PART IV

DROMEDARIES

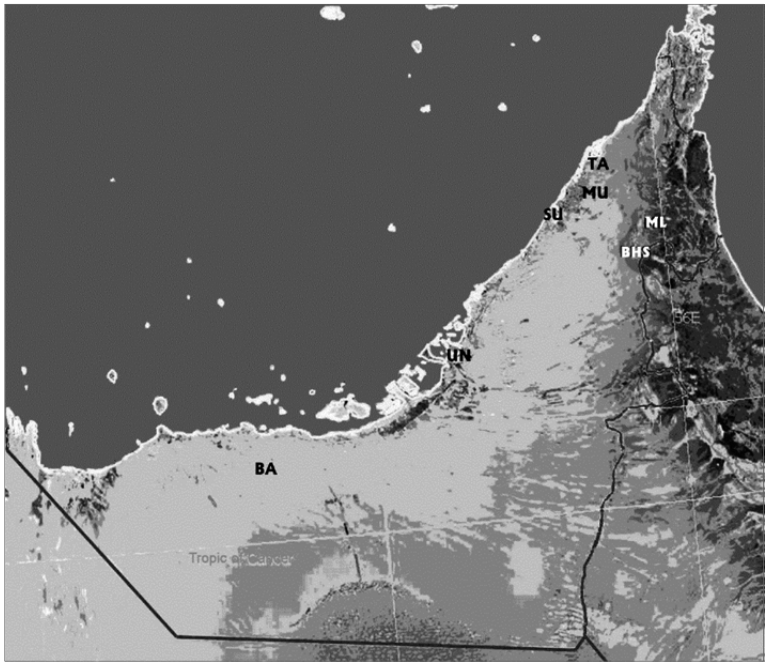
(Camelus dromedarius)

MARGARETHE UERPMANN, HANS-PETER UERPMANN

Archeozoology of Camels in South-Eastern Arabia

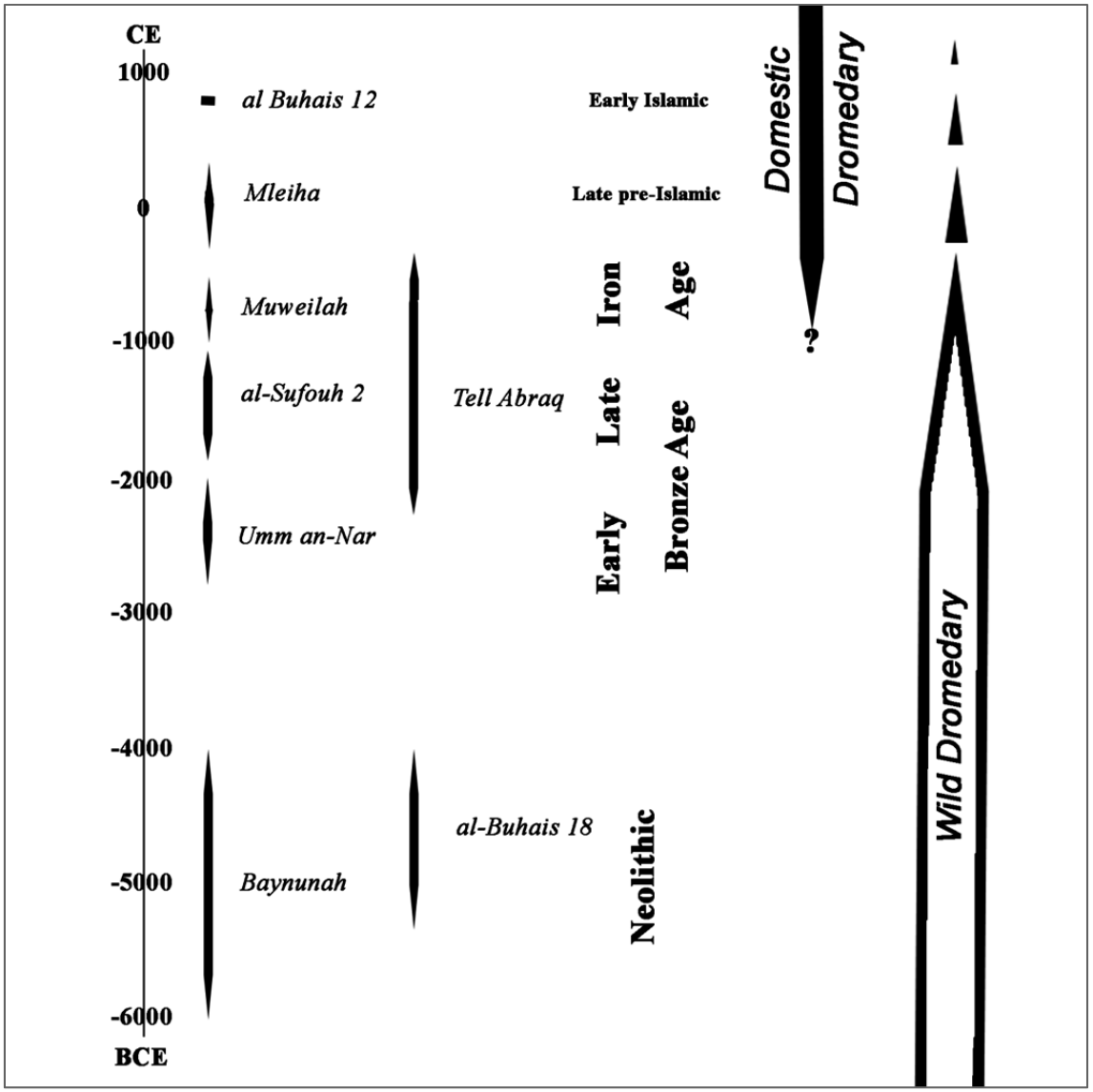
In the western world when we talk about the desert we immediately imagine camels as well. The camel as "ship of the desert" is a well-known topos in many languages. In the Arab culture, in the world of the Bedouins, the notion of camels evokes much more. Apart from a means of locomotion and transportation, camels represent an aid to survival, a lifestyle, and objects of admiration, poetic inspiration and cult. The camel's significance is emphasized in the Holy Quran and in Islamic literature in general: the twenty-three camels of Prophet Muhammad are proverbial. The Arabic language includes many different words for camels.[1] Because of these deeply rooted alliterations it is not surprising that most people – including many archeologists – have difficulty in imagining human life in the desert without the camel. Thus all sorts of speculation and assumptions about the very early development of the close relationship between humans and camels in pre- and protohistoric times have been put forward.

