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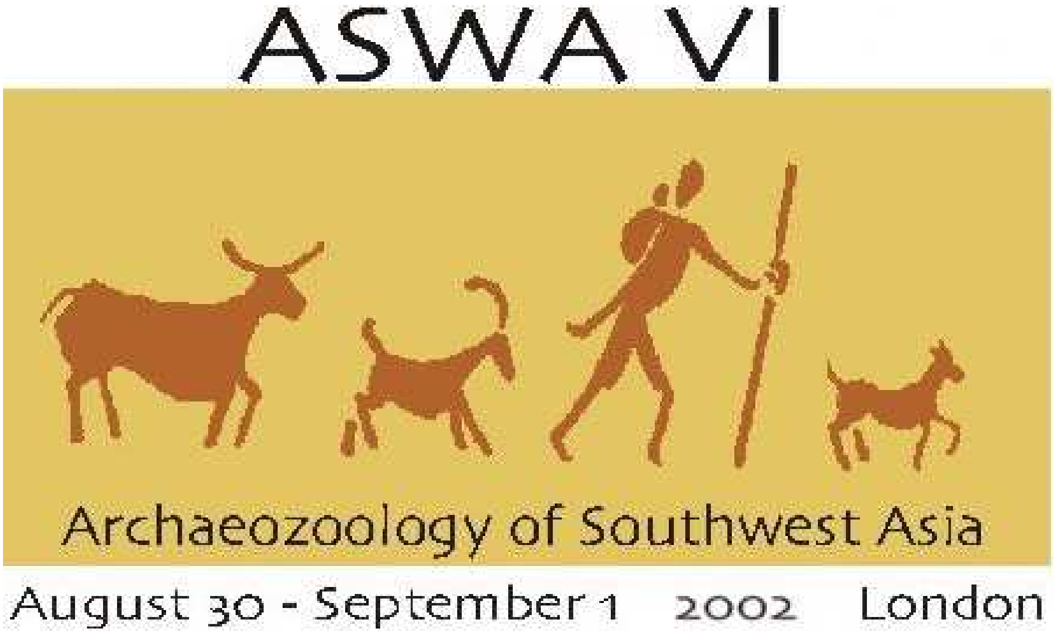

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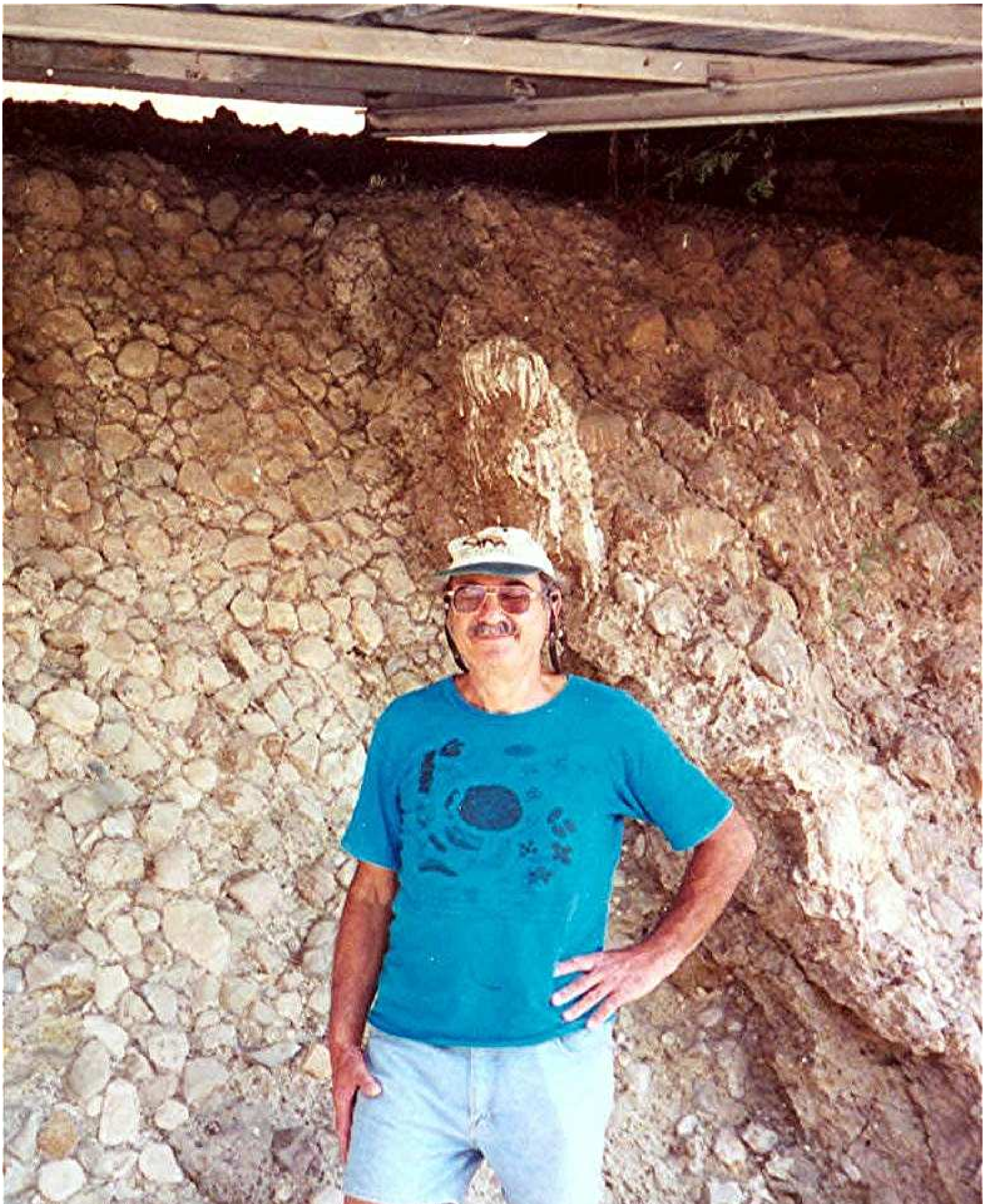

Prof.Dr. Eitan Tchernov

This volume is dedicated to the memory of Prof. Dr. Eitan Tchernov, in fond memory of his enthusiasm and support to many in the field of archaeozoology**.**

Preface

The ASWA VI meeting was held at the Institute of Archaeology, University College London, from 30th August-1st September 2002, timetabled to follow on the heels of the ICAZ meeting in Durham, UK. Over 55 participants attended the meeting, travelling from 13 countries, bringing the latest research results from our field. As usual, it was a pleasure to see so many doctoral students presenting their research – a sign for a very healthy future for zooarchaeology in south west Asia. It is still unfortunate, however, that colleagues from some Middle Eastern countries were unable to attend due to financial and political constraints.

Presentations were organized into the following six themes, which highlight the scope of the ASWA membership: Animals in Palaeolithic and Epipalaeolithic Levant; Neolithic Patterns of Animal Use; Animals in Neolithic Anatolia; Animals in the Chalcolithic and Bronze Ages; Iron Age, Nabatean and Roman Patterns of Animal Use; Animals in Ancient Egypt. There was also a poster session, and contributors were invited to submit papers to this volume.

As always with the ASWA forum, the meeting served to welcome new scholars to the group, but was also very much a reunion of old friends and colleagues who have been sharing new information and discussing issues of joint interest for many years now. In this vein, it is a great sadness that ASWA VI was the last international meeting attended by Prof. Eitan Tchernov, an original founder of the group and mentor and inspiration to so many. For many of us, it was the last time we saw Eitan, and experienced his usual incisive comment, unstoppable enthusiasm for the subject, and warm friendship. He will be greatly missed.

