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# Prehistoric camels in south-eastern Arabia: the discovery of a new site in Abu Dhabi's Western Region, United Arab Emirates

**Mark Beech, Marjan Mashkour, Matthias Huels & Antoine Zazzo**

**Summary**
A remarkable new site consisting of a concentration of as many as forty or more camel skeletons has been discovered in Abu Dhabi's Western Region in the United Arab Emirates. Eight camel bone samples (from six individuals) from the site have been AMS radiocarbon dated by the Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, Kiel University, Germany, revealing that they date from the second half of the fifth millennium BC. The site is located in an interdunal area to the south-east of the Baynunah Plantation, not far from the Ruwais–Habshan pipeline. The spread of camel bones extends over an area of about 10,000 $m^2$. Preliminary analysis of the bones suggests that they are from wild dromedaries. Other archaeological finds associated with the camel bones include a finely made flint arrowhead. This important newly discovered site will provide a valuable opportunity to examine a large sample of wild camel bones during the later prehistory of south-eastern Arabia. Future detailed investigations at the site will throw fresh light on the early interactions between the communities inhabiting late prehistoric Arabia and the camel.

**Keywords:** camel, skeletons, fifth millennium BC, Abu Dhabi, United Arab Emirates

## Introduction

Surprisingly little is known about the history of camels. The fossil history of camels in the later parts of the Pleistocene and Early Holocene is extremely meagre (Uerpmann H-P 1987). Domestication of the dromedary seems to have taken place in Arabia, whereas it has been suggested that the Bactrian camel may have been domesticated in Bactria or north-eastern/eastern Iran (Uerpmann H-P 1987; Köhler-Rollefson 1993; Peters 1997) or even further east (Potts 2005).

It was originally believed that the dromedary may have been domesticated in Arabia as early as the Bronze Age, as approximately 200 camel bones were recovered from excavations at the island of Umm an-Nar (2600–2000 BC), off the Abu Dhabi coast (Frifelt 1991; 1995). It was suggested that the relatively high percentage of bones from juvenile animals within this assemblage might have reflected an early stage of domestication (Hoch 1979). In addition, there was a carving of a single-humped camel on one of the outer facing stones of one of the tombs (Frifelt 1991: 28, figs 22 & 22a). Subsequent re-evaluation of this material suggests that these could all in fact represent wild camels. Analysis of recently excavated samples of camel bones from Bronze and Iron Age levels at Tell Abraq and Iron Age levels at Muweilah, both located in Sharjah emirate in the UAE, have revealed the presence of both wild and domesticated dromedaries at both these sites (Uerpmann & Uerpmann 2002). The distinction between wild and domesticated dromedaries was recognized using biometric techniques, in particular the use of logarithmic size indices (LSIs) as well as demographic data, as there was a decrease followed by a progressive increase in the number of camels. This study demonstrated that domestic smaller-sized camels first appeared during the period known as Iron Age II, 1000–500 BC (Uerpmann & Uerpmann 2002).

Details are presented here concerning a newly discovered site with important skeletal remains of camels located in the Baynunah area of Abu Dhabi's Western Region, known as "Al Gharbia". These have proved to date to the second half of the fifth millennium BC and shed an important light on the question of the origins of wild and domesticated dromedaries in south-east Arabia.

## Location

The Baynunah camel bone site is located approximately


**Figure 1.** *The location of the Baynunah camel bone site.*

**Figure 2.** *The view looking south across the site.*

**Figure 3.** *General view looking north of camel skeletons eroding out of the modern-day ground surface (Scale = 25cm).*

130 km south-west of Abu Dhabi city, being about 22 km south of the Gulf coastline and 18 km south of the main Abu Dhabi to Ghuweifat highway (Fig. 1).

The site is located in an interdunal area (Fig. 2) about 50 m above sea level at about 9 km south-east of the boundary fence of the Baynunah Forest Plantation. Its local setting is about 350 m south-west of the main Ruwais–Habshan pipeline and only 100 m south-west of a line of electricity pylons and a "gatch" (hardcore) track which run parallel to the pipeline on its southern side.

