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Animal Bones from Iron Age and Mamluk-Period Contexts in Ḥorbat 'Ofrat

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Introduction

Salvage excavations at Ḥorbat 'Ofrat (see Alexandre, this volume) uncovered a small assemblage of animal bones, most of which were collected from a large building dating to the Mamluk period. 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 zooarchaeology. A smaller quantity of bone fragments was also excavated from loci associated with Iron Age II architectural remains or with Hellenistic and Byzantine pottery, and are briefly discussed here.

Methods

The bones were hand-collected during the excavation, and washed in tap water in the field. After drying, the faunal remains were packed in two standard archive boxes, to which they were returned following the faunal analysis.

Bones were identified to taxa level using the comparative collections of the Laboratory of Archaeozoology at the University of Haifa. Morphologically similar caprine, cervid and equid taxa were distinguished based on morphological and metric criteria (Eisenmann 1986; Lister 1996; Zeder and Lapham 2010). All bone specimens were examined; however, only a restricted suite of skeletal element parts (POSACs, or "parts of the skeleton always counted"; Davis 1992) was employed to quantify taxonomic and skeletal element frequencies (see Albarella and Davis 1994 for details; for methodological discussion and validation, see Marom and Bar-Oz 2008; Trentacoste 2009). More specifically, the counted number of POSACs was treated as the Number of Identified Specimens (NISP), and its division by the number of POSACs in a complete skeleton gave the Minimum Animal Units (MAU) employed in the discussion of skeletal element frequencies.

Age determination was based on epiphyseal fusion data (Silver 1969) and mandibular tooth eruption and wear patterns (based on Payne 1973, for caprines, and Grant 1982, for cattle and pigs). Sufficiently complete pelvic fragments were sexed (Edwards, Marchington and Smith 1982). Measurements were taken using Vernier callipers following von den Driesch (1976), Davis (1992), and Zeder and Lapham (2010).

Bone fracture morphology was recorded for long-bone POSACs as "green" or "dry," indicating breakage of fresh or desiccated specimens, respectively; percentage completeness of the original shaft was noted (Villa and Mahieu 1991). Specimens showing cracking and exfoliation of the cortical surface were recorded as "weathered" (Behrensmeyer 1978; Stage 2 and up). Carnivore and rodent gnawing, burning and butchery marks were also documented.

RESULTS

The Iron Age II Sample

The small sample of Iron II remains includes 40 bones identified to taxon (Table 1; Appendix 1). These represent mainly caprines (NISP = 18; 45%), which include both definite sheep (*Ovis aries*; NISP = 2; 5%) and goats (*Capra hircus*; NISP = 2; 5%), as well as cattle (*Bos taurus*; NISP = 16; 40%). Other animals present in the assemblage include deer (either fallow deer, *Dama mesopotamica*, or red deer, *Cervus elaphus*), represented by a worked astragalus (L179, B1153; Fig. 1), a radius and two burned antler fragments; a young wild

Table 1. Skeletal Element Frequencies for the Iron Age II Contexts[i]

Portion	POSAC	F/U	Caprine	Cattle	Other
Head	M1/2		2	2	2 (equid)
	M3			2	2 (pig)
Forelimb	Scapula	F	2		
	Humerus	F	3	2	
	Radius	U	2	1	
	Ulna	U	1		
		n.d.		1	
	Metacarpus	U	1		
Hindlimb	Pelvis	F	1		
	Tibia	F	1	1	
	Astragalus	F		2	1 (deer), 1 (equid)
		U		1	
	Calcaneum	F	1		
	Metatarsus	F	1		
		U	1	1	
Feet	Phalanx I	F	1	2	
	Phalanx III		1	1	
Total			18	16	6

[i] F = fused; U = unfused; n.d. = not determined.

Fig. 1. A worked deer astragalus from L179, B1153.

boar (*Sus scrofa*), represented by its large and unworn mandibular third molars (L = 47.9, WII = 19.3; for other metric data, see Appendix 2); and three equid specimens, one of which was a tooth identified as belonging to a donkey (*Equus asinus*). A single bird (family Gallidae) humerus and a porcupine (*Hystrix indicus*, L139) maxilla were found in the Iron II loci; the rodent bone is probably intrusive.

