

The socioeconomic status of Iron Age metalworkers: animal economy in the ‘Slaves’ Hill’, Timna, Israel

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The popular image of metalworking sites in desert settings envisages armies of slaves engaged in back-breaking labour. This is in conflict with ethnographic evidence indicating that skilled specialist metalworkers are often accorded high social status. This study approaches that contradiction directly by studying the remains of domesticated food animals from domestic and industrial contexts at Timna in southern Israel. The authors demonstrate that the higher-value meat cuts come from industrial contexts, where they were associated with the specialist metalworkers, rather than the ‘domestic’ contexts occupied by lower status workers engaged in support

roles. It is suggested that the pattern documented here could also have been a feature of early metalworking sites in other times and places.

Keywords: Timna, Wadi Arabah, copper smelting, faunal analysis, Egyptians, craft specialists, social status

Supplementary material is provided online at <http://antiquity.ac.uk/projgall/sapirhen341>

Introduction

Metalworkers in ancient societies played a substantial role which is yet to be fully understood (e.g. Ehrenreich 1991). Various sources can be drawn upon, including ethnographic studies (e.g. Bisson *et al.* 2000), historical and textual research (e.g. Blakely 2006), and archaeological investigations (e.g. Levy *et al.* in press). Animal remains have long been recognised in archaeology as an important medium for extracting social meanings (see below); in archaeometallurgical studies, however, associated faunal remains are rarely integrated. The faunal assemblages from Timna, an extensive ancient copper production district in the

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southern Levant (Ben-Yosef 2010 and references therein), illustrate how faunal remains can illuminate aspects of the social status of early metalworkers. Metalworkers are commonly perceived to have been a cheap labour force, but a growing set of data shows the contrary, especially in the pyrotechnological stage of primary metal production (*versus* mining or other related activities, e.g. Haaland & Shinnie 1985; Ben-Yosef 2010).

The new excavations at Timna have been carried out as part of the Central Timna Valley Project (directed by author E.B.-Y.) in an attempt to explore the ancient societies engaged in the exploitation of copper ore in the Late Bronze Age and early Iron Age of the southern Levant. Central to this attempt is the study of animal remains, as evidence for the ancient economy and social diversity of the societies under investigation (O'Connor 2000). Study of the animal remains retrieved in the 2013 field season has implications for this particular society, as well as providing insights into societies engaged in primary metal production in general. In addition, as ancient bones from sites in arid regions are often poorly preserved, highly fragmented and scarce, the new assemblage is an important addition to the existing database on the economy of past societies in the broader Wadi Arabah of the southern Levant.

Timna Valley is the smaller of the two major copper ore deposits in the southern Levant, the other being Faynan (Jordan) (Figure 1). The current research focuses on one of the peaks in copper production in this area, which occurred at the turn of the first millennium BC. The social processes related to metal production at this time have been discussed previously (e.g. Ben-Yosef 2010; Levy *et al.* 2012, in press) and it has been concluded that the principal labour force was based on a nomadic or semi-nomadic population organised as a tribal kingdom. These processes have not hitherto been studied through the prism of animal economy. Food and the manner of its production and consumption is strongly related to social diversity, as it has a role in defining and maintaining social relations (reviewed in Gumerman 1997; Twiss 2012). Food may also serve as a cultural indicator (Mintz & Du Bois 2002), and may help to resolve issues of cultural identity (e.g. Sapir-Hen *et al.* 2014). As such, the choice of food and the manner of its production and consumption may indicate, in addition to subsistence patterns, the social status of metalworkers with different levels of specialisation in the community responsible for primary copper production in the Wadi Arabah and beyond. Although systematic investigation of archaeometallurgical sites is now part of a well-established research discipline (e.g. Pigott 1996), animal remains from smelting and mining sites *per se* (from around the world) are often not documented, and usually provide rather small assemblages with poor control over context (e.g. Reese 2006; Bohm 2008; Croft in press; Muniz & Levy in press).

The focus of the 2013 field season was Site 34, one of the largest smelting camps in the Timna Valley (*c.* 3ha). Site 34 was recently dated to the early Iron Age (eleventh to tenth centuries BC; Ben-Yosef in prep). The name, 'Slaves' Hill', was coined after Nelson Glueck (1935) surveyed the area in 1934 and assumed that the inhabitants of the site were slaves engaged in copper production. He further interpreted the unique location of the site on a hilltop surrounded by cliffs and a wall as evidence for the use of forced labour, intended to prevent the workers from escaping. The site was also surveyed by the Arabah Expedition directed by Beno Rothenberg (1959–1961) (Rothenberg 1972), but it was not until the 2013 season that the first detailed mapping and systematic excavations took place.