The site was first discovered by a team from the Abu Dhabi Islands Archaeological Survey (ADIAS) on 13 October 2003 during an archaeological survey of the Ruwais–Habshan pipeline for ADNOC. An engineer employed by the Municipality within the Baynunah Forestry department drew the attention of the ADIAS team to a place where there were "many ancient bones". The site was inspected and it was recognized that these were clearly camel skeletons. A walkover survey by the ADIAS team collected a handful of Late Islamic period Julfar pottery sherds about 100 m north of the spread of camel bones. These related to Bedouin activities in the surrounding desert area. The only archaeological find that might be associated with the camel skeletons was a single projectile point (Fig. 5). This, however, is a surface find that lay directly on top of one of the eroding camel skeletons. This arrowhead was made from the typical locally available Abu Dhabi coastal flint, being grey to pale brown in colour. It was about 7 cm in length by 2 cm in width. Traces of cortex were visible on both sides of the arrowhead indicating that it had been manufactured out of a piece of tabular flint. The arrowhead is laurel-shaped and barbed and tanged, being typical of so-called "Qatar D" projectile points known throughout south-eastern Arabia. These are known broadly to date to a period between the late sixth to late fifth millennium BC.

## Research on the camel remains

The site was initially inspected by the first author (MB)

on 13 October 2003. There appeared to be a substantial spread of camel dromedary bones eroding out on the modern-day ground surface. Comparatively little time, however, was spent at the site (less than 15 minutes), and due to the paucity of archaeological finds the site was initially somewhat dismissed by other survey team members as being probably the result of the death of a herd of recent camels, which had been slaughtered because of disease. However, the first author (MB) collected two camel bone samples from the site, with the idea of undertaking radiocarbon dating on them at some future date to determine the relative age of the camel skeletons. These two samples were as follows: a proximal tibia (right side, 380 g) and a distal femur (right side, 426 g). As no funding was available at the time to pay for their dating these two samples were simply curated in the ADIAS archives.

On the 9 April 2006 a team from the Historic Environment department of the Abu Dhabi Authority for Culture and Heritage then visited the site. This visit included the first author and formed part of a programme of systematic mapping and evaluation of palaeontological and archaeological sites in the Western Region of Abu Dhabi. Several important points were realized during this visit. Since the initial evaluation of the site in October 2003 there had been further erosion to the site that had uncovered further camel skeletal remains. More importantly, the site had been partly damaged by bulldozing activities. A series of electricity pylons had been erected running parallel to the Habshan–Ruwais pipeline on its southern side. In order to collect gatch material suitable for creating stable platforms onto which the pylons could be constructed, bulldozers had excavated a slit trench, fortuitously through the edge of the main scatter of camel bones (Fig. 4). This slit trench had an interesting profile, which revealed that the camel bones indeed formed an extensive substantial layer that was up to 26 cm in thickness from the surface. It was clear from the bones embedded in this profile that they were of some antiquity, judging by the hardened sediment formed inside their natural cavities as well as by their general condition. The profile also revealed that immediately beneath the camel bones was a series of gypsum layers interspersed with sandy horizons, which represented wetter climatic phases immediately prior to the deposition of the camel bones. As the profile had conveniently exposed the camel bone layer, a further camel bone sample was taken for radiocarbon dating. This was a fragment of distal humerus (382 g), which was sampled from towards the base of the camel layer directly from the exposed profile.

This latter camel bone sample, together with the two samples collected earlier in 2003, were then submitted to the Leibniz Laboratory, Kiel University, Germany for radiocarbon dating (samples KIA30387–9). Details of the results are discussed in more detail below.

Subsequently, as a direct result of the realization of the great antiquity of the camel remains, a protective fence was erected around the site by a team from the Historic Environment Department at the Abu Dhabi Authority for Culture and Heritage during the summer of 2007. This was designed to ensure that no vehicle access was permitted onto the site, which might cause damage to the camel bone remains.

The most recent phase of fieldwork at the site took place on 12–14 May 2008, and was undertaken by the first and second authors (MB & MM). The aim of this work was to begin recording the camel remains at the site and to collect further camel bone samples for radiocarbon dating and biometric analysis. A hand-held Garmin GPS map 60CSx was used to document the co-ordinates of the major clusters of camel remains. An individual number was assigned for each significant cluster of animal bones, where it was a partially complete skeleton, simply articulated limb, or cluster of random bones (Fig. 4). These were labelled as follows: C1, C2, C3, etc. GPS co-ordinates were taken in decimal degrees with WGS84 as the datum. Photographic documentation was also undertaken of each of the significant clusters (e.g. Fig. 3 & 6).

