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The Faunal Remains from the Mamluk-Period al-Waṭṭa Quarter, Safed (Ẓefat)

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Introduction

Few animal bone assemblages have been published from late medieval sites in Israel. This is in contrast with the general increase in the application of zooarchaeological research in excavations in Israel (Bar-Oz and Horwitz, forthcoming: Fig. 2) and the rising number of international publications concerning medieval zooarchaeology (e.g., Bartosiewicz 1995; Albarella 1999; O'Connor 2003; Davis 2007; Sykes 2007). In this respect, the salvage excavation in the medieval al-Waṭṭa quarter, Safed (Ẓefat; see Dalali-Amos and Getzov, this volume) provides a systematically sampled faunal assemblage attesting to a wealthy domestic urban occupation. The excavated houses yielded large concentrations of domestic refuse, including local and imported pottery, and animal bones (see Dalali-Amos and Getzov, this volume).[1]

The three main occupation phases identified by the excavators all date to the Mamluk period (see Dalali-Amos and Getzov, this volume): Stratum III, the earliest, represents an urban site that was destroyed by a strong earthquake in the first decades of the fifteenth century CE; Stratum II is a post-destruction layer; and Stratum I is a later settlement on the slope.

This paper presents the faunal assemblage from the al-Waṭṭa quarter, Safed, followed by a discussion of the mundane aspects of daily life in Safed in the Mamluk period. The relative distribution of the domestic and wild taxa, and the completeness of the skeletal elements, are used to reconstruct food consumption and distribution, animal husbandry, and social and cultural variation in foodways. This comprehensive study of the zooarchaeological data

[1] The bone assemblage was returned to the Israel Antiquities Authority, except for bones such as complete epiphyses and measurable teeth that were curated for future analysis in the Laboratory of Archaeozoology of the University of Haifa. The authors wish to thank Vera Damov for her assistance in preparing the graphic material.

includes species representation and taphonomic observation, with the aim of discerning patterns of bone consumption and offering explanations for these observations.

Methodology
The bones were examined and documented in the laboratory.

Recording.— Bones from loci that were poorly defined stratigraphically or mixed chronologically, including surface and mixed deposits, were not analyzed or recorded, except for bones of particular interest, such as those of wild animals. Statistics on recorded bones were coded in a Microsoft Excel 2000 worksheet.

Cleaning.— All bones from stratified loci were immersed in diluted acetic acid (5%) for approximately one hour to remove calcareous deposits. Each excavation unit was treated separately. Subsequently, bones were rinsed in fresh water and dried slowly. This procedure enabled the detection of taphonomic modifications on the surface of the bones, including butchery marks, burning and signs of dog gnawing.

Sorting, Labeling and Packing.— Bones from each excavation unit were weighed, and then divided into identified and unidentified fragments. Unidentified bone fragments longer than 40 mm were counted. Skeletal elements, such as complete epiphyses and teeth, were separated from the rest of the assemblage and were then labeled and packaged.

Taxonomic Identification.— Bone remains were identified to bone element and species using the comparative collection of the Laboratory of Archaeozoology of the University of Haifa. Separation of sheep (*Ovis aries*) from goat (*Capra hircus*) was based on morphological criteria of selected bones (following Boessneck 1969 and Zeder and Lapham 2010). Sheep and goat skeletal elements that could not be identified to species were pooled into a sheep/goat category. Differentiation of horse and donkey specimens was based on tooth size and comparison with the data presented by Eisenmann (1980).

Measurements.— Bone measurements followed von den Driesch (1976) and Eisenmann (1980). Measurements, recorded to 0.1 mm, were made using a digital caliper (Sylvac model S225), and were introduced into a Microsoft Excel worksheet using an Opto-RS232C compatible interface and OptoFace software (version 1.01). Bones with fusion marks or porous epiphyses, indicating incomplete ossification, were not measured.

Quantification.— Diversity of taxa was quantified according to NISP (number of identified specimens), MNE (minimum number of elements) and MNI (minimum number of individuals). These values were calculated using procedures described by Klein and Cruz-Uribe (1984) and Lyman (1994); NISP was used as a basic measure of taxonomic abundance (Grayson 1984).

Recording the Taphonomic Data.— The recorded elements were inspected for various macroscopic bone surface modifications, such as butchery marks and signs of animal activity (e.g., rodent gnawing, carnivore punctures, and digestion; Lyman 1994). Butchery marks were coded according to Binford (1981) and classified into three categories that corresponded to three stages in the butchery sequence: skin removal, dismemberment of the carcass, and filleting of meat from the bones.

Burning.— The state of burning was recorded for each of the identified elements. Two categories of burned bones were recorded: (1) partially or completely carbonized bone, and (2) calcined bone (Lyman 1994).

Mortality Profile.— Age at death of the major culled species was analyzed based on epiphyseal closure (Silver 1969) and tooth eruption (Payne 1973).

THE FAUNAL ASSEMBLAGE

Taxonomic Representation

A total of 1160 complete and fragmentary identified bones was retrieved from the three occupation phases (see Tables 1–3). The distribution of identified and non-identified bone remains by chronological phases, and further, into loci and baskets, appears in Appendix 1. Bone measurements for all specimens are given in Appendix 2.

The dominant taxa (over 90%) in all occupation phases are sheep (*Ovis aries*) and goats (*Capra hircus*), with a considerably smaller number of cattle (*Bos taurus*; less than 5% of the total identified specimens in all phases), followed by domestic fowl (*Gallus gallus*). Changes in the frequencies of livestock species across the different occupation phases show minor diachronic changes in taxonomic abundance (Fig. 1), revealing that the subsistence patterns and socio-economic organization at the site did not change through time. There were no pig remains in all phases.

Differentiating sheep from goat based on distinctive taxonomic features was possible only for small numbers of sheep/goat remains. In all three strata, sheep outnumbered goats (Table 4). In Stratum III, sheep comprised 66% of the total number of sheep/goat; in Stratum II, the number of sheep increased to 83%; and in Stratum I, it decreased to 65%. The overrepresentation of sheep during all phases suggests that they were exploited chiefly for their meat, a conclusion supported by the culling profile of sheep and goat specimens.

Equid remains appeared regularly in all strata, represented primarily by isolated teeth and fragmentary bones. None of the bones was found in articulation or in a context that would differentiate the equid remains from the general zooarchaeological assemblage. The equid remains were identified as horse (*Equus caballus*) based on their teeth (occlusal length, after Eisenmann 1980) (Fig. 2); this conclusion was supported by morphometric comparisons of upper and lower molars using the taxonomic criteria in Johnstone 2004.

Table 1. Stratum I, Number of Identified Specimens (NISP), Minimum Number of Elements (MNE) and Minimum Number of Individuals (MNI) for Each Taxon

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus*		*Equus Size*		*Vulpes vulpes*		*Felis sp.*		*Gallus gallus*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Head																				
Mandible Ramus	2	2											2	2						
Mandible Teeth	2	2					1	1	2	1										
Maxilla Teeth	2	2					6	5	3	1										
Body																				
Atlas							8	3												
Axis							5	2												
Ver: Cervical							7	4												
Ver: Thoracic							15	7			2	2								
Ver: Lumbar							15	9												
Rib frag.							21	16												
Sternum							1	1												
Forelimb																				
Scapula Glenoid Fossa			5	5	1	1	8	8												
Humerus Proximal							2	2									1	1		
Humerus Distal			7	7	1	1	15	10							2	2	4	4		
Radius Proximal			5	5			16	9	1	1										
Radius Distal					1	1	5	4												
Ulna Proximal							6	4	1	1										
Metacarpus Proximal							6	6												

Table 1. (cont.)