The identified Iron II bones permit little in the way of understanding herd management practices. A look at the data presented in Table 1 shows that the percentage of juveniles (see Arbuckle et al. 2014) among the caprines is 33%; the only ageable tooth was a mandibular M1/2, which showed early wear consistent with a young age at death. These observations suggest culling of both younger and older flock, which is consistent with a generalized production strategy, i.e., not specialized in terms of wool or milk production (Payne 1973).

The sexually dimorphic distal measurements of adult caprine humeri suggests that the two Iron II specimens for which data were available were small, and probably female (Fig. 2). Also, two pelvic fragments were sexed as male (unfused, young) and female (fused, adult). It is more likely to encounter the mature bones of female animals, as males were usually slaughtered at a younger age unless specialized wool production was practiced.

The percentage of cattle juveniles is 30%, which, like the caprine statistics, indicates the consumption of individuals of all age class; mandibular cheek teeth (n = 4), however, are all worn beyond wear Stage K, indicating the slaughter of older stock. This observation would agree with a reading of the mortality data as representing slaughter from animals raised locally for secondary products (such as work), and not in order to supply beef to an urban center. The single sexed cattle pelvic fragment belonged to an adult male.

Bone preservation in the Iron II assemblage was probably affected by density mediated attrition; in other words, denser bone elements survived better than porous and soft elements. This can be demonstrated by the low ratio of proximal (soft), to distal (hard) parts of humeri

Fig. 2. A large carnivore canine (a) and radii of deer (b), gazelle (c) and jungle cat (d) from L111, B1012.

and tibiae in the sample (2:7). Also, recovery bias against smaller bone elements is suggested by the complete absence of incisors, isolated milk teeth and carpal bones in the assemblage.

Few bones in the assemblage (NISP = 40) were weathered (n = 3; 7.5%), gnawed (n = 1; 2.5%) or burned (n = 1; 2.5%). The only burned bone was a cattle phalanx; since feet are usually discarded early in the butchery sequence, burning may have happened by chance or while trying to separate the hoof for use as raw material. Two-thirds of the bone fractures that could be classified as "green" or "dry" (n = 9) displayed the smooth and spiral morphology associated with the breakage of fresh bone, reflecting marrow extraction activities by humans and dogs. Butchery marks were found on thirteen specimens in the sample (Appendix 3), and reflect skinning and disarticulation activities carried out with a knife and a chopper, the latter applied mainly to cattle carcasses.

The Byzantine Sample

The small sample of bones from Byzantine loci (NISP = 9) consists of cattle (NISP = 5; 56%), caprine (NISP = 2; 22%) and equid (NISP = 2; 22%) bones. Cattle remains comprise a milk tooth (dp4), a heavily worn mandibular molar (M1/2, Wear Stage J), two fused metapodial fragments (one of which bears a cut-mark indicating skinning) and a fused calcaneus. The caprine remains include two fragments of a kid's mandible, very likely from the same individual; the mandible can be assigned to Wear Stage B, with an estimated age of 3–6 months at death (Payne 1973). The equid remains consist of two forelimb elements (a radius and a humerus) of an adult animal. Carnivore gnawing appears on three of the identified bone fragments (33%).

The Mamluk Sample

The Mamluk loci yielded a large sample of identified mammal bones (NISP = 87; Table 2). Caprines (NISP = 55; 63%) dominate the assemblage, with a similar frequency of sheep (NISP = 8; 9%) and goat (NISP = 9; 10%) bones. Cattle bones are rather common (NISP = 22; 25%). The few equid bones (NISP = 3; 3%) did not include teeth or other elements diagnostic of species. A single camel bone (astragalus; *Camelus dromedarius*) was found in L112, B1024. In addition to the domesticated mammal bones, some chickens (NISP = 5; 6%) are represented by a coracoid bone (NISP = 1; 1%) and by tarsometatarsi (NISP = 4; 4.5%), none of which are spurred and therefore, probably belonged to females.

