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IRON AGE CANAAN: REGIONAL TRENDS IN ANIMAL ECONOMY

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ABSTRACT

The Late Bronze Age is often described as an age of internationalism characterized by well-developed political and commercial contacts facilitated by empires and regional imperialism. The end of the Late Bronze Age during the final decades of the 13th century B.C.E. witnessed crises, collapse, and the decline of this world system and imperial aspirations. This upheaval changed the political and economic landscape of the southern Levant, resulting in fragmentation and regionalism that characterizes the 12th and 11th centuries B.C.E. of the early Iron Age. The political environment became increasingly structured with the rise of territorial states during the Iron IIA and the eventual reintegration into an imperial system during the Iron IIC. The restructuring of the region resulted in similarities of livestock frequencies and management strategies at sites in close proximity, forming recognizable economic groups. In this thesis, I examine diachronic change of livestock frequencies and herd management strategies at seven sites – Tel Akko, Tel Miqne-Ekron, Tel es-Safi/Gath, Hazor, Tel Dan, Megiddo, and Tel Dor – located in the southern Levant. Each of these sites have identifiable regional roles, represent a variety of ethnic groups and environmental zones, and have a stratigraphic sequence spanning the Iron I to Iron IIC. Based on analysis of the faunal remains, I reconstruct the animal economy at each of these sites during the Iron I – Iron IIC. I examine to what extent a site's regional role, location, and ethnic affiliation influenced species selection and herd management. A major conclusion of this study suggests that increased administrative control by ruling groups over production resulted in management strategies focused on secondary products, a trend that is evident at all sites examined in this study. Influence on species selection and herd management practices due to a site's ethnic affiliation remains inconclusive.

TABLE OF CONTENTS

List of Tables……v
List of Figures……vi
Acknowledgments..……...vii

Chapter 1. INTRODUCTION……..……1
Canaan at the End of the Late Bronze Age and Iron Age……..……4
Importance of this Study…….……..7

Chapter 2. SITE DESCRIPTIONS…….…….....10
Tel Akko……..……...……11
Miqne-Ekron…….……...…….....14
Hazor…….....19
Tel es-Safi/Gath……...……..…22
Tel Dor……...……....……27
Tel Dan……...……32
Megiddo……...……...……...……..35
Summary……38

Chapter 3. METHODS……...……40
Faunal Analysis at Tel Akko...……43

Chapter 4. ANALYSIS……...46
Iron I Period……48
Iron IIA Period……...…53
Iron IIB Period……...…59
Iron IIC Period……....64

Chapter 5. DISCUSSION……...68

Chapter 6. CONCLUSIONS…….…74

References…….……80

Appendix A: Mortality Data….…….……88

Appendix B: NISP Values and Other Data…...…….……94

LIST OF TABLES

Table 1.0 Chronology of periods represented by site……..……..…10
Table 1.1 Outline of site sources and total livestock NISP……11
Table 1.2 Tel Akko chronological sequence…….……..12
Table 1.3 Iron Age chronology of the Levant…….……....42
Table 2.1 Livestock NISP values through time…….....…….96
Table 2.2 Sheep and goat NISP values through time…….....……96

LIST OF FIGURES

Figure 1.1 Location of sites discussed in this study……...3
Figure 1.2 Site map of Tel Akko……13
Figure 1.3 Tel Akko livestock frequencies through time……..……..14
Figure 2.1 Plan of Tel Miqne-Ekron with inset plan of Field I……17
Figure 2.2 Ekron livestock frequencies through time……19
Figure 3.1 Site map of Hazor upper city excavation areas ……..……20
Figure 3.2 Hazor livestock frequencies through time……22
Figure 4.1 Site map of Tel es-Safi/Gath……..……25
Figure 4.2 Tel es-Safi livestock frequencies through time……..……27
Figure 5.1 Excavated areas at Tel Dor, showing sub-areas of Area D……30
Figure 5.2 Tel Dor livestock frequencies through time……...……31
Figure 6.1 Tel Dan site map……...……33
Figure 6.2 Tel Dan livestock frequencies through time……..……35
Figure 7.1 Megiddo site map……..37
Figure 7.2 Megiddo livestock frequencies through time……38
Figure 8.0 Number of mammalian taxa identified plotted against total NISP of each site……...47
Figure 8.1 Sheep to goat ratio as a function of livestock NISP across all time periods……47
Figure 8.2 Iron I relative livestock frequencies with NISP values……..49
Figure 8.3 Iron I relative proportions of sheep and goats with NISP values……50
Figure 9.1 Iron IIA relative frequency of livestock and NISP values……..55
Figure 9.2 Iron IIA relative proportions of sheep and goats and NISP values……57
Figure 10.1 Iron IIB relative livestock frequency and NISP values……....60
Figure 10.2 Iron IIB relative proportions of sheep and goats and NISP values……...62
Figure 11.1 Iron IIC relative livestock frequencies and NISP values……..…65
Figure 11.2 Iron IIC relative proportions of sheep and goats and NISP values……...66
Figure 11.3 Iron Age cattle frequency per period as a percentage of total livestock NISP……..94
Figure 11.4 Iron Age sheep/goat frequency per period as a percentage of total livestock NISP…..94
Figure 11.5 Iron Age pig frequency by site per period as a percentage of total livestock NISP …..95
Figure 11.5 Diachronic Sheep to Goat ratios by site per period……95
Figure 12.1 Akko cattle mortality in percent unfused per age group……...88
Figure 12.2 Akko sheep and goat mortality in percent unfused per age group……....88
Figure 13.1 Tel Dor cattle mortality in percent unfused per age group……...89
Figure 13.2 Tel Dor sheep and goat mortality in percent unfused per age group……89
Figure 14.1 Ekron cattle mortality in percent unfused per age group……..90
Figure 14.2 Ekron sheep and goat mortality in percent unfused per age group……...90
Figure 15.1 Megiddo cattle mortality in percent unfused per age group……91
Figure 15.2 Megiddo sheep and goat mortality in percent unfused per age group……...91
Figure 16.1 Hazor cattle mortality in percent unfused per age group……..92
Figure 16.2 Hazor sheep and goat mortality in percent unfused per age group……...92
Figure 17.1 Tel Dan cattle mortality in percent unfused per age group……...93
Figure 17.2 Tel Dan sheep and goat mortality in percent unfused per age group……....93

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CHAPTER 1: INTRODUCTION

The Iron Age I – IIA (1150 – 900 B.C.E.) marks the beginning of a restructuring in Canaan, in the southern Levant. The period is characterized by regionally defined settlement patterns and fragmentation of the formerly homogenous material culture of the region. This fragmentation led to the rise of new power centers, political systems, the reemergence of indigenous cultures, and, in some cases, the movements of people, along defined geological boundaries. The arrival of the Philistines in the south, the continuation of the Canaanite culture at Phoenician sites along the northern Levantine coast, and the emergence of the Israelites in the central hill country changed the political landscape of Canaan. Awash with differentiated material culture, identities, and ideologies, the new entities developed, interacted, and vied for dominance forming identifiable sub-regions in the southern Levant. The increase in the political autonomy of the newly independent polities is a key factor in the Late Bronze Age/Iron Age transition. Without political unification, independent polities expanded without much foreign political influence (Killebrew 2005: 21-22; Killebrew 2014: 596-597).

The collapse of the international trade system at the end of the Late Bronze Age severely disrupted the Levantine palace system of elite gift exchange. This led which led to shift from a palace system to one centered on entrepreneurial mercantile activity (Joffe 2002: 430). This is not to say that the previously established regional systems of trade and communication ceased to be, but that the new types of goods were traded on a more circumscribed regional level and are harder to detect archaeologically (Killebrew 2014: 600-601). This study investigates shifts in animal economy during this period of political and economic change. Specifically, how is decision making in regards to animal economy affected by the policies of independent polities in the southern Levant? How does this decision making change as the scale of political power and

administrative control changes? Herd management strategies and livestock species selection are examined at seven sites with respect to each site's regional role, location, and population ethnicity.

Tel Akko, a mound located southeast of the modern city of Akko, Israel is the primary focus of comparison. Additional sites were chosen to best represent a variety of locations, cultures, and regional roles in the Levant during the Iron Age (1150-586 B.C.E.). The six additional sites selected for this study are: Tel Dor, Megiddo, Tel es-Safi/Gath, Tel Miqne-Ekron, Tel Dan, and Hazor (see Figure 1.1). Two sites are associated with each of the three groups (Phoenicians, Philistines, and Israelites) listed above. They featured in the region's economic development by fulfilling trade, administrative, and/or ritual roles within Canaan as it developed during the Iron Age.

Regional studies comparing the animal economy during the Iron Age in the Levant are rare. There are a few notable exceptions to this, including the work of Sapir-Hen et al. (2013, 2014), Hesse (1990), and Zeder (1996). Most zooarchaeological work tends to focus on just one site, added as a section in the excavation reports, or one aspect of the faunal remains for comparison[1]. Several major issues face zooarchaeological studies: the lack of standardized collection methods; differences in sample size; various contexts lumped into site-wide analyses; and reporting traditions. This leads to variation in the comparability of samples from different sites, making regional overviews difficult. For this study, collection methods, sample size, and

[1] See Lev-Tov 2012b, Hesse 1986, Hesse 1990, Raban-Gerstel et al. 2008, Zuckerman et al. 2007, and Marom et al. 2009. These examples are a fraction of available faunal reports detailing only single site analysis or single aspect analysis and comparison.

context of each site are explicitly stated in the site descriptions given below. All data used in this analysis are presented in Appendix A and B as well as throughout the text.

Figure 1.1 Location of sites discussed in this study.

Canaan at the End of the Late Bronze Age and Iron Age

Late Bronze Age Canaan (the southern Levant) was subject to imperial Egyptian rule. During the Late Bronze Ib, after victory at the Battle of Megiddo (1482 B.C.E.), Tuthmosis III had authoritative control over the cities of Canaan. As a part of his new policy, Tuthmosis III appointed oath-sworn princes to each town in Canaan who were required to report to one of three Egyptian administrators. The tribute system he had put in place was highly structured and successful, and lasted in this form for over a century (Leonard 1989: 12-13). Despite the Egyptian hegemony over Canaan, the internal political atmosphere remained volatile. Each town had a ruler jostling for power, and the rulers constantly asked Egypt to intervene and settle disputes (Killebrew 2005: 32-33). The economy of these towns was controlled by the Egyptian administration and thus had a fairly uniform structure providing tribute, and facilitating trade with other polities.

While Egypt laid claim to Canaan, especially the region of Palestine in the south, the Northern Levant, including the region of modern day Syria, was controlled by the Hittite Empire in the Late Bronze Age. These borders were established by the Battle of Kadesh (1285 B.C.E.) along the Orontes River (Killebrew 2005: 25). The Levant was a peripheral region to these empires and contributed economically as vassals. The Egyptian imperial system was focused on extracting tribute in exchange for little Pharaonic obligations, while the Hittite system was more mutually beneficial (Knapp 1998: 187; Klengal 1992: 112)[2]. The system was conducted through the governmental institution that is the palace, and the ruling elite that formed connections with other elite rulers around the Mediterranean following a strict set of guidelines on rhetoric, royal

[2] Originally cited in Killebrew 2005, 25.

marriage, gift exchange, trade, and warfare (Joffe 2002: 427). Factors influencing the Late Bronze Age Levant included the Egyptian system of exploitation with taxation, obligation of corveé labor, constant geo-political competition and warfare with neighbors, and periodic threats to urban centers from nomadic groups occupying semi-arid zones (Joffe 2002: 428). This system facilitated international trade and economic development, and provided limited military support to vassal kings, and loose political unification.

The Late Bronze Age collapse famously ended the hegemony of Egypt and the Hittites in the Levant, leaving the region without a clear political power structure. The cause of the collapse is a debated topic in Near Eastern archaeology with several theories offered on the subject (see Killebrew 2005: 33-42; Killebrew 2014, and citations therein). Mass migrations took place mostly through Cyprus, possibly as a part of the invasion of the "sea peoples" described in Egyptian texts during the reign of Rameses III (Joffe 2002: 430-431). The Philistines, and perhaps other "sea peoples", settled in Canaan from Aegean regions and possibly from Cyprus (Killebrew and Lehman 2013: 11-15). The complex interplay of destruction and continuity during this period is astonishing. Several sites at this time experienced destruction, others saw abandonment and reoccupation with a complete cultural break, and others experienced cultural continuity and expansion (Killebrew and Lehman 2013: 5-8). Additionally, the Israelites settled the highlands that were sparsely occupied in the Late Bronze Age. The Iron I saw the intensive settlement of the highlands with a great expansion into statehood during the Iron II (Finkelstein 1996b: 207).

The increase in the political autonomy of the city-states in Canaan is a key factor in the Late Bronze Age/Iron Age transition. The division of material culture and differing settlement patterns was along defined geological boundaries and led to the rise cultural groups within those

borders. Fragmentation of this nature was made less extreme by the connectivity provided by the Mediterranean Sea, but differences remained (Killebrew 2014: 596-597). This period witnessed the development the Phoenician city-states, the most prominent of these were Tyre, Sidon, Beirut, Byblos, and Arvad that were all geographically separated by rivers. Tel Akko located on the border of Phoenicia and Canaan, continued its Canaanite material culture into the Iron I (Joffe 2002: 432; Killebrew 2014: 597-598). A series of "Neo-Hittite" and "Syro-Hittite" city-states formed to the north of Phoenicia due to the collapse of the Kingdom of Ugarit and the Hittite Empire. To the east, the Syrian steppe was settled by nomads taking advantage of the power vacuum and establishing themselves in the region, referred to as Aram by the Assyrians. The Southern Levant, or Canaan, experienced a complex interaction of imperial retreat, urban decline, and foreign settlement (Joffe 2002: 434).

Philistia, comprised of five major urban centers referred to as the 'Pentapolis', dominated Southern Canaan during the Iron I. They and other 'Sea Peoples' continued the tradition of urban living in Palestine during the Iron I (Mazar 1990: 308-313). The Late Bronze Age/Iron I transition in Southern Canaan was characterized by a steep decline of rural settlements and a coalescence of population to fortified urban centers. The number of identified sites declines from 102 in the Late Bronze Age to 49 in the Iron I, while the occupied area in Philistia only changed from 173 to 155 hectares (Finkelstein 1996a: 231). By the 11th century B.C.E. urban centers in Canaan were trending toward greater social, economic, and political differentiation and centralization. Elites likely manipulated space, labor, and ideology to create more exploitative social and economic structures leading to the organization of the city-state system based on lineage and genealogical links to local communities (Joffe 2002: 439).

