

THE ANTHROPOLOGICAL WORK

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This preliminary report briefly describes the anthropological work carried out by the authors and their assistants during the 1973 season of excavations at *Tell Hesbân*.¹ It also attempts to interpret a portion of the data collected. The first section of the report will discuss activities such as 1) bone reading, 2) assembling of a comparative collection, 3) conducting a topographical bone survey, and 4) carrying out ethnographical studies. It will also describe the method used for describing, recording, and analyzing the animal bones recovered. The second section will deal with some of the findings, discuss some of the problems encountered, and explain some of the methods used in solving the problems.

Supportive Activities

In order to provide the Area and Square supervisors with a regular preliminary report on the number and species identification of bones recovered from each locus, a weekly "bone reading" was carried out at the field station. These sessions provided the archaeologists with up-to-date information on the animal remains recovered, and the anthropologists with information about the archaeological context from which the bones came.

¹ The following individuals deserve a special word of gratitude for their willingness to lend a helping hand during the last few days of the expedition, when "scribes" were at a premium, to get the data recorded: Eugenia Nitowski, Nahla R. Abbouski, Tom Meyer, Avery Dick, and Rick Mannell. Mohammad Saied's helpfulness as a translator and informant was also much appreciated. The first-named author also wants to thank the Zion Research Foundation, Boston, Massachusetts, for a travel scholarship which enabled him to participate in the expedition.

An important achievement of last summer's expedition was the assembling of possibly the first osteological comparative collection in Jordan. It consists of unbroken skeletal remains of sheep, goat, cattle, donkey, horse, camel, dog, cat, and chicken. These, collected by the authors in the fields surrounding the modern village of *Hesbân*, facilitated greater accuracy in identifying the more than 7,000 bone fragments of domestic species² found during the excavations.

A topographical bone survey was conducted in conjunction with assembling the comparative collection. This consisted of a random crisscrossing of the fields surrounding *Hesbân* and the grounds inside the village. The survey aided us in observing patterns related to the deposition of animal remains. An especially interesting finding relates to the remains of food animals versus non-food animals; *all* the bones of the donkey, horse, dog, or cat skeletons were found, whereas bones of sheep, goat, and cattle were mostly from meat-poor sections like skulls or extremities. An exception would be sheep or goats killed by predators. In such cases, the skin of the animals and large portions of their skeletons were found.

Ethnographic inquiries were initiated with the specific goal of compiling data that would shed light on the problems arising from the analysis of the animal remains. The butchering and consumption of two sheep and two goat carcasses at a *mensef* feast were witnessed by one of the authors. In particular, observations were made of meat-cutting and carcass-utilization practices. Husbandry practices such as those related to herd management and herd composition were also noted.

Fourteen categories of information were delineated for describing each bone fragment.³ Categories 4, 5, and 7-13 were used only where applicable.

² Macerated and sun-bleached bones were plentiful in the fields surrounding the village.

³ We developed a "recording guide" to enable us to write in the data with maximum efficiency and at the same time make subsequent sorting easier.

1. Find spot—the Area letter, and the Square, pail and locus numbers for the place in which the bone fragment was found.

2. Taxonomy—the kind of animal the bone represented (e.g., sheep, or goat, cattle, etc.).

3. Element—the name of the bone as it related to the complete skeleton (e.g., humerus, radius, etc.).

4. Fusion—the state of the epiphysial union in the bone: whether fused, partially fused, or unfused.

5. Element modifier—if the bone was an element with sub-categories (e.g., phalanges can be first, second, or third), the sub-category.

6. Fragment description—a description of each bone fragment, using a letter for its fragment type, and a number for its approximate size, “measured” on a scale of concentric circles numbered from 1 to 25 and with radii increasing by 10 mm. to 250 mm. (e.g., B7 indicates a “B” type of fragment on a bone of 70 mm. size).

