

Camel and horse skeletons from protohistoric graves at Mleiha in the Emirate of Sharjah (U.A.E.)

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Animal burials from a graveyard at Mleiha in the interior of the Sharjah Emirate (U.A.E.) are described and documented with regard to the archaeozoology of the represented species. These are two horses, nine dromedaries, and three camel hybrids. The hybrids represent crossbreeds between two-humped Bactrian camels and one-humped Arabian dromedaries where the latter species has been the female parent. According to their central position in the graveyard, the hybrids seem to have been status animals. One of the horses was in a similar position while the other was in a peripheral grave together with a dromedary.

Burials of at least twelve camels and two horses were discovered during excavations carried out in 1994 by Sabah A. Jasim of the Directorate of Antiquities of the Department for Culture and Information of the Government of the Emirate of Sharjah in the United Arab Emirates. They were found in the surroundings of the township of Mleiha in the interior of the Emirate not far from the archaeological sites known through the previous work of the French archaeological mission in this area (1). The animal skeletons were first studied by M. Mashkour from the Laboratoire d'Anatomie Comparée of the Paris Natural History Museum. She prepared drawings of some of the graves which we reproduce here with her kind permission (2). While she concentrated her studies on questions of burial practices, the present author was asked to examine the archaeozoological

features of the animals. This study was undertaken during the excavation of another camel burial found one year later by the same excavator at the site of al-Buhais 12, which lies some 17 km south of Mleiha near the village of al-Madam (3). The map of the Mleiha camel graveyard – reproduced as Figure 1 – was compiled during fieldwork in 1997 at the site of al-Buhais 18 by Kurt Langguth and Tim Prindiville.

The animal graves at Mleiha belong to a complex of pits which are interpreted as burials of a small group of people of a particular social status. In the centre of the excavated area there are four walled subterranean structures, which are thought to have been the grave chambers. As no human remains were found in these chambers their interpretation remains somewhat insecure. However, given the acidity of the soil at the site, the obvious

looting of the graves may well have lead to the complete disappearance of the thereby disturbed skeletons. There are, in any case, exceptional animal burials in what appears to have been the entrance galleys of two of these assumed burial chambers (nos. 1 and 4 in Fig. 1). The central chamber between these two structures has a separate camel grave (no. 11) directly associated to it. The camel skeletons in these graves are particular because they represent animals which were much larger than the 'normal' dromedaries found in the peripheral animal graves. In addition there was the skeleton of a horse in grave 4 wearing its head-gear adorned with large golden disks (4).

The order of the peripheral animal graves around the central chambers is an indication that they belong to the same burial complex. Their orientation towards the centre and their alignment is evidence against the assumption that they represent independent burial events. With one horse and six camel skeletons on the west side one might expect a similar arrangement on the east side, where only one camel skel-

eton (grave 13) was encountered. This may, however, be due to the bulldozing of the area prior to the excavation. In grave 13 only the lowermost portion of the pit and of the skeleton is preserved. If neighbouring pits were slightly more shallow, they may have been destroyed completely during the discovery of the site. It seems possible, therefore, that originally there was a symmetrical arrangement of animal graves on both sides (west and east) of the central grave chambers. To the north there is only one pit containing remains of animal burials. This is grave 18, where heavily disturbed skeletons of two camels were encountered. One of them may have been moved during looting from grave 19. The structures with numbers 25 and 26 cannot be called graves, because they contained only some bone fragments (no. 25) and a camel mandible (no. 26), but no complete skeletons. The whole assemblage of grave structures and other features is part of the protohistoric site of Mleiha dating to the centuries between about 300 BC and 200 AD.

All the undisturbed camel graves con-

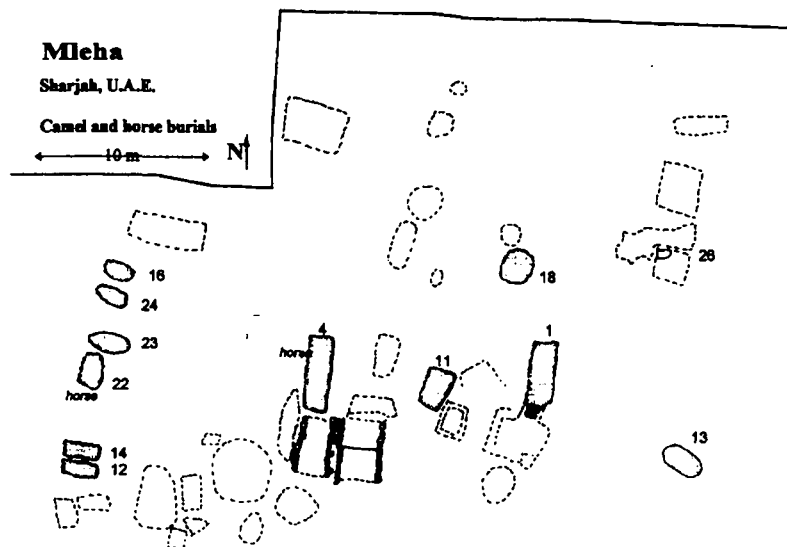


Fig. 1.
Map of the animal graves (shaded) and other pits and chambers in the north-central part of the excavated area.

tained animals in their natural resting position with the legs folded under the bodies. This indicates that the animals entered their graves alive and were made to kneel down by their masters. They were then killed in this position. Traces of the killing itself could not be observed, which might be due to the bad preservation of the bones, but cutting the large blood vessels in the neck of the animal would not necessarily leave traces on the bones. Where the head was preserved, it rested upside down on the shoulder of the animal. There is no indication that the neck was completely cut. Neck vertebrae were observed *in situ* in al-Buhais 12. In other cases they had dissolved in the soil like many other parts of the badly-preserved skeletons. The animal graves will first be described individually

before the archaeozoological observations are dealt with in detail.

Description of individual skeletons:

Grave 1 (Fig. 2):

Large camel in kneeling position looking south. Only a few parts of the right front leg and of a hind leg were still *in situ* when the graves were examined by the present author. The bones kept in the excavation house which could be associated with this grave are a skull of an adult male and other parts of the body indicating that the animal was complete except for parts of the trunk which had apparently dissolved in the soil.

