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Byzantine and Early Islamic Faunal Remains from Building 900 in the Southern Tyropoeon Valley

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The excavation in the western part of the City of David uncovered small assemblages of animal remains from the Byzantine and Early Islamic periods, attesting to similar consumption patterns in both occupation phases. The basic suite of domesticates is characteristic of urban settlements in late antiquity, comprising caprines, pigs and cattle, as well as fowl, and possibly fish. This varied diet points to the high-status of the inhabitants of the building.The public and commercial production of pork in the Early Islamic period is noteworthy.

Keywords: City of David, Byzantine period, Early Islamic period, consumption, bone modification, food preparation, pork

Introduction

The excavation in the western part of the City of David uncovered small assemblages of animal remains from the Byzantine and the Early Islamic periods, found in association with floors and fills of Building 900 (see Szanton and Uziel, this volume). The material was examined with the possibility in mind of identifying changes in consumption patterns between the two periods, despite the limitations imposed by the small sample sizes of the assemblages. Material from L100, in which mixed pottery was found, was omitted from the analysis.

Methods

All the bones, most of which were hand-collected and only a few by sieving (3 × 3 mm mesh), were washed in tap water in the field. All identifiable bone fragments, including limb bone shaft, skull and rib fragments, were recorded as to skeletal element. Their assignment to biological taxa was facilitated by use of the comparative collection of the Laboratory of Archaeozoology at the University of Haifa. The remains of the closely-related sheep

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and goats were identified to species using morphological criteria described by Zeder and Lapham (2010). Bones that could be identified as to skeletal element but that could not be assigned to biological taxon were attributed to two size classes: large mammals (cattle-sized animals) and medium mammals (sheep-sized animals).

Quantifying the abundance of specimens from each taxon uses the numbers of identified specimens (NISP), and the percentages of taxa are calculated out of the total number of fragments identified to each biological taxon. To obtain the relative frequency of occurrence of skeletal elements in five body-part categories, head, trunk, forelimb, hind limb and foot parts, the minimum number of element (MNE) values were first calculated, using different techniques: the fraction summation technique for the long bone elements (Klein and Cruz-Uribe 1984); ubiquity counts of anatomical features for the skull elements (horncores, zygomatic and occipital bones); and diagnostic zones (Dobney and Rielly 1988) for the other elements. The frequency of occurrence of each of the body parts (MAU; terminology follows Lyman 2008) was the highest MNE of any of the elements included in that part of the body.

Other types of data were collected, including the state of epiphyseal fusion of long bones and tooth wear (Grant 1982; Zeder 2006). Sufficiently complete bones were measured to the closest 0.1 mm, using Vernier callipers (Driesch 1976). Pubic elements were sexed using morphological criteria (Edwards, Marchinton and Smith 1982). Bone surface modifications, such as weathering (Behrensmeyer 1978), gnawing and burning, were recorded. Butchery marks were distinguished with respect to butchery implement (chopper, knife and saw) and location on the skeletal element (Rixson 1989; Seetah 2006). Statistical analyses were carried out using PAST 3.01.

Data on the bone measurements, the skeletal element composition and the butchery marks are presented in Appendices 1–3, respectively.

THE FINDS

Taxonomic Abundances (Table 1)

The Byzantine Period. A total of 193 bones were identified. This assemblage is dominated by caprines (N = 108, 56%), among which sheep (*Ovis aries*, N = 16) outnumber goats (*Capra hircus*, N = 4). The frequency of pigs (*Sus scrofa*) is high (N = 51, 26%). The bone sizes of pigs seem relatively small (Appendix 1; see Hongo and Meadow 1998), indicating that they belonged to domesticated animals, although the number of pig bones was too small to allow a statistically sound analysis of the metric data. The frequency of cattle (*Bos taurus*, N = 20, 10%) is relatively low. Two equid bones are present. Bird bones consist of chicken (*Gallus gallus domesticus*, N = 7, 4%), a coracoid bone of a duck or a goose (*Anatidae* sp.) and two specimens that could not be assigned to taxon within *Aves*.

Table 1. Taxonomic Abundances in the Byzantine and Early Islamic Contexts

Period / Taxon	Byzantine		Early Islamic	
	N	%	N	%
Sheep (*Ovis aries*)	16		2	
Goat (*Capra hircus*)	4		2	
Caprine	88	56	20	45
Suid (*Sus scrofa*)	51	26	18	34
Cattle (*Bos taurus*)	20	10	3	6
Equid (*Equus* sp.)	2	1	1	2
Dog (*Canis lupus familiaris*)	2	1		
Chicken (*Gallus gallus domesticus*)	7	4	3	6
Raptor (*Accipitridae* sp.)			1	2
Duck or goose (*Anatidae* sp.)	1	1		
Bird (*Aves* sp.)	2	1	2	4
Fish (*Pisces*)			1	2
Total	*193*	*100*	*53*	*101*
Large mammal	21			
Medium mammal	143	27		
Grand Total	*357*	*80*		

The Early Islamic Period. A total of 53 bones were identified. Similar to the Byzantine-period assemblage, most of the bones belong to caprines (N = 24, 48%), which include both sheep (N = 2) and goats (N = 2). Pigs are also well-represented (N = 18, 34%); a maxillary third molar (L114) was complete enough to obtain a length measurement (28.1 cm), indicating that the animal was domesticated (see Mayer, Novak and Brisbin 1998: Table 2). Cattle (N = 3, 6%) and equids (N = 1, 2%) are relatively rare in the assemblage. Chicken bones (N = 3, 6%), a fish bone and the coracoid of a large raptor, a somewhat unusual find (L104), were also identified.