7. Thermal effects—any signs of a bone having been cooked or roasted, and the color of the burn mark.

8. Right or left—whether the bone was from the right or left side of the animal.

9. Special—a notation of pathology or other irregularities not covered by any of the other categories.

10. Sex—pelvic features most often pertinent.

11. Cultural marks—any signs of cutting, chopping, piercing, etc., the location of these marks on the bone being pinpointed by comparison with a model drawing of the element prepared with a lettered horizontal scale and a numbered vertical scale.

12. Physical condition—whether the bone was in poor physical condition; i.e., if it was crumbling, had a pitted surface, etc.

13. Animal marks—any rodent chews, dog bites, etc. on the bone.

14. Measurements, where desired—length, width, height, and circumference of such parts as metapodial condyles.

Currently we are engaged in the analysis and interpretation of the 1973 materials. We are developing a computer program which will enable us to handle large retrieval jobs such as are

It consisted of a card with 17 rectangular 10 x 30 mm. openings cut out, one each for 13 of the above information categories, and four for the 14th, to accommodate all possible measurements made on one bone. This instrument enabled us to record all the necessary information for each bone on a standard data card 6 cm. x 14 cm. We found that this method, using the 14 information categories and a recording guide, has almost unlimited flexibility and convenience for sorting. It has been easily adapted to computerization by transforming the 14 information categories into “fields” contained on a standard 80-column data card. Key-punching was simplified by having the data cards sorted by element and then by species. Thus best possible use could be made of auto-duplication in the key-punch process.

required in analyzing zooarchaeological data.⁴

Preliminary Results

By utilizing ethnographic observations of the butchering and carcass utilization practices of the present-day villagers of *Ḥesbân* it has been possible to make inferences about some of the practices of the inhabitants of the *tell* in the Late Roman and Hellenistic periods.

Our study is based on an analysis of remains of sheep and goat from two Hellenistic loci, D.1:59 and D.1:60, and from two Late Roman loci, D.2:36 and D.2:40. The samples from these loci were selected because they had the largest number of bones from clear contexts available at the time of writing this report.

In antiquity, sheep and goats were the most popular food animals during all periods of occupation at *Tell Ḥesbân*,⁵ just as they are today in modern *Ḥesbân*. In contrast to the present-day villagers, whose herds are composed of only slightly more sheep than goats, the ancient villagers seem to have had a generally stronger preference for sheep. Of the bones for which separation was possible (a few well preserved long bones, scapulae, and pelves), 17 came from sheep and two from goats in the Hellenistic loci; seven came from sheep and two from goats in the Late Roman loci.

Today's villagers maintain mixed herds composed mostly of mature females of each species, with usually only one or two mature males in each flock. Males are presumably slaughtered while still young. Even though there were few bones in our samples, they do indicate that females outnumbered males. For the bones for which separation was possible, two were females and one was male in the Hellenistic sample, and one was female in the Late Roman sample.

⁴ John Lindquist and Paul Perkins, both computer programmers, have been assisting with this project.

⁵ Øystein LaBianca, "The Zooarchaeological Remains from *Tell Ḥesbân*," *AUSS*, 11 (1973): 133-144.

The age at which an animal is slaughtered can be estimated from postcranial remains by studying rates of fusion of the epiphysis.⁶ Table 1 shows counts (grouped as in Hole and Flannery) of fused versus unfused epiphyses among sheep and goats from the four loci. By adding the number of fused bones in each group within a sample and then computing the percentage of the total number of fused and unfused bones in the same group that this sum represents, it is possible to obtain a percentage estimate of the survival rates of sheep and goats of various ages. Because the samples had so few bones, the Hellenistic samples and the Late Roman samples were combined, respectively; and groups A and B and groups C and D (see Table 1) were combined, respectively, as follows:

GROUP	BONE	D.1: 59 HEL.		D.1: 60 HEL.		D.2: 36 L.R.		D.2: 40 L.R.	
		F	U	F	U	F	U	F	U
A. FUSING WITHIN ONE YEAR	RADIUS PR	3		2		1		1	
	HUMERUS DI	2	1	1			2		
	SCAPULA	1	1						
	PELVIS			1		2	1	3	
B. 2 YEARS	TIBIA DI	2	1	1	1	1		2	1
C. 2.5 YEARS	METAPOD DI	3	1	2		4	1	2	2
D. 3 - 3.5 YEARS	FEMUR PR	2	2		2	1	2		
	FEMUR DI								1
	RADIUS DI	1			1		1		
	TIBIA PR	1							

Table 1. Raw counts of fused versus unfused epiphyses among sheep and goats from four loci.

For the Hellenistic samples, 76% of the bones from groups A and B and 60% from groups C and D were fused. For the Late Roman sample, 71% of the bones from groups A and B and 50% from groups C and D were fused. These findings suggest that sheep and goats had a relatively shorter life expectancy during the Late Roman period than during the Hellenistic period.

*Frank Hole, Kent V. Flannery, and James A. Neeley, *Prehistory and Human Ecology of the Deh Luran Plain*, Memoirs of the Museum of Anthropology, University of Michigan, no. 1 (Ann Arbor, 1969).

Table 2 shows measurements (in centimeters) of the width (w) of the distal end of the metacarpals and metatarsals, and the diameter of the outer condyle (n) and the inner condyle (m) of the distal epiphysis of the metapodials for the four samples. The largest number of measurements was possible from metapodials in the Late Roman sample from D.2:36. A comparison of the measurements reveals that as a group the measurements of bones from the Late Roman samples are slightly larger than those from the Hellenistic samples.

BONE	D.1: 59 HEL.			D.1: 60 HEL.			D.2: 36 L.R.			D.2: 40 L.R.		
	W	N	M	W	N	M	W	N	M	W	N	M
METACARPAL	2.68	1.61	0.91		1.61	0.91		1.81	1.31			
								2.17	1.26			
								1.73	1.19			
METATARSAL		1.73	1.18				2.57	1.69	1.05	2.77	1.71	1.16
							3.02	1.85	1.25			

Table 2. Measurements (in centimeters) of the distal ends of nine metapodials of sheep and goats from four loci.

Table 3 illustrates the average size of the fragments of the respective elements recovered, based on the data obtained by measuring each fragment. The sample from D.1:59 shows that bones of the forelimb (scapula, humerus, and radius) were represented by larger fragments than bones of the hind limb (femur and tibia). In the Late Roman samples (from D.2:36 and D.2:40) metacarpals were represented by larger fragments than were the metatarsals. In a Late Roman sample from D.2:36 the mean size of fragments was larger (4.1 cm.) than in the other three samples (approximately 3.1 cm. for each).

The fact that the majority of the skeletal remains recovered were incomplete fragments, such as distal or proximal ends or shafts of long bones, leads one to ask the question: Who or what fragmented these bones, and how?

The possibility that some bones may have been fragmented simply by being trodden upon by man and beast has been

suggested by findings from a study that compared the condition of the bones from an enclosed cistern environment with bones from a regular layer.⁷



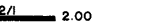







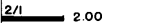


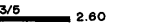















BONE	D.1: 59 HEL.	D.1: 60 HEL.	D.2: 36 L.R.	D.2: 40 L.R.
SCAPULA	43/11  3.91	6/2  3.00	2/1  2.00	
HUMERUS	11/3  3.66	12/4  3.00	10/3  3.33	
RADIUS	24/6  4.00		37/10  3.70	2/1  2.00
ULNA			3/1  3.00	
PELVIS	2/1  2.00	16/5  3.20	20/6  3.33	13/5  2.60
FEMUR	8/3  2.66		12/2  6.00	3/1  3.00
TIBIA	14/5  2.80	9/3  3.00	3/1  3.00	37/10  3.70
METACARPAL	21/6  3.50	9/3  3.00	53/12  4.41	39/9  4.33
METATARSAL	10/4  2.50	13/3  4.33	16/5  3.60	37/10  3.70
CENTIMETERS:	2 3 4 5	2 3 4 5	2 3 4 5	2 3 4 5

Table 3. Average size of fragments of some elements of sheep and goats from four loci. In the fraction above each bar, the numerator is the sum of the individual fragment measurements; the denominator is the number of fragments measured.