At the beginning of the Iron II, more centralized territorial states arose, notably the United Monarchy, which formed in response to a need for a more centralized system than the previous tribal system used by the Israelites (Mazar 1990: 368-369). The rise of the United Monarchy introduced a new era of centralized administrative control over a hinterland/periphery of once independent polities in Canaan. The kingdoms established in the late Iron I and Iron IIA eventually succumbed to outside conquest by larger, more stable empires. First the Neo-Assyrians swept through in conquest, resulting in their control of Canaan by the end of the 8th century B.C.E. (Mazar 1990: 544-545). Late in the 7th century B.C.E., the Neo-Assyrian Empire collapsed and the Neo-Babylonians stepped into the power-vacuum in Canaan (Mazar 1990: 545). The end of the Iron Age is marked by the destruction of the First Temple at Jerusalem at the hands of the Babylonians. The relatively quick succession of political systems, collapse, recovery, development, and extent of trade in such a small region presents a unique opportunity to examine how these systems, including group identity, regional economic role, and geo-political status affected the animal economy.

Importance of this Study

This study presents a regional view of the animal economy through the Iron Age, 1200 – 586 B.C.E., and exposes new trends within the regional system. These trends include how choices in animal economy at related sites affected one another, how changes in political structure influenced herding strategies and herd composition, how regional economies developed, and how use of secondary products changed with political structure, on a site by site as well as a regional scale.

Fading Egyptian control, and the disintegration of the regional Canaanite economy in the Levant during the early Iron Age only served to increase the political disunity of Canaan.

Without a universal focus or centralized administrative control, this study suggests that a change in herd management strategies should be visible through time and be correlated with the regional economic role of sites through the Iron Age. Change would occur as sites developed and became reintegrated into a larger regional economic system with centralized administrative control over a large area. This phenomenon would likely have coincided with the development of cohesive kingdoms in the region of Canaan, which increased the administrative control over production strategies and promoted involvement in larger regional markets. Comparison of relative livestock frequencies and culling patterns at each site through time will serve to highlight potential changes correlated with the development of regional economies and cohesive states. Additionally, wild taxa will be discussed in congruence with livestock taxa. The extent to which communities relied on wild taxa reflects herd management practices as well as the diversity of resources available in local environments.

Animal economies during this period were typically based upon sheep and goat herding. Ovicaprids dominate assemblages throughout the Near East throughout the Bronze and Iron Ages, as well as cattle and pigs. Sheep, goats, and cattle were used for both primary (meat) and secondary (labor, milk, wool) production (Greenfield 2010: 30). As urban centers grew and became more centralized, the need to regulate production increased. Administrators exerted greater control over production and the distribution of resources. The degree to which resources came under regulation depended on the supplier's ability to meet the needs of the growing urban center. If the demand was not met then the administration stepped in and regulated the rasing and distribution processes. Production then became structured akin to a specialized economy (Zeder 1988: 6-9). As the demand for animal products outgrew the ability of pastoralists to supply these urban centers, regulation of herding strategies became a prerogative of the urban center's

administrators. While administrative and temple price setting systems were in place, pastoralists and other producers were subject to the market forces of supply and demand as well (Silver 1983).

Shifts in animal husbandry strategy are visible archaeologically through species selection, mortality profiles, and part selection. While part selection provides the finest detail when examining specialized economies within sites, species selection (i.e. livestock frequencies) reflect overall management concerns. The examination of species selection along with mortality profiles allows for the finer understanding of the herd management processes occurring at a site (Zeder 1988: 47-48). This study seeks examines species selection and mortality profiles to evaluate economic trends of animal management on the regional scale.

CHAPTER 2: SITE DESCRIPTIONS AND SAMPLES

The faunal remains from the six selected sites listed below form the basis of comparison for this study. The sites have been chosen for their similar breakdown of faunal data into fine detail chronological categories, a key detail when examining gradual change among several sites. Their varied locations in the southern Levant give examples from coastal, inland, and highland sites in the region (Figure 1.1). Tel Akko and Tel Dor serve as coastal examples. Tel Dan and Hazor serve as the highland sites, and Tel es-Safi, Ekron, and Megiddo represent inland sites. In the following, each site is described and its individual history examined. Table 1.0 summarizes the time periods represented at each site. For an outline of site sources and livestock stop NISP, see Table 1.1.

	Iron I (1150-900 B.C.E.)	Iron IIA (900-700 B.C.E.)	Iron IIB (700-600 B.C.E.)	Iron IIC (600-500 B.C.E.)
Tel Akko	-	Yes	Yes	Yes
Tel Dan	Yes	Yes	Yes	Yes
Tel Dor	-	Yes	Yes	-
Tel es-Safi	Yes	Yes	Yes	-
Hazor	Yes	Yes	Yes	-
Megiddo	Yes	Yes	Yes	-
Tel Miqne-Ekron	Yes	Yes	Yes	Yes

Table 1.0: Chronology of periods represented by site.

Site	Grouping	Livestock NISP	Reference
Tel Akko	Carmel	904	Unpublished, Lev-Tov (Personal Communication)
Tel Dor	Carmel	1916	Sapir-Hen et al. 2014
Megiddo	Carmel	5247	Sasson 2013
Ekron	Philistia	9584	Lev-Tov 2010
Tel es-Safi	Philistia	1296	Lev-Tov 2012b
Hazor	Northeast Highlands	473	Lev-Tov 2012a
Tel Dan	Northeast Highlands	554	Wapnish and Hesse 1991

Table 1.1 Outline of site sources and total livestock NISP.

Tel Akko

Tel Akko is located at the northern edge of the bay of Haifa in Israel, just east of the modern city of Akko. First mentioned in Egyptian execration texts dating to the 2nd millennium B.C.E., Akko was an important site in the Levant during the Bronze and Iron Ages, and well into Crusader period, functioning as a major port town and entry into the Near East (Dothan 1976: 1-3). The Tel Akko Total Archaeology Project, which began in 2010, is currently excavating the tell under the direction of Professor Ann Killebrew, Pennsylvania State University, and Professor Michal Artzy, University of Haifa. Previous excavations by Professor Moshe Dothan from 1973 – 1989, a team from the Marburg University in Germany headed by Professor D. Conrad, an American team directed by Professor A. Ritterschpach, and members of the University of Haifa's Center for Maritime Studies, resulted in few publications[3] (Artzy and Beeri 2010: 15). The current project combines a survey of the tell with renewed excavations in Area A. The faunal remains from this area are comprised mostly of material from the Iron IIA to the Early

[3] See Dothan 1976, the *Israel Exploration Journal*'s Notes and News 1973, 1975, 1977-79, 1981. 1983-84.

Hellenistic Period, analyzed by Dr. Justin Lev-Tov beginning in the 2013 excavation season. This study will focus on the faunal remains recovered from Area A dating to the Iron IIA – Iron IIC. The chronological sequence at Akko is outlined below in Table 1.2.

Stratigraphy	**Period**	**Date**
A-1	Post-Hellenistic	Post-Hellenistic, Modern
A-2	Late Hellenistic	Mid-2nd Century – Early 1st Century B.C.E.
A-3	Early Hellenistic	Late 4th Century through Mid-2nd Century B.C.E.
A-4	Persian	5th – Late 4th Century B.C.E.
A-5	Early Persian/Babylonian	6th Century B.C.E.
A-6	Iron Age IIC	7th Century B.C.E.
A-7	Iron Age IIB	8th Century B.C.E.
A-8	Iron Age IIA-IIB	Late 9th Century – Early 8th Century B.C.E.

Table 1.2 Tel Akko chronological sequence.

The remains within Area A (see Figure 1.2) were excavated to the Late Bronze Age strata by Moshe Dothan (Dothan 1976: 5-13). Test pits dug during the survey of the tell, performed by the Tel Akko Total Archaeology Project, have come up with Early Bronze Age material as well, but these strata have not yet been reached in the main excavation (Killebrew and Olson 2014: 563). One of the last phases of the Late Bronze Age at Akko boasts a large rampart overlaying the remains of a fortress, along with an elaborate ashlar tomb, including several burials, and a layer of crushed murex shells, indicating purple dye production. (Dothan 1993: 18-21). The first major, possible public, structure appeared in the Iron Age along with an intact floor that showed signs of a destruction/debris layer from fire (Dothan 1976: 23). In the Persian period, Stratum A-4, a large public building was uncovered. It was constructed partly of ashlars and contained a court and a large complex of rooms, resembling administrative centers at contemporary sites

such as Lachish and Tell Qasile, and could have possibly served as a Persian administrative center (Dothan 1993: 22).

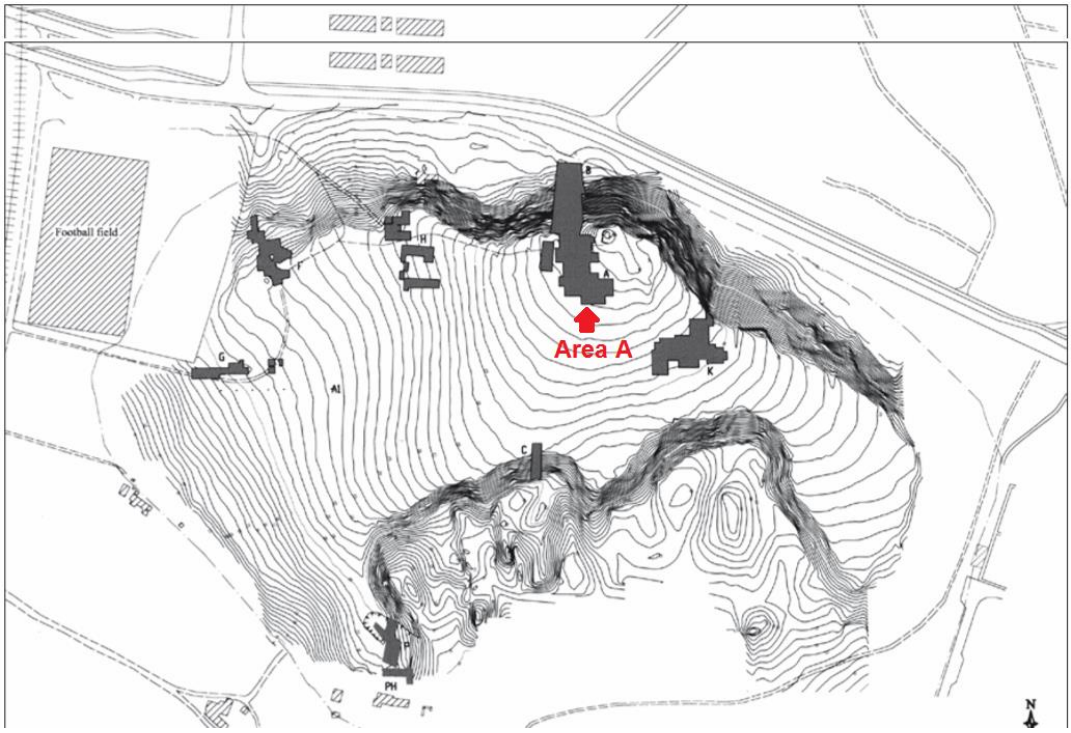
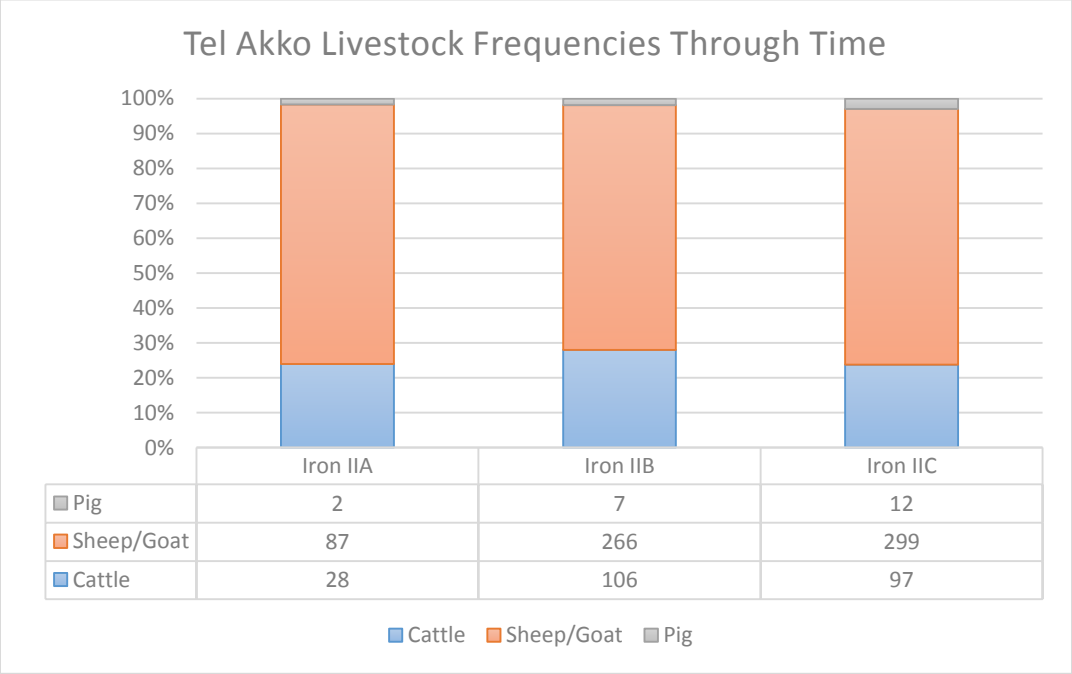


Figure 1.2 Site map of Tel Akko. (Artzy and Beeri 2010: Figure 11 (Drawing by J. Quartermaine))

Area A seems to have been mostly an industrial area during the Iron Age. Evidence for this includes a crucible found in Area A, along with crushed murex shells associated with dye production, a kiln, metalworking remains, and little evidence for domestic architecture (Killebrew and Olson 2014: 562). Akko served as an important settlement through the Iron Age and a main port for the Assyrian Empire. The city's role in the early Iron I was a diminished one due to the presence of Tell Keisan farther inland that replaced it as an administrative center when port activity waned. Its prominence as a port city was regained under the Assyrians (Artzy and Beeri 2010: 18-20). Akko retained its Canaanite material culture, that eventually transformed into Phoenician material culture, through the Iron Age (Dothan and Conrad 1978: 264-265).

