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Geography and Economic Preferences as Cultural Markers in a Border Town: The Faunal Remains from Tel Beth-Shemesh, Israel

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ABSTRACT We present a zooarchaeological analysis of the faunal remains at Tel Beth-Shemesh, a site located in the Shephelah region of Israel, which has been dated to the Late Bronze Age and Iron Age I. The site, identified as the biblical city of Beth-Shemesh, was a Canaanite border town between Philistine and Israelite settlements and of great importance in our attempts to understand the social and cultural transformations that occurred in the southern Levant during those periods. This study contributes to a more accurate understanding of the cultural identity of the site's inhabitants by exploring the cultural differences between populations as reflected in their different dietary preferences. We analysed the subsistence economy at the site, the general exploitation patterns, herd management strategies and consumption practices, all of which are based mostly on domestic livestock. We determined the cultural identity at the site mainly by comparing the representation of pig remains with that found at other sites in the region, and offer various explanations for the differences. The comparisons revealed clear differences between Tel Beth-Shemesh and other known nearby Philistine sites. This site appears to have possessed a self-contained production and consumption economy with similarities in the general pattern of animal exploitation between the two periods. These similarities constitute evidence for the continuation of the local population and of its culture at the site during the period of turmoil that swept the region during the transition to the Iron Age. Copyright © 2013 John Wiley & Sons, Ltd.

Key words: animal exploitation; border town; cultural marker; Iron Age I; Late Bronze Age; pig abundance; Tel Beth-Shemesh; zooarchaeology

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Introduction

The transition from the Late Bronze Age (LBA) to the Iron Age constitutes an important cultural phase in the southern Levant, characterised by the withdrawal of the Egyptian empire from the region and the appearance of several new entities, including the Israelites and Philistines, which altered the local socio-cultural composition. These events disrupted the stability of existing political, social, economic and cultural organisations causing upheavals, which remain poorly understood today (Mazar, 1990). Consequently, fundamental questions have been raised regarding the ethnogenesis of the Israelites and of the Philistines, as well as regarding the cultural diversity, daily life and continuity of many archaeological sites in the region.

The Shephelah region in Israel is of great interest in this context as during the transition to the Iron Age it constituted a border between the Philistine territory in the Mediterranean coastal plain to the west, and the Israelite territory in the central hills of Judea to the east (Figure 1). In this border region, events and processes such as cultural, economic, and military interactions and conflicts took place between these two rival entities. These processes frequently affected the local border community (Mazar, 1990; Faust, 2006; Bunimovitz and Lederman, 2009). A border community may be affected in three ways: (i) it may absorb some or all characteristics from its neighbours; (ii) it may avoid them; or (iii) it may selectively absorb certain characteristic and avoid others. The adoption or avoidance of the neighbouring cultures, together with internal processes

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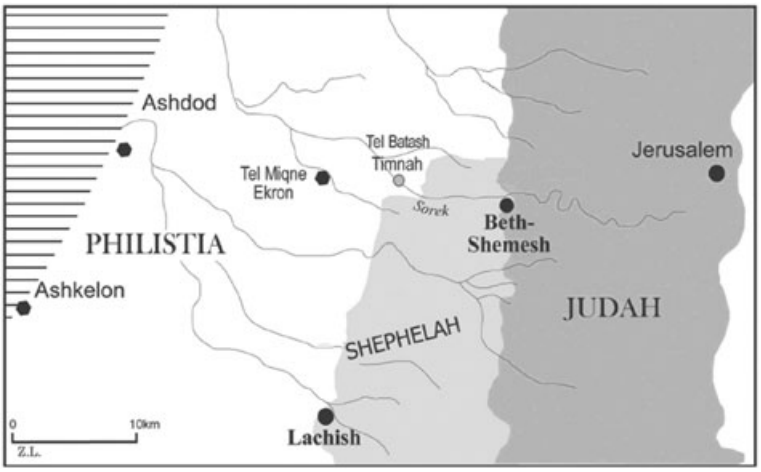

Figure 1. Location map of the Shephelah and adjacent regions.

within the border population, may promote further development of local cultural characteristics. Border populations are thus important to interpreting the interaction between different cultures as different groups differentiating certain of their cultural characteristics in order to distinguish themselves from the 'other' group (Barth, 1969). More explicitly, border populations function as mirrors to the complex and varied relationships between different groups as well as to the entity to which they represent. They thus have an important impact on the formation and unification of that entity (Barth, 1969). In the case of the Shephelah region, the local Canaanite population, confronting another entity, the Philistines, may have reflected its association with that entity by adopting and portraying Philistine symbolic attributes or it may have chosen to resist and avoid them, all depending on the political situation. Studying such border towns may shed light on the cultural shifts and social conflicts between local populations, and their influence on the processes of creation and establishment of new nations and cultures.