In addition to the livestock and work animals, a relatively diverse component of game animals is present in the Mamluk assemblage. Mountain gazelles (*Gazella gazelle*; NISP = 3; 3%) are represented by a first phalanx, a distal radius and a horn core, all belonging to adult individuals; large deer (probably fallow deer, *D. mesopotamica*) are represented by an astragalus and a fused distal radius; a large cat radius (Bd = 19.8; maybe a jungle cat, *Felis chaus*) and a large carnivore (maybe a brown bear, *Ursus arctos*; the specimen, a canine tooth, is not sufficiently complete to provide certain identification) close the list. It is remarkable that a single basket (L111, B1112; for locus location see Alexandre, this volume: Plan 1, Sq 4) contained many of these wild game finds (the cat, deer, and gazelle radii and the carnivore canine; Fig. 2). A single suid distal femur metaphysis may also have belonged to wild boar, since domestic pigs, if part of the diet, would tend to constitute a higher percentage of the assemblage.

Caprine slaughter was not focused on a single age or sex group: the percentage of juveniles (7/22; 24%) indicates a substantial presence of both young and adult individuals. More precise aging could be obtained from mandibular tooth rows and isolated posterior molars (n = 6), which include two specimens assigned to Wear Stage B (3–6 months old at death), two specimens assigned to Wear Stage E (2–3 years old at death), and two specimens of older individuals assigned to Wear Stages G and H (4–6 and 6–8 years at death, respectively). The tooth wear data therefore support the heterogeneous age-at-death distribution obtained from the epiphyseal fusion data.

In regard to sex ratios, two caprine pelvic fragments were identified as female, and humerus measurements (Fig. 3) indicate the presence of both male and female sheep and goats. The composition of the caprine sample, which comprises both sheep and goats, male and female animals of all ages represents culling from flocks kept under a generalized husbandry regime, probably prioritizing herd security and demographic stability over marketable surplus production of wool, mutton or milk. An intensive husbandry regime would result in a herd composition clearly dominated by specific age, sex and species groups.

Table 2. Skeletal Element Frequencies for the Mamluk Contexts[i]

Portion	POSAC	F/U	Caprinei[ii]	Cattle	Other
Head	dp2		1 (1)		
	dp3		2 (2)		
	dp4		1 (1)		
	P3		1 (1)		
	P4		3 (2)		
	M1/2		9 (7)	3 (1)	
	M3		3 (1)	3 (1)	
	Zygomatic		1	1	
Forelimb	Scapula	F	2		
		?	1		
	Humerus	F	9[iii]		
	Radius	F			1 (cat), 1 (deer), 1 (gazelle)
		U		1	
	Ulna	F		1	
		U		1	
	Carpals			1	
	Metacarpus	F			1 (equid)
		U	1		
Hindlimb	Pelvis	F	1	1	1 (equid)
		U	1		
	Femur	F			1 (pig)
		U	1		
	Tibia	F	3	1	
		U	2		
	Astragalus	F			1 (camel), 1 (deer)
	Calcaneum	F		1	1 (equid)
		U		1	
		n.d.	2		
	Metatarsus	F	1		
		U	1	1	
Feet	Phalanx I	F	5	2	1 (gazelle)
		U	1		
	Phalanx II	F	1		
		U			
	Phalanx III		2	4	
Total			*55*	*22*	*10*

[i] F = fused; U = unfused; n.d. = not determined.

[ii] Numbers in parenthesis signify the number of teeth in mandibles.

[iii] Eight out of nine elements are right-sided.

