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The Fauna from Ḥorbat 'Ofrat

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The excavations carried out by Yardenna Alexandre at Ḥorbat 'Ofrat in the Lower Galilee uncovered settlement remains from the late Hellenistic to the late Byzantine–Early Islamic periods (see Alexandre, this volume). This short report pertains to the faunal remains recovered from that excavation. Although the small assemblage has several distinct stratigraphic subsamples, it cannot facilitate exploration of herd demography or skeletal element representation patterns. Therefore, the report will concentrate on providing primary data on the animal bones, without extensive discussion.

Methodology

The bones, recovered by hand from the excavation, were packed in paper bags inside three standard archive boxes. The assemblage was relatively free of clinging dirt and calcite concretions, and so did not require cleaning with acid or water. Following analysis, the bones were returned to the original boxes, without separating identified or special bones.

Bone specimens, including long bone shaft fragments, were identified to skeletal element. Diaphyseal fragments were recorded using a variant of the fraction summation approach (Klein and Cruz-Uribe 1984; see Marom and Zuckerman 2012 for details). Other fragments were recorded using Dobney and Rielly's diagnostic zone system (Dobney and Rielly 1988). Specimens were assigned to a biological taxon whenever possible by using the reference collections at the Laboratory of Archaeozoology, University of Haifa. Otherwise, size-class taxa were employed—for example medium-sized versus large-sized mammals could correspond to sheep and cattle-sized animals respectively. Whenever possible, sheep and goat bones were identified to a species level by using the morphological criteria of Zeder and Lapham (2010). Equid bones were identified to species, where possible, based on their morphology (Johnstone 2004). Quantification of taxonomic frequencies used NISP (number of identified specimens).

Measurements of unburned and sufficiently complete bones were taken with a Vernier caliper to the nearest tenth of a millimeter, following von den Driesch (1976), and the state of epiphyseal closure (Silver 1969) and tooth wear (Grant 1982) were recorded. Bone surface modifications observed with the naked eye include cut-marks (Rixson 1989), percussion marks, carnivore gnawing (Lyman 1994) and weathering (Behrensmeyer 1978). Statistical analyses were carried out on PAST 2.14 (Hammer, Harper and Ryan 2001).

Results

The faunal remains from the late Hellenistic Stratum VI and the Roman Strata V and IV are very few in number (Table 1). Most of the identified specimens belong to cattle (*Bos taurus*, NISP = 12; 57.1%), with some remains of sheep/goats (*Ovis aries* and/or *Capra hircus*, NISP = 2; 9.5%) and donkeys (*Equus asinus*, NISP = 3; 14.3%). Stratum IV, of the Middle to Late Roman period, also included one domestic chicken (*Gallus gallus domesticus*) bone. Two left-sided humeri of large cats (*Felis* sp.; Bd = 28.5; for measurements, see Table 2; for counts of skeletal elements by taxon, see Table 3) were also found in this stratum, both in B1068, L121.

The largest sample of identified bones at Ḥorbat ʻOfrat derives from the early Byzantine Stratum III (NISP = 75). The fauna from Stratum III appears to echo the pattern discerned in the preceding Roman strata with cattle consisting of the majority of the finds (NISP = 41; 54.7%), and caprines comprising the second-largest taxonomic group (NISP = 19; 25.3%). The five caprine bones that could be identified to species level indicate that both sheep (NISP = 3; 4.0%) and goats (NISP = 2; 2.7%) were consumed in the early Byzantine settlement. Unfortunately, age-at-death data cannot be meaningfully analyzed given the current sample sizes (see Table 4 for epiphyseal fusion data, and Table 5 for tooth wear data). Chickens are present in small numbers (NISP = 4; 5.3%). Interestingly, pigs are lacking from the Byzantine assemblage.

The Byzantine assemblage from Stratum II is smaller (NISP = 47) than the early Byzantine assemblage from Stratum III. Stratum II represents a discontinuity in the faunal sequence observed from Roman times, as can be seen in a sharp rise in the taxonomic richness of the assemblage (see rare faction analysis results in Fig. 1) brought about by the appearance of two taxa (dog, *Canis familiaris*, NISP = 2; 4.3%; mountain gazelle, *Gazella gazella*, NISP = 1; 2.1%) within a lower overall sample size. Another change is the dominant taxon: whereas in previous strata, cattle dominated the assemblage, in Stratum II sheep and goats (NISP = 20; 42.6%) are more numerous than cattle (NISP = 14; 29.8%). This shift is statistically significant, and is unlikely to be an artifact of sample size (chi-square = 6.76, P = 0.04). Like previous strata, donkeys are represented in the Stratum II assemblage (NISP = 8; 17.0%), along with chickens (NISP = 2; 4.3%).