This is also true of SE Arabia, where archeology as such has a fairly short history – just a little more than 50 years (Potts 2009:14). Archeozoology, the scientific evaluation of faunal materials from archeological excavations, has an even shorter history in this part of the world. As an additional difficulty, bones and other organic materials are generally not well preserved in sandy soils. Nonetheless, recent archeological activities have meanwhile produced sufficient numbers of camel bone finds from several archeological sites, dating from the Neolithic to early historic time (see graphs 17 and 18). It is therefore now possible to join the ongoing discussions about man and the camel in South East Arabia from the standpoint of archeozoology. This seems essential, as up to now there has been extreme disjunction between the extensive discussions of the camel question from the historical side – that is, from textual and pictorial evidence – and the archeological side based on actual findings from excavated contexts. The available



Graph 17: Location of the archeological sites in the United Arab Emirates mentioned in the text:
BA = Baynunah,
BHS = al-Buhais 12+18,
ML = Mleiha,
MU = Muweilah,
SU = al-Sufouh 2,
TA = Tell Abraq,
UN = Umm an-Nar

[1] For a more detailed discussion about Arabic camel names see the article by Darem Tabbaa in this volume.



Graph 18: Chronology of the archeological sites and periods mentioned in the text and of the disappearance of the wild and appearance of the domestic dromedary

archeozoological evidence from SE Arabia comes almost exclusively from the territory of the United Arab Emirates. Although archeological research is also progressing in the Sultanate of Oman, not much new information on camels has been put forward recently. This paper will therefore concentrate on findings in the UAE. Fig. 1 indicates the locations of the respective sites.

THE WILD ANCESTOR OF THE DOMESTIC DROMEDARY

So far the domestic dromedary does not have an "official" ancestor. There is no valid scientific description of the Holocene[2] wild dromedary in Arabia. The name *Camelus* "*arabs*" was proposed by the present authors (Uerpmann/Uerpmann 2002), but at that time the available archeozoological materials were insufficient for a meaningful description of a "new" species. Meanwhile there have been enough finds of Holocene wild dromedaries, but a formal description still needs to be published in order to provide a valid scientific name for the wild ancestor of the domestic dromedary – unless, as assumed by von den Driesch and Obermaier (2007), the Pleis-

[2] Holocene: the present geological period, which began ca. 10,000 years ago at the end of the Pleistocene or "Ice Age".

tocene North African *Camelus thomasi* (Pomel 1893) is considered identical to the Holocene wild dromedary of the Arabian Peninsula. If generally accepted, *Camelus thomasi* must then be considered the wild ancestor of the dromedary.

Contrary to earlier assumptions, there is no doubt that *Camelus thomasi* was more closely related to one-humped camels than to two-humped camels (Peters 1998). Given the geographical and ecological separation of the potential areas of distribution, however, complete zoological species-identity of the wild camels in South West Asia and North Africa should not *a priori* be taken for granted. In our opinion this question should be left open for the time being, because paleogenetic research might soon find means of quantifying the relationship between the fossil species involved. If the Late Pleistocene camels of North Africa (between 100,000 to 10,000 BCE) turn out to be genetically identical to the Holocene wild dromedaries of Arabia (from 10,000 BCE to around 100 CE), then these last ones must be included into that species.

The ancestry problem of the dromedary was further complicated by the findings of a Pleistocene "giant" camel from Syria (Schmid in Le Tensorer et al. 2007). The name "*Camelus moreli*" was proposed for these finds, but their description is too incomplete to be considered a valid denomination of a new species. Apart from the "giant" specimens, "normal" sized camel bones were found in the same contexts. The available documentation raises the question of whether the observed size differences do not simply represent sexual dimorphism within a Pleistocene population otherwise closely related to the Holocene wild camels of the area. In any case, the presently available knowledge about these finds does not help to better define the wild ancestor of the Arabian dromedary.

ARCHEOLOGICAL EVIDENCE

Even without having a proper scientific name, the Holocene wild Arabian dromedary is meanwhile a well-known animal. An initial result derived from excavations at a site called BHS18 at Jebel al-Buhais in the interior of Sharjah Emirate (UAE, see graph 17). BHS18 is a Neolithic graveyard surrounded by many fire-pits and other indications of the repeated presence of nomadic herders. Obviously the site was visited seasonally during several centuries from the end of the 6th to the beginning of the 4th millennium BCE (Uerpmann, H.-P. et al. 2006, 2008). Although animal bones were badly preserved at the site, some 45 bone fragments could be identified as camel remains. These finds were attributed to the wild dromedary on the basis of the Neolithic date of the site. The bones were so fragmented that no measurements could be taken, but luckily it was possible to reconstruct the diastema part of a mandible (Uerpmann M. et al 2000, Uerpmann/Uerpmann 2008a:103, fig. 3). Its morphological features indicated the one-humped rather than the two-humped camel. This observation was quite important at the time of this discovery, because the earlier assumption that both kinds of domestic camel – the one-humped and the two-humped variety – had a single wild ancestor, namely the Central Asian *Camelus ferus* (Przewalski 1878), was still favored by some researchers at the time.

The knowledge about wild Arabian dromedaries in the Neolithic period was further increased by the subsequent discovery of the "camel site" of Baynunah, some 130 km south-west of Abu Dhabi in 2003 (see BA in graph 17). Baynunah is located in an interdunal area on the northern fringes of the Rub al-Khali. A substantial number of camel bones were found there, eroding out of the modern ground surface (Beech et al 2009). Subsequent fieldwork revealed a thick layer of flood deposits, including numerous camel bones covering an area of about 100 X 90m. The bones obviously derive from many individuals, some of them preserved as relatively complete skeletons. They show no signs of pathology and no butchery marks. The lower part of the section indicates repeated wet episodes at the site. During these periods the site was a good water hole for the local wild fauna. Radiocarbon dates suggest that the accumulation of the bones started in the early to mid 5th millennium BCE, ending during the 4th millennium BCE. Apparently camels died there naturally during hyperarid phases (Beech et al 2009). The end of

the 5th millennium marks a significant climatic change towards a dryer climate (Parker/Preston 2008).

Another important "camel site", in this case belonging to the Late Bronze Age (see graph 18) *Wadi Suq* period, is Al Sufouh 2, found by rescue excavations in Dubai Internet City, about 1 km inland of the present coastline (Gruber et al. 2005; see SU in graph 17). Here again the main finds were camel bones, some 18,000 specimens deriving from at least 60 individuals. The faunal material was studied by Von den Driesch and Obermaier (2007), who concluded that there are still no signs of domestication (compare graph 19) and that the animals were wild dromedaries. The non-anatomical arrangement of the finds and many butchery marks on the bones suggest that the camels were hunted and slaughtered at the site. Hearths in the vicinity of the bones indicate that they were also eaten there (Gruber et al. 2005). Obviously the site was visited seasonally for camel hunting. Apparently the animals were attracted to the area by the halophytic plants in the salt marshes and in particular by the rich stands of *Avicennia* mangrove.