Community rules as well as identity markers or symbols are central to cultural determination processes. Many researchers have dealt with the issues of ethnicity: whether through its definition or through examining the formation processes that have led to it (Barth, 1969; McGuire 1982; Emberling, 1997; Jones, 1997). Cultural identity can be defined by many characteristics, including dietary habits and practices, as food is a primary symbol of culture (Harris, 1987; Simoons, 1994; Twiss, 2007). Food is a cultural resource shared by all, while reflecting one's heritage, culture and way of life. One such dietary character, the consumption and husbandry of pigs, is a taboo in several cultures, and although the origins of this prohibition are still a matter of debate among scholars, it may be used as an identity marker (Harris, 1987; Simoons, 1994). Some scholars explain the origin of pig avoidance in Canaan as a cultural preference intended to differentiate its practitioners from the Philistines who were known for their extensive pig husbandry brought from the Aegean region (Stager, 1995; Faust, 2006; Faust and Lev-Tov, 2011; Yasur-Landau, 2010). Other interpretations relate pig avoidance or preference to alternative causes (acting alone or in concert) rather than to an ethnic or cultural definition (see Discussion).

The border town of Tel Beth-Shemesh is situated at the western fringe of the Shephelah region, on the south bank of the Sorek valley (Figure 1). In this region, ethnic boundaries frequently shifted between Philistine, Israelite and Canaanite entities, especially during the transition to the Iron Age. Excavations at the site have been carried out by three expeditions (for additional history, see Bunimovitz and Lederman, 1993, 2008, 2009). These have exposed two distinct settlements from the Late Bronze Age - Iron Age I periods. The older settlement was a prosperous LBA Canaanite settlement (current levels 9–8; 14th–13th centuries BCE). The Iron Age I (IAI) settlement however has been differentially identified by the three excavations (current levels 7–4; 12th to mid-10th centuries BCE). The current excavation has characterised it as a large, unfenced village reflecting strong Canaanite traditions. The two previous excavations defined the site's population as Canaanite or Israelite under Philistine influence and domination on the basis of Philistine pottery found at the site. The material culture from the current excavation, however, exhibits a continuous Canaanite tradition to at least the end of the 11th century BCE, implying occasional, small-scale contact with nearby Philistine settlements, rather than Philistine occupation (Bunimovitz and Lederman, 2011).

Tel Beth-Shemesh's location and continuous settlement history make it an ideal site for exploring the interaction between different cultures, ethnic identities and ancient economies. One question addressed by this study refers to the cultural identity of Tel Beth-Shemesh's inhabitants as reflected in their dietary habits. The complexity of this question is apparent from the different answers given by the previous and current excavators of the site. This zooarchaeological analysis of the LBA and IAI settlements in Tel Beth-Shemesh provides an in-depth look at the economy of its inhabitants, including diet spectrum and animal exploitation processes. This analysis sheds new light on the issue of cultural unity or disunity, as the relative abundance of several taxa could be considered cultural markers.

Methods

We studied the faunal assemblages of the LBA levels (levels 9–8) and IAI (levels 7–4) from the 2004–2008 excavation seasons collected in areas A and D (Figure S1). All bone fragments were retrieved manually and belong to stratigraphically and contextually well-defined layers. Taxonomical and anatomical identifications were performed using bone catalogues (Schmid, 1972; Hillson, 1992) and comparative collections from the Natural History Museum at Tel-Aviv University, the Archaeozoological laboratory at the University of Haifa, and the Department of Evolution, Systematics and Ecology at the Hebrew University in Jerusalem. Mammalian bone fragments that could not be attributed to any taxonomical category were assigned to body-size classes. Identifiable mammalian bones were recorded using 'diagnostic zones' according to Dobney and Rielly (1988). Bone quantification was based on the percentage of completeness of each diagnostic zones and was used to derive the standard counting units (as described in Klein and Cruz-Uribe, 1984; Lyman, 1994): the number of identified specimens (NISP), the minimum number of elements (MNE) and the minimum number of individuals (MNI).

