is the same site as Site ABY 9 (see above).

Site ABY 33

GPS: N 24.22042
E 53.68281

Settlement. Hearths, graves, structures, middens, Late pre-Islamic and Late Islamic pottery

This site is located very close to the north shore of the island, c.5.3km north-west of Jebel Yarib. Site ABY-33 is a complex, multi-featured site, with hearths, graves, structures, including several possible mosques, and shell middens.

There are several different types of hearth, including rectangular and circular shapes and low mounds with ash, while pottery of both Late pre-Islamic and Late Islamic date has been identified, indicating usage of the site during at these two periods. Radiocarbon dating of a hearth at ABY33.11 has produced a date of around 735 AD, in the Early Islamic period.

The site is one of the largest on Abu Al Abyad, and probably represents the remains of a settlement.

Site ABY 34

GPS: N 24.22157
E 53.87682

Hearths

This site is located c.200m south-west of Site ABY 33, immediately north and west of a large plantation fence. It is located on, and immediately landward of, a limestone outcrop, in a similar fashion to Site ABY 33. Two rectangular and one sub-circular hearths are present, as well as further possible hearths. No pottery was recorded.

Site ABY 35

GPS: N 24.23576
E 53.74382

Mosque

This feature is located, like Sites ABY14, 15, 29, 30 and 36, on a narrow strip of land between a plantation of trees and the coast, on the north side of the island, c.4.5km north-east of Khor Abu Al Abyad. It is immediately south of the track from Site ABY 14.

The *qibla* wall is 8m long, constructed from local sandstone and *faroush* blocks, typically 0.1 - 0.5m across, and laid in both an end-set and a flat fashion. It has an elevation of 0.3m, and is aligned west-south-west, at a bearing of 260 degrees. Slightly to the south of what is now the centre of the *qibla* wall lies an impressive *mihrab*, constructed from 3 end-set *faroush* slabs (1.0 x 1.0 x 1.0m).

Site ABY 36

GPS: N 24.235720
E 53.743370

Mosque

This feature is also located, like Sites ABY 14, 15, 29, 30 and 35, on a narrow strip of land between a plantation of trees and the coast, on the north side of the island. It has been damaged by construction and tree-planting.

The *qibla* wall is now just 5.0m long, and is aligned west-south-west. Local limestone blocks, typically 0.2 - 0.6m across, are the only construction material evident. It consists of 4 - 5 courses, and has an elevation of around 0.3m.

Site ABY 37

GPS: N 24.23600
E 53.73581

Mounds

This site is located c.250m east-north-east of Site ABY 29, c.30m south of the track.

It comprises a series of at least eight low mounds, typically 0.3m in elevation, which could represent either graves or hearths. Each has a concentration of limestone cobbles on top. They are confined to an area around 15 x 15m. There were no associated finds.

Site ABY 38

GPS: N 24.15299
E 53.69443

Structures

This site is located between **Site ABY -25** (to the east) and **Site ABY 26** (to the west), on the coast of the island and on a low natural outcrop. It includes two features, a possible structure, consisting of a roughly rectangular arrangement of singularly coursed local stone cobbles, measuring 2.0m east / west x 2.1m north / south, and a circular mound, c.4m in diameter, and with a ring of limestone blocks and cobbles lining its circumference. The centre is a cleared, flat, sandy area. There were no associated finds.

Site ABY 39

GPS: N 24.15013
E 53.63850

Shell middens, hearths, Late Islamic pottery

This site is also located on the south coast, c.300m west of **Site ABY 28**. It consists of at least 3 hearths, a *Pinctada radiata* midden, several scatters of pottery sherds, and 3 further low mounds which may be either hearths or graves. They are spread over an area measuring at least c.30m east / west x c.15m north / south. One hearth includes part of a probable Late Islamic Julfar ware storage vessel as part of the hearth surround, the only occasion on which such use has been noted anywhere on the islands of Abu Dhabi.