Mleha: Central camel and horse graves

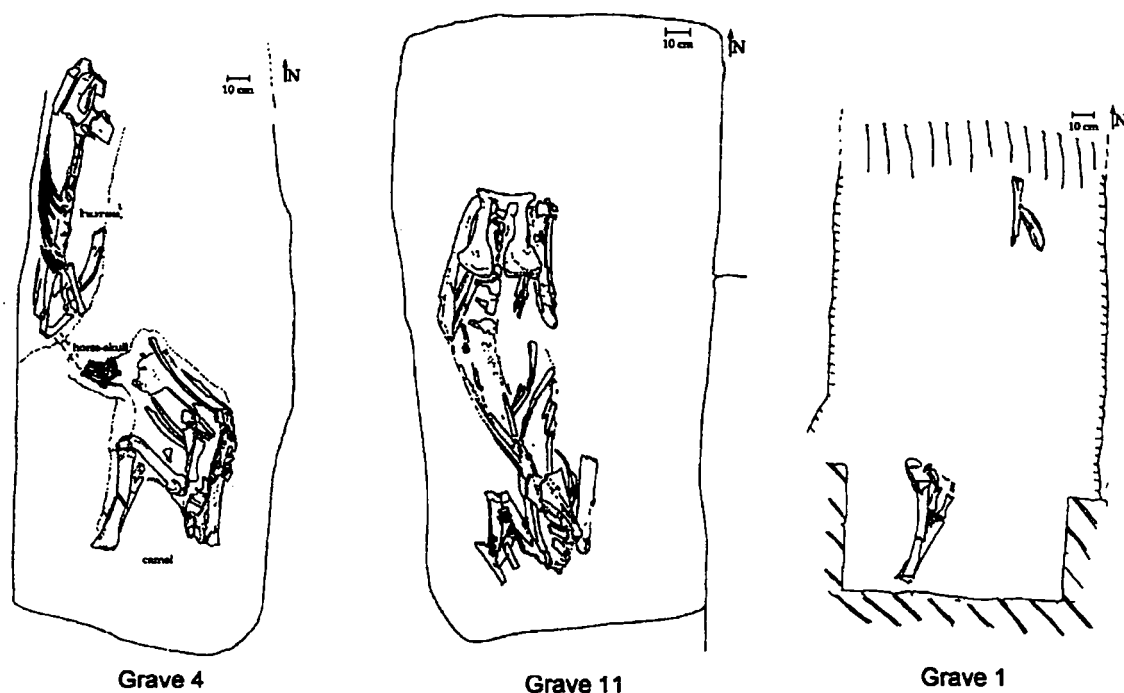


Fig. 2.
Animal skeletons in the central graves (after Mashkour).

Grave 4 (Fig. 2):

Large camel in kneeling position looking south. The body was leaning to the left, the hind legs were slightly turned inwards. Parts of the thoracic chest were still *in situ* with the right and parts of the left front leg attached to it. Head, neck, lumbar vertebra and hind legs were removed during excavation and could be examined in the excavation house. Two isolated canine teeth and parts of the pelvis clearly indicate a male animal. The animal was adult, but some of the apophyses of the vertebra were still in the process of fusion. The bones of this animal are comparatively well preserved, probably because of its particularly heavy structure. Apparently the animal was complete, but parts were destroyed in the process of excavation. The parts still found *in situ* were recovered for the museum collection.

To the right of the camel and half of its length backwards there was the skeleton of a horse in a similar position, but with the neck bent towards the camel and the head in an upright position near the belly of the camel. The head was removed during excavation and is now part of the exhibition of the Archaeological Museum of Sharjah. Apparently the upper jaw of the animal was broken, the front teeth being displaced into the interior of the mouth. According to these teeth the animal was adult and in its best years. No determination of the sex was

possible because the front part of the lower jaw was still embedded in the sediment of the floor of the grave. Only parts of the thoracic chest and the front legs were still *in situ* and could be studied in order to obtain bone measurements. Some parts could be located among the camel bones from the same grave in the excavation house. According to photographs taken during excavation, the horse seems to have been complete. The animal was obviously wearing its ornamented bridle with an iron bit consisting of two linked parts inside the mouth with the vertical pieces on both sides.

Grave 11 (Fig. 2):

Large camel in kneeling position looking south. Parts of the trunk dissolved in the soil and other parts were removed during excavation. Some parts could be found in the excavation house, among them a piece of the pelvic bone which indicates a female. The animal was fully adult although most of the apophyses of the vertebra were still in the process of fusion. According to the rich finds associated with this animal the grave was not disturbed by looting and the missing parts must therefore have dissolved in the soil.

Grave 12 (Fig. 3):

Dromedary in kneeling position looking east with the head bent backwards and resting upside down on the left shoulder.

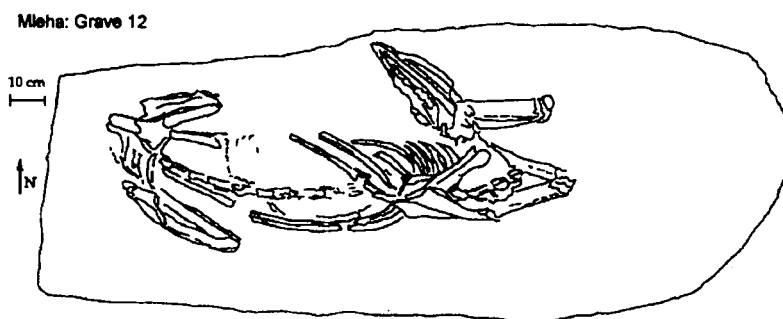


Fig. 3.
Animal skeleton in Grave 12
(after Mashkour).

The skeleton is in a bad state of preservation but was complete before excavation. According to the thin upper canine teeth the animal was a female. Its last cheek tooth had erupted but was not yet worn, indicating that the animal was between 5 and 6 years old.

Grave 13 (Fig. 4):

Dromedary in kneeling position looking west-northwest. The skeleton was mostly destroyed by the bulldozing prior to excavation. Only the parts close to the bottom of the grave were preserved, although heavily crushed.

Grave 14:

Dromedary in kneeling position looking east. Only the thoracic chest and the front legs were still present in the grave, although in a very bad state of preservation. The animal was at least subadult but its sex could not be determined.

Grave 16:

Dromedary in kneeling position looking east with the head bent backwards resting upside down on the left side of the hump. The skeleton was found in bad condition

but seems to have been complete originally. The animal was a female of about 5 years of age. This type of dromedary is today locally called *theneiyah*.

Grave 18:

Mixed remains of two dromedaries. They were both probably in a kneeling position looking south, but only a small part of one right front leg is still in its original position. The other parts of the body are heavily mixed. Apparently the grave was opened and its contents turned over by looters. When this happened, the bones were already in bad condition because most of them were broken during the looting. Fragments of the same bone were found in different areas of the grave at a different depth. All parts of the body are present, which indicates that both animals were complete. At least one of them was fully adult, but the sex could not be determined. It is possible that one of the animals came from grave 19.