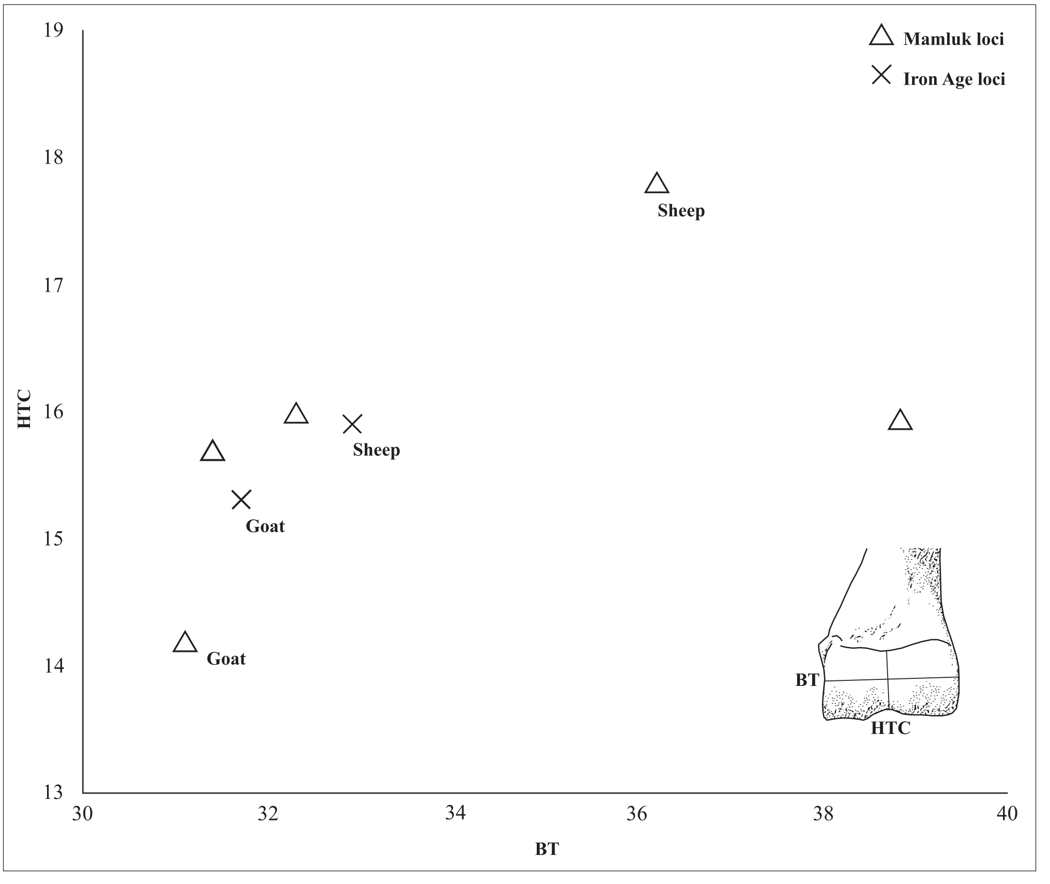

Fig. 3. Caprine distal humerus height (HTC) plotted over trochlea breadth (BT); identification to species is indicated by the data points relating to specimens that could be distinguished as sheep or goats.

Cattle juveniles statistics (4/10; 40%) indicates a rather high percentage of young animals in the death assemblage, which is at odds with the few dental elements that could be aged, and which belonged to older animals (two lower M3 assigned to Wear Stages F and G; two lower M1/2 assigned to Wear Stage K). This pattern is observed on a very small sample size, and should be interpreted very carefully (if at all). Hypothetically, the discrepancy between the juvenile age composition obtained from the bones and the older age at death obtained from the teeth could indicate the consumption of younger animals that were slaughtered off site and only their meaty parts were brought in, plus the occasional on-site slaughter of older work animals which resulted in the deposition of adult butchery waste (mandibles).

The size of the Mamluk sample was sufficient to observe caprine skeletal element frequencies. The results suggest that the most frequent carcass portion discarded at the excavated Mamluk contexts was the forelimb, closely followed by the hindlimb (Fig. 4). Butchery waste, such as head, lower limb and foot elements, are represented by fewer specimens, indicating that the primary processing of the animal carcasses (skinning,