ASWA VI was supported by the Institute of Archaeology, UCL, who provided facilities and financial and administrative help. In particular, the organizing team was aided greatly by the administrative assistance of Jo Dullaghan at the Institute. ARC bv (Archaeological Research and Consultancy, Groningen, The Netherlands) once again shouldered the finances of the publication of the proceedings, and we are extremely grateful for their continuing support. Many thanks are also due to the postgraduate student helpers from the Institute of Archaeology who made the meeting run so smoothly: Banu Aydinoğlugil, Jenny Bredenberg, Chiori Kitagawa, Peter Popkin, and Chris Mosseri-Marlio (who also produced the logo reproduced on the frontispiece of this volume).

Many thanks to all the participants for making the meeting such a success!

Louise Martin
London 2005

Participants of the 6th ASWA Conference, held at the Institute of Archaeology, University College London.

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Contents

PASTORAL PRODUCTION IN A CORPORATE SYSTEM: THE EARLY BRONZE AGE AT KHIRBET EL-MINSAHLAT, JORDAN

Cheryl A. Makarewicz[1]

Abstract

Pastoral products are assumed to form an integral part of the subsistence economy in Early Bronze Age societies but are usually implicitly viewed as only minor contributors to higher level economies. The formulation of newer models characterizing the Levantine EBA as heterarchically organized corporate villages have necessitated a re-evaluation of this perspective. Excavations at Khirbet el-Minsahlat, a large transitional EB III/IV settlement located on the Kerak Plateau, have yielded an important faunal assemblage that potentially lends insight into corporate and household level social, political, and economic structures at Minsahlat. Faunal results from the 2001 and 2002 seasons are presented here and possible approaches to integrating pastoralism into heterarchical models used to characterize the Southern Levantine EBA are discussed.

Resumé

Les produits pastoraux sont supposés formés une part importante de l'économie de subsistance dans les sociétés de l'âge du Bronze ancien, mais généralement sont implicitement considérés comme contribuant peu à des économies de plus haut niveaux. La formulation de nouveaux modèles caractérisant l'âge du Bronze ancien levantin comme villages corporatifs organisés hiérarchiquement a nécessité une réevaluation de cette perspective. Les fouilles archéologiques à Khirbet al-Minsahlat, un grand établissement de la transition âge du Bronze ancien III/IV situé sur le Plateau Kerak a fourni une importante quantité de vestiges fauniques qui apporte des informations sur la maisonnée au niveau des structures sociale, politique et économique. Les résultats d'analyses fauniques des campagnes 2001 et 2002 sont présentés ici et des approches possibles discutées pour intégrer le pastoralisme dans les modèle hiérarchiques utilisés pour caractériser l'âge du Bronze ancien du Levant Sud.

Key words: Khirbet el-Minsahlat, Early Bronze Age, pastoralism, kill-off patterns, spatial distribution, heterarchy.

Mots Clés: Khirbet el-Minsahlat, Age du Bronze ancien, pastoralisme, ages d'abattage, distribution spatiale, heterarchy.

Introduction

Khirbet el-Minsahlat is a large Early Bronze Age settlement situated on the Kerak Plateau, Jordan, and is located 1 km south of the modern village of Hmud (Fig. 1). While Miller (1991) suggested that occupations at Minsahlat dated to the EB II and III based on ceramic surface collections, pottery and radiocarbon dates recovered from the 2001 and 2002 excavation seasons indicate that Minsahlat is composed primarily of terminal EB III/early EB IV deposits (Table 1) (Chesson *et al* nd.). The site covers approximately 5.5 hectares of which c. 65 m^2 have been excavated and contains both residential areas and large, non-residential units, interpreted as potential fortification systems and administrative complexes (Chesson *et al* 2003). The presence of non-residential structures at Minsahlat, which are quite similar to those at Bab edh-Dhra and Khirbet Iskender (Rast and Schaub 1981; Richard 1987), indicates that the EB III economic, social, and political structures may have been carried over into the EB IV (Palumbo 1991).

Table 1. Khirbet Minsahlat radiocarbon dates.

Sample	Context	Age	?13 C	Calibrated Date 1- sigma
ISGS-A0244	Floor	4081 ± 48	-24.4	2840 - 2500 cal BCE
ISGS-A0245	Hearth	3973 ± 48	-24.5	2565 - 2460 cal BCE
ISGS-A0247	Hearth	4026 ± 49	-23.2	2618 - 2471 cal BCE

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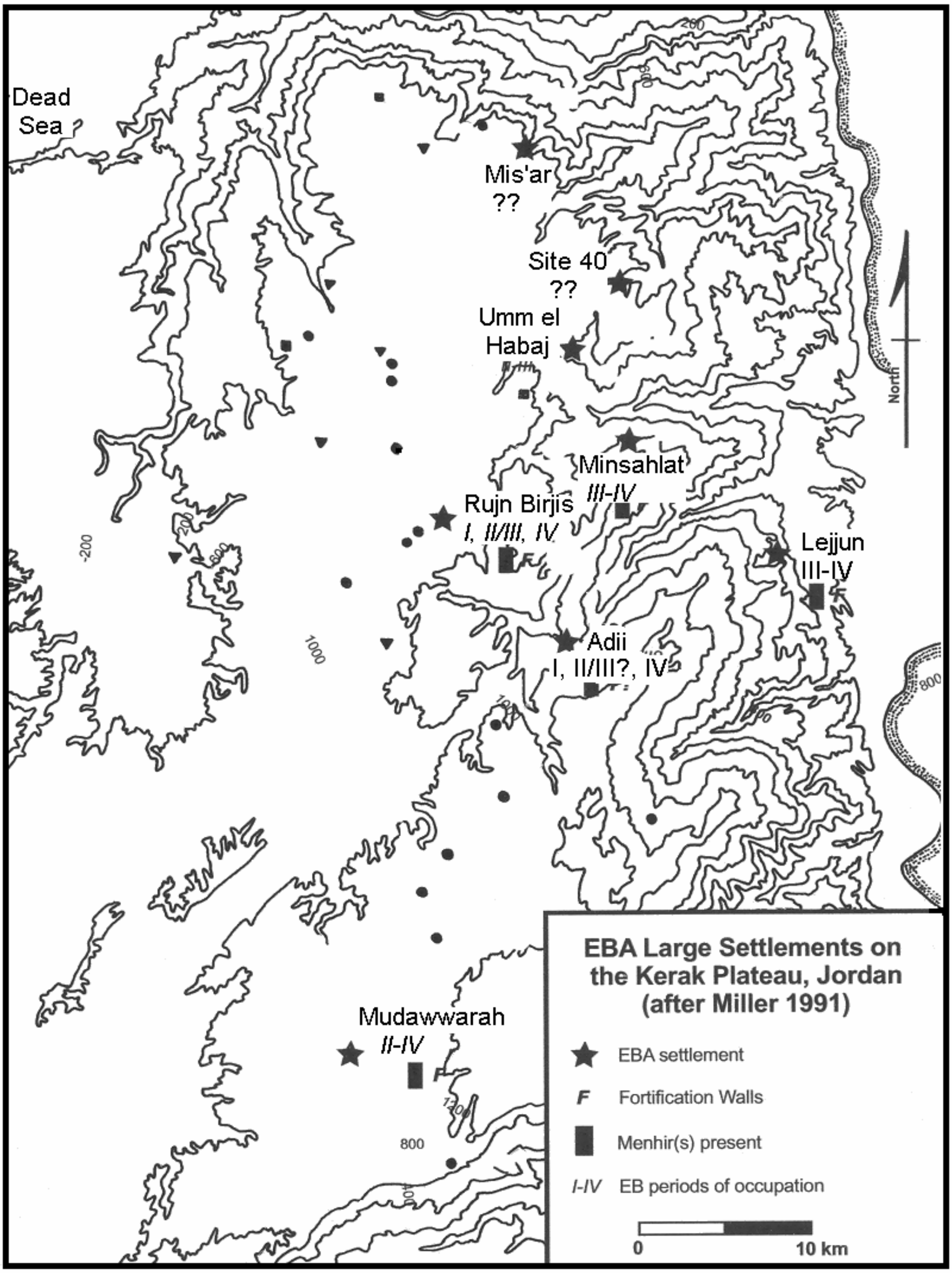

Fig. 1. Location of Khirbet el-Minsahlat and other Early Bronze Age sites on the Kerak Plateau, Jordan (after Chesson 2002).