Metric measurements were taken as described by von den Driesch (1976) using a digital caliper recorded to 0.1 mm. Identification and discrimination between sheep (*Ovis aries*) and goat (*Capra hircus*) were based on morphological and metric criteria (following Boessneck, 1969; Payne, 1969, 1985; Zeder and Lapham, 2010). Indistinguishable bone fragments were defined as *Ovis/Capra*. Discrimination between domestic pigs (*Sus scrofa domesticus*) and wild boar (*Sus scrofa*) was based on the differences in size dimensions that developed during domestication (Haber and Dayan, 2004). Swine bones were measured according to Von den Driesch (1976), and discrimination was carried out using the log size index method (Uerpmann, 1978). A comparison was carried out to a standard value of a modern female wild boar from the collections of the Natural History Museum at Tel-Aviv University. Age structure of the major taxa was determined by reconstructing survival curves using two methods: epiphyseal fusion data of different skeletal elements (data from Silver, 1969) and tooth eruption and wear of the last lower deciduous fourth premolar and the lower third molar (data from Payne, 1973; Grant, 1982). Age determination for pigs was based on data from Bull and Payne (1982), Magnell and Carter (2007). Caprovine remains were sexed using the dimorphic distal humerus (measurements of the humerus breadth of trochlea and minimum height of trochlea; see Davis, 2000, 2008), as compared with modern specimens of known sex.

In this study, a multivariate approach to taphonomic analysis was carried out as outlined in Bar-Oz and Munro (2004). All recorded bones were scanned with the naked eye and with a magnifying glass (×2.5) for various macroscopic bone surface modifications such as bone weathering (Behrensmeyer, 1978), rodent gnawing and carnivore ravaging (Lyman, 1994), and butchery marks (Binford, 1981). Bone pathologies and deformations were identified and recorded. To assess whether bone density-mediated attrition had modified the assemblage, we examined the relationship between bone densities and survivorship (bone mineral density values from Lam *et al.*, 1999). Consumption patterns were analysed using the relative frequency of elements (%MAU) in order to examine the relationship to their food utility index values (FUI; following Metcalfe and Jones, 1988).

Statistica™ 7.0 (StatSoft, Inc., Tulsa, OK) and PAST (Hammer *et al.*, 2001) were used to run the statistical analyses.

Results

The faunal assemblage

The faunal assemblage is composed of 5050 remains from the LBA and of 7551 from IAI (Table 1). The mammalian remains comprise 99% of the assemblage and are dominated by domestic livestock—mainly caprovine [goats (*C. hircus*), sheep (*O. aries*) and the *Ovis/Capra* category] and cattle (*Bos taurus*). These species comprise 97% of the entire assemblage (caprovine, cattle and pig NISPs and MNEs are detailed in Table S1). Only 2% of the mammalian assemblage was composed of other species such as pig (*Sus scrofa*) and wild ungulate species such as the mountain gazelle (*Gazella gazella*), Mesopotamian fallow deer (*Dama mesopotamica*), red deer

Table 1. Species abundance (NISP, MNI) of the taxa represented in the Late Bronze Age and Iron Age I assemblages at Tel Beth-Shemesh

	Late Bronze Age			Iron Age I		
Species/body size	*NISP*	% *NISP*	*MNI*	*NISP*	% *NISP*	*MNI*
Mammals						
Capra hircus	200	3.96	22	346	4.58	26
Ovis aries	194	3.84	16	274	3.63	21
Ovis/Capra	3451	68.34	46	5422	71.81	59
Bos taurus	871	17.25	10	1212	16.05	13
Gazella gazella	6	0.12	1	21	0.28	2
Dama mesopotamica	34	0.67	3	79	1.05	3
Cervus elaphus				1	0.01	1
Capreolus capreolus	1	0.02	1			
Large cervid	42	0.83	2	46	0.61	2
Equus asinus				4	0.05	1
Equus mulus				7	0.09	2
Equidae	16	0.32	1	14	0.19	1
Sus scrofa	79	1.56	4	14	0.19	2
Canis sp.	13	0.26	2	6	0.08	1
Vormela peregusna	7	0.14	2	4	0.05	2
Lepus capensis	4	0.08	1			
Spalax ehrenbergi	17	0.34	1	2	0.03	2
Hare/fox size	48	0.95	3	60	0.79	3
Aves						
Alectoris chukar	24	0.48	4	11	0.15	2
Phasianidae	1	0.02	1	1	0.01	1
Corvus corone	3	0.06	1	2	0.03	1
Gyps fulvus				3	0.04	1
Buteo buteo				1	0.01	1
Falconidae				1	0.01	1
Neophron percnopterus				1	0.01	1
Anatidae				2	0.03	2
Struthio camelus syriacus				1	0.01	1
Passeriformes size	2	0.04	1	1	0.01	1
Partridge size	20	0.40	4	6	0.08	2
Vulture/pelican size				1	0.01	1
Reptiles						
Testudo graeca	16	0.32	4	8	0.11	4
Unidentified	1	0.02	1			
Total	5050			7551		

NISP, number of identified specimens; MNI, minimum number of individuals.