The final stratum at the site, Stratum I, represents an occupation from the late Byzantine–Early Islamic periods, which seems to have centered on some short-lived industrial activity. The very small (NISP = 22) faunal sample is also exceedingly rich in taxa (Table 1). Caprines are few (NISP = 5; 22.7%, of which one specimen is positively identified as goat), while cattle are slightly more numerous (NISP = 8; 36.4%). Work animals, i.e., donkeys (NISP = 3; 13.6%) and camels (NISP = 3; 13.6%), form a large part of the assemblage. Gazelle (*Gazella* cf. *gazella*; NISP = 2; 9.1%) and pig (NISP = 1; 4.5%) appear in low frequencies, but chicken bones were not found in Stratum I. Many bone specimens in this stratum are burned (Table 6).

Table 1. Identified Bone Specimens (NISP), by Taxon, Stratum and Excavation Area

Period	Late Hellenistic	Early Roman			Middle to Late Roman			Early Byzantine			Byzantine				Late Byzantine–Early Islamic	*Grand Total*
Stratum	VI	V			IV			III			II				I	
Excavation Area	C	A	C	Total	A	D	Total	A	E	Total	B	D	E	Total	D	
Species (NISP)																
Sheep or goat		1	-	1	-	1	1	13	1	14	1	16	-	17	4	*37*
Sheep, *Ovis aries*		-	-	-	1	-	1	3	-	3	-	1	-	1	-	*5*
Goat, *Capra hircus*		-	-	-	-	-	-	2	-	2	-	2	-	2	1	*5*
Cattle, *Bos taurus*	1	7	-	7	3	1	4	23	18	41	3	10	1	14	8	*75*
Equid, *Equus* cf. *asinus*		3	-	3	-	-	-	9	2	11		1	7	8	3	*25*
Camel, *Camelus* cf. *dromedarius*		-	-	-	-	-	-	-	-	-		-			3	*3*
Pig, *Sus scrofa*		-	-	-	-	-	-	-	-	-		-	-	-	1	*1*
Gazelle, *Gazella* cf. *gazella*	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2	*3*
Dog, *Canis familiaris*	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	*2*
Cat, *Felis* sp.	-	-	-	-	2	-	2	-	-	-	-	-	-	-	-	*2*
Chicken, *Gallus gallus domesticus*	-	-	-	-	1	-	1	4	-	4	-	2	-	2	-	*7*
Total NISP	*1*	*11*	-	*11*	*7*	*2*	*9*	*54*	*21*	*75*	*4*	*35*	*8*	*47*	*22*	*165*
Size Class Taxa																
Large mammal	1	6	3	9	7	3	10	48	11	59	-	5	1	6	11	*96*
Medium mammal	-	-	-	-	-	1	1	13	6	19	2	6	4	12	15	*47*
Grand Total	*2*	*17*	*3*	*20*	*14*	*6*	*20*	*115*	*38*	*153*	*6*	*46*	*13*	*65*	*48*	*308*

Table 2. Bone Measurements (following von den Driesch 1976)

Taxon	Element	Locus	Fused/ Unfused	Measurement	Value	Measurement	Value	Measurement	Value
Bos taurus	Metacarpus	120	F	Bd	55.9				
		120	F	Bd	57.9				
		506		Bp	55.7				
	Metatarsus	506		Bp	44.9				
		519		Bp	46.4				
	Phalanx 1	111	F	Bp	26.6				
		111	F	Bp	27.1				
		511	F	Bd	22.9				
	Scapula	601	F	BG	49.4				
	Tibia	111		Bd	58.1				
		133	F	Bd	70.9				
Canis familiaris	Metacarpus	528	F	Bd	7.2	GL	64.6		
		528	F	GL	64.6				
Equus asinus	Astragalus	111		GH	57.6	GB	54.2		
		111		GB	54.2				
	Phalanx 1	110	F	Bp	~45.0			GL	89.2
		110	F	Bd	34.3				
	Scapula	111	F	Bd	70.5				
Felis sp.	Humerus	121	F	Bd	28.5				
Gallus gallus domesticus	Humerus	111		Bd	15.8	GL	73.6		
		111		GL	73.6				
		121	F	Bd	13.6				
	Tibiotarsus	528		Bd	9.5				
Gazella gazella	Metatarsus	519	U	Bp	19.4				
Capra hircus	Astragalus	540	F	Bd	18.8	GLl	30.8		
		540	F	GL1	30.8				
	Radius	111	F	Bp	38.0	BFp	35.7		
		111	F	BFp	35.7				
		519	F	Bp	32.0	BFp	30.6		
		32	F	BFp	30.6				
Ovis aries	Phalanx	110		Bd	13.1				