Wild camels in coastal environments close to lagoons do not easily fit the popular imagination of "camel and desert". It is even more difficult to imagine wild camels existing on small islands in a lagoon environment. This is one of several reasons for the interpretation of the camel bone finds from Umm an-Nar Island as remains of domestic dromedaries (Hoch 1979, see UN in graph 17). This site is the famous eponymous harbor site of the Early Bronze Age (c. 2600–2000 BCE) off the Abu Dhabi coast. The high number of camel bone finds was interpreted by some authors as indication of domestication of this species (e.g. Dobney/Jaques 1994: 113–114). Another reason to assume domestication was their demography – including a remarkable amount of juvenile and infantile individuals, as already mentioned by Hoch (1979: 613) and again by Rosen/Saidel (2010:74). A further argument (Tosi 1989:139) was the iconographic representation of one-humped camels on the outer facing stones of the famous Umm an-Nar tombs (see picture 29). An additional argument is based on far-reaching trade connections, which could not be imagined without the possession of dromedaries as beasts of burden (Frifelt 1975:366).

Based on new faunal studies, the present authors (Uerpmann, H.-P./Uerpmann, M. 2002, Uerpmann M./Uerpmann H.-P. 2008b, Uerpmann, M./Uerpmann, H.-P. in press) argue that these assumptions are not sufficient to prove a domestic status of the Umm an-Nar camels. This is not the place to discuss all arguments in detail. Apart from the fact that the bones from Umm an-Nar are within the size-range of wild dromedaries (graph 19) one has to focus on the special ecological situation of the Umm an-Nar site. It is on a fairly small island near the landward end of the lagoon north of Abu Dhabi Island. The island is much too small to keep a herd of domestic camels all year round – in particular if there were sheep, goats and cattle as other domestic ungulates as well.

Apparently the main function of the site was as a harbor (Frifelt 1995, 240–241), and it must have been quite difficult to sustain the human population of the site in that particular environment. The nearly exclusive use of wild resources from on and off the island, ranging from fish, turtles, dugongs, dolphins and whales from the marine environment to oryx, gazelles and the wild dromedary from the mainland was the predominant means of achieving (Hoch 1979, Uerpmann M./Uerpmann H.-P. 2008b). With regard to the camels, human predation strongly influenced their demography. Heavily exploited, the wild camels – although replenished by animals from the desert hinterland – would soon have undergone a demographic change of their population structure towards an increase in the proportion of young animals. This is a known reaction of wild ungulate populations to heavy hunting pressure (Koike/Ohtaishi 1987). The wild status of the camel finds from Umm an-Nar is also underlined by the fact that during the same period important sites in the interior such as Hili 8 and Maysar – sites with a stable subsistence economy based on animal husbandry – have no or only single finds of camel bones (Uerpmann M./ Uerpmann H.-P. 2008b).

PROBLEMS OF DETECTING CAMEL DOMESTICATION IN ARCHEOLOGY

From a biological point of view, domestic animals are defined by exhibiting typical inheritable differences from their wild ancestors. From an archeological viewpoint, domestic animals are characterized by a particular man-animal relationship, which makes them available for different purposes required by humans, who keep the animals at their disposal. Recognizable differences between wild and domestic animals are not necessarily required by the archeological definition. This is why many archeologists can easily imagine an early phase of animal domestication, neither recognizable in the outer appearance nor in the skeletal morphology of these animals. The related problems cannot be discussed here in detail. In the case of camels, however, it is obvious that adult wild animals could not be tamed to the extent that they might have been handled by people. This is still difficult enough with adult domestic camels today.

The people who first brought camels under human control – both the two-humped and the one-humped species – already had a long tradition of handling domestic animals, including cattle as animals of comparable size and strength. They would have known that taming had to be started with very young animals and that selection of appropriate individuals was crucial. Under human control both the biological and social environment of the animals will have been very different from natural conditions. In spite of the slow reproductive cycle of camels, the resulting biological changes within the small populations, first brought under human control, would therefore have been comparatively fast. Ten generations or a time span of between about 50 and 100 years were most probably enough to produce a visible diminution of average body size – a common indicator of early domestication in populations of medium to large mammals (H.-P. Uerpmann 2008). None of the archeological sites discussed above as "camel sites" in SE Arabia were short-lived enough *not* to have produced recognizable remains of early domestic camels – if an incipient domestication process would really have happened at these sites. Empirically, about five to ten generations (in camels not more than 50–100 years) would be long enough to cause size diminution. This does not contradict the statement that the nature of particular relationships between camels and humans must also be determined by archeological observations (e.g. Rosen/Saidel 2010). Nevertheless, even incipient domestication profoundly involves the animals as well, and their biology would have reacted correspondingly. If the animals did not react, this means that human control over the animals did not go beyond normal prey-monitoring to the extent needed by all hunters in order to find their prey.

In any case, the period without recognizable morphological differences between the wild and domestic status of camel bone finds would have been quite short – certainly shorter than the millennium that passed between the end of the Early Bronze Age and the Iron Age – the time when the domestic dromedary appears in the archeological record of SE Arabia. The obvious lack of remains of domestic dromedaries at al-Sufouh (Wadi-Suq-phase of the Late Bronze Age, see graph 18 and above) and their presence at Muweilah (Iron Age II, see below) indicates that dromedary domestication (or introduction of the domestic form) must have happened in the transitional period from the Bronze to the Iron Age or during Iron Age I (around 1000 BCE). This may have been influenced by the presumably earlier domestication (or introduction) of the two-humped camel in southern Iran. However, to our knowledge there is so far no biological evidence available for the early domestication of the Bactrian camel. An osteological indication comes from the appearance of bone finds from two-humped camels in Late Bronze Age levels at Tell Sheikh Hamed in northern Syria prior to the appearance of dromedary bones in Iron Age levels of that site (Becker 2008). The observations at Shahr e-Sokhta in south-eastern Iran (Compagnoni/Tosi 1978) might also point in that direction.

EVIDENCE FROM TELL ABRAQ (EMIRATES OF SHARJAH AND UMM AL-QUWAIN)

Tell Abraq is situated on the borderline between the Emirates of Sharjah and Umm al-Quwain. It is one of the few Tell sites in SE Arabia, which means that it was inhabited during several archeological phases over a long time-span (see graph 18). It is situated near the former south-

ern shore of the Umm al-Quwain lagoon. Its ecology during the Bronze Age was probably similar to that of Umm an-Nar or al-Sufou 2 (see TA, SU and UN in graph 17). The shells found in the early layers of the site clearly indicate a mangrove environment. The site is remarkable for its long settlement sequence covering the time from about 2200 BCE to 300 BCE (Potts 1993, 2000).

During the Early Bronze Age the animal economy of Tell Abraq, as reflected by the faunal remains, resembles that of Umm an-Nar with regard to a low proportion of domestic animals and the substantial use of wild resources. Wild camels contributed a lot to the meat supply of the early inhabitants, but their share decreased over time and camel bone finds disappear at the end of the Bronze Age – probably due to over-exploitation of the local wild camel population. There are no camel remains at all in the sample studied for the Iron Age I period. However, the sample size is quite small for this period and thus not completely conclusive (see picture 30).