Grave 19:

Mostly empty with some fragments of camel bones in a disturbed position. One bone is of an adult animal. The grave was

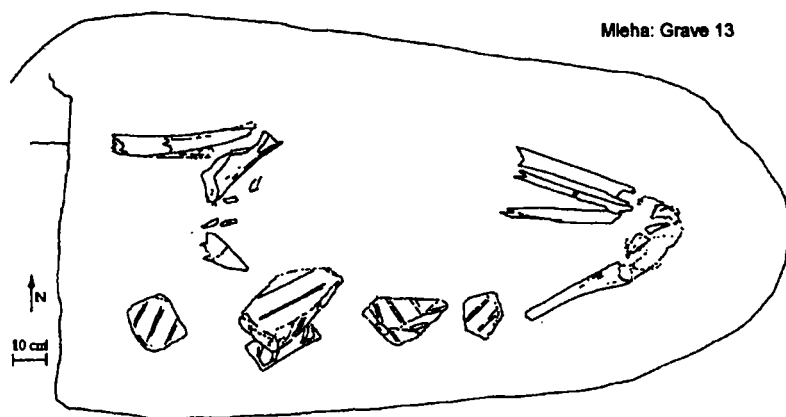


Fig. 4.
Animal skeleton in Grave 13
(after Mashkour).

obviously looted and most of the camel skeleton removed. It seems possible that its parts were disposed of in grave 18, which would indicate that the two graves were looted at the same time.

Feature 21:

Some small fragments of animal bone, which according to their size may be camel bones. There is no indication that this structure was a camel burial and the bone fragments may be intrusive.

Grave 22:

A horse and a dromedary in a kneeling position looking southeast. The horse was situated on the south side of the grave, close to the right side of the camel. Its head stood upright on the mouth in the same way as was found in grave 4. Of the head, only the front teeth were preserved, because the bottom of the grave is close to the present surface and the upper parts of both skeletons were destroyed by the bulldozer which removed the surface layer. The horse was an adult stallion, probably about 6 years old. The camel was at least subadult but its sex could not be determined. The preservation of the bones of both animals is rather poor.

Grave 23:

Dromedary in a kneeling position looking east-southeast with the head bent backwards, resting upside down on its left shoulder. Originally the skeleton was complete but the upper parts were destroyed by the bulldozer. The animal was subadult and its sex could not be determined. Preservation of the bones is poor.

Grave 24:

Dromedary in a kneeling position looking east-southeast. Most of the skeleton was destroyed by the bulldozing. The animal was subadult and its sex could not be de-

termined directly, but the larger size of the bones indicates a male.

Feature 25:

Isolated part of the front leg of a camel consisting of the lower part of a radius, the carpal joint, and the metacarpus found in a position indicating that the bones were still in conjunction when deposited.

Feature 26:

Isolated left lower jaw of an adult female dromedary found in the corner of a walled structure.

Oven structure in the settlement area of Mleiha:

As well as the animal skeletons from the graveyard, some animal remains from a large oven built of mud brick and bones in the protohistoric settlement area of Mleiha were examined. Apart from the bones used in its construction others were recovered from its ashy fill. The bones used for building the structure were mainly long bones of camels, but also some mandibles and other bones. Only one skull of a sheep or goat could be seen sticking out of the mud bricks in addition to the many camel remains. Bones of old and young animals as well as males and females were used. The specimens found in the ashy fill of the structure were also mainly camel bones. They represent different animals, one of them a young male. Apart from camel bones there were several sheep bones and some fish vertebra in the fill. These remains probably represent kitchen refuse from cooking the meat of the animals. Measurements of the camel bones were taken in order to compare them to those recorded for the animals from the graves.

Archaeozoology of the Mleiha camels

Two types of camels were found at Mleiha: very large and heavy individuals were as-

sociated with the walled burial chambers in the centre of the graveyard (graves 1, 11 and 4). As will be shown below, they were probably camel hybrids specially bred as a mix of dromedary and Bactrian camel. In any case they represent a kind of camel which is no longer used in southeast Arabia today. The second type of camel found in all other graves at Mleiha (and in the neighbouring camel graves of al-Buhais and Jebel Emeilah (5)) corresponds to present-day dromedaries of the area. Among the large camels there were two males and one female. All were adult (more than 8 years old). Of the dromedaries, two could be identified as females because of their thin canine teeth. The rest was too badly preserved to be sexed directly, but according to size, there was probably only one male among the buried animals. Most of them were young adults between 5 and 7 years old.

Because of the very bad preservation of the bones, only a few measurements could be taken and these are documented in Table 1. It is obvious that the individuals from the central graves yielded the largest osteometric values. Nevertheless, it is difficult to base meaningful comparisons on the few measurements available for each individual. Under such circumstances the use of size indices provides a better picture of the relative sizes. The LSI (Logarithmic Size Indices) method used for this purpose is based on the calculation of logarithmic proportions between the finds and the respective bones of a 'standard' individual. For the camel remains from Mleiha we used the skeleton of an old male dromedary from the Batinah of Oman as standard (6). LSIs were calculated for each measurement taken on the bone finds from Mleiha according to the formula:

$$LSI_x = \log x - \log s$$

where x is the find-measurement and s is the respective measurement of the stan-

dard. If the find is larger than the standard the resulting value is positive, if it is smaller the LSI is negative. If more than one measurement exists for a bone find, the mean of the different LSI values is calculated. LSIs of the camel finds from Mleiha are shown in Figure 5. From this figure it is obvious that the large camels from the central graves had bone measurements well above the standard, while – with the exception of the animal from grave 24 – the other individuals were a little smaller than the old male from the Batinah. Interestingly enough, large animals were also found in the oven structure ('MO' of Fig. 5) in the settlement area.

In terms of their size as well as of all their morphological features the animals from graves 12 to 26 were normal dromedaries. Except for the individual from grave 24 they were probably all females; this was already determined based on the teeth or pelvic bones from graves 12 and 16, as well as from the remains from feature 26.