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus*		*Equus Size*		*Vulpes vulpes*		*Felis sp.*		*Gallus gallus*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Hindlimb																				
Pelvic acetabulum							23	9			2	2								
Femur Proximal	2	1					18	9									2	2		
Femur Distal							8	4			1	1								
Tibia (Tibio-Tarsus) Proximal							2	2												
Tibia (Tibio-Tarsus) Distal							30	24									8	8		
Fibula									1	1										
Astragalus			2	2			3	3	3	3										
Calcaneus					2	2	1	1												
4th Central	1	1																		
Metatarsus Proximal							4	4												
Metatarsus Distal			2	2																
Toes																				
Phalanx 1			3	3	7	7	7	7	1	1										
Phalanx 2									1	1										
Metapod cond.							5	2												
Long bone																	1	1		
Shell																			1	1
NISP (N = 322)	9		24		12		23.8		13		5		2		2		16		1	
%NISP	2.8		7.5		3.7		73.9		4.0		1.6		0.6		0.6		5.0		0.3	
MNI (N = 34)	1		7		2		13		2		2		1		1		4		1	

Table 2. Stratum II, Number of Identified Specimens (NISP), Minimum Number of Elements (MNE) and Minimum Number of Individuals (MNI) for Each Taxon

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Head																						
Occipital							4	3														
Petrosum							1	1														
Horn							1	1														
Mandible Ramus							2	2														
Mandible Teeth	1	1					7	5	1	1												
Maxilla Teeth							44	24	2	2												
Body																						
Atlas							6	2							1	1						
Axis	2	1					3	2							1	1						
Ver: Cervical							20	14					3	2								
Ver: Thoracic	1	1					29	9					2	1								
Ver: Lumbar							30	16														
Sacrum							4	1														
Rib frag.					1	1	25	20					2	1								
Forelimb																						
Scapula Glenoid Fossa	1	1	8	8	2	2	13	11														
Humerus Proximal							2	1														
Humerus Distal	2	2	24	21			21	13							1	1						
Radius Proximal	1	1	5	4			18	10														

Table 2. (cont.)

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Radius Distal			1	1			8	6														
Ulna Proximal	1	1					6	3														
Metacarpus Proximal	1	1					10	10	2	2												
Metacarpus Distal			1	1	1	1	1	1														
Metacarpal IV									2	2												
Hindlimb																						
Pelvic acetabulum	3	2					25	8														
Femur Proximal	1	1					15	8									3	3				
Femur Distal	4	2					20	9	1	1			2	2			1	1				
Tibia (Tibio-Tarsus) Proximal	1	1					11	7									1	1				
Tibia (Tibio-Tarsus) Distal							38	34	1	1							4	4				
Astragalus	2	2	2	2			7	7	2	2												
Calcaneus	1	1					8	6														
4th Central	1	1					1	1														
Metatarsus (Tarsus-Metatarsus) Proximal	1	1					10	9			1	1										
Metatarsus (Tarsus-Metatarsus) Distal			3	3			2	2											1	1		

Table 2. (cont.)

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Toes																						
Phalanx 1			9	9	7	7	3	3	3	3												
Phalanx 2	1	1					3	3	1	1												
Phalanx 3	1	1																				
Metapod cond.							8	3														
Carpal/Tarsal									1	1												
Long bone							1	1			1	1	1	1			2	2				
Shell																					1	1
NISP	26		53		11		407		16		2		10		3		11		1		1	
%NISP	4.8		9.8		2.0		18		3.00		0.4		1.8		0.6		2.0		0.2		0.2	
MNI	1		13		2		75.2		2		1		1		1		3		1		1	

Table 3. Stratum III, Number of Identified Specimens (NISP), Minimum Number of Elements (MNE) and Minimum Number of Individuals (MNI) of Each Taxon

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus.*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Anas sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Head																								
Occipital							3	2																
Petrosum							2	2																
Horn							1	1																
Mandible Ramus	1	1					7	3																
Mandible Teeth							9	7			1	1			1	1								
Maxilla Teeth							31	19							1	1								
Body																								
Atlas							1	1																
Axis							4	2																
Ver: Cervical							7	3					3	2										
Ver: Thoracic							11	4																
Ver: Lumbar							10	4	2	2														
Rib frag.							15	13																
Sternum							2	1																
Coracoid																	2	2						

Table 3. (cont.)

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus.*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Anas sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Forelimb																								
Scapula Glenoid Fossa					3	3	9	8							1	1								
Humerus Proximal							3	2																
Humerus Distal			4	3			11	7									4	4						
Radius Proximal			5	5			9	4																
Radius Distal	1	1					3	2																
Ulna Proximal							4	3									2	2						
Metacarpus Proximal							5	5																
Metacarpus Distal					2	1	1	1																
Metacarpal II									1	1														
Hindlimb																								
Pelvic acetabulum							13	5									1	1						
Femur Proximal							11	6									1	1						
Femur Distal	1	1					7	4	2	2			1	1			4	4						

Table 3. (cont.)

	Bos taurus		*Ovis aries*		*Capra hircus*		*Capra/Ovis*		*Equus caballus.*		*Gazella gazella*		*Equus Size*		*Vulpes vulpes*		*Gallus gallus*		*Anser sp.*		*Anas sp.*		*Mollusks*	
	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE	NISP	MNE
Tibia (Tibio-Tarsus) Proximal	1	1	1	1	1	1	2	2									1	1						
Tibia (Tibio-Tarsus) Distal							14	11									2	2						
Astragalus			2	2			3	2																
Calcaneus			2	2	1	1	3	3																
Metatarsus (Tarsus-Metatarsus) Proximal	1	1					3	3	1	1									1	1				
Metatarsus (Tarsus-Metatarsus) Distal			3	3			1	1																
Toes																								
Phalanx 1			5	5	3	3	3	3	1	1														
Phalanx 2							2	2																
Phalanx 3					2	2	1	1																
Metapod cond.							7	2	1	1														
Long bone																	2	2			1	1		
Shell																							3	3
NISP (N=297)	5		22		12		218		8		1		4		3		19		1		1		3	
% NISP	1.7		7.4		4.0		73.4		2.7		0.3		1.4		1.0		6.4		0.3		0.3		1.0	
MNI (N=30)	1		4		3		10		1		1		1		1		3		1		1		3	