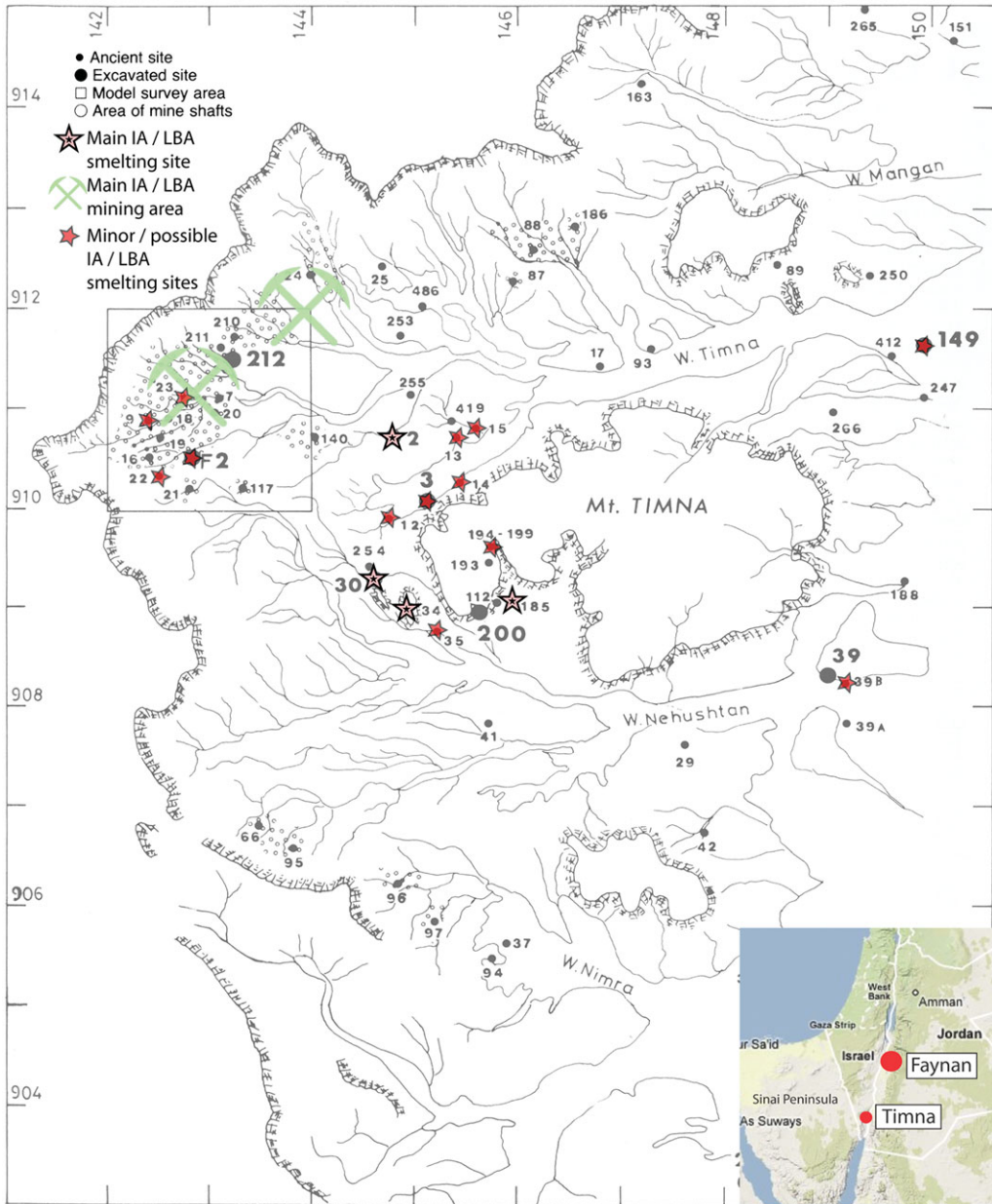


Figure 1. Map of the Timna Valley and its archaeological sites (based on Rothenberg 1990).

The Arabah Expedition dated this site, like many others in the Timna Valley, to the Late Bronze Age (c. 1300–1150 BC) from the similarity of surface finds to other, supposedly well dated, smelting sites in the valley. There was also an assumed connection with New Kingdom Egyptian activity in a nearby miners’ temple (Site 200; Rothenberg 1988). Recent research, however, has demonstrated that at least some of these sites are not related to

Egyptian-controlled activities and should be dated to the early Iron Age (1150–800 BC) (Ben-Yosef *et al.* 2012). These developments have rekindled an earlier scholarly debate regarding the ethnic identity of the metalworkers, especially regarding the role of Egyptians *versus* local tribes in the metallurgical activities.