Using the larger of the two assemblages (Byzantine) as the reference sample in individual-based rarefaction analysis (see Gotelli and Colwell 2001), it was observed that the Early Islamic assemblage is somewhat richer than expected for its sample size (Fig. 1). A comparison of the absolute frequencies of caprines, cattle and pigs between the two assemblages demonstrates that the difference are statistically insignificant (chi-square = 2.55, P = 0.28); the differences observed may be an artifact of sample size.

Demographic Composition

Caprines. The age-at-death data of these animals was examined based on epiphyseal fusion (Table 2), as tooth wear was recorded for very few specimens (Table 3). In both the Byzantine

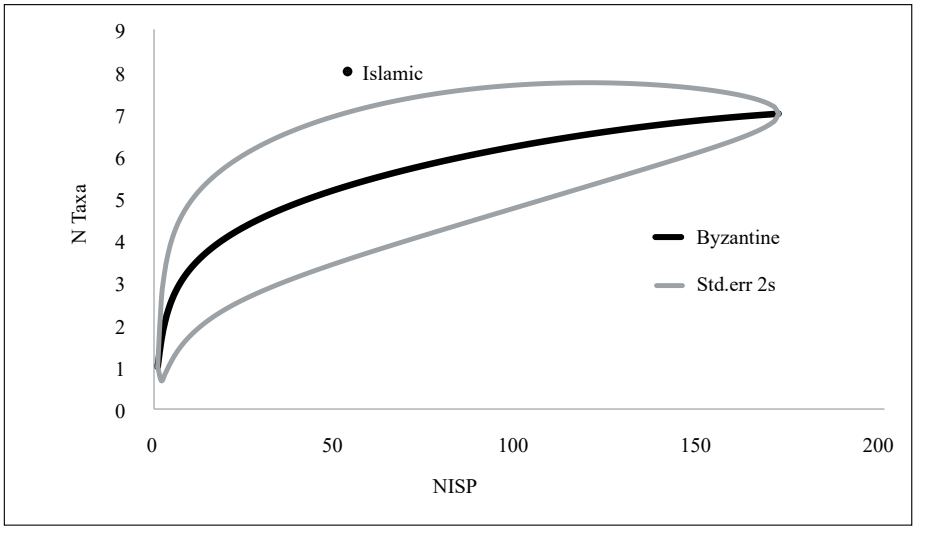

Fig. 1. Individual-based rarefaction analysis, showing the number of taxa expected to occur in a sample of a given size, calculated with the data of the Byzantine assemblage as the reference.

Table 2. Epiphyseal Fusion of Caprines by Period

Age Group[i]	Element	Byzantine		Early Islamic	
		Fused	Unfused	Fused	Unfused
A	Radius, proximal	2			
Total		2			
B	Humerus, distal	4		1	
	Pelvis	2		1	
	Scapula	1		1	
Total		7		3	
C	Phalanx 1	5	3	2	
	Phalanx 2	4			
Total		9	3	2	
D	Tibia, distal	1	2	3	1
	Metacarpus, distal		2		2
	Metatarsus, distal	2	1		1
Total		3	5	3	4
E	Femur, distal		1		
	Radius, distal	1	1	1	
	Tibia, proximal				
Total		1	2	1	
F	Vertebrae	2	7		1
Total		*2*	*7*		*1*
%Juveniles		41		36	

[i] Age groups follow Zeder (2006); %juveniles is the number of unfused bones out of the total of fused and unfused fragments (Arbuckle et al. 2014).

Table 3. Data on Tooth Wear by Taxon

Taxon	Element	Wear Stage[i]	Age Estimate	Locus	Period
Caprine	Mandible (M1/2)	b	Young adult	126	Byzantine
	Mandible (M1/2)	e	Adult	121	Byzantine
	Mandible (P2, P3, P4, M1, M2)	j, h, g	Adult	124	Late Roman/Byzantine[ii]
Cattle	Mandible (M)	a	Young	121	Byzantine
	Mandible (M1, M2, M3)	h, h, g	Adult	124	Late Roman/Byzantine
	Mandible (M1/2)	g	Adult	125	Byzantine
	Mandible (M1/2)	b	Adult	116	Byzantine
	Mandible (M1/2)	g	Adult	127	Byzantine
	Mandible (M1/2)	b	Young adult	123	Byzantine
Suid	Mandible (dp4)	b	Young	121	Byzantine

[i] Wear stages follow Grant 1982.

[ii] Very few bones, recovered from mixed loci of apparently tertiary deposition, are included here, but not considered in the report.