At this preliminary stage of research on the site, the following points can be made:

- A total of eighty-five find points were documented.
- These come from at least forty individual camel skeletons.
- The camel remains extend over an area of about 100×90 metres. The majority of the remains appear to be from adult, mature animals. Only a single specimen was identified as being from an immature individual. This was a metapodial with an unfused distal epiphysis (Fig. 6/b).
- There are no signs of pathology or disease to any of the bones so far examined on the surface of the site.
- There are no signs of butchery marks to any of the bones so far examined on the surface of the site.

These are all, however, preliminary comments based

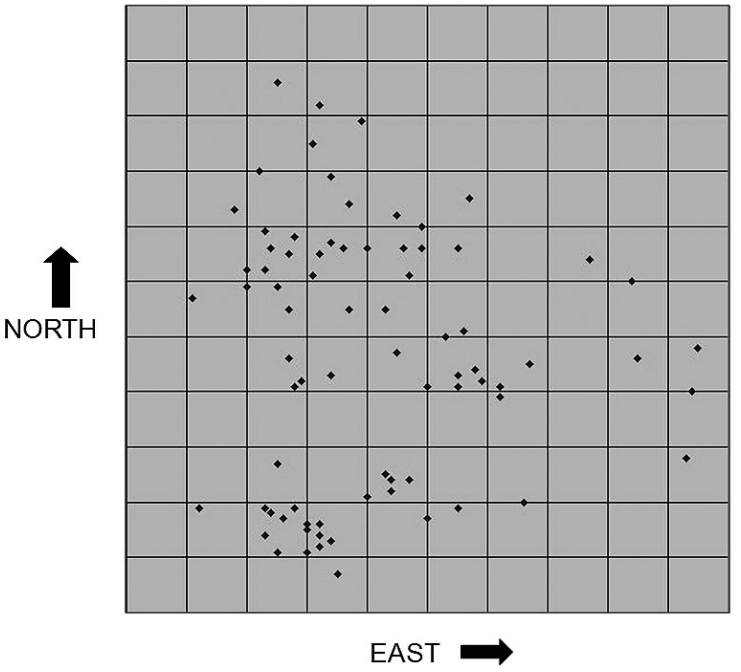



**Figure 4.** *Distribution of skeletons and clusters of articulated camel bones. Each square represents 100 m².*

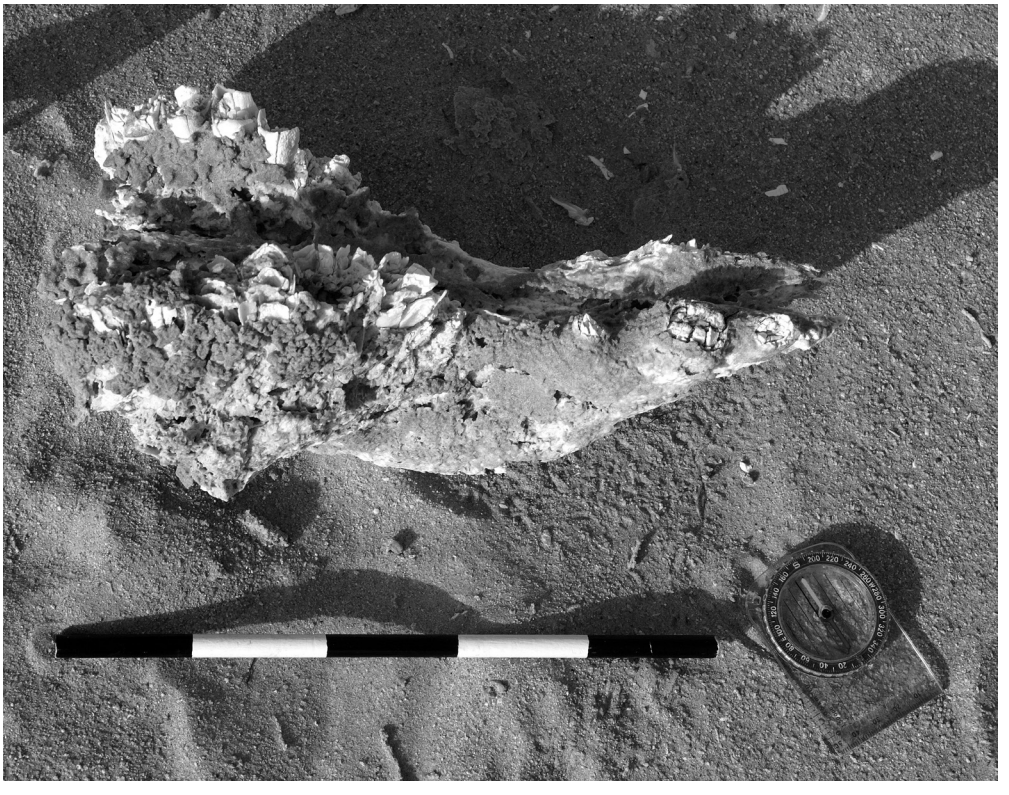

**Figure 5.** *A flint projectile point discovered on the ground surface above one of the camel skeletons.*

a.

b.

**Figure 6. a.** *Articulated camel limb bones in situ;* **b.** *the only evidence of an immature individual: an unfused distal metapodial;* **c.** *a camel skull (Scale = 25cm).*

c.



| Sample ID | Sample Description | Bone Description | Sample fraction | % Weight Non–soluble C | Conventional Age yr BP[1] | Calibrated Age CAL BC (2σ range) | $\delta^{13}C$ (‰)[2] |
|---|---|---|---|---|---|---|---|
| FIRST ATTEMPT | | | | | | | |
| KIA30387 | HAB0002–1 | Distal femur | Organic bone rest (non–soluble fraction) | 0.25 | 4310 ± 50 | 3089–3058<br>3039–2869<br>2804–2782 | –12.7 ± 0.2 |