With regard to their morphological features the large camels from the central

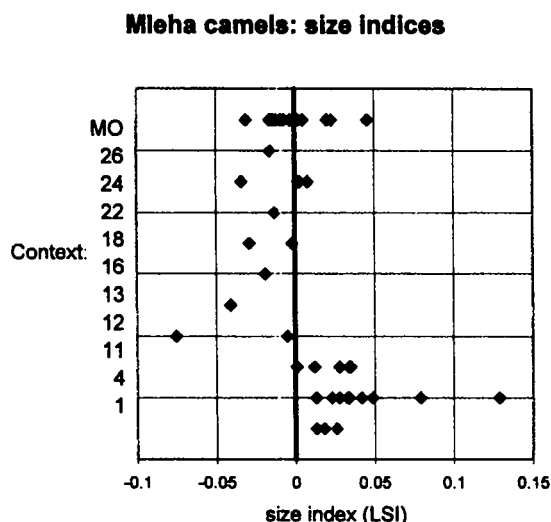


Fig. 5.
Size indices (LSI) for the camel remains from the graves and other contexts in Mleiha.

CAMEL AND HORSE SKELETONS AT MLEIHA

Table 1. Osteometry of the camels from the Mleiha graveyard.

a – skull and vertebrae

Maxilla	LTR	LMR	LPR	4	5	6	7	8	sex	remarks
Grave 1/left	150.5	101.5	47.0	–	–	–	–	–	m	alveoli
Grave 12/left	–	98.0	–	–	–	–	–	–	f	alveoli
Mandible	1	LMR	3	4	5	LM ₃	BM ₃	8		
Grave 26/left	–	108.0	–	–	–	44.0	–	–	f	alveoli
Grave 1/left	–	–	–	–	–	52.0	25.2	–	m	
Grave 16/right	–	–	–	–	–	47.0	19.5	–	f	
mean	–	–	–	–	–	47.7	–	–		
stand.dev.	–	–	–	–	–	4.04	–	–		
coeff.var.	–	–	–	–	–	8.5	–	–		
n=	–	–	–	–	–	3	2	–		
Axis	BACr	SBv	3	4	5	6	7	8	sex	
Grave 18	87.5	(35.5)	–	–	–	–	–	–		

b – anterior extremity

Scapula	SLC	GLP	LG	BG	5	6	7	8		remarks
Grave 4/left	(78.0)	(116.0)	67.5	–	–	–	–	–	m	
Grave 4/right	81.0	118.5	–	–	–	–	–	–	m	
Grave 12/left	64.0	–	–	–	–	–	–	–	f	
oven fill/right	–	113.3	69.0	(64.0)	–	–	–	–		
oven fill/left	72.0	106.5	64.5	63.5	–	–	–	–		
mean	73.8	113.6	67.0	–	–	–	–	–		
stand.dev.	7.50	5.17	2.29	–	–	–	–	–		
coeff.var.	10.2	4.6	3.4	–	–	–	–	–		
n=	4	4	3	2	–	–	–	–		
Humerus	Bd	BT	SD	4	5	GLC	7	HT		
Grave 4/right	92.5	77.5	53.0	–	–	425.0	–	63.5	m	
Radius	1	SD	Bd	GL	Ld	LwEd	BAP	BAd		
Grave 4/right	–	57.5	97.0	571.0	–	–	(80.0)	83.0	m	
Grave 12/left	–	(47.0)	–	–	–	–	–	–	f	
Grave 13/left	–	–	(50.0)	–	–	–	–	–		
Grave 14/right	–	53.0	–	–	–	–	–	–		
Grave 18/right	–	–	51.0	–	–	491.5	–	–		
Grave 24/?	–	–	53.0	–	508.0	–	–	–		
mean	–	52.5	62.8	–	–	–	–	–		
stand.dev.	–	5.27	22.87	–	–	–	–	–		
coeff.var.	–	10.0	36.4	–	–	–	–	–		
n=	–	3	4	2	–	1	1	1		
Metacarpus	1	SD	Bd	Bdm	Ddm	Bdl	Ddl	GL		
Grave 4/left	–	50.5	–	45.0	50.0	45.5	46.0	415.0	m	
Grave 24/?	–	(33.5)	–	–	–	–	–	(365.0)		
oven-?	–	30.3	–	–	(40.0)	–	–	–		
oven-?	–	–	(90.0)	–	–	–	–	–		

c – posterior extremity

Pelvis	LA	2	3	4	5	6	7	8	sex	remarks
oven fill/right	61.0	–	–	–	–	–	–	–	m	
Femur	1	DC	3	4	5	6	7	8		
Grave 4/?	–	57.0	–	–	–	–	–	–	m	
oven/?	–	59.5	–	–	–	–	–	–		DC=59–60
oven fill/?	–	51.7	–	–	–	–	–	–		
mean	–	56.1	–	–	–	–	–	–		
stand.dev.	–	3.98	–	–	–	–	–	–		
coeff.var.	–	7.1	–	–	–	–	–	–		
n=	–	3	–	–	–	–	–	–		

Table 1 cont.