In the Iron Age II (c. 1000–750 BCE) sample, the dromedary re-appears among the animal remains. However, these bones are clearly different in terms of size from those of the Bronze Age. Thus they provide evidence of the domestic status of the animals (Uerpmann M. 2001, Uerpmann H.-P./Uerpmann M. 2002). The small bone sample from the Iron Age III does not contain camel remains, but is generally dominated by medium-sized animals (sheep and goats) reflecting a different economic status of the inhabitants of the site at that time just before Tell Abraq was abandoned as a major settlement in the following ed-Dur phase. On the whole, the stratigraphic sequence of Tell Abraq gives clear evidence for a gradual disappearance of the wild dromedary during the Bronze Age – probably due to over-exploitation – and a reappearance of this species as a member of the domestic fauna during the Iron Age. Unfortunately, the faunal samples from the Iron Age layers are too small to provide detailed insight into the role of camels at Tell Abraq during this period.

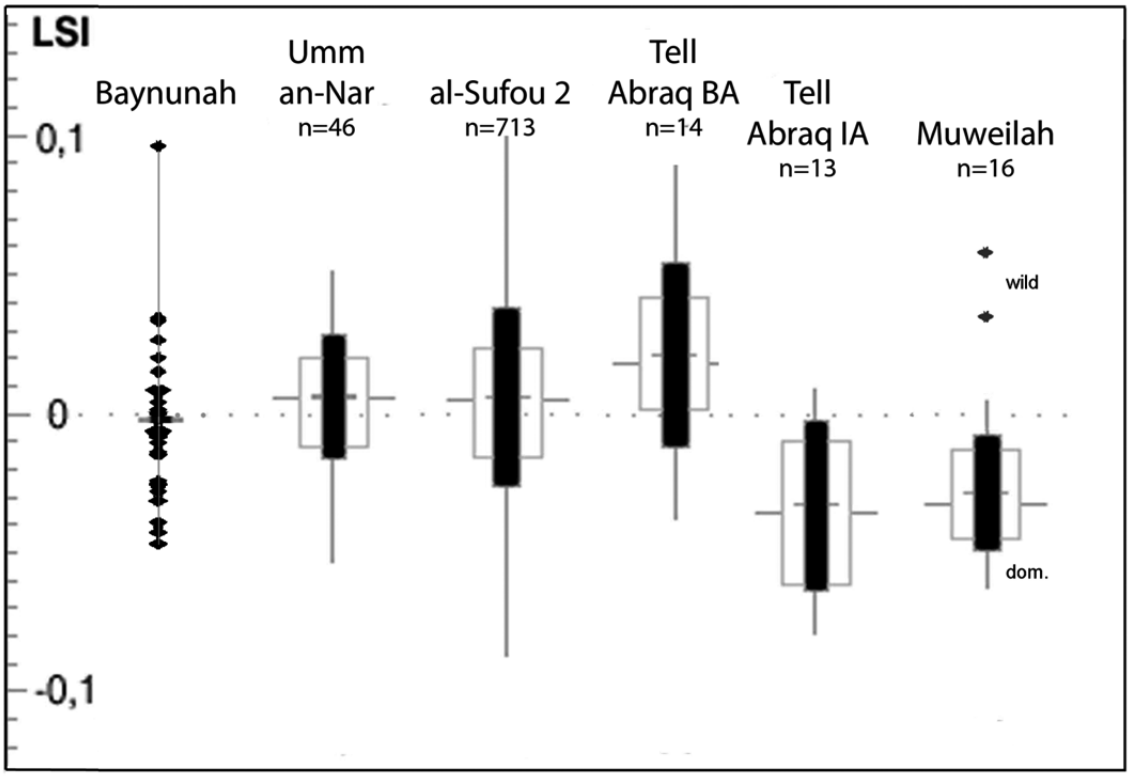
THE IRON-AGE II DROMEDARY REMAINS FROM MUWEILAH (EMIRATE OF SHARJAH)

Muweilah is a large Iron Age II site situated in the eastern outskirts of Sharjah City (MU in graph 17). It is dated by multiple radiocarbon determinations to around 850 BCE (Magee et al. 2002). Several thousand animal bones have already been studied by the authors and faunal analyses are still continuing. The domestic dromedary played an important role in the economy of this site (Uerpmann M./Uerpmann H.-P., in press). According to the weight proportions of the bone finds almost 30% of the meat eaten at Muweilah was from dromedaries. Only sheep were more important as meat producers. However, this does not necessarily indicate that the dromedaries were domestic animals. At al-Sufou2 almost 100% of the mammal bones are from wild dromedaries (Von den Driesch/Obermaier 2007). The two sites are less than 30 km apart. Although Muweilah is a little farther from the coast, the environmental setting of the two sites is very similar. The chronological difference is more difficult to define, because the camel bones from al-Sufou yielded a wide range of radiocarbon dates (Von den Driesch/Obermaier 2007:144), however, there will not have been more than 1000 years between the two assemblages. From what is known about environmental changes within that millennium, the environmental differences should not have been able to cause much morphological difference between the wild dromedary populations of both sites. Nevertheless, the dromedaries at Muweilah were statistically different in terms of body size from those of al-Sufou 2.

As a general rule, animals in the size-range from cats to cattle became smaller when they were first domesticated. This does not exclude the possibility that they could later become larger again through selective breeding. An overall reduction in size can also be observed in the Iron Age camel finds from Muweilah and Tell Abraq in comparison to the earlier finds, not only from al-Sufou 2 but also from Umm an-Nar and Baynunah. It is interesting to see that the large sample from al-Sufou 2 includes some small individuals, indicating that domestication does not "create" small animals but simply selects the smaller ones from the wide natural range. Two

finds in the upper size range from Muweilah are considered to represent hunted wild dromedaries. Hunting scenes in the Arabian rock art – stylistically attributed to the Iron Age – also indicate that the wild one-humped camel still existed during that period.

As skeletal dimensions are directly related to the size of the respective animals, comparison of bone-measurements is a simple means of obtaining evidence for the size-ranges of animals found at archeological sites. The calculation of the "Logarithmic Size Index" (LSI) is a simple means of producing comparable indicators for bone sizes deriving from different skeletal elements. It is generally applied in order to scale breadth and depth measurements of weight-bearing skeletal elements of the legs and allows direct comparison between different assemblages of bone finds. Graph 19 represents the size ranges of archeological dromedary finds in the form of "box and whisker plots", where the black box represents the standard deviation of the LSI values around the mean of the respective assemblage, while the whiskers indicate minima and maxima. The open box comprises the inner quartiles of the values and the position of the horizontal whiskers indicates the median of all LSI values.