(*Cervus elaphus*) and roe deer (*Capreolus capreolus*). The two latter taxa were identified on the basis of a single antler each, which is suggestive of trade rather than hunting or trapping. Bones of red deer and roe deer were rare in the entire assemblage, and therefore their contribution is assumed to be negligible. We therefore view the category of large cervids as referring to fallow deer. The bird assemblage contains 81 bones and constitutes 0.65% of the entire assemblage. The most predominant species was the partridge (*Alectoris chukar*; *NISP* = 35), which comprised 48% of the LBA bird assemblage and 35.5% from IAI. Unidentified bones were classified to Passeriformes size ($N = 3$), partridge size ($N = 26$) and vulture/pelican size ($N = 1$). The reptile assemblage consisted of 25 remains and constituted 0.2% of the entire assemblage. The spur-thighed tortoise (*Testudo graeca*) was the only identifiable species, represented by 24 remains, mostly carapaces and plastrons.

The caprovine %MAU was significantly correlated with bone mineral density values in both periods (LBA: Spearman's $r = 0.617$, $p = 0.003$; IAI: Spearman's $r = 0.546$, $p = 0.013$), indicating that density-mediated attrition had modified the assemblage. Nevertheless, shallow surface weathering (<3; Behrensmeyer, 1978) was observed on only 52 bones, and signs of rodent gnawing and carnivore ravaging were found on only 45 bones. Both finds indicate that post-depositional bone fragmentation was insignificant, suggesting that most bones had been broken prior to their deposition by the site inhabitants during processing and consumption.

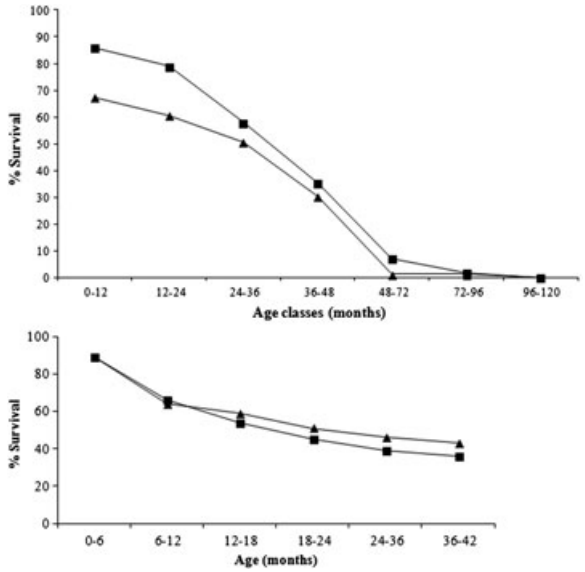

Figure 2. Survivorship curve for the caprovines at Tel Beth-Shemesh from the Late Bronze Age (■) and Iron Age I (▲). Survivorship based on tooth eruption and wear of the last lower deciduous fourth premolar and the lower third molar (top; reference data listed in Table 2); survivorship based on epiphyseal fusion (bottom).

Livestock exploitation

The age structure of the caprovines in each period could not be determined for sheep and goats separately because of the paucity of identifiable elements. The survivorship curves using dental wear rate and epiphyseal closure gave similar results for each period as well as a similar overall pattern (Figure 2; Table 2). The two methods show a preference for culling caprovines at two stages, at young ages before reaching their third year (42–50% and over 50%, respectively) and at adulthood beyond 3 years (50–58% and 40–46%, respectively). The sheep to goat ratio between identifiable adult individuals is also fairly even (1:1.03 LBA; 1:1.26 IAI). The sheep to goat ratio of young individuals (based on deciduous teeth; Payne 1985) shows a preference to goats (1:2.2 LBA; 1:1.43 IAI). Sexual dimorphism in caprovines was determined using measurements of fused epiphyses of the distal humerus, these belonging to the 65 separately identified individuals (Figure S2). For both taxa, the measurements show a fairly equal division between sexes.

Cattle (*B. taurus*) is the next most common taxon following caprovines, comprising 16.5% of the entire assemblage. Age structure for the cattle was reconstructed by epiphyseal closure alone, because of the insufficient tooth sample size ($N = 18$; Table 2). The survival rate is similar for both periods (Figure 3) with two cycles of slaughter, peaking in the second year of life (45-49% survival rate) and at later ages as 22% were kept for over 4 years. Foot pathologies of cattle were found solely from the LBA ($N = 4$). These pathologies were defined according to Baker and Brothwell (1980) as osteoarthritis and ankylosis.