Tibia	1	2	Bd	Dd	5	6	7	8		
oven/?	-	-	79.0	45.0	-	-	-	-	with astragalus	
oven/?	-	-	(81.0)	-	-	-	-	-		
oven fill/left	-	-	86.5	47.6	-	-	-	-		
mean	-	-	82.2	-	-	-	-	-		
stand.dev.	-	-	3.88	-	-	-	-	-		
coeff.var.	-	-	4.7	-	-	-	-	-		
n=	-	-	3	2	-	-	-	-		
Os malleolus	D	BAp	3	4	5	6	7	8		
Grave 4/left	43.5	17.5	-	-	-	-	-	-	m	
Astragalus	Ll	Lm	DI	4	BC	BAQ	7			
Grave 1/left	(79.0)	(74.5)	-	-	(50.0)	(20.0)	-	-	m	
Grave 4/right	81.3	73.1	45.6	-	54.0	23.4	-	-	m	
oven/left	75.0	66.5	41.5	-	49.0	-	-	-	with tibia	
oven fill/right	73.8	65.3	41.6	-	49.3	19.8	-	-		
oven fill/left	78.0	69.3	45.2	-	48.9	17.8	-	-		
mean	77.4	69.7	43.5	-	50.2	20.3	-	-		
stand.dev.	3.04	4.01	2.23	-	2.15	2.32	-	-		
coeff.var.	3.9	5.8	5.1	-	4.3	11.5	-	-		
n=	5	5	4	-	5	4	-	-		
Calcaneus	GL	2	GD	4	5	6	7	8		
Grave 4/left	-	-	(70.0)	-	-	-	-	-	m	
oven-?	137.5	-	-	-	-	-	-	-		
Central tarsal	B	D	L	LAC	5	6	7	8		
Grave 4/right	45.5	62.7	43.0	44.5	-	-	-	-	m	
oven fill/right	45.0	61.0	43.5	-	-	-	-	-		
Metatarsus	Bp	Dp	SD	4	5	Bdl	Ddl	GLI		
Grave 1/right	64.0	50.5	-	-	-	-	-	-	m	
Grave 4/left	(66.0)	-	-	-	-	38.5	40.5	-		
Grave 16/left	-	-	-	-	-	-	-	(365.0)	f	
Grave 22/left	-	-	-	-	-	-	-	370.0		
Grave 24/?	57.5	-	28.5	-	-	-	-	372.0		
oven/?	-	-	-	-	-	-	-	(375.0)		
oven fill/right	67.5	50.5	(37.0)	-	-	-	-	-		
oven fill/right	65.0	48.0	-	-	-	-	-	-		
mean	64.0	49.7	-	-	-	-	-	370.5		
stand.dev.	3.86	1.44	-	-	-	-	-	4.20		
coeff.var.	6.0	2.9	-	-	-	-	-	1.1		
n=	5	3	2	-	-	-	-	4		
d - phalanges										
Phalanx 1 ant.	Bp	SD	Bd	GL	Dp	DD	Dd	Lphys	sex	remarks
Gr1/right medial	-	23.0	39.0	112.5	-	-	-	-	m	
Gr4/left medial	44.8	24.1	(45.0)	(116.5)	38.5	22.1	32.0	110.0	m	
Grave 18/?	-	23.0	(36.0)	(103.0)	-	-	-	99.5		
mean	-	23.4	40.0	110.7	-	-	-	-		
stand.dev.	-	.64	4.58	6.93	-	-	-	-		
coeff.var.	-	2.7	11.5	6.3	-	-	-	-		
n=	1	3	3	3	1	1	1	2		
Phalanx 1 post.										
Gr4/right lateral	39.5	21.0	-	-	-	-	-	-	m	
Gr24/left medial	36.0	20.1	(28.0)	92.0	-	-	-	89.0		
Gr24/left lateral	36.5	19.0	-	90.5	-	-	-	87.0		
mean	37.3	20.0	-	-	-	-	-	-		
stand.dev.	1.89	1.00	-	-	-	-	-	-		
coeff.var.	5.1	5.0	-	-	-	-	-	-		
n=	3	3	1	2	-	-	-	2		
Phalanx 2 ant.										
Gr1/right medial	-	-	-	69.7	-	-	-	-	m	

graves also resemble dromedaries. There are, however, slight deviations. This, together with their enormous size, is an indication that they represent hybrids between the two-humped Central Asian (or Bactrian) camel and the one-humped Arabian camel (or dromedary). Such hybrids are known to have been bred in Turkey, Iran, Afghanistan and Turkmenia until the middle of this century. According to Bulliet the Arabian word for the first generation hybrids is *bukht* (7). They are famous for having been larger than both parental species, stronger than dromedaries and faster than two-humped camels, thus combining the favourable characters of both parents. It is, however, difficult to provide convincing osteological evidence for the hybrid nature of the large camels from Mleiha, because the osteological features of the hybrids have not been studied to any larger extent. As such animals no longer exist, it is impossible to obtain fresh skeletal material for comparative purposes.

A fragment of the axis, an astragalus,

and a first phalanx of the individual from grave 4 were taken to Tübingen for detailed comparison and documentation. For these specimens the osteological characters will be discussed in detail. Comparisons are based on the skeletons of five dromedaries and three Bactrian camels in the Tübingen collection and on the descriptions by Wapnish and Steiger (8). In addition, the skeletal remains of some camels which died in an earthquake in the year 747 AD in Pella, Jordan (9) were used. According to Köhler-Rollefson they represent hybrids between the two camel species (10).

The axis (second neck vertebra) of the two camel species has several distinctive characters. One of them is a thin bone ledge across the transverse foramen found only in the dromedary (11). From grave 4 at Mleiha there is a small axis fragment from the area of the transverse foramen. The bone ledge is present in this specimen, indicating that the animal was not a Bactrian camel. Contradicting evidence comes from the metacarpal bone: according

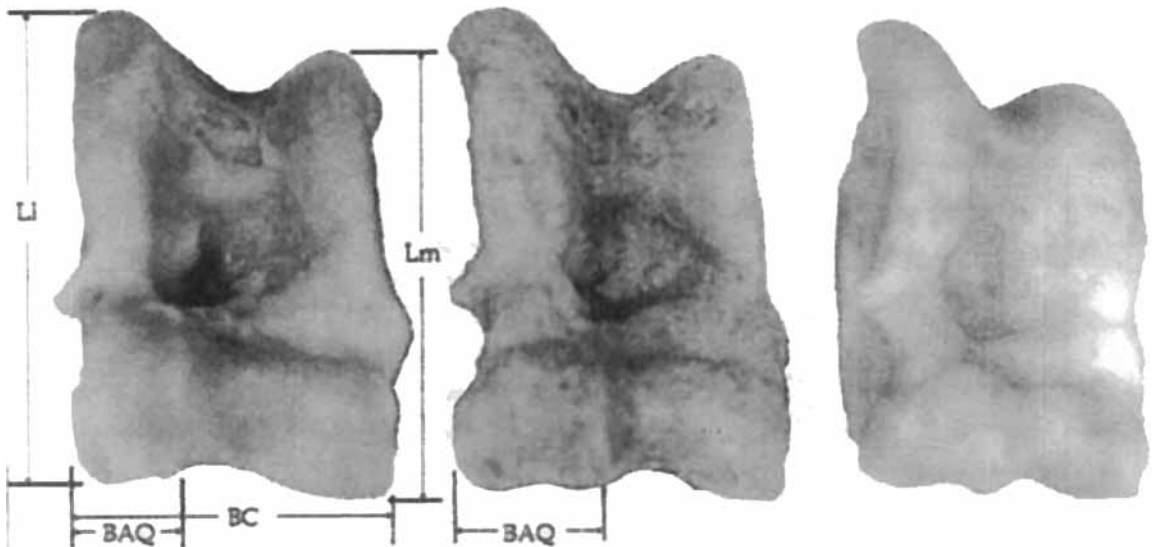


Fig. 6.

Camel astragalus from Grave 4 at Mleiha (centre) in comparison with astragali of a dromedary (right) and a Bactrian camel (left) (with indication of discriminating measurements).

to Steiger (12) the length/width-index of this bone is $9.21 \pm 0.71\%$ in dromedaries and $11.81 \pm 0.54\%$ in Bactrian camels (13). In the animal from Grave 4 it is 12.19%, which is clearly in the range of the Bactrians. However, the bone is longer and wider than any of the comparative specimens used by Steiger or available to the present author. A metacarpus from grave 24 is, on the other hand, well within the range of the dromedaries both according to its absolute size and to the length/width-index, which is 9.17% in that specimen.

