'Atiqot 75, 2013

Early Bronze Age Fauna from Qiryat Ata—Area O

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Extensive salvage excavations at the site of Qiryat Ata encompassed 15 different areas (see Golani, this volume). Faunal remains have previously been published from Areas A–G (Horwitz 2003) and Area L (Sade 2000). This report describes the fauna from Area O, situated between Areas G and K, on the southern boundary of the site adjacent to Ha-Te'enim Street (Golani, this volume: Plan 1).

In Area O, the same stratigraphic sequence as previously found in other areas of the site was identified (Golani, this volume: Table 1): Phase 1 equals Areas A–G and L Stratum I—Early Bronze Age II (EB II); Phase 2 equals Areas A–G and L Stratum II—EB IB; and Phase 3 equals Areas A–G and L Stratum III—early EB IB.

Methods

The faunal remains were analysed following the same methodological protocol as applied to the previously excavated assemblages from Areas A–G (Horwitz 2003). The total number of identified bones per species (NISP), as well as their frequencies and estimates of the minimum number of individuals (MNI), are given in Table 1. MNI estimates were calculated for each phase based on the most frequently occurring skeletal elements according to the ages of animals represented. Sheep and goats were identified using morphometric criteria outlined in Boessneck, Müller and Teichert (1964) and Prummel and Frisch (1986). Ageing of cattle based on bone fusion and tooth eruption stages follows Grigson (1982), while ageing of pigs and sheep/goat follows Silver (1969). Dental attrition stages for cattle and pigs follow Grant (1982). Skeletal element counts are given in Table 2 and grouped into five categories based on the major body parts in Table 3. All bones were examined for modifications, including burning, animal damage and butchery marks. Measurements taken of bones and teeth are after von den Driesch (1976) with a few additions which are noted where relevant (Appendix 1).

Material

Area O yielded only 118 identified bones and 21 unidentified bone fragments. The small size of this assemblage may be attributed to the limited extent of the excavation, further compounded by collection methods since bones were primarily hand collected. These limiting factors are reflected in the clear bias for bones of larger animals, large skeletal elements and absence of bones of small-sized species, such as fish (despite the proximity of the Qishon river and Mediterranean Sea), rodents, reptiles and birds, all species represented in the larger excavation in Areas A–G at this site.

Phase 3: Early Bronze Age IB (L813, L818, L819, L821, L832, L833, L856, L858 and L865)

A total of 24 identified animal remains were recovered from surface cleanings, as well as outside (L808) a preserved section of an oval house (Structure 1). No bones were recovered from within this structure (L868).

The most common species in this assemblage is pig (58.5%), followed by sheep/goat (25%) and cattle (12.5%) (Table 1). In this sample, no distinction could be made between bones

Table 1. NISP, MNI Counts and Relative Frequencies of the Different Species Represented in Each Stratum (Areas A–G and L) or Phase (Area O) at the Site

