# THE FAUNA REMAINS FROM NAHAL 'ANAVA, MODI'IN Dana Shtainberg Finali and Ram Bouchnick

## INTRODUCTION

This report presents the fauna remains from Modi'in (Kaizer South; see Tendler and Torge, this volume),<sup>1</sup> mostly found in the eastern part of the site (Area A), including an ashlar building dating to the Byzantine period and a farmhouse dating from the Umayyad period (seventh–beginning of the eighth centuries CE). Numerous animal bone remains were revealed at the entrance (L190) to the cave enclosed within the later farmhouse's courtyard. The present study describes the faunal assemblage retrieved from the Byzantine and Early Islamic strata,<sup>2</sup> suggesting tentative explanations for the patterns observed and a general summary of the finds that includes the different species, bone surface modifications, skeletal-part profiles and demographic composition.

The assemblage contains a wide range of animal species, including domestic livestock and birds, and one remnant each of reptile and fish, thus allowing to describe the characteristics of the ancient animal economy of Modi'in during the studied periods.

## MATERIAL AND METHODS

The bones were collected by handpicking. All the animal-bone baskets provided by the excavators were examined and documented.

*Recording*. The bones were registered on a standard Windows Excel (2003) worksheet. Bones from poorly defined loci, either stratigraphically or mixed chronologically (as defined by the excavator), were excluded from the analysis. Such loci included surface and mixed deposits. Some of these bones were not recorded.

<sup>&</sup>lt;sup>1</sup> We would like to thank Avraham Tendler for his cooperation in analyzing the faunal assemblage. The complete research protocol and dataset for each of the identified zooarchaeological specimens are stored in the Israel Antiquity Authority Archives or may be obtained from the authors. The bone assemblage is stored at the IAA.

<sup>&</sup>lt;sup>2</sup> Tiny fauna assemblages were retrieved from other periods—Abbasid, Mamluk and Ottoman—however, due to their small size, they are not discussed in this report.

*Sorting.* Animal bones from each excavation unit were separated to identified (long bones epiphyses and teeth) and unidentified (such as diaphysis, vertebrae, and ribs) fragments of the taxon or animal species (based on Davis 1992).

*Taxonomic Identification*. Bone remains were identified using the comparative collection of the Laboratory of Archaeozoology, University of Haifa. When necessary, morphological markers aided in the differentiation of closely related species (e.g., Davis 1987: Fig. 1.8 for sheep and goat). The separation of sheep (*Ovis aries*) from goat (*Capra hircus*) was based on morphological criteria of selected bones (following Boessneck 1969; Zeder and Lapham 2010). Sheep and goat skeletal elements that could not be identified to species were combined in a general caprine category.

*Measurements*. Selected skeletal elements, such as complete and fragmented epiphyses, were measured following Driesch (1976). Measurements, recorded to 0.1 mm, were made using a digital caliper (FUJI 150 stainless hardened).

*Quantification*. The number of identified specimens (NISP) was used as the basic measure (Grayson 1984). The relative abundance of skeletal parts was quantified using MNE (minimum number of elements) and MNI (minimum number of individuals). These values were calculated applying the premises described in Klein and Cruz-Uribe (1984) and Lyman (1994).

*Recording of Bone-Surface Modification Data*. Recorded bones were inspected for various macroscopic bone surface modifications, such as butchery marks, weathering marks (Behrensmeyer 1978), root etching (Lyman 1994) and signs of animal activity (i.e., rodent gnawing, carnivore punctures and digestion; Lyman 1994). Butchery marks were coded following Binford (1981) and classified into three categories reflecting three stages in the butchery sequence: removal of the skin, dismemberment of the carcass, and cut marks and meat filleting from the bones. Burning was recorded for each identified element; four categories of burned bones were found: brown, black, gray and calcined (Stiner et al. 1995).

*Mortality Profile*. Age at death of the major culled species was analyzed based on epiphyseal closure (Silver 1969). Calculating the ratio between young and old individuals was based on selective epiphysis that fused around the age of two years (Davis 1983).