| KIA30388 | HAB0002–2 | Proximal tibia | Organic bone rest (non–soluble fraction) | 0.2 | 4165 ± 45 | 2881–2620<br>2609–2599 | –17.9 ± 0.1 |
| KIA30389 | HAB0002–3 | Distal humerus | Organic bone rest (non–soluble fraction) | 1.2 | 6320 ± 45 | 5466–5444<br>5420–5401<br>5381–5208<br>5165–5145 | –6.7 ± 0.2 |
| SECOND ATTEMPT | | | | | | | |
| KIA36731 | 3 – C46 | Huge proximal humerus | Bone apatite | | 5445 ± 35 | 4349–4241 | –7.6 ± 0.2 |
| KIA36732 | 1 – C52 | Large proximal humerus | Bone apatite | | 5785 ± 30 | 4711–4550 | –3.5 ± 0.3 |
| KIA36733 | 2 – C78 | Well-preserved mandible with teeth | Bone apatite | | 5280 ± 30 | 4232–4188<br>4181–4038<br>4020–3996 | –5.0 ± 0.2 |
| KIA36734 | 2 – C78 | Well-preserved mandible with teeth | Bone apatite | | 5260 ± 30 | 4229–4198<br>4172–4089<br>4084–3984 | –4.0 ± 0.2 |
| KIA36735 | 2 – C78 | Well-preserved mandible with teeth | Enamel apatite | | 5275 ± 45 | 4234–3988 | –4.0 ± 0.2 |

**Figure 7.** *Radiocarbon dating of the Baynunah camel bones.*

just on our initial analysis of surface material exposed at the site. Our understanding of the Baynunah camel bone site may have to be modified once formal systematic excavations have been undertaken and we have deepened our understanding of how the deposits originally formed.

Three further camel bone samples were taken for radiocarbon dating: a huge proximal humerus (C46, KIA36731), an extremely large proximal humerus (C52, KIA36732), and a mandible (C78, KIA36733–36735). In the case of the latter specimen, this was subjected to dating of both its leached bone apatite and enamel apatite fractions. Details of the radiocarbon dating programme are provided in the following section.