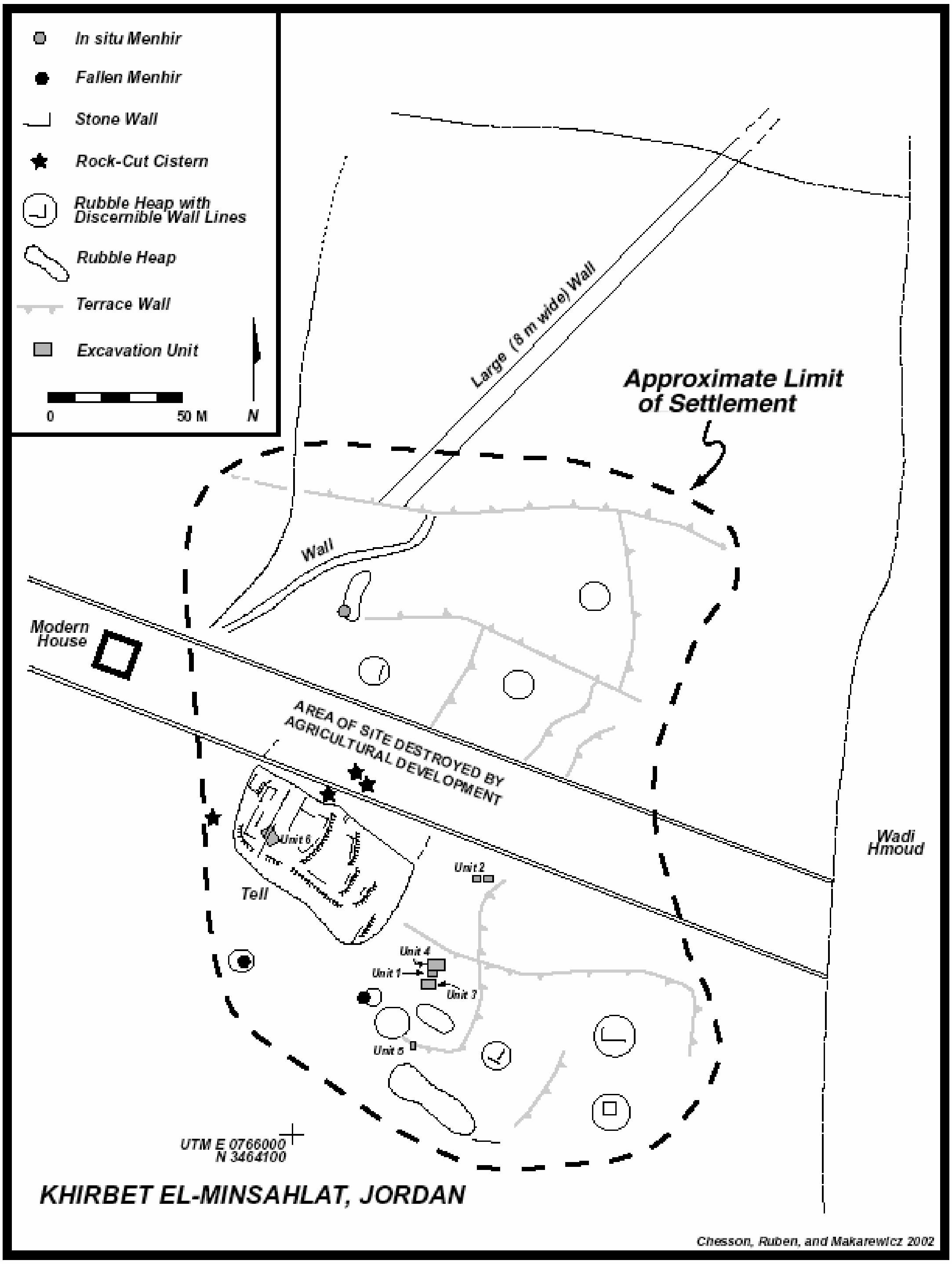

Fig. 2. Khirbet el-Minsahlat site map, including location of 2000 and 2001 excavation units.

Six excavation units, totaling 65 m^2 in area, were opened in both residential and non-residential areas during the 2001 and 2002 seasons at Minsahlat (Fig. 2) (Chesson *et al* 2002). Units 3 and 4 each contained a discrete residential unit and were further divided by the excavators into 'spaces' to differentiate between indoor and outdoor courtyard areas within the larger architectural unit. Faunal remains are reported by 'space' in Table 2.

Unit 1 was a 2 × 1 m 2001 test excavation unit and revealed part of the same domestic architectural unit as in Unit 3, which was placed 1 m away from Unit 1 during the 2003 season. Stratigraphic connections between Unit 1 and Unit 3 have been made, and with the exception of NISP counts, data for Units 1 and 3 are combined. Several limestone and basalt coursed walls run through Unit 3 (5×5 m), dividing the residential unit into three spaces of differing functions. Space 1 (S1) is an outdoor courtyard area during the earliest three phases, indicated by the presence of beaten earth and ash surfaces. An open doorway and associated threshold stone leads from S1 into indoor space S4. During the last occupation phase, the doorway was blocked with a large stone and S1 was filled with ash and debris, indicating that the space was no longer used as a living space but for refuse. S2 is a primary indoor residential space containing several floors and stone features. S4 is an indoor space containing a particularly interesting feature, composed of a shallow pit cut into mudbrick floor material in which 11 flat stones were placed to construct a rectangular space. Light ashy sediments were found within this feature, and dark ash was found outside the stones but still within the cut. Very little fauna was recovered from this feature, and the material found in it is extremely fragmentary.

Unit 4 (5 × 5 m) is located directly north of Unit 3, shares a wall with Unit 3, and contains two different spaces, S3 and S6. S3 is an entire residential building with floors, hearths, pillarbases, and stone installations. S6 is an outside space between buildings to the east of S3 bounded by three walls and the edge of the excavation. The earlier phases of S6 contained only earthen floors; the space was changed into a courtyard during the latest occupation phase with the construction of a well-laid floor and two slightly concave ceramic installations. Unit 2 (1 × 3.5 m), excavated to a depth of 1.5m, contained solely ashy sediments and is interpreted as a domestic midden. Bone density in the midden was extremely high.

Table 2. Number of Identified Specimens (NISP) at Minsahlat by architectural space.

	Unit 1	**Unit 2**	**Unit 3**			**Unit 4**		**Unit 6**	
Taxa	***Space 1***		***Space 1***	***Space 2***	***Space 4***	***Space 3***	***Space 6***		**Total**
Mammal	3	109	63	54	23	87	71	2	**412**
Medium mammal	42	128	69	72	43	145	34	32	**565**
Medium artiodactyl	79	397	127	167	61	278	120	24	**1253**
Medium bovid	1	16	4	6	1	18	8	0	**54**
Small mammal	2	0	7	1	0	1	1	1	**13**
Ovis/Capra/Gazella	2	2	10	1	2	5	8	3	**33**
Ovis/Capra	22	130	23	35	40	61	22	10	**343**
Capra sp.	6	29	16	13	8	14	3	7	**96**
Ovis sp.	2	16	13	9	8	11	3	3	**65**
Gazella sp.	1	3	0	0	0	1	0	0	**5**
Large mammal	1	5	2	12	3	3	3	2	**31**
Large artiodactyl	0	7	3	1	0	7	2	0	**20**
Bos sp.	1	1	5	3	1	3	5	0	**19**
Bos/Equus	2	1	2	0	0	0	1	0	**6**
Equus sp.	0	6	2	2	2	1	0	0	**13**
Oryx sp.	0	0	0	0	0	0	0	1	**1**
Medium cervid	0	0	1	0	0	0	0	0	**1**
Capreolus sp.	0	0	0	0	1	0	1	0	**2**
Sus sp.	0	0	0	0	0	1	1	0	**2**
Carnivore	0	0	0	0	0	1	0	0	**1**
Aves	0	0	0	1	1	0	0	2	**4**
Crustacean	0	1	2	2	0	1	0	0	**6**
Total NISP	**164**	**851**	**349**	**379**	**194**	**638**	**283**	**87**	**2945**