Previous archaeozoological studies in the Wadi Arabah have focused on the major site of Khirbat en-Nahas in Faynan (Muniz & Levy in press), and three sites from Timna: Site 200, Site 2 and Site 30 (Figure 1). While the fauna from Site 200 was studied thoroughly and published as part of the final report of the site (Lernau 1988), the two other Timna sites provide only fragmentary data. The extensive 1964 excavations at the smelting camp of Site 2 (e.g. Rothenberg 1999) were never published as a final report and no faunal study is available. However, recent small salvage excavations directed by T. Erickson-Gini in the northern part of the site generated an insightful archaeozoological report (Bar-Oz & Erickson-Gini in press) that we believe represents the animal economy of Site 2 at its peak period of operation. Site 30, one of the largest smelting camps in the valley, was excavated by the Arabah Expedition in 1974 and 1976 (Bachmann & Rothenberg 1980), and in 2009 by present author Ben-Yosef (Ben-Yosef *et al.* 2012). Here again, no final report on the early excavations was produced, but the camel and donkey remains have recently been published (Grigson 2012; see also Sapir-Hen & Ben-Yosef 2013 for a reconsideration of the camel dating), together with a qualitative species list. The small faunal assemblage from the 2009 excavations was included in our current research using the same procedures described below for Site 34 (see online supplementary Table S1; see also Sapir-Hen *et al.* in press a). All these assemblages are dominated by domestic livestock, as is common in these periods in the southern Levant.

The study presented here is based on fieldwork followed by laboratory analyses of the macro- and micro-fauna. The excavations were specifically designed to secure comprehensive retrieval of animal remains under tight contextual control. This unique approach allowed us to reconstruct social diversity at an intra-site level at Site 34, and to gain new insights regarding the social organisation at primary metal production sites. In addition, comparison with other contemporaneous smelting sites sheds new light on the ethnic identity of their inhabitants.

Materials and methods

Contextual analysis is essential for understanding the activities, organisation and use of space by past societies (Schiffer 1976). While studying undifferentiated whole assemblages may suffice to detect broad economic patterns, consideration of the contextual origin of the individual components, as well as of taphonomic factors, is crucial for understanding human behaviour (Sapir-Hen *et al.* 2012). Trenches excavated at Site 34 (Square A, Slag Mound 19; Figure 2) revealed a vertical sequence of alternating layers that were divided into ‘industrial’ and ‘domestic’ accumulations, based on the presence or absence of pyrotechnological debris respectively. Loci rich in slag, tuyère and furnace fragments are referred to as ‘industrial’, while those rich in organic material are ‘domestic’ (Figures 3 & 4). Both contexts, however, represent complementary aspects related to the *raison d’être* of the site, namely the production of copper. Smelting took place in advanced



Figure 2. Excavating Slag Mound 19 at Site 34, Timna ('The Slaves' Hill').

shaft furnaces at designated areas, while preparation of ore, charcoal and food and other auxiliary tasks were conducted nearby. Through time, a specific location at the site (such as the excavated square, 19A) changed function as reorganisation of production activities took place (Figure 4).

To achieve comprehensive retrieval of faunal remains, the entire volume of excavated material was dry sieved on site, and a sample of the material that passed through the coarse mesh was wet sieved (using a 1mm mesh) (method reviewed in Lyman 2008; in the southern Levant see Sapir-Hen 2010). Wet sieving took place at the nearby Timna Lake.

Identification of skeletal elements and species was achieved using the comparative collections stored at the Institute of Archaeology and the Steinhardt National Natural History Museum and Research Center at Tel Aviv University. Identification included all skeletal elements and their portions. Distinguishing sheep (*Ovis aries*) from goats (*Capra hircus*) was based on morphological criteria (following Zeder & Lapham 2010).

Identified long-bone fragments were coded according to the completeness of five morphological zones (proximal epiphysis, proximal shaft, shaft, distal shaft and distal epiphysis). Other bone fragments were coded according to their percentage of total completeness. The percentage completeness was used to calculate MNI and MNE (see below). Modifications on the bones' surface were recorded, including butchery marks and signs of burning (following Lyman 1994).

In order to examine possible diagenetic processes, skeletal element representation (%MNE) was correlated to density-mediated attrition (Lyman 1994; based on the DPD values of modern sheep; Symmons 2005).

In addition, in order to extract evidence for specialisation, models introduced by Wapnish and Hesse (1988) and Zeder (1991) were followed. These models integrate three aspects