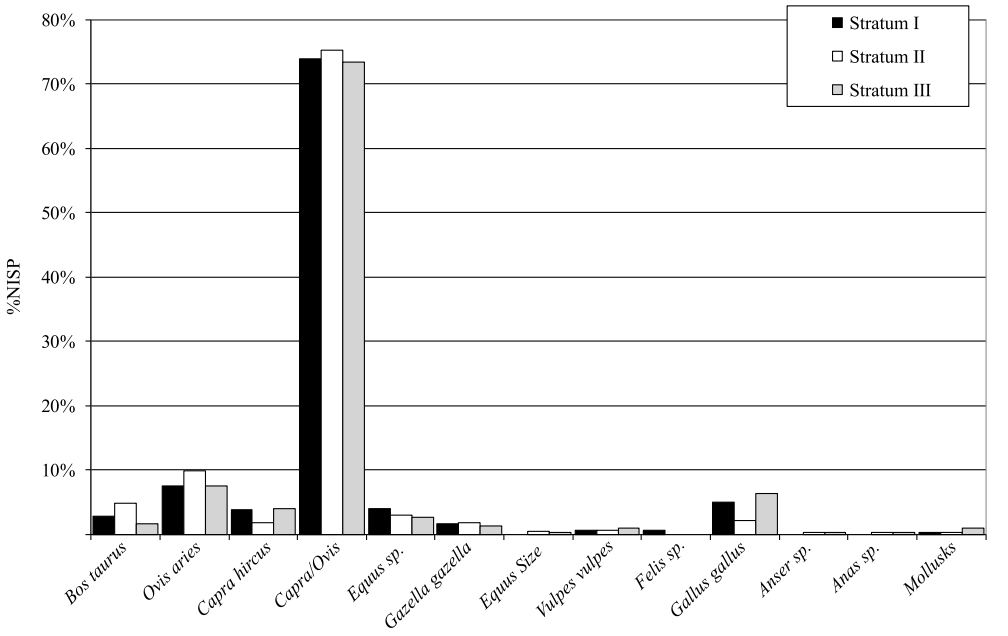

Fig. 1. Distribution of animal taxa from the three occupation phases.

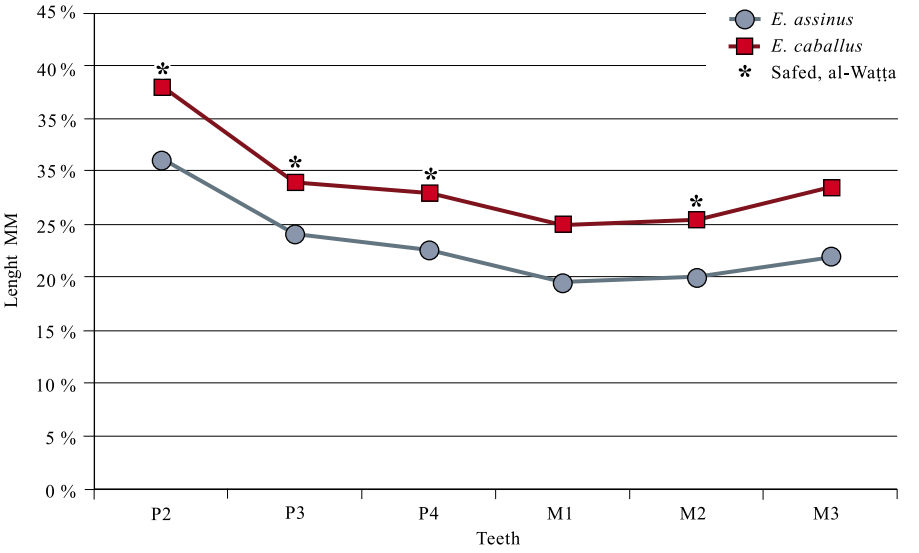

Fig. 2. Equid tooth measurements (occlusal length) compared with E. *caballus* and E. *assinus* tooth measurements (data from Eisenmann 1980).

Table 4. Number of Identified Specimens (NISP) in Each Stratum for Sheep and Goats

Stratum	NISP		NISP%	
	Sheep	Goats	Sheep	Goats
I	24	12	66	34
II	53	11	83	17
III	22	12	65	35
Total	*99*	*35*	*74*	*26*

Fig. 3. Left (above, L206) and right (below, L223) humeri of a cat from Stratum 1; note the carnivore tooth puncture on the proximal end of the bottom humerus, most probably made by a fox.

Game animals are infrequent; they include isolated remains of mountain gazelle (*Gazella gazella*), found in Strata II and III. Other mammals recorded in negligible numbers (<1% of total NISP) were fox (*Vulpes Vulpes*; all phases) and cat (*Felis* sp.; Fig. 3; Stratum I). Four bones of medium-sized aquatic avifauna (mallard, *Anas* sp.; and goose, *Anser* sp.) were also identified.

Mollusk remains are present in all phases and include *Cypraea panherina*, *Glicimeris insubrica*, *Trunculariapsis trunculus* and *Chambardia rubence*.[2] *Cypraea pantherina* originates from the Red Sea, and *Chambardia rubence* (Fig. 4) is an import from Egypt, known from multiple-period sites in Israel (Bar-Yosef Mayer 2002). *Chambardia rubence* was found at the Early Islamic site of Sede Boqer (Heller and Bar-Yosef 1985) and in Mamluk-period strata in Kenyon's excavations in Jerusalem (Reese 1995).

[2] The authors wish to thank Daniella Bar-Yosef Mayer for identifying the mollusk remains.

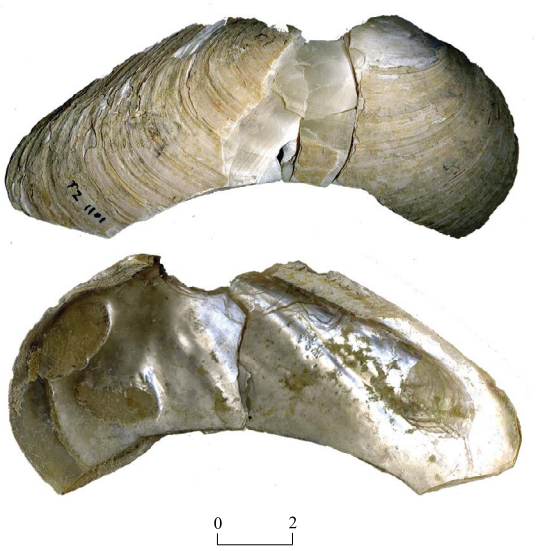

Fig. 4. Complete *Chambardia rubence* (Stratum III, L215).

Demographic Profile of Sheep, Goats and Cattle

The age of the culled sheep and goats was estimated based on epiphyseal closure (bone fusion). In Stratum I, young individuals (less than 24 months of age, see Davis 1983) were 24% of the population; in Stratum II, 38%; and in Stratum III, 39% (Table 5). These finds must be interpreted with caution: the lack of sieving can have a strong influence on the recovery of unfused epiphyses in young animals. Thus, the estimated proportion of juveniles in these deposits may be biased (Payne 1975; Clason and Prummel 1977). Moreover, the mortality profile of sheep/goat related to two species that may have been exploited differently. The small sample of teeth did not permit similar analysis. Nevertheless, the high ratio of juveniles, particularly in Strata II and III, suggests that most animals were culled to maximize meat yields.

The small sample of cattle impeded carrying out a similar analysis. Nevertheless, at least one mandible from the age range of 3.0–4.5 years from Stratum 1 and an unfused element of an individual under the age of 24 months from Stratum II were recorded. Therefore, it appears that young cattle were consumed on-site as well.