Several low mounds of uncertain function run across the site. Unit 5, a small test trench (2.5 × 1.5 m), was cut through a mound which runs down an east-west slope. Very few faunal remains were recovered from this unit, and they are not included in preliminary analysis due to the unclear chronological relationship between Unit 5 and the other excavation units. Unit 6, located on the southwestern edge of the tell, is a 4 × 6 m unit characterized by a large, non-residential wall system approximately 2 meters wide and at least 2.3 m in height, with more left still to excavate. Several floors articulating with the large wall were uncovered, but no other features have yet been identified. The presence of a relatively modern burial forced a reduction in the size of Unit 6 to 1 × 4 m, which was again reduced to a 2 × 1 m in order to uncover the bottom of the wall more quickly. Thus, faunal remains recovered from Unit 6 come from an extremely limited area.

Preliminary Results

It is only within the last decade that zooarchaeological data has become a priority in Bronze Age research agendas. Prior to this, faunal analyses moving beyond lists of taxa and relative abundance figures were relatively rare (Levy 1992: 74). Analyses attempting anything more were seriously hampered by methodological problems during the data collection stage, including an absence of sifted sediments and immediate conflation of data from smaller stratigraphic levels into broad cultural periods, obscuring changes in subsistence activity over time (Horwitz and Tchernov 1989). Fortunately several recent analyses coming from Early Bronze Age sites in Israel, Turkey, and Jordan are grounded in more rigorous data collection, employing fine-screen sediment sifting and recording specimen context at a more detailed level than the broad cultural level it originated from (Greenfield 2002; Bartosiewicz 1998; Dechert 1995; von den Driesch 1993). Importantly, these efforts allow for the examination of subsistence trends on smaller temporal and spatial scales, in particular subsistence changes within the Early Bronze Age and the spatial distribution of taxa and skeletal elements in respect to uncovered features.

Table 3a. Relative abundance of taxa, unadjusted.

n = 215

Capra sp.	44.6%
Ovis sp.	30.2%
Gazella sp.	2.3%
Bos sp.	8.8%
Equus sp.	6.0%
Sus sp.	1%
Capreolus sp.	1%
Oryx sp.	1%
Cervid	<1%
Carnivore	<1%
Aves	1.8%
Crustacean	2.8%

Table 3b. Relative abundance of taxa, proportionally allocated.

n= 2945

Capra sp.	57.4%
Ovis sp.	35.2%
Gazella sp.	2%
Bos sp.	1%
Equus sp.	1%
Sus sp.	<1%
Capreolus sp.	<1%
Oryx sp.	<1%
Cervid	<1%
Carnivore	<1%
Crustacean	<1%

All sediments at Minsahlat were sieved using a 2mm mesh screen since small screen size is known to greatly increase the quality of bone recovery (Payne 1972). Despite these measures, biases may still affect the faunal assemblage. Differential representation of skeletal parts may occur due to a variety of taphonomic processes, including diagenetic alteration, carnivore ravaging, and human cooking of bone (Lyman 1994). Carnivore or rodent gnawing was not noted on any of the Minsahlat specimens, and burned remains comprised c. 6% of the entire assemblage. The impact of pre- and post-depositional taphonomic processes on faunal assemblages can potentially impact conclusions about human subsistence strategies (Bar-Oz and Dayan 2002, 2003). There have been recent attempts to correct for taphonomic factors, although the viability of these models are still being tested (Munson 2000). It is unclear at this point the extent to which taphonomic processes have impacted the Minsahlat faunal assemblage and subsequent interpretations regarding human subsistence strategies. It is beyond the scope of this paper to address this topic in detail; future analyses will consider this issue separately.

Much of the bone recovered from Minsahlat was covered in a light concretion that fortunately had no impact on taxonomic identification due to the thinness of the concretion. Approximately 5% of the sheep and goat tooth remains were covered so as to obscure wear patterns. Despite this, an effort to remove concretions from these teeth was not made as it was clear

Table 4. Ovis sp., Capra sp., and Ovis/Capra fusion data (Ds = distal, Px = proximal, MC = metacarpal, MT = metatarsus, Ph = phalanx).

Ovis sp.	*Fused*	*Unfused*	***% Fused***
Scapula	0	0	**100%**
Acetabulum	2	0	
Px. Radius	2	0	**66%**
Ds. Humerus	2	2	
Ph. 1	3	1	**77%**
Ph. 2	7	2	
Ds. MC	1	0	**71%**
Ds. MT	1	0	
Ds. MP	0	2	
Ds. Tibia	3	0	
Px. Femur	2	3	**42%**
Px. Ulna	1	1	
Ds. Radius	0	0	
Px. Tibia	0	0	
Px. Humerus	0	2	**40%**
Ds. Femur	2	1	

Capra sp.	*Fused*	*Unfused*	***% Fused***
Scapula	1	0	**100%**
Acetabulum	5	0	
Px. Radius	1	0	**75%**
Ds. Humerus	2	1	
Ph. 1	4	5	**53%**
Ph. 2	5	3	
Ds. MC	3	2	**36%**
Ds. MT	0	2	
Ds. MP	0	3	
Ds. Tibia	1	0	
Px. Femur	0	3	**0%**
Px. Ulna	0	2	
Ds. Radius	2	0	
Px. Tibia	0	0	
Px. Humerus	0	0	**75%**
Ds. Femur	1	1	

Ovis sp. and Capra sp. *combined*	*Fused*	*Unfused*	**% Fused**
Scapula	1	0	
Acetabulum	10	2	**85%**
Px. Radius	5	1	
Ds. Humerus	5	3	**71%**
Ph. 1	7	7	
Ph. 2	14	5	**64%**
Ds. MC	5	2	
Ds. MT	1	2	
Ds. MP	0	5	
Ds. Tibia	7	0	**60%**
Px. Femur	2	6	
Px. Ulna	1	4	**23%**
Ds. Radius	2	1	
Px. Tibia	0	0	
Px. Humerus	0	3	**45%**
Ds. Femur	3	2	

that affected teeth were permanent ones from the upper jaw. As recorded, wear patterns from upper teeth only very broadly categorize life stage, here, "juvenile" or "adult". All measurements were taken following von den Driesch (1976) and are presented in millimeters to the nearest tenth. Sheep and goat tooth wear stages are recorded following the categories of Payne (1973) (Table 5) and cattle tooth wear according to Grant (1982). Relative abundance of taxa were calculated in two different ways - as raw unadjusted percentages, where only those specimens identified to genus level were utilized (Table 3a), and as adjusted percentages, where bones assigned to categories such as medium artiodactyl and medium mammal were proportionally allocated to taxon (Table 3b). The rationale behind this procedure relies on the premise that the composition of the unidentified fraction of the assemblage will most likely reflect the proportions of taxa in the identified fraction. Thus most of the shaft fragments, ribs, and skull fragments that comprise the specimens classified as medium artiodactyl, medium mammal, large artiodactyl, and large mammal are likely to have come from sheep and goat, the bones of which make up about 78% of the identified assemblage. The overall (proportionally allocated) assemblage is dominated by goat (c. 57%) followed by sheep (c. 35%). Cattle are not well represented, their bones making up only 1% of the proportionally allocated total. Remains of pig and wild taxa such as gazelle and roe deer were also recovered, but their numbers are also extremely few.