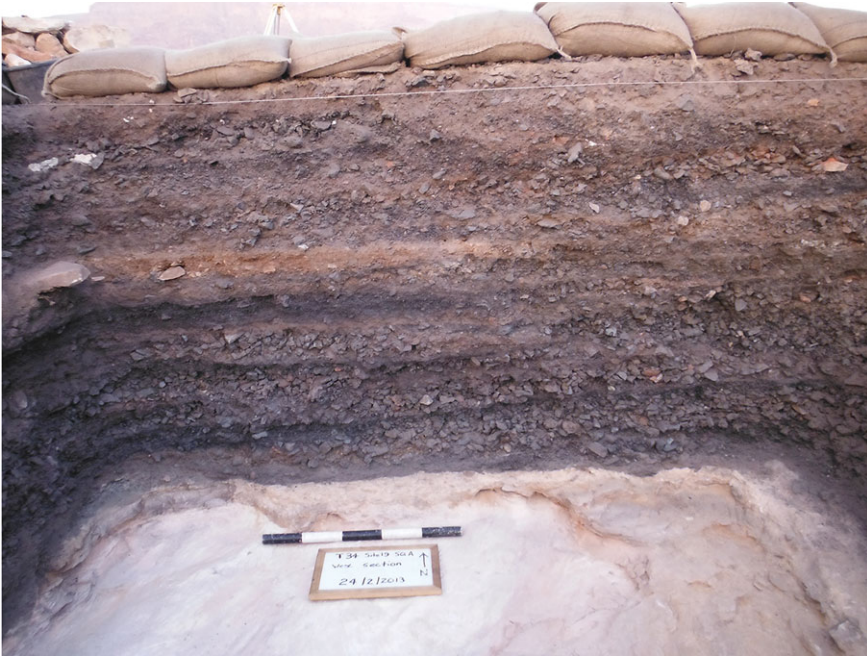


Figure 3. The western section of Square A in Slag Mound 19, Site 34, Timna, showing alternating 'industrial' (slag-rich, black) and 'domestic' (organic-rich, bright) layers representing diachronic changes in the organisation of production on the hill.

of faunal remains—species range, mortality profiles and body-part distribution—to predict modes of economic specialisation in early urban societies, including differentiation between producers and consumers. While in practice the results are not always conclusive (Zeder 1991: 245–48), they may serve as a basis for discussion (reviewed in Crabtree 1990; Twiss 2012). We recorded these aspects as follows:

1) Taxonomic abundance was based on NISP (number of identified specimens) (Lyman 2008). MNI (minimum number of individuals) values are provided but not integrated into the analysis (see O'Connor 2000: 59–61), and are calculated on the basis of MNE (minimum number of elements). MNE, quantifying relative abundance of skeletal elements, was calculated as the most abundant morphological zone per element, to avoid overlap of specimens (Dobney & Reilly 1988).

2) Skeletal part frequencies were calculated following the method adapted from Andrews (1990) by Lyman (2008: equation 6.5). Normalising the observed MNE to a model skeleton enables comparison between different assemblages.

3) Caprines' age of death is based on the timing of epiphyseal fusion sequences (Zeder 2006) and tooth eruption and wear (Payne 1973). Mortality profiles were not analysed as a small assemblage does not allow such analysis.