Site ABY 40

GPS: N 24.15365
E 53.63514

Hearths, midden, Late Islamic pottery

This site is also located close to the south coast, c.500m north-west of **Site ABY 39**. It includes a square hearth, approx. 1.5 m. by 1.5 m., two *Pinctada radiata* middens and a series of low mounds (elevation no more than 0.3m), with scatters of local limestone pebbles on top. They may be either hearths or graves.

Site ABY 41

GPS: N 24.21661
E 53.70345

Jetty (harbour)

This site is a marine feature, probably a small jetty, observed offshore just to the west of Khor Abu Al Abyad. It is not visible at high tide. It is a slightly curvilinear arrangement of local stone blocks (typically c.0.5m across), forming a feature c.40m long x c.1m wide. This feature extends from a rock outcrop and runs in an approximately east / west direction, and thus parallel to the shoreline (curving slightly towards it), at a distance of around 25m from it.

Site ABY 42

GPS: N 24.18593
E 53.65594

Jetty (harbour)

This is another marine feature, located on the north-west coast of the island, c.4km east of **Sites ABY 1-to 7**. It is not visible at high tide. It is some way out in the bay, and consists of a linear arrangement of local limestone or sandstone blocks, forming a barrier c.10m long x c.0.8m wide. It runs approximately parallel with the shore (and thus east / west).

Site ABY 43

GPS: N 24.15778
E 53.68442

Middens (shell, marine mammals and reptiles), Late Islamic pottery

This site is located on the south shore of the island, c.750m west of **Site ABY-26**, and just c.10m or so from the beach shelf.

It comprises a very large area of marine animal bones, extending for at least c.100m east-west x c.30m north-south. Several species are present, including turtle, dugong, sting-ray and dolphin. There are also shell middens, mainly of *Pinctada radiata*, though *Hexaplex laevis* is occasionally represented. Late Islamic/Recent pottery was scattered to the north and west of the main butchery site.

Site ABY 44

GPS: N 24.15304
E 53.66610

Hearths, Late Islamic and possible Late pre-Islamic pottery

This site is located c.70-100m south of **Site ABY 20**. It comprises two hearths and a small pottery scatter, including Late Islamic wares and others of possible Late pre-Islamic date.

Site ABY 45

GPS: N 24.15263
E 53.66627

Pottery (15th/16th Century) and flint

This site was located c.60m southeast of **Site ABY -44**, and c.30m north of the beach shelf. There were two finds: a sherd of Blue Speckled Ware pottery, of probable 15th/16th Century date, and 1 piece of flint debitage.

Site ABY 46

GPS: N 24.15420
E 53.66809

Hearths, middens (shell, marine mammals and reptiles), Late Islamic pottery

This site comprises a very large complex of hearths, pottery scatters and some recent rubbish, spread in a band c.180m east / west x c.20m north / south, running parallel with the shoreline. Finds included a nearly complete stoneware bottle made in Amsterdam and of 19th probable Century date, while radiocarbon dating of two hearths has produced dates of around 1680 AD and 1770 AD. The eastern extent of the site is almost level with the westernmost structure at **Site ABY 21** (though c.200m south of it), and its westernmost extent is c.200m south-east of the **Site ABY 20 jebel** or *qassar*. **Site ABY 46** may be associated with these sites.

This juxtaposition of sites suggests that **Site ABY -20** (the well), **Site ABY 21** (possible mosque sites and

butchery site). **Site ABY 44** (2 hearths and some pottery). **Site ABY 45** (further pottery) and **Site ABY 46** (extensive hearth complex) may have been closely related at some point in (if not throughout) the Late Islamic period. This does not necessarily assume that all of these sites were always contemporary, however. Some may have re-used sites occupied during earlier periods.

At least 14 hearths are present, though some variation is present in their form.

Turtle and dugong bone are present, as are *Hexaplex kuesterianus*, spiny oyster *Spondylus marisrubri* and *Pinctada radiata* shells.