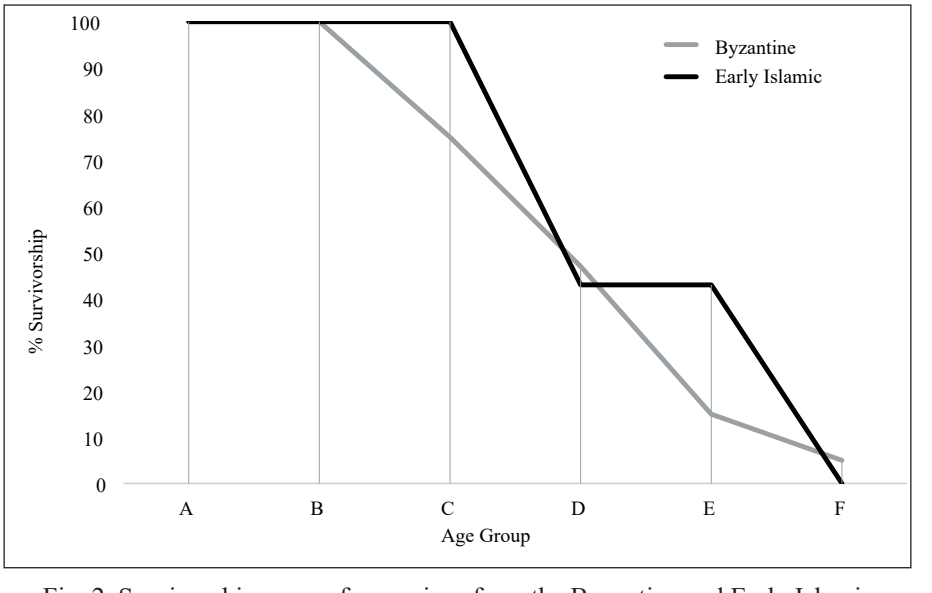

Fig. 2. Survivorship curves for caprines from the Byzantine and Early Islamic periods (data from Table 3); age groups follow Zeder 2006.

and the Early Islamic periods, mortality rates peak at the late first and second years of life (Zeder 2006: Age Groups B and C; Fig. 2), indicating that caprine demographic composition did not change between the two periods. Three caprine pelvic fragments could be sexed, two from a Byzantine context and another, Early Islamic; all were identified as male. Based on the apparent consistency in demographic composition through time, it is possible to calculate the chances of randomly drawing three male pelvic fragments in a row from a population in which both male and female animals are equally represented. As this has a very low probability ($P = 0.125$), it is suspected that the two assemblages were male-dominated.

Table 4. Data on Epiphyseal Fusion of Suids

Fusion Stages[i]	Element	Byzantine		Early Islamic	
		Fused	Unfused	Fused	Unfused
I	Phalanx 2	1	1		
	Scapula		1		1
	Femur, distal				1
	Humerus, distal			1	
Total (0–12 months)		1	2	1	2
II	Metacarpus		3		
	Metapodial		4		
	Phalanx 1	3			
	Tibia, distal		1		
Total (24–30 months)		3	8		
III	Radius, distal		2		
Total (36–42 months)			2		
%Juvenile		75		67	

[i] Fusion stages follow Hongo and Meadow 1998.

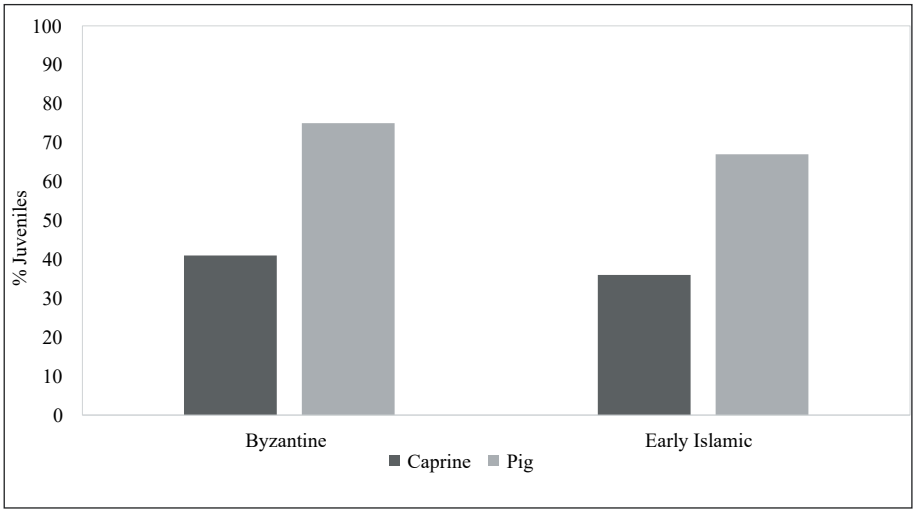

Fig. 3. The %juvenile statistics (Arbuckle et al. 2014) for caprines and suids by period.

Suids. Although the number of suid elements that could be aged is small (Table 4), the very high rate of juvenile mortality is clearly observed when compared with the caprine mortality in each of the two periods (Fig. 3). This mortality pattern is typical of domesticated pigs, since they achieve optimal slaughter weight early on and are not utilized for secondary products that justify delayed slaughter.

Table 5. Data on Epiphyseal Fusion of Cattle

Period	Locus	Element	Fusion
Byzantine	121	Phalanx 1	Fused
	126	Scapula	Fused
	127	Phalanx 2	Unfused
	123	Tarsal, calcaneum	Unfused
	127	Tibia, distal	Unfused
	123	Vertebra, thoracic	Unfused
Early Islamic	104	Phalanx 1	Fused

Cattle. The state of epiphyseal fusion could only be determined for seven cattle bone fragments (Table 5). Four unfused bones from Byzantine loci and one from an Early Islamic context belonged to immature individuals.

Skeletal Element Representation

The analysis of skeletal element representation was limited due to the presence of two medium-sized taxa, caprines and pigs, in nearly equal proportions; this prevented increasing the sample size for the purpose of conducting a taxon-specific analysis, by attributing the bones assigned to the size category "medium mammals" to either one of the two taxa. Therefore, skeletal element representation will only be examined in general terms, in respect to all the medium-sized animals combined, for the larger of the two assemblages (Byzantine).