## RESULTS

The small assemblage of animal remains from Modi'in comprised 243 complete and fragmentary animal remains (for the measurements of all measurable bones, see Appendix 1). The majority of the faunal remains came from the sixth–seventh-century CE (n = 140) and Umayyad-period (n = 50) deposits, but small bone assemblages from other periods were

also retrieved: early Byzantine (n = 7), Abbasid (n = 16), Mamluk (n = 6) and Ottoman (n = 24) (Table 1). The distribution of bone remains by locus and basket is detailed in Appendix 2, and the frequency of animal bones from each major stratum (Fig. 1) compares species ratio within the main period represented in the excavation.

## The Byzantine Period

As with most of the represented periods, the sixth–seventh-century CE assemblages are dominated by caprine and few cattle bones (*Bos taurus*) (Fig. 1). Based on taxonomically distinctive features, sheep (*Ovis aries*) are overrepresented compared to goat (*Capra hircus*). Pigs are present only in these two centuries (n = 4, 3%), and a single vertebra of a fish was also found (L190).



Fig. 1. Distribution of dominant taxa.

Table 1	l. NISP	by	Period	and	Taxa
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Period	NISP	Taxa
Byzantine	7	Caprine, dog, turtle
Sixth-seventh centuries CE	140	Goat, sheep, caprine, cattle, pig, dog, rodent, fish
Umayyad	50	Goat, sheep, caprine, cattle, camel, rodent, chicken
Abbasid	16	Caprine, cattle
Mamluk	6	Caprine
Ottoman	24	Goat, caprine, cattle
Total	243	

Carnivores are represented by several dog specimens (*Canis familaris*) identified in the small Byzantine assemblage (L196; Table 1). Also represented in this period's assemblage is a single turtle shell (L166).

### The Umayyad Period

In contrast, in the Umayyad period, a reversed picture emerged, with goat being overrepresented compared to sheep. This assemblage also includes the remains of a single camel (*Camelus dromedarius*) phalanx (L136; Fig. 1). Bird bones are represented only by domestic fowls (*Gallus domesticus*).

The demography of the culled sheep and goat helped shed light on how livestock was exploited. Although the sixth–seventh-century CE sample size is inadequate for a detailed demographic analysis, caprine's age structure indicates that nearly three-quarters of the animals (73%) were slaughtered before they reached the age of 20 months. The contrary was observed in the Umayyad period when slightly more than a fifth of the caprine (21%) were slaughtered before they reached 20 months (Table 2). In the sixth–seventh centuries CE, the high proportion of young sheep and goat suggests a husbandry system that placed a high value on meat consumption. Nevertheless, the decline in mature caprine suggests an Umayyad husbandry system that placed a high value on products obtained from mature live caprine, i.e., milk, wool, or breeding. The small size of the bone assemblage from other strata does not allow for a similar analysis.

Evidence for bone surface attrition is low in the entire sixth–seventh-century CE bone assemblage, with the bone remains appearing to be in good preservation condition. Of the 72 and more examined long-bone shafts, about 64% exhibited weathering reflecting Behrensmeyer's Level 2 (out of his five weathering stages; Behrensmeyer 1978), evidenced

	Period	Sixth-Seventh Cer	nturies CE	Umayyad	
Age					
		Unfused	Fused+Unfused	Unfused	Fused+unfused
Infant	dis. scapula	2	5		3
(6–10 months)	dis. humerus	14	17		3
Juvenile	dis. metapod	4	10	1	5
(12–20 months)	dis. tibia	11	15		1
Sub-Adult	dis. radius	8	8	2	2
(20–30 months)	dis. femur	7	7		
	dis clcaneum	3	5		
Total		49	67	3	14
% young (Unfused	d)	73		21	

Table 2. Mortality Profile of Caprine by Period

by the low occurrence of bone cracking and exfoliation. The bones' high preservation degree is also indicated by the low occurrence of bones with typical root etching (39%). The small Umayyad assemblages depict a different picture. Of over 19 examined long-bone shafts, only 42% showed weathering corresponding to Behrensmeyer's Level 2 weathering stage (Behrensmeyer 1978). The bones' good preservation degree is also indicated by the high occurrence of bones with typical root etching (94%).

Further bone surface modification is evidenced by several cases of carnivore gnawing, chewing, digesting and tooth punctures (n = 13, 9%) found only in contexts dated to the sixth–seventh centuries CE, and most probably the result of dog scavenging activities (Table 3).