The faunal sample was collected over 2010 – 2014 excavation seasons. A total number of bones of 10,645 bones were recovered. Of that total, 7,305 bones were not identifiable past the designation of small, medium, or large mammal and 38 bones were not identifiable at all. The remaining total (NISP (Number of Identified Specimens)=3,302) includes livestock and wild taxa species, some of which were not attributable to a time period. For this analysis, only the livestock species sheep, goats, cattle, and pigs, were used and they vary considerably by period, and is indicated in Figures 1.4 - 4.2. For example, the sample for the Iron IIA at Akko is NISP=117, whereas the Iron IIB the sample increases to NISP=379 and the sample from the Iron IIC is NISP=408. See Figure 1.3 for a breakdown of these data by species and time period.



	Iron IIA	Iron IIB	Iron IIC
Pig	2	7	12
Sheep/Goat	87	266	299
Cattle	28	106	97

Figure 1.3 Tel Akko livestock frequencies through time.

Tel Miqne-Ekron

Tel Miqne-Ekron, henceforth referred to as Ekron, is located on the eastern edge of the coastal plain in southern Israel, ca. 20km from the Mediterranean Sea (Gitin 2006: 17). Initially

surveyed by W.F. Albright in the 1920s, the site was identified as Ekron by Joseph Naveh, working for the Israel Antiquities Authority, in 1957. The identity was confirmed with the discovery of an inscription which contains the name of the biblical city of Ekron and lists five of its rulers, two of whom are mentioned as kings in texts other than the bible (Gitin, Dothan, and Naveh 1998: 30). The only excavation of Ekron, 1981-1996, was conducted by the W.F. Albright Institute of Archaeological Research in Jerusalem and The Hebrew University of Jerusalem, led by Seymour Gitin (Gitin 2006: 19). These excavations uncovered a stratigraphic sequence spanning the Late Bronze Age to the Iron II, roughly 1400 – 700 B.C.E. (Lev-Tov 2010: 91).

Ekron is characterized by six phases of occupation. The first major phase of occupation occurs in the Middle Bronze Age IIB (Stratum XI), dating to the 17th/16th centuries B.C.E. Large ramparts that appear to form the shape of the tell are found in this stratum. MBA IIB pottery is found throughout the tell in the upper and lower cities which suggests that Ekron was a fairly large Canaanite city occupying a good portion of the mound. The lower city yielded only limited architectural remains, and was abandoned at the end of the Middle Bronze Age (Gitin 2006: 19-20).

Ekron was fairly small in the Late Bronze Age, a modest, un-walled settlement of about 10 acres, confined to the acropolis (Field I). Late Bronze Age remains appear in Strata X-VIII, and dates to the 15th-13th centuries B.C.E. It was one of several Canaanite settlements in the Late Bronze Age that shared a similar material culture. The Late Bronze Canaanite town ended in the destruction of a large building complex that held storage areas for various grains, other crops, and pottery (Gitin 2006: 20).

In the Iron I, Ekron expanded dramatically to a large, fortified town that occupied the entire 50-acre mound. The Iron I, and 7th century B.C.E. mark the only periods when the upper (Field I) and lower cities (Fields II, III, and IV) were occupied at the same time (see Figure 2.1) (Gitin 1989: 277). The dramatic expansion of the city coincides with the arrival of Philistine settlers at the site. The new settlement demonstrated a completely new urban plan, and new construction phases were built directly over MBA and LBA Canaanite architectural remains all over the mound (Killebrew 2005: 209-210). In addition to new construction, the material culture of the site is distinctly Aegean in style as evidenced by Mycenaean IIIC:1b pottery found in the early Iron I levels (Stratum VII). This pottery style was a significant break from local traditions (see Killebrew 2005: 219-230 for discussion). The people of Ekron, along with a loose coalition of other Philistine city-states including Tel es-Safi, dominated economically and militarily in the Southern Levant for the remainder of the Iron I (Mazar 1990: 308-313).

From the Iron IIA to the end of the Iron IIC, Ekron decreased in size again to ten-acres and remained a small, fortified settlement through the next two occupation phases (Phases four and five). This is partly due to renewed military and economic pressure from outside empires, such as Egypt, and the rise of the United Monarchy directly to the east that was the major political power in the Southern Levant at the time trying to assert its influence (Gitin 2006: 20). During the fourth occupation phase the lower city was likely abandoned or destroyed due to this outside pressure. The material culture at the site, while still partially Philistine in nature, was heavily influenced by Israelite and Phoenician traditions (Gitin 1998: 167). The acropolis was continually occupied during this time with 600 years of occupation in Field I (Gitin 1989:278). It was then conquered by the Neo-Assyrian Empire and made into a vassal state when it again flourished and expanded to include the lower city during the sixth phase of occupation. It was at

this time that Ekron become an industrial city with a focus on producing olive oil (Gitin 1989: 278).

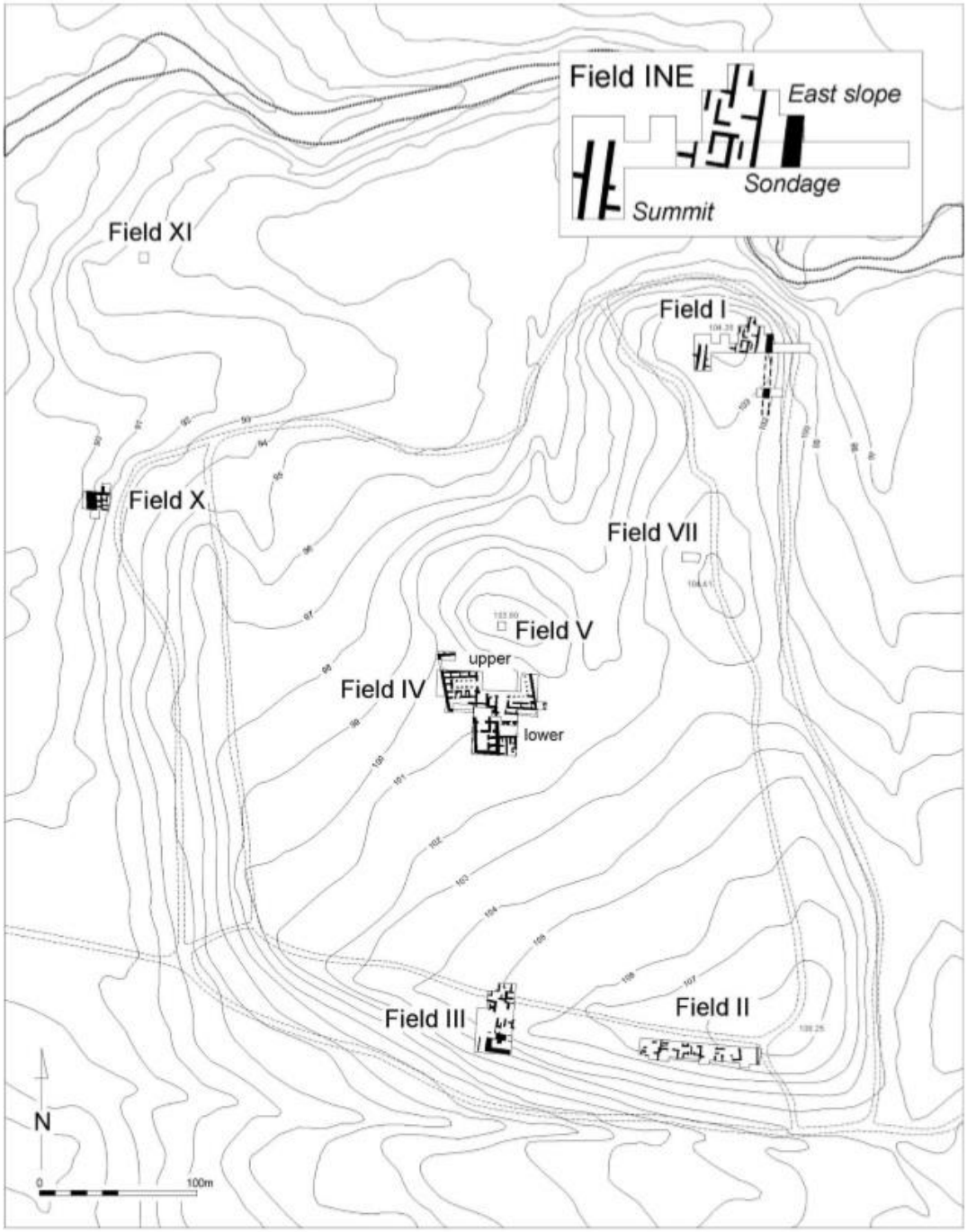
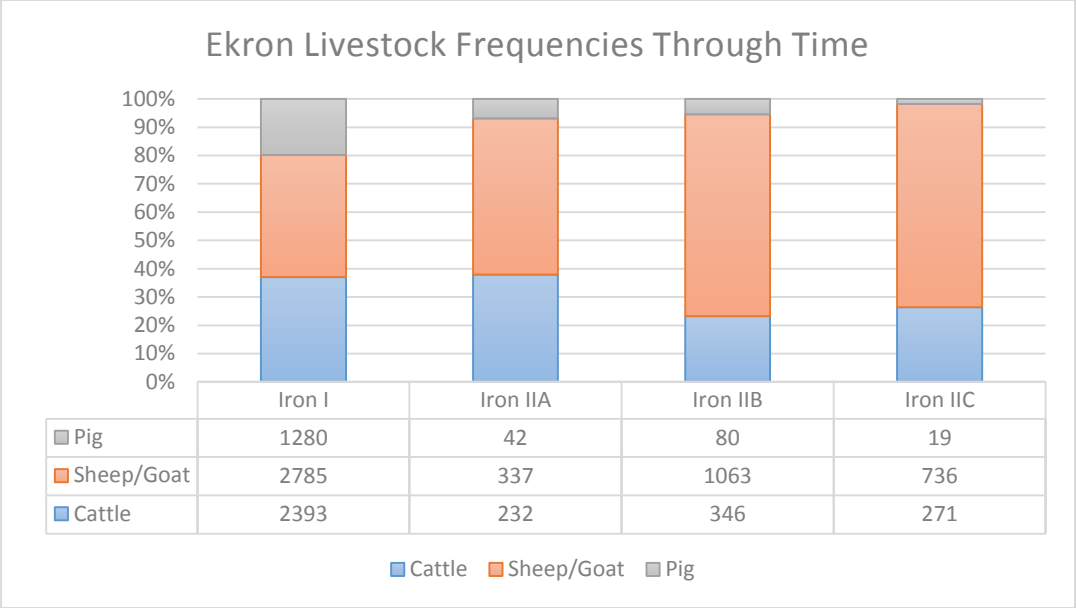


Figure 2.1: Plan of Tel Miqne-Ekron with inset plan of Field I. (from Gitin 2006: Figure 1.2)

The faunal sample for Ekron comes from Field I, located on the acropolis. The acropolis represents a range of different contexts including residential, industrial, and cultic architecture and material culture. During the Iron I, the area shifted from a combination of industrial and residential functions, to a mostly residential area. Erosion at the northern part of acropolis prevented excavation, so the function of the site could not be determined (Gitin, Meehl, and Dothan 2006: 48-49). Animal remains from the continuous occupation of the acropolis provides a diachronic record of resource use and exploitation at Ekron.

Bone samples were assigned to a time period based on the excavation stratum. The Iron I is represented by Strata VII – V (Livestock NISP=5181, Total NISP=6714), the Iron IIA is represented by Stratum IV (Livestock NISP=596, Total NISP=643), the Iron IIB is represented by Stratum III/II (Livestock NISP=1538, Total NISP=1689), and the Iron IIC is represented by Stratum Ic/Ib (Livestock NISP=1007, Total NISP=1107). Animal bones were largely hand collected, although either one in ten buckets, one in five buckets, or all soil for special contexts, were sieved through 5mm screens. The recovery methods may have reduced the diversity of species recovered, but livestock species' relative abundance was likely not greatly affected (Lev-Tov 2010: 94). See Figure 2.2 for a breakdown of livestock frequencies through time at Ekron.



	Iron I	Iron IIA	Iron IIB	Iron IIC
Pig	1280	42	80	19
Sheep/Goat	2785	337	1063	736
Cattle	2393	232	346	271

Figure 2.2 Ekron livestock frequencies through time.

Hazor

Hazor is located in the Upper Galilee and was a relatively large and prosperous city throughout the Bronze Age, peaking in the Middle Bronze, and ending in a conflagration in the 13th century B.C.E. (Zuckerman 2007: 190). Which group exactly caused the destruction of Hazor is of considerable debate (see Ben-Tor and Zuckerman 2008), however, the importance and wealth of Hazor is attested in both biblical sources and in cuneiform tablets found at the site (Zuckerman 2007: 195). Hazor was first excavated under the direction of Professor Yigael Yadin in four seasons from 1955-1958, and a final season taking place in 1968 funded by James A. de Rothschild. These excavations were significant in the early statehood of Israel and laid the foundations for future excavations at Hazor and across Israel. The recent excavations, from which the faunal was collected, began in 1990 and are ongoing. The faunal sample was collected during the 1990-2009 seasons and presented in *Hazor VI*. The Selz Foundation Hazor

Excavations in Memory of Yigael Yadin were under the direction of Professor Ammon Ben-Tor through the Hebrew University of Jerusalem (Ben-Tor, Ben-Ami, and Sandhaus 2012: 1).