The head, foot, trunk and upper limb elements from the Byzantine assemblage are all well-represented among both the caprine and pig bones (Table 6), although it is noteworthy that the meat-rich limb bones are somewhat better represented in the Byzantine period than butchery waste, such as head and foot specimens. When these specimen counts are combined with the bones identified only as medium mammals (Table 7), the relative frequency of representation of the head and limb body parts increases at the expense of the trunk and the feet (Fig. 4). The latter reconstruction of skeletal element representation is more likely than the preceding one, based only on the remains identified to taxa, given a considerable rate of fragmentation of the assemblage through density-mediated bone attrition (see below); under such conditions, reliable reconstruction of skeletal element frequencies should focus on high-density limb-bone shaft fragments (Marean and Frey 1997), which are usually identified only to size-class.

Butchery Patterns

Butchery marks appear on many bone specimens in the assemblage (N = 80; Appendix 3). The most common tool employed in butchery is the knife (N = 41), with chopper marks (N = 30) almost as common. Few marks made by a saw (N = 9) may represent preparation

Table 6. Skeletal Element Representation of Caprines and Suids from the Byzantine Period

Body Part	Element	Caprine			Suid		
		NISP	MNE	MAU	NISP	MNE	MAU
Head	Mandible (toothless)	7	5	3	2	1	1
	Skull	1	1	1	1	1	1
	Total	*8*	*6*	*3*	*3*	*2*	*1*
Trunk	Vertebra, atlas	1	1	1			
	Vertebra, axis	3	3	3			
	Vertebra, cervical						
	Vertebra, thoracic	2	1	1	1	1	1
	Vertebra, lumbar	6	6	2			
	Ribs	12	10	1			
	Pelvis	4	3	2			
	Total	*28*	*24*	*3*	*1*	*1*	*1*
Forelimb	Scapula	3	1	1	1	1	1
	Humerus	6	5	3			
	Radius	13	4	2	2	2	1
	Total	*22*	*10*	*3*	*3*	*3*	*1*
Hindlimb	Femur	1	1	1	1	1	1
	Tibia	8	4	2	5	4	2
	Total	*9*	*5*	*2*	*6*	*5*	*2*
Feet	Metacarpal	5	3	2	4	2	1
	Metatarsal	5	2	1	3	3	2
	Phalanx 1	9	9	2	3	3	1
	Phalanx 2	4	4	1	2	2	1
	Phalanx 3	3	3	1	3	3	1
	Total	*26*	*21*	*2*	*15*	*13*	*2*

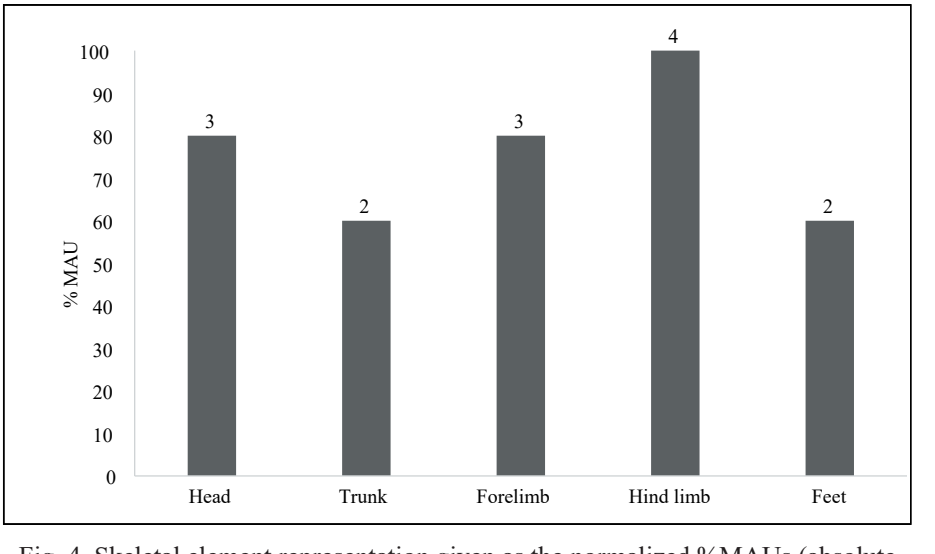

Fig. 4. Skeletal element representation given as the normalized %MAUs (absolute values given above the bars) per body part for caprines, suids and medium-sized mammals in the Byzantine assemblage.

Table 7. Skeletal Element Representation of Medium- and Large-Sized Mammals from the Byzantine Period

Body Part	Element	Medium Mammal			Large Mammal		
		NISP	MNE	MAU	NISP	MNE	MAU
Head	Mandible (toothless)	14	8	4	6	3	2
	Skull	7	3	2			
	Total	*21*	*11*	*4*	*6*	*3*	*2*
Trun	Vertebra, atlas	1	1	1			
	Vertebra, axis	3	3	3			
	Vertebra, cervical	1	1	1			
	Vertebra, thoracic	9	7	1	3	2	1
	Vertebra, lumbar	12	7	2			
	Ribs	75	54	3	5	2	1
	Pelvis	5	3	2	1	1	1
	Total	*106*	*76*	*3*	*9*	*5*	*1*
Forelimb	Scapula	9	3	2	2	2	1
	Humerus	22	7	4	2	2	1
	Radius	19	6	3	1	1	1
	Total	50	16	4	5	5	1
Hindlimb	Femur	8	2	1	1	1	1
	Tibia	33	9	5	5	2	1
	Total	*41*	*11*	*5*	*6*	*3*	*1*
Feet	Metacarpal	9	5	3	2	2	1
	Metatarsal	9	4	3	1	1	1
	Phalanx 1	12	11	2	3	3	1
	Phalanx 2	6	6	1	1	1	1
	Phalanx 3	6	6	1	1	1	1
	Total	*42*	*32*	*3*	*8*	*8*	*1*

of the material for bone working (see Rixson 1988). It appears that choppers served more frequently in the butchery of pigs than of other taxa (Table 8). Interestingly, it would appear that at least in one case a caprine was decapitated using a chopper, an atypical practice which could have taken place during slaughter (Fig. 5).