Pig remains comprised less than 1% of the entire assemblage. Of the 93 identified pig bones, 79 were dated to the LBA and 14 to the IAI. The relative abundances show a clear difference between the two periods (Figure 4), obvious at the transition from the final phase of the LBA to the first phase of IAI (levels 8 to 7; $\chi^2 = 22.094$, $p < 0.001$). A comparison between pig bone measurements from Tel Beth-Shemesh and those of a modern female wild boar from northern Israel showed that all of the ancient bone measurements were significantly smaller, suggesting that the bones are of domesticated pigs (Wilcoxon paired test: $p < 0.001$; Table 3). The profile of age at death could not be determined because of the small sample of teeth and bones. However, the five jaws and few bones that could be used to determine the age of the pigs at the site show that they were culled at young ages, probably for meat.

Table 2. Age classes of caprovines and cattle from Tel Beth-Shemesh according to the eruption and wear stages of the deciduous lower fourth premolar and lower third molar

		Late Bronze Age		Iron Age I	
Tooth wear stages	Age (months)	Caprovines	Cattle	Caprovines	Cattle
A–C	0–12	8	3	29	5
D	12–24	4	1	6	
E	24–36	12		9	2
F	36–48	13		18	1
G	48–72	18	2	26	1
H	72–96				1
J	96–120	2			
K–M	>120			1	2
Total		57	6	89	12

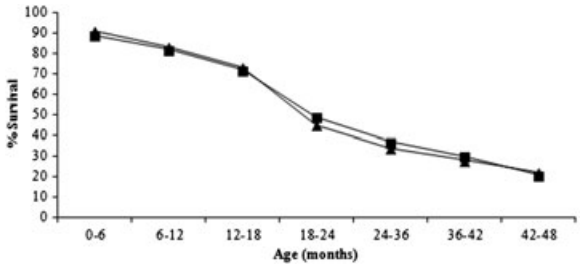

Figure 3. Survivorship curve based on epiphyseal fusion for the cattle at Tel Beth-Shemesh from the Late Bronze Age (■) and Iron Age I (▲).

Consumption patterns

Skeletal element distribution profiles for caprovines and cattle based on MAU% (Figure S3) for both periods show a fairly complete representation of all skeletal elements in each period for both taxa, including elements that have either high or low dietary values. Furthermore, there were similar abundances of meat-rich and meat-poor elements of caprovines and cattle. No significant difference was found in the caprovine or cattle skeletal element representation between the two periods (Spearman's: $r = 0.941$, $p < 0.001$; $r = 0.839$, $p < 0.001$, respectively). In addition, no correlation was found between caprovine or cattle bone survivorship of each element (%MAU values) to its respective FUI value (Metcalfe and Jones, 1988) in either period (caprovines: Spearman's $r = 0.099$, $p = 0.688$ LBA; $r = 0.121$, $p = 0.622$ IAI; cattle: Spearman's $r = 0.102$, $p = 0.676$ LBA; $r = 0.245$, $p = 0.311$ IAI). These two results suggest that no major selection or transport of specific body parts took place in the formation of the assemblage.

Butchery marks were observed on 901 mammalian bones (Table 4; 358 marks from the LBA and 545 marks from IAI). The majority of the marks were found on the most common species in the assemblage, caprovines ($N = 680$), cattle ($N = 189$) and on other mammals such as cervids ($N = 24$) and pigs ($N = 6$). The butchery marks

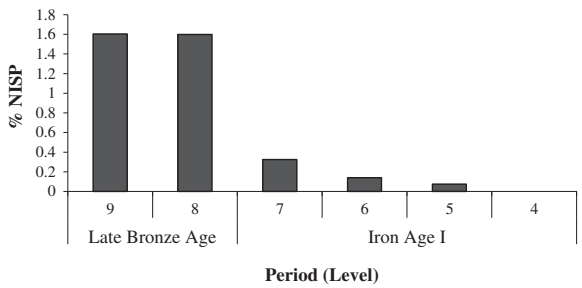

Figure 4. Pig representation from Tel Beth-Shemesh in each phase of excavation.

Table 3. LSI values for measurements of pig bones from Tel Beth-Shemesh in comparison with a standard specimen (modern female wild boar from northern Israel)

Element	Standard	Tel Beth-Shemesh	*SD*	*N*	*LSI*
As-GLl	47.5	42.69	N/A	1	−0.05
As-GLm	43.6	37.91	1.7	2	−0.06
Sc-GLP	39.4	33.9	0.16	2	−0.065
Sc-SLC	26.5	22.15	N/A	1	−0.08
Ra-Bp	34.2	29.12	0.4	2	−0.07
Hu-BT	34.6	30.36	1.82	4	−0.06
MT4-Bp	17.5	14.95	N/A	1	−0.07
MC4-Bp	19.1	13.78	N/A	1	−0.14
Average					−0.07

LSI, log size index.

represent a full range of slaughter activities and stages in handling the carcass, from primary to secondary butchering, suggesting an onsite processing and consumption.