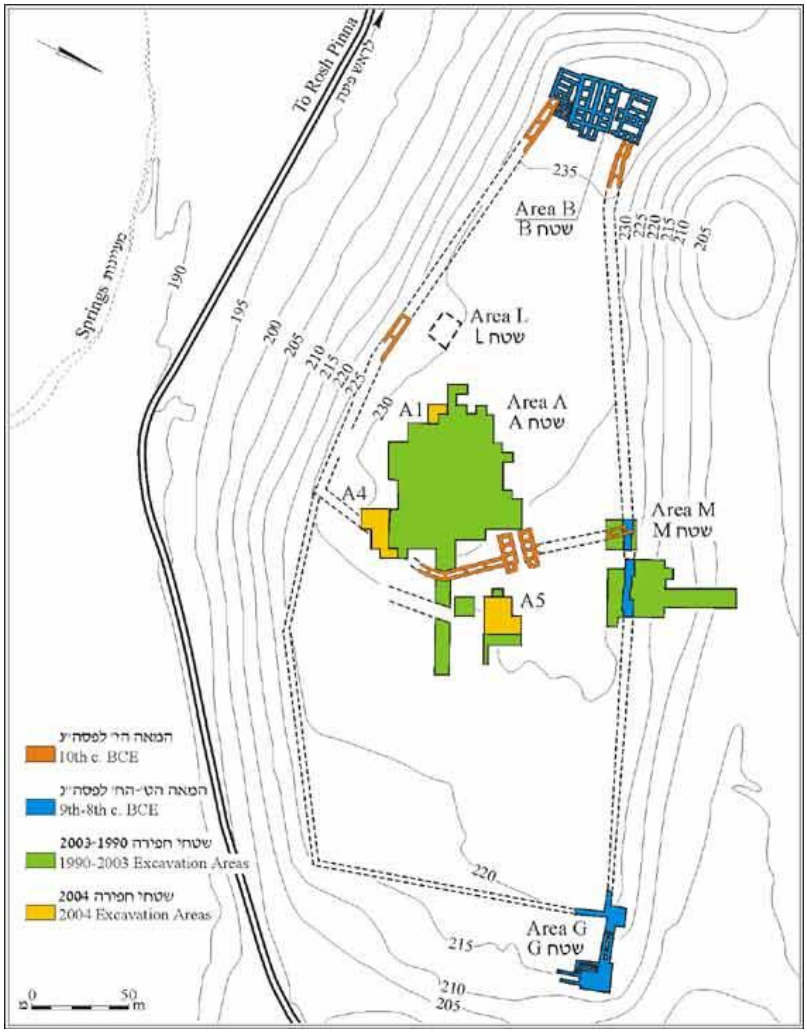


Figure 3.1 Site map of Hazor upper city excavation areas (Ben-Tor 2004: Figure 1).

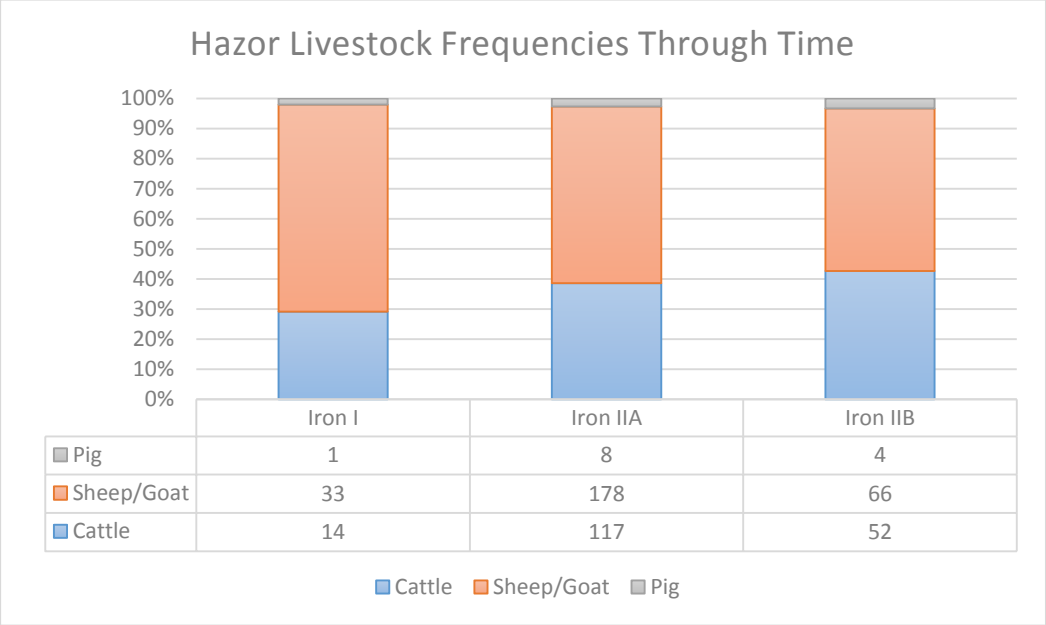
The faunal remains for this study were recovered from Area A2 of Hazor, located in the Upper City (see Figure 3.1). This area contained material dating from the Late Bronze Age to the 8th century B.C.E.. After its abandonment in the 13th century B.C.E., the site was reoccupied in the mid-11th century B.C.E., in the Iron I (Ben-Ami 2013: 103). The reoccupation of the site was scant. The Iron I levels at Hazor are characterized by the paucity of remains found there aside

from many pits of an unknown nature. The presence of the pits is an indicator of the "Israelite settlement sites" (Ben-Ami and Ben-Tor 2012: 24-25), supporting the Israelite ethnicity of the new inhabitants. The palace area was occupied, but not rebuilt by the new inhabitants of the site. Instead, they left their remains scattered around the palace architecture, but not directly on top of it (Ben-Ami 2013: 103-104). Due to the relative lack of remains for this period the sample size for the Iron I at Hazor is comparatively small at NISP=48 livestock specimens. Area A2 of the Hazor excavation was identified as a "Ceremonial Palace" and cannot be considered typical of a residential population. However, the sample could be representative of tribute levied from the local population, as most of the animals were fully mature males (Zuckerman 2007: 194-195).

In the early Iron II, Hazor became a well-planned, fortified, and prominent Israelite settlement. The fortifications constructed in the beginning of this period include the casemate wall, and a six-chambered city gate of "Solomonic" fame. It appears that the majority of residences in this period were constructed around the same time in a very organized and planned fashion (Ben-Ami 2012a: 108 – 109). During the 9th century, a new round of construction occurs. The upper city doubled in size during the 9th and 8th centuries B.C.E.. The doubling included not only new residences and administrative buildings, but also significant additions to the fortification system. The city remained impressive into the latter half of the Iron II, with some reorganization in the residential areas of the city (Ben-Ami 2012b: 235; Sandhaus 2012: 286).

The bones from Area A2 provide a glimpse of animal economy during the Iron Age at Hazor. The sample is relatively small, but offers a fairly tight stratigraphic sequence. The assemblage from the Iron I to 8th century B.C.E. totals 1646 specimens. The sample was fairly fragmented and only 18% of the total fragments recovered could be identified (Lev-Tov 2012: 586). When only livestock are considered the number drops to 473 specimens, NISP=48 during

the Iron I, NISP=303 during the Iron IIA, and NISP=122 associated with the Iron IIB. For a breakdown of livestock frequency by period at Hazor, see Figure 3.2.



	Iron I	Iron IIA	Iron IIB
Pig	1	8	4
Sheep/Goat	33	178	66
Cattle	14	117	52

Figure 3.2 Hazor livestock frequencies through time.

Tel es-Safi/Gath

Tel es-Safi, is located south of Ekron on the eastern edge of the hilly region of southern Israel. It is the western most of the five major Philistine settlements and has been known since the mid-nineteenth century. Aside from a brief two-week excavation carried out in 1899, Tel es-Safi has been excavated since 1996 by the Tell es-Safi/Gath Archaeological project (Maier 2003: 238). The association of the Philistines with this site is supported by finds of Mycenaean IIIC: 1b pottery, as well as biblical sources and contemporary texts (Maeir 2012: 5-6). Further evidence of its Philistine association has come with additional excavation in Area F where a selection of "Philistine 1" ceramics have been recovered (Maeir 2012: 19).

Tel es-Safi was a prominent city in the Late Bronze Age and is mentioned in the Amarna letters. The letters refer to at least one, and likely two rulers of Tel es-Safi (referred to as Gath in the letters) that were involved in the political environment of Canaan in the Late Bronze Age. The city's importance during this time is attested by archaeological evidence of occupation across the 50 acre tell in both survey and the main excavation. The Late Bronze Age levels have only been uncovered in two areas, and only a limited fashion. Egyptian glyptics and two Egyptian inscriptions were found in the Late Bronze Age levels, but interestingly no Egyptian style pottery has been recovered. This may be due to the limited exposure of these strata. However, the evidence that is present suggests that Tel es-Safi was involved in the Egyptian administration of southern Canaan (Maeir 2012: 16-17).

The Iron I at Tel es-Safi is marked by the settlement of the Philistines. Philistine material culture dominates the Iron I levels at the site. Material is found across the site and suggests that not only had the Philistines settled at Tel es-Safi, but also the city was large and urban in nature. The early Iron I was the only time that Tel es-Safi and neighboring site, Ekron, were both large cities, while in most other periods only one of the two sites was large at the expense of the other (Maeir 2012: 19). It is clear that the entire Iron I Philistine culture is present at Tel es-Safi in addition to the "Philistine I" ceramic types, "Philistine 2" (Bichrome) and "Philistine 3" (monochrome) are present as well. The late Iron I is extensively represented at the site and across the tell suggesting Tel es-Safi remained a relatively large site through the Iron I (Maeir 2012: 19-21).

During the Iron IIA, Tel es-Safi reached its greatest size, occupying as much as 40-50 hectares, and along with evidence of a substantial lower city during this time, makes it one of the largest Iron IIA sites in the Southern Levant. Several domestic contexts dating to the early Iron

IIA were excavated which included various features such as courtyards, round pebbled hearths, pits, and instillations. These finds, along with the transition of the Philistine I pottery style to Philistine 2 styles suggests that the Philistines continued to occupy the site into the Iron Age II (Maeir 2012: 26-27). Tel es-Safi was destroyed in the mid/late 9th century B.C.E. at the hands of Hazael of Damascus, followed by a short abandonment of the site. After this destruction and abandonment, the site is reoccupied and the material culture associated with these strata suggests the site was completely under Judahite control towards the end of the 8th century B.C.E. (Maeir 2012: 47-51).

The faunal remains came from two areas at Tel es-Safi, Areas A and E (see Figure 4.1). Area A is comprised mainly by stratum A-3 (Late Iron IIA) remains with densely packed A-5 to A-4 (Iron I) remains beneath it. The earlier phases of stratum A-5 and A-4 appear to have been uninterrupted for some time, making the identification of sub-phases and clear stratigraphic designations difficult. Pre-A-3 strata were only exposed in isolated parts of Area A, but probes throughout the area suggest the remains extend across the entire terrace, although the remains are poorly preserved (Zuckerman and Maeir 2012: 185). The eastern portion of the Iron I remains in Area A provides an undisturbed trash dump containing numerous animal bones, ash, and pot sherds. Along with the western material, the context includes loom weights, assorted stone weight, a bronze knife, animal bones, and ash. Additionally at least a half a dozen hearths were identified, showing typical Philistine using pebble construction characteristic to hearths of similar time period found at Ekron. These hearths, along with the refuse pit, symbolic decorated vessels, and figurines suggest feasting activity at Tel es-Safi during the Iron I (Hitchcock et al. 2015: 13-21). Conclusions about the primary usage of the area in this stratum are difficult without additional evidence.

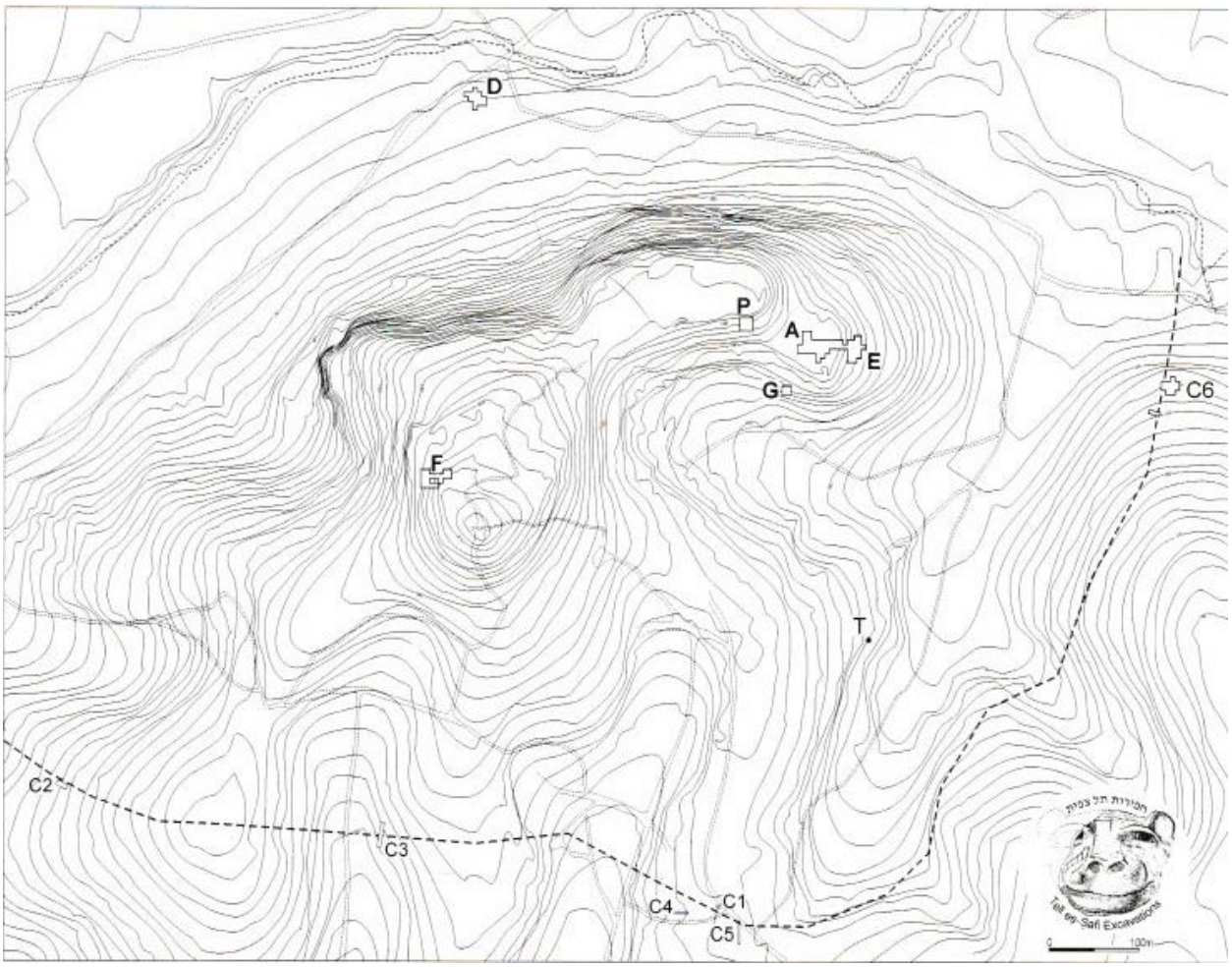


Figure 4.1 Site map of Tel es-Safi/Gath (Maeir 2012: Figure 1.1).