Capra sp. and *Ovis* sp.

Capra sp. and *Ovis* sp. are the most commonly identified taxa at Minsahlat (NISP= 96 and 65, respectively), a pattern typical of most Levantine EBA faunal assemblages. The dominance of goat may be attributed to environmental factors; goats are better adapted to drier environments and more marginal food sources. Fusion data for both sheep and goats are presented in Table 4, tooth wear in Table 5, and measurements in Table 6a (goat) and Table 6b (sheep). It is most likely that extremely young animals are underrepresented; 10% of medium artiodactyl fragments have been characterized as coming from animals juvenile or younger, categorized on the basis of the cortical bone being poorly developed. Very few skeletal remains were complete enough to allow for sexing. Two goat left ilia were identified as female and one goat pubis as male.

Table 5. *Capra* sp. and *Ovis* sp. tooth wear stages according to Payne (1973).

ID#	Unit (Space)	dp/4	P/4	M/1	M/2	M/3	STAGE
Capra sp.							
2129	3 (S1)					1	**D**
2159	4 (S3)		6				**E**
2324	3 (S2)					10	**G**
2046	3 (S4)					10	**G**
2003	4 (S6)					10	**G**
Ovis sp.							
964	2			erupting			**B**
2117	3 (S4)	at least 5		2			**C**
2261	3 (S2)			3			**C**
2103	3 (S4)	6		4			**C**
2105	3 (S4)	6		7			**C**
973	2	9					**D**
2104	3 (S4)	7		8			**D**
2130	3 (S1)		4	at least 7			**D/E**
2194	4 (S3)					6	**E**
2195	4 (S3)					6	**E**
2144	4 (S6)			8	8	10	**G**
Ovis/Capra sp.							
2277	4 (S3)			3			**C**
2005	4 (S6)			at least 7			**C**
2185	4 (S3)			8			**D**
2204	4 (S6)				8		**F/G**
2219	3 (S1)				8		**F/G**

Table 6a. Minsahlat *Capra* sp. measurements (in mm; after von den Driesch, 1976; pxfu = proximal fused, pxun = proximal unfused, dsfu = distal unfused, dsun = distal unfused, x = degree of fusion unknown).

ID #	Fusion					
Phalanx 1		***Bd***	***Bp***	***GL***	***Glpe***	***SD***
1875	x	13.0	x	x	x	x
2016	x	10.3	x	x	x	x
2139	x	11	x	x	x	x
2191	x	12.5	x	x	x	x
2218	pxfu	9.6	10.3	30.1	x	8.9
2223	pxfu	11.9	12.5	34.2	x	10.5
670	pxfu	15.0	12.0	x	39.0	11.0
809	pxfu	8.0	9.0	34.0	32.0	x
751	pxun	12.0	13.0	37.0	36.0	x
752	pxun	12.0	22.0	37.0	36.0	x
Phalanx 2		***Bd***	***Bp***	***GL***	***Glpe***	***SD***
2127	pxfu	13	10	x	x	10.0
2315	pxfu	7.2	9.2	19.6	x	7.0
2233	pxfu	9.2	12.2	22.1	x	8.8
667	pxfu	12	15	27.0	26.0	11.0
Phalanx 3		***Ld***	***DLS***			
2322	x	29.0	34.7			
Calcaneum		***Bd***				
712	x	16.0				
Metacarpal		***Bd***	***Bp***			
	x	29.0	x			
755	x	26.0	x			
	x	30.0	x			
764	x	x	23.0			
2134	dsun	x	17.0			
Radius		***Bp***	***Bfp***			
2075	pxfu	30.0	x			
885	dsfu	30.0	26.0			
Ulna		***BPC***				
2267	x	18.5				
2236	pxun	18.1				
Tibia		***Bd***				
	x	22.0				
2107	dsfu	21.5				
Talus		***Bd***	***Dm***	***Glm***	***GLI***	***DL***
2099	x	16.2	15.4	24.3	36.2	
	x	17.0	16.0	26.0	28.0	17.0
873	x	16.0	14.0	25.0	26.0	15.0
737	x	18.0	16.0	26.0	38.0	17.0
754	x	18.0	16.0	27.0	28.0	16.0

Table 6b. Minsahlat *Ovis* sp. measurements (in mm; after von den Driesch, 1976; pxfu = proximal fused, pxun = proximal unfused, dsfu = distal unfused, dsun = distal unfused, x = degree of fusion unknown).

ID #	Fusion					
Phalanx 1		***Bd***	***Bp***			
		11.0	12.0			
702	x	11.0				
Phalanx 2		***Bd***	***Bp***	***GLpe***	***GL***	**SD**
2151	pxfu	10.0	12.0	24.0	24.0	x
2186	pxfu	11.0	15.2	x	x	x
2210	pxfu	8.3	10.8	x	22.2	x
2243	pxfu	7.8	11.1	22.0	22.4	22.7
2257	pxfu	8.9	11.9	x	23.3	x
2269	pxfu	9.6	12.6	x	25.6	x
		10.0	13.0	x	26.0	x
765	pxfu	8.0	9.0	21	22.0	7
Phalanx 3		***DLS***	***Ld***			
731	x	35.0	27.0			
692	x	27.0	23.0			
Tibia		***Bd***				
2177	dsfu	28.0				
2183	dsfu	26.2				
2221	dsfu	24.1				
Talus		***Bd***	***Dm***	***GLm***	***GLI***	***Dl***
700	x	29.0	20.0	30.0	31.0	17.0
892	x	18.0	16.0	28.0	29.0	16.0
2326	x	20.7	x	29.2	30.7	x
Radius		***Bp***				
2076	pxfu	26.8				
Scapula		***BG***	***LG***			
2292	x	16.9	21.9			
Humerus		***BT***	***Bd***			
2018	dsun	31.8	x			
2235	dsfu	31.6	32.3			
684		27.0	31			
Femur		***Bp***				
2262	pxfu	43.4				
Metatarsal		***Bd***				
2101	dsfu	*17.5*				
		12.0				

Bos sp.

Only 19 bones from Minsahlat were identified as *Bos* sp. Specimens include a proximal femur, mandible fragments, a metacarpal fragment, two proximal metatarsals, a distal metapodial, a fused second phalanx, a proximal radius, an unfused proximal ulna, and several broken teeth. One upper M3 exhibits no wear and an undeveloped root system, indicating that it came from a juvenile animal. The horn core is extremely large, and probably from a male individual. The presence of older cattle at Early Bronze Age sites is generally interpreted as indicating the use of the animal for traction. Four large cut marks on the volar side of the radius suggests that cattle were processed in some manner and perhaps used as a food source. Measurements were taken on the radius (BP = 80.0 mm) and the second phalanx (Bd = 25.2, Bp = 29.2, SD = 24.4, and GL = 41.5 mm).

Equus sp.

Several equid remains, probably donkeys based on the small size of skeletal elements, were recovered from Minsahlat, including a proximal left third metatarsal (Bp = 41 mm), a fused distal tibia, two fibulae, an unfused lumbar vertebra, the glenoid fossa and spine of a scapula, a proximal femur, and a few teeth). It is still unclear exactly when and where the donkey was domesticated, but the substantial increase of donkey remains in Early Bronze Age sites is usually taken to indicate the presence of domesticated animals. Equid skeletal elements at EBA sites are often found in articulation, suggesting to some that they were not utilized primarily as a food source (Grigson 1993). The presence of pictorial representations from EBA contexts in Israel, where donkeys are loaded with goods, seems to attest to their importance as transport animals (Grigson 1993: 645). None of the equid bones recovered from Minsahlat were in articulation, but instead were found singly in floor removals, ashy pits, and ashy layers, indicating that the bones may have been processed in some manner, although none of the elements display cut marks.