Discussion

Economic structure at Tel Beth-Shemesh

The subsistence economy during the LBA and the IAI at Tel Beth-Shemesh was primarily based on caprovines and cattle, with the occasional consumption of wild and other domestic animals. The bone assemblage is similar to most zooarchaeological assemblages from the studied periods in the southern Levant (Hesse 1990) where caprovine and cattle herds were the most common livestock species, although depending on varying economic strategies, as well as on environmental, ecological and physiological factors, there were some fluctuations in abundance and inter-site ratios (Grigson, 1995; Lev-Tov et al., 2011). The presence of wild species (e.g., deer, gazelles and hares) may suggest the exploitation of several ecological habitats such as open areas and woodlands that are found in the vicinity the site. The consumption of meat from these species indicates supplemental hunting and trapping, although they probably did not play a significant role in the diet of the people.

Comparison of the demographic profile of caprovines at the site shows a preference during both periods for goats in both young and adult age classes. This ratio is close to the mean described by Redding (1981) as the optimal herd management strategy for herd security. Herd security is defined as a minimisation of fluctuations in herd size and production despite disease or environmental changes. This is achieved by maintaining a fairly even ratio between sheep and goats while accounting for the differences in the two species' ability to rebound

Table 4. Frequencies of butchery marks for caprovines, cattle and other mammals at Tel Beth-Shemesh

	Late Bronze Age				Iron Age I			
Activity	Caprovines	Cattle	Cervidae	Pigs	Caprovines	Cattle	Cervidae	Pigs
Skinning	6	20	3	1	8	18	\4	
Dismembering	177	43	4	3	252	59	7	1
Severing of head	3	1			11			
Hanging	1	2			3	1		
Filleting	51	13	1	1	109	18	3	
Other	18	8	1		41	6	1	
Total	256	87	9	5	424	102	15	1

Typology following Binford (1981).

from losses. The slaughter of caprovines and cattle seems to have occurred at two life stages, the culling of young individuals optimal for meat consumption (probably surplus young) and the culling of adult individuals apparently used for secondary products such as dairy, wool and labour. The presence of foot pathologies in cattle may imply their use as beasts of burden, for plowing or traction (Bartosiewicz *et al.*, 1997) in addition to their use for meat. The relatively low presence of cattle pathologies in the assemblage may also suggest a non-intensive agricultural community. Consumption patterns, together with the range of butchery activities identified, indicate that animals were butchered, processed and consumed on site without consideration of caloric value. Pig remains are considered to represent domestic pigs and are rare in all strata, a pattern that is most pronounced in the Iron Age phases, and were probably kept for meat consumption.

The dominance of caprovines and cattle indicates that they were probably raised locally and represent direct contact between herders and consumers at the site, as no preferences for the higher caloric value of certain body parts or of species are apparent. The economic structure at the site, during both periods, indicates that caprovines were herded near the site and exploited for secondary products, as well as for meat. Cattle were probably raised on site and utilised for meat at early ages and for secondary products and agricultural activities, later consumed locally. The higher ratio of caprovines to cattle during both periods may suggest that the inhabitants relied on herding and on the production of secondary products rather than on meat, and that the site was a non-intensive agricultural settlement. The preference for goats over sheep and cattle shows a preference for the exploitation of the species best adapted to the local ecological conditions rather than species with a higher or better meat yield (Redding 1981).

Our results lead us to conclude that the subsistence economy at Tel Beth-Shemesh represents a self-sufficient, producer/consumer settlement, according to classification of economic strategies from Zeder (1991). The generalised, traditional Mediterranean agro-pastoral economy was based on livestock animals for meat and for secondary products, which were processed and consumed on site. There were no apparent differences between the economic patterns of both studied periods as the traditional herding strategies and consumption practices that prevailed during the LBA continued into IAI, suggesting continuous site occupancy by the Canaanite population in Tel Beth-Shemesh.

Local and regional livestock abundance

Pigs have been a part of the southern Levant consumption since their domestication, although their abundance in faunal assemblages is scarce in comparison with caprovines and with cattle (Hesse, 1990; Zeder, 1996; Hesse and Wapnish, 1997). As some consider that the pig avoidance may have evolved from the entrance of the Philistines into the region in the early Iron Age (see recent review in Faust and Lev-Tov, 2011), comparisons to known Philistine sites are important. Low representation of pigs in archaeological sites in southern Canaan has been attributed to ecological and physiological characteristics of pigs (Grigson 1987, 1995). Therefore, local and regional comparisons were carried out with other sites in the vicinity of Tel Beth-Shemesh in order to elucidate patterns within the same ecological region (Table 5 and Figure 5).