Butchery and Consumption of Livestock

The bones in the assemblage were well-preserved. The presence of porous, low-density bones, as well as the abundance of young animals, attest to the excellent state of preservation of the entire assemblage. There may have been a minor loss of bones due to post-depositional fragmentation processes. Further evidence for the quality of bone preservation is the low fragmentation rate. Though many of the long bone shafts were broken, in most cases their ends were found complete, which may indicate that many of the long bones were deliberately

Table 5. Bone Fusion Data of Sheep/Goat Elements[i]

Age	Bone Element	Stratum I		Stratum II		Stratum III	
		Fused	Unfused	Fused	Unfused	Fused	Unfused
Infant	Distal Scapula	14	0	22	1	11	1
	Distal Humerus	22	1	43	2	14	2
	Proximal Radius	20	1	18	5	11	2
	Proximal Metapod	9	1	18	2	8	0
	Total	*65*	*3*	*101*	*10*	*44*	*5*
Juvenile	Distal Tibia	17	12	24	13	4	10
	Distal Metapod	1	6	8	8	7	6
	Phalanx1	14	3	18	1	7	4
	Phalanx2			3	0	2	0
	Total	*32*	*21*	*53*	*22*	*20*	*20*
Sub-Adult	Proximal Humerus	0	2	1	1	0	3
	Proximal Ulna	5	1	6	0	3	1
	Proximal Femur	10	8	7	9	3	8
	Distal Radius	4	2	7	2	1	2
	Distal Femur	2	6	4	16	3	4
	Proximal Tibia	0	3	3	8	0	4
	Calcaneum	1	2	6	2	1	5
	Acetabullum Pelvic	22	1	20	5	12	1
	Total	*44*	*25*	*54*	*43*	*23*	*28*
Adult	Atlas	8	0	5	1	1	1
	Axis	4	1	2	1	4	0
	Vertebra	17	20	36	43	12	16
	Total	*29*	*21*	*43*	*45*	*17*	*17*

[i] Infant = less than 12 months; juvenile = up to 18–28 months; sub-adult = up to 3.5 years; adult = more than 3.5 years (based on Silver 1969).

broken to extract the marrow, leaving the bone epiphyses complete. Lack of sieving might be another explanation.

Traces of carnivore chewing, most probably of dogs, and signs of rodent gnawing, were observed on the surface of bones from all strata (16 bones from Stratum I; and 18 from both Strata II and III), indicating that these remains were attractive to commensal species, mainly carnivores and rodents with secondary access to them.

Butchery marks were found on 38 bones from Stratum I, 79 bones from Stratum II and 34 bones from Stratum III (Table 6), on the remains of sheep, goat, cattle, fowl (Fig. 5) and on two horse bones. These marks are of all major stages of carcass processing, mainly dismemberment and filleting. Some of the butchery marks were observed on unfused long bone epiphyses of young animals (mainly sheep and goat, and a single cattle bone). The ratio of butchery marks on juvenile bones is 15%, 28%, and 35% in Strata I, II and III,

Table 6. Distribution of Butchery Marks according to the Stages of Carcass Processing

Stratum	Skinning	N	Dismembering	N	Filleting	N	Other	N	Total
I	Phalange 1	1	Scapula	1	Radius	2	Mandible	1	
			Atlas	1	Tibia	5	Scapula	2	
			Axis	1	Sternum	1	Humerus	2	
			Humerus	1	Rib	1	Radius	1	
			Radius	1			Metacarpal	1	
			Pelvic	6			Femur	1	
			Tibia	1			Tibia	2	
			Metatarsal	3			Rib	1	
							Vertebrae	1	
							Tibio-Tarsus	1	
Total		*1*		*15*		*9*		*13*	*38*
II			Atlas	1	Scapula	1	Mandible	1	
			Axis	1	Ulna	1	Axis	1	
			Scapula	7	Femur	1	Humerus	3	
			Humerus	5	Tibia	15	Radius	4	
			Pelvic	5	Rib	2	Ulna	1	
			Femur	3			Metacarpal	3	
			Tibia	4			Sacrum	1	
			Metatarsal	1			Pelvic	1	
			Tarsal 4th Central	1			Femur	3	
			Vertebrae	4			Tibia	1	
							Calcaneum	1	
							Astragal	1	
							Rib	1	
							Vertebrae	2	
							Phalanx 1	1	
							Tibio-Tarsus	2	
Total				*32*		*20*		*27*	*79*
III	Mandibula	1	Scapula	1	Radius	1	Mandible	1	
			Axis	1	Ulna	1	Axis	1	
			Humerus	1	Femur	3	Humerus	4	
			Metacarpal	1	Tibia	6	Ulna	1	
			Pelvic	3	Rib	1	Rib	1	
			Femur	4			Vertebrae	1	
							Tibio-Tarsus	1	
Total		*1*		*11*		*12*		*10*	*34*

Fig. 5. Cut marks on a distal tibia of domestic fowl (Stratum II, L214).

Fig. 6. (a) Sawed horn of a sheep/goat (Stratum III, L230);
(b) cattle femur shaft (Stratum II, L211).

respectively. The high ratio of butchery marks on juvenile animal bones lends weight to the observation that they were used chiefly for their meat and suggests that the bone assemblage accumulated mainly during urban-consumption episodes.

Among the butchered animal bones were several sawed bones (N = 88) cut in a repetitive manner, 9% of the bones in Stratum I and 7% in both Strata II and III (Appendix 3). Moreover, several sawing marks were found on horn, vertebrae and other long bones (Fig. 6). Many of the sawed bones are distal humeri (Fig. 7:a) and proximal radii (Fig. 7:b). There is a close resemblance between the location and angle of the saw on the bones, revealing a consistent work process that may indicate the existence of a bone tool processing industry.

Burning marks were observed on only five bones from Stratum II (all sheep/goat). Only one of the five (from L211) was highly calcined, signaling that it was disposed after it was directly exposed to live coals.

Skeletal part representation of sheep and goats reveal that all body parts are represented in all occupation phases (Fig. 8). No preference for a specific side of the carcass was noted.

Fig. 7. (a) Sawed sheep and goat distal humeri (from top to bottom: Stratum I, L223; Stratum III, L211; Stratum II, L214; Stratum II, L218); (b) sawed sheep and goat proximal radii (from top to bottom: Stratum I, L223; Stratum II, L205; Stratum I, L223; Stratum II, L220).

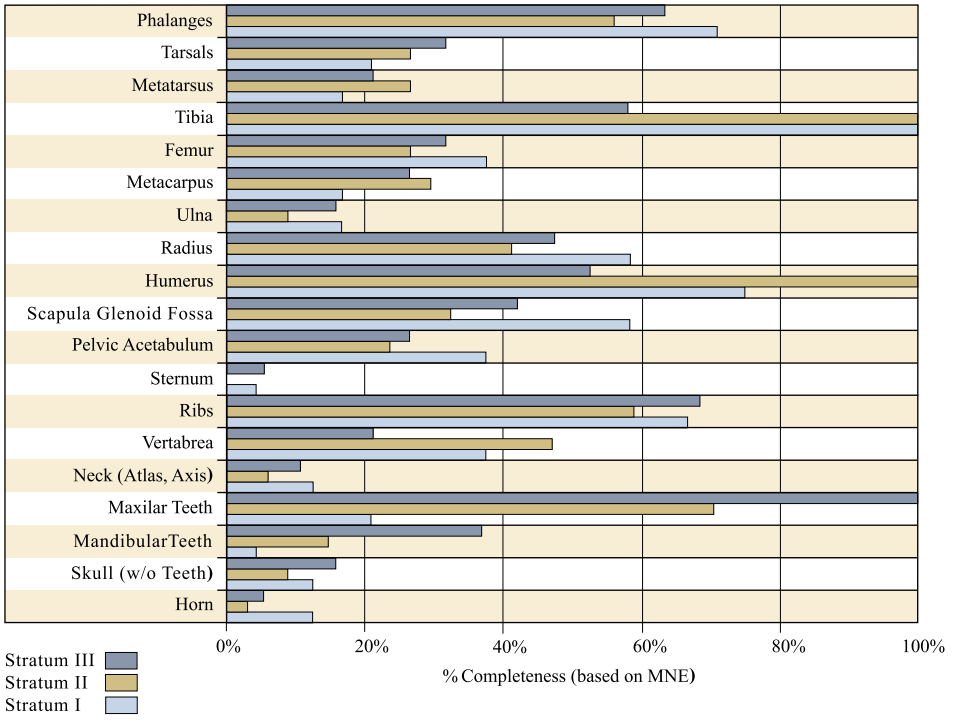

Fig. 8. Skeletal part representation of sheep/goat from the three occupation phases.