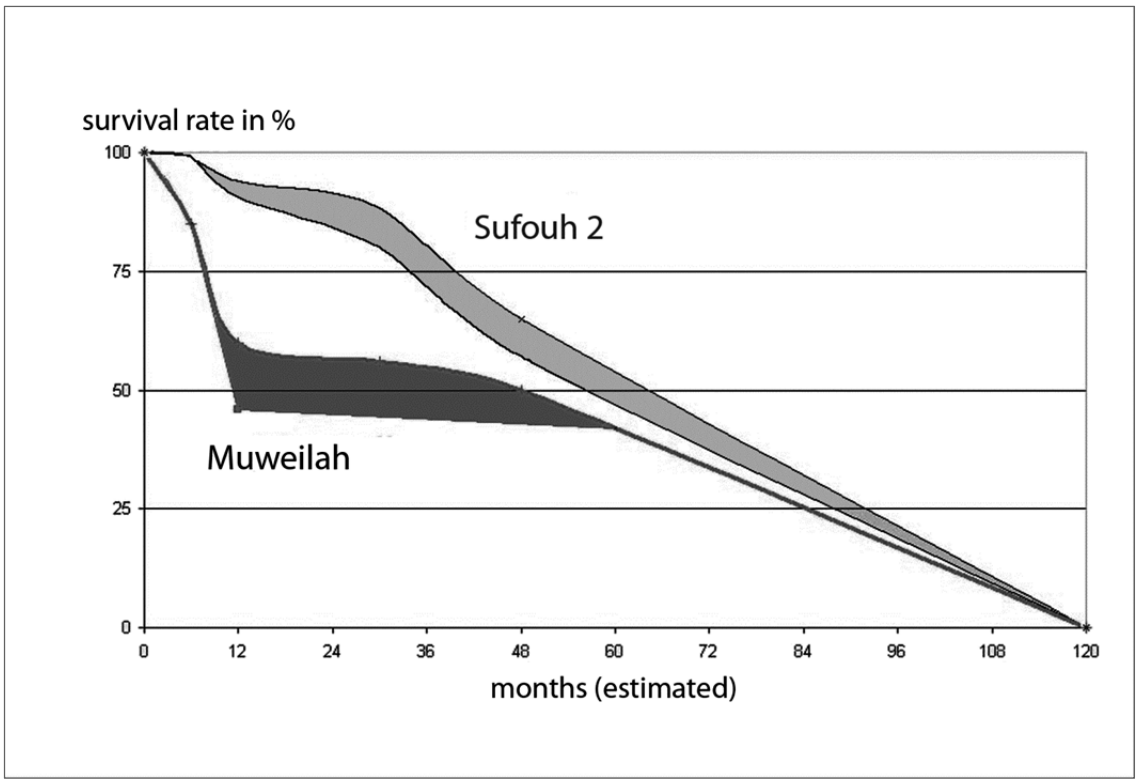


Graph 19: LSI distributions of dromedary bone finds from Neolithic to Iron Age sites in the UAE

Interestingly, the LSI values for the Neolithic dromedaries from Baynunah, transferred directly into graph 20 from the graph published by Beech et al. (2009), indicate that most of these animals were comparatively small. There is only one really large one among them, but about a third of the LSI values are in the range of the Iron Age domestic camels. This observation can be explained by the nature of the Baynunah site, where wild dromedaries died of natural causes when there was not enough rain to flood the interdunal basins and when water and vegetation there were insufficient. Only the larger and stronger individuals would have had the energy to leave the area for somewhere better before it was too late to escape. This was certainly one of the mechanisms that selected for the large body-size of the wild camels.

Conversely this also explains why domestic dromedaries can be smaller than their wild counterparts: herders would have recognized early enough when it was time to leave a desiccating area with their animals. On the other hand, to minimize the risk of loss they would have preferred to have more of the smaller than fewer of the larger animals, which in addition may have

been more difficult to handle. It is therefore the mutualistic relationship between man and domestic dromedary that caused the biological changes in the latter. Once this relationship started it created particular conditions to which both partners had to adjust accordingly.



Graph 20: Approximate survival rates of the dromedary populations at al-Sufouh2 and Muweilah

Additional evidence of the respective status of the dromedaries at Muweilah and al-Sufouh 2 comes from demographic data obtained from the rates of fusion of long-bone epiphyses. In young animals one or both ends of the large bones of the legs are separated from the shaft by a layer of cartilage which is responsible for growth. The cartilage is not preserved in archeological finds. Thus the articular ends of bones from young animals are found separate from the shafts, whereas in adult animals they are fused to the shaft. As fusion in particular bones happens at different periods during growth, counts of fused versus unfused epiphyses provide evidence of the ages before or after which the animals were slaughtered or hunted. Unfortunately, not much is known about the ages at which particular epiphyses fuse in dromedary skeletons. However, according to the available comparative skeletons, the sequence of fusions is similar to that in other artiodactyls. Percentages of fused versus unfused epiphyses can therefore be plotted in a relative order from young to old (graph 20). While the time-scale in this figure can only be a rough estimate, the relative difference between the two camel bone collections is quite obvious: at Muweilah only between 45% and 60% of the "early" epiphyses (fusing between about 12 to 18 months) are fused, while the respective figure at al-Sufouh 2 is around 90%. For the "late" epiphyses (fusing around 48 months) the difference is less obvious: they are fused in about half of the observed cases at Muweilah while the figure at al-Sufouh 2 is about two thirds of the respective specimens. Obviously, almost half of the dromedary offspring was culled at Muweilah during the first year. Later culling was modest, indicating that the surviving animals were mostly raised to adulthood. Contrary to this, around a third of the animals killed at al-Sufouh 2 were between about one and for years old, which accords well with the normal yield of non-selective hunting of wild artiodactyls.

Both the diminution of body size and the demographic differences between the camels from al Sufouh 2 and Muweilah indicate a domestic status of the latter. Disarticulation and fragmentation of the skeletal elements, as well as chop-marks on the bone finds from Muweilah indicate

that dromedaries were slaughtered there for meat. The early culling of young dromedaries (graph 20) might also indicate that camel milk was used for human consumption. This is in good agreement with the remarkable flattening of the demographic curve between the ages of 12 to 48 months, indicating that animals older than one year were spared for later use. As clearly indicated by several finds of camel statuettes, this later use included riding and transportation of goods (see graph 21).

Graph 21: Camel figurine from Muweilah (Maggee 1996:210, fig. 28).

Although the flat saddle on top of the camel's hump does not seem appropriate for riding at first sight, there are known recent examples of the use of such saddles, in particular by women. Nevertheless, the increase of the remains of fish and shellfish at inland sites in SE Arabia from the Iron Age onward can also be considered as an effect related of the use of dromedaries as beasts of burden. Rapid transportation of fresh fish from the coast to the interior remained an important function of the domestic dromedary till the advent of motorized transport in the 20th century.

CAMEL GRAVES OF THE LATE PRE-ISLAMIC PERIOD

The importance of domestic dromedaries for the emergence of the Arabic culture and way of life from the Iron Age onward cannot be discussed here in any detail. The domestic use of the camel induced substantial changes of many facets of daily life. It permitted wide-ranging mobility and was of great significance for economy, trade, and warfare (e.g. Rosen/Saidel 2010, Cleuziou/Tosi 2007:293–294, Retsö 1991).