Almost all of the butchered vertebrae in the assemblage were longitudinally split, suggesting the halving of hanged carcasses, including those of large-sized cattle. The hanging of cattle-sized carcasses indicates large-scaled specialized butchery (see O'Connor 2000). Splitting of the front limb bones of both cattle and caprines was probably done to extract the marrow.

Fig. 5. Cranial view on a caprine axis vertebra (L127, B2480), with its articular process cleft off along the frontal plane.

Table 8. Frequency of Bone Damage Caused by Different Butchery Tools by Taxon and Period

Taxa/Period	Tool		
	Chopper	Knife	Saw
Caprines			
Byzantine	12	10	1
Early Islamic			
Total	*12*	*10*	*1*
Cattle			
Byzantine	1	3	1
Early Islamic			1
Total	*1*	*3*	*2*
Pig			
Byzantine	3	2	1
Early Islamic	3		
Total	*6*	*2*	*1*

Bone Surface Modification and Preservation

Bone surface modifications occur in similar frequencies in the two assemblages (Table 9), with the only exception being the relatively high frequency of weathered bones (30%) in the Early Islamic assemblage, indicating a long period of sub-aerial exposure before burial. The

Table 9. Frequencies of Bone Surface Modifications, fracture morphology and differential preservation of humeral and tibial fragments for all taxa

Variable		Byzantine	Early Islamic
Modification			
Weathering	Sample size	89	23
	Weathered[i]	18	10
	%	17	30
Gnawing	Sample size	372	99
	Gnawed	8	2
	%	2	2
Burning	Sample size	372	99
	Burnt	1	0
	%	0.2	0
Fracture Morphology			
Breakage	Sample size	64	16
	Fresh fractures	46	10
	%	42	38
Differential preservation			
Humeral and tibial specimens	Proximal	1	0
	Distal	9	5

[i] Weathered = weathering stage higher than Behrensmeyer's (1978) Stage 1.

frequency of carnivore gnawing and burning is low in both temporal phases, respectively indicating little involvement of dogs as bone accumulators and food preparation by cooking rather than by roasting. Bone fracture morphology indicates breakage of both fresh bone, presumably for marrow extraction and pot-sizing large meat portions, and of dry bone, caused by diagenetic processes (see Villa and Mahieu 1991).

The relatively small size of the assemblages meant that density-mediated attrition of bones could not be reliably examined by looking at the correlation between skeletal element frequencies (MNEs) and measures of bone mineral density. Hence, Binford's (1981) simple procedure of comparing the frequency of occurrence of the proximal and distal parts of humeri and tibiae (pooled across all taxa) was carried out. Here it is assumed that the specimens from these two skeletal elements arrived at the context of consumption and consequent deposition together, and so the difference in the representation of their dense distal parts and their relatively spongy proximal parts can serve as a general indication of the extent of bone density-mediated attrition. As only one proximal fragment was recorded as opposed to 14 distal fragments (for both periods; Table 9), density-mediated attrition is evident.

SUMMARY AND CONCLUSIONS

While the relatively small sample sizes of the faunal assemblages from Building 900 limit the conclusions which can be drawn, it is possible to make some broad generalizations regarding the animal consumption patterns taking place in connection with the structure (for a similar context and reconstruction, see Hesse 1986). The remains appear to have been modified by density-mediated bone attrition, evidenced by the differential preservation of the proximal relative to the distal humeri and tibiae. Carnivore gnawing is rare, and bone fragmentation appears to have been equally caused by human consumption and by post-depositional processes, with some of the manmade modification resulting from longitudinal splitting of the bones to obtain the marrow. The bones from the Byzantine contexts were buried quickly, while it appears that at least some of the bones from the Early Islamic loci remained exposed on the surface for some time before burial.

Little change in the animal consumption patterns is detected between the Byzantine and the Early Islamic occupation phases. The basic suite of domesticates characteristic of urban settlements in late antiquity, e.g., Tel ‘Ira (Dayan 1999) and Tel Bet She’an (Horwitz 2006), comprising caprines, pigs and cattle, occurs in both phases, without appreciable difference in the taxonomic richness. The reconstructed culling ages of caprines and suids demonstrate a focus on young individuals during both phases, reflecting the typical pattern expected in a consumer-oriented urban setting (Zeder 1998), possibly an indication of an affluent status of the inhabitants of Building 900. This conclusion is reinforced by the somewhat more abundant presence of meat-rich skeletal elements compared to the meat-poor elements.

The use of fowl, together with that of Mediterranean mussels (see Ktalav, this volume), and possibly fish as well, indicates a varied diet and further suggests that the faunal assemblages were part of the cuisine of high-status individuals. Food preparation was by cooking, rather than by roasting. Butchery involving the frequent use of a chopper tool, for the halving of hanged carcasses, is observed in both of the chronological phases, indicating the work of specialized urban butchers (see Rixson 1988; O’Connor 2000). Thus, the production of pork does not seem to have been a private household affair, but rather a publicly visible commercial activity, possibly in both the Byzantine and the Early Islamic occupation phases.

