The faunal remains from Mamluk Khirbat al-Sar (Jordan)

Abstract: Excavations at Khirbat al-Sar in 2019 yielded a small assemblage of animal remains dating mainly to the Mamluk period. An archaeozoological analysis provided insight into the food provisioning of the site's inhabitants. Caprines (sheep and goat) and cattle made up the bulk of animal food products. The other species present in small quantities are the dromedary, the horse, the dog, the chicken and the hare. The faunal remains offer an opportunity to collect data on animal management and consumption during this period, of which we know very little in terms of archaeozoology.

Keywords: faunal remains, caprine, cattle, dromedary, archaeozoology, Mamluk, Jordan

In general, animal bones discovered during an archaeological excavation may be the result of either natural processes, independent of human activities, or they may be anthropogenic in origin (Lyman 1994: 115). The former are chiefly intrusive—animals like rodents and carnivores dying *in situ* of a variety of causes (ailment, accident, natural catastrophe, building collapse, etc.). Often they are commensal for humans and then the bones represent food waste found in an oven, on an occupation floor or dumped, for example, when cleaning house. These animals could have also died from natural causes, either illness or accident. The carcasses would

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have been thrown away without being consumed, deposited in pits, in refuse fill or simply put aside in the homes (Monchot 2016: 261). The article discusses the faunal remains from three trenches excavated by a team from the Polish Centre of the Mediterranean Archaeology (University of Warsaw) working at the site of Khirbat al-Sar in Jordan.

Khirbat al-Sar (the ancient name is not known) lies in the western suburb of modern Amman [*Fig. 1* inset]. Its location on the plateau edge (972 m a.s.l.), commanding a broad view to the south and west, made it an important strategic and trading point on the road linking the Jordan Valley with Rabbat Ammon/Philadelphia/Amman. Travelers from the second half of the 19th century and the first half of the 20th century either mentioned or described the site briefly (see numerous references in Młynarczyk and Burdajewicz 2018), but no field excavations had been conducted there.

Many architectural relics have been preserved in Khirbat al-Sar, among them a magnificent architectural complex standing on the highest ground in the area. It includes a square building, probably erected in the Iron Age, and a large arcaded courtyard added in the Roman period (2nd–3rd century AD) [see *Fig. 1*], as attested by the characteristic material and building technique, as well as the style of the architectural decoration. The excavators also unearthed evidence for the enclosing of the Roman-era courtyard sometime during the 9th or 10th century and its use as a shop or residence into the 15th century. A lintel block in this chamber was decorated with an equal-armed cross set within a wreath, which may have been a Christian symbol. Human remains, buried without any grave goods, were discovered under a courtyard arcade; they were most likely Bedouin burials from late Ottoman times, dating to the 19th century.

A survey conducted by the PCMA UW team within a fenced area belonging to the Department of Antiquities, which covers 16,000 m², aimed at a better understanding of the site (it should be noted, however, that a part of the ancient site lies outside the fence). The objectives of the survey were: a) mapping visible architectural remains; b) testing the area with non-invasive geophysical methods (electric resistivity); c) collecting surface finds to establish site chronology. In the follow-up, three trenches, S1, S2 and S3, were opened in the eastern part of the courtyard of an architectural compound provisionally identified as a Roman-period sanctuary (Młynarczyk and Burdajewicz 2018: Fig. 2).

Trench S1 was aligned with the long axis of the courtyard. It covered an area of 37.95 m² and revealed a massive north–south wall with a series of floors abutting it on the east. All of the floors except for the lowermost one were pottery-dated to the Mamluk period (13th–15th century AD). The lowermost floor associated with the original structure was attributed securely to the Roman period (2nd century AD?), also on the grounds of pottery finds.

Trench S2 (surface area 7.22 m²) was opened in front of the easternmost arch preserved in the southern row of arcades in the courtyard. The arches were clearly of Roman origin, but the floors associated with the occupation of this chamber, either a dwelling or a workshop, yielded pottery of medieval, mainly Mamluk date. Trench S3 (surface area 9.1 m²) was situated outside the corresponding arcade in the northern row.

The exploration of these three trenches yielded material attesting to dense habitation of the site in the Middle Ages, especially in the Mamluk period, when