The local comparison was carried out with Tel Miqne/Ekron, a major Iron Age Philistine city located 12 km east of Tel Beth-Shemesh (data from Lev-Tov, 2000). In the LBA, Tel Miqne/Ekron was under Egyptian control and has been characterised as a self-sufficient town with an agricultural economy based on caprovines and cattle (71% and 26%, respectively; pigs comprised 3%). With Philistine occupation of the site during IAI, the agricultural economy shifted to raising mainly pigs and cattle for meat consumption (24% and 36%,

Table 5. Representation frequencies of caprovines, cattle and pig remains in the Late Bronze Age and Iron Age I assemblages

Site	Period	*NISP*				Reference
		Caprovines	Cattle	Pigs	Total	
Ashdod XIII–XI	IAI	68	79	19	180	Maher, 2005
Tel Jemmeh	LBA	3152	788	10	3950	Wapnish and Hesse, 1988
Tel Miqne IX–VIII	LBA	1,574	582	60	2,241	Lev-Tov, 2000
Tel Miqne/Ekron VII–IV	IAI	3,125	2,625	1,322	7,327	Lev-Tov, 2000
Tel Miqne/Ekron	LBA	697	232	78	1,007	Hesse, 1990
Tel Miqne/Ekron	IA	228	183	91	502	Hesse, 1990
Tell es-Safi/Gath	IA	165	78	38	281	Lev-Tov, 2012
Tel Batash/Timna	LBA	217	83	17	317	Hesse, 1990
Tel Batash/Timna	IA	142	71	18	231	Hesse, 1990
Lachish VI	LBA	413	175	16	800	Drori, 1979
Lachish VII–VI	LBA	13,537	4,707	282	19,594	Croft, 2004
Lachish V–II	IA	141	137	0	297	Lernau, 1975
Tel Michal XVI–XV	LBA	289	258	2	641	Hellwing and Feig, 1989
Tel Michal XIV–XII	IAI	239	123	3	406	Hellwing and Feig, 1989
Shiloh VI	LBA	2623	253	5	2972	Hellwing *et al.*, 1993
Shiloh V	IAI	1014	306	1	1350	Hellwing *et al.*, 1993
Tel Masos III–I	IAI	278	109	1	422	Tchernov and Drori, 1983
Izbet Sartah III–I	IAI	635	411	5	1203	Hellwing and Adjeman, 1986
Beer-Sheba IX–VI	IAI	1010	164	3	1222	Hellwing, 1984
Tel Beth Shemesh 9	LBA	1,141	197	23	1,434	This study
Tel Beth Shemesh 8	LBA	2,667	666	56	3,503	This study
Tel Beth Shemesh 7	IAI	1,935	455	8	2,470	This study
Tel Beth Shemesh 6	IAI	2,928	506	5	3,566	This study
Tel Beth Shemesh 5	IAI	1,081	235	1	1,359	This study
Tel Beth Shemesh 4	IAI	98	16	0	117	This study

respectively), use of cattle for labour and to a much reduced reliance on caprovine husbandry. The sharp differences in the exploitation patterns found in the two sites despite their close proximity suggests that the shift in pig abundance was not caused by ecological or physiological factors. Moreover, the marked difference in the faunal assemblages and economic strategies between the two sites during IAI suggests that they may have been inhabited by two different populations.

Regional comparisons to other sites in the region support the same conclusion. During the LBA, a clear pattern of a traditional Mediterranean economy with preference for caprovines and cattle, and to a much lesser extent pigs, is found at all sites (pig abundance at additional sites of Ashkelon, 13th-12th century BCE, 4%; and Tell es-Safi/Gath, 0%; Hesse, 1990 and Lev-Tov, 2012, respectively). Pig remains at Tel Beth-Shemesh fit the prevalent pattern of no intensive pig utilisation. However, during the early Iron Age, at sites related to Philistine occupation, pig utilisation becomes very prominent, reaching to over 18%, alongside an increased percentage of cattle and a decrease in caprovines (Tel Miqne/Ekron, 18%; Tel Batash/Timna, 8%; Tell es-Safi/Gath, 13%; Ashdod, 11%, pig abundance at the additional site of Ashkelon, 12th century BCE, 19%; 11th century, 5%; Hesse, 1990). In contrast, at sites not under Philistine influence, pig remains are almost non-existent (Tel Beth-Shemesh, 0.2%; Lachish, 0%), and the economy appears to have been primarily based on caprovines and to a lesser extent on cattle. It should be noted that the increase in cattle representation alone may not reflect a cultural change, but rather an increase in human population size and intensification of agriculture.