Site ABY 47

GPS: N 24.21211
E 53.70921

Midden, Late Islamic pottery

This site is located on the north side of the island, c. 400m inland from the westernmost end of **Site ABY 43**. It consists of a small *Pinctada radiata* midden, c.3 x 1m in area, with an elevation of c.0.5m. Late Islamic pottery sherds were present.

Site ABY 48

GPS: N 24.14887
E 53.86152

Mosques, other structures, cairns, hearth, Late Islamic and possible Late pre-Islamic pottery

This site is located on and around a long, approximately east west aligned, triangular-shaped *qasr* on the south side of a modern creek, c.4.5km west of the ferry terminal. The *qasr* has an estimated altitude of c.4-5m. The site consists of at least three outline mosques, cairns, at least ten hearths, a possible well and several other possible structures. Late Islamic pottery is present, as well as other wares which may be Late pre-Islamic (or possibly earlier).

Further investigation of this site is required, but it appears to represent an area of extensive settlement. A charcoal sample was collected from one of the hearths.

Site ABY 49

Mosques, hearths, midden, Late Islamic pottery

GPS: Northern end: N 24.14790
E 53.86198
Southern end: N 24.14522
E 53.86617

This site stretches for around 600-700m along the shoreline to the south of **Site ABY 48**, and occupies an area from 10 to 500m from high water mark. The northernmost end of the site is located c. 200m south of the *qasr* occupied by **Site ABY 48** (*Qassar bu Taj*).

There are at least 72 individual archaeological features stretching along the beach at **Site ABY 49**. 57 hearths are present, with at least seven different types represented. In addition there is a midden of spiny oyster *Spondylus marisrubri* (the only midden yet identified on the islands of Abu Dhabi where this species is predominant), some possible structures, Late Islamic pottery and a series of graves. This site may have been used as a temporary settlement, perhaps for a very long period of time.

Fieldwork and Research

The majority of the fieldwork on Abu Al Abyad was undertaken for the Abu Dhabi Islands Archaeological Survey in January 2001 by Daniel Hull in association with Stephen Rowland, and assisted by Simon Aspinall and Captain Maarten Verhage, both of whom also undertook earlier preliminary survey work on several occasions. A re-examination of some sites identified in the January 2001 survey was undertaken by Daniel Hull in May 2001. Pottery analysis was undertaken by Dr. Robert Carter, while historical research was carried out by Peter Hellyer. Radiocarbon dating was carried out by the Scottish Universities Research and Reactor Centre, Glasgow.