The majority of material recovered in Area A comes from Stratum A-3 and contains one large structure along with several smaller and partially uncovered structures including a street. This stratum represents a novel settlement, with a different plan than the previous A-5/A-4 settlement. Stratum A-3 represents Tel es-Safi at the peak of its prosperity. The settlement was densely packed with relatively new construction not incorporating the architecture of the previous strata (Zuckerman and Maeir 2012: 217). The structures throughout this stratum appear to have been used for multiple purposes, encompassing domestic, industrial, and cultic aspects. Occupation of this period ended in a violent destruction as demonstrated by evidence of fire,

building collapse, and rich in-situ deposits of artifacts in this stratum. The conflagration divides the Iron IIA and the Iron IIB phases at Tel es-Safi. Stratum A-2 is represented by only one well-preserved building in the western part of Area A, along with less well preserved structures to in the south. It differs from the previous stratum in architectural layout and material culture. The Philistine material culture is replaced by Judahite style objects and ceramics, notably the four room style plan of Building 21012 (Zuckerman and Maeir 2012: 206 – 208, 218).

Area E is located on the eastern slopes of the tell one terrace below and to the east of Area A. Stratum E-3 and stratum E-2 are dated to the Iron Age I and Iron Age IIA respectively. Architectural evidence of the Philistine 1 cultural phase is found primarily in this area, and sherds of the corresponding style are found throughout Area A and E. The two areas are stratigraphically linked only by typological similarities in ceramics and architecture (Maeir 2013: 208 – 210). Stratum E-3 is characterized by rubbish pits and limited architecture. The rubbish pits all cut each other and were filled with Philistine bichrome pottery and animal bones. Stratum E-2 continues the large destruction layer found in Area A (Stratum A-3). The extent of this stratum in Area E was limited to a four course terracing wall and a rubbish pit (Shai, Uziel, and Maeir 2012: 232).

The faunal data from Tel es-Safi used in this study are representative samples of Iron Age contexts (Lev-Tov 2012b: 590-591). The bones were not recovered from all contexts, so the assemblage represents a subset of the total sample. Animal bones were collected using standard methods - hand collection and sieving of special contexts - from contexts deemed stratigraphically secure (Lev-Tov 2012b: 590). The Iron Age faunal assemblage used in this study totals NISP=1780 from Areas A and E. Most of the bones come, unsurprisingly, from the ubiquitous domesticates pigs, sheep, goat, and cattle, the focus of this study. The total number of

animal bones analyzed for the Iron I is 327 (including unidentifiable bones), 281 belonging to domesticates. For the Iron IIA, the total analyzed is 804 (including unidentifiable bones), 489 bones belong to domesticates. The Iron IIB assemblage total is 565, 526 of which belonged to domesticates. For a breakdown of livestock frequencies by period at Tel es-Safi, see Figure 4.2. Additionally some bones from wild game were recovered as well as dogs. This sample is only a portion of the bones recovered from Tel es-Safi since the beginning of the 1996 excavation.

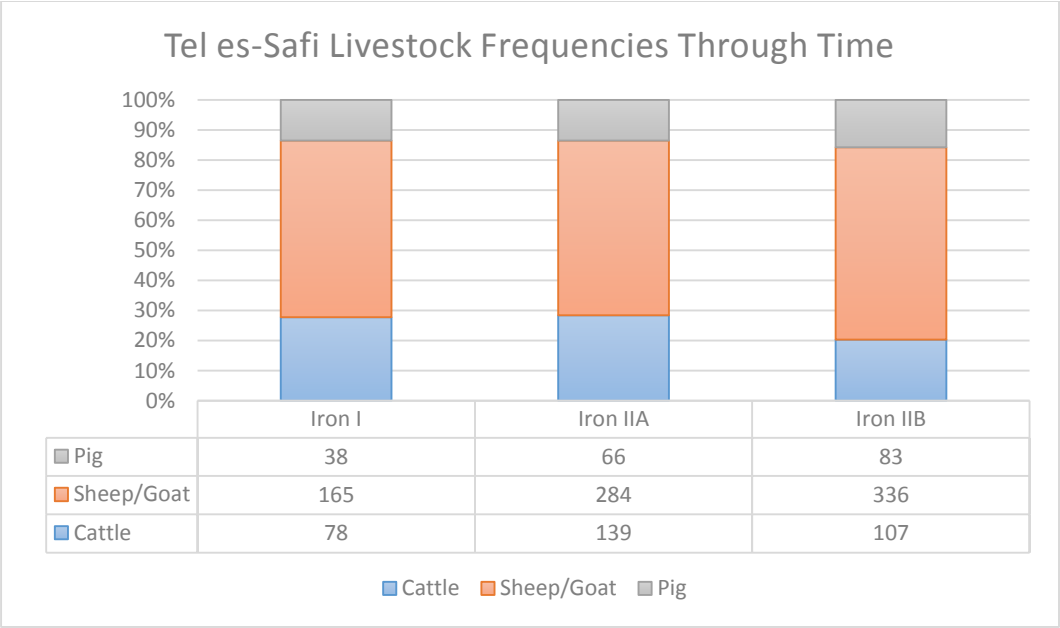


Figure 4.2 Tel es-Safi livestock frequencies through time.

Tel Dor

Located on Israel's Carmel coast, 30km south of modern day Haifa, Tel Dor was likely the most prominent site on the coastal stretch from the Yarkon River to Tel Akko in the early Iron I, a status that remained through the Iron Age. It is the only site specifically mentioned in Egyptian records as the seat of a non-Philistine "sea people" (Raban-Gerstal et al. 2008: 26). The Iron I ceramics at this site do not present any forms new to the area. Other than some Cypriot and Syrian influence, the material culture is overwhelmingly Canaanite in appearance. Most of the

Cypriot-style *pithoi* and bell shaped drinking vessels were made at Dor. This points to a Cypriot influence and possible origin of the "non-Philistine sea people" at Dor (Gilboa and Sharon 2008: 155-156).

The earliest Iron Age remains were found in Area B1. A massive wall was uncovered along with two rooms with in-situ vessels including storage jars, a pilgrim flask, and a *pithos*. The *pithos* was decorated in a similar fashion to *pithoi* found at Tel Dan and other sites in the Northern Galilee and Phoenician coast. This earliest Iron Age stratum, dated approximately to the second half of the 12th century/first half of the 11th century B.C.E., is interpreted as being part of a *Sikil*, one of the 'sea peoples' groups (Stern 1993: 358). However, Gilboa and Sharon (2008) have argued that foreign "sea peoples" never settled at Dor and the material culture there is the result of the continuation of Canaanite material culture with the introduction of Cypriot and Syrian elements.

The *Sikil* settlement at Dor stood for roughly a hundred years until it was either overtaken or simply quickly assimilated to Canaanite culture transforming itself into a settlement with Phoenician styles. Dor was then conquered by the Israelites during the reign of King David in the 10th century B.C.E. Interestingly, it seems Dor was heavily involved in oversea trade with Cyprus and Egypt and had contact with Southern Philistia, as evidenced by Philistine containers, and with the hill country in the form of collared-rim jars (Raban-Gerstal et al. 2008: 30; Gilboa and Sharon 2008: 156). Dor stood in contrast to Philistine sites in the Iron I, and through its history it transformed several times, roughly corresponding with the dominant factions in Canaan (Sapir-Hen et al. 2014: 85).

The next stratum, featuring a broad mud-brick wall, is dated to the 10th century B.C.E. This stratum appears in Area D and Area G, with Area D containing the majority of the

excavated remains of the Iron Age Phoenician/Israelite settlement at Dor. This area was comprised of three large structures, a large wall surrounding the acropolis of the site, and a large monumental building that overtook the other three structures and was made up of several floor layers. Above this were the Israelite remains displaying the four room house architecture common to Israelite sites in the Iron Age (Stern 2008: 1696-1699).

Area D is comprised of mostly courtyard style houses excavated in multiple subsections of the Area, namely D2, D4, and D5 where the majority of the faunal remains were recovered and most recently excavated (Sapir-Hen et al. 2014: 85) (see Figure 5.1). The houses in Area D contained large Cypriot *pithoi* for storing food. A large monumental building was erected in Area D2 in the latter half of the Iron I; it likely served as a public building for an unknown purpose. In the Iron II the area turned into a higher end domestic area demonstrated by the "benny's house" structure erected on top of the old Iron I monumental building. Additionally, a new city wall was built around this time along with some additional expansion in other areas of the tell (Gilboa and Sharon 2008: 153-163). The remains are sparse after the principle discoveries of the "benny's house" architecture, rooms, and wall. The pottery was overwhelmingly Phoenician in style until the Assyrian conquest in the seventh century B.C.E. as presumably the inhabitants of Dor remained Phoenician despite the conquest by the Israelites in the 10th century B.C.E. (Stern 2008: 1689-1699).

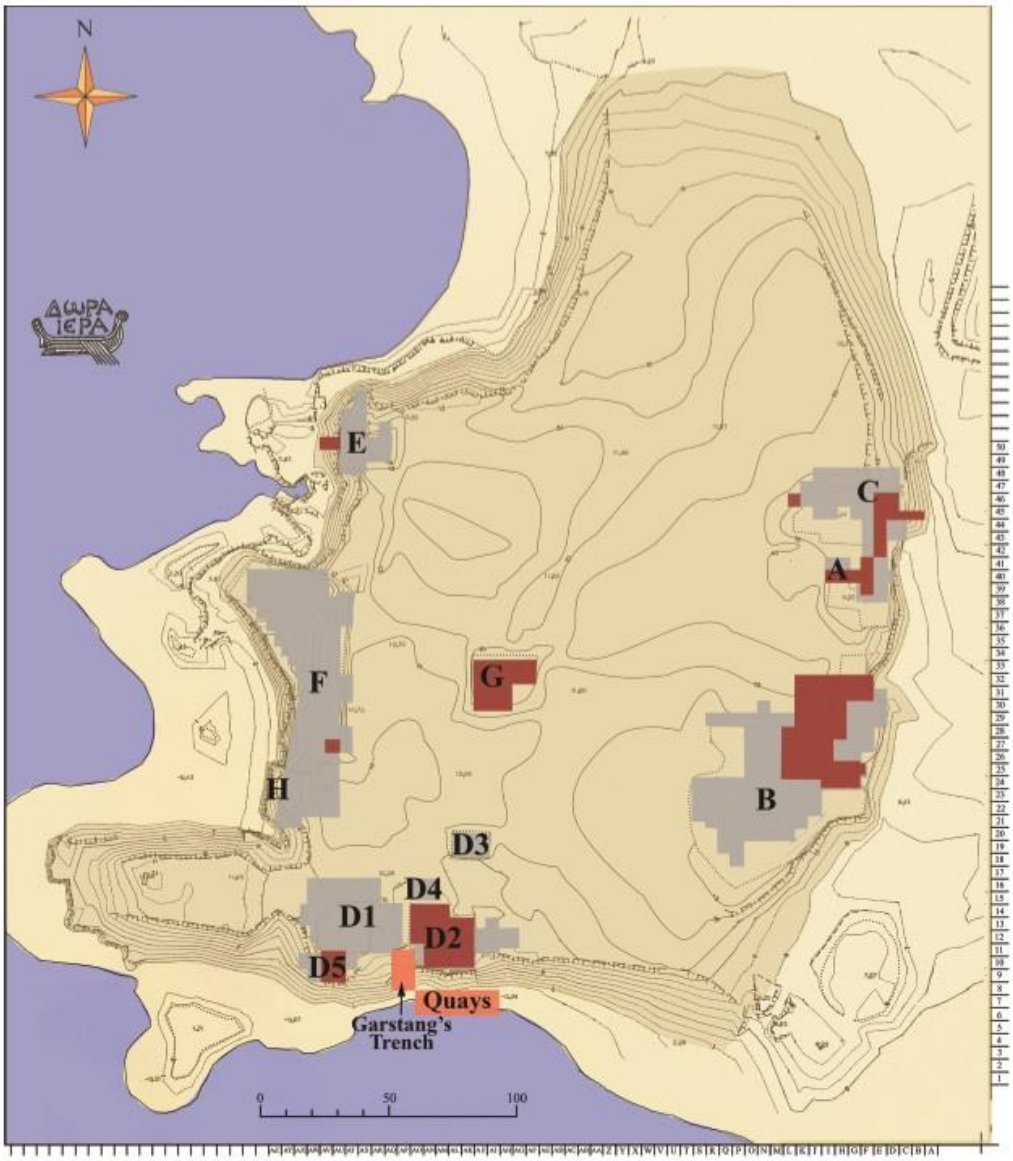


Figure 5.1 Excavated areas at Tel Dor, showing sub-areas of Area D (Sapir-Hen et al. 2014: Figure 1)

The faunal assemblage at Dor is one of the largest and best published assemblages for non-Philistine sites in the Iron Age. The data used here are from Area D contexts representing the Iron I to the Iron IIB. The transitional phase is categorized here as the Iron IIA, and the phase designated as the Iron II was added to the Iron IIB category. A thorough sampling strategy was employed during excavation. Sieving was carried out for all types of deposits using 1mm mesh

(Sapir-Hen et al. 2014: 86). Only the smallest microfauna would be underrepresented in this case (see Cannon 1999). Due to the meticulous collection methods, fishing is well represented at Dor. In an earlier study of faunal remains from Area D, an assemblage of 10,000 mammalian remains was accompanied by roughly 60,000 fish remains (Sapir-Hen et al 2012: 591-592). While fish remains are not the focus of this study, fishing represents a major industry at this site, similar to Akko.