Further human-induced bone modifications in the assemblages point to the significance of butchery practices. Butchery marks were found on sheep, goat and chicken specimens. Most of these marks were found on sheep and goat bones (sixth–seventh centuries: n = 9, 6%; Umayyad: n = 4, 8%) and were left while dismembering the carcass (after Binford 1981). Other cut marks include filleting, represented in low numbers (Table 3).

The bone assemblage of Modi'in Kaizer also comprises one burned bone from a sixth– seventh-century CE context and another dating from the Umayyad period. The low number of burned bones in the different periods suggests that meat preparation did not involve roasting over an open fire but was done in cooking vessels as meat stews (Table 3).

Analysis of the anatomical representation was reconstructed for caprines only (Fig. 2). These data show that although all the elements are represented, certain parts are present in higher percentages, e.g., in the sixth–seventh centuries CE, the forelimbs (humerus) are overrepresented, while horn and toes are underrepresented. This skeletal-part representation pattern can be associated, in both periods, with refuse from a slaughterhouse and not with evidence of market activity or private homes, and is reinforced by the high frequency of long bones (upper and middle limb).

Period	Sixth-Seventh Centuries CE	Umayyad
Bone Modification		
Weathering (Average) <sup>i</sup>	2.5	3.5
Root etching (%) <sup>ii</sup>	39	94
Gnawing marks (%) <sup>ii</sup>	9	
Cut marks (%)	6	8
Burned Bones (%)	1	2

Table 3. Bone Surface Modification by Period

<sup>i</sup> Average of long-bones shaft examined following Behrensmeyer's five weathering stages (Behrensmeyer 1978).

<sup>ii</sup> Percentage of the entire specimen in the assemblages.



Fig. 2. Distribution of caprine skeletal parts.

### CONCLUSIONS

The bone assemblage from Modi'in is dominated by numerous bone fragments, probably indicating slaughterhouse waste.

The taxa consist of major livestock resources primarily composed of caprine (sheep and goat) and, to a lesser extent, cattle and pig. Similar livestock frequencies were also found in contemporaneous assemblages dating from the Byzantine to the Umayyad periods, e.g., Horbat Sumaq (Horwitz, Tchernov and Dar 1990); City of David (Horwitz 1996); Horbat Karkur 'Illit (Horwitz 2004); Tel 'Ira (Dayan 1999); and from Jerusalem: the Jewish Quarter (Bouchnick 2018) and Tyropoeon Valley (Giv'ati Parking Lot) (Bouchnick 2020). These were also found in Ottoman-period contexts at Bet She'an<sup>3</sup> and in the Jewish Quarter in Jerusalem (Bouchnick 2018). However, at Modi'in, the low number of cattle present throughout the various periods is remarkable, indicating local agriculture ruled by caprine herds and derived produce (e.g., milk, wool). Also noteworthy is the low number of pig bones (n = 4) in the sixth–seventh-century CE assemblage and the dominancy of kosher animals (caprine) at the site. These phenomena may indicate the ethnic origins of the ancient inhabitants, since, in these centuries, two ethnic groups, Jews and Muslims, refrained from eating pig, as evidenced by the assemblages from Jerusalem's Late Temple City-Dump (Bouchnick, Bar-Oz and Reich 2007); Tyropoeon Valley (Giv'ati Parking Lot) (Bouchnick

<sup>&</sup>lt;sup>3</sup> Raban-Gerstel N. and Bar-Oz G. 2006. Archaeozoological Analysis of the Faunal Remains from the Early Byzantine and Ottoman Site of Beth-Shean 3537/0 (Unpublished Report, Israel Antiquities Authority Archives).

2020); and Horbat Rimmon (Horwitz 1998). Evidence of the same, for the Early Islamic period, can be found at Tel Jemmeh (Hesse and Wapnish 1979), Yoqne'am (Horwitz and Dahan 1996) and Tyropoeon Valley (Givati Parking Lot) (Bouchnick 2020).