References

- ADIAS internal report on Ra's Ghumeis site RG-1.
- Ahmed, R.A. (1984). *Water and Plant Life*. University of Mousel. University Press. Mousel-Iraq.
- Al Abed, I. & Vine, P. (Eds.) 1998. United Arab Emirates Yearbook 1998. Trident Press, UK.
- Al-Qasimi, Dr. Sheikh Sultan bin Mohammed, (ed.) (1996). **The Gulf in Historic Maps, 1497-1931**. Privately published. p.25.
- Al-Qasimi, Dr. Sheikh Sultan bin Mohammed, (ed.) (1999). **The Gulf in Historic Maps, 2nd edition, 1478-1861**. Privately published.
- Al-Sayari S.S. and Zötl J. (Eds.), (1978). Quaternary period in the Saudi Arabia. 1: sedimentological, hydrogeological, hydrochemical, geomorphological and climatological investigations in the central and eastern Saudi Arabia. Springer-Verlag/Wien, 335p.
- Angerman, R. & Flux, J.E.C. (1990). The hares and jackrabbits. In Rabbits, Hares and Pikas: Status survey and conservation action plan. (Ed. By J. A. Chapman and J.E.C. Flux), pp.72-74. IUCN, Gland, Switzerland.
- Aspinall, S.J. & Hockey, P.A.R. (1997). The Indian Ocean Crab Loving Plover. *Arabian Wildlife* 3(1): pp.32-35. Trident Press, London.
- Aspinall, S.J. (1996). Status and Conservation of the Breeding Birds of the United Arab Emirates. Hobby Publications, Dubai. 1st. Edition.
- Aspinall, S.J. (1998). *Harvesting The Sea in Waves of Time: the marine heritage of the United Arab Emirates*. (ed. P. Hellyer), Trident Press, London [1998]. pp.150-165.
- Aspinall, S.J. (1998). The UAE's Rarer Breeding Birds. *Tribulus* 8(1): pp.22-25. ENHG, Abu Dhabi.
- Batanouny, K.H. (1981). *Ecology and Flora of Qatar*. University of Qatar.
- Bullewag, X.B. (1995). **Cited in The Emirates: The Fabulous History of the Pearl Coast**.
- Relations Internationales et Culture, Paris. p.29.
- Bottomley, N. (1996). *Recent Climate of Abu-Abu Dhabi*. In Desert Ecology of Abu-Abu Dhabi (Ed. P.E. Osborne), pp.36-49, Pisces publications, Newbury, U.K.
- Brucks, G.B. (1856). *Memoir Descriptive of the Gulf of Persia*, in **Selections of the Bombay Government XXIV, New Series**. Oleander Press, Cambridge (facsimile edition, 1985). pp.549-550.
- Builer G.P. (1970). Holocene gypsum and anhydrite of the Abu Dhabi sabkha, Trujal Coast: An alternative explanation of origin. 3rd Symposium on Salt, Northern Ohio Geological Society, Vol.1, pp.120-152.
- Carter, R. (2000). *New evidence for the medieval occupation of Abu Dhabi*. **Tribulus** Vol. 10.1 (Spring/summer 2000). pp.10-11.
- De Cardi, B. (1997). *Third millennium and later pottery from Abu Dhabi Airport*. **Arabian Archaeology and Epigraphy**, 8, pp.161-173.