It is likely, however, judging from cut marks observed on bone fragments, that many bones were fragmented as a result of butchering and meat cutting. This explanation is supported by observations of present-day practices.

The villagers of modern *Hesbân* slaughter their sheep and goats on the grounds outside their dwellings. Holding the front two legs of the animal in his left hand and pressing the neck to the ground with his right foot, the villager slits the animal's throat with a knife. After the blood has drained for a few minutes he completely severs the head between the occipital bone and the atlas.

In preparation for the skinning, the forefeet are amputated

⁷ Øystein LaBianca: "A Study of Postcranial Remains of Sheep and Goat from *Tell Hesbân*, Jordan" (unpublished manuscript, Harvard University, Spring, 1973), pp. 53, 54.

between the distal end of the radius and the proximal end of the metacarpal bone to facilitate the removal of the skin. Then an incision is made at the distal end of the left tibia separating the bone and the flesh so that a rope can be threaded through and the carcass hoisted up the side wall of one of the dwellings. While thus suspended by one hind leg the carcass is skinned and the internal organs removed. The remaining carcass is sectioned as follows: the two forelimbs are separated by dissecting the scapula away from the trunk; the left half of the rib cage is partially separated by cuts—starting at the caudal end—severing the proximal end of the rib from the rest of it; the sternum is cut away from the partially separated left half of the rib cage; the neck, including the atlas, axis, and 4th-5th cervical vertebrae, is sectioned off; the fat tail is cut off at the caudal end of the sacrum; the right half of the rib cage is separated; the vertebral column is divided into two sections, one consisting of approximately three cervical vertebrae and six thoracic vertebrae, the other of the seven remaining thoracic vertebrae and two lumbar vertebrae; the right hind foot is cut off between the proximal end of the metatarsal and the distal end of the tibia and discarded; the right hind limb is removed by severing the muscles and sinews binding it to the pelvis; finally, the left hind limb is loosened from the rope and the left hind foot is cut off in the same manner as the right hind foot, and discarded.

The major post-cranial sections seen in this butchering practice are: two forelimbs, two forefeet, two halves of the rib cage, the sternum, five vertebral column sections, two hind limbs, and two hind feet. For the most part, the bones themselves were not broken or fragmented during this process. Most of the fracturing occurred subsequently, when the sections were cut into smaller pieces. For the *mensef* meal, and also for many other meals, the meat is cut as follows: long bone sections and rib sections are cut into three or four small pieces; the scapula is cut into three or four pieces; vertebral column sections are frequently split

right down the middle, cutting each vertebra into two or more pieces; the pelvis is usually split at the pubis into two parts; thereafter each part is chopped into three or four smaller pieces.

Table 4 shows the counts of skeletal remains from each of the four loci studied. The various elements are presented as members of the major sections of the animal, based on the above observations of butchering practices at the village of *Heshbân*. The total number of bones from each sample is shown at the bottom of the chart. To allow for quick reference to each sample in the subsequent discussion, note the abbreviations at the top of Table 4: H.1 and H.2 = Hellenistic samples from Loci D.1:59 and D.1:60; L.R.1 and L.R.2 = Late Roman samples from Loci D.2:36 and D.2:40.

In three of the four samples, skull fragments made up the largest group: H.1 = 31%, L.R.1 = 48%, L.R.2 = 37.5%. In H.2 skull fragments were outnumbered by vertebra fragments 28.5% to 18.6%. The very high percentage of skull fragments in L.R.1 is partially calculated from the large number of molars (separate from those in mandibles) found in that sample.