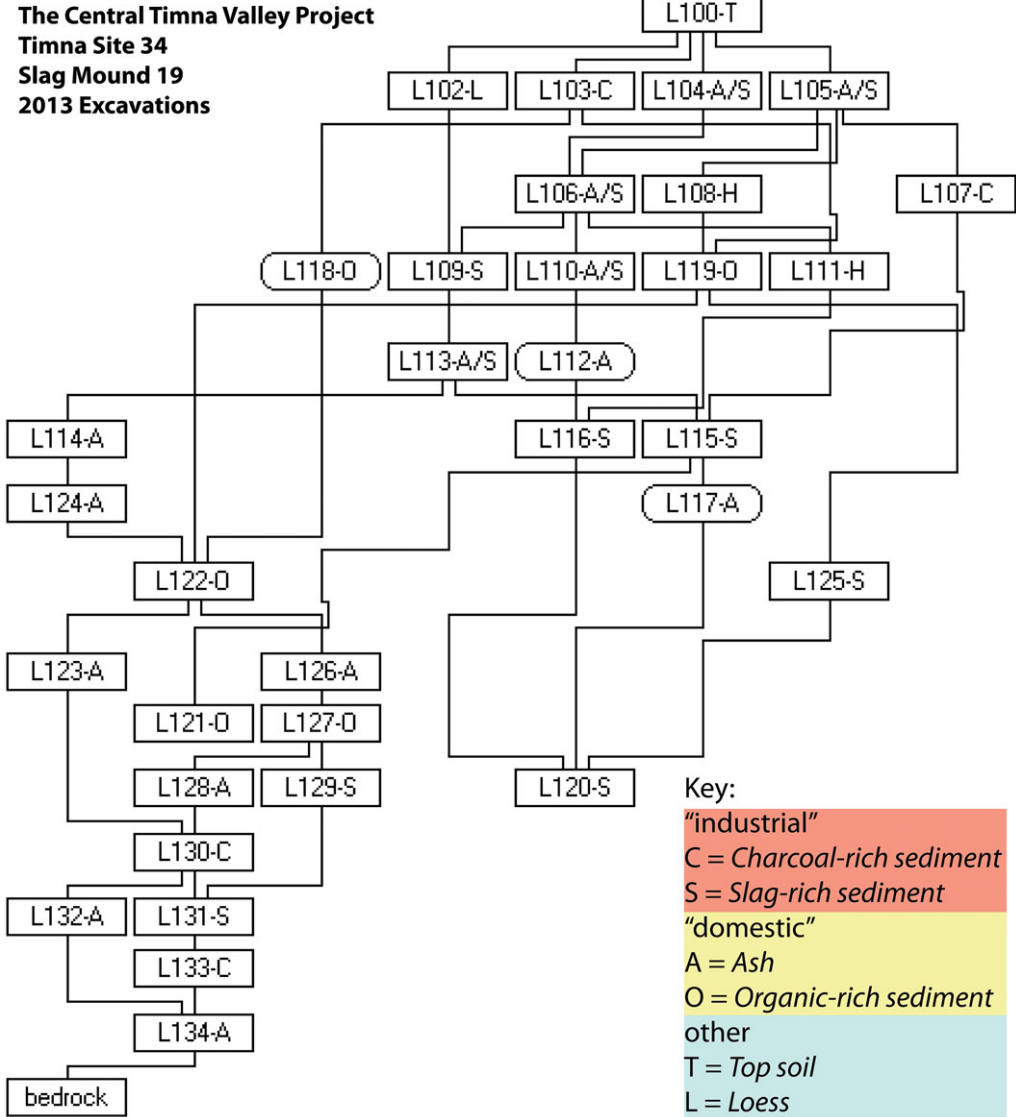


Figure 4. Schematic spatial distribution of the excavated loci and their classification into 'industrial', 'domestic' and 'other'. Animal bones were found in all loci except 120 and 128.

Results

Remains of 198 (NISP) mammals, in addition to one mollusc, one eggshell (Table 1), and 11 fish were identified in the Timna Site 34 assemblage. The mammal assemblage, the focus of the current paper, is dominated by domestic livestock, mainly caprines (sheep (*Ovis aries*) or goat (*Capra hircus*): NISP = 179), followed by a few donkey remains (*Equus asinus*: 11), and a few rodent bones (most probably mouse (*Mus sp.*)). Fish remains include mullets (*Mugilidae sp.*), porgies (*Sparidae sp.*) and catfish (*Clariidae sp.*) (Sapir-Hen *et al.*

Table 1. Species frequencies (NISP and MNI) at Site 34, Timna.

Species	Common name	Industrial		Domestic		Undefined	
		NISP	MNI	NISP	MNI	NISP	MNI
<i>Ovis/Capra</i>	caprines	31	1	57	3	76	3
<i>Ovis aries</i>	sheep			2	1	1	1
<i>Capra hircus</i>	goat	3	1	1	1	8	1
<i>Equus asinus</i>	donkey	2	1	3	1	6	1
rodent				2	1	6	1
<i>Cypraea annulus</i>	cowrie			1			
<i>Struthio camelus</i>	ostrich eggshell			1			
Total		36		67		97	

in press a). The sample size is sufficient to detect patterns, especially given the systemic retrieval of finds at the site.

Sixty-seven remains (NISP) were attributed to domestic contexts, and 36 (NISP) to industrial. The rest of the identified fauna could not be attributed to specific activity contexts.

Both assemblages (domestic and industrial) are dominated by domestic livestock. A difference exists in the identity of additional animals: the rodents, mollusc (cowrie (*Cypraea annulus*)) and eggshell (ostrich (*Struthio camelus*)) all originate from domestic contexts.

The state of preservation is poor and the bones are highly fragmented. However, we found no meaningful relationship between bone survival and bone density (bone density values from Symmons 2005; Spearman's $r = 0.19$, $p = 0.42$), suggesting there is no bias caused by density-mediated attrition. Only two bones display evidence of burning, and both are from industrial contexts. Butchery marks were evident on caprine bones from both contexts (not assignable to Binford's (1981) typology) and on a donkey pelvis (dismembering; Binford 1981).

Mortality curves could not be produced due to the small sizes of the samples when the contexts were considered separately. However, both unfused and fused elements were recorded (Table 2), and caprine teeth include erupting as well as highly worn examples (Table 3), indicating the presence of animals slaughtered at a young age as well as adults.

Among skeletal elements the frequency of caprines differs significantly between the two activity contexts defined above ($\chi^2 = 4.38$, $dF = 1$, $p = 0.03$; butchery waste parts *versus* meaty parts per context, based on MNE values; meaty parts are trunk and upper limbs, based on Meat Utility Indices values of sheep (Binford 1978)). The industrial contexts are dominated by meat-rich, high-calorie body parts, and show near absence of meat-poor body parts; skeletal elements from the domestic contexts include both groups of body parts, the meat-rich as well as the butchery waste (Figure 5 & Table 4).