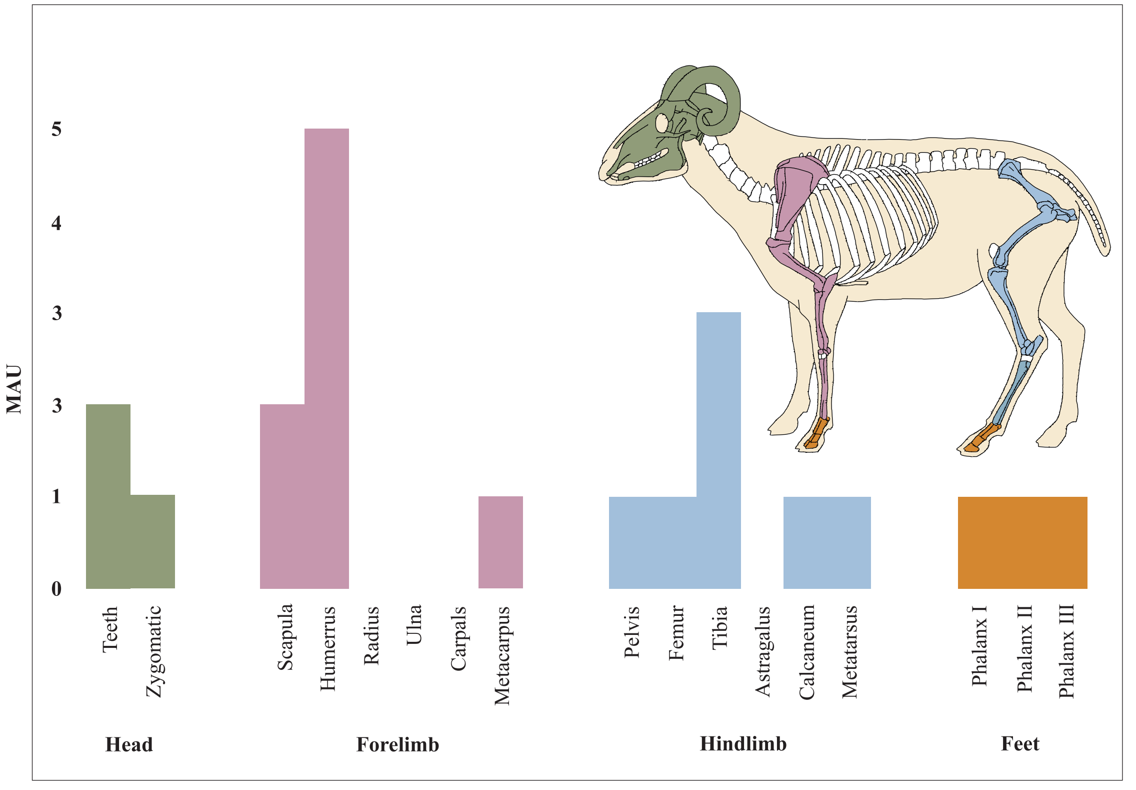

Fig. 4. Skeletal element representation for caprines in the Mamluk contexts; sheep drawings were modified from Michel Coutureau and Vianney Forest (ArchéoZoo.org), after Barone (1976:23).

evisceration and the removal of extremities) was not carried out at the excavated contexts. Smaller skeletal elements are missing, probably due to recovery bias. Notably, the representation of humeri is skewed in favour of right-sided elements (NISP = 8), with only one left-sided element. This pattern is not statistically significant (Fisher's Exact Test: P = 0.13), given the small number of available observations.

Within the different skeletal portions, dense and durable parts, such as the distal humerus, distal tibia and teeth, are more common than the distal femur, radius and pelvis; furthermore, the softer parts of the proximal tibia and humerus are entirely missing from the assemblage, although the durable distal parts of the same elements are very well-represented. This is an indication for the action of density-mediated bone attrition, probably caused by scavenging dogs that chewed off spongy, fatty epiphyses.

Many of the bones in the Mamluk contexts were gnawed by dogs (n = 16; 18%; Fig. 5), an observation which explains the pattern of density-mediated attrition that was observed in the skeletal element frequency analysis above. Fracture morphology was recorded on 19 bones, out of which most (n = 11; 58%) showed a breakage pattern consistent with fragmentation of fresh bones. Only two bones of the fracture morphology sample (11%)

Fig. 5. Carnivore gnawed "shaft cylinders" (L125, B1041).