The sample employed for use in this study comes from several sub-areas of Area D: D1, D2, D4, and D5 shown in Figure 1.3 and represents the Iron I to the Roman Period. Only the Iron I – Iron IIB assemblages are used here. The Iron I/II transition is represented here by the category Iron IIA. The Iron I livestock sample size is NISP=648 (total NISP=750); Iron IIA livestock is NISP=560 (total NISP=619); and Iron IIB livestock sample is NISP=708 (total NISP=807). For a breakdown of livestock frequencies by time period at Tel Dor, see Figure 5.2.

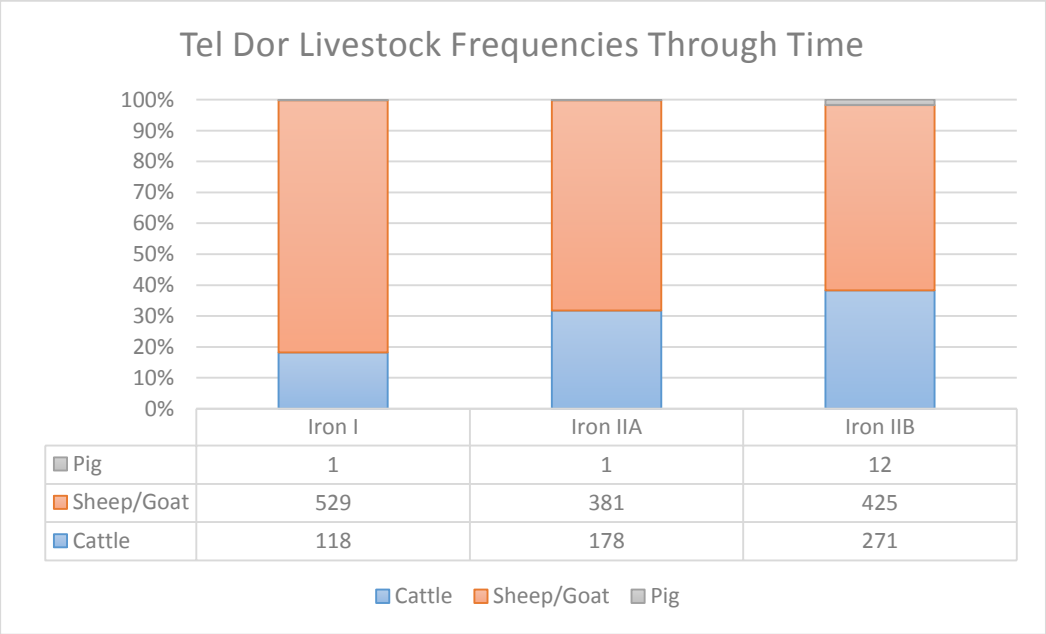


Figure 5.2 Tel Dor livestock frequencies through time.

Tel Dan

Tel Dan is located in northern Galilee in Israel. Historically, it resides in the Northern kingdom of Israel, separate from the Kingdom of David and the city of Jerusalem. Aside from a brief exploratory excavation on behalf of the Israeli Department of Antiquities and Museums in 1963, the primary excavations began in 1966, and continued every year since then under the direction of A. Biran. Recently, nine seasons of excavation were conducted from 1990-1999 by the Nelson Glueck School of Biblical Archaeology of Hebrew Union College – Jewish Institute of Religion under the direction of A. Biran. Tel Dan is mentioned numerous times in the Bible as the most northern point of ancient Israel, and in other contexts discussed below (Biran 1993: 323-324). Several areas were excavated at Tel Dan, with recent excavations focusing on Area A, T, and M (see Figure 6.1).

The earliest remains indicate that Dan was first inhabited during the Pottery Neolithic period. The settlement grew and became fortified beginning in the Early Bronze Age, with earthen ramparts being added during the Middle Bronze Age. Town expansion and fortification continued in this manner through the Late Bronze and Iron Age periods. During the 9th century B.C.E. a massive city wall was constructed along with an elaborate gate complex, which were destroyed during the later Assyrian conquest. The city, however, remained rather prosperous until the Babylonian conquest a short time later (Biran 2008: 1689).

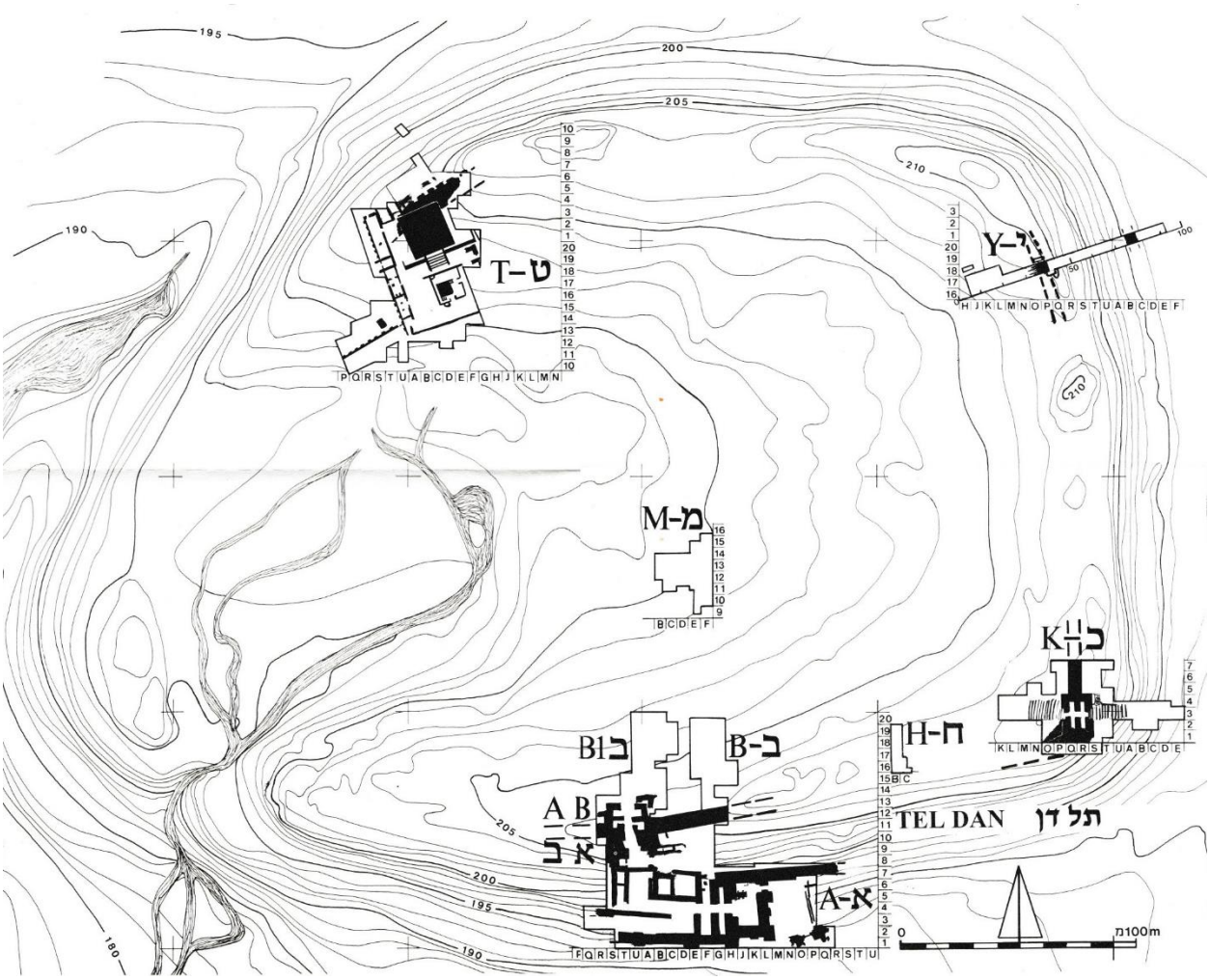


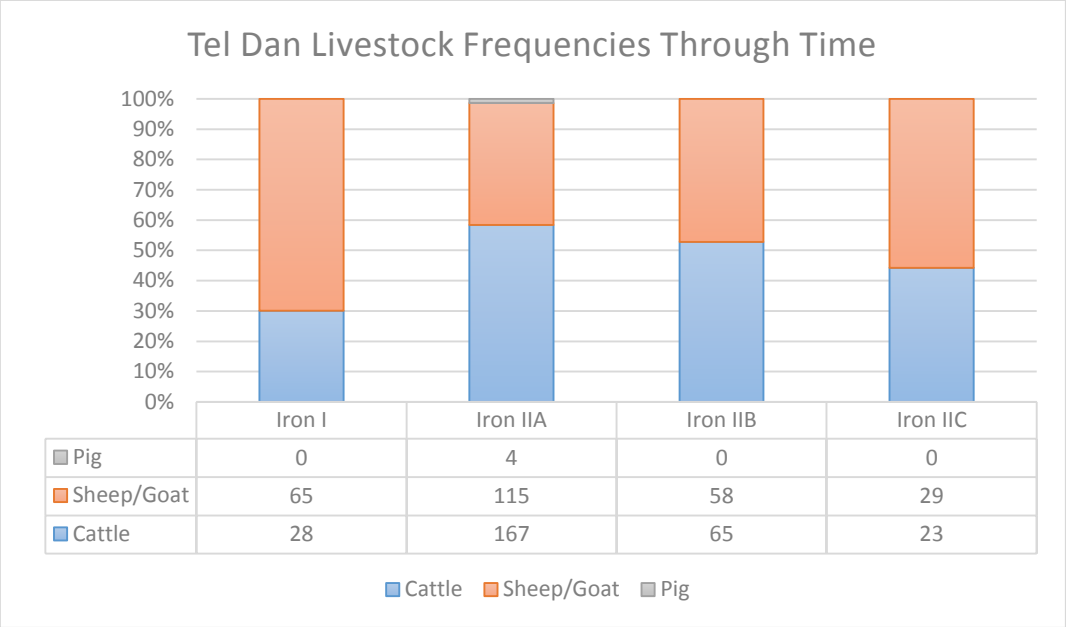
Figure 6.1 Tel Dan site map (Biran et al. 1996: Plan 1).

The majority of the Iron Age faunal samples used in this study were recovered from Areas M and T. Area T is located in the high part of Dan and is thought to be part of a larger sacred complex at the site during the Iron I (Biran 1980: 175). The majority of the faunal data dating to the 9th to the 6th century used in this study was recovered in Area M. The function of this area is unclear but cooking pots, storage jars, and ovens uncovered within a multi-phase wall suggest a domestic context during the 8th and 9th centuries (Stratum III). Stratum II included a with paved square, or road, incorporating the Stratum III walls, and was most likely a public space dating to the 8th to early 7th centuries B.C.E. Stratum IV consisted of only pottery and no

architectural remains. Stratum V, dated to the 11th century B.C.E. included crushed pottery, burnt beams, plaster, ash, and burnt brick collapse. Below this, in Stratum VI, excavators found many pits that may have incorporated Late Bronze Age remains, and were cut into Middle Bronze Age tombs (Biran 1996: 30-32).

Area T, where a portion of the bones was recovered, is considered to be cultic in nature, and is otherwise known as the "sacred precinct". The precinct was dated, using ceramics, to the reign of Jeroboam I, correlating with the 10th and 9th centuries B.C.E., or the Iron IIA (Biran 1994: 165). The area boasts a large 18m x 18m raised platform along with a 5.25m x 8m stepped porch dating to the Iron Age II, with temple-like architecture. Additionally, a monumental horned alter adorns the center of the area (Greer 2013: 43-45). The cultic nature of the area is supported by finds such as figurines, Egyptian cultic inscriptions, incense stands, large *pithoi*, and the altar itself. Use of the altar for sacrifices is not directly attested through text, but the zoological remains found around the altar suggest heavy use (Greer 2013: 60-78).

The bones recovered from Area M and Area T total NISP=975 and NISP=1095 respectively (Wapnish and Hesse 1991: 17-18). After narrowing the assemblage to include only identifiable livestock remains, the livestock total for both areas is NISP=554. For a breakdown of livestock frequency by time period, see Figure 6.2. The identifiable remains consisted mostly of livestock, as is expected, with a few rare finds such as camel and some wild taxa such as gazelle (Wapnish and Hesse 1991: 18). The faunal sample was hand collected, so smaller taxa and young animals are likely underrepresented in the sample.



	Iron I	Iron IIA	Iron IIB	Iron IIC
Pig	0	4	0	0
Sheep/Goat	65	115	58	29
Cattle	28	167	65	23

Figure 6.2 Tel Dan livestock frequencies through time.

Megiddo

Megiddo is one of the most extensively excavated sites in the Levant. Beginning in the 19th century, excavations continued sporadically to the modern day. The most famous excavations were led by the University of Chicago in the 1920s. These research programs sparked debates about the 10th century B.C.E. date of the site and the historicity of the Bible. Megiddo sits at a crossroads of trade, near the Carmel Ridge. It was an important site in the Levant through time and has provided a wealth of archaeological material.

Megiddo was already an important fortified city in the Early and Middle Bronze Ages. It is not mentioned in historical sources of the time until the annals of Tuthmosis III that describe the battle that took place there in 1482 B.C.E. After the Battle of Megiddo, the city was turned into an Egyptian administrative center and military stronghold. After the withdrawal of Egyptian control in the 12th century B.C.E. Megiddo again became a prominent Canaanite city. Late in the Iron I, Megiddo came under the control of the United Kingdom of Israel and was one of the

cities listed as fortified by King Solomon, along with Hazor and Gezer (Aharoni 1993:1003-1004).

Megiddo fades in the written sources thereafter but it is clear that it remained an important city in northern Canaan up to and including the Neo-Assyrian conquest. When Tiglath-pileser III conquered the northern part of Israel, he made Megiddo the capital of the new Assyrian province and Magiddu. More than a century later (609 B.C.E.), Josiah of Judah fought against the Pharaoh Neco at Megiddo, suggesting that for a short time Megiddo was under Judean control. Josiah's battle likely marks the end prosperity at Megiddo as it was no longer mentioned in written sources afterwards (Aharoni 1993: 1004).