Mandible fragments were arranged into three types based on the portions of the bone most frequently recovered. A = ascending ramus, B = longitudinal ramus, C = front section. Ascending ramus fragments were most common in all the samples except in L.R.1, where front sections were more numerous.

On the whole, skull fragments were more common in the Late Roman samples than in the Hellenistic samples. Mandible fragments were more than twice as plentiful in the Late Roman as in the Hellenistic samples.

Vertebra fragments were categorized as follows: A = neural arch fragment, B = centrum, C = centrum epiphysis, D = spine, E = entire neural canal, F = complete, G = vertically split centrum. Vertebrae were very numerous in H.1 (20%) and H.2 (28.5%), while relatively few were found in L.R.1 (5.7%) and L.R.2 (5.3%). The fragments were mostly neural arch, spine, and centrum fragments. Four centrum fragments from the Hellenistic samples showed signs of having been split vertically (apparently as in the observed butchering practice). One such fragment was found in the Late Roman samples. Rib fragments were present only in the Hellenistic samples.

Pelvis fragments were grouped into eight categories: A = ilium with no evidence of pit, B = ischium with no evidence of acetabulum, C = pubis with no evidence of acetabulum, D = ilium with evidence of pit, E = ischium with evidence of aceta-

ABBREVIATIONS		H.1 (D.1:59)			H.2 (D.1:60)			L.R.1 (D.2:36)			L.R.2 (D.2:40)		
SECTIONS	BONE	R	L	X	R	L	X	R	L	X	R	L	X
SKULL	MAXILLA			4			1			1			
	INCISOR									1			2
	PREMOLAR			3			1		4				1
	MOLAR			11			2			39			8
	MANDIBLE A	3	3		4	1		4	4		2	6	
	" B		1		1		1	1		1	1	2	3
" C	3				1			9	3		1	2	
SKULL ?				4			1						
VERTEBRAE	ATLAS			1			2						
	AXIS						1						
	CERVICAL			6			3			2			1
	THORACIC			7			9			2			2
	LUMBAL			3			1			4			1
	SACRAL			1									
	VERTEBRAE ?			3			4						
RIB CAGE	RIB	1	1		2	1							
PELVIS	PELVIS A					1	1						
	" D	1				2		1			1		
	" E					1			3		1	2	
	" F										1	1	
	" G								1				
FORELIMB	SCAPULA A			2		2		1					
	" B	1		3	1								
	" C	2		1									
	" D	1											
	HUMERUS PR	1		2	1	2		1	2				
	" SH						1						
	RADIUS PR	2		1	2			1			1		
	" DI	1				1			1				
	" SH	2		1			1	2	3	3	1		
ULNA													
HIND LIMB	FEMUR PR			1	3		2		3				
	" DI											1	
	" SH			1				1					
	TIBIA PR			1		1							
	" DI	3				1	1	1				2	1
" SH				1									
EXTREMITIES	METAPOD.				1								
	METACARP. PR			4		1	1	1	4	2	1	3	
	" DI	1			1					3			2
	" SH									2			3
	METATARS. PR			2		1		1		2	3	1	3
	" DI				1					2			1
	" SH				1		1						2
	PHALANX I	2	2		1	2		9	4		4	3	
	" II	3						3			2		
	" III							1			3		1
	TALUS					1	2						
CALCANEUS			1		1	1	3	1					
NUMBER OF BONES IN SAMPLE:		105			70			130			75		

Table 4. Raw counts of skeletal remains of sheep and goats from four loci. Key: R = right side; L = left side; X = undifferentiated; PR = proximal end; DI = distal end; SH = shaft.

bulum, F = pubis with evidence of acetabulum, G = acetabulum with ilium and ischium, and H = obturator foramen with partial or complete acetabulum. Pelves were more common in the Late Roman samples where types E and F dominated. Types A and D dominated the Hellenistic samples.