Fig. 6. A caprine distal humerus cleft obliquely by a heavy blade (chopper) (L111, B1031).

preserved less than 50% of the original shaft circumference; most were "shaft cylinders" of the type frequently associated with carnivore-induced bone destruction. Bone fragmentation therefore shows that some breakage of bone occurred during human food preparation (evidenced by long bone slivers found in most baskets), but also subsequent fragmentation and destruction by scavenging dogs. Only three specimens were weathered by prolonged exposure before burial, suggesting rapid sediment accumulation.

Human-induced bone surface modifications, including burning, is rare (n = 3; 3%) and was likely caused by the post-depositional conflagration that ruined the building. Butchery marks occurred on 11 specimens (12%), and represent defleshing and disarticulation of caprine meat-bearing skeletal elements. Three bones bore butchery marks inflicted by a chopper: a caprine humerus and pelvis and a cattle distal metapodial (Fig. 6). The latter specimen was cut with a knife during the skinning process, and then severed from the phalanges using a heavy blade.

SUMMARY AND DISCUSSION

The faunal assemblage from Ḥorbat ʻOfrat yielded a small sample of identified bones from Iron II contexts and a medium-sized sample of bones from a Mamluk building. Both assemblages were shaped by density-mediated attrition (the destruction of softer skeletal elements) and by partial recovery, which would probably explain the absence of fish and the paucity of bird remains. The earlier Iron II sample is dominated by both cattle and caprines, with a representation of young and adult individuals indicating a non-specialized economy, probably practiced by town-dwellers and mixed agriculturalists that inhabited the nearby villages supplying the livestock. Wild boar, gazelle and deer remains indicate a diverse diet and the probable use of sporadic hunting as a status-enhancing activity, which was common practice in antiquity (Marom and Bar-Oz 2013).

The faunal remains recovered from the large Mamluk-period building are dominated by meat-bearing parts of sheep and goats, which appear to have been kept under an extensive husbandry regime consistent with a small-scale agro-pastoral economy. The faunal sample shows two notable features: firstly, a bias in favour of right-sided forelimb elements (humeri); and secondly, evidence of hunting of deer, gazelles, jungle cat and bear. This menagerie is not typical of the few published zooarchaeological assemblages from Islamic times, which infrequently include few game animals such as deer and gazelles (Horwitz and Dahan 1996).

Furthermore, some of the large game remains were concentrated in a single basket from L111, and consisted of three radii. Such "structured" deposits in an accumulation of debris in an open space (Hayden and Cannon 1983; LaMotta and Schiffer 1999) are probably not random, but indicate formal treatment of game animal remains—the kind of *savoir faire* commonly associated with "royal hunts" (Allsen 2006; Sykes 2014; for the importance of hunting in local Medieval elite culture see Ibn-Munqidh 2000). Both the right-side dominance of caprine humeri and the concentration of wild animal radii could suggest the presence of high-status individuals in the excavated precincts (compare with Davis 2008 for side-bias in a medieval context in England). It is not possible at this point to decide whether the garbage deposit with this extraordinary zooarchaeological signature was accumulated by Christian pilgrims on their way to Nazareth or by itinerant Muslim elites on a hunting foray; however, some use of the building by individuals of high status is clearly reflected by the archaeozoological finds.

Appendix 1. The Number of Bones Identified to Taxon in Each Locus.

Period and Locus	Caprine	Sheep	Goat	Cattle	Equid	Camel	Chicken	Pig	Deer	Gazelle	Cat
Iron II											
111				1							
120	2	1		1							
132	1				1						
139	3		1	2	2						
160	1	1		3			1				
163				1							
169				1							
171	4			3							
172				1							
176	2										
179								2	1		
180				2							
184			1								
185				1							
187	1			1							
Total	*14*	*2*	*2*	*17*	*3*		*1*	*2*	*1*		
Byzantine											
113	1		1	3	2						
118				1							
140				1							
Total	*1*		*1*	*5*	*2*						
Mamluk											
101			1								
103				2							
104										1	
105	3			1	1						
109	1		3	1			1				
110	4	2		1	1		2		1		
111	6	2		3				1	1	1	1
112	2	2	1	5		1	1				
125	2			1	1						
126	1										
133	3	1	1	3							
144	2			6							
147	1										
161	6	1	3				2				
Total	*31*	*8*	*9*	*23*	*3*	*1*	*6*	*1*	*2*	*2*	*1*
Total	*46*	*10*	*12*	*45*	*8*	*1*	*7*	*3*	*3*	*2*	*1*