- Diestler-Hass L. (1973). Holocene climate in the Persian Gulf as deduced from grain size and pteropod distribution. *Marine Geol.* Vol.14, pp.207-223, Amsterdam.
- Drew, C.R. (2000). The distribution of the Cape hare, *Lepus capensis*, in Abu Dhabi Emirate, United Arab Emirates. *Zoology in the Middle East*. Vol.20. pp.15-20.
- Duckworth, W. (1996). Land mammals of Abu Dhabi. In Desert Ecology of Abu Dhabi - a review and recent studies. Pisces publications, Newbury, UK.
- Evans G., Schmidt V., Bush P., & Nelson H. (1969). Stratigraphy and geologic history of the sabkha, Abu Dhabi, Persian Gulf. *Sedimentology* Vol.12, pp.145-159, Amsterdam.
- Evans, G., Schmidt, V., Bush, P. & Nelson, H. (1969). *Stratigraphy and Geologic History of Sabkha, Abu Dhabi, Persian Gulf, in Sedimentology* 12, (1969), pp.145-169.
- Evans, M.I. (comp.) (1994). Important Bird Areas in the Middle East. BirdLife International, U.K.
- Gardner L.R. (1972). Origin of the Mormon Mesa caliche, Clark Country, Nevada. *Geol. Soc. Amer., Bull.* Vol.83, pp.143-156, Boulder, Colorado.
- George, D. and D. John. (1999). High Sea Temperatures along the coast of Abu Dhabi (UAE) Arabian Gulf- their impact upon corals and macroalgae. *Reef Encounter* Vol. 25, pp. 21-23.
- Glennie K.W. (1996). The geology of Abu Dhabi. In P. E. Osborne (Eds.), *Desert Ecology of Abu Dhabi*. Published by Pisces Publications, pp.16-35.
- Glennie K.W. (1992). Quaternary dunes of SE Arabia and Permian (Rotliegend) dunes of NW Europe: some comparisons. *Zbl. Geol. Palaont. Teil 1*. pp.1199-1215.
- Glennie, K. W. (2001). The geology of Abu Dhabi. In ERWDA (Eds.), *Atlas of Abu Dhabi Island*.
- Glennie, K.W. (1996). *Geology of Abu-Abu Dhabi*. In Desert Ecology of Abu-Abu Dhabi (Ed. P.E. Osborne), pp.16-35, Pisces publications, Newbury, U.K.
- Goodall, T. M. (1995). The geology and geomorphology of the Sabkhat Matti Region (United Arab Emirates): A modern analogue for ancient North-West Europe. Ph.D. Thesis, Aberdeen University.
- Harrison, D.L. and Bates, P.J.J. (1991). The mammals of Arabia. Harrison Museum Publications, Sevenoaks, Kent, UK. 354pp.
- Hayward, H.E. (1996). *Plant Growth Under Saline Conditions*. Reviews of research on problems of utilisation of saline water. U.N.E.S.C.O., Paris. pp.37-72.
- Hellyer, P. Hull, D. & Rowland, S. (2001). *An Archaeological Survey of the island of Abu Al Abyad, Abu Dhabi, United Arab Emirates*. Unpublished ADIAS report to the Office of HH Sheikh Khalifa bin Zayed Al Nahyan. 88 pages. p.16.

