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English cover: Cross decoration in the middle of the bema mosaic carpet, the Southern Church at Tell es-Samak (Shikmona/Porphyreon) (photo by M. Eisenberg).

Hebrew cover: An Achaemenid bulla from Tell es-Samak (Shikmona/Porphyreon) (photo by Sh. Haad).

The Late Bronze and Iron Age Livestock Remains of Tell es-Samak (Shikmona/Porphyreon)

Catherine Ujma, Shay Bar and Guy Bar-Oz

This paper presents the results of the study of the animal economy across the Late Bronze and Iron Ages at the Carmel coast site of Tell es-Samak (Shikmona/Porphyreon). Focusing on the livestock, this paper addresses whether changes occurred in diet and secondary products exploitation. The results demonstrate that, like most sites of these periods, goat (*Capra hircus*) and sheep (*Ovis aries*) were the major contributors to lifeways. Across time, there was minimal change in the exploitation and consumption of domestic animals. This paper reflects the continuity in diet by the inhabitants of the site between the Late Bronze and Iron Ages.

Introduction

The faunal remains from Tell es-Samak (Shikmona) provide a unique opportunity for a glimpse into the foodways of Israel's northern coastal plain during the Late Bronze (1550–1200 BCE) and Iron Ages (1200–586 BCE) (Bar 2021). Extensive research has been carried out on the faunal remains of the nearby harbor site of Dor as well as research on smaller sites nearby Shikmona, such as Megadim (Raban-Gerstel *et al.* 2008; Sapir-Hen, Wolff and Bar-Oz, in prep.; Sapir-Hen *et al.* 2014). These remains provide new ways to explore inter- and intra-site variability in sociocultural diversity of rural lifeways, in periods that are characterized by their complex cultural mosaic. The site of Shikmona is located on the shore, at the southern fringe of the Phoenician territories north of the central Phoenician site of Dor (Gilboa, Sharon and Bloch-Smith 2015). As at Dor, the people of Shikmona enjoyed both the sea and the surrounding coastal plain and their subsistence relied on both fishing and agro-pastoral economy. The purpose of this report is to describe the animal economy of the site's inhabitants with a focus on the livestock economy. Our data rely solely on the new excavation's remains that allow us to examine the main diachronic changes in faunal exploitation strategies that occurred in three sequential occupational phases presented at the site: the Late Bronze Age, the early Iron Age and the late Iron Age. Following the

presentation of the main livestock exploitation strategies we compare our results to nearby contemporaneous sites from northern Israel. The rich and abundant fish assemblages are not presented in this paper.

Results

The faunal assemblage of Shikmona comprised a total of 1,388 identified bones (Table 1). Over 50% of these belong to the Iron Age I assemblage, ca. 30% to the Late Bronze and ca. 20% to the Iron Age II. The assemblage comprises 15 taxa, excluding fish and bird remains, which are not discussed here. Goat (*Capra hircus*) and sheep (*Ovis aries*) referred to here as caprovines, represent the largest group (Table 1) of the mammal assemblage. Their ratio varies slightly across periods. This demonstrates the stability of this aspect of herd management that did not change significantly over time.

Cattle (*Bos taurus*) accounts for the second largest group of livestock at Shikmona. Yet their presence is small, constituting less than 10% of the entire assemblage.

Pig (*Sus scrofa*) is almost entirely absent in all periods, being represented by a total of only four skeletal elements across the entire assemblage (Table 1). The extremely small quantity of pig bones suggests that pork was not part of the foodways for Shikmona inhabitants.