In sum, the faunal assemblages indicate the continued affluent status of the occupants of Building 900, based on the kinds of cuisine they were consuming over the entire period of occupation. The public and commercial production of pork continued into the Early Islamic period, aligning with the general understanding among researchers that the cultural changes coinciding with the transition to Islamic rule were rather moderate (Avni 2014).

Appendix 1. Bone Measurements (following Driesch 1976)

Taxon	Element	F/U[i]	Bp	Bd/BT	GL/Gll/Glpe	Period	Locus
Caprine	Metacarpus	dU		34		Byzantine	112
	Metacarpus		23.5			Early Islamic	111
	Metatarsus	dU		21.1		Early Islamic	114
	Metatarsus	dU		26.8		Byzantine	127
	Phalanx 2	F	11.4	8.8		Byzantine	121
	Radius	pF	35.8			Byzantine	121
	Radius	dU		31.3		Byzantine	123
	Scapula	dF		36.6		Byzantine	113
	Scapula	F		35		Early Islamic	207
	Tibia	dU		27.2		Byzantine	113
	Tibia	dF		29.8		Byzantine	126
	Tibia	dF		31.3		Early Islamic	108–110
	Tibia	dF		26.2		Early Islamic	108
Goat	Phalanx 1	F	14.7	13.5	38.4	Early Islamic	104
	Phalanx 1	U	11.5	12.2		Late Roman/ Byzantineii	124
	Phalanx 1	F	13.2	13.2	41	Late Roman/ Byzantine	124
	Phalanx 2	F	13.4	10.4		Byzantine	116A
Sheep	Humerus	dF		32.9		Byzantine	126
	Humerus	dF		31.5		Byzantine	116A
	Humerus	dF		32.3		Early Islamic	104
	Humerus	dF		30.2		Late Roman/ Byzantine	124
	Humerus	dF		34.2		Late Roman/ Byzantine	124
	Phalanx 1	F	12.9	12.5	37	Byzantine	121
	Phalanx 1			14.3		Byzantine	126
	Phalanx 1	F	13.2	12.8	34.2	Byzantine	126
	Phalanx 1	U	13	12.8		Byzantine	121
	Phalanx 1	F	14	13.4	44.2	Byzantine	121
	Phalanx 1	F	14.1	13.1	36.6	Early Islamic	114
	Phalanx 1	F	13.5	12.3	37.6	Late Roman/ Byzantine	124
	Phalanx 1	U		13.6		Late Roman/ Byzantine	124
	Phalanx 2	F	13.5	11.1		Byzantine	118
	Phalanx 2	F	13	10.6		Byzantine	121
	Radius	dF		31.7		Byzantine	116
	Tarsal, astragalus			20		Late Roman/ Byzantine	209

[i] F = fused; U = unfused; dF = distal fused; dU = distal unfused.

[ii] Very few bones, recovered from mixed loci of apparently tertiary deposition, are included in this appendix, but not considered in the report.

APPENDIX 1. (cont.)

Taxon	Element	F/U[i]	Bp	Bd/BT	GL/Gll/Glpe	Period	Locus
Suid	Humerus	dF		36.9/28.4		Early Islamic	114
	Maxilla (M3)	Active wear			28.1	Early Islamic	114
	Metacarpus IV	dU	15.1			Byzantine	116A
	Metacarpus IV		17.5			Early Islamic	104
	Metapodial	dU		14.5		Byzantine	116A
	Metatarsus III		16.3			Byzantine	112
	Metatarsus III		15.2			Byzantine	121
	Metatarsus III		14.4			Byzantine	123
	Metatarsus IV		14.1			Early Islamic	207
	Phalanx 1	F	17.9	15.7	34.5	Byzantine	116A
	Phalanx 1	F	15.2	15	32.3	Byzantine	126
	Phalanx 1	F	18.7			Byzantine	123
	Phalanx 2	F	15.2	14.3		Byzantine	113
	Phalanx 2	U	14.6	13.2		Byzantine	116A
	Tarsal, astragalus				41.7	Early Islamic	207
	Tarsal, astragalus	Porous			40.5	Mixed	100
Cattle	Metacarpus		51.7			Byzantine	121
	Phalanx 1			28		Byzantine	121
	Phalanx 1	F	25.2	23.7	53.5	Byzantine	121
	Phalanx 1	F		27.3	65.6	Early Islamic	104
	Phalanx 1			26		Byzantine	123
	Scapula	dF		60.4		Byzantine	126
	Tarsal, astragalus	F		38.4	61	Byzantine	123
Equid	Radius	pF/dF	58.8	56.9	270		126B
Chicken	Tibiotarsus			10.2		Byzantine	125
	Tibiotarsus			12.9		Byzantine	121
	Ulna				73.4	Byzantine	123
Anatidae sp.	Humerus	dF		15.2		Byzantine	113

Appendix 2. Specimen Counts by Taxon and Skeletal Element for the Byzantine and Early Islamic Periods: Mammal Remains Identified to Taxa (a); Birds (b); Material Assigned to Size-Class (c)