Table 3. Skeletal Element Counts (NISP), by Taxon and Stratum

Taxon and Element	Stratum					*Total*
	I	II	III	IV	V	
Sheep						
Horncore				1		*1*
Humerus			1			*1*
Radius			1			*1*
Calcaneus		1				*1*
Phalanx 1			1			*1*
Total Sheep		*1*	*3*	*1*		*5*
Goat						
Horncore			1			*1*
Radius	1		1			*2*
Astragalus		2				*2*
Total Goat	*1*	*2*	*2*			*5*
Sheep or Goat						
Mandible	2	9	5		1	*17*
Maxilla			2			*2*
Vertebrae			1			*1*
Scapula		2		1		*3*
Humerus		1	1			*2*
Radius	1					*1*
Metacarpus		2				*2*
Pelvis			1			*1*
Femur		2	1			*3*
Metatarsus	1	1	2			*4*
Total Sheep or Goat	*4*	*17*	*13*	*1*	*1*	*36*
Cattle						
Mandible	1	4	13	1	1	*20*
Maxilla		2	8			*10*
Scapula			2			*2*
Humerus		1	1	1	2	*5*
Radius		1	1			*2*
Metacarpus	2	1	3			*6*
Pelvis	1				1	*2*
Femur	1		2			*3*
Tibia			2		3	*5*
Astragalus			1			*1*
Calcaneus		1	1			*2*
Metatarsus	1	2	2			*5*
Phalanx 1	2		2	1		*5*
Phalanx 2		1				*1*
Total Cattle	*8*	*13*	*38*	*3*	*7*	*69*

Table 3. (cont.)

Taxon and Element	Stratum					*Total*
	I	II	III	IV	V	
Equid (Donkey)						
Mandible	2	7	3		2	*14*
Maxilla		2	1	1		*4*
Scapula			1			*1*
Humerus			2			*2*
Metacarpus			1			*1*
Pelvis		1				*1*
Femur	1		1			*2*
Astragalus			1			*1*
Total Equid (Donkey)	*3*	*10*	*10*	*1*	*2*	*26*
Camel						
Mandible	3					*3*
Total Camel	3					*3*
Dog						
Ulna			1			*1*
Metacarpus			1			*1*
Total Dog			2			*2*
Chicken						
Tibiotarsus		2	2			*4*
Humerus			1	1		*2*
Femur			1			*1*
Total Chicken		2	4	1		*7*
Gazelle						
Scapula	1					*1*
Metatarsus	1	1				*2*
Total Gazelle	2	1				*3*
Cat						
Humerus				2		*2*
Total Cat				2		*2*
Pig						
Mandible	1					*1*
Total Pig	*1*					*1*
Large-Sized Mammal						
Mandible	3		4		1	*8*
Petrosum			1			*1*
Vertebrae	1	1	8	3		*13*
Rib	3	3	19	1	3	*29*
Pelvis	2		1			*3*
Femur			7	1	1	*9*
Tibia	1	1	3	2		*7*

Table 3. (cont.)

Taxon and Element	Stratum					*Total*
	I	II	III	IV	V	
Metatarsus			1	1	1	*3*
Scapula	1		4	1		*6*
Humerus	1		6	4	2	*13*
Radius			9		1	*10*
Ulna		1	2			*3*
Carpal			1			*1*
Metacarpus	1		2			*3*
Total Large-Sized Mammal	*13*	*6*	*68*	*13*	*9*	*109*
Medium-Sized Mammal						
Mandible			1			*1*
Vertebrae		1	1			*2*
Rib	1	5	2			*8*
Scapula	1		2	1		*4*
Humerus	2	1	1			*4*
Radius	4		6			*10*
Metacarpus	1		2			*3*
Femur	3	2	1			*6*
Tibia	2	3	3			*8*
Metatarsus	1			1		*2*
Total Medium-Sized Mammal	*15*	*12*	*19*	*2*		*48*
Total	*50*	*64*	*159*	*24*	*19*	*316*

The three camel specimens in Stratum I are all mandibles and share an interesting burning pattern. While the ramus is only slightly singed, the teeth are calcined and white from direct exposure to fire (Fig. 2). The author does not know of parallels for this type of burning, but hypothetically, this pattern could have been caused by using the very large jaws as ad hoc clamps to hold objects in a fire.