The livestock assemblage also includes a single equid maxillary from the Iron Age I that could not be identified to the species level. Game and wild animals account for less than 10% of the assemblage, with the Iron Age I demonstrating the highest taxonomic diversity (Table 1). Fallow deer (*Dama mesopotamica*) are represented by 14 bones and mountain gazelle (*Gazella gazella*) by 13. Other taxa represented

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Animal			Total		Late Bronze		Iron Age I		Iron Age II	
			NISP	%	NISP	%	NISP	%	NISP	%
Live-stock	<i>Capra/Ovis</i>	Caprovines	523	37.7%	172	43.5%	249	34.3%	102	39.4%
	<i>Capra hircus</i>	Goat	26	1.9%	6	1.5%	18	2.5%	2	0.8%
	<i>Ovis aries</i>	Sheep	14	1.0%	1	0.3%	11	1.5%	2	0.8%
	<i>Bos taurus</i>	Cattle	108	7.8%	42	10.6%	50	6.9%	16	6.2%
	<i>Sus</i>	Pig	4	0.4%	1	0.3%	1	0.1%	2	0.8%
Wild Game	<i>Dama</i>	Deer	12	0.9%	5	1.3%	5	0.7%	2	0.8%
	<i>Dama mesopotamica</i>	Mesopotamian fallow deer	1	0.1%	1	0.3%				
	<i>Gazella gazella</i>	Gazelle	13	0.9%	3	0.8%	4	0.6%	6	2.3%
	<i>Equus</i>	Equid	1	0.1%			1	0.1%		0.8%
	<i>Canis</i>	Canine	5	0.4%	1	0.3%	4	0.6%		
	<i>Felis</i>	Cat	1	0.1%			1	0.1%		
	<i>Erinaceus</i>	Hedgehog	1	0.1%					1	0.4%
	<i>Lepus</i>	Hare	1	0.1%			1	0.1%		
	<i>Trionychidae</i>	Softshell turtle	2	0.1%			2	0.3%		
	<i>Testudo greaca</i>	Greek tortoise	6	0.4%	4	1.0%			2	0.8%
		Bird	31	2.2%	6	1.5%	11	1.5%	14	5.4%
		Fish	639	46.0%	153	38.7%	369	50.8%	110	42.5%
		NISP	1388		395		727		259	

Table 1: NISP of faunal remains at Tel Shikmona.

include common Greek tortoise (*Testudo greaca*) and softshell turtle (*Trionyx triunguis*), hare (*Lepus capensis*) and hedgehog (*Erinaceus europeas*). In addition, several carnivore bones were encountered, including dog/wolf (*canis* sp.) and cat (*Felis*). Birds are represented by only 31 bones. Currently these have not been identified to the species level. Over time, the ratio of sheep to goat gradually increased (Table 2). In the Late Bronze Age, the proportion is 1:6, in the Iron Age I ca. 2:3 and by the Iron Age II the ratio sees equal amounts of sheep and goat (note that the sample size of the Iron Age II assemblage is small). The low-level changes demonstrate that the stability of herd management did not change significantly over time. The mortality profile of caprovines (Table 3) shows fluctuations in the kill-off profile across the three occupational phases. In the Late Bronze the ratio of juvenile caprovines is low (17%), as are young adults (22%). and sub-adults account for 46% of the assemblage. In contrast, the Iron Age saw a shift in the age profile: Juveniles comprise 27%, young adults comprise 35% and sub-adults 45%. The Iron Age II saw a further increase in juveniles (39%), similar quantities of young adults (28%) and a drop in sub-adults (33%), suggesting similar herd management techniques. In contrast, the Late Bronze

Age saw greater survivorship into maturity, suggesting a different way of caprovine exploitation.

Period	S&G Total	Sheep	% of S&G Total	Goat	% of S&G Total	Sheep: Goat Ratio
Total	563	14	0.2%	26	4.6%	1:1.9
Late Bronze	179	1	0.6%	6	3.4%	1:6
Iron Age I	278	11	4.0%	18	6.5%	1:1.6
Iron Age II	106	2	1.9%	2	1.9%	1:1

Table 2: Sheep/goat ratio.