None of the skeletal remains were recovered in anatomical articulation, indicating that all the remains derived from household consumption debris. The high presence of bones of low dietary value suggests that much of the assemblage belonged to a butchery deposit.[3]

CONCLUSIONS

The assemblage is dominated by numerous bone fragments, which most likely resulted from cooking and bone processing, as well as bone-tool manufacturing. Analysis of the husbandry remains indicates that in all three phases the assemblage is dominated by livestock species, predominantly sheep and goats, and to a much lesser extent, cattle and fowl.

The mortality profile for sheep and goats in all occupation phases reflects the slaughter of juvenile animals, showing that these animals were utilized primarily for meat, shown by the abundance of butchery marks on young individual specimens. Body-part distribution shows that sheep and goats are well-represented, regardless of their economic value. Likewise, the more 'meaty' parts (i.e., upper limbs) are not over-represented and there is a substantial presence of slaughter waste—body-parts of very low economic value (i.e., feet and heads). Thus, it appears that sheep and goat skeletal elements represent a mixture of primary butchery refuse (slaughter and carcass division) and secondary butchery refuse (food processing and consumption). This conclusion is also supported by butchery marks showing evidence for both primary (skinning, dismemberment and hanging) and secondary (filleting meat from bones) butchery. The high ratio of sawed bones indicates that a bone-tool industry existed nearby, and that after butchering, the bones were further utilized to produce tools. All the remains suggest that the assemblage derived from typical household debris.

While wild game is scarce, represented merely by gazelle and waterfowl (from Strata I and II), this may point to the affluent status of al-Waṭṭa's residents—they could afford 'gourmet' meat (see, e.g., Marom and Bar-Oz 2013). The high socio-economic status of the residents is also supported by the presence of high-quality meat portions of young sheep and goats.

The absence of pig remains in the al-Waṭṭa bone assemblage is evidence for a predominantly Jewish or Muslim population.

[3] As opposed to a typical consumption deposit, with an abundance of meat-rich elements.

APPENDIX 1. Distribution of Identified and Unidentified Animal Bone Remains[i]

Locus	Basket	Weight (g)	No. of Identified Bones	No. of Unidentified Sheep/Goat-Size Bones	No. of Unidentified Cattle-Size Bones	No. of Unidentified Birds	Total No. of Bones
Stratum I							
201	2007	18	1				1
202	2008	90	2	2			
	2023	40	2	1			7
203	2009	54	3	1			
	2049	330	23	4			
	2067	174	12	3			
	2090	284	19	13	1		
	2125	470	32	16	1	2	130
206	2028	62	3				
	2656	40	2	1			6
207	2069	60	5	1			
	2091	74	1	6			
	2126	42	14	7			
	2068/2088	100	6	4			45
212	2070	156	3	1			
	2089	32	2	0			
	2093	38	2	1			
	2119	4	1	0			10
223	2343	298	10	5	2		
	2358	90	6	6			
	2368	422	13	3	1		
	2382	305	34	1	7		
	2412	54	3	1			
	2419	68	5	3		1	
	2433	90	8	5			
	2449	240	17	10			
	2450	70	8	2			
	2454	190	15	10			
	2463	48	4	1			
	2472	40	4	1			
	2482	50	8	1			
	2494	268	22	12			229
228	2495	130	6	3			
	2505	298	14	18			
	2516	186	7	5			53
229	2529	26	1				
	2534	28	4				5
Total			*322*	*148*	*12*	*4*	*486*

[i] Total number of bones includes unidentified bones that were distinguished to bone-size class.

APPENDIX 1. (cont.)

Locus	Basket	Weight (g)	No. of Identified Bones	No. of Unidentified Sheep/Goat-Size Bones	No. of Unidentified Cattle-Size Bones	No. of Unidentified Birds	Total No. of Bones
Stratum II							
117	1090	112	2	1			
	1097	72	2	1	1		
	1100	26	1				8
122	1103	186	4	6	1		11
125	1108	342	11	8	7		26
205	2027	258	7	1	3		
	2033	44	2	1	1		
	2034	246	2				
	2048	64	4	2			
	2051	70	3	1			
	2053	6	1				
	2065	124	6	1			
	2120	116	4				39
210	2052	60	4				4
211	2063	218	9	2	2		
	2078	40	2				
	2092	256	6	5			
	2132	194	10	2	1		
	2133	204	12	1			
	2145	154	8	4	2		
	2157	50	2	1	1		
	2165	42	2	2			
	2173	205	4	3	2		
	2218	498	17	8			
	2243	218	8	5			121
213	2134	20	2				
	2143	314	23	12	3		
	2154	422	45	22			
	2163	156	12	9	1		
	2166	252	17	14			
	2174	198	8	6			
	2181	146	13	12			
	2189	3	3				
	2206	168	20	7	2	1	
	2260	132	5	9			
	2298	50	5	2			
	2316	182	16	4			

APPENDIX 1. (cont.)

Locus	Basket	Weight (g)	No. of Identified Bones	No. of Unidentified Sheep/Goat-Size Bones	No. of Unidentified Cattle-Size Bones	No. of Unidentified Birds	Total No. of Bones
	2343	76	2	1			
	2344	10	1	1			
	2356	28	3	2			
	2367	214	9	5	1		
	2381	356	4	1			
	2385	26	2				
	2386	114	5	4			
	2403	48	4	2			
	2405	148	3	3			
	2452	24	1	1	1		
	2469	12	2				
	2515	152	3	1	1		
	2523	110	1		1		
	2535	52	3	1			
	2556	198	3				
	2360+2357	112	8	2			355
214	2164	194	11	10			
	2176	202	9	4			
	2190	348	22	8	3	1	
	2193	408	26	14		1	
	2200	46	4	1			
	2263	58	7			1	
	4210	580	37	9	1	1	170
220	2261	258	13	7	1		
	2275	180	9	5			
	2281	284	20	2	1		
	2299	66	10	1			
	2304	70	6	2			
	2317	66	6	1			
	2337	46	5				89
Total			*541*	*240*	*37*	*5*	*823*
Stratum III							
215	2147	70	3	1			
	2162	50	1	1			
	2188	55	2				
	2267	68	3		1		
	2279	26	1				
	2296	162	3	1			
	2297	210	6	2			

APPENDIX 1. (cont.)