Species	Early EB IB				Late EB IB					EB II				
	Stratum III	Phase 3			Stratum II		Phase 2			Stratum 1		Phase 1		
	Areas A–G	Area O			Areas A–G	Area L	Area O			Areas A–G	Area L	Area O		
	%	NISP	MNI	%	%	%	NISP	MNI	%	%	%	NISP	MNI	%
Domestic														
Sheep (*Ovis aries*)	0.6	-	-	-	1.0	-	-	-	-	0.1	-	-	-	-
Goat (*Capra hircus*)	2.0	-	-	-	1.0	-	-	-	-	2.0	-	-	-	-
Sheep/goat (*Ovis/Capra*)	21.5	6	1	25.0	34.0	56.0	1	1	3.8	38.0	54.0	5	1	7.3
Cattle (*Bos taurus*)	25.0	3	1	12.5	39.0	25.0	16	1	61.5	33.0	44.0	48	2	70.5
Pig (*Sus scrofa dom.*)	37.0	14	1	58.3	19.0	14.0	9	3	34.6	19.5	1.0	13	3	19.1
Dog (*Canis familiaris*)	0.6	-	-	-	-	3.0	-	-	-	0.3	-	-	-	-
Donkey (*Equus asinus*)	-	-	-	-	0.5	1.0	-	-	-	1.0	-	-	-	-
Wild														
Aurochs (*Bos primigenius*)	0.6	-	-	-	1.0	-	-	-	-	-	-	-	-	-
Wild boar? (*Sus scrofa fer.*)		-	-	-			-	-	-	0.5		2		3.0
Red deer (*Cervus elaphus*)	0.6	-	-	-	-	-	-	-	-	0.1	-	-	-	-
Fallow deer (*Dama mesopotamica*)	3.5	-	-	-	-	-	-	-	-	1.0	-	-	-	-
Cervid sp.	3.5	-	-	-	-	-	-	-	-	0.5	-	-	-	-
Mountain gazelle (*Gazella gazella*)	3.5	-	-	-	1.0	-	-	-	-	1.0	-	-	-	-
Small carnivore	-	1	1	4.1	-	-	-	-	-	-	-	-	-	-
Hyaena (cf. *Hyaena hyaena*)	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-
Bear[i] (*Ursus arctos*)	-	-	-	-	1.0	-	-	-	-	0.5	-	-	-	-
Rodent (*Rodentia*)	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Bird (*Aves*)	0.6	-	-	-	1.5	-	-	-	-	0.3	-	-	-	-
Spur-thighed tortoise (*Testudo graeca*)	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Fish (*Pisces*)	0.6	-	-	-	-	-	-	-	-	0.3	-	-	-	-
Freshwater crab (*Potamon potamios*)	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Total NISP	169	24	4	100	203	147	26	5	100	520	72	68	6	100
Unidentified Bones		5					11					0		

X = present

[i] The bear probably originated in Stratum II, even though some of its bones were found in Stratum I contexts (see Horwitz 2003).

Table 2. NISP Counts of Skeletal Elements for the three Main Taxa in Area O

	Phase 3 Early EB IB			Phase 2 Late EB IB			Phase 1 EB II		
	Sheep/Goat	Cattle	Pig	Sheep/Goat	Cattle	Pig	Sheep/Goat	Cattle	Pig
Skull			2					2	
Maxilla			2			1			
Upper isolated teeth								2	
Mandible			1		1	2		1	3
Lower isolated teeth						1	1	1	
Axis								1	
Cervical vertebrae								2	
Thoracic vertebrae					1		1	2	
Lumbar vertebrae					1				
Vertebrae undet.								4	
Sacrum									1
Ribs	1	3	3		2			9	
Scapula					4			3	1
Humerus			2		2			4	3
Radius			1			1	1	2	
Ulna						1		1	
Metacarpal					1			1	
Pelvis									2
Femur	2		1			1		4	
Tibia	1		2	1			2	4	3
Calcaneum								1	
Metatarsal					1			2	1
Phalanx I					2			1	
Metapodial	2				1	2		1	1
Total NISP	6	3	14	1	16	9	5	48	15

of sheep and goat. The size of pigs appears to fall within the range of domestic pigs recovered from other strata at the site (Appendix 1). A single shaft fragment identified as belonging to a small, unidentified carnivore, possibly fox, was also noted.

The pig remains are primarily those of immature animals: unfused occipital, parietal and zygomatic bones of the same piglet and an upper M3 with no wear—both representing at least one animal aged c. 17–22 months. A fused distal humerus indicates the presence of an animal aged older than 1 year (Silver 1969), and may represent the same animal as a lower PM3 with no wear. In terms of NISP counts, pig body parts are represented in similar numbers, but given the small sample size, the percentage differences between them should be

Table 3. Skeletal Element Breakdown by Category for Cattle and Pigs by Strata/Phases

(a) Cattle

	Stratum III	Phase 3		Stratum II	Phase 2		Stratum I	Phase 1	
	Areas A–G	Area O		Areas A–G	Area O		Areas A–G	Area O	
	%	NISP	%	%	NISP	%	%	NISP	%
Cranial	25.0	0	0	14. 5	1	6.2	21.0	6	12.5
Forelimb	16.0	0	0	13.2	7	44.0	20.4	11	23.0
Hindlimb	23.0	0	0	29.0	1	6.2	25.0	12	25.0
Trunk	27.2	3	100	42.1	5	31.1	26.1	18	37.5
Feet	9.0	0	0	1.2	2	12.5	7.5	1	2.0
Total NISP	44.0	3	100	83.0	16	100.0	172.0	48	100.0