Discussion

Notwithstanding its fragmentary nature, the faunal assemblage from Site 34 provides significant insights into social aspects of the metalworkers, including their identity and status,

Table 2. Frequency of fused and unfused elements among caprines.

Fusion age (in months)	Element	Domestic		Industrial	
		unfused	fused	unfused	fused
0–6	proximal radius				1
6–12	distal humerus			1	1
6–12	pelvis		1		1
6–12	scapula		1		1
12–18	1st phalanx		1		4
12–18	2nd phalanx		2		1
18–30	distal tibia				1
18–30	distal metapod	1	1		1
30–48	calcaneus		1		
30–48	proximal femur			1	
30–48	distal femur				
30–48	distal radius		1		
30–48	proximal tibia		1		
30–48	proximal ulna				
48+	proximal humerus				
Total		1	9	2	11

Table 3. Tooth wear stage of caprines (following Payne 1973).

Context	Tooth	Wear stage	Age
undefined	M2	C	0–12 months
domestic	dP4	D	12–24 months
domestic	M3	F	36–48 months
undefined	M1	G	48–72 months

through archaeozoological and taphonomic analysis. As the excavations at Slag Mound 19 used advanced techniques with good control over sample contexts, we believe that the assemblage is representative of activity at the site as a whole.

The animal economy at Site 34 is based on domestic livestock, a common dietary pattern in the Bronze and Iron Ages in the southern Levant (Sasson 2008; Sapir-Hen *et al.* in press b). The two assemblages—domestic and industrial—display both similarities and differences. Both the industrial and domestic contexts are dominated by caprines—sheep and goats, supplemented by donkey (which also was consumed, as evident from the presence of butchery marks). Wild game is completely absent from the assemblage. In the southern Levant, hunted wild game contributes a very minor addition to the economy of this period (Tsahar *et al.* 2009). The lack of wild game (at other Timna sites as well) could testify to a lack of hunting; however, it might be a bias of the small sample size (Lyman 2008: 71–78). In terms of species range, the two contexts differ in the additional fauna, which are found only in the domestic contexts: mouse, cowrie (mollusc) and ostrich eggshell. The cowrie is especially common at Iron Age sites in the Negev and originates in the Red Sea (see Bar-Yosef Mayer 2007 for discussion about its probable use as currency).

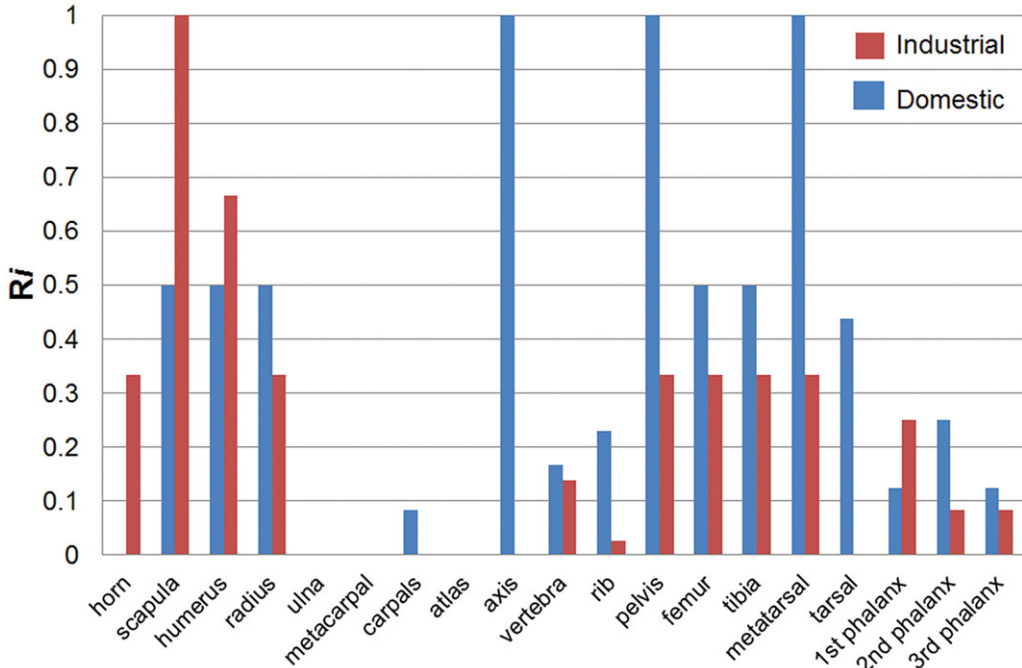


Figure 5. Frequency of caprine skeletal elements from 'industrial' and 'domestic' contexts in Slag Mound 19, Site 34, Timna. Skeletal part frequencies (R_i) were calculated by dividing the observed MNE values of skeletal part i (N_i) in the assemblage (per species), by the expected MNI value (the frequency of skeletal part i in one skeleton [E_i], multiplied by MNI). $R_i = N_i/(MNI)E_i$. Adapted from Andrews 1990; method reviewed in Lyman 2008.