Locus	Basket	Weight (g)	No. of Identified Bones	No. of Unidentified Sheep/Goat-Size Bones	No. of Unidentified Cattle-Size Bones	No. of Unidentified Birds	Total No. of Bones
	2313	14	1	0	0	0	
	2315	186	2	2	0	0	30
221	2240	128	11	2	4	0	
	2265	88	4	3	0	0	
	2276	114	12	2	0	0	
	2278	350	26	14	0	0	
	2314	272	19	4	0	0	
	2322	170	6	1	0	0	
	2336	482	18	11	0	0	
	2340	128	5	2	0	0	
	2355	75	4	2	0	0	150
230	2529	82	4	1	0	0	
	2535	94	6	4	0	0	
	2540	102	5	0	0	0	
	2548	80	2	0	0	0	
	2549	490	6	1	7	0	
	2590	62	3	0	0	0	
	2617	80	2	2	0	0	
	2539/a	126	5	0	0	0	48
239	2602	82	4	4	0	0	8
242	2585	108	7	7	0	0	
	2589	112	17	7	0	0	
	2591	212	24	1	0	0	63
244	2592/7(?)	892	59	12	4	0	75
245	2604	76	8	2	0	0	
	2610	34	8	2	0	0	
	2613	114	9	3	0	0	32
253	2629	62	1	2	0	0	3
Total			*297*	*96*	*16*	*0*	*409*

APPENDIX 2. Measurements (in mm) of Sheep and Goat Bones.

a. Tibia

Cat. No.	Stratun	Bp	SD	Bd
15	II			29.58
46	III			29.40
69	II			28.32
76	II		17.45	27.65
77	II			31.01
98	III	39.50		
125	III			30.20
149	II			29.77
150	II			30.12
151	II			27.79
211	II			25.33
226	II	39.43		
227	II			28.19
229	II			28.78
250	III	41.12		
322	II			26.67
367	III			27.40
426	II			30.79
429	II			29.29
460	II			32.54
471	II			28.20
497	II			27.20
510	I			30.34
521	I			27.02
558	II			29.30
561	II	43.63		
654	III	42.78		
668	I			28.55
699	III			31.19
700	III			28.56
707	I			26.84
708	I			29.21
768	I			26.34
769	I			29.70
796	I			26.65
808	I			27.46
830	II			27.65
831	II			29.18
832	II			30.17
833	II			26.34
834	II			30.26
835	II	41.10		
978	II			30.17
979	II			28.90
1074	I			29.82
1132	III			27.59
1143	I			27.93
1188	I			30.18
1233	I			31.66
1241	II			30.15
1261	I			29.94
1262	I	43.91		
1263	I	39.76		
1291	I			27.87
1302	II			28.71
1320	II			29.67
1330	II			29.06

b. Scapula

Cat. No.	Stratum	BG	LG	GLP	SLC
6	II	24.63		37.79	
9	II	22.68	28.29	34.65	
25	II	24.30	30.41		23.21
36	III	23.68			
50	III	22.76			
165	III	18.86	23.21		16.18
245	III	23.35	27.99	34.99	
342	III	20.445	23.78		16.84
361	III	21.95	29.84	37.54	
371	II	19.93	28.57	35.32	
425	II	23.70	29.41	26.67	20.00
502	II	17.88	29.72		18.61
615	II	23.45	29.08	36.20	
681	I	20.40	27.73	34.53	20.30
682	I	24.76	28.48	34.90	24.04
683	I	21.12			20.81
780	I	21.10	26.62		

Cat. No.	Stratum	BG	LG	GLP	SLC
791	I	26.93	30.47	37.90	
794	I	21.94	28.96	33.34	
797	I	22.77			
841	II	21.11	28.96	35.87	20.38
842	II	21.93	28.79	34.42	
968	I	24.80	28.56		18.98
986	II	22.64			
999	I	21.60	26.26	31.06	18.74
1011	I	25.62	30.12	37.50	20.89
1016	II	22.04	26.38		20.90
1119	I	23.56	28.10	39.07	
1151	III	22.42	30.57		
1214	II	22.86	28.68	35.40	
1232	I	22.55			18.78
1244	II	22.70			17.10
1300	II	22.78	28.70	34.82	
1321	II	23.04	30.91	37.06	

c. Humerus

Cat. No.	Phase	BT	Bd	SD
21	II	33.45	35.07	
114	II	34.24	35.43	15.67
360	III			11.84
399	II	34.66	35.75	
420	II	28.93	30.00	
423	II	31.07	31.94	
479	II	29.56	29.31	
496	II		27.99	
556	II	31.74	34.10	
616	II	29.99	30.35	

Cat. No.	Phase	BT	Bd	SD
617	II	30.90		
883	II	31.17	34.90	
977	II	35.51	37.51	
1073	I	34.61	32.17	17.32
1106	II?	32.57		
1165	III		32.87	14.89
1282	I	31.96	34.60	
1283	I	30.67	32.67	
1303	II	33.97	36.40	

d. Femur

Cat. No.	Phase	Bd	Bp	DC
97	III		46.18	22.98
99	III			21.94
100	III			21.58
190				22.93
242	III			23.67
385	II	41.92		
428	II		47.38	22.60
685	I		49.17	23.48
788	I		48.00	22.10

Cat. No.	Phase	Bd	Bp	DC
924	II			21.78
954	I			15.42
956	I			21.50
957	I	39.24		
1148	III		44.08	
1250	II			21.33
1274	II			22.49
1331	II		38.94	21.72

e. Radius

Cat. No.	Stratum	Bp	Bd	SD
70	II	29.91		16.61
75	II	31.33		
117	II	29.27		
172	III	32.03		
171	III	34.91		
403	II	34.86		
473	II		30.91	
614	II		27.74	

Cat. No.	Stratum	Bp	Bd	SD
625	III	34.48		17.41
672	I	34.14		
760	I		30.44	
807	I		30.23	
925	II		34.36	
1173	III	34.90		
1229	I	33.26		

f. Ulna

Cat. No.	Stratum	DPA
52	III	32.05
104	III	28.62

g. Metacarpal

Cat. No.	Stratum	Bp	Bd	SD
72	II	23.97		15.35
80	II	24.35		
92	II	26.44		
109	III	24.68		
225	II	26.88		
239	III			28.62
255	III	23.60		
335	III	30.73		
351	III	23.68		
476	II	27.97		
517	I	25.74		
691	II	21.80		
746	II?	27.95		
767	I	26.94		
903	II–I			31.33
969	I	24.75		
1123	I	27.88		
1227	I	25.58		
1260	I	27.13		
1322	II			30.090
3	III			

Cat. No.	Stratum	Bp	Bd	SD
5	II	22.24		12.02
11	II		37.33	
24	II	22.12		
152	II		24.62	
238	III		29.12	
240	III		27.83	
319	III	19.14		10.38
321	III		29.25	
336	III		32.64	
402	II		27.87	
509	I		26.94	
557	II	21.32		
674	I	20.41		
745	II?		26.38	
845	II	22.19		
1076	I	19.96		
1090	III	22.64		
1226	I		27.53	
1245	II	21.41		
1278	II	21.57		

h. Tarsal-Calcaneus

Cat. No.	Stratum	GB	GL
128	III	20.99	
174	III	22.99	63.90
246	III	20.51	62.94
390	II	18.96	50.86

Cat. No.	Stratum	GB	GL
789	I	23.95	71.57
1009	I	20.58	61.71
1306	II	22.73	60.25

i. Tarsal-Astragal

Cat. No.	Stratum	Gli	GLm	Bd
129	III	32.49	31.07	19.88
380	II	31.50	29.68	20.24
759	I			
792	I	30.72	28.51	20.01
813	II	30.95	29.01	20.67
814	II	28.57		
847	II	34.32	31.06	22.22
946	II	30.94	28.30	19.51