Other taxa

Only two pig bones were recovered from Minsahlat - a rib and a tooth fragment. The low number of pig remains may be due to the small size of the assemblage, but could also be attributed to local environments that do not support pig populations. Grigson (1987) notes that during the Chalcolithic, pig bones are not present in sites located where rainfall is less than 200 mm per annum and are even less abundant in drier environments. Possible parallels with Minsahlat may be found in the pig material from Jericho; PPNB and Middle Bronze Age Jericho yielded a relatively large percentage of pig, 15.2% and 7.7% of the total number of identified specimen respectively, while the Early Bronze Age level contained only 1.8% (Clutton-Brock, 1979). While this difference between cultural periods may be due to different recovery procedures, it may also be due to conscious cultural choices by site occupants to not exploit pigs (Clutton-Brock 1979) or increased aridity during the EBA.

While it is not uncommon to find gazelle remains in Bronze Age deposits, they usually comprise only a small portion of the total faunal assemblage. In Horwitz and Tchernov's (1989) review of Bronze Age sites in Israel, gazelle remains usually account for approximately 4% of the total faunal assemblage for each site. Minsahlat is not much different, with *Gazella* sp. comprising approximately 2% of the remains identified. Remains include a fused distal metatarsal, two fused second phalanges, and a right mandible displaying a moderately worn dp/2 and dp/3, heavy wear on the dp/4, and erupting M/1 and M/2. Measurements were taken on one phalanx (Bp = 8.0 mm); all other specimens were broken in such a fashion that measurements could not be taken.

Very few other remains from wild taxa were recovered from Minsahlat. Particularly interesting is an oryx horncore recovered from a degraded mudbrick layer in Unit 6. A proximal radius and scapula fragment have been identified as *Capreolus capreolus*, and one first phalanx may be from a medium sized cervid. (Both the oryx and roe deer specimens were identified using the comparative collection at the CBRL in Amman). A fragmented medium carnivore incisor was also recovered. While the type of wild taxa present may indicate the type of local environment present around Minsahlat, wild animals also may have been hunted elsewhere and traded in (Horwitz and Tchernov 1989: 289).

Birds and Crustaceans

Detailed information concerning smaller taxa, including birds, reptiles, and fishes is not well reported for Bronze Age sites. Bird and fish remains have been recovered from Yarmouth, Arad, Tel Dalit, and Tel Aphek, but their role in human subsistence economies has not been discussed (Davis 1976, 1988; Hellwing and Gophn 1984; Lernau 1978). Bird remains from Minsahlat are few and all are shaft fragments. While fish remains have not yet been found, several crab claws have been recovered. Freshwater aquatic crabs are known to inhabit springs, streams, and rivers in the southern Levant, and if the crustacean remains originate from the wadi next to Minsahlat, their presence would indicate continual water flow in the wadi during the EB IV. However, the crabs could just as easily originate from springs or the rock-cut cisterns that may have been constructed during the EBA (Chesson *et al* 2003). The presence of a single claw was reported at the EB III walled settlement of Numeira (Finnegan 1984). Interestingly, crab claws were found at PPNA Netiv Hagdud (Tchernov, 1994) and are the most frequently occurring skeletal element at PPNA 'Iraq ed-Dubb (Mullen and Gruspier 1990). It is unclear if crabs were intentionally collected by humans for consumption at any of these occupations, including Minsahlat.

Discussion

The EB I through EB III has been traditionally characterized as a relatively stable period of secondary city-state formation and urban continuity, followed by the abandonment of walled settlements and the complete collapse of the urban structure during the EB IV (Richard 1987). Here, pastoralism was implicitly understood to have a relatively marginal role in subsistence economies in comparison to the agrarian sector during the EB I-III, and pastoral-nomadic models were used to define EB IV post-urban social and economic structures (Dever 1992; Falconer and Magress-Gardiner 1984, 1989; Prag 1985). However, recent discussions have re-oriented our understanding of EBA political, social, and economic structures in the southern Levant by focusing on 'corporate village models' where these agricultural and pastoral systems are managed heterarchically within the community by cooperative structures including families, lineages, or neighborhoods (Chesson 2003; Philip 2001, 2003). The use of corporate village (Philip 2001; Schwartz and Falconer 1994) and 'house society' models (Chesson 2003) as frameworks for understanding the EBA requires a re-evaluation of the role of pastoralism within EBA economic and political structures. The careful contextual controls and excellent recovery procedures make the excavated faunal assemblage from Minsahlat a good starting point for investigating the role of pastoral production in EBA social, political, and economic structures.

The use of pastoral products such as meat, milk, and wool at Minsahlat were understood through the use of animal age profiles and the spatial distribution of skeletal remains. Three separate survivorship-profiles were constructed using fusion data for sheep, goat, and a combined sheep/goat category from residential Units 3 and 4 (Fig. 3). The kill-off pattern for both sheep and goat is the same through the second fusion stage, after which the patterns diverge drastically. Seventy percent of sheep survived the first four life stages, closely mirroring Redding's (1984) theoretical age profile for wool production. The goat profile, however, indicates a steady reduction of animals as they become older. Only 36% of goats survived the fourth stage, a pattern typical of animals exploited for their meat. Female: male ratios could potentially corroborate these finds, but the small size of the assemblage does not permit the construction of reliable sex ratios.

The distinct nature of the sheep and goat age profiles may reflect a flexible resource exploitation

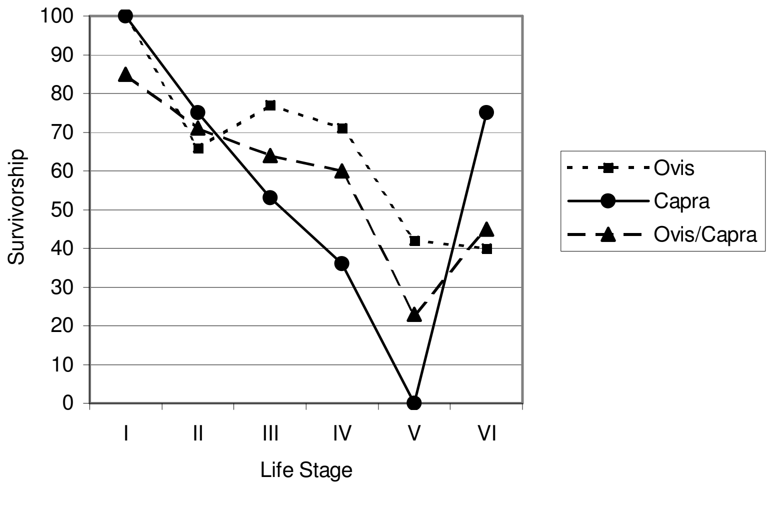

Fig. 3. Survivorship curves for *Ovis* sp., *Capra* sp., and *Ovis/Capra* combined.

Table 7. Sheep vs. goat skeletal distribution by residential unit.

	Unit 3	Unit 4
Ovis sp.		
Forelimb	33.3%	18.2%
Hindlimb	29.2%	45.4%
Foot	37.5%	36.4%
	n = 24	*n = 11*
Capra sp.		
Forelimb	12.1%	38.5%
Hindlimb	27.3%	0.0%
Foot	60.6%	61.2%
	n = 33	*n = 13*
OC/OCG		
Forelimb	44.4%	25.0%
Hindlimb	22.2%	43.8%
Foot	33.3%	21.9%
	n = 54	*n = 32*

strategy utilized to cope with the constraints imposed by the local dry-farming and steppic ecological zones of the Kerak Plateau (Palumbo 2001; Philip 2001). It has been suggested that these strategies operate on both household and community levels in the form of a heterarchical corporate village, where groups of people related by kinship or some other institutional affiliation, work as a group to achieve economic, social, and political goals (Philip 2001; Schwartz and Falconer 1994). It is anticipated that this model can be evaluated in part with the faunal data, with special attention to the spatial distribution of taxa and skeletal elements. Initial analysis indicates some interesting, albeit very preliminary, patterns in the distribution of goat *versus* sheep appendicular skeletal elements between domestic residential structures. If the distribution is examined according to residential unit, where Spaces S1, S2, and S4 form one distinct unit (Unit 3 and 1 combined) and Spaces S3 and S6 form a second, separate unit (Unit 4), broad disparities between sheep and goat representation are visible (Table 7). Each residential area contains different proportions of goat appendicular skeletal elements. Unit 3 contains c. 30% hindlimbs while Unit 4 contains none at all, yet Unit 4 contains c. 39% forelimbs while Unit 3 contains only 11%. The proportion of goat feet elements between both units is similar. The distribution of sheep axial elements, however, is much more similar between both residential units.