The identity of the species and the presence of butchery marks testify to their consumption as food. Careful study of the assemblage excludes the possibility of their use as a fuel source (see e.g. Thery-Parisot 2002): burning to high temperatures will result in a significant colour change that is almost entirely absent from the studied assemblage of Site 34. Moreover, using bones as fuel in smelting processes produces a high concentration of phosphorus in slag and metal that is not found in the slag (Rothenberg 1990; Hauptmann 2007; Ben-Yosef 2010) or metal (Hauptmann *et al.* 2002) from the periods under discussion. Thus, the assemblage reflects the remains of the meals of the metalworkers.

The primary difference between the industrial and domestic contexts is evident not in the species diversity but in the choice of body parts consumed: the industrial contexts include mainly the meaty parts of the caprines, whereas the domestic contexts include the butchery waste as well. The frequency of skeletal elements can be related to diagenetic processes (Lyman 1994), but we found no bias caused by density-mediated attrition. The presence of meaty parts or butchery waste (among other characteristics of production, consumption and discard) may point to the mode of distribution of meat products: whether meat is received directly through contact with herds or herders, which results in a fuller representation of skeletal elements, or received indirectly through regulated distribution channels (Wapnish & Hesse 1988; Zeder 1991). The model predicts that the 'regulated' population will be provided with the better meat cuts. In the current study, the differences

Table 4. MNE of caprine skeletal elements in industrial and domestic contexts at Site 34, Timna (cf. Figure 5).

	Domestic	Industrial
1st phalanx	1	3
2nd phalanx	2	1
3rd phalanx	1	1
carpal	1	
femur	1	1
horn		1
humerus	1	2
humerus/femur	1	1
long bone	1	1
mandible	5	
maxilla	3	
metapod	1	1
metatarsal	2	1
occipital condyle	1	
patella	1	
pelvis	2	1
radius	1	1
rib	6	1
scapula	1	3
tarsal	6	
tibia	1	1
tooth	1	
vertebra	4	5
axis	1	
Total	45	25

in economic specialisation testify to the social diversity present at the site. We argue that the difference between the contexts is derived from the scenario in which the people engaged in furnace operation ('industrial' in the division above) were provided with the better meat, while the people engaged with auxiliary activities ('domestic' in the division above) were responsible for preparing food among other tasks supporting the core smelting process.

This observation implies that different ranks may be attributed to the two populations, with the people engaged in smelting enjoying the higher status. This is also implied by the presence of fish remains (including catfish) and abundant seeds of cereals and fruits (including Mediterranean species such as grape and pistachio; see Ben-Yosef in prep.) at the site, albeit in both contexts. These remains indicate a substantial effort to vary the diet of the workers by transporting food from at least 30km away (the Red Sea, Figure 1, and more than 200km in the case of the catfish), most probably from different food procurement systems via trade.

These new observations from Site 34 'Slaves' Hill' stand in contrast to the common perception that workers in mining areas were a low-class, poorly paid labour force engaged in the arduous work of mining and smelting. The notion that the people engaged in

smelting activities were neither slaves nor poorly paid, but highly skilled craftspersons, is also supported by ethnographic evidence of iron smelting in sub-Saharan Africa. For example, according to de Barros (2000), primary smelting tasks require long apprenticeship and could be done only by specialists. De Barros (2000: 174–83) claims that as iron tools are at the centre of economic, political and ritual life, iron-workers are viewed with fear and respect by non-craftspersons and often have high status. The social status of metalworkers is further explored by Budd and Taylor (1995) who discuss aspects of magic and cult in metallurgical craftsmanship. It is reasonable to assume that the ranked social status and distinct activity spheres documented at Site 34 were accompanied by cultic activities that helped maintain (and justify) the existing system, although direct evidence is lacking.

The development of metal production and specialist tasks in the Late Bronze and early Iron Age at Timna must have generated further social divisions through different levels of specialisation. It is expected that those engaged in mining activities were indeed part of a lower class, possibly including slaves, *corvée* labour and prisoners, as reflected in later historical sources (e.g. Friedman 2008 on Roman-Byzantine Faynan copper mines). However, the lack of published studies of faunal remains from mines, mining camps and other smelting sites limits the discussion at the moment to the current study. The only large faunal assemblage from a metallurgical site in the southern Levant comes from the early Iron Age Khirbat en-Nahas, a major smelting site located in Faynan (Muniz & Levy in press). Muniz and Levy found that, although the architectural finds point to social stratification at the site, there is no such evidence in the faunal remains and there is no evidence for preference in body-part selection. Similar conclusions were proposed by Antipina and Morales (2006), who studied two major metallurgical sites from Late Bronze Age Europe, and reached ambiguous results concerning the economic organisation of the society. These studies, however, currently lack the fine distinctions between different kinds of contexts that were observed at Site 34. Their analysis is based on site-level observations (with emphasis on areas in the case of Muniz and Levy), and thus ignores potential differences between local contexts that might relate to different levels of specialisation among workers at the same site (for the loss of information by using ‘lumped’ faunal assemblages see also Sapir-Hen *et al.* 2012).