(b) Pig

	Stratum III	Phase 3		Stratum II	Phase 2		Stratum I	Phase 1	
	Areas A–G	Area O		Areas A–G	Area O		Areas A–G	Area O	
	%	NISP	%	%	NISP	%	%	NISP	%
Cranial	14.0	5	36.0	26.3	4	44.5	23	3	20.0
Forelimb	32.5	3	21.4	18.3	2	22.2	30	4	26.7
Hindlimb	28.5	3	21.4	34.2	3	33.3	23	7	46.6
Trunk	22.0	3	21.4	16.0	0	0	19	1	6.7
Feet	3.0	0	0	5.2	0	0	5	0	0
Total NISP	63.0	14	100.0	38.0	9	100.0	104	15	100.0

Cranial: skull, antler, horn, maxilla, mandible and loose teeth
Forelimb: scapula, humerus, radius, ulna, metacarpal, carpals
Hindlimb: pelvis, femur, tibia, patella, calcaneum, astragalus, metatarsal, tarsals
Trunk: atlas, axis vertebrae, cervical and thoracic, lumbar and caudal vertebrae
Feet: 1st, 2nd and 3rd phalanges

related to with caution (Table 3). The absence of foot bones probably relates to the fact that this assemblage was not sieved, such that these small bones were not recovered. The samples for the other species are too small to allow a meaningful assessment of age and skeletal part representation.

A single modified bone, the tip of a bone point, was recovered from L821 in this phase (Fig. 1). The point was made on a mammalian long bone shaft that had been halved and then smoothed on both its outer and inner (medullary cavity) aspects. Longitudinal stria are evident on the outer surface of this piece, probably resulting from use-wear rather than from the manufacturing process. Other modified bones include a cattle tibia shaft with a single, deep chop mark on it's proximal end. Four of the five unidentified bone fragments from this stratum, all four deriving from L856, were burnt.

Fig. 1. Broken bone point from Stratum III (early EB IB).

Phase 2: Late Early Bronze Age IB (L811, L814, L816, L829, L848 and L864)

The small sample of 26 identified bones from this stratum derives from debris on surface cleanings and from within a small (diam. 2 m) circular structure (Structure 2; L864) that probably served as a storage installation. Within this structure only five bones were recovered: two cattle metatarsal shaft fragments, a pig distal metapodial and two unidentified fragments of a large mammal long bone. It is most likely that these remains are not associated with the original function of the installation but represent fill.

For Phase 2 as a whole, remains of cattle are the most numerous (61%) followed by pig (35%), with only scarce remains of sheep/goat (4%) for which the two species could not be separated (Table 1). Only few of the cattle bones could be aged, all belonging to animals older than 1.5–2 years (fused 1st phalanx). Likewise, due to the small sample size, no age determinations could be made for sheep/goat. For pigs, however, it is clear that the majority of remains belong to young animals. At least two immature pigs are present: one aged 14–17 months (dp3—Grant stage d, M1 erupted no wear—Grant stage a) and another animal aged c. 2 years (M1 erupted—Grant wear c, and permanent PM4 erupted with no wear). In addition, two bones of a sub-adult pig, aged slightly less than 3–3.5 years (fusing distal ulna and an unfused distal femur), were identified in the same locus (L864).

Too few skeletal elements of sheep/goat are represented to determine any patterning. Cattle body parts contain few cranial remains (i.e., few teeth and jaws) with trunk, forelimb and foot elements the most numerous (Tables 2, 3). An opposite pattern is found for pigs, with high frequencies of cranial, fore- and hindlimb elements, but no trunk or foot bones. However, the significance of these trends is questionable given the small size of the sample.

Of the 11 unidentified fragments, only one unidentified fragment, from L848, was burnt.

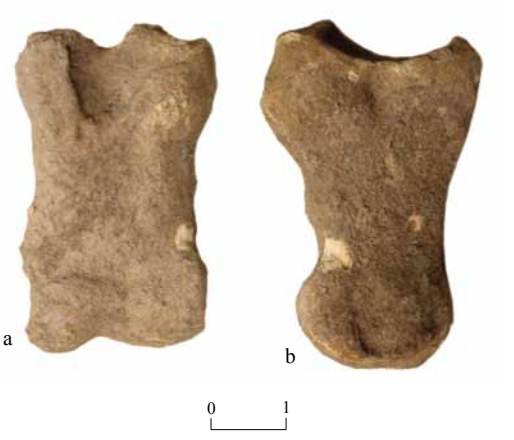

Fig. 2. Domestic cattle (*Bos taurus*) adult 1st phalanx (Phase 1, L846): (a) dorsal view; (b) lateral view.