The bones' preservation state at Modi'in and, in particular, the low incidence of bone weathering, indicates that most had been rapidly buried, explaining perhaps the relatively low frequency of carnivore ravaging characterizing the Umayyad assemblages. In contrast, the sixth–seventh-century CE assemblage included a higher degree of bone weathering and carnivore ravaging, characterizing bone surface neglect before being buried.

The presence of cut marks corresponding to some phases of the butchery process, in addition to skeletal part representation, tentatively suggests that caprine slaughtering and processing were carried out in the vicinity of the site.

No.	Locus	Species	Bone	Part	Fused/ Unfused	Burned/ Unburned		Meas	surements	
							GLP	LG	BG	
130	302	Capra/Ovis	Forelimb	Scapula	F	UB	31.3	25.58	22.18	
132	121	Capra/Ovis	Forelimb	Scapula	F	UB	38.78			
							Вр	Bd	HDH	
131	302	Capra/Ovis	Forelimb	Humerus	F	UB		28.21	15.15	
133	121	Capra/Ovis	Forelimb	Humerus	F	UB	33.07		15.34	
25	142	Capra/Ovis	Forelimb	Humerus	F	UB	28.14		15.17	
							Вр	BFd		
76	194	Capra/Ovis	Forelimb	Radius	F	UB	30.89	29.7		
145	194	Capra/Ovis	Forelimb	Radius	F, UF	UB	29.95	28.98		
							Bd			
85	203	Capra/Ovis	Hind limb	Tibia	F	UB	26.59			
92	187	Bos taurus	Hind limb	Tibia	F	UB	57.98			
110	198	Capra/Ovis	Hind limb	Tibia	F	UB	29.21			
112	184	Capra/Ovis	Hind limb	Tibia	F	UB	27.22			
113	184	Capra/Ovis	Hind limb	Tibia	F	UB	26.43			
39	194	Capra/Ovis	Hind limb	Tibia	F	UB	25.86			
							Вр	Bd	GL	SD
65	184	Capra/Ovis	Forelimb	Metacarpus	F	UB	24.51			16.21
84	202	Capra/Ovis	Forelimb	Metacarpus	F, F	UB	24.53			
126	132	Capra hircus	Forelimb	Metacarpus	F, F	UB	26.47	29.33	118.96	19.33
149	194	Capra/Ovis	Forelimb	Metacarpus	F	UB	24.04			
150	194	Capra hircus	Forelimb	Metacarpus	F, F	UB	24.35	26.71	109.67	15.41
157	145	Capra/Ovis	Forelimb	Metacarpus	F, F	UB	28.58			18.5
158	145	Capra hircus	Forelimb	Metacarpus	F, F	UB	25.42	28.11	109.5	16.4
26	142	Capra/Ovis	Forelimb	Metacarpus	F	UB	24.84			
50	189	Bos taurus	Forelimb	Metacarpus	F	UB		58.36		

APPENDIX 1. Bone Measurements of Cattle and Caprine Specimens (in mm)

No.	Locus	Species	Bone	Part	Fused/ Unfused	Burned/ Unburned		Meas	urements		
38	194	Capra/Ovis	Forelimb	Metacarpus	F	UB	24.07				
64	184	Ovis aries	Hind limb	Metatarsus	F, F	UB	21.34	24.28	122.51	15.14	
77	195	Ovis aries	Hind limb	Metatarsus	F, F	UB	19.7	23.85	121.83	12.64	
78	196	Ovis aries	Hind limb	Metatarsus	F, F	UB	20.5	24.23	121.74	13.7	
95	164	Capra/Ovis	Hind limb	Metatarsus	F	UB	21.23				
136	136	Capra/Ovis	Hind limb	Metatarsus	F	B (BR)	21.28				
159	145	Capra/Ovis	Hind limb	Metatarsus	F	UB	21.07			13.8	
166	195	Capra/Ovis	Hind limb	Metatarsus	F	UB	21.55				
111	184	Capra hircus	Limb	Metapod	F	UB		28.02			
							Вр	Bd	GL	SD	
81	199	Capra hircus	Toes	Phalanx1	F	UB	12.41	11.94	37.63	11.11	
134	136	Camel dromedarius	Toes	Phalanx1	F	UB	38.08				
160	145	Capra hircus	Toes	Phalanx1	F	UB	14.82	13.75	40.56	13.14	
172	195	Capra hircus	Toes	Phalanx1	F	UB	15.92	15.79	15.79 47.49		
173	195	Capra hircus	Toes	Phalanx1	F	UB	14.13	3 13.73 42.89		12.3	
33	194	Ovis aries	Toes	Phalanx1	F	UB	14.23	4.23 12.52 38.41		11.52	
34	194	Ovis aries	Toes	Phalanx1	F	UB	12.38	12.38 11.38 36.94		9.74	
116	135	Bos taurus	Toes	Phalanx1	F	UB	25.36	24.04	54.23	21.44	
143	194	Capra hircus	Toes	Phalanx1	F	UB	13.83	13.18	38.53	12.06	
143	194	Capra hircus	Toes	Phalanx1	F	UB	13.51	13.3	38.83	11.73	
175	195	Capra hircus	Toes	Phalanx2	F	UB	11.52	9.96	25.72	8.22	
94	164	Bos taurus	Toes	Phalanx2	F	UB	31.48	27.34	45.73	28.67	