There is also extensive pictorial evidence for dromedaries and their use from the period following the Iron Age, which is usually called the "Late Pre-Islamic" in the terminology of Arabian archeology. Camels depicted in different ways and on different materials are characteristic traits for the iconography of this period (Daems 2004). Two famous sites of this period in the region under concern are Mleiha (Mouton 1999, 2008) in the interior of Sharjah Emirate and ed-Dur (Haerinck 2003) at the coast of the Umm al-Quwain Emirate. The study of the faunal re-

mains of both sites (Van Neer/Gautier 1993, Gautier/Van Neer 1999) clearly indicates the ongoing importance of the dromedary during this time, even after the later arrival of the horse (see graph 22).

Graph 22: Fragment of a plate from Mleiha with warriors on camel and horse.

A new feature of this period with regard to the archeozoology of camels is the occurrence of camel graves. Camel skeletons may occur together with those of humans in the same grave or as individual burials in the context of a necropolis. This custom is interpreted as "*baliya*" – the sacrifice of an animal. It is assumed that this was an immolation for a deceased individual in order to be used in the afterlife. The sacrifice of camels can also be seen in relation to tokens of prestige and indications of rank (Daems/De Waele 2008, King 2009).

The dates of the camel graves found at Mleiha (H.-P. Uerpmann 1999) range from 300 BCE to 200 CE. These graves are important in various respects. The detection of camel-hybrids, cross-breeds between one-humped and two-humped camels, is one of these particular features. Hybrids can be identified by their particularly large size and by specific morphological traits, which are usually intermediate between the characters of the two parental species. The occurrence of camel hybrids, however, is not an exclusive feature of SE Arabia.[3] They are known from the eastern Mediterranean area in the west to Bactria in the east and throughout the Arabian Peninsula down to Yemen. Recent observations by the authors on faunal remains from Dhafar, the capital of the Hymarite kingdom (Yule 2007), indicate the presence of both dromedaries and hybrids in this area around 500 CE.

Another important feature of the camel graves excavated at Mleiha in the early 1990s (Jasim 1999) is the fact that they represent a conceptual entity of animals offered simultaneously in the context of the burial of an important person or of a noble family. At a greater distance from the central graves – which were robbed and therefore empty – there is a row of eleven dromedary graves and one grave with single dromedary and a horse, whereas one camel hybrid and a horse with golden adornments on its bridle were found in the corridor of the noble grave chamber. Other bones of camel hybrids – not in anatomical order – are from a robbed grave shaft near the central grave. Thus the hybrids seem to have been highly esteemed, judging by their position in the graveyard. From the position of the complete camel skeletons it could be observed that the animals entered the graves alive and were put to death there. Altogether the value of the animals offered at the Mleiha graveyard must have been quite high. The dromedaries had reached the ideal age when they would have started to breed and when they would first have been ridden.

[3] For a detailed discussion of camel hybridization see article by Bernard Faye and Gaukhar Konuspaveva in this volume.

The hybrids were somewhat older and had reached their full size and strength. Their value as beasts of burden was probably at its highest during this part of their lives.

As a last remark on the archeozoology of camels in SE Arabia we should mention that our first experience with a camel grave in that area turned out to be an anachronism. A camel skeleton found in grave BHS12 of the Middle Bronze Age at Jebel al-Buhais (BHS in graph 17) was the incentive for our ongoing involvement in the archeology and archeozoology of that particular area. Very soon during the excavation it became obvious that this camel skeleton was a later intrusion into the Bronze Age grave. It was not clear, however, how much later. A human burial, also intrusive and potentially representing the rider of the camel, contained iron arrowheads but no further indication for a reliable archeological dating. The bones of the camel were very fragile and not well enough preserved for radiocarbon dating, but the stomach content was still there. It contained large numbers of the durable seeds of a plant of the genus *Lithospermium*. These provided a radiocarbon date for the camel's last meal, which it ate between 655 and 670 CE (Uerpmann H.-P./Uerpmann M. 1999). This was after the initial spread of Islam in this area. The *baliya*, the offering of a camel with the burial of its owner, was against Islamic rules (King 2009). Thus the buried camel at al-Buhais 12 might provide archeozoological evidence of the historically known resistance in eastern Arabia against the spread of Islam and its attempt to free itself from Islamic rule after the death of the prophet Mohammed.

Graph 23: Dromedary skeleton in grave 12 at al-Buhais (Sharjah, UAE) during excavation

CONCLUSIONS

Timing of dromedary domestication remains the central problem of camel archeozoology in SE Arabia. The osteological differences between the dromedary remains from the Iron Age and those from the Bronze Age and older periods clearly indicate that the shift from hunting to herding camels occurred between about 1400 and 900 BCE. Whether domestication happened locally in the little-known transitional phase from the Late Bronze to the Early Iron Age or whether the domestic dromedary was introduced to the area from a hitherto unknown center of camel domestication elsewhere in Arabia is unknown. More evidence will probably come to light when further archeological sites in the United Arab Emirates and Oman have been evaluated with regard to their animal remains. Large areas of the Arabian Peninsula, where the wild dromedary also occurred during the Early Holocene and where its domestication may have happened,

are still completely unexplored in archeozoological terms. An exception is the Yemen, where thanks to the work of Francesco Fedele (2009, and in press) we know more about the early presence of domestic dromedaries. Fedele provided evidence of the use of domestic dromedaries at around 850 BCE in the Sabaean town of Yalā. This date is in accordance with the appearance of domestic camels in SE Arabia in the Iron Age II contexts of Tell Abraq and Muweilah.

The introduction of the domestic dromedary into an area where its wild ancestor did *not* exist beforehand was recently described by Cornelia Becker for Tell Sheikh-Hamad on the Khabur River in NE Syria (Becker 2008). Remains of dromedaries were discovered at Sheikh Hamad in layers of the Neoassyrian Phase, the beginnings of which correspond to the Iron Age in SE Arabia. The domestic dromedary is well documented by the palace reliefs of this period in Mesopotamia. Textual evidence reports its contemporaneous presence in the Levant. It will be interesting to critically review the dating evidence for the appearance of this animal in the coastal areas of the eastern Mediterranean, which in the Holocene were outside the natural range of the wild dromedary.