No evidence for butchery was found on any of the bones in the sample.

Phase 1: Early Bronze Age II (L806, L809, L810, L822, L827, L846, L854, L855 and L860)

The largest proportion of identified bones from Area O was recovered from this phase. The 68 identified bones are associated with a portion of a fortification wall and a glacis. Cattle clearly predominate in this assemblage (70.5%), with smaller numbers of pig and sheep/goat remains (19% and 7.5% respectively; Table 1). Two bones were tentatively attributed to wild boar on the basis of their large size (see Appendix 1).

With respect to ageing, for cattle, at least one animal was older than 2–2.5 years (fused distal tibia and 1st phalanx; Fig. 2), while another animal, or perhaps the same one, was younger than 3.5–4 years based on the presence of an unfused distal and proximal femur. For pigs, a humerus with an unfused proximal epiphysis, but a fused distal epiphysis was found, representing a sub-adult animal aged between 1–3.5 years, while the presence of a fused distal tibia indicates an animal aged 3.5 years or older. Given the relatively larger dimensions of this bone it may represent a male (see Appendix

1). Dental data for pigs shows a predominance of immature animals, with one animal aged c. 2 years (M1 erupted and in wear—Grant stage c/d, and M2 erupting with no wear—Grant stage a) and another younger one aged c. 1 year (M1 erupted—Grant stage a, and deciduous dp3 erupted with little wear—Grant stage b).

Both cattle and pig are primarily represented by limb bones and trunk elements (Table 3). No data was available for sheep/goat due to the small numbers of their bones in the sample. Furthermore, no burnt or cut bones were noted in this sample.

FINDINGS

The Area O faunal assemblage is very small (NISP = 118) compared to the assemblages recovered from Areas A–G (NISP = 892) and Area L (NISP = 219; Table 1). However, with respect to the main species found at the site, no major differences were evident between strata or excavation areas, with sheep/goat, cattle and pig the most common in all.

In Area O, very few remains of wild animals were recovered, the exceptions being a long bone shaft of a small carnivore, possibly fox, from Phase 3, and two bones tentatively identified as wild boar on the basis of their large size from Phase 1 (Table 1; Appendix 1). Areas A–G yielded a broader spectrum of wild taxa, albeit also in small numbers (Table 1). Since all areas excavated to date have yielded domestic structures, the paucity of wild fauna in the Area O samples does not appear to relate to differences in function between the different areas excavated. Most likely, it is due to the smaller sample sizes (i.e., rare taxa are less likely to occur in small samples), as well as to the less extensive sieving practiced in Area O.

With respect to diachronic trends based on data from excavated Areas A–G and L (Table 1), a chi square test found a statistically significant difference (P = 0.00) in the relative frequency of domestic taxa between Stratum III on the one hand and Strata I and II on the other (Horwitz 2003:229). Stratum III was dominated by remains of pig (Table 1). This pattern does not appear to be the result of sample size, since pigs also constitute the majority of remains in the smaller Area O, Phase 3 sample. Thus, the early EB IB layer yielded significantly higher pig frequencies than the other two (late EB IB and EB II), making a decline in pigs relative to sheep/goat and cattle the most marked diachronic trend at the site.

As in Areas A–G Stratum I, isolated bones from Phase 1 in Area O were identified—based on their large size—as those of wild boar (see Appendix 1). All other pig bones from the site fell within the range of domestic pigs and were of comparable size to domestic animals from Chalcolithic Gilat (Grigson 2006). A single bone from Area O, Phase 1 is slightly larger than the Gilat domestic pigs and may represent a large domestic male (Appendix 1).

Cattle remains from Qiryat Ata fell within the range of those from EB IA Afridar and EB IA–IB Tel Ḥalif. The smallest cattle from Qiryat Ata (Fig. 3) all derive from the EB II levels at the site. No definite identifications of aurochs were made on bones from the Area O sample, but isolated remains from Areas A–G were tentatively identified as such (Appendix 1; Fig. 3). The range of variation in size observed for most cattle measurements, best fits that expected due to sexual dimorphism (Appendix 1).