APENDIX 1. (cont.)

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APPENDIX

Period	Locus	Basket	Context	Goat	Sheep	Caprine	Cattle	Pig	Camel	Dog	Rodent	Chicken	Reptile	Pisces	Total
Byzantine, Umayyad	121	1071	Room III			2									2
		1084				4						1			5
		1150				2									2
Byzantine, Umayyad	131	1158	Stable			2									2
Umayyad	132	1287	Cistern in room IX	1		5									6
		1312				5					1				6
Byzantine	135	1160	Upper level of ashlar				1								1
		1195	building				1								1
Byzantine, Umayyad	136	1179	East of the courtyard			2			1						ю
			floor												
Byzantine, Umayyad	142	1190	Collapse above olive			3									3
		1206	press cave			1	1								2
		1214				1									1
Byzantine, Mamluk	143	1427	Collapse above olive			1									1
			press cave												
Byzantine-Umayyad,	145	1422	Probe in southern	2		8									10
Abbasid, Ottoman		1222	cave												
Byzantine-Umayyad, Abbassid Ottoman	156	1286	Southwestern end of			8									8
		1001													
Byzantine–Umayyad	164	1291	Collapse above olive press cave			m					_				4
Byzantine-Umayyad	166	1296	Collapse above olive			1				5			1		7
			press cave												
Byzantine, Umayyad	172	1368	Lower level of ashlar building				1								1
Byzantine	174	1339	Staircase of ashlar building			4									4
Byzantine, Umayyad	175	1348	Stable			1									1
6th c. CE	182	1424	Trash pit					4							4
		1446					1								1

# The Fauna Remains from Naḥal 'Anava, Modi'in

APPENDIX 2. (cont.)

Total	4	6	21		7	69	-	2	13	-	16	4	ю	9	7	4	ю		-	243
Pisces						1														I
Reptile																				Ι
Chicken												1								7
Rodent																				2
Dog																				5
Camel																				I
Pig																				4
Cattle				1	1							1		4						13
Caprine	3	6	16			60	1	5	10	1	10	2	ю	2	2	4	ю		1	186
Sheep			2			8		2												12
Goat	1		з						Э		9									16
Context	Olive press			Collapse of upper level of ashlar building	Lower level of ashlar building	Probe in southern cave	Eastern entrance of the cave	Eastern wall of olive	press cave	Olive press		Lower level of ashlar building	Under collapse in ashlar building		Olive press		Collapse of eastern	cave	Southern part of eastern cave	
Basket	1421	1441	1454	1428	1480	1400	1456	1418	1442	1459	1446	1476	1468	2019	1458	1477	1487		1477	
Locus	184			187	189	190	193	194		195		196	198	207	302		303		304	
Period	6th c. CE			Byzantine, Umayyad, Abbasid	Byzantine, Umayyad	Byzantine	6th/7th c. CE, Abbasid	Umayyad		6th c. CE		6th/7th c. CE– Umayyad	6th/7th c. CE	Abbasid	6th c. CE		6th/7th c. CE,	Umayyad, Mamluk	6th/7th c. CE, Abbasid	Total

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