## Radiocarbon dating

### First attempt

The first three samples, which were submitted for dating (distal humerus, distal femur, and proximal tibia, KIA30387–9), were subjected to a standard collagen extraction using the modified Longin method (Longin 1971; Grootes, Nadeau & Rieck 2004; Huels, Grootes & Nadeau 2007) for a date on the organic bone carbon. In the final cleaning step the collagen, dissolved as gelatine, is filtered over a 0.45 μm pore-size silver filter, which retains non-soluble bone organics and contaminants. Unfortunately, the collagen content of the samples was extremely low, as is often the case for desert bones (< 0.01wt %), which indicates a strong degradation of the organic bone material with an almost complete removal of the collagen. The amount of carbon recovered from the gelatine fractions was too small to be measured.

The non-soluble bone rests on the filter were also dated and gave enough carbon and sufficient ion beam during the AMS measurement. Although the measurements of these fractions itself are reliable, the $^{14}C$ ages obtained are questionable since the filtering concentrates particulate

contaminants in the non-soluble organic bone rest. As the carbon recovered in the three rest fractions amounts to less than 0.1 wt % of the bone it is very sensitive to contamination and may contain a significant amount of foreign carbon. We therefore decided not to include these dates in the discussion, and to try an alternative method of dating the material.

**Second attempt**

Following advice and assistance provided from both the Archaeozoology laboratory in Paris and the Leibniz Laboratory in Kiel, Germany, it was decided to undertake a further programme of dating on camel bones from this intriguing site. This time, however, the dating method used concentrated not on the organic but on the inorganic fraction of bone and tooth apatite (bio-apatite). Here, $CO_3^{2-}$ substituted in the bio-apatite for $PO_4$ during the lifetime of the organism, the so-called structural carbonate, is extracted by hydrolization with acid. The suitability of this bone fraction for radiocarbon dating was suggested by Hassan, Termine and Haynes Jr (1977) and it was successfully applied to desert bones found in arid and semi-arid environments by Saliège, Person and Paris (1995). A potential problem of dating inorganic carbon is the possibility of post-depositional exchange and deposition of secondary carbonates. Possible contamination with secondary calcite was qualitatively evaluated in the Leibniz Laboratory with infrared spectroscopy on powdered bone material. To remove secondary calcite, about 3 g of sample material was treated with 15 ml 1 % HCl and titrated with 1.8–1.9 ml $HCl_{conc}$ so that >60 wt % of the material was leached away (method 1). However, it must be noted that at this stage the removal of possible secondary calcite could only qualitatively be confirmed by re-evaluation of prepared (=leached) material with infrared spectroscopy. A different pre-treatment was used in Paris, with 125 ml 1M acetic acid under vacuum preferentially removes carbonates and to a lesser degree apatite (method 2). The advantage of this method is that it preferentially removes secondary carbonates without leaching bio-apatite carbonate. $CO_2$ was liberated from each sample with 4 ml 60 % phosphoric acid at 90°C. Graphitization, AMS measurements, and data processing was done following Nadeau *et al.* (1997; 1998).

Two sub-samples of mandibular bone from the same individual (2-C78) were prepared according to the two methods and gave identical radiocarbon ages (KIA36733 and 36734), showing that the two methods were successful in removing contaminating carbonates. Tooth enamel from the same camel mandible was also dated and gave an identical age (KIA36735).

The results of these new leached bone apatite samples are presented in Figure 7. The series of samples all provide coherent dates falling during the fifth millennium BC. More importantly, the sample dated in Kiel on the mineral fraction from the camel mandible (2-C78) matched the dates done in Paris on bone and enamel apatite (and subsequently measured in Kiel) from the same mandible despite the fact that slightly different treatment methods and material were used. Because enamel is better crystallized and less prone to diagenetic alteration than bone apatite, the close agreement of measured radiocarbon ages of different sample fractions from sample 2-C78 seem to indicate the good reliability of bone apatite ages at this site.

## The size of the Baynunah camels

Preliminary metric analysis has been carried out on thirty camel bone specimens (Fig. 8). Measurements were taken in the field using Mitutuyo electronic callipers and were measured to the nearest 0.1 mm. Standard measurements were taken following von den Driesch (1976).

Logarithmic size indices (LSI) were then calculated according to the formula $LSI\ (x) = \log\ (x) - \log\ (s)$, where $x$ is the measurement of the bone find, and $s$ is the respective measurement of the standard. The standard camel used in this analysis is a male dromedary collected near Al Ain, UAE, from the University of Tübingen reference collection (catalogue number CA4), supplemented by a few small bones of another skeleton of virtually the same size collected on the Batinah coast of Oman (catalogue number CA1). The base measurements for calculating dromedary LSIs are those from the aforementioned specimens cited in Uerpmann and Uerpmann (2002: table 1).