Even more interesting than the dromedary finds from Tell Sheikh Hamad are other findings by Cornelia Becker at this important site: there are remains of the two-humped or Bactrian camel in layers below those which yielded the dromedary finds. As the wild ancestor of the Bactrian camel is not known to have occurred in the Djazirah area of Syria or in Lower Mesopotamia, the finds also indicate an early introduction: in this case of the domestic two-humped camel from its hitherto unknown area of original domestication. This area may well have been in the dry steppes and deserts of the Iranian Highland, where the wild two-humped camel may have existed (Uerpmann 1987) and where it may have been domesticated during the Bronze Age – as possibly indicated by the early findings at Shar-e-Sokhta (Compagnoni/Tosi 1978). If domestic Bactrian camels existed in south-eastern Iran at the end of the 2nd millennium BCE, dromedary domestication in Arabia might have been inspired by contacts across the Gulf. Such contacts are well documented by finds from Muweilah (Magee 1999, 2002). It should, however, also be mentioned that the site also yielded evidence for contacts with South Arabia in the form of an inscribed name on a large jar using the Old South Arabic alphabet (Magee 1999). Thus SE Arabia is clearly on the crossroads of the early history of dromedary domestication. However, only a major intensification of archeozoological research throughout the Arabian Peninsula will provide a solid answer to the most interesting question of when and where dromedaries were tamed and domesticated for the first time.

A rapid spread of early domestic dromedaries over the Arabian Peninsula and the adjacent areas of Mesopotamia and the Levant can easily be imagined. This spread may even have occurred so fast that a precise localization of the initial center of domestication may remain difficult because of the inaccuracy of archeological dating. The influence of the possession of large animals as beasts of burden and for riding would in any case strongly have influenced the further development of the economy and culture in general. The origin of what can now be understood as the "Arabian cultural complex" would have been impossible without the domestic dromedary.

REFERENCES

Becker, C, (2008): "Die Tierknochenfunde aus Tall Šēh Hamad/Dūr-Katlimmu: Eine zoogeographisch-haustierkundliche Studie", in: Kühne, Hartmut (ed.): *Umwelt und Subsistenz der Assyrischen Stadt Dūr-Katlimmu am unteren Habur.* Berichte der Ausgrabung von Tall Šēh Hamad/Dūr-Katlimmu 8. Wiesbaden: Harrassowitz Verlag, pp. 61–132

Beech, M/Mashkour, M/Huels, M/Zazzo, A (2009): "Prehistoric Camels in South-eastern Arabia: The Discovery of a New Site in Abu Dhabi`s Western Region, United Arab Emirates", in: *Proceedings of the Seminar for Arabian Studies* 39, pp. 17–30

Cleuziou, S/Tosi, M (2007): *In the Shadow of the Ancestors – The Prehistoric Foundations of the Early Arabian Civilization in Oman.* Muscat: Ministry of Heritage and Culture

Compagnoni, B/Tosi, M (1978): "The Camel: Its Distribution and State of Domestication in the Middle East During the Third Millennium B.C. in Light of Finds from Shahr-I Sokhta", in: Meadow, RH/Zeder,

MA (eds.): *Approaches to Faunal Analysis in the Middle East.* Cambridge, Mass.: Harvard University Press

Daems, A (2004): "The Terracota figurines from ed-Dur (Umm al-Qaiwain, U.A.E.): The Animal Representations", in: *Arabian Archaeology and Epigraphy* 15/2, pp. 229–239

---/De Waele (2008): "Some Reflections on Human-Animal Burials from Pre-Islamic South-East Arabia (poster)", in: *Proceedings of the Seminar for Arabian Studies* 38, pp. 137–140

Dobney, KM/Jaques, D (1994): "Preliminary Report on the Animal Bones from Saar", in: *Arabian Archaeology and Epigraphy* 5, pp. 106–120

Fedele, FG (2009): Sabaean Animal Economy and Household Consumption at Yalā, Eastern Khawlan al-Tiyal, Yemen, in: *Proceedings of the Seminar for Arabian Studies* 39, pp. 135–154

--- (in press): "New Data on Domestic and Wild Camels *(Camelus dromedarius)* in Sabaean Yemen", in: Beech, M et al. (eds.): *Archaeozoology of the Near East IX. Proceedings of the 9th Meeting of the ASWA Working Group of ICAZ, Al Ain (UAE) November 2008*

Frifelt, K (1975): "On Prehistoric Settlement and Chronology of the Oman Peninsula", in: *East and West* 25, pp. 329–423

--- (1995): *The Island of Umm An-Nar, Vol. 2 the Third Millennium Settlement.* Jutland Archaeological Society Publications XXVI: 2

Gautier, A/Van Neer, W (1999): "Étude générale des restes vertébrés de Mleiha", in: Mouton, M: *Mleiha I: environnement, stratégies de subsistance et artisanats.* Lyon: Travaux de la Maison de l'Orient 29, pp. 107–120

Gruber, C/Ayoub, S/Brückner, H/von den Driesch, A/Manhart, H/Qandil, H/Werner, P/Zander, A (2005): "The Site of Al Sufouh 2 within Dubai Internet City/U.A.E.: Preliminary Report on Four Campaigns of Excavation (03/2001–11/2002)", in: *Emirates Cultural Heritage*

Haerinck, E (2003): "Internationalisation and Business in Southeast Arabia During the Late 1st Century B.C./1st Century A.D.: Archaeological Evidence from ed-Dur (Umm al-Qaiwain, UAE)", in: Potts, DT/Al Naboodah, H/Hellyer, P (eds.): *Archaeology in the United Arab Emirates. Proceedings of the First International Conference on the Arachaeology of the U.A.E.* Trident Press, pp. 196–206

Hoch, E (1979): "Reflections on Prehistoric Life at Umm an-Nar (Trucial Oman) Based on Faunal Remains from the Third Millennium BC", in: Taddei, M (ed.), *South Asian Archaeology* 1977, pp. 589–638

Jasim, SA (1999): "The Excavation of a Camel Cemetery at Mleiha, Sharjah, UAE", in: *Arabian Archaeology and Epigraphy* 10/1, pp. 69–101

King, G (2009): "Camels and Arabian *balîyah* and Other Forms of Sacrifice: A Review of Archaeological and Literary Evidence", in: *Arabian Archaeology and Epigraphy* 20/1, pp. 81–93

Koike, H/Ohtaishi, N (1987): "Estimation of Prehistoric Hunting Rates Based on the Age Composition of Sika Deer (*Cervus nippon*)", in: *Journal of Archaeological Science* 14/3, pp. 251–269

LeTensorer, JM/Hauck, T/Wojtczak, D/Schmid, P/Schuhmann, D (2007): *Le Paléolithique d'El Kowm (Syrie)* https://forschdb2.unibas.ch/inf2/rm_projects/object_view.php?r=5910, consulted 20 Feb., 2011

Magee, P (1999): "Writing in the Iron Age: The Earliest South Arabian Inscription from Southeastern Arabia", in: *Arabian Archaeology and Epigraphy* 10, pp. 43–50

--- (2002): "The Indigenous Context of Foreign Exchange Between South-eastern Arabia and Iran in the Iron Age", in: *Journal of Oman Studies* 12, pp. 161–168

---/Thompson, E/Mackay, A/Kottaras, P/Weeks, L (2002): "Further Evidence of Settlement Complexity: Report on the 2001 Excavations at the Iron Age Site of Muweilah, Emirate of Sharjah, United Arab Emirates", in: *Arabian Archaeology and Epigraphy* 13/2, pp. 133.160