Intermediate evidence within a single bone comes from the astragalus of the camel in Grave 4. It is shown in dorsal view in Figure 6 together with comparative specimens of a dromedary (CA1) and a Bactrian camel (CA8) from the Tübingen collection. There are obvious differences between the two species as regards the proportion of medial versus lateral length and the relative position of the edge separating the lateral from the medial part of the distal articular surface. Figure 7 is a plot of lateral (Ll) versus medial length (Lm) of the astragalus

published by Steiger (14) together with additional specimens from the Tübingen collection. Some of them are from the Oman Peninsula and are marked as 'local' in Figure 7. As indicated by the two regression lines, the proportions of these measurements provide a useful separation between the astragali of Bactrian camels and dromedaries. The astragali from graves 1 and 4 of Mleiha fall in the uppermost range of both species and their proportions are intermediate (Grave 4) or even on the side of the Bactrians (Grave 1). Three specimens from Pella are very similar to the finds of the large camels from Mleiha. Two astragali from the oven structure in ancient Mleiha (marked as 'Mleiha' among the dromedaries) represent 'normal' Arabian camels.

As seen in Figure 7 the large specimens from Mleiha and Pella show Bactrian affinities in the proportion of the two length measurements of the astragalus. In contrast, the position of the ridge separating the articular facet for the central tarsal from that for the fourth tarsal clearly indicates

Camel astragalus

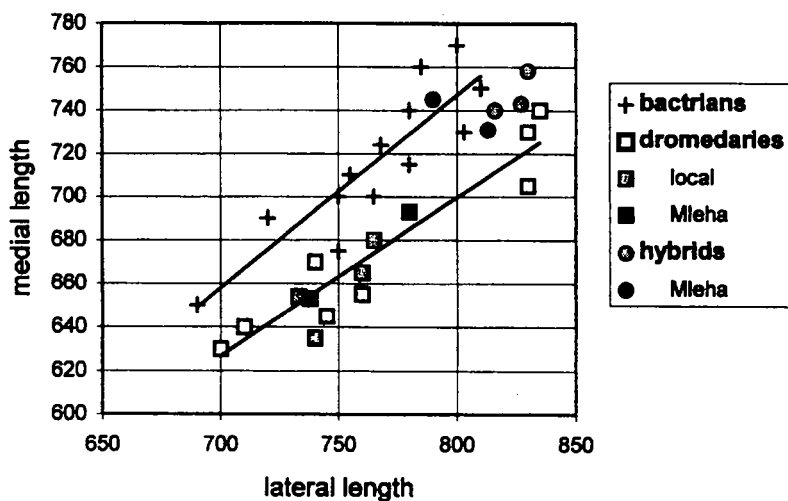


Fig. 7.
Scatterplot of medial versus lateral length of camel astragali.

close relations to the dromedary. As can also be seen in Figure 6 the position of the dividing line between the two portions of the distal articular surface in the find from Grave 4 is very similar to that seen in the comparative dromedary specimen. The tipped lateral process, which is more prominent in dromedaries, is partly broken in the Mleiha specimen, but is also more like a dromedary's than a Bactrian's. The shape of the groove below this process, however, is more as it is usually found in Bactrian camels. Again these characters are shared between the specimens from Mleiha and from Pella.

A complete medial first phalanx from the left front leg of the camel from Grave 4 is shown in Figure 8 between comparative specimens of a dromedary (CA1) and a Bactrian camel (CA8), both of the Tübingen collection. Like other long bones, the first phalanx of the dromedary is in general more slenderly built than that of the Bactrian camel. The best separation is reached when plotting the greatest length (GL) against the proximal breadth (Bp) as shown in Figure 9, where the anterior first phalanges published by Steiger (15) are in-

cluded with additional specimens from the Tübingen collection and the respective finds from Mleiha and Pella. As an additional specimen a camel phalanx from the Roman layers of Troy (Turkey) is also included in this graph. This specimen is also thought to have come from a camel hybrid (16).

The general tendency of dromedary phalanges to be more slender than those of Bactrian camels is visible from Figure 9, although the separation between the two species is not as clear as with the astragali shown in Figure 7. The first phalanges of the presumed hybrids from Mleiha, Pella and Troy are longer than both dromedary and Bactrian specimens, but not broader than the last ones. It is obvious that the specimens from Mleiha, Pella and Troy represent a particular group of huge animals not found among the recent camels of southwest Asia. They were as long-legged as dromedaries, but their bones were as broad as those of the strongest Bactrian camels. From the general appearance of their skeletons and from the detailed study of the bones taken to Tübingen there can be no doubt that the large camels from the



Fig. 8.

First anterior phalanx of camel from Grave 4 at Mleiha (centre) in comparison with first phalanges of a dromedary (right) and a Bactrian camel (left).

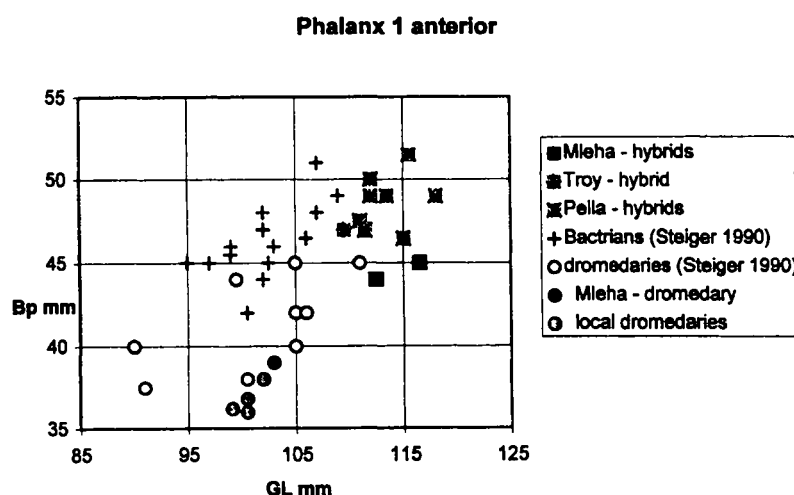


Fig. 9.

Scatterplot of proximal breadth versus greatest length of first anterior phalanges of camels.

central graves of Mleiha represent hybrids between the two camel species, which are historically known to have been within the size range indicated by the described finds.