Cat. No.	Stratum	Gli	GLm	Bd
947	II	32.73		22.17
961	I	32.85	30.18	20.21
987	II		28.79	
1058	III	32.12	30.11	18.69
1272	I	34.46	31.47	21.88
1277	II		29.00	22.22
1315	II	30.61	27.53	19.05

j. Tarsal-4th Central

Cat. No.	Stratum	GB
621	II	25.84

k. Pelvic-Ilium+Ischium

Cat. No.	Stratum	LA
401	II	34.67
976	II	32.87

l. Phalanx 1

Cat. No.	Stratum	Bp	SD	Bd
55	III	14.20	11.22	13.30
130	III	15.99	13.28	16.06
185	III	12.48	9.94	12.08
252	III	14.31	11.31	12.47
334	II	12.05	9.94	11.94
337	III	13.45	11.09	12.39
338	III			13.85
339	III			11.56
340	III	12.92	10.21	12.06
369	II	14.30	11.03	13.51
408	II	14.11	11.85	13.42
427	II	15.02	13.81	15.59
447	II	13.67	12.03	13.94

Cat. No.	Stratum	Bp	SD	Bd
458	II	13.94	11.98	13.50
474	II	14.86	13.52	16.96
475	II	14.19	11.43	12.59
480	II	15.29	12.67	14.90
513	I	13.53	11.32	13.54
514	I	13.02	10.81	13.21
568	II	11.94	8.83	11.35
569	II	11.68	8.61	10.28
570	II	13.99	10.37	12.82
571	II	14.46	11.46	13.52
666	I	13.27	11.09	12.83
667	I	13.91	10.93	12.87
762	I	11.87	8.40	9.55

Cat. No.	Stratum	Bp	SD	Bd
771	I	14.83	14.58	15.42
849	II	13.44	11.32	13.02
850	II	14.85		
971	I	14.07	11.16	12.69
972	I	12.37	9.84	11.42
984	II	13.61	11.41	13.42
1026	I	14.27	12.24	14.01
1075	I	14.91	11.28	15.60
1096	I	15.04	12.68	13.86

Cat. No.	Stratum	Bp	SD	Bd
1129	II			13.61
1154	III	13.31	10.13	11.92
1155	III	13.17	10.65	12.01
1156	III	13.58	9.66	10.01
1169	I	16.35	13.72	16.06
1174	III	13.40	10.73	13.38
1204	II	13.25	10.27	12.70
1258	I	14.04	11.85	12.62
1279	II	9.37	6.53	8.02

m. Phalanx 3 1

Cat. No.	Stratum	DLS	Ld
1187	III	32.91	26.73

n. Vertebra-Axis

Cat. No.	Stratum	LCde	LApa	SBV	BFcd
299	I	59.13			
1006	II		47.52	25.02	18.32

o. Vertebra-Atlas

Cat. No.	Stratum	GL	GLF
293	II	56.15	47.28
811	II		
955	I		31.27

APPENDIX 3. Measurements (in mm) of Cattle Bones.

Cat. No.	Bone	Stratum	BT	Bd	SD	Bp	DC
7	Humerus	II	74.39				
1199	Humerus	II	64.69	67.77			
Cat. No.	Bone	Stratum	Bd	SD	Bp	DC	
611	Femur	I				40.69	
1144	Femur	I				38.34	
Cat. No.	Bone	Stratum	Bp	Bd	SD		
153	Metacarpal	II	47.91				
333	Metatarsal	II	46.21				
Cat. No.	Bone	Stratum	GB	GL			
28	Tarsal-Calcaneus	II	34.67	104.60			
Cat. No.	Bone	Phase	Gli	GLm	Bd	Dm	Di
398	Tarsal-Astragal	II	56.00	51.98	35.40	30.13	30.92
Cat. No.	Bone	Stratum	GB				
974	Tarsal-4th Central	I	52.38				
Cat. No.	Bone	Stratum	Bp	Sd	Bd	GL	
1083	Phalanx 1	I-II	35.07	34.50	30.60	71.38	
Cat. No.	Bone	Phase	DLS	MBS	Ld		
1181	Phalanx 3	I-II	56.00	20.55	48.60		

APPENDIX 4. Measurements (in mm) of Equid Bones.

Cat. No.	Bone	Stratum	Bd	Dd	Bp	Dp	SD	
148	Tibia	II	77.03	46.20				
Cat. No.	Bone	Stratum	Bp	Dp	Bd	SD		
184	Metatarsal	III	34.93	31.54				
237	Metapod	III			52.85			
555	Metacarpal	II	54.14	43.48				
1197	Metacarpal	II	52.47	33.40		34.78		
Cat. No.	Bone	Stratum	GB	GH	Lmt	BFd		
758	Tarsal-Astragal	I	63.87	60.55	62.22	49.96		
802	Tarsal-Astragal	I	60.93	61.88	64.95	53.06		
1317	Tarsal-Astragal	II	65.46	61.94	63.48	53.76		
Cat. No.	Bone	Phase	BFp	Bp	SD	BFd	Bd	GL
244	Phalanx 1	III	52.56	59.02	32.91	44.53	51.11	89.02
665	Phalanx 2	I	45.72	55.36	44.24		48.70	49.83
1105	Phalanx 1	II?	56.47		35.38	41.84	46.38	85.79
1194	Phalanx 2	II	43.73	53.49	40.85		46.60	50.17
1198	Phalanx 1	II	51.93	55.18	35.70	42.37	46.94	87.64
Cat. No.	Bone	Phase	30	29	27			
565	Skull-Occipital	II	18.24	19.50	54.64			
Cat. No.	Bone	Phase	BFp	Bp				
704	Radius	I	52.00	57.23				
Cat. No.	Bone	Phase	Ht	Lo	lo	LP		
202	Teeth-P2	II	38.15	39.42	23.46	9.84		
203	Teeth-P4	II	50.35	28.10	28.20	10.55		
203	Teeth-P3	II	47.70	31.33	23.97	14.13		
542	Teeth-P4	I	76.64	29.48	15.05			
1145	Teeth-M2	I	46.70	26.60	18.69			
1145	Teeth-P4	I	43.92	24.61	16.47			

APPENDIX 5. Measurements (in mm) of Other Mammal Bones.

Cat. No.	Species	Bone	Stratum	BT	Bd						
1213	Vulpes vulpes	Humerus	II	22.78	31.79						
Cat. No.	Species	Bone	Stratum	Bp	SD						
1130	Gazella gazella	Metatarsal	II	20.07	11.79						
Cat. No.	Species	Bone	Stratum	LCde	LApa	H	BFcr	BPacd	BPtr	SBV	BFcd
470	Vulpes vulpes	Vertebra-Axis	II	54.72	51.82	34.50	28.89	38.73		20.29	13.86
Cat. No.	Species	Bone	Stratum	Dp	GLC	GLI	SD	BT	Bd		
543	Felidae/ Mustelidae	Humerus	I		87.54		6.16	12.48	17.10		
1266	Felidae/ Mustelidae	Humerus	I	20.04	95.18	96.20	7.36	13.51	18.00		
1213	Vulpes vulpes	Humerus	II					20.73	26.60		
Cat. No.	Species	Bone	Stratum	4	5	6					
753	Vulpes vulpes	Mandibula	I	86.16	82.08	85.60					
754	Vulpes vulpes	Mandibula	I	85.30	82.12	84.20					

APPENDIX 6. Measurements (in mm) of Bird Bones.