Discussion

The livestock economy of Shikmona was based primarily on caprovines with evidence for some lesser consumption of cattle, and pigs are almost entirely absent. Game animals occur in small numbers. Overall, the assemblage is similar to other sites in the southern Levant, however, the large quantities of fish found at Shikmona are not

Element	Late Bronze		Iron Age I		Iron Age II	
	Fused	Unfused	Fused	Unfused	Fused	Unfused
Scapula	8	-	8	3	2	-
Distal humerus	6	1	13	5	5	4
Proximal radius	2	1	3	3	4	2
Proximal metapodial	9	3	13	3	6	5
First year total	25	5	37	14	17	11
Phalanx 1, proximal	7	1	22	7	4	4
Phalanx 2, proximal	5	-	3	8	3	-
Tibia, distal	5	-	3	8	3	-
Metacarpal, distal	1	-	6	1	3	-
Metatarsal, distal	9	-	8	1	2	-
Metapodial, distal	4	8	11	7	3	6
Second year total	31	9	53	32	18	10
Ulna, proximal	-	3	2	4	1	2
Femur, proximal	2	2	4	4	-	3
Calcaneus, proximal	2	1	-	5	4	-
Radius, distal	-	-	3	-	1	2
Third year total	4	6	9	13	6	7
Humerus, proximal	-	-	-	-	3	-
Femur, distal	-	-	3	3	2	-
Tibia, proximal	-	-	1	1	1	-
Fourth year total	0	0	4	4	6	0

Table 3: Epiphyseal fusion of caprovines.

common in the Late Bronze and Iron Ages (Neer, Zohar and Lerna 2005). The quantities of fish combined with and caprovines demonstrates that Shikmona was based on a dual-subsistence economy. It sustained a combined fishing and agro-pastoral community, exploiting the surrounding rich coastal plain grazing pasture and the sea. The livestock remains from Shikmona are very similar to nearby and contemporaneous southern Levantine sites from the Mediterranean region of Israel (e.g. Marom *et al.* 2009; Sapir-Hen *et al.* 2013; Sapir-Hen *et al.* 2014; Sapir-Hen, Wolff and Bar-Oz, in prep.; Tamar *et al.* 2013; Wapnish and Hesse 1991). When comparing the livestock at Shikmona to Dor, the results are relatively similar (Table 4). The results from Megadim are more varied, especially in relation to sheep/goat quantities, however, this may relate to the small assemblage (total NISP = 120) and also the disturbed nature of the site (Sapir-Hen, Wolff and Bar-Oz, in prep.). While there are minor changes among the sites, overall, they are fairly similar to each other. Tamar *et al.* (2013) suggest that these minor differences relate to agricultural changes over time as well as economic changes across sites and over time.

The finds from the Late Bronze Age caprovine herd of Shikmona demonstrate 80% survivorship beyond the second year. These results suggest that animals were predominantly exploited for their milk and/or wool and finally slaughtered after their productivity was exhausted (Redding 1981; Sasson 2008). We expect that by this scenario the majority of adult animals were females, but unfortunately, the small sample size did not allow us to examine their demographic ratios in more detail. This hypothesis is further supported by the higher quantities of goats compared to sheep. In contrast, both Iron Age phases saw a much lower rate of survivorship into adulthood and equalization of the sheep/goat ratio. These results could suggest an increase in secondary product consumption and a shift in economy that emphasized meat exploitation. The periodic drop in the frequency of goats could be addressed by several other potential explanations, ranging from environmental factors to herd maintenance strategy aimed at optimizing herd products (Marom *et al.* 2014; Redding 1981). The widely held view attributes this Iron Age trend to increasing social complexity across the transition to the Iron Age (Sapir-Hen