The primary excavated areas of Megiddo that are relevant to this study are Areas H, K, L, M, and F (see Figure 7.1). Area H contains evidence of occupation before a conflagration in the Iron I. Occupation then resumed in this area during the Iron IIA. Based on the finds and architecture, this area was mostly residential in nature. It experienced fluctuations in activity during the Iron IIA, sandwiched by episodes of destruction (Arie 2013: 253-272). Area K dates to the Iron Age and is defined by several domestic structures. K-4 shows evidence of a violent conflagration, which is mirrored in Area H-9. Domestic occupation continues through K-2 (Gadot et al. 2006: 87-103). Area L is characterized by monumental architecture. Palace 6000 and the Megiddo stables were located in this area, along with some poorly preserved residential contexts (Cline 2006: 104-123). For additional information on these areas and strata see Franklin (2013: 195-203) for Area M and Ilan, Frankline, and Hallote (2000: 75-103) for the remaining areas. The combination of these three major areas suggests a mostly residential perspective of animal remains, and a snapshot into domestic life. Megiddo provides evidence of a continually occupied central Levantine site. The faunal data for Iron IIC levels has not yet been published,

but the data analyzed here are a good representation of previous periods and for comparison between contemporary sites.

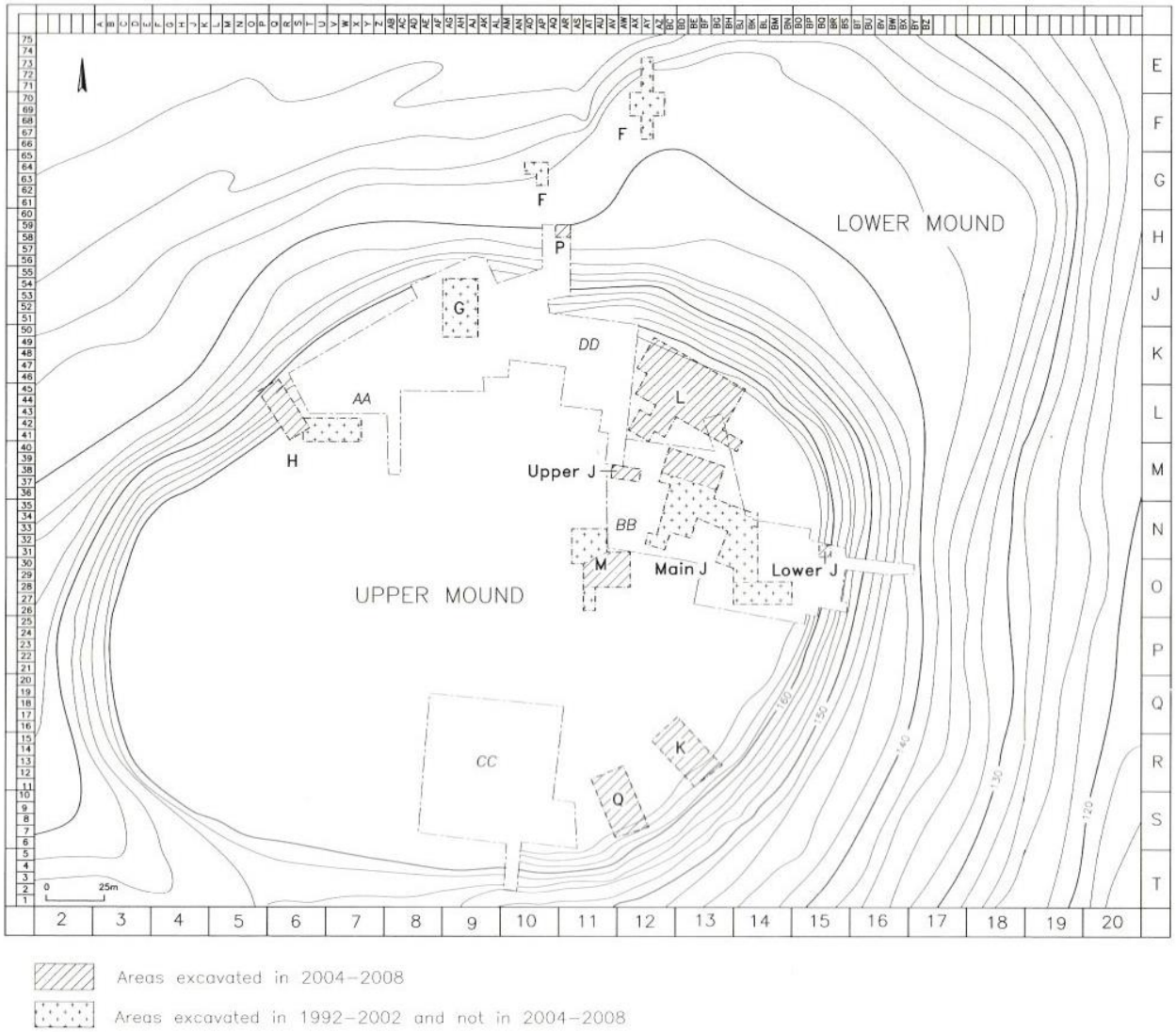


Figure 7.1 Megiddo site map (Finkelstein, Ussishkin, and Cline 2006: Figure 1.1)

The faunal remains from the 1994 – 2008 seasons at Megiddo are included in this study. The animal remains come from five areas: F, H, K, L, and M. The majority of the bones were recovered from Areas H, K, and L, and represent northern, southeastern, and northeastern portions of the tell, five chronological horizons, and eight levels. NISP=30,060 animal bones from Iron Age contexts have been recovered at Megiddo. Area H contributed 13,995 bones, and

Area K contributed 9,231 bones. Of those areas and the others listed above, 5,600 bones could be identified and 10,500 could at least be partially identified (Sasson 2013: 1131-1138). The total sample for the Iron I is NISP=3166, of that sample livestock NISP=2933. The sample for the Iron IIA is NISP=2147, and livestock within that is NISP=2044. The sample for the Iron IIB is NISP=298, and livestock during the Iron IIB is NISP=270. For a graphical breakdown of livestock frequencies per time period, see Figure 7.2.

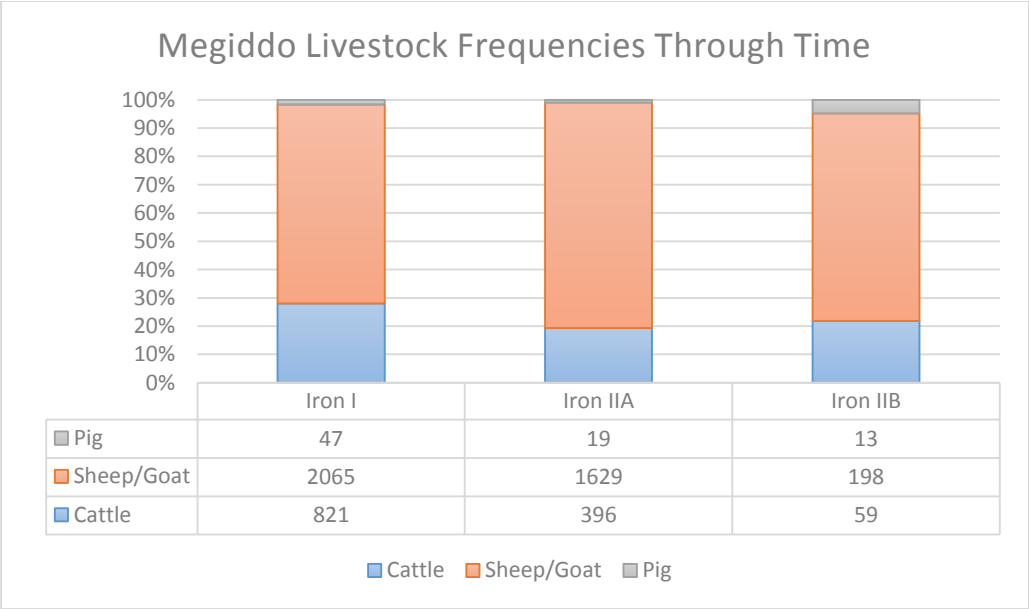


Figure 7.2 Megiddo livestock frequencies through time.

<u>Summary</u>

The economic, political, and environmental situations at each site play a factor in the eventual generation of the data analyzed below. Tel Akko, Tel Dor, and Megiddo share a location in the northwest area of modern Israel, incorporating a coastal zone with high commercial value that is reflected in each site's material culture. Tel Dan and Hazor, located in the highlands of northeastern modern Israel, share a similar location and cultural identity that is reflected in their material culture and faunal assemblages. Ekron and Tel es-Safi occupy the

southern piedmont zone in southern modern Israel. Their shared Philistine identity and material culture through the Iron Age makes them excellent points of comparison, not only for the other sites in this study, but to each other as well. Each site chosen was based on its overlapping chronologies with the other sites, the faunal data fitting those chronologies, and their significant role in Iron Age Canaan.

CHAPTER 3: METHODS

In this study, the relative frequencies (% NISP) of primary livestock animals (pigs, sheep, cattle, and goats) were compared diachronically between the sites described above. The time periods under consideration include the Iron Age I to the Early Persian Period, 12th – 6th centuries B.C.E., as these periods are well documented at a number of sites in the region. Several sites included in this study, such as Ekron and Tel es-Safi, are located on the coastal plain, and represent this environmental zone. Tel Dor and Tel Akko are both situated on the coast, or were in antiquity, and represent littoral environmental zones. The coastal plain is characterized by relatively flat, watered land extending inland from the coast. Slow moving rivers and the flat landscape form marshy areas in some sections of the coastal plain, more suitable for riverine taxa including fresh water fish and waterfowl. Sites such as Hazor, Megiddo, and Tel Dan represent inland environmental zones, which tend to be more arid, geographically featured, and at a higher elevation.

In the following, faunal data from each site are evaluated in terms of their location, history, context, and occupation phases. Faunal data is generally reported in two ways in Near Eastern archaeology: NISP (Number of Identified Specimens) and MNI (Minimum Number of Individuals). NISP is an observational unit that allows for the derivation of other units of analysis, such as MNI. However, NISP may over-represent taxa because skeletal elements from any given taxon vary in number and durability. MNI also has its drawbacks. MNI is calculated by assessing the minimum number of whole skeletons, per species, needed to constitute a given faunal assemblage. Because of this, it tends to exaggerate the importance of rare species in small samples, under represent species in large samples, and must be recalculated whenever the data are organized in a different way (Grayson 1978: 59).

Few zooarchaeologists explicitly define terms such as “specimens”, “elements”, “fragment”, and so on (Lyman 1994: 39). Differing definitions of these terms along with different methods of calculation of minimum counts (MNI; MNE - Minimum Number of Elements; MNB - Minimum Number of Bones, etc.) can lead to confounding variables in data compared between sites. The NISP method of quantification allows for the simple comparison between assemblages, and was therefore chosen as the method of comparison for this study. Identifiable specimens in this study are considered to be elements or fragments of bones that could be identified to the level of sub-family or below, if not genus or species. All data sets listing NISP, or TNF (Total number of fragments), are treated as NISP, using the quantification method defined above.

Livestock species are defined as sheep (*Ovis aries)*, goats (*Capra hircus)*, cattle (*Bos taurus*), and domestic pigs (*Sus scrofa domesticus*). Data for individual livestock species are represented along with percentages of total livestock NISP at each site. Wild taxa are defined as species not considered livestock animals. Excluded from this category are fish, shellfish, equids, rodents, and dogs. Fish are excluded because the fishing industry is not the main focus of this analysis and considering them wild taxa would skew data for more inland sites, misrepresenting the exploitation of wild land taxa. Dogs and rodents are excluded because they are typically not food animals. Frequency comparisons between sites are based on the relative percentage of livestock NISP. For example, if the total NISP of sheep, goats, pigs, and cattle is 100, and the number of cattle identified is 25, then cattle would be 25% of the total livestock NISP. The ratio of sheep and goats at each site will be considered as well, where available. Identifications of sheep and goats are generally low in number in most site reports, and the two species are typically lumped into the general category of ovi-caprid. This is due to the similarity of the

skeletal morphology of the two animals. Only a handful of features can be used to determine sheep from goat (Zeder and Lapham 2010: 2887). Where available, the ratio of sheep to goats will be presented as a percentage of total number of individually identifiable sheep and goats for each assemblage. The sheep to goat ratio is useful in inferring economic activity based on the two animals. However, the ovicaprid category is used here for inter-site comparison of livestock frequencies.

Livestock frequencies are compared graphically by time period, although some span multiple time periods due to the limited nature of available chronological data. Transitional phases such as strata marked as "Iron I/II" are combined into the Iron IIA category for ease of comparison. The time periods that form the framework of this analysis are as outlined in Table 1.3.

Iron I	~1150 B.C.E. – 900 B.C.E.
Iron IIA	~900 B.C.E. – 700 B.C.E.
Iron IIB	~700 B.C.E. – 600 B.C.E.
Iron IIC	~600 B.C.E. – 500 B.C.E.

Table 1.3 Iron Age chronology of the Levant

Culling patterns for sheep and goats are discussed where data are available. Mortality data for all sites, except Tel es-Safi (exact data are unavailable), are available in Appendix A. Age at death in sheep and goats can be used to determine primary products (i.e. meat) versus secondary products including any good or service harvested or provided by an animal other than meat (e.g. milk, wool, labor, etc.) (Crabtree 1990: 161-163). Since bone fusion data is more reliably recorded and comparable as an estimate of age at death (Zeder and Lapham 2010: 2904-2905), data presented here will be based on those measures rather than tooth eruption and wear

data. Aging systems and methods used at each site differ, making comparisons between sites more difficult than if standardized methods for aging had been used. Prime aged animals are those that have reached maturity, are close to their optimum weight, and are still useful for secondary products. Sub-adults are defined as animals younger than mature adults, but older than 6 months. For the most part, the standard system for aging using epiphyseal fusion and tooth wear is based on Silver (1969) and Payne (1973). This was the system used at Tel Akko, Tel es-Safi/Gath (Lev-Tov 2012b: 590, 592), Megiddo (Sasson 2013: 1133), Tel Dor (Raban-Gerstel et al. 2008: 34), Tel Dan (Greer 2013: 63-64), and Hazor (Lev-Tov 2012a: 589). For this study, age profiles at Akko were constructed using Zeder's (2006) age categories for epiphyseal fusion in sheep and goats. This was done to ensure a large enough sample size for each period represented at Akko.