Mouton, M (1999): "Mleiha: Description and Dating of the Site", in: Mouton, M (ed.): *Mleiha I: environnement, stratégies de subsistance et artisanats.* Lyon: Travaux de la Maison de l'Orient 29, pp. 9–32

--- (2008): *La péninsula d'Oman de la fin de l'Age du fer au début de la période sassanide.* Oxford: Archaeopress, Society for Arabian Studies Monographs No. 6, BAR International Series 1776

Parker, AG/Preston, GW (2008): "Early to Middle Holocene Climate Change and Vegetation Dynamics in the Northern Oman Peninsula: An Ecogeographical Synthesis of the Jebel al-Buhais Environment", in: Uerpmann, H-P/Uerpmann, M./Jasim, SA (2008): *The Natural Environment of Jebel al-Buhais: Past and Present: The Archaeology of Jebel al-Buhais, Sharjah, United Arab Emirates*, Vol. 2. Department of Culture and Information, Government of Sharjah, United Arab Emirates, in collaboration with the Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen, Germany and Kerns Verlag Tübingen, pp. 71–81

Peters, J (1998): "*Camelus thomasi* Pomel, 1893, a Possible Ancestor of the One-Humped Camel?", in: *Zeitschrift für Säugetierkunde* 63: pp. 372–376

Potts, DT (1993): "Four Seasons of Excavations at Tell Abraq (1989–1993)", in: *Proceedings of the Seminar of Arabian Studies* 23, pp. 117–126

--- (2000): *Ancient Magan: The Secrets of Tell Abraq.* London: Trident Press

--- (2009): "Globalization, 'Big History' and Multi-scalar Analysis: Conceptualizing 8000 Years of the UAE's Cultural Development", in: *Proceedings of the International History Conference on New Per-*

spectives on Recording UAE History. National Center for Documentation & Research. Abu Dhabi, UAE, p. 24

Retsö, J (1991): "The Domestication of the Camel and the Establishment of the Frankincense Road from South Arabia", in: *Orientalia Suecana* XL: pp. 187–219

Rosen, SA/Saidel, BA (2010): "The Camel and the Tent: An Exploration of Technological Change among Early Pastoralists", in: *Journal of Near Eastern Studies* 69/1, pp. 63–77

Tosi, M (1989): "Protohistoric Archaeology in Oman: The First Thirty Years (1956–1985)", in: Costa, Paolo M/ Tosi, M (eds.): *Oman Studies: Papers on the Archaeology and History of Oman,* Serie Orientale Roma LXIII. Rome, pp. 135–161

Uerpmann, H-P (1987): *The Ancient Distribution of Ungulate Mammals in the Middle East*, Beihefte zum Tübinger Atlas des Vorderen Orients, Wiesbaden: Dr. Ludwig Reichert

--- (1999): "Camel and Horse Skeletons from Protohistoric Graves at Mleiha in the Emirate of Sharjah (UAE)", in: *Arabian Archaeology and Epigraphy* 10/1, pp. 102–118

--- 2008. "Animal Domestication", entry in: Pearsall, D. M. (ed): *Encyclopedia of Archaeology,* Vol. 1. New York: Academic Press, pp. 434–445

---/Uerpmann, M (1999): "The Camel Burial of Al-Buhais 12 (Sharjah, UAE)", in: Becker, C/Manhart, H/Peters, J/ Schibler, J (eds.) *Historia Animalium Ex Ossibus – Festschrift für Angela von den Driesch*. Leidorf, Rahden 1999, pp. 455–462

---/Uerpmann, M, (2002): "The Appearance of the Domestic Camel in SE-Arabia", in: *Journal of Oman Studies* 12, pp. 235–260

---/Uerpmann, M/Jasim, SA (2006): *Funeral Monuments and Human Remains from Jebel al-Buhais: The Archaeology of Jebel al-Buhais, Sharjah, United Arab Emirates,* Vol. 1. Department of Culture and Information, Government of Sharjah, United Arab Emirates, in collaboration with the Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen, Germany and Kerns Verlag Tübingen

---/Uerpmann, M/Jasim, SA (2008): *The Natural Environment of Jebel al-Buhais: Past and Present: The Archaeology of Jebel al-Buhais, Sharjah, United Arab Emirates*, Vol. 2. Department of Culture and Information, Government of Sharjah, United Arab Emirates, in collaboration with the Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen, Germany and Kerns Verlag Tübingen

Uerpmann, M (2001): "Remarks on the Animal Economy of Tell Abraq (Emirates of Sharjah and Umm al-Quwain, UAE)", in: *Proceedings of the Seminar for Arabian Studies* 31, pp. 227–233

---/Uerpmann, H-P (2008a): "Neolithic Faunal Remains from al-Buhais 18 (Sharjah, UAE)", in: Uerpmann, H-P/Uerpmann, M/Jasim, SA: *The Natural Environment of Jebel al-Buhais: Past and Present: The Archaeology of Jebel al-Buhais, Sharjah, United Arab Emirates*, Vol. 2. Department of Culture and Information, Government of Sharjah, United Arab Emirates, in collaboration with the Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen, Germany and Kerns Verlag Tübingen, pp. 97–132

---/Uerpmann, H-P, (2008b): "Animal Economy During the Early Bronze Age in South-East Arabia", in: Vila, E et al. (eds.) *Archaeozoology of the Near East VIII.* Lyon: Maison de l'Orient et de la Méditerranée, pp. 465–485

---/Uerpmann, H-P (in press): "The Iron Age Site of Muweilah (Sharjah, UAE) and the Problems of Dromedary Domestication", in Beech, M et al. (eds.): *Archaeozoology of the Near East IX. Proceedings of the 9th Meeting of the ASWA Working Group of ICAZ*, Al Ain (UAE) November 2008

---/Uerpmann, H-P/Jasim, SA (2000): "Stone Age Nomadism in SE-Arabia: Palaeo-economic Considerations on the Neolithic site of Al-Buhais 18 in the Emirate of Sharjah, UAE", in: *Proceedings of the Seminar of Arabian Studies* 30, pp. 229–234

Van Neer W/Gautier A (1993): "Preliminary Report on the Faunal Remains from the Coastal Site of ed-Dur, 1st–4th Century AD Umm al-Quwain, United Arab Emirates", in: Buitenhuis H/Clason AT (eds.): *Archaeozoology of the Near East: Proceedings of the First International Symposium on the Archaeozoology of Southwestern Asia and Adjacent Areas.* Leiden: Universal Book Services, pp. 110–118

Von den Driesch, A/Obermaier, H (2007): "The Hunt for Wild Dromedaries During the 3rd and 2nd Millennia BC on the United Emirates Coast: Camel Bone Finds from the Excavations at Al Sufouh 2, Dubai, UAE", in: *Documenta Archaeobiologiae* 5, Rahden/Westf.: Marie Leidorf GmbH, pp. 133–167

Yule, P (2007): *Himyar.* Aichwald: Linden Soft