(a) Taxa							
Period	Caprine	Goat	Sheep	Cattle	Equid	Suid	Dog
Late Roman/Byzantinei (Total)[i]	*4*		*1*		*1*	*2*	
Maxilla (M)					1		
Vertebra, axis	1						
Pelvis	1						
Humerus						1	
Femur	1						
Tibia	1						
Tarsal, astragalus			1				
Tarsal, calcaneum						1	
Byzantine (Total)	*88*	*4*	*16*	*20*	*2*	*51*	*2*
Mandible	7			1	1	2	
Mandible (dp)						1	
Mandible (dp4)						1	
Mandible (incisor)						3	
Mandible (M)				1			
Mandible (M1, M2, M3)				1			
Mandible (M1/2)	3			4			
Mandible (P2, P3, P4, M1, M2)	1						
Maxilla						1	1
Maxilla (dp4, M1, M2)	1						
Maxilla (M)						2	
Maxilla (M1)						1	
Maxilla (M1, M2)						2	
Maxilla (M1, M2, P4)						1	
Maxilla (M1/2)	3					1	
Maxilla (P2)	1						
Maxilla (P3, P4, M1)	1						
Skull, frontal						1	
Skull, horncore			1				
Rib	12						
Vertebra	1						
Vertebra, atlas	1						
Vertebra, axis	3						
Vertebra, lumbar	6						
Vertebra, thoracic	2			1		2	
Pelvis	4						
Scapula	3			2		1	
Humerus	2		4				1
Radius	11		2			2	

APPENDIX 2. (cont.)

(a) Taxa							
Period	Caprine	Goat	Sheep	Cattle	Equid	Suid	Dog
Ulna	3						
Femur	1					1	
Tibia	8			1		5	
Tarsal, astragalus				1		1	
Tarsal, calcaneum	1			1		1	
Metacarpus	5			1	1		
Metacarpus II						1	
Metacarpus IV						1	
Metacarpus V						2	
Metapodial						4	
Metatarsus	4	1		1			
Metatarsus III						3	
Phalanx 1		2	7	3		3	
Phalanx 2	1	1	2	1		2	
Phalanx 3	3			1		3	
Early Islamic (Total)	*20*	*2*	*2*	*3*	*1*	*18*	
Mandible	2					4	
Mandible (incisor)						1	
Mandible (M)					1		
Maxilla						1	
Maxilla (M3)						2	
Skull, horncore				1			
Vertebra, atlas	1						
Vertebra, axis	1						
Vertebra, lumbar	1						
Pelvis	1						
Scapula	2					2	
Humerus			1			1	
Radius	2						
Ulna				1		1	
Femur						2	
Tibia	4						
Tarsal, astragalus						1	
Tarsal, calcaneum	1	1					
Metacarpus	3						
Metacarpus II						1	
Metacarpus IV						1	
Metatarsus	2						
Metatarsus IV						1	
Phalanx 1		1	1	1			

Appendix 2. (cont.)

(b) Birds				
Period	Chicken	Accipitridae	Anatidae	Bird
Late Roman/Byzantine (total)	*1*			
Coracoid	1			
Byzantine (total)	*7*		*1*	*2*
Coracoid	1			
Femur	1			
Humerus			1	
Pelvis	1			1
Shaft				1
Tibiotarsus	3			
Ulna	1			
Early Islamic (total)	*3*	*1*		*2*
Carpometacarpus	1			
Coracoid		1		
Rib				1
Tarsometatarsus	1			
Tibiotarsus	1			1

(c) Size-class		
Period	Medium Mammal	Large Mammal
Late Roman/Byzantine (Total)	5	2
Skull, occipital		1
Humerus	1	
Femur	1	1
Vertebra, thoracic	1	
Rib	2	
Byzantine (Total)	143	21
Mandible	5	4
Maxilla	1	
Skull	1	
Skull, frontal	2	
Skull, styloid process	1	
Skull, temporalis	1	
Rib	63	5
Vertebra	1	
Vertebra, caudal	2	
Vertebra, cervical	1	
Vertebra, lumbar	6	
Vertebra, sacrum	1	
Vertebra, thoracic	5	2

APPENDIX 2. (cont.)

(c) Size-class		
Period	Medium Mammal	Large Mammal
Pelvis	1	1
Scapula	5	
Humerus	16	2
Radius	4	1
Femur	6	1
Tibia	20	4
Metapodial		1
Metatarsus	1	
Early Islamic (Total)	*27*	
Skull, zygomatic	1	
Rib	11	
Vertebra	2	
Vertebra, thoracic	1	
Scapula	1	
Humerus	6	
Femur	4	
Tibia	1	

Appendix 3. The Location and the Inferred Tool and Butchery Stage of Each Butchery Mark