Comparison of livestock frequencies, culling patterns for sheep and goats, and presence/absence of wild taxa between sites provides the data to assess an aspect of regional economic development of Canaan. Fishing is especially important at coastal sites where it could potentially provide enough protein to allow a large portion of livestock herds to focus on secondary products as opposed to meat production. Hunting is documented by the presence of game animals such as wild ungulate and bird species that are representative of local environments. Considering the exploitation of local environmental resources when exploring animal economy at a site is paramount to understanding subsistence strategies (Lev-Tov, Porter, and Routledge 2011).

Faunal Analysis at Tel Akko

A total of 8730 bones were collected over the course of five excavation seasons at Tel Akko. 5038 bones are attributable to the Iron Age (10th – 6th centuries), and of these 1295 bones

were identifiable. Bones were recovered from Area A, sub-divided into seventeen squares in the grid system. Not all squares were excavated during every season but data from each square are represented here. Bones were collected from all contexts by hand as well as sieving. Material from all loci, aside from those designated as cleaning loci, were subjugated to 100% sift using quarter-inch sieves.

Analysis of the faunal assemblage was performed at the excavation's base camp located the Israel Naval Academy in Akko, Israel. All bones from loci with assigned stratigraphic information were analyzed in a preliminary fashion by the excavation's zooarchaeologist, Dr. Justin Lev-Tov. Bones were identified and analyzed based on personal experience and use of reference manuals as needed. For difficult specimens, the comparative collection at University of Haifa was used. Fish bones were not yet identified beyond the class level and that analysis is ongoing. All other bones were identified to the lowest taxonomic level possible.

In addition to taxonomic identification, demographic information was recorded to the greatest extent possible. Age was recorded using Payne's (1973) system of recording tooth wear for sheep and goats. Epiphyseal fusion of long bones was recorded for sheep, goats, cattle, and other species. Fragmented bones were scored in accordance to the system derived by Dobney and Rielly (1988) to track the types of fragments being recovered. Skeletal elements are "mapped" and given numbers or letters to designate a specific portion of the element. This was recorded for all specimens.

The presence of modifications to bones including butchery marks, burning, or non-human modifications such as rodent or carnivore gnawing were recorded. Cattle toe pathology was also recorded to investigate the extent to which cattle were being used for labor-intensive tasks such as pulling plows (cf. Bartosiewicz et al. 1997). These data were recorded using a custom

database constructed within Filemaker Pro 12 by Justin Lev-Tov, Yossi Salmom, and Ragna Stidsing. The database is used for the entire excavation, with separate datasets linked accordingly to interconnect all appropriate data.

The methods employed here aim to provide a relatively complete picture of animal economy across the region during the Iron Age. At Akko specifically, the goal was to provide as complete a report as possible for the excavation project, and use in future studies. The methods provided here seek to minimize the inter-site variation in reporting and sample sizes. These methods are applied to the faunal data from each site in a uniform manner where data permits. These data are outlined and presented below.

CHAPTER 4: ANALYSIS

The dataset contains information on animal bone assemblages from seven sites in the Levant. The analysis is subdivided by time period, where each relevant site is presented and compared. The data were compiled into an Excel spreadsheet for graphical comparison of livestock frequencies, sheep and goat ratios, and sheep and goat mortality data. Livestock frequency is presented as a percentage of the total NISP of livestock in a given time period. Sheep and goat mortality is presented as the percentage of individuals to have survived to a certain age. Variation in species diversity was not greatly affected by sample size ($r^{2=}$.0299). The number of mammalian taxa identified was plotted against total NISP for each site in Figure 8.0. The number of mammalian taxa identified was chosen to eliminate outliers caused by the identification of aquatic taxa at coastal sites. A limited correlation of sample size to species diversity suggests that findings in this study are the result of inter-site differences rather than differences in reporting and recovery methods. In Figure 8.1 sheep to goat ratios are plotted against corresponding livestock NISP for that period. Sheep to goat ratio was also not greatly affect by sample size ($r^{2=}$.0167). The negative correlation is due Tel Dan acting as an outlier. This analysis demonstrates that livestock NISP does not greatly affect the sheep to goat ratio at these sites, and differences among sites were due to other factors.

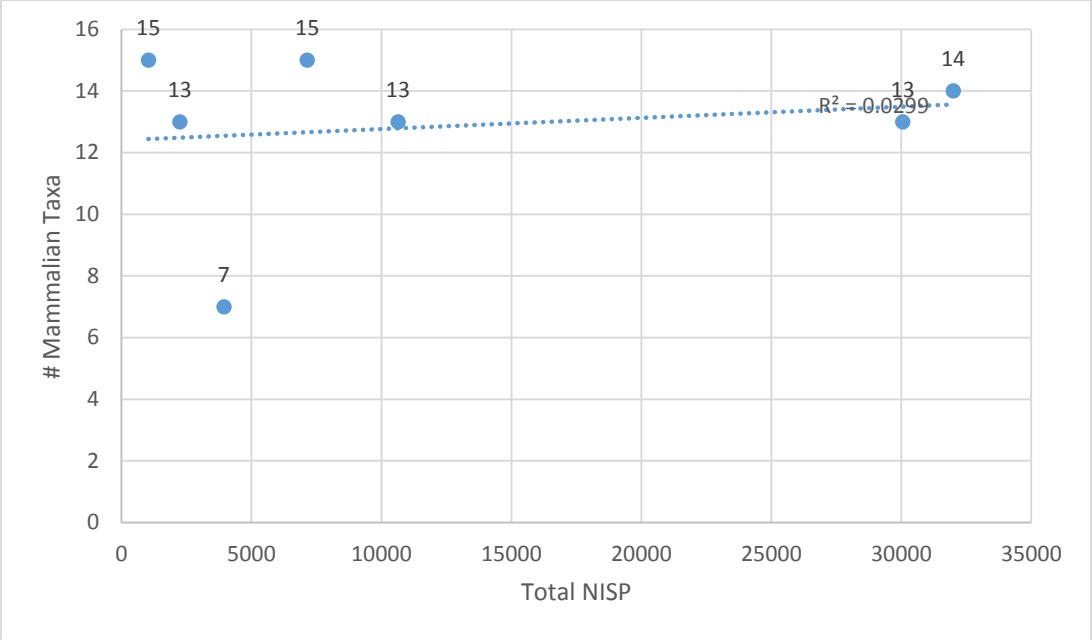


Figure 8.0 Number of mammalian taxa identified plotted against total NISP of each site.

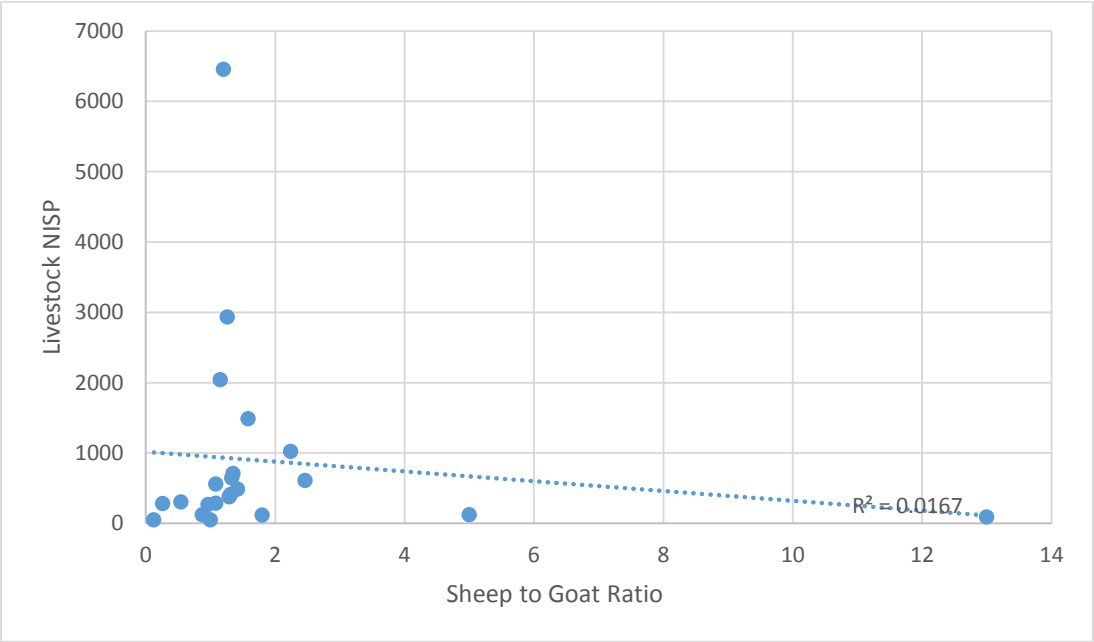


Figure 8.1 Sheep to goat ratio as a function of livestock NISP across all time periods.

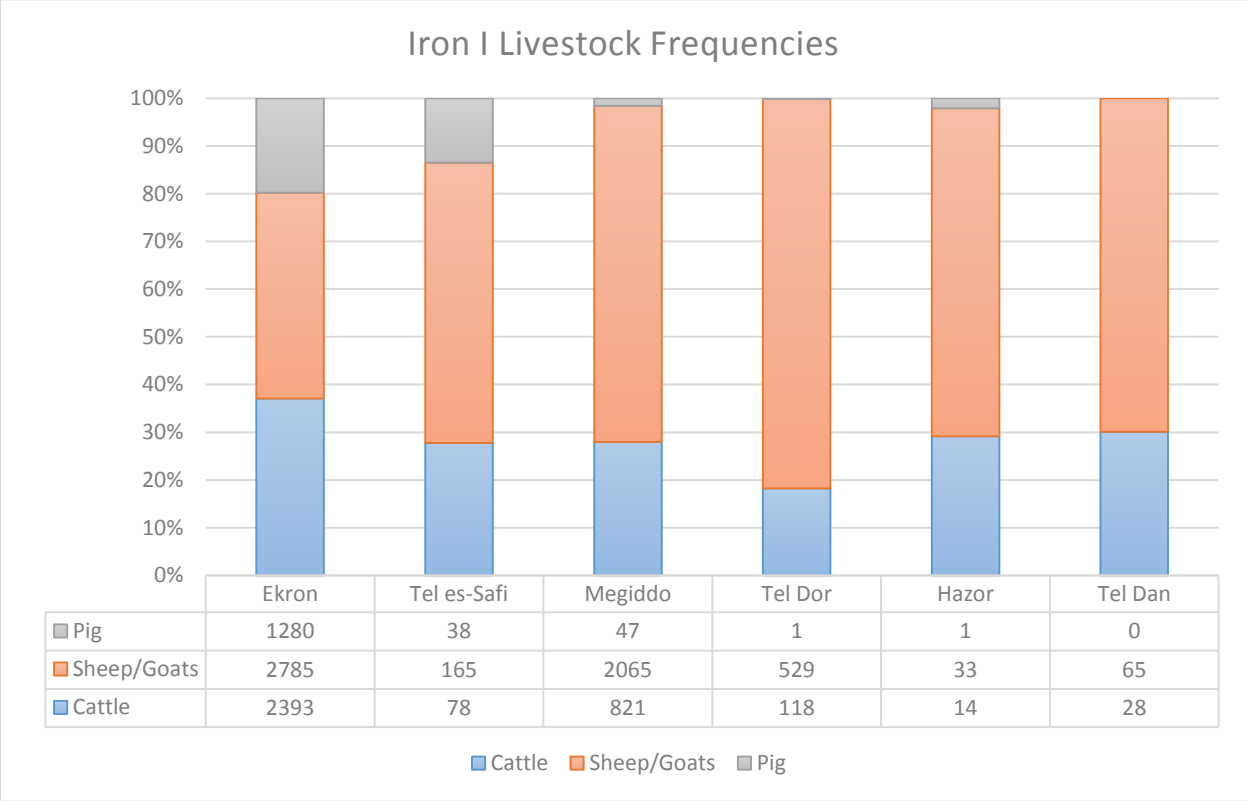
Iron I Period

Many settlements abandoned or destroyed during the Late Bronze Age collapse were rebuilt during the Iron I. Southern Canaan was densely populated in the Late Bronze Age. After the collapse and subsequent migrations that occurred in the Mediterranean in the early Iron I, the number of settlements decreased dramatically (Finkelstein 1996a: 228-233). In Southern Canaan (south of modern Tel-Aviv), settlement patterns focus on large, central cities with few hinterland settlements. Urban centers in Northern Canaan suffered a similar fate with a series of destructions that can be seen in the archaeological record of the early Iron I period. Among these, Megiddo (Stratum VIIB), Beth-Shean (Stratum VII), Ashdod (Stratum XIV), and Hazor, suffered widespread destruction (Mazar 1990: 287-291).

The change in Iron I settlement patterns is marked by several phenomena. One is the appearance of coastal urban centers, typified by the Philistine pentapolis, which included a reduction in population or abandonment of smaller hinterland sites around these urban centers (Killebrew 2005: 97; Finkelstein 1996a: 231). The next is significant settlement growth in previously marginal areas in the highlands, typified by small villages. The contraction of settlements patterns in southern Canaan paired with the rise of the Philistine pentapolis (Ashdod, Tel es-Safi/Gath, Ashkelon, Ekron, and Gaza), made Philistia the dominant power in southern Canaan during this time period. The hill country was populated by numerous small villages, possibly of pastoral Canaanite origin, that would later develop into the territorial state of Judah (Finkelstein 1996b: 208).

Figure 8.1 shows the relative livestock frequencies for six sites in the Iron I period. As is typical of post-Neolithic sites in the Levant, sheep and goat remains dominate each, followed by cattle. Despite the small sample sizes from Hazor (NISP=48) and Tel Dan (NISP=47) from this

period, the data mirror this general trend. Cattle represent over 20% of livestock in five out of the seven sites represented here. At Ekron, cattle are 37% of the total livestock. Such a high frequency of cattle is comparable to not only neighboring Tel es-Safi (28%), but also to more northern sites such as Megiddo (28%), Dan (30%), and Hazor (29%). People at Dor seem to have exploited cattle to a lesser degree (18%), though still on a large scale.