Not much can at present be said about the early history of camel hybridisation in the Middle East. The finds from Mleiha dealt with in this paper probably date to the first centuries AD. The single first camel phalanx found in square M of the Roman city of Ilion (Troy) is probably slightly later. The specimens from Pella are well dated because the earthquake which killed the animals has a historical date of 747 AD. They are all later than the assumed beginning of crossbreeding in the second century BC during Parthian times. Based on Diodorus, Bulliet locates this process somewhere in southern Mesopotamia (17). A recent bone find from a Parthian context in Dibba (18) on the east coast of the Musandam Peninsula might indicate that southeast Arabia also participated in the early production of camel hybrids. It is in any case obvious from the association of the large camels with the central grave chambers that the hybrids were status animals during the Mleiha period.

It may be surprising to find early evidence for hybrid camels in southeast Arabia, because they are reported as not being well adapted to hot climates (19). The same was certainly true for the horses at the time of their first appearance in southeast Arabia. Nevertheless, the ancient inhabitants of the area obviously had enough skills in managing these animals to make them thrive. One might argue that the animals found in the graves could have been freshly imported from further north, but the camel bones from the protohistoric oven structure at Mleiha indicate that the large hybrids were also part of the meat-producing domestic stock (see Fig. 5). Using selected Bactrian studs from southern Iran, it even seems possible that the area east of Mleiha, with its potential access to cooler pastures farther up in the mountains, was a breeding centre for camel hybrids with unlimited resources in dromedary mares. The prevailing dromedary characters of the hybrid bones both in Mleiha and in Pella (20) leave no doubt that the maternal species in this crossbreeding was the Arabian camel. Given the slow reproduction rates of camels, the fe-

male part of the production of hybrids will have been a limiting factor much more than the possession of appropriate studs. The ample supply of female dromedaries in protohistoric times at Mleiha is well exemplified by the offering of at least nine animals – according to size and morphological characters most of them female – during the funeral rites documented by this article and by Mashkour's earlier descriptions.

Archaeozoology of the Mleiha horses

Unfortunately the two horse skeletons from Graves 4 and 22 of the Mleiha graveyard are in a very bad state of preservation. Some osteometric data are documented in Table 2. In addition to the bone fragments which were still available at the time of this study, Mashkour could measure a fairly complete metatarsal from the horse in Grave 4. According to the length measurement of that bone the horse was about 137 cm high at the withers. From the length of the radius an estimation of the withers height is possible to about 139 cm (21). These values are similar to recent Arabian

horses. However, knowledge about the skeletal characteristics of the famous Arabian breed of horses is not detailed enough to make any valid statements about possible similarities with the horses found in Mleiha. The width measurements given in Table 2 can be transformed into size indices (22). They indicate small but not necessarily gracile horses. Any final statement on the nature of the Mleiha horses must include a study of the skull from Grave 4, which at present is part of the exhibition of the Archaeological Museum in Sharjah.

Conclusions

The site of Mleiha is extraordinary for the number of camel graves and for the fact that there is evidence of the presence of camel hybrids, evidence which was not found until now in the south of Arabia, and not at this early date. The finds add something to the understanding of the role of camels in early funerary rituals in so far as assumed evidence for cutting the neck of the animals (23) could not be corroborated. Where the skulls were preserved they

Table 2. Osteometry of the horses from the Mleiha graveyard.

Scapula	SLC	GLP					LSI
Grave 22/left	60.3	85.0					0.004
Humerus	SD	BT	HTm	SHT	HTV	GLC	-
Grave 4/left	-	73.6	51.0	34.7	42.0	-	0.005
Grave 4/right	35.5	-	-	-	-	270.0	-
Radius	BAP	DAP	Bp	Bd	GL	-	
Grave 4/left	72.5	37.5	(80.5)	-	-	0.022	
Grave 4/right	-	-	-	(40.0)	(325.0)	-	
Phalanx 1, ant.	Bp	Dp	SD	DSm	-		
Grave 4/left	51.2	34.5	35.0	23.8	0.020		
Patella	GL	GD	-				
Grave 4/left	(66.0)	(38.5)	0.005				
Astragalus	GH	LVm	DV	GDm	-		
Grave 22/left	(57.5)	(57.0)	(27.5)	(46.0)	0.022		

rested upside down in the expected natural position on the back of the animals. The absence of neck vertebrae and skulls in some graves is most probably caused by the bad preservation of bone in the sandy soil of Mleiha. All the skeletons, unless disturbed later, were found in the natural resting position of camels with the legs folded under the body. This indicates that the animals entered their graves alive. At Mleiha they were clearly killed there and buried immediately after death because all the bones remained in their anatomical position (24) until they were excavated or disturbed by looters, who seem to have opened some of the Mleiha graves.

The orientation of the peripheral dromedary graves towards the central court and the close association of the hybrid skeletons with the central grave chambers indicates that all the animal burials are part of one single conceptual entity, perhaps related to the funeral(s) of one noble family. The value of the nine dromedaries and three hybrids offered during this process must have been considerable. The dromedaries had reached the ideal age when they would have started to breed and when they would have first been ridden. The hybrids were a little older and at an age when their value as animals of burden was at its highest. Based on the appreciation of the hybrids as beasts of burden in historical times and judging from their central position in the graveyard they must have been quite expensive as live animals. This sheds some light on the wealth of the family buried here. The value of the two horses may even have been higher than that of the hybrid camels, but the evidence is ambiguous. The fact that there are only two horses and that at least one of them wore heavy golden ornaments indicates high value. On the other hand, one of the horses was deposited in a peripheral grave together with a dromedary and the other

horse, in the central Grave 4, was placed behind the camel hybrid (25). In any case, horses were still exceptional animals during the Mleiha period and up to now the Mleiha skeletons, together with the unsubstantiated evidence from Ed-Dur (26), represent the earliest occurrence of this species in southeast Arabia. Altogether, the animal remains from the Mleiha graveyard have added a lot of new information about the role of animals in human history in a central part of the ancient Middle East.