One hypothesis to help account for this differential skeletal patterning between taxa, where there is a broadly even appendicular element distribution for sheep and extremely dissimilar pattern for goats, focuses on the presence of an administrative system responsible for food redistribution. Several EBA sites contain non-domestic structures used for central storage of agricultural products (Genz 2003; Mazar 2001; de Miroschedji 1999; Tubb and Dorrel 1994; Mittman 1994), suggesting resource redistribution by an institutionalized administration, perhaps a kinship-based corporate group (Palumbo 2001). The absence of conspicuous consumption and elites at Minsahlat and other EBA sites, further supports the use of surplus products by a corporate decision-making body for community-level projects (Philip 2001: 184). While a central storage area has not yet been uncovered at Minsahlat, the presence of fortification systems suggests that economic and social structures capable of carrying out large-scale public constructions such as storage facilities were in place.

Although surplus redistribution is generally associated only with agricultural products such as grains, grapes, and oil, the pastoral sector could have easily accrued surplus products for redistribution. Faunal remains from EB II-III Tel Dan are interpreted to indicate meat redistribution within the community (Wapnish and Hesse 1991). Based in part on these findings at Tel Dan, it can be hypothesized that an administrative entity at Minsahlat engaged in wool production, possibly for long-distance exchange with other EBA communities, and then distributed sheep meat once sheep wool productivity declined. As an alternative hypothesis, the differential patterning of *goat* remains may also indicate centralized milk production and subsequent meat distribution, but different cuts of meat had different values and were redistributed within the community according to the social or economic standing of the household (Wapnish and Hesse 1988). While the mortuary data do not clearly reveal the extent and intensity of social hierarchies during the EBA (Palumbo 2001), there is increasing evidence that distinctions between corporate groups were emerging throughout the period (Chesson 2003; 1999), possibly leading to differential distribution of resources. It seems more likely, however, that a corporate administrative system would utilize sheep wool rather than goat milk for local or regional exchange as food products might not hold as much value as those products such as wool which can be further processed into a more valuable material.

While corporate level production and redistribution was probably necessary to carry out community level projects, household level production likely formed the basis of the subsistence economy during the EBA. The sheep, goat, and combined sheep/goat age profiles at Minsahlat display a drop-off in surviving animals during the first life stage. Skeletal elements from infant animals were recovered from the residential units, but since these specimens were not identified to taxon, they are absent from the survivorship data. If these specimens are considered, survivorship during the first life stage would decrease significantly, a pattern that is expected for milk production. Specimens identified as coming from infants (n = 24) were recorded in several categories including medium mammal, medium artiodactyl, *Ovis/Capra/Gazella*, *Ovis/Capra, Ovis* sp., and *Capra* sp. It seems likely that most of these bones came from sheep or goat.

The presence of infant material may be indicative of household milk production. While it is not known if the majority of infant-aged skeletal elements came from sheep or goats, it is interesting to note that goats, which are hypothesized to have been controlled on a household level at Minsahlat based on skeletal part distribution, produce milk almost two months longer than do sheep. If breeding is scheduled accordingly, milk can be made available for almost ten months out the year (Palmer 2002). Unlike meat, which is produced only once per dead animal, milk provides a nearly continuous source of fresh product from a living animal, reducing risk at the subsistence level (Wapnish and Hesse 1991; Cribb 1984). Milk can also be processed in a variety of ways, some of which result in products which can be stored for months or even years (Palmer 2002). Milk processed into long-shelf life products potentially allows households to engage in trade even during times of scarcity of fresh resource.

The faunal remains from Minsahlat have revealed patterns, leading to the formation of several hypotheses regarding subsistence economy and political structure. One must emphasize that these are *hypotheses* that can be tested only with additional excavations and an increased assemblage size. Based on the preliminary data, it is suggested that the inhabitants of Minsahlat engaged in a complex risk-reducing strategy that focused on maintaining economic security on both household and community levels, a pattern that seems to be fairly characteristic of Levantine EBA and MBA occupations (Falconer 1995). It is hypothesized that this was accomplished with goat meat and milk production at the household level combined with sheep wool production and meat redistribution by a more centralized administrative system. A diversified economy on both household and institutional levels allows for greater stability during periods of social or economic stress. The hypothesized presence of a highly diversified, stable economy at transitional EB III/IV Minsahlat suggests that pastoral activity in the EB IV was not nomadic or completely rurally oriented at this time, as previously suggested. Although it remains to be seen if pastoral production strategies formed part of a complex heterarchical system at Minsahlat, future work at the site promises to increase the faunal and botanical remains through exposure of more residential and non-residential architecture and should permit us to test the validity of the hypotheses presented here.

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References

Bar-Oz G. and T. Dayan, 2002. "After 20 years" : A taphonomic re-evaluation of Nahal Hadera V, an Epipaleolithic site on the Israeli coastal plain. *Journal of Archaeological Science* 29: 145-156.

Bar-Oz G. and T. Dayan, 2003. Testing the use of multivariate inter-site taphonomic comparisons: the faunal analysis of Hefzibah in its Epipaleolithic cultural context. *Journal of Archaeological Science* 30: 88-900

Bartosiewicz L., 1998. Interim report on the Bronze Age animal bones from Arslantepe (Malatya, Anatolia). In: H. Buitenhuis, L. Bartosiewicz, and A.M. Choyke (eds.), *Archaeozoology of the Near East III*. Groningen, ARC-Publicaties 18, pp. 221-232.

Clutton-Brock J., 1979. The mammalian remains from the Jericho Tell. *Proceedings of the Prehistoric Society* 45: 135-157.

Chesson M.S., 2003. Households, houses, neighborhoods and corporate villages: modeling the Early Bronze Age as a House Society. *Journal of Mediterranean Archaeology* 16: 79-102.

Chesson M.S. and C. Makarewicz, I. Kuijt and C. Whiting, C., in press. Results of the 2001 Kerak Plateau survey. *Bulletin of the American School of Oriental Research.*

Cribb R., 1984. Computer simulation of herding systems as an interpretive and heuristic device in the study of kill-off strategies. In: J. Clutton-Brock and C. Grigson (eds.), *Animals and Archaeology 3: Early herders and their Flocks*. Oxford, BAR International Series, 202, pp. 161-170.

Davis S.J., 1976. Mammal bones from the Early Bronze Age city of Arad, northern Negev, Israel: Some implications concerning human exploitation. *Journal of Archaeological Science* 3: 153-164.

Davis S.J., 1988. The mammal bones: Tel Yarmuth 1980-1983. In: P. de Miroschedji, *Yarmouth 1*, Paris, Editions Recherche sur les Civilizations, pp. 143-149.

Dechert B., 1995. The bone remains from Hirbet ez-Zeraqon. In: H. Buitenhuis and H.-P. Uerpmann (eds.), *Archaeozoology of the Near East.* Leiden: Backhuys, pp. 79-87.

Dever W.G., 1992. Pastoralism and the end of the urban Early Bronze Age in Palestine. In: O. Bar-Yosef and A. Khazanov (eds.), *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Madison, Wisconsin, Prehistory Press, pp. 83-92.