		Caprovine		Cattle		Pig		Reference
		NISP	%	NISP	%	NISP	%	
Phoenicia	Shikmona Late Bronze	178	455	42	11%	2	0.50%	
	Shikmona Iron Age I	278	38%	50	7%	1	0.10%	
	Shikmona Iron Age II	106	41%	16	6%	2	0.80%	
	Dor Iron Age I	529	71%	118	16%	1	0.10%	Raban-Gerstel <i>et al.</i> 2008
	Dor Iron Age I-IIA	1547	32%	679	14%	32	0.70%	Raban-Gerstel <i>et al.</i> 2008
	Dor Iron Age II	425	53%	271	33%	1	0.10%	Sapir-Hen <i>et al.</i> 2014
	Megadim LB	-	74%	-	20%	-	5%	Sapir-Hen, Wolff and Bar-Oz, in prep.
Jezreel Valley and the Lower Galilee	Megiddo Late Bronze	436	65%	134	20%	15	2.25%	Sapir-Hen <i>et al.</i> 2016
	Megiddo Iron Age I	1224	69%	529	30%	23	1%	Sapir-Hen <i>et al.</i> 2016
	Megiddo Iron Age II	85	63%	23	9%	-	-	Sasson 2013
	Yoqne'am Late Bronze	73	74%	19	19%	-	-	Horwitz <i>et al.</i> 2005
	Yoqne'am Iron Age I	170	63%	83	64%	4	1%	Horwitz <i>et al.</i> 2005
	Yoqne'am Iron Age II	218	60%	41	11%	7	2%	Horwitz <i>et al.</i> 2005
	Horbat Rosh Zayit Iron Age II	211	74%	74	26%	-	-	Horwitz 2000
	Tel Qashish Late Bronze	77	60%	43	33%	5	4%	Horwitz 2003
	Tel Qashish Iron Age I	3	50%	1	16%	2	33%	Horwitz 2003
	Tel Qashish Iron Age II	95	48%	97	49%	2	1%	Horwitz 2003
	Tel Qiri Iron Age II	793	97%	-	-	14	5%	Davis 1987
	Hazorea Iron Age II	633	86%	79	11%	14	2%	Davis 1982

Table 4: Comparing Late Bronze and Iron Age livestock quantities from sites on the Carmel coast and adjacent sites in the Jezreel Valley and the Lower Galilee.

et al. 2014). Yet, Raban-Gerstel *et al.* (2008) point out that this move to a more evenly mixed herd is a common phenomenon in the southern Levant during the Iron Age, potentially suggesting some sort of environmental factor. As at Dor, we found evidence for exploitation of wild resources (Raban-Gerstel *et al.* 2008). Aside from fishing, Shikmona presents evidence of hunting as demonstrated by the presence of wild ungulates, like gazelle and fallow deer that inhabit the various environmental zones near Shikmona, including Mount Carmel and the more open areas of the coastal plain. The presence of deer correlates to woodlands, gazelle to grasslands and softshell turtle and some of the bird remains to marshy environments. The assemblage contains extremely small quantities of pig across all phases. These results mirror those of Dor. Quantities of pig bones in southern Levantine sites have been the focus of extensive discussions relating to ethnic identity (Hesse and Wapnish 1997; Sapir-Hen *et al.* 2013). This argument typically focuses on Philistia, on the southern coastal plain, while the northern coastal plain is not discussed. Table 4 presents the quantities of pig bones from sites in northern Israel, including Phoenician sites. Overall pig quantities at all sites are small across all periods. Some sites, especially the Iron Age II sites that are recognized as part of the

Northern Kingdom demonstrate larger quantities of pigs. In contrast, the Phoenician sites demonstrate smaller and more consistent quantities of pig through all periods. The small numbers of pigs seem to suggest that Phoenicians did not raise them and probably also avoided consuming pork. A comparison of the results between the Late Bronze and Iron Ages at Shikmona, demonstrates that while there are minor changes throughout the occupation, overall, the animal economy was relatively consistent over time. This is especially the case in the transition from the rural village of the Iron Age I to the Iron Age II fortified settlement, where the results are the most similar. The Late Bronze Age seems to reflect greater dependence on secondary products like milk and wool, whereas in the Iron Age there seems to be greater dependence on the consumption of younger livestock. Cattle were likely used first for labor and only older individuals were consumed. Pig was avoided unlike nearby sites belonging to the Northern Kingdom. Skeletal element profiles suggest that livestock were slaughtered and consumed. The diet at Shikmona seems to have been based primarily on fish, caprovines and supplemented to a lesser extent by consumption of cattle and wild species. All of this leads to the conclusion that the inhabitants of Shikmona were engaged in a small-scale local economy.

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