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List of abbreviations

B	breadth
BACr	breadth of the cranial articular surface
BAd	breadth of the distal articular surface
BAP	breadth of the proximal articular surface
BAQ	breadth of the articular surface for the quartal tarsal
BC	breadth of the caput
Bd	distal breadth
Bdl	breadth of the lateral condyle
Bdm	breadth of the medial condyle
BG	breadth of the glenoid cavity
BM ₃	breadth of M3
Bp	proximal breadth
BT	breadth of the trochlea
D	depth

DC	diameter of the caput
DD	depth of the diaphysis
Dd	distal depth
Ddl	depth of the lateral condyle
Ddm	depth of the medial condyle
DI	lateral depth
Dp	proximal depth
Dsm	depth of shaft in the middle
DV	distance of the verticillae
GD	greatest depth
GDm	greatest depth medial
GH	greatest height
GL	greatest length
GLC	greatest length from the caput
GLI	greatest lateral length
GLP	greatest length of the articular process
HT	height of the trochlea
HTm	medial height of the trochlea
HTV	height of the trochlea at the verticillus
L	length
LA	length of the acetabulum
LAC	length of the articular facet for the calcaneus
Ld	dorsal length
LG	length of the glenoid cavity
LI	lateral length
Lm	medial length
LM ₃	length of M3
LMR	length of the molar row
Lphys	physiological length
LPR	length of the premolar row
LTR	length of the cheektooth row (P ³ -M ³)
LVm	length of the medial verticillus
LwEd	length without distal epiphysis
SBv	smallest breadth of corpus
SD	smallest breadth of diaphysis
SHT	smallest height of the trochlea
SLC	smallest length of the column

References

1. Eg. Boucharlat R & Mouton M. Mleha (Emirate of Sharjah, UAE) at the Beginning of the Christian Era. *PSAS* 24: 1990: 13-25.
2. The manuscript provided by Marjan Mashkour was of great help during the field studies for identifying the contexts and for reconstruction of the original situation. From our side there is not much to be added to her interpretation of the ritual meaning of the burials. We are most grateful to her for the manuscript and for permission to use her drawings in this paper. The article by M. Mashkour is in press and expected to appear in 1998: Mashkour M. The Funeral Rites at Mleiha (Sharjah-U.A.E.): The Camelid Graves. *Anthropozoologica* 25-26: 1997: 725-736.
3. Excavation of the camel burial at al-Buhais 12 was undertaken by the present author together with Margarethe Uerpmann who also participated in the studies carried out at the Mleiha graveyard. See also Uerpmann H-P & Uerpmann M. The Camel Burial of Al-Buhais 12 (Sharjah, U.A.E.): In press.
4. See S. A. Jasim, this volume.
5. For the first see note 3, the second was excavated by the Australian expedition; see Benton J. Excavations at Jebel Emalah. *Tribulus* 4: 1994: 12-13.
6. Skeleton CA 4 of the comparative collection of the Institute of Pre- and Protohistory of Tübingen University.
7. Bulliet RW. *The Camel and the Wheel*. New York: Columbia University Press, 1990: 144.
8. Wapnish P. The Dromedary and Bactrian Camel in Levantine Historical Settings: The Evidence from Tell Jemmeh. In: Clutton-Brock J & Griegson C, eds. *Animals and Archaeology 3: Early Herders and their Flocks*. BAR Intern. Series 202, Oxford, 1984: 171-200; Steiger C. *Vergleichend morphologische Untersuchungen an Einzelknochen des postkranialen Skeletts der Altweltkamele*. Dissertation, Munich, 1990.
9. Many thanks are due to Ilse Köhler-Rollefson who saved the skeletal remains of these animals and presented them to the Tübingen collection.
10. Köhler-Rollefson I. Zoological Analysis of Camel Skeletons. Appendix to: Smith RH & Day LP. *Pella of the Decapolis* 2. Final Report on the College of Wooster Excavations in Area IX, The Civic Complex, 1979-1985, The College of Wooster, 1989: 142-164.
11. Steiger, *Vergleichend morphologische Untersuchungen*: 18f.
12. Steiger, *Vergleichend morphologische Untersuchungen*: 67.
13. Smallest breadth of the diaphysis (SD) in percentage of the greatest length (GL) expressed as mean value \pm one standard deviation.
14. Steiger, *Vergleichend morphologische Untersuchungen*: 100.
15. Steiger, *Vergleichend morphologische Untersuchungen*: 103.

16. The specimen was encountered during the excavations of 1989 directed by M. Korfmann (Tübingen) in square M18 of the Lower City of Troy. It was identified by the present author in 1990. Its full publication is being prepared by Marian Fabiš, who is studying the animal remains from the historic occupations of the site, eg. Fabiš M. Archaeofaunal Remains from the Lower Sanctuary. A preliminary report on the 1994 excavations. *Studia Troica* 6: 1996: 217–227.
17. Bulliet, *The Camel and the Wheel*: 167ff.
18. Salvage excavations carried out by Sabah A. Jasim and Aissa Abbas of the Directorate of Antiquities of the Department of Culture and Information of the Government of Sharjah Emirate yielded Parthian pottery and some fragments of very large camel bones at a site in the Sharjah part of Dibba on the east coast of the peninsula close to the border towards Musandam. They could not yet be studied in detail, but the size of one humerus fragment is clearly above the size range of dromedaries and well within the range of the hybrid camels.
19. Burckhardt JL. *Notes on the Bedouins and Wahabys*. London: 1831, and Lesbre M. *Recherches anatomiques sur les camélidés*. *Archives du Musée d'histoire naturelle de Lyon* 8: 1903: 1–195, cited after Köhler-Rollefson, *Zoological Analysis of Camel Skeletons*: 149.
20. Köhler-Rollefson, *Zoological Analysis of Camel Skeletons*: 149.
21. For the methods of estimation of the withers height based on bone length see Driesch A von den & Boessneck J. Kritische Anmerkungen zur Widerristhöhenberechnung aus Längenmaßen vor- und frühgeschichtlicher Tierknochen. *Säugetierkundliche Mitteilungen* 22: 1974: 325–344.
22. LSI values based on an Icelandic pony as a standard, comp. Uerpmann H.-P. Die Domestikation des Pferdes im Chalkolithikum West- und Mitteleuropas. *Madridrer Mitteilungen* 31: 1990: 109–153.
23. Compare Mashkour, The Funeral Rites at Mleiha, and Vogt B. Death, resurrection and the camel. In: Nebes N, ed. *Arabia Felix, Beiträge zur Sprache und Kultur des vorislamischen Arabien*. Wiesbaden: Harrasowitz, 1994: 279–190.
24. At the camel burials of Beles, Hadramaut, there was evidence that dogs had access to the carcasses and that the bones were shifted from their anatomical position before they were embedded in the grave fill, see Uerpmann H.-P. & Langguth K. Archaeozoological Observations on Four Camel Skeletons from Beles (Hadramaut, Yemen): In press.
25. There could of course also have been practical reasons for this order, because it may have been quite difficult to make a huge male bukhti camel enter the steep and narrow grave corridor even without a dead horse already lying there.
26. Van Neer W & A Gautier. Preliminary report on the faunal remains from the coastal site of Ed-Dur, 1st–4th century A.D. Umm al-Quwain, United Arab Emirates. In: Buitenhuis H & Clason AT, eds. *Archaeozoology of the Near East*. Leiden: Dr W. Backhuys, 1993: 110–118.

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