It has been previously stated that the camel remains from the Bronze age layers of Tell Abraq and from Umm an-Nar are from animals which are identified as wild dromedaries (2002). At Umm an-Nar and other coastal sites in the Early Bronze Age the wild dromedary seems to have been an important game animal. Its disappearance in the upper part of the Tell Abraq sequence indicates that this resource was over-exploited. The first bone finds of domestic camels appear among the faunal remains of the Iron Age II layers of Tell Abraq at about 800–900 BC. They also appear at the site of Muwaylah in Sharjah emirate during the second phase of the Iron Age, but wild dromedaries still existed in the general area at the same time. They are distinguished on the basis of their larger

| ID NO | ELEMENT | NOTES | Gl | Bp | Dp | Bd | BT | Dd | Sd | Bdl | Bdm | GLl | GLM | Dm | Dl | GB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C17 | Humerus | | 400 to 410 | | | | | *95.4* | | | | | | | | |
| C18 | Humerus | | 370 | | | | | | | | | | | | | |
| C41 | Humerus | | | | | | 86.4 | | | | | | | | | |
| C46 | Humerus | | | | 141.85 | | | | | | | | | | | |
| C53 | Humerus | | | | 113.8 | | | | | | | | | | | |
| C53 | Radius | | | | | 38 | | | | | | | | | | |
| C6 | Metacarpal | | 360 | 69.8 | | 97.8 | | | 37.8 | 46 | 40.1 | | | | | |
| C34 | Metacarpal | | | | | | | | | | 41.7 | | | | | |
| C51 | Metacarpal | | | | | 103.2 | | | | 48 | 45.4 | | | | | |
| C51 | Metacarpal | | | | | | | | | 47 | 43.6 | | | | | |
| C21 | Tibia | | | | | 76 | | *47.6* | | | | | | | | |
| C24 | Tibia | Right | | | | 71.9 | | *45.2* | | | | | | | | |
| C41 | Metatarsal cf Metacarpal | | | | | | | | | 46 | | | | | | |
| C48 | Calcaneum | | 154 | | | | | | | | | | | | | |
| C49 | Calcaneum | | 141.7 | | | | | | | | | | | | | |
| C6 | Talus | | | | | | | | | | | 70 | 64 | | 44 | 45 |
| C18 | Talus | Left | | | | | | | | | | 75 | 66.7 | 39 | 41 | 50 |
| C18 | Talus | Right | | | | | | | | | | 77 | 66.5 | 38 | 44 | 51 |
| C24 | Talus | | | | | | | | | | | 77 | 67.5 | 39.9 | 48 | 50 |
| C32 | Talus | | | | | | | | | | | 65 | 59.4 | 34.4 | 40 | 47 |
| C48 | Talus | | | | | | | | | | | 71 | 62.7 | 41.1 | 36 | 45 |
| C53 | Talus | | | | | | | | | | | | 70.4 | 41.6 | | 54 |
| C6 | Phalanx 1 | Ant | 98.5 | 39.05 | 35.4 | 37.4 | | *30.75* | 21.6 | | | | | | | |
| C6 | Phalanx 1 | Ant | 100 | 40.5 | 32.6 | 37.3 | | *30.1* | 21.6 | | | | | | | |
| C18 | Phalanx 1 | Ant | 97.7 | 40 | 34.3 | 33 | | *26* | 21.8 | | | | | | | |
| C34 | Phalanx 1 | Ant | 99.4 | 44.6 | | | | | | | | | | | | |
| C34 | Phalanx 1 | Ant | 101.5 | 38.4 | | 36 | | | | | | | | | | |
| C51 | Phalanx 1 | Ant | 102 | | | | | | | | | | | | | |
| C6 | Phalanx 1 | cf Post | 87.1 | 34.7 | 30 | 32 | | *26.4* | 18.9 | | | | | | | |
| C49 | Phalanx 1 | Post | 82.8 | 33.9 | 27.3 | 28.8 | | *22.4* | 18.1 | | | | | | | |

**Figure 8.** *Measurements of some of the Baynunah camel bones. All measurements are given in millimetres. The bone measurement codes follow von den Dreisch 1976.*

size from the smaller domestic camels (2002).