While cattle are the most common taxon in Area O, Phases 1 and 2, this is not the case in Strata I and II in Areas A–G, where sheep/goat either predominate or are of equal importance (Table 1). In Area L, sheep/goat are the most common species in both Strata I and II. It is difficult to determine whether this inter-area variation is due to differences in collection methods (intensity of sieving versus hand collection), sample size, or in the functions of different parts of the site.

Data on body-part representation (Tables 2 and 3) are difficult to assess due to the small sample sizes for Area O. For Areas A–G, Horwitz (2003) concluded that food preparation/

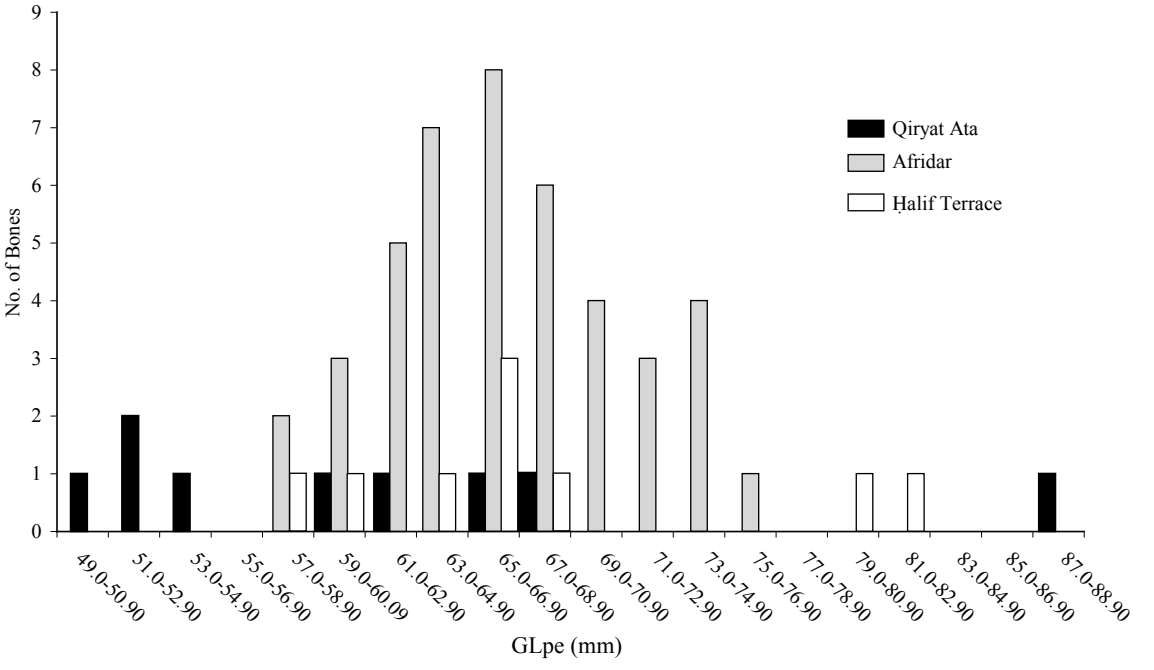

Fig. 3. Bar diagram comparing greatest length (GLpe) of cattle 1st phalanges from Qiryat Ata (all excavated areas and strata) with measurements for Afridar Area G (EB IA) and Tel Ḥalif (EB IA and EB IB) taken from Whitcher (1999).

consumption of carcasses of different species was similar—irrespective of body size, with an almost equal representation of crania, limbs and trunk elements. However, as in Area O, it was concluded that the scarcity of foot bones for all taxa, relates to these smaller elements having been overlooked during excavation rather than resulting from butchery/consumption practices.

Data on ageing was limited due to the small bone samples in Area O. For pigs, and to a lesser extent cattle, some information was gleaned from both bone fusion and dental attrition. In all three phases, the majority of pigs had been culled while immature which fits a management strategy suited to animals raised primarily for meat. This matches the mortality profiles reported in Horwitz (2003) for Areas A–G, with pigs consistently showing a high immature mortality—60% in the early EB IB dropping slightly to 50% in the EB II. For cattle, no clear trend is apparent in any of the strata in Area O, with both adult and immature animals having been slaughtered. In Areas A–G, in both early EB IB and EB II few cattle (c. 27% and 30% respectively) were aged under 48 months, implying that the majority were kept into adulthood, probably for secondary product exploitation—milk and labour (Horwitz 2003). Due to the paucity of remains of sheep/goat in Area O, no mortality data is available. This can perhaps be extrapolated from Areas A–G where, in all strata, few caprines were culled under 1 year, followed by a rise in mortality in the 1–2 year age group. Close to 60% of caprines survived into adulthood. This was interpreted (Horwitz 2003) as approximating a management strategy aimed at secondary product utilization with the peak mortality at 1–2 years reflecting the culling of excess young rams.