Driesch A. von den 1976. A guide to the measurement of animal bones from archaeological sites. *Peabody Museum Bulletin* 1. Cambridge, Harvard University,

Driesch A. von den 1993. Faunal remains from Habuba Kabira in Syria. In: H. Buitenhuis and A.T. Clason (eds.), *Archaeozoology of the Near East I*. Leiden, Backhuys Publishers, pp. 52-59.

Falconer S.E., 1995. Rural responses to early urbanism: Bronze Age household and village economy at Tell el-Hayyat, Jordan. *Journal of Field Archaeology* 22: 399-419.

Falconer, S.E. and B. Magness-Gardiner, 1984. Preliminary report of the first season of the al-Hayyat Project. *Bulletin of the American Schools of Oriental Research* 255: 49-54.

Falconer S.E. and B. Magness-Garinder, 1989. Hayyat (Tell al-). In: D. Homes-Fredericq and J.B. Hennessy (eds.), *Archaeology of Jordan. II. 1. Field Reports: Surveys and Sites A-K.* Leuven: Peeters, pp. 254-61.

Finnegan M., 1984. Faunal remains from Bab edh-Dhra and Numeira. In: W.E. Rast and R.T. Schaub (eds.), *The Southwestern Dead Sea Plain Expeditions: An Interim Report of the 1977 Season*. Cambridge, The Annual of the American Schools of Oriental Research 46, pp. 177-180.

Genz H., 2003. Cash crop production and storage in the Early Bronze Age Southern Levant. *Journal of Mediterranean Archaeology* 16 (1): 59-78.

Grant, A., 1982. The use of tooth wear as a guide to the age of domestic ungulates. In: B. Wilson, C. Grigson, and S. Payne (eds.), *Ageing and Sexing Animal Bones From Archaeological Sites*. Oxford, BAR British Series 109, pp. 91-108.

Greenfield H., 2002. Preliminary report on the faunal remains from the Early Bronze Age site of Titris Höyük in southeastern Turkey. In: H. Buitenhuis, A.M. Choyke, M. Mashkour, and A.H. al-Shiyab (eds.), *Archaeozoology of the Near East V*. Groningen, ARC-Publicaties 32, pp. 251-260.

Grigson C., 1987. Shiqmim: Pastoralism and other aspects of animal management in the Chalcolithic of the northern Negev. In: T.E. Levy (ed.), *Shiqmim I: Studies Concerning Chalcolithic Societies in the Northern Negev Desert, Israel (1982-1984)*. Oxford, BAR International Series 356, pp. 219-241.

Grigson C., 1993. The earliest domestic horses in the Levant? – New finds from the fourth millennium of the Negev. *Journal of Archaeological Science* 20: 645-655.

Hellwing S. and R. Gophna, 1984. The animal remains from the Early and Middle Bronze Ages at Tel Aphek and Tel Dalit: a comparative study. *Tel Aviv* 11: 48-59.

Horwitz L.K. and E. Tchernov, 1989. Animal exploitation in the Early Bronze Age of the Southern Levant: an overview. In: P. de Miroschedji (ed.), *L'Urbanisation de la Palestine à l'âge du Bronz ancien*, Oxford, BAR International Series 527 (II), Oxford, pp. 276-296.

Lernau H., 1978. Faunal remains. In: R. Amiran, *Early Arad, the Chalcolithic Settlement and Early Bronze Age City. I.*, Jerusalem, Israel Exploration Society, pp. 83-113.

Levy, T. 1992. Transhumance, subsistence, and social evolution in the northern Negev desert. In: O. Bar-Yosef and A. Khazanov (eds.), *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Madison, Wisconsin, Prehistory Press, pp. 65-92.

Lyman R.L., 1994. *Vertebrate taphonomy*. Cambridge, Cambridge University Press.

Mazar A., 2001. On the significance of the Early Bronze III granary building at Beit Yerah. In: S.R. Wolff (ed.), *Studies in the Archaeology of Israel and Neighbouring Lands in Memory of Douglas L. Esse*. Studies in Ancient Oriental Civilizations 59. Chicago, The Oriental Institute, University of Chicago, pp. 447-464.

Miller J.M., 1991. *Archaeological Survey of the Kerak Plateau*. Atlanta, Scholars Press.

Miroschedji P. de., 1999. Yarmouth: The dawn of city-states in Southern Canaan. *Near Eastern Archaeology* 62: 2-19.

Mittmann S., 1994. Herbet ez-Zeraqon: Eine Stadt der frühen Bronzezeit in Nordjordanien. *Archaeologie in Deutschland*: 10-15.

Mullen G. and K. Grurpier, 1990. Preliminary analysis of faunal remains from ‘Iraq ed-Dubb, WY130. *Annual of the Department of Antiquities of Jordan, Amman* 34: 114.

Munson P.J., 2000. Age-correlated differential destruction of bones and its effect on archaeological mortality profiles of domestic sheep and goats. *Journal of Archaeological Science* 27: 391-407.

Palmer C., 2002. Milk and cereals: Identifying food and food identity among Fallahin and Bedouin in Jordan. *Levant* 34: 173-195.

Palumbo G., 1991. *The Early Bronze Age IV in the Southern Levant: Settlement Patterns, Economy, and Material Culture of a ‘Dark Age’*. Rome, Contributi e Materiali di Archaeologia Orientale 3.

Palumbo G., 2001. The Early Bronze Age IV. In: B. MacDonald, R. Adams, and P. Bienkowski (eds.), *The Archaeology of Jordan*. Sheffield, Academic Press, pp. 233-269.

Payne S., 1972. Partial recovery and sample bias: the results from some sieving experiments. In: E.S. Higgs (ed.), *Papers in Economic Prehistory*, Cambridge, University Press, pp. 49-64.

Payne S., 1973. Kill-off patterns in sheep and goats: The mandibles from Aşvan Kale. *Anatolian Studies* 23: 281-303.

Philip G., 2001. The Early Bronze I-III Ages. In: B. MacDonald, R. Adams, and P. Bienkowski (eds.), *The Archaeology of Jordan*, Sheffield, Academic Press, pp. 163-232.

Philip G., 2003. The Early Bronze Age of the Southern Levant: A landscape approach. *Journal of Mediterranean Archaeology* 16: 103-132.

Prag K., 1985. Ancient and modern pastoralism in the Levant. *Levant* 17: 81-88.

Rast W.E. and R.T. Schaub, 1981. *The Southeastern Dead Sea Plain Expeditions: An Interim Report of the 1977 Season*. Annual of the American Schools of Oriental Research 46, Cambridge, MA: American Schools of Oriental Research.

Redding R.W., 1984. *Theoretical determinants of a herder’s decisions: modeling variation in the sheep/goat ratio*. Oxford, BAR International Series 202, pp. 223-241.

Richard, S., 1987. The Early Bronze Age, the rise and collapse of urbanism. *Biblical Archaeologist* 50: 22-43.

Schwartz G.M. and S.E. Falconer, 1994. Rural approaches to social complexity. In: G.M. Schwartz and S.E. Falconer (eds.), *Archaeological Views from the Countryside: Village Communities in Early Complex Societies*. Washington, D.C: Smithsonian Institution, pp. 19-36.

Tchernov E., 1994. *An Early Neolithic Village in the Jordan Valley Part II: The Fauna of Netiv Hagdud*. American School of Prehistoric Research Bulletin 44, Cambridge, Peabody Museum of Archaeology and Ethnology, Harvard University.

Tubb J.N. and P.G. Dorrell, 1994. Tell es-Sa’idiyeh 1993: Interim report on the seventh season of excavations. *Palestine Exploration Quarterly* 126: 52-67.

Wapnish P. and B. Hesse, 1988. Urbanization and the organization of animal production at Tell Jemmeh in the Middle Bronze Age Levant. *Journal of Near Eastern Studies* 47: 81-94.

Wapnish P. and B. Hesse, 1991. Faunal remains from Tel Dan: Perspectives on animal production at a village, urban and ritual. *Archaeozoologia* 4: 9-86.