The faunal assemblages from the smelting sites of the Arabah also add to the current discussion about the identity of the metalworkers themselves. The fundamental question is the role of Egyptians (*versus* local societies) in the copper production activities. New radiocarbon dates from a key smelting site at Timna (Site 30) have suggested that the role of Egyptians in operating the mines was considerably less important than previously assumed, and that most of the smelting sites in the region were operated by local societies during the early Iron Age (Ben-Yosef *et al.* 2012). However, the shrine of Site 200 (Rothenberg 1988) yielded clear evidence of Late Bronze Age Egyptian presence in the valley, undoubtedly related to copper production, and new evidence suggests the possible presence of Egyptians also during the Iron Age (Twenty-second Dynasty, late tenth–ninth centuries BC) (e.g. Levy *et al.* 2012). The range of animals available in an area may be dictated by local climate, but the decision of what to raise, and to what purpose, in these periods in the southern Levant, was dictated by historical and political processes rather than climatic ones (Sapir-Hen *et al.* in press b) or by cultural preference (Sapir-Hen *et al.* 2013). In Late Bronze–early

Iron Age Timna, a combination of these factors was responsible for the choice of diet. Caprines, camels and donkeys, adapted to the local climate, were exploited for meat and their secondary products. Pigs (*Sus scrofa*), however, were only present at the Late Bronze Age Timna Site 2 (Bar-Oz & Erickson-Gini in press, NISP = 39, 79 per cent caprines and 21 per cent pigs), and are not considered suitable for nomadic life or for the local desert climate (e.g. Hesse & Wapnish 1998). Sapir-Hen *et al.* (2013) demonstrate that pig consumption in the Late Bronze Age southern Levant is an Egyptian culinary habit, not practised by the local population. While caution should be exercised when connecting presence or absence of a species with ethnic identity, the pigs at Late Bronze Age Site 2 at Timna probably indicate the presence of Egyptians, hence corroborating the interpretation of that site as an Egyptian-controlled smelting camp (e.g. Rothenberg 1990, 1999). The absence of pigs in the contemporary temple at Site 200 (Lernau 1988) does not imply the absence of Egyptians there, however, since pigs were not included in Egyptian religious rituals (Hecker 1982). Later, in early Iron Age Canaan, pork was consumed only in the Philistine urban centres (Sapir-Hen *et al.* 2013). In turn, the absence of pigs from the other studied smelting sites (Sites 30, Site 34 and Khirbat en-Nahas) implies the absence of Egyptians in those locations. These observations further support the new argument for less Egyptian involvement in the region, with fundamental implications for our understanding of social processes in this key period of change in the southern Levant, when new local polities appear (Edom, ancient Israel) replacing the former hegemony of an empire (Egypt) (for discussion in light of the archaeology of copper production sites, see Ben-Yosef *et al.* 2010).

Conclusion

Returning to the social status of those engaged in copper smelting, our study has identified patterns in the archaeological sample that have social meanings. The new data from Site 34 demonstrated differences between the meat procurement methods of those engaged respectively in direct smelting ('industrial') and auxiliary ('domestic') activities in a central smelting camp. We suggest that the people engaged in smelting were actually highly skilled craftspersons and were treated as such. This fundamental observation stems from the inherent complexity of the technology that demanded and created an idiosyncratic class of workers, and hence we believe it should apply to smelting activities across time and space, namely at different periods, in different cultures and even in relation to different metals. Our study demonstrates that only by conducting a high-resolution contextual study that takes into consideration all aspects of the faunal remains, can this kind of diversity among workers at the same site be detected. This is the first stage of an ongoing study focusing on the socioeconomic status of different levels of specialisation in metal production, including primary exploitation (mining and smelting) and specialised metallurgical workshops within settlement contexts.

Acknowledgements

We wish to thank the area supervisors Willie Ondricek and Ilana Peters; Craig Smitheram for technical help; and Dr Daniella Bar-Yosef Mayer for identifying the mollusc. We are grateful to the two anonymous reviewers for their helpful comments. This research is supported by Marie Curie FP7-PEOPLE-2012-CIG grant # 334274.

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Received: 24 July 2013; Accepted: 10 October 2013; Revised: 19 November 2013