How then to interpret the size of the camels at the Baynunah camel bone site? Considering the dating of the site one might reasonably assume that the camels here all represent wild dromedaries. There is clear evidence for the presence of large wild animals at the site (Fig. 9). But how to interpret the smaller individuals? Could they be large wild females or domestic males? This question addresses specifically the specimens that are spread around the reference line (which is based on a domestic male). An obvious remark is that the average size of the camels at the Baynunah camel site and Umm an-Nar and Tell Abraq Bronze Age is closer and different from those of the Iron Age.

## Conclusions

The Baynunah camel site is clearly of great importance. It represents one of the largest potential samples of Neolithic-period wild dromedary bones from Arabia. The context of the Baynunah camel bone site may be a key to understanding its precise development and history.

The site is located topographically within a small shallow basin area between dunes. There is evidence in the

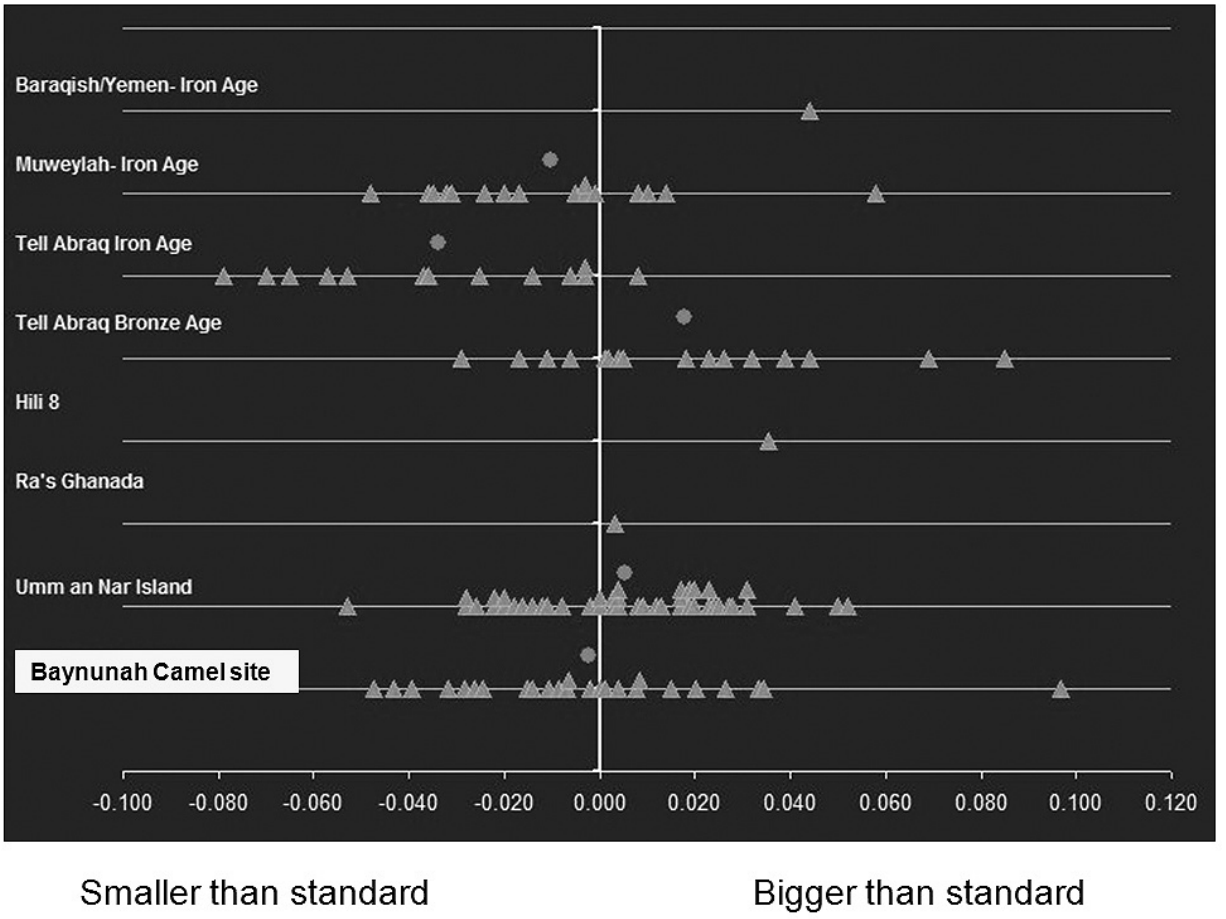



**Figure 9.** *Distribution of size indices (LSI) of camel bone finds from the Bayunah site in comparison with those from Umm an-Nar, Tell Abraq, and Muweilah. Standard LSIs are calculated from standard measurements defined in von den Driesch 1976. Means are calculated from all LSIs. The dots represent the means.*

stratigraphic profile of repeated wet episodes, represented by the succession of gypsum horizons immediately beneath the camel bone layer. Could these camels represent the last survivors of a herd of wild camels driven to a water hole at the end of the fifth millennium BC? It is known that there was a marked climatic deterioration at the end of the so-called Holocene Climatic Optimum period around 6000 years ago as the Indian Ocean Monsoon weakened and there was the regional onset of aridity, aeolian deposition, and dune reactivation and accretion (Parker *et al.* 2006). Our radiocarbon dates however do not support this hypothesis. The dates point towards accumulation over several centuries starting in the early to mid-fifth millennium BC (sample C52) and ending at the end of the fifth millennium BC (sample C78). This is however based on only three individuals. Only by further excavations, the analysis of further bone samples, and the undertaking of a more comprehensive series of radiocarbon dating will we have clearer confirmation of the precise chronology.

Or, will further excavations reveal that we are in fact dealing with a prehistoric hunting site of wild camels? This latter hypothesis seems less likely at present, on account of the camel skeletons appearing in some cases to be relatively complete and *in situ*. If these animals had been hunted, why did the hunters simply leave them there and not butcher and carry away what would have been a substantial amount of food and protein? The presence of wild camel bones was noted at the Neolithic site of Al Buhais 18 (dated to between *c.* 5100–4700 cal. BC) in Sharjah emirate in the UAE, indicating that these animals were regularly hunted at this time (Uerpmann