- Hellyer, P. & King, G.R.D. (1999). *A site from the early first millennium AD at Ra's Bilyayyar, Abu Dhabi, UAE. Arabian Archaeology and Epigraphy*, 10.1, pp.119-124.
- Hellyer, P. (1998). Hidden Riches: An Archaeological Introduction to the United Arab Emirates. Union National Bank. Illustration on p.93.
- Hornby, R.J. & Aspinall, S.J. (1997). A Red Data List for the Birds of the United Arab Emirates. Sand Grouse 19(2): pp.102-110. OSME, UK.
- Ibn Sirhan, Sirhan ibn Sa'id (ed. E.C. Ross). (1984). *Annals of Oman*. Oleaner Press, UK. (facsimile edition). pp.21-22. (Originally published in Journal of the Asiatic Society of Bengal 43, part 1, no.2 1874).
- Kanim, F.M. (1998). *Flora of the United Arab Emirates*, vols. (1 & 2) unpublished. University of the UAE. Al-Ain.
- King, G.R.D., Hellyer, P. & Aspinall, S.J. (1999). *An Archaeological Baseline Study of the ADCO oilfields. Part One: Coast and Islands*. Unpublished ADIAS report to the Abu Dhabi Company for Onshore Oil Operations, ADCO. 88pp.
- Kirkham, A., (1998). Pleistocene carbonate seif dunes and their role in the development of complex past and present coastlines of the UAE. GeolArabia, Vol. 3, No. 1., Gulf PetroLink, Bahrain.
- Kronfeld, N. and Shklorik, A. (1996). Adaptation to life in the desert in the brown hare (*Lepus capensis*). Journal of mammalogy. Vol.77(1) pp.171-178.
- Loreau, J. P. & Purser, B. H. (1973). Distribution and ultrastructure of Holocene ooids in the Persian Gulf. In: B. H. Purser (Ed.), The Persian Gulf: Holocene carbonate sedimentation and diagenesis in shallow epicontinental sea. Springer-Verlag, New York, Heidelberg, Berlin, 471pp.
- Lorimer, J.G. (1908). *Gazetteer of the Persian Gulf, Oman and Central Arabia*. Vol 1 (Geographical and statistical) Government Printer, Delhi, India. p.1651.
- Mandaville, J.P. (1990). *Flora of Eastern Saudi Arabia*. Kegan Paul International London, with National Commission for Wildlife Conservation and Development. Riyadh.
- McClure, H. A. (1976). Radiocarbon chronology of late Quaternary lakes in the Arabian Desert. Nature, Vol.263, pp.755-756, London.
- Pearson, W.H., J. M. Neff, C. J. Brandt, K. Wellman, T. Green and S. Al Ghais. (1997). Assessment of Damages to Commercial Fisheries and Marine Environment of Fujairah, UAE resulting from Seki Oil Spill of March (1994): A Case Study. Presented to the Conference on the Transformation of M. E. Natural Environments, Oct 30 to Nov 1, (1997), Yale University, New Haven, Connecticut.
- Pielowski, Z. (1971). The individual growth curve of the hare. Acta Theriologica. Vol.16. pp.79-88.
- Potts, D.T. (1998a). *Maritime Beginnings, in Waves of Time: the marine heritage of the United Arab Emirates*. (ed. P. Hellyer), Trident Press, London [1998]. p.10.
- Potts, D.T. (1998b). Cited in *Seas of Change, in Waves of Time: the marine heritage of the United Arab Emirates*. (ed. P. Hellyer). Trident Press, London [1998]. p.53.
- Purser, B. H. (1973). The Persian Gulf: Holocene carbonate sedimentation and diagenesis in shallow epicontinental sea. Published by Springer-Verlag, 471pp.
- Purser, B. H. & Evans, G. (1973). Regional sedimentation along the Trucial coast, S.E. Persian Gulf. In: B. H. Purser (Ed.), The Persian Gulf, Holocene carbonate sedimentation and diagenesis in shallow epicontinental sea. Springer-Verlag, New York, pp.211-232.
- Rose, P.M. & Scott, D.A. (comps.) (1994). *Waterfowl Population Estimates*. IWRB Publication 29. IWRB, Slimbridge, UK.
- Roshier, D.A. et al (1996). *Vegetation of Abu-Abu Dhabi and a Preliminary Classification of It's Plant Associations. In Desert Ecology of Abu-Abu Dhabi*. (Ed. P.E. Osborne), pp.50-65, Pisces publications, Newbury, U.K.
- Sasaki, T. & Sasaki, H. (2001). *Excavations at Luluyyah Fort, Shatjah, UAE*, in **Tribulus Vol. 11.1** (Spring/summer 2001), pp. 10-16.
- Satchell, J.E. (1978). *Ecology and Environment in the United Arab Emirates*. Arid Environ Journal. Vol. 40, no.3, pp.210-226.
- Schmidt-Nielsen, K.T., Dawson, T.J., Hammel, H.T., Hinds, D. and Jackson, D.C. (1965). The Jackrabbit: a study in its desert survival. Hvalradets skrifter Norske Videnskaps Ada.48. pp.125-142.
- Sheppard C. P. C. (1988). Similar trends, different causes: responses of corals to stressed environments in Arabia Seas. Proceedings of the 6th International Coral Reef Symposium, Australia, Vol. 3, pp.297-302.
- Sheppard C. P. C., A. Price and C. Roberts. (1992). Marine Ecology of the Arabian Region. London, Academic Press. pp347.
- Sigmond, A.A.J. (1927). The classification of alkali and salty soils. Int. Congr. Soil Sci.; 1, pp.330-44.
- Slot, B.J. (1993). Cited in, **The Arabs of the Gulf, 1602-1784**. Leischendam. pp.37-28.
- Stokes, W. L. (1968). Multiple parallel-truncation bedding planes - A feature of Wind deposited sandstone formations. Journal of Sedimentary Petrology, Vol. 38, pp.510-515.
- Teller, J.T., Glennie, K.W., Lancaster, N. & Singhi, A.K. (2000). Calcareous dunes of the United Arab Emirates and Noah's Flood: the post-glacial re-flooding of the Persian (Arabian) Gulf, in **Quaternary International**, 68-71. pp.297-308.
- Zohary, M. (1973). *Geo-botanical Foundations of the Middle East (vols. 1 & 2)*. Gustav Fischer Verlag, Stuttgart, Germany.