In all phases of occupation, animal carcass disarticulation was carried out with a fine blade, and a heavier cleaver was used to severe the bones (Table 7). Severe weathering (stage 2+; Behrensmeyer 1978) is common in Ḥorbat ʻOfrat (Table 6). Bone weathering occurs as the result of exposure to sunlight, wind and changes in temperature and humidity, and therefore, indicates there was a long period of exposure between discarding the bones and final burial.

Table 4. Epiphyseal Fusion Data, by Stratum and Taxon

Taxon in Stratum	Element	Fused	Unfused	*Total*
Stratum I				
Cattle	Phalanx 1	2		*2*
Gazelle	Metatarsus, d.		1	*1*
	Scapula	1		*1*
Goat	Radius, p.	1		*1*
Sheep or goat	Mmetatarsus, d.		1	*1*
	Rradius, d.	1		*1*
Total Stratum I		*5*	*2*	*7*
Stratum II				
Cattle	Humerus, d.	1		*1*
	Metapod, d.		1	*1*
Dog	Metacarpus, d.	1		*1*
Gazelle	Metatarsus, d.		1	*1*
Goat	Astragalus	1	1	*2*
Sheep or goat	Femur, d.		1	*1*
	Scapula	1		*1*
Total Stratum II		*4*	*4*	*8*
Stratum III				
Cattle	Astragalus	1		*1*
	Femur, p.		1	*1*
	Humerus, d.	1		*1*
	Metacarpus, d.	3		*3*
	Metapod, d.	1		*1*
	Phalanx 1	2		*2*
	Radius, d.	1		*1*
	Scapula	1		*1*
	Tibia, p.	1		*1*
	Ulna, p.		2	*2*
Equid	Humerus, d.	2		*2*
	Phalanx 1	1		*1*
	Scapula	1		*1*
Goat	Radius, p.	1		*1*
	Radius, p.	1		*1*
Sheep or goat	Femur, p.		1	*1*
	Metapod, d.	1		*1*
	Metatarsus, d.	1		*1*
	Pelvis	1		*1*
	Vertebra	1		*1*
Sheep	Humerus, d.	1		*1*
	Radius, p.	1		*1*
Total Stratum III		*23*	*4*	*27*

Table 4. (cont.)

Taxon in Stratum	Element	Fused	Unfused	*Total*
Stratum IV				
Cattle	Phalanx	1		*1*
Cat	Humerus, d.	2		*2*
Total Stratum IV		*4*		*4*
Stratum V				
Cattle	Humerus, d.		1	*1*
	Tibia, d.	1	1	*2*
Total Stratum V		*1*	*2*	*3*
Total		*37*	*12*	*49*

Table 5. Tooth Wear Stages (following Grant 1982)

Tooth Wear Stage[i]	Cattle					Sheep and Goat						
	dp4	P4	M1/2	M3	*Total*	dp4	P3	M1	M1/2	M2	M3	*Total*
a			1	1	*2*					1		*1*
b			1	1	*2*						1	*1*
c											1	*1*
d			1		*1*			1	1			*2*
e	1		1		*2*						1	*1*
f										1		*1*
g		1	5	2	*8*	1		1	2	5	3	*12*
h							1					*1*
i								1				*1*
j								1				*1*
k								1				*1*
l												
m				1	*1*							
Total	*1*	*1*	*9*	*5*	*16*	*1*	*1*	*5*	*3*	*7*	*6*	*23*

[i] ʻaʼ represents the least tooth wear, ʻmʼ represents the most wear

Table 6. Bone Surface Modifications

Stratum	Burned		Gnawed		Weathered		*Total*	
	N	%	N	%	N	%	*N*	*%*
I	14	11.96	2	1.71	13	11.11	*29*	*24.78*
II	1	0.85	1	0.85	13	11.11	*15*	*12.81*
III	1	0.85	24	20.51	35	29.91	*60*	*51.27*
IV			2	1.71	4	3.42	*6*	*5.13*
V					7	5.98	*7*	*5.98*
Total	*16*	*13.66*	*29*	*24.78*	*72*	*61.53*	*117*	*99.97*

Table 7. Location and Description of Butchery Marks by Strata, Excavation Area, and Taxa[i]