& Uerpmann 2000; Uerpmann, Uerpmann & Jasim 2000). We also know that wild camels were hunted and systematically butchered during the Umm an-Nar and Wadi Sūq periods (late third to first half of the second millennium BC), as witnessed by the site of al-Sufouh 2 within the Internet City in Dubai (Gruber *et al.* 2005; von den Driesch & Manhart 2006). By contrast, the camel bones there were generally in a non-anatomical position, and cut and chop marks on the bones indicated that the meat was prepared and apparently eaten on the spot.

Alternatively, could these camels have been deliberately slaughtered and buried here as some form of ritual behaviour? An extensive survey of camel burials throughout the Arabian Peninsula was conducted by Vogt (1994). Camel burials are of course known to occur much later in Arabia between the sixth and fifth centuries BC and the first centuries AD (Vogt 1994; Mashkour 1997; Uerpmann & Uerpmann 1999), but none so far are known that date back to this period.

Clearly further archaeological surveys are required of the region around the site to check for traces of other sites. The Baynunah camel bone site represents just part of a series of already known Neolithic period sites located in the desert interior area of the Western Region of Abu Dhabi. These include such sites as Habshan, Liwa, and Rumaitha (Kallweit 2003; Kallweit & Hellyer 2003).

This work has demonstrated the possibility of reliable radiocarbon dating based on the analysis of apatite fractions, which are better preserved than bone collagen which is typically preferred. These new data provide inspiration for carrying out a much more detailed investigation of the site and region with a multi-disciplinary team. Future work to be carried out in 2009 will concentrate on:

(a) the excavation of more of the site and the retrieval of a larger sample of camel bones;

(b) developing a better understanding of the palaeo-environmental context of the site;

(c) the biometric analysis of a larger sample of camel bones;

(d) the further dating of more camel bone specimens from the site.

Unlike Stanley Olsen's rather pessimistic view that "… it is difficult, if not impossible, to determine whether camel bones found in a 6000 year old Neolithic site represent wild animals killed for food or domestic camels when bones are the only evidence" (1988: 19), we hope that the Baynunah camel site may shed important new light on the early history of the dromedary in Arabia.

## Acknowledgements

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