Given the overall concurrence between the Area O assemblage and those recovered from Areas A–G and L at Qiryat Ata, these data support the conclusion reached by Horwitz

(2003) that in terms of animal economy, the EB I to EB II transition at the site was one of gradual change. This transition entailed the realignment of the society from a loosely organised rural economy of an unfortified village that was aimed at fulfilling local subsistence requirements, to a fortified settlement with a specialised economy aimed at the production of surplus, probably for urban markets. Thus, the animal economy (and architecture) of Qiryat Ata reflects the increasing social complexity, scale and specialization of Early Bronze Age society in the southern Levant from EB IA through EB II, echoing the conclusion reached by Horwitz et al. (2002) based on faunal assemblages from sites in the Naḥal Besor and Be'er Sheva' regions.

ACKNOWLEDGEMENTS

Special thanks to Amir Golani for facilitating access to the Qiryat Ata fauna.

APPENDIX 1: Comparison of Bone Measurements from Area O with those from Areas A-G (from Horwitz 2003) All measurements are in mm and follow von den Driesch (1976) with the exception of HT = trochlea height of the distal humerus, after Horwitz, Cope and Tchernov (1990)

Species/Skeletal Element	Area	Stratum/ Phase	Period	Measurements			
Cattle							
Scapula distal				*GLP*	*BG*	*SLC*	
	A–G	I	EBII	52.4	37.6	43.1	
	O	1	EB II	71.7	55.6	54.5	
Radius distal				*Bd*	*Dd*		
	A–G	I	EB II	83.2	42.8		
	A–G	I	EB II	83.1	43.5		
	O	1	EB II	84.9	45.4		
1st Phalanx				*GLpe*	*Bd*	*Bp*	*Dp*
	A–G	III	Early EB IB	60.1	26.7	27.9	32.7
Possibly wild	A–G	II	Late EB IB	87.3	40.9	40.4	44.5
	O	2	Late EB IB	-	-	32.1	35.6
	O	2	Late EB IB	59.3	-	33.8	-
	A–G	I	EB II	68.6	28.7	29.5	35.2
	A–G	I	EB II	52.7	25.5	-	-
	A–G	I	EB II	49.2	22.2	23.2	26.6
	A–G	I	EB II	60.1	28.9	29.4	-
	A–G	I	EB II	51.1	24.9	24.6	30.4
	A–G	I	EB II	54.9	27.3	28.6	32.0
	O	1	EB II	65.2	30.0	33.2	33.4
	O	1-2	EB II–EB IB	62.1	35.9	37.1	37.2

GLP–greatest length of glenoid process; BG–breadth of glenoid cavity; SLC–smallest length scapula neck; L–length; B–breadth; Glpe–greatest length of peripheral half; Dp–proximal breadth; Bd–distal end; Dd–distal depth; BT–greatest breadth of trochlea

APPENDIX 1 (cont.)