Stratum	Area	Species Identification	Element	Location	Type of Mark
I	D	Large	Pelvis	Ischium	Cleaved
		Medium	Femur	Middle shaft	Transverse cut
II	D	Large	Tibia	Proximal shaft	Diagonal cut
III	A	Cattle	Calcaneus	Lateral side of articulation	Transverse cut
			Metacarpus	Trochlea	Cleaved
			Scapula	Articulation	Cleaved
			Tibia	Distal shaft	Chopped
			Ulna	Articulation	Transverse cut
		Equus	Humerus	Distal	Chopped, transverse cut
			Metacarpus	Proximal shaft	Chopped
		Large	Humerus	Distal	Cleaved
			Humerus	Distal	Cleaved
			Mandible	Ramus	Transverse cut
			Metacarpus	Middle shaft	Longitudinal cut
			Metapodial	Distal	Cleaved
			Radius	Middle shaft	Transverse cut
			Rib	Distal	Transverse cut
			Rib	Distal	Longitudinal cut
			Rib	Distal	Longitudinal cut
			Rib	Medial	Transverse cut
			Rib	Distal shaft	Transverse cut
		Medium	Radius	Distal shaft	Transverse cut
		Sheep/goat	Metapodial	Distal	Cleave
			Vertebra	Centrum	Cleave
		Large	Femur	Distal	Cleave
			Rib	Distal	Transverse cut
IV	A	Cattle	Humerus	Middle shaft	Chopped
		Large	Humerus	Distal shaft	Transverse cut
			Vertebra	Articulation	Transverse cut
			Femur	Proximal shaft	Transverse cut
V	A	Cattle	Tibia	Distal shaft	Transverse cut
		Large	Rib	Proximal shaft	Chopped, transverse cut

[i] Cleaved specimens were severed by a heavy, sharp blade; chopped specimens show damage inflicted by a heavy blade, but were not severed.

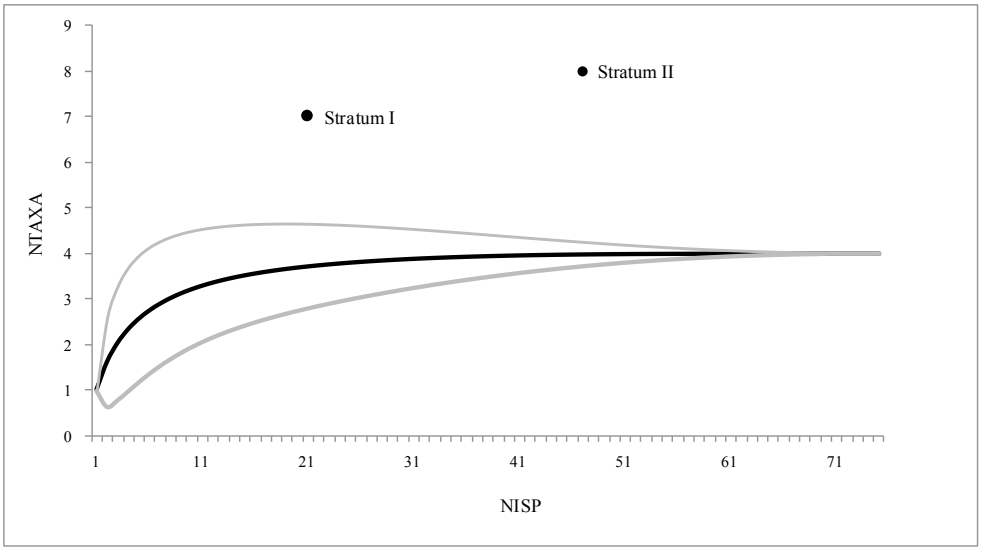

Fig. 1. Individual rarefaction analysis of taxonomic richness in the Byzantine assemblage. The black line represents taxonomic richness in Stratum III; gray lines demarcate the confidence intervals of the two standard deviations.

Fig. 2. Camel mandible with burned teeth from L519 (B5056).

Summary

The small faunal assemblage from Ḥorbat ‘Ofrat contains a diverse assortment of bones that are generally intact. The specimens were affected by subaerial weathering, indicating a long time of exposure before burial.

The high frequency of cattle would suggest that the economy of the settlement was focused on agricultural production during Roman times. With caution due to the small sample size, a shift during the transition to early Byzantine Stratum III from earlier strata can be observed: sheep and goats became dominant in the assemblage, while cattle frequencies decline, despite no significant change in diversity ($t = -0.10$, $P = 0.91$). A possible explanation for the higher sheep and goat frequencies may be due to an economic shift away

from agricultural production—which required keeping cattle as draft animals—toward a consumption economy that relied on external supplies of sheep and goats for meat. This is, however, very difficult to demonstrate using the present data and must remain conjectural.

The latest occupation at the site shows a slightly different faunal signature with relatively more beasts of burden and game animals, in addition to cattle and caprines in moderate proportions. The absence of chickens, present at the site from Roman times, may also be an indication of the ephemeral nature of occupation in this phase.

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