Cat. No.	Species	Bone	Stratum	Lm	Gl	BF	Bd	
145	Gallus gallus	Coracoid	III	51.77	53.86	11.04		
146	Gallus gallus	Coracoid	III	46.70	48.12	10.55	11.37	
Cat. No.	Species	Bone	Stratum	Bp	SC	Bd	GL	Lm
1	Gallus gallus	Femur	III	13.44	5.57	14.29	70.39	65.60
60	Gallus gallus	Femur	III	16.22	6.33	15.92		74.87
142	Gallus gallus	Femur	III		5.16			
183	Gallus gallus	Femur	III	14.90	6.36	14.49		69.53
538	Gallus gallus	Femur	I	16.35				
591	Gallus gallus	Femur	II	14.23	5.73			
687	Gallus gallus	Femur	I	16.90				
872	Gallus gallus	Femur	II	14.11				
873	Gallus gallus	Femur	II	15.31				
1309	Gallus gallus	Femur	II			14.02		
Cat. No.	Species	Bone	Startum	Bp	SC	Bd	GL	
143	Gallus gallus	Humerus	III		5.85	12.42		
144	Gallus gallus	Humerus	III			13.40		
292	Gallus gallus	Humerus	III		5.20	11.19		
1171	Gallus gallus	Humerus	III	18.47	6.43	14.16	68.53	
1271	Gallus gallus	Humerus	I			15.21		
Cat. No.	Species	Bone	Startum	Dia				
147	Gallus gallus	Pelvic	III	7.47				
Cat. No.	Species	Bone	Startum	Bp	SC	Bd	GL	
1065	Anas?	Tarso-Metatarsus	III		3.73			
Cat. No.	Species	Bone	Startum	Bp	SC	Bd	GL	
1108+1137	Anser?	Tarso-Metatarsus	II?	18.64	8.75	18.89	96.28	
Cat. No.	Species	Bone	Startum	Dip	GL	La	Dd	
112	Gallus gallus	Tibio-Tarsus	III				10.54	
182	Gallus gallus	Tibio-Tarsus	III	12.75				
372	Gallus gallus	Tibio-Tarsus	II				11.38	
439	Gallus gallus	Tibio-Tarsus	II	14.60				
462	Gallus gallus	Tibio-Tarsus	II				10.01	
537	Gallus gallus	Tibio-Tarsus	I				13.21	
590	Gallus gallus	Tibio-Tarsus	II				12.62	
659	Gallus gallus	Tibio-Tarsus	III				10.78	
694	Gallus gallus	Tibio-Tarsus	II				11.98	
1027	Gallus gallus	Tibio-Tarsus	I				10.78	
1146	Gallus gallus	Tibio-Tarsus	I				11.04	
1240	Gallus gallus	Tibio-Tarsus	I				11.83	
1270	Gallus gallus	Tibio-Tarsus	I	10.95	93.38	88.76	9.95	
1298	Gallus gallus	Tibio-Tarsus	I	13.66	116.89	111.98	13.11	
Cat. No.	Species	Bone	Startum	Dip	Bp	SC	GL	
61	Gallus gallus	Ulna	III	11.62	8.15	3.93	61.64	
1164	Gallus gallus	Ulna	III	12.78	9.00			

APPENDIX 7. Distribution of Sawed Bones.

Stratum	Locus	Species	Bone
I	203	*Ovis arias*	Humerus
	203	*Capra/Ovis*	Femur
	203	*Capra/Ovis*	Vertebra-Lumbar
	203	*Capra/Ovis*	Radius
	203	*Capra/Ovis*	Radius
	203	*Capra/Ovis*	Humerus
	203	*Ovis arias*	Radius
	206	*Capra/Ovis*	Humerus
	207	*Capra/Ovis*	Pelvic-Ilium+ Ischium+Pubis
	207	*Capra/Ovis*	Radius
	207	*Capra/Ovis*	Femur
	212	*Capra/Ovis*	Radius
	212	*Ovis arias*	Radius
	223	*Capra/Ovis*	Radius
	223	*Ovis arias*	Radius
	223	*Capra/Ovis*	Humerus
	223	*Capra/Ovis*	Humerus
	223	*Capra/Ovis*	Radius
	223	*Capra/Ovis*	Radius
	223	*Ovis arias*	Radius
	223	*Capra/Ovis*	Radius
	223	*Capra/Ovis*	Radius
	223	*Capra/Ovis*	Humerus
	223	*Ovis arias*	Humerus
	223	*Ovis arias*	Humerus
	223	*Capra/Ovis*	Humerus
	223	*Capra/Ovis*	Humerus
	228	*Capra/Ovis*	Humerus
	228	*Capra/Ovis*	Ulna
II	117	*Ovis arias*	Humerus
	205	*Bos taurus*	Pelvic-Ischium
	205	*Ovis arias*	Humerus
	205	*Capra/Ovis*	Radius
	205	*Ovis arias*	Humerus
	211	*Bos size*	Femur
	211	*Capra/Ovis*	Vertebra-Axis
	211	*Capra/Ovis*	Radius
	211	*Capra/Ovis*	Humerus
	211	*Capra/Ovis*	Humerus
	211	*Bos taurus*	Pelvic-Ischium
	213	*Capra/Ovis*	Tarsal-Calcaneus
	213	*Capra/Ovis*	Radius
	213	*Capra/Ovis*	Vertebra-Thoracic
	213	*Capra/Ovis*	Vertebra-Thoracic
	213	*Ovis arias*	Humerus
	213	*Ovis arias*	Humerus
	213	*Capra/Ovis*	Radius
	213	*Ovis arias*	Humerus
	213	*Ovis arias*	Humerus
	213	*Ovis arias*	Humerus
	213	*Ovis arias*	Radius
	213	*Capra/Ovis*	Radius
	213	*Capra/Ovis*	Pelvic-Pubis
	213	*Capra/Ovis*	Radius
	213	*Ovis arias*	Radius
	213	*Ovis arias*	Scapula
	214	*Capra/Ovis*	Vertebra-Thoracic
	214	*Capra/Ovis*	Sacrum
	214	*Capra/Ovis*	Radius
	214	*Ovis arias*	Humerus
	214	*Capra/Ovis*	Femur
	214	*Capra/Ovis*	Humerus
	214	*Capra/Ovis*	Vertebra-Cervical
	220	*Capra/Ovis*	Tarsal-Calcaneus
	220	*Ovis arias*	Humerus
	220	*Ovis arias*	Radius
	220	*Ovis arias*	Humerus
III	215	*Ovis arias*	Humerus
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Vertebra-Atlas
	221	*Capra/Ovis*	Vertebra-Axis
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Humerus
	221	*Capra/Ovis*	Femur
	221	*Capra/Ovis*	Tarsal-Calcaneus
	221	*Capra/Ovis*	Vertebra-Cervical
	230	*Capra/Ovis*	Radius
	230	*Capra/Ovis*	Radius
	230	*Capra/Ovis*	Radius
	230	*Ovis arias*	Humerus
	230	*Capra/Ovis*	Horn
	230	*Capra/Ovis*	Radius
	230	*Ovis arias*	Radius
	242	*Capra/Ovis*	Vertebra-Lumbar
	244	*Capra/Ovis*	Rib

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