Species/Skeletal Element	Area	Stratum/ Phase	Period	Measurements			
Pig							
Mandible							
dp_3				*L*	*B*		
	A–G	II	Late EB IB	18.7	8.2		
	A–G	II	Late EB IB	20.2	9.2		
	A–G	I	EB II	17.6	8.1		
	A–G	I	EB II	19.1	8.7		
	A–G	I	EB II	19.1	9.4		
	A–G	I	EB II	19.4	9.2		
	O	1	EB II	19.1	8.8		
M_2				*L*	*B*		
	A–G	I	EB II	19.0	12.4		
	O	1	EB II	19.8	13.3		
M_1				*L*	*B*		
	O	2	Late EB IB	17.6	-		
Possibly wild	A–G	I	EB II	18.1	11.2		
	O	1	EB II	15.3	10.0		
	O	1	EB II	15.3	10.1		
	O	?1	EB II?	15.7	10.0		
Humerus distal				*Bd*	*BT*	*HT*	
	A–G	III	Early EB IB	38.2	31.4	18.9	
	O	3	Early EB IB	37.6	31.9	16.7	
	A–G	I	EB II	40.2	32.8	19.9	
Possibly wild	A–G	I	EB II	45.6	38.0	20.5	
	O	1	EB II	35.9	30.3	17.9	
	O	1	EB II	34.5	25.8	15.1	
Radius proximal				Bd	Dd		
	A–G	III	Early EB IB	23.7	16.0		
	A–G	II	Late EB IB	35.4	22.6		
	0	2	Late EB IB	39.8	27.8		
Tibia distal–domestic				*Dd*	*Bd*	*Bd Gilat* [i]	
	A–G	III	Early EB IB	23.5	26.8		
	A–G	II	Late EB IB	25.7	28.2		
	A–G	II	Late EB IB	25.4	28.8		
Possibly male	O	1	EB II	32.1	37.1		
Mean					30.2	28.5	
Range					26.8–37.1	26.8–30.1	
SD					4.65	1.18	
Tibia distal–possibly wild							
	O	1	EB II	43.4	48.7		
	O	1	EB II	42.5	54.4		

[i] Pig measurements (N = 6) for Chalcolithic Gilat from Grigson (2006: Appendix 6.4).

REFERENCES

Boessneck J., Müller H-H., and Teichert M. 1964. Osteologische Unterscheidungsmerkmale zwischen Schaf (*Ovis aries* Linne) und Ziege (*Capra hircus* Linne). *Kuhn-Archiv* 78:1–129.

Driesch A. von den 1976. *A Guide to the Measurement of Animal Bones from Archaeological Sites* (Harvard University, Peabody Museum of Archaeology and Ethnology Bulletin 1). Cambridge, Mass.

Golani A. This volume. Rescue Excavations at the Early Bronze Age Site of Qiryat Ata—Area O.

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* (BAR British Series 109). Oxford. Pp. 91–109.

Grigson C. 1982. Sex and Age Determination of Some Bones and Teeth of Domestic Cattle: A Review of the Literature. In B. Wilson, C. Grigson and S. Payne eds. *Ageing and Sexing Animal Bones from Archaeological Sites* (BAR British Series 109). Oxford. Pp. 7–23.

Grigson C. 2006. Farming? Feasting? Herding? Large Mammals from the Chalcolithic of Gilat. In T.E. Levy ed. *Archaeology, Anthropology and Cult: The Sanctuary at Gilat, Israel.* London. Pp. 215–319.

Horwitz L.K. 2003. Early Bronze Age Animal Exploitation at Qiryat Ata. In A. Golani. *Salvage Excavations at the Early Bronze Age Site of Qiryat Ata* (IAA Reports 18). Jerusalem. Pp. 225–241.

Horwitz L.K., Cope C. and Tchernov E. 1990. Sexing the Bones of Mountain-Gazelle (*Gazella gazella*) from Prehistoric Sites in the Southern Levant. *Paléorient* 16 (2):1–12.

Horwitz L.K., Tchernov E., Mienis H.K., Hakker-Orion D. and Bar-Yosef Mayer D.E. 2002. The Archaeozoology of Three Early Bronze Age Sites in Nahal Besor, North-western Negev. In E.C.M. van den Brink and E. Yannai eds. *In Quest of Ancient Settlements and Landscapes: Archaeological Studies in Honour of Ram Gophna.* Tel Aviv. Pp. 107–133.

Prummel W. and Frisch H.J. 1986. A Guide for the Distinction of Species, Sex and Body Side in Bones of Sheep and Goat. *Journal of Archaeological Science* 13:567–577.

Sade M. 2000. Animal Bones from Qiryat Ata, Area L. *Tel Aviv* 27:57–60.

Silver I.A. 1969. The Aging of Domestic Animals. In D. Brothwell and E.S. Higgs eds. *Science in Archaeology.* New York. Pp. 283–302.

Whitcher S.E. 1999. *Animals, Environment and Society: A Zooarchaeological Approach to the Late Chalcolithic–Early Bronze I Transition in the Southern Levant.* Ph.D. diss., University of Edinburgh. Edinburgh.