Taxon	Element	Butchery Location	Tool	Butchery Stage	Locus	Period
Caprine	Femur	Proximal shaft	Knife	Defleshing	209	Late Roman/ Byzantine[i]
	Humerus	Distal shaft	Knife	Defleshing	121	Byzantine
	Metacarpus	Proximal	Chopper	Disarticulation	126	Byzantine
	Pelvis	Acetabulum	Chopper		123	Byzantine
	Pelvis	Ischium	Chopper	Dismemberment	126	Byzantine
	Radius	Distal	Saw		123	Byzantine
	Rib	Shaft	Knife		126	Byzantine
	Rib	Shaft	Knife		121	Byzantine
	Scapula	Blade, lateral	Knife	Defleshing	126	Byzantine
	Tibia	Distal, cranial	Knife	Disarticulation	126	Byzantine
	Tibia	Proximal shaft, distal shaft	Knife	Defleshing	127	Byzantine
	Vertebra	Split	Chopper		121	Byzantine
	Vertebra, atlas	Dorsal	Knife		118	Byzantine
	Vertebra, axis	Anterior articular process	Chopper		127	Byzantine
	Vertebra, axis	Cleft	Chopper		115	Byzantine
	Vertebra, axis	Cranial articulation	Chopper		121	Byzantine
	Vertebra, lumbar	Centrum, ventral	Knife		124	Late Roman/ Byzantine
	Vertebra, lumbar	Centrum, ventral	Knife		123	Byzantine
	Vertebra, lumbar	Split	Chopper		124	Late Roman/ Byzantine
	Vertebra, lumbar	Split	Chopper		121	Byzantine
	Vertebra, lumbar	Split	Chopper		121	Byzantine
Sheep	Humerus	Distal	Chopper	Disarticulation	124	Late Roman/ Byzantine
	Humerus	Distal, medial	Knife	Disarticulation	126	Byzantine
	Radius	Proximal	Chopper	Disarticulation	116	Byzantine
Suid	Femur	Mid-shaft	Chopper	Dismemberment	114	Early Islamic
	Humerus	Distal	Chopper	Disarticulation	114	Early Islamic
	Metacarpus II	Distal shaft	Knife	Skinning	116b	Byzantine
	Scapula	Acromion	Chopper	Defleshing	114	Early Islamic
	Tibia	Proximal	Saw		121	Byzantine

[i] Very few bones, recovered from mixed loci of apparently tertiary deposition, are included in this appendix, but not considered in the report.

APPENDIX 3. (cont.)

Taxon	Element	Butchery Location	Tool	Butchery Stage	Locus	Period
	Tibia	Proximal and mid-shaft	Chopper	Defleshing	121	Byzantine
	Tibia	Proximal shaft, medial	Knife	Defleshing	122	Byzantine
	Vertebra, thoracic	Cleft	Chopper		116A	Byzantine
	Vertebra, thoracic	Split	Chopper		115	Byzantine
Cattle	Humerus	Distal	Chopper	Split	100	Mixed
	Mandible	Dentary	Knife		124	Late Roman/ Byzantine
	Metacarpus	Distal/ proximal	Chopper/knife	Disarticulation	121	Byzantine
	Scapula	Distal, cranial	Knife	Disarticulation	126	Byzantine
	Scapula	Neck, medial	Knife		123	Byzantine
	Skull, horncore	Base	Saw		104	Early Islamic
	Tibia	Distal shaft	Saw		127	Byzantine
Equid	Metacarpus	Proximal, cranial	Knife	Disarticulation	126	Byzantine
Large mammal	Mandible	Ramus, lateral	Knife		121	Byzantine
	Pelvis	Ischium	Chopper	Defleshing	127	Byzantine
	Rib	Mid-shaft	Knife		127	Byzantine
	Rib	Shaft, medial	Knife		123	Byzantine
	Rib	Under articulation	Knife	Disarticulation	123	Byzantine
	Tibia	Proximal shaft	Knife	Defleshing	127	Byzantine
Medium mammal	Femur	Mid-shaft	Knife	Defleshing	126	Byzantine
	Humerus	Distal shaft	Chopper	Split	121	Byzantine
	Humerus	Distal shaft	Saw		113	Byzantine
	Humerus	Distal shaft	Saw		121	Byzantine
	Humerus	Proximal shaft	Knife	Defleshing	121	Byzantine
	Rib	Shaft	Knife		115	Byzantine
	Rib	Shaft	Knife		116A	Byzantine
	Rib	Shaft	Knife		209	Late Roman/ Byzantine
	Rib	Shaft	Knife		123	Byzantine
	Rib	Shaft	Knife		121	Byzantine
	Rib	Shaft	Saw		123	Byzantine
	Rib	Shaft, lateral	Knife		126	Byzantine

Appendix 3. (cont.)

Taxon	Element	Butchery Location	Tool	Butchery Stage	Locus	Period
	Rib	Shaft, medial	Knife		121	Byzantine
	Rib	Shaft, medial	Knife		116	Byzantine
	Rib	Shaft, medial	Knife		125	Byzantine
	Rib	Shaft, medial	Knife		116b	Byzantine
	Rib	Shaft, medial	Knife		126	Byzantine
	Rib	Shaft, medial	Knife		121	Byzantine
	Scapula	Blade	Saw		121	Byzantine
	Skull	Occipital(?)	Chopper		116b	Byzantine
	Tibia	Distal shaft	Knife		123	Byzantine
	Tibia	Mid-shaft	Knife	Defleshing	125	Byzantine
	Tibia	Proximal shaft	Knife	Defleshing	123	Byzantine
	Tibia	Proximal shaft	Knife	Defleshing	124	Late Roman/ Byzantine
	Vertebra	Cleft	Chopper	Dismemberment	114	Early Islamic
	Vertebra, cervical	Split	Chopper		116A	Byzantine
	Vertebra, lumbar	Split	Chopper		116	Byzantine
	Vertebra, lumbar	Split	Chopper		116A	Byzantine
	Vertebra, sacrum	Split	Chopper		121	Byzantine
	Vertebra, thoracic	Neural spine	Knife	Defleshing	121	Byzantine
	Vertebra, thoracic	Split	Chopper		116b	Byzantine
	Vertebra, thoracic	Split	Chopper		116A	Byzantine
	Vertebra, thoracic	Split	Chopper		116A	Byzantine

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