Appendix 2. Skeletal Element Measurements (in mm)[i]

Element and Taxon	F/U[ii]	Measurements					Locus	Period
M3		L	W I	W II				
Caprine		24.8	9.4				125	Mamluk
Cattle		35.5	15				171	Iron IIA–B
Cattle		39.3	15.8				160	Iron IIA–B
Cattle		33.1	15.1				144	Mamluk
Cattle		33.7	13.7				144	Mamluk
Pig		47.9		19.3			179	Iron IIA–B
Scapula		GLP	BG					
Caprine	EF	33	23.3				171	Iron IIA–B
Caprine	F	30.7	21.5				120	Iron IIA–B
Caprine	EF	32.5	23.1				161	Mamluk
Caprine	F	37.6	24				111	Mamluk
Humerus		BT	HTC	GL	Bp	Bd		
Caprine	EF	32.3	16				133	Mamluk
Caprine	EF	31.4	15.7				126	Mamluk
Caprine	EF	38.9	17				110	Mamluk
Goat	EF	31.7	15.3				184	Iron IIA–B
Goat	EF	31.1	14.2				133	Mamluk
Sheep	EF	32.9	15.9				120	Iron IIA–B
Sheep	EF	36.2	17.8				133	Mamluk
Sheep	EF		15.5				111	Mamluk
Sheep	EF		16.4				110	Mamluk
Cattle	EF	61.5	27.5				120	Iron IIA–B
Equid	EF	48.3	24.5				113	Byzantine
Chicken	F			76.5	20.8	15.9	160	Iron IIA–B
Radius		BFd	Bd	Bd(m)				
Caprine	EU	32.9	36.7				176	Iron IIA–B
Caprine	MU		32.1				171	Iron IIA–B
Cattle	EU		56.1				160	Iron IIA–B
Cattle	MU			39.5			112	Mamluk
Equid	EF	44.8	51.8				113	Byzantine
Deer	EF	31.8	37.5				111	Mamluk
Gazelle	EF	23.8	25.4				111	Mamluk
Cat	EF		19.8				111	Mamluk
Tibia		Bd	Dd					
Caprine	EF	26.5	21.2				171	Iron IIA–B
Caprine	EF	29.4	23.6				161	Mamluk
Caprine	EF	26	19.1				163	Mamluk

[i] Measurements were taken as in von den Driesch (1976) and Davis (1992), except for WMT (width of the medial part of the distal metapodial trochlea) and WLT (width of the lateral part of the distal metapodial trochlea) (Zeder and Lapham 2010).

[ii] EF = epiphysis fused; F = fused/mature; EU = epiphysis unfused; MU = metaphysis unfused.

APPENDIX 2. (cont.)