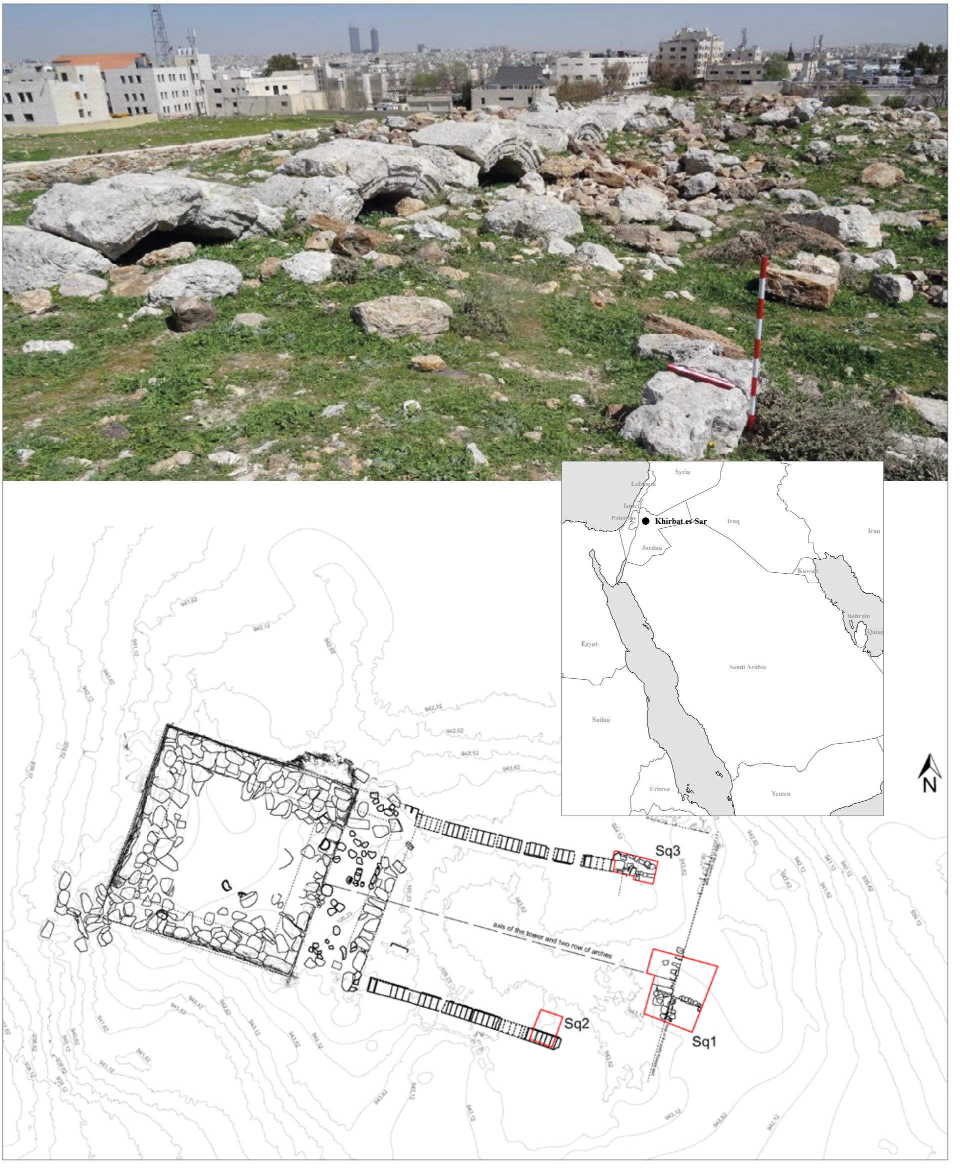

Fig. 1. Khirbat al-Sar: top, general view of the site showing the large Roman arcaded courtyard; bottom, master plan of the site marking the location of the three excavated trenches S1, S2 and S3; location of the site in the region in the inset (Courtesy PCMA UW Khirbet al-Sar Project | photo and processing J. Młynarczyk and M. Burdajewicz; plan A. Kubicka)

the earlier Roman structures were largely reused. Among the finds from the survey was a small faunal assemblage (NISP = 375; of this 301 in trench S1, 50 in S2 and 24 in S3). The assemblage was made up of the remains of seven species [*Table 1*]. While some of these remains could date to Roman times, they will be considered for the purpose of this preliminary study as coming from the Mamluk period. (Two human phalanges in trench 2 [B055] are most certainly from a disturbed grave.)

Table 1. List of species by number of identified specimens (NISP) and minimum number of individuals (MNI), recovered from the three trenches at Khirbat al-Sar (1, S2 and S3) (fieldwork in 2019)
Key: M = Mamluk; R = Roman; LH = large herbivore, cattle or dromedary; Indet. = indeterminate

	Trench	NISP	Caprine	Cattle	Equid	Drome-dary	Dog	Hare	Chicken	LH	Indet
B001	S1 (M)	21	1	19	1						
B001–002	S1 (M)	6	2	4							
B002	S1 (M)	46	13	23	4		1				5
B003	S1 (M)	23	7	13							3
B004	S1 (M)	64	14	22		7			1	15	5
B005	S1 (M)	31	15	13							3
B006	S1 (M)	23	8	15							
B007	S1 (M)	4	2	2							
B010	S1 (M)	17	12	5							
B012	S1 (M)	32	17	13				1	1		
B013	S1 (M)	12	11	1							
B014	S1 (M)	13	7	2							4
B015	S1 (M)	4	4								
B018	S1 (R?)	5	5								
NISP/MNI	**S1**	**301/19**	**118/9**	**132/5**	**5/1**	**7/1**	**1/1**	**1/1**	**2/1**	**15**	**20**
B055	S2 (M)	5	2	3							
B056	S2 (M)	9	6	3							
B058	S2 (R?)	36	32	2					2		
NISP/MNI	**S2**	**50/5**	**40/3**	**8/1**					**2/1**		
B071	S3 (M)	7	4	2						1	
B072-073	S3 (M)	17	6	11							
NISP/MNI	**S3**	**24/2**	**10/1**	**13/1**						**1**	
TOTAL		**375**	**168**	**153**	**5**	**7**	**1**	**1**	**4**	**16**	**20**
% NISP		100	49.6	45.1	1.5	2.1	0.3	0.3	1.2	–	–
Total MNI		26	13	7	1	1	1	1	2	–	–

METHODS

SPECIES IDENTIFICATION

Bone specimens were identified to the lowest possible taxonomic category and anatomical element, or portion thereof. Published literature, including Barone's anatomy atlas (Barone 1986) and Steiger's paper on the camel (Steiger 1990) were used wherever necessary.[1]

Distinguishing between the bones of sheep and goat is a notorious challenge in archaeozoology. Several methodological contributions have been published to facilitate this task, largely relying on a macro-morphological approach (see Salvagno and Albarella 2017, and references therein). However, despite the extensive literature, specific separation is not always easy, the bulk of the criteria being not 100% reliable and diagnostic elements, such as horncore or complete coxae, being absent from the Khirbat al-Sar assemblage. The sheep and goat remains were placed in a combined sheep/goat, that is, caprine category.

QUANTIFICATION

The method for determining the number of identifiable specimens used in this study is the most widely used faunal parameter available for the characterization of faunal assemblages from archaeological excavations. The quantification of bone remains is based on the total number of identified specimens (NISP) and on a minimum number of individuals (MNI). The MNI is defined as "the minimum number of (complete) individual animals necessary to account for (to have contributed to) the specimens observed" (Lyman 1994: 510).

AGEING

To estimate the age at death and thus obtain a mortality (slaughter) profile, two main methods have been used. The first one calls for estimating the stage of tooth eruption and analyzing dental wear: the work of Payne (1973)[2] for sheep and goats, and that of Grant (1982) for cattle. The second method, epiphyseal fusion, is less reliable as a result of the various taphonomic processes affecting skeletal remains, especially those of young immature individuals and those with a high marrow and spongiosa content. For caprines, cattle and equids, dates of bone fusion published by Barone (1986) were used.

SEXING

The morphology of some skeletal parts differs between the sexes in the case of many mammal species. In bovids, female skulls lack horns or bear ones different in size or shape from the males. In caprines, the principal criteria for diagnosing sex differences are the morphology of the horns, the development and the form of the muscular insertion on the rear of

1 For more information on archaeozoological methods the reader is referred to the following handbooks: Lyman 1994; Reitz and Wing 1999; Chaix and Méniel 2001; Gifford-Gonzalez 2018.

2 There are many works criticizing and modifying the Payne methodology (see Greenfield and Arnold 2008). The most important in Payne's work is establishing a scale for classifying the stages of eruption and tooth wear.

the skull, and the first cervical vertebrae (Boessneck et al. 1964). Otherwise the female pelvis differs significantly in shape from that of the male, because the female pelvis must accommodate the birth canal (Prummel and Frisch 1986). Unfortunately, these parts useful for sexing are relatively fragile and are therefore rare in archaeological assemblages due to selective removal, post-depositional leaching, profile compaction, and other fragmentation processes. In some samples, it may be possible to use differences in bone size to establish a sex ratio as an alternative to differences in bone shape. Male skeletal parts tend to be larger than female homologues in most mammal species, reflecting larger average male body size (Fernandez and Monchot 2007).

SURFACE TREATMENT

Cut and chop marks

Butchering consists of a set or a series of sets of human activities directed towards the extraction of consumable resources from a carcass. It has a temporal duration, made up of the set and order of activities carried out to extract these resources from a carcass (i.e., butchering pattern) (Lyman 1987: 252). So, during butchering, anthropogenic marks are the result of several carcass-processing activities like skinning, dismemberment or disarticulation or meat removal (filleting) (e.g., Binford 1981; Lyman 1987; Monchot 1996). Two categories of damage resulting from tool use were identified, namely cut marks and chop marks (Horwitz and Monchot 2002). Cut marks are incisions resulting from the cutting movement of a sharp-edged implement on the bone surface. These are elongated, linear striations of variable length and width. Chop marks are defined as broad, deep and relatively linear depressions that often have a V-shaped cross-section. Internal striations within the main groove may be observed. Chop marks are the result of a heavy blow to the bone with a sharp implement.

Burning

The bones may show traces of combustion. These may be linked directly or indirectly to human action. In cases of intentional burning, the meat could have been cooked, a broth could have been made allowing fat recovery (in this case bone fragments are not charred), or even fresh bones could have been used as fuel. Bones may have also been burned by accident, falling into a hearth, being in a fire, or deposited underlying a fire. Burned bones can be grouped by color, which is directly related to the intensity of combustion (Stiner et al. 1995).

Carnivore traces

In archaeology, the carnivore damage characteristic is studied to determine the effect that these species could have on a faunal assemblage, both through the complete removal/destruction of bone and through alterations made to surviving bone. The main traces left by carnivores on bones are chewing, gnawing, tooth punctures, scores and furrows (Fisher 1995; Pokines and Tersigni-Tarrant 2013).

METRIC EVALUATION

The good state of preservation of animal bones from the site provides an opportunity for collecting relatively numerous bone measurements. All the measurements and abbreviations used are according to the von den Driesch standard (1976). Measurements were taken using a caliper rule and are expressed in millimetres.

RESULTS

Domestic mammals constitute the bulk of the assemblage, including the following species [see *Table 1*]: caprid (*Ovis aries*/*Capra hircus*), cattle (*Bos taurus*), equid, mainly horse (*Equus caballus*), dromedary (*Camelus dromedarius*), dog (*Canis lupus familiaris*) and chicken (*Gallus gallus*). Wild mammals were represented only by the hare (*Lepus capensis*). Caprines represent 49.6% of the identifiable elements, closely followed by cattle (45.1%), which is not surprising given the important role played by these animals in the diet of the Mamluk inhabitants of the Levant.[3]

Fig. 2. Root etching on a caprine right radius (on the left) and a cattle humerus right diaphysis (on the right) (B056, trench S2) (Photo © H. Monchot)

BONE PRESERVATION

Many taphonomic processes: anthropogenic, such as butchering and bone fracturing, or natural, can affect animal carcasses and bones between the animal's death and the burial of the carcass or bones (Lyman 1994: Chapter 9). At Khirbat al-Sar, apart from post-depositional fragmentation or fragmentation related to butchery activities, the bones are well preserved, with weak weathering (except for some longitudinal cracks on the long bones) and intense root etching. Indeed, the roots of many plants excrete humic acid, and often "dendritic patterns of shallow grooves" on bone surfaces [*Fig. 2*] are interpreted as the results of dissolution by acids associated with the growth and decay of roots or fungus in direct contact with bone surfaces (Behrensmeyer 1978: 154). The presence of root etching indicates the bone was in a plant-supporting sedimentary environment for at least part of its taphonomic history.

3 Meat for the inhabitants of Palestine in all of the historical periods has meant primarily one of the four domesticates: sheep, goats, cattle and pigs (MacDonald 2008: 32).

SPECIES COMPOSITION

Caprine: sheep (*Ovis aries* L. 1758)/ goat (*Capra hircus* L., 1758)

Sheep/goat are represented by 301 specimens, tooth and bone fragments and they were found in all of the excavated areas [see *Table 1*]. The total minimum number of individuals (MNI) is 13: nine in trench S1, three in trench S2 and one in trench S3. Distinguishing between the bones of sheep and goat is a notorious challenge in archaeozoology. Several methodological contributions have been published at different times and by various people to facilitate this task, largely relying on a macro-morphological approach (see Salvagno and Albarella 2017 and references therein). The sheep and goat remains were placed in a combined sheep/goat category, i.e., caprines.

Skeletal representation. The sample size was sufficient to observe caprine skeletal element frequencies [*Table 2*]. The representation and fragmentation is the result of several ante-depositional (e.g., butchery techniques) and post-depositional processes (e.g., trampling and excavation technique as well). It is thus difficult to imagine that caprines were introduced to the site whole for slaughter and consumption. Anatomical representation data indicate that a broad range of elements was present at the site and the data also suggest that the most frequent parts of the carcass discarded in the excavated Mamluk contexts were the upper anterior limbs (scapula, humerus, radioulnar), closely followed by the upper posterior limbs (coxal, femur, tibia). Furthermore, there is a significant underrepresentation of the trunk (vertebrae and ribs) and foot elements (metapodial and phalanges). This skeletal profile represents a mix of elements derived from, on the one hand, butchery waste—head, lower limb and foot elements, indicating on-site primary processing of animal carcasses (skinning, evisceration and removal of extremities) —and on the other hand, meal leftovers.

No articulated joints were found but some long bones are complete (radius, metacarpal, metatarsal) allowing withers height to be calculated by multiplying the maximum length by a coefficient given by Teichert (1975) [*Table 3*]. The withers height of caprines from the archaeological site is between 62.1 cm and 65.9 cm.

Slaughter profile. The age-at-death of nine individuals from trench S1 could be established based on tooth eruption and wear:

– five young lambs aged from six to 12 months at death (Payne's stage C) [*Fig. 3*];

– one young adult aged two to three years at death (Payne's stage E);

– two adult individuals aged three to six years at death (Payne's stages F and G);

– one adult aged six to eight years at death (Payne's stage H).

In trench S2, one juvenile (Payne's stage C, 6–12 months at death), characterized notably by the presence of a complete skull, and two adults could be identified. One adult is present in trench S3. One should also note the presence of two femurs, two metacarpals and one humerus in trench S1 and one humerus in trench S3, the unfused epiphyses of which are characteristic of immature animals.

The percentage of juveniles (6/13=46% of the MNI) indicates a substantial presence of young animals. Such a presence of suckling lambs is not uncommon and is recorded on archaeological sites from late antiquity and the Middle Age in Jordan (e.g., Machaerus: Monchot 2019; Khirbet el-Dharih: Bouchaud et al. 2018; Khirbet el-Samra: H. Monchot, unpublished data).

Surface treatment. Only three caprine bones from Khirbat al-Sar show butchery marks. The first one was observed on a proximal extremity of a left radius (B002, trench S1, code Binford Rc-p5) on the dorsal view; the second on the neck of a proximal extremity of a right scapula (B002, trench S1, code Binford S-2); and the third on the medial view of a distal end of a right humerus (B001, trench S1, code Binford Hd-2). All of these marks correspond to operations of dismembering of the anterior limb (shoulder and elbow), certainly from the perspective of removing the shank. In addition, a chop mark is reported on the diaphysis of

Table 2. Skeletal profile of caprine and cattle remains from Khirbat al-Sar presented by number of identified specimens (NISP) in a division by trenches

	TRENCH S1		TRENCH S2		TRENCH S3	
SKELETON PART	**CAPRINE**	**CATTLE**	**CAPRINE**	**CATTLE**	**CAPRINE**	**CATTLE**
Skull	2	6	24			
Mandible	14	5	1		1	
Isolated teeth	5	5	1			
Axis		1				
Cervical vertebrae		1				
Thoracic vertebrae	1	2				
Lumbar vertebrae	2	2				1
Vertebrae indeterminate		4	1			3
Sacrum				1		
Rib	29	37	1	2	1	1
Scapula	7	1			1	
Humerus	5	7		1	1	
Radius	4	9	2		1	
Ulna		4	1			
Metacarpal	6	1	1			
Pelvis	3	9	1	2	2	
Femur	5	2	1			1
Tibia	5	5	2			2
Talus					1	
Calcaneus	1	2				
Cubonavicular						1
Metatarsal	1	3	3		1	1
Phalanx I	1		1	1		
Long bone diaphysis	26	27		1	1	3
Indeterminate		2				
TOTAL	**118**	**132**	**40**	**8**	**10**	**13**

a tibia (B002, trench S1) and could thus correspond to disarticulation or even extraction of the marrow. Only one piece (a left proximal metacarpal, B012, trench S1) shows traces of burning. Finally, a proximal humerus (B002, trench S1) and a glenoid cavity of a scapula (B012, trench S1) showed gnawing/chewing traces left by a dog.

Cattle (*Bos taurus* L., 1758)

Represented by 153 bone remains, cattle accounts for 45.1% of the domestic mammals. The remains come from a minimum of seven adult individuals. Five of these are from trench S1, comprising four adults, identified from the right fused-radius proximal end, and a calf aged 18–24 months. One adult each came

Fig. 3. Three mandibles of young lamb (B006, S1) (Payne's Stage C, 6–12 months) (Photo © H. Monchot)

Table 3. Skeletal element measurements (in mm)

Bone/species	Side	Trench	Measurements							WH
Humerus			Btro	Htro						
Caprine	R	TR1	32.0	19.1						
Radius			GL	Bp	Dp	SD	Bd	Dd	BFd	
Caprine	R	TR2	161.2	34.6	16.7	18.5	33.1			64.8
Caprine	R	TR2					31.1			
Caprine	L	TR1		28.7	14.2					
Caprine	R	TR1		29.6						
Cattle	R	TR1		53.1	33.4					
Cattle	R	TR1		71.8	37.7					
Cattle	R	TR1					57.7	34.8		
Cattle	R	TR1					60.4			
Cattle	R	TR1					59.4			
Equid (horse)	L	TR1					85.9	49.7	78.3	
Ulna			LO	SDO	DPA					
Caprine	R	TR2	39.7	24.5	26.8					
Cattle	R	TR1	57.2	37.2	46.9					
Scapula			GLP	LG	BG	SLC	ASG			
Caprine	R	TR1	29.2	24.7	21.6	17.5	26.6			
Caprine	L	TR1	33.3	27.4	21.2	19.7	19.5			
Femur			Bd							
Cattle	R	TR3	85.1							
Tibia			Bd	Dd						
Caprine	R	TR1	29.5	22.6						
Caprine	L	TR1	27.3	20.2						
Caprine	R	TR2	28.3	21.1						
Cattle ♀	R	TR1	44.0	34.5						
Cattle ♀	R	TR1	54.3	41.7						
Cattle ♀	R	TR1	56.2	34.7						
Cattle ♂	L	TR1	76.0	46.1						
Cattle ♂	R	TR3	73.5	47.1						
Talus			GL	BL	GM	BM	Bp	Bd		
Caprine	L	TR3	27.6	13.6	25.5	14.3	15.7	16.8		62.6
Camel	L	TR1	77.2	41.0	68.9	42.3	43.7	52.5		
Calcaneus			GL	GB						
Cattle	L	TR1	114.9	45.1						
Cubonavicular			GL	GB						
Cattle	R	TR3	49.3	39.4						

Table 3. Continued

Metacarpal			GL	Bp	Dp	SD	Bd	Dd		
Caprine	R	TR2	127.1	23.6	17.1	14.3	27.8	17.3		62.1
Caprine	L	TR1		21.3	14.2					
Caprine	R	TR1		24.6	13.0					
Caprine	L	TR1		27.1	18.8					
Caprine	R	TR1		22.7	15.2					
Metatarsal			GL	Bp	Dp	SD	Bd	Dd		
Caprine	L	TR2	145.2	23.7	23.2	14.1	29.1	19.2		65.9
Caprine	L	TR2	143.5	21.9	21.2	12.4	25.7	17.2		65.0
Caprine	L	TR2		20.6	21.2					
Cattle	L	TR3		40.3	40.8					
Cattle	L	TR1		48.5	46.8					
Camel	R	TR1		60.4	46.4					
Phalanx 1			GL	Bp	Dp	SD	Bd	Dd		
Caprine		TR1	39.3	13.5	16.5	11.8	12.5	10.8		
Caprine		TR2	40.4	13.1	15.7	9.9	12.3	12.7		
Cattle		TR2	52.9	27.9	31,8	25.7	31.6	22.3		
Phalanx 3			GL	GB	Ld	BF	LF			
Equid (horse)		TR1	78.3	49.0	65.2	47.5	28.4			
Femur			GL	Lm	Bp	Dp	SC	Bd	Dd	
Chicken		TR2	68.4	63.7	12.6	9.2	5.5	12.8	11.1	

Key (according to Teichert 1975): GL = Greatest length; GB = Greatest breadth; GH = Greatest height; Lm = Medial length; GM = Greatest length of the medial half (talus); Bp = Greatest breadth of the proximal end; Bd = Greatest breadth (depth) of the distal end; BL = Breadth of the lateral half (talus); BM = Breadth of the medial half (talus); Btro = Greatest breadth of the distal trochlea (humerus); Htro = Height of the distal trochlea (humerus); Dp = Greatest depth of the proximal end; Dd = Greatest depth of the distal end; SD = Smallest breadth of the diaphysis; SC = Smallest breadth of the corpus (for the bird); GLP = Greatest length of the processus articularis (scapula); LG = Length of the glenoid cavity (scapula); BG = Breadth of the glenoid cavity (scapula); SLC = Smallest length of the collum scapulae (scapula); ASG = Shortest distance from the base of the spine to the edge of the glenoid cavity (scapula); LF = Length of the articular surface; BF = Breadth of the articular surface; BFd = Breadth of the distal articular surface; Ld = Length of the dorsal surface; LO = Length of the olecranon (ulna); DPA = Depth across the Processus anconaeus (ulna); SDO = Smallest depth of the olecranon (ulna); WH = wither height from trenches S2 and S3. The skeletal representation [see *Table 2*] shows an even distribution between head, trunk, forelegs and hind limbs, with a dominance of meaty bones. The origin of the bones (butchery, leftovers) seems to be the same as for the caprines. The dimensions of the proximal radius [see *Table 3*] suggest the presence at least two males and three females.

Only a rib shaft (B006, trench S1) showed cut marks (filleting), while a cranial fragment (B002, trench S1) and a coxal fragment (B006, trench S1) demonstrated chop marks. Five pieces of bone (two long bone diaphyses, a condyle of a right mandible, a rib shaft and a right distal tibia) exhibited traces of combustion and a complete diaphysis (tube) of a metacarpal showed carnivore damage at both extremities.

The origin of the bones (butchery, leftovers) seems to be the same as that of the caprines.

Equid (*Equus sp.*)

Five bone pieces belonging to an equid were identified from trench S1: phalanx 3, neck of a right scapula which was gnawed by a dog, fragment of coxal, distal epiphysis of a left radius and a fragment of a distal radius metaphysis. They belong to an adult individual, aged at least 42 months (age of the epiphysation of the distal radius, Barone 1986). The morphometric distinction of the different equine species is not easy, but the large dimensions of the distal radius and phalanx 3 [see *Table 3*] suggest that we are dealing with the remains of a horse (*Equus caballus*) rather than those of a donkey (*Equus asinus*) or a mule.

Dromedary (*Camelus dromedarius* L., 1758)

The dromedary (Arabian camel) is represented by seven elements: one left talus, a right subcomplete metatarsal [*Fig. 4*], a lumbar vertebra, three fragments belonging to a coxal and one unidentified epiphysis. The dimensions of the animal from Khirbat al-Sar conform to those of modern camels [see *Table 3*; *Fig. 5*]. Camel remains are abundant in Mamluk levels at the Aqaba castle (De Cupere et al. 2017) and the Tell Hesban village (von den Driesch and Boessneck 1995).

Dog (*Canis lupus familiaris* L., 1758)

The dog is represented by a fragment of a right mandible without teeth found in trench S1 (B 002, trench S1). Never abundant, dogs as a commensal species are often listed from sites in the Levant. The presence of some bones with traces of carnivore gnawing, chewing, tooth pitting suggested that dogs had access to the dumps and were generally rummaging through the garbage or scavenging for abandoned herbivore carcasses (or meal leftovers).

Chicken (*Gallus gallus domesticus* L., 1758)

A distal diaphysis fragment of a tibiotarsus and caudal vertebrae testify to the presence of domestic fowl in trench S1, while a complete right femur and a right diaphysis fragment of a humerus are present in trench S2. Contrary to what is currently believed, it seems that chicken did not play an important role in the meat diet of the Khirbat al-Sar inhabitants.

Fig. 4. Dromedary right metatarsal (B004, trench S1) (Photo © H. Monchot)

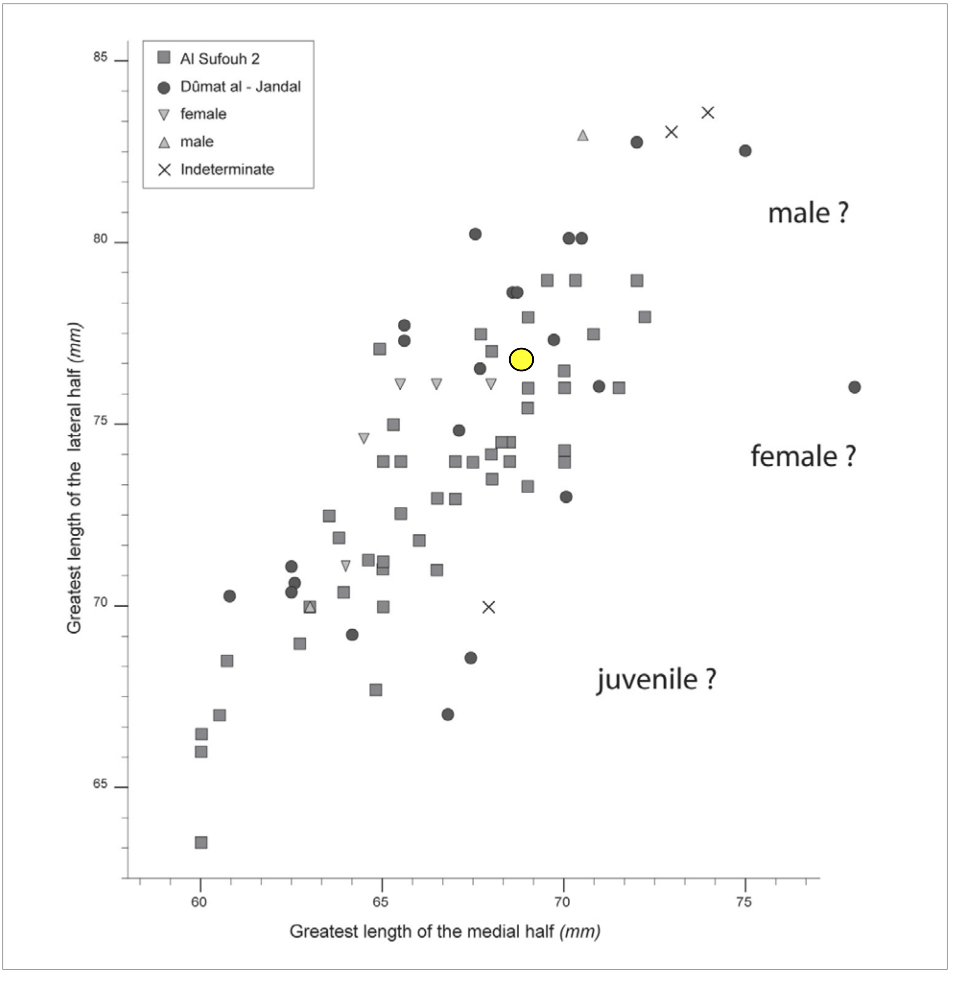

Fig. 5. The greatest length of the lateral half and the greatest length of the medial half (in mm) of the dromedary talus from Khirbat al-Sar in yellow (modified from Monchot 2014: modern data from Steiger 1990; Al Sufouh 2 from von den Driesch and Obermaier 2007; and Dûmat al-Jandal from Monchot 2013)

Cape hare (*Lepus capensis* L., 1758)

The only representative of a wild species, the Cape hare, is present at the site as a complete right diaphysis of a humerus found in trench S1 (B006). This species is widely distributed throughout the region today. It can occur in a wide variety of habitats, from deserts and mountains to sandy deserts with sufficient vegetation (Amr, Abu Baker, and Rifai 2004). Never abundant, this species has been reported from many Jordanian sites, notably from the Mamluk levels of the Aqaba castle (De Cupere et al. 2017).

SUMMARY AND DISCUSSION

First, it is interesting to note that these trenches delivered a small faunal assemblage of great diversity. The faunal list from Khirbat al-Sar is consistent with what is found in the region during the Mamluk period (13th–15th century AD). The bone assemblage is dominated by domestic species, sheep/goat and cattle, species widely consumed in the Levant in Roman and Byzantine times (King 1999; Kroll 2012), and then later in the Middle Ages, in different Islamic periods (e.g., von den Driesch and Boessneck 1995; Loyet 1999; Gharaibeh 2002; Brown 2016; Bouchaud et al. 2018; Bar-Oz and Raban Gerstel 2019; Marom 2019).

These bones represent meal leftovers or residue from primary butchery. It is worth remembering that meat was an expensive dish and the preparation of food was of interest mainly to the top echelons of the Mamluk ruling elite, to members of the civilian upper class who were able to cook food at home, and to the professional cooks who kept shops catering to the urban lower classes (Levanoni 2005).

Classically, sheep are preferred for their meat,[4] wool and also milk. Goats, on the other hand, are better suited to more arid environments and breed more quickly than sheep. Goats also provide more milk than sheep and for a longer period of time (Palmer 1998). Cattle were exploited for two main reasons: most importantly, they provided traction for plowing the fields, and secondarily, they were a source of meat.

No pig remains have been identified certainly in accordance with Islamic bans (Simoons 1994; Jump 2002; Benelmouffok 2008). Chicken also does not appear to have been an important part of the inhabitant's diet.[5] Wild species showing signs of hunting activity are represented by hare alone.

Camel and horse are present, which should not come as a surprise given

4 Ways of adulterating meat dishes included the incorporation of much fat and little meat; the replacement of mutton with goat meat or with the meat of impure animals like dogs, and the use of spoiled, cooked meat or carrion masked by the liberal use of spices (Levanoni 2005: 210).

5 An explanation other than taphonomic processes for the lack of chicken bone from the site is that this animal was so expensive in the 14th century that an unskilled worker needed one month's earnings to buy 12 chickens (Ashtor 1970 cited by Perho 2014).

the importance of these animals in the villages during Mamluk rule (Shehada 2013). For instance, the economic role of the dromedary, especially for the Bedouin, was such that Arab poets often referred to the animal as a 'ship of the desert'. Both the Mamluk and the Bedouin use the camel for many purposes, including transport, meat, milk, and sometimes to make use of their skins. But while an abundant (ethnographic) literature exists demonstrating the economic value of the camel, archaeozoological studies of camel bones have developed only in recent years (Shehada 2013; Monchot 2014).

Concerning the origin of the bone remains, the paucity of the sample does not allow rigorous conclusions to be drawn concerning caprine and cattle kill-off patterns at Khirbat al-Sar. Nevertheless, we have seen that bone remains represent food leftovers rather than remains from primary butchery and that juvenile animals (lambs/kids) and young adults are in the majority. In the sheep/goats category, the meat-bearing parts, such as shoulder, lamb shank and lamb rump predominate. Traditionally, male lambs, which are appreciated by the Bedouin/Muslim population, are killed in the first year, particularly on occasions like weddings or religious holidays (for instance, Aïd al-Adha). Of the males not killed as a lamb, most are killed in the second year. Female lambs are rarely killed, because of the replacement needs of the flock. Few juveniles are kept on for breeding; rams are finally chosen at 3–4 years, and the rest are killed at that age. Males are often castrated a few months before slaughter to improve weight gain. The killing of goats follows a similar pattern, although probably a higher proportion is killed as kids as there are more individuals surplus to breeding needs: fewer kids die, and twinning is rather commoner than in sheep (Monchot, Lorain, and Bendezu-Sarmiento 2019).

The usual cooking method involved long simmered stews for tough and tendinous portions of caprines. Charred bone is extremely rare on Islamic sites, indicating that roasting with the bone was probably equally rare. Finally, the presence of many small fragments of ribs implies preparation of a costal grill, as for making kebab.

Further excavations bringing more faunal samples, should add substantially to the archaeoenvironmental and archaeozoological body of data already processed from the site.

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