Cultural examination of Tel Beth-Shemesh

The decline in pig abundance in Southern Levant during the Iron Age has been linked, by some, to the formation of the Israelite entity, an entity which was at least partially shaped by the influence and interactions with the Philistines (Finkelstein, 1997; Faust, 2006). The comparisons to other sites and our intra-site economic patterns lead us to conclude that the traditional economic strategy of the LBA as seen in the dietary habits continued at Tel Beth-Shemesh into IAI, implying a continuation of the existing local population and culture. Whereas the previous excavation had interpreted the presence of Philistine pottery at the site as evidence of Philistine political or economic domination in the area, this is not reflected in the economic strategy or dietary habits of Tel Beth-Shemesh inhabitants. This conclusion, however, do not rule out the possibility that the site's inhabitants, as a border population, had interacted

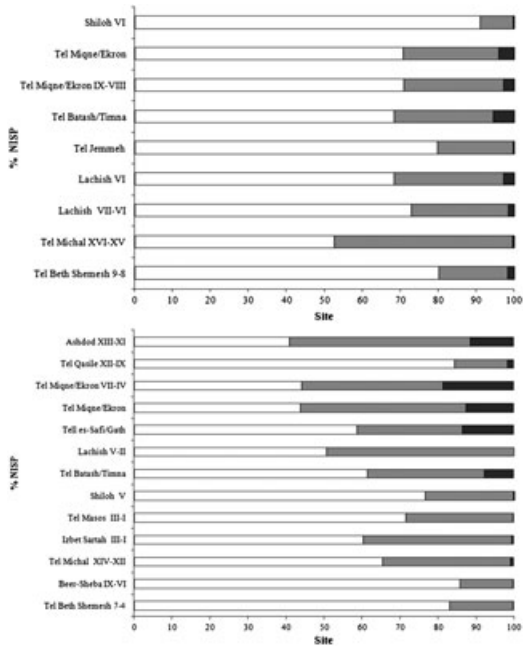

Figure 5. The relative frequencies of caprovines (white), cattle (grey) and pigs (black) at several sites dated to the Late Bronze Age (top) and Iron Age I (bottom). Reference data listed in Table 5.

with their Philistine neighbours. Although trading between the two is evident from the presence of Philistine pottery at the site, the decrease in pig consumption at Beth-Shemesh hints that its inhabitants did not adopt Philistine dietary preferences.

However, non-ethnic factors, such as socio-economic and political forces, should also be considered when explaining the fluctuations of pig abundance at different sites. There are three common alternative explanations: (i) Pigs are characteristic of independent households or peasant communities as they are easy to rear and reproduce quickly, have a high number of offspring and a fast growth rate, are easy to feed and have a higher caloric yield than other livestock animals. Thus, they are usually linked to political and economic independence. According to Zeder (1996, 1998), pig utilisation increases when the regional economy is weak or non-existent, and their abundance decreases when regional economy becomes more organised and regulated. (ii) Harris (1987) and Redding (1991) have argued that as pigs consume food that is also suitable for human populations, they compete for food resources with the local population. The intensification of agriculture increases the competition and thus decreases pig husbandry. Pig husbandry in arid regions may thus negatively impact the population, as it is not economically profitable. (iii) Crabtree (1989), Hesse (1990), Hesse and Wapnish (1997) and Lev-Tov (2000) stated that pig husbandry might serve as a acclimatisation strategy for new settlers in a new environment as pigs provide food quickly and thus are a safe food source when the environment is still unknown and resources are scarce. As the economy and the population strengthen and become more acclimatised, caprovines and cattle become increasingly important while pig husbandry declines. When taking into account the different alternative explanations and comparisons, we still find no evidence for the cause of the different circumstances at Tel Beth-Shemesh (i.e. ecological, physiological, economic or political), in contrast to neighbouring Philistine towns. The first two explanations cannot explain the different pattern found at nearby sites, and the third explanation may be relevant to the Philistine sites, but not to Tel Beth-Shemesh.

The location of Tel Beth-Shemesh at a border region with a neighbouring entity provides an interesting glimpse into the decisions making of a local population. Even though Tel Beth-Shemesh is located close to Philistine sites, its population maintained its own cultural preferences as reflected by the different dietary and economic behaviours and by the archaeological findings. This does not prove that the local population was an early Israelite entity, but rather Tel Beth-Shemesh was probably inhabited by Canaanites that avoided Philistine habits. This resistance to Philistine dietary habits may have later evolved to more pronounce ethnic characteristics and led to the joining and formation processes of the new Israelite entity. This zooarchaeological study is another step in understanding the processes that may evolve to the ethnogenesis of new cultures and underlines the importance of zooarchaeological studies in understanding complex processes and the additional knowledge they provide about everyday life in historic times.

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