Element and Taxon	F/U[ii]	Measurements					Locus	Period
Caprine	EF	25.5	19.8				125	Mamluk
Cattle	EF	53.3	43.3				111	Iron IIA–B
Astragalus		Bd	GLl	Dl	GH	GB		
Cattle	F	41.6					180	Iron IIA–B
Cattle	F	40.7	68.1	37.2			180	Iron IIA–B
Camel	F	55.3	77.9	44.4			112	Mamluk
Equid	F				45.2	44	139	Iron IIA–B
Deer	F	32.1	56.9	30.7			110	Mamluk
Calcaneum		GL						
Cattle	EF	111.9					144	Mamluk
Metacarpus		Bd	Bd(m)	WLT	WMT	BC		
Caprine	MU	26.2					171	Iron IIA–B
Caprine	MU		33.1				120	Iron IIA–B
Caprine	MU		29				111	Mamluk
Caprine	MU		23.4				111	Mamluk
Goat	EU			12	21.3	15.3	161	Mamluk
Cattle	EF	53.7	50.9				113	Byzantine
Metatarsus								
Caprine	MU	23.6					171	Iron IIA–B
Goat	EF	26.7	26	9.8	17.5	11.9	139	Iron IIA–B
Sheep	EF	23.1	23.3	12.5	17		110	Mamluk
Cattle	MU		38.5				139	Iron IIA–B
Cattle	MU		41.6				103	Mamluk
Metapodial								
Sheep	EF	25.4		10.5	16.1	11.7	112	Mamluk
Cattle	EU	52					111	Mamluk
Phalanx I		Bp	Bd	Glpe				
Caprine	EF	12.9	11.4	39.9			160	Iron IIA–B
Goat	EF	12.2	11.9	38.6			112	Mamluk
Sheep	EF	16.6	15.7				111	Mamluk
Sheep	EF	13.1	12.9	35.9			112	Mamluk
Cattle	EF	26	25	52.5			160	Iron IIA–B
Cattle	EF	24.4	24.1	53			133	Mamluk
Cattle	EF	29.2	27.3	59.6			105	Mamluk
Gazelle	EF	11.7	9.6	40.6			104	Mamluk
Tarsometatarsus		Bd	GL					
Chicken	F	14.5					110	Mamluk
Chicken	F		73.3				110	Mamluk
Chicken	F	9.6	50.7				109	Mamluk

APPENDIX 3. Butchery Marks in the Assemblage and Their Description

Taxon	Element	Age[i]	Butchery marks	Locus	Basket	Period
Caprine	Mandible		Transverse cut marks on lateral aspect of the posterior dentary	171	1152	Iron II
Caprine	Thoracic vertebra		Cut marks on the inside of neural arch	176	1146	Iron II
Caprine	Thoracic vertebra		Cut marks on caudal aspect of the neural spine base	160	1133	Iron II
Caprine	Scapula		Deep slices transverse to medial aspect of the caudal rim	133	1076	Mamluk
Caprine	Scapula	EF	Cut marks on medial aspect above articulation	161	1110	Mamluk
Caprine	Scapula	F	Cut lateral above distal articulation	111	1012	Mamluk
Caprine	Humerus	EF	Cut distal shaft	126	1056	Mamluk
Caprine	Humerus	EF	Chop distal articulation	110	1022	Mamluk
Sheep	Humerus	EF	Cut marks on medial aspect of the distal shaft	161	1110	Mamluk
Sheep	Humerus	EF	Sheared (see Fig. 6)	111	1031	Mamluk
Caprine	Metacarpus	MU	Parallel transverse cut marks on plantar aspect	171	1142	Iron II
Caprine	Metacarpus	MU	Cut distal shaft	120	1079	Iron II
Caprine	Pelvis	F	Chopped through on illiac and ischial shafts	110	1011	Mamluk
Caprine	Pelvis	F	Cut marks on ventral aspect of illiac shaft	171	1159	Iron II
Caprine	Femur	EF	Cut marks on caput femoris	160	1133	Iron II
Caprine	Femur	MU	Cut across medial shaft	110	1030	Mamluk
Caprine	Tibia	EF	Cut distal shaft	111	1023	Mamluk
Sheep	Calcaneum	EF	Cut on plantar aspect below sustenculum	160	1133	Iron II
Cattle	Humerus	EF	Chopped on medial side of distal articulation	169	1128	Iron II
Cattle	Humerus	EF	Cut distal	120	1143	Iron II
Cattle	Metacarpus	EF	Cut distal shaft	113	1065	Byzantine
Cattle	Metapodial	EU	Chopped across distal articulation; distal sheared	111	1023	Mamluk
Cattle	Astragalus	F	Chopped	180	1155	Iron II
Cattle	Phalanx I	EF	Cut marks on dorsal aspect below articulation	172	1138	Iron II
Deer	Astragalus	F	Cut	179	1153	Iron II

[i] EF = epiphysis fused; F = fused/mature; EU = epiphysis unfused; MU = metaphysis unfused.

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