Bones of the forelimb were more numerous in H.1 (20%) and H.2 (14.4%) than in L.R.1 (10.8%) and L.R.2 (1.3%). Scapula fragments were grouped into four types: A = blade with evidence of spine but no glenoid cavity, B = blade with no evidence of spine or glenoid cavity, C = evidence of glenoid cavity and spine, D = glenoid cavity only. Almost all the scapula fragments came from H.1. Only distal ends and shafts of humeri were represented. Radius fragments were best represented by shafts. Only one ulna fragment was found in L.R.1.

Bones of the hind limb were also more common in H.1 (8.5%) and H.2 (7.1%) than in L.R.1 (3.6%) and L.R.2 (5.4%). Femurs were mostly proximal end fragments, while tibia remains were mostly distal end fragments. Hind limb fragments, however, were fewer than forelimb fragments.

Extremities were numerous in all four samples. L.R.1 (26.7%) and L.R.2 (42.8%) had more than H.1 (17.9%) and H.2 (20%). Metacarpals were slightly more numerous than metatarsals. For all the metapodials, proximal ends were better represented than distal ends. First phalanges were by far the best represented; second and third phalanges followed far behind. Somehow right phalanges seem to outnumber left ones by quite a few. A few tali and calcanei were also found, mostly in H.2 and L.R.1.

In answering the question, "How were the bones fragmented?" it is now possible to suggest that they were, for the most part, fragmented as a result of butchering and meat cutting. The majority of the long bones were represented by either proximal ends, shafts, or distal ends; the scapula appears to have been cut into three or four pieces; the vertebral column shows signs of having been split down the middle; the pelvis was fragmented into eight or more sections. These fragment categories are strikingly similar to the fragment categories that resulted from the meat cutting observed at the present-day village.

There are signs indicating that the animals were slaughtered in close proximity to the dwellings rather than outside the village. Since fragments of skulls, except for the mandibles, and feet are frequently not saved, we would not expect to find many of them

unless they were discarded within the village. During both periods, judging from the large number of these fragments found, it seems that they were so discarded in the village.

None of the distal ends of tibia show signs of having been pierced, a strong indication of butchershop practices whereby carcasses are hung on hooks by the distal tibia. This would suggest that the meat was not acquired in butcher shops.

There appear to have been at least four animals represented in each of the Hellenistic samples (four left distal tibiae, four right mandibles). The Late Roman bones appear to stem from a greater number of animals, at least nine right mandibles in L.R.1 and at least six left mandibles in L.R.2. There exists a greater discrepancy between right and left bones in the Late Roman samples than in the Hellenistic (see for example mandibles and phalanges).

Along with the above mentioned discrepancy between right and left bones, the Late Roman samples differ from the Hellenistic samples in other ways: There are very few vertebrae, no ribs, generally fewer fore- and hind-limbs, but numerous mandible fragments and extremities. No easy explanation for this problem has been found.

Finally it should be mentioned that the samples described above are probably biased somewhat by the identification skills of the authors. For example, proximal and distal ends of long bones are easier to identify than shafts, especially in the case of humeri and femurs. Other biases are likely accounted for by post-depositional effects: skull fragments are much less likely to endure considerable kicking around than are pelvis fragments.

In conclusion, from this preliminary study of 380 bone fragments the following summary statements can be made:

1. Sheep constituted a larger portion of the herds in the Hellenistic period than in the Late Roman period.
2. Females constituted a larger portion of the mature animals in both periods.

3. The animals were slaughtered at an earlier age in the Late Roman period than in the Hellenistic period.

4. The fragmentation of the animal bones appears to have resulted in large measure from meat-cutting practices during both periods.

5. The Late Roman animals may have been slightly larger than Hellenistic ones.

6. Late Roman fragments may have been generally larger than Hellenistic ones.

7. In both periods, the animals were slaughtered in close proximity to the villagers' dwellings.

8. For both periods, the evidence suggests that each family slaughtered and ate their own animals rather than having acquired them in butcher shops.

Further study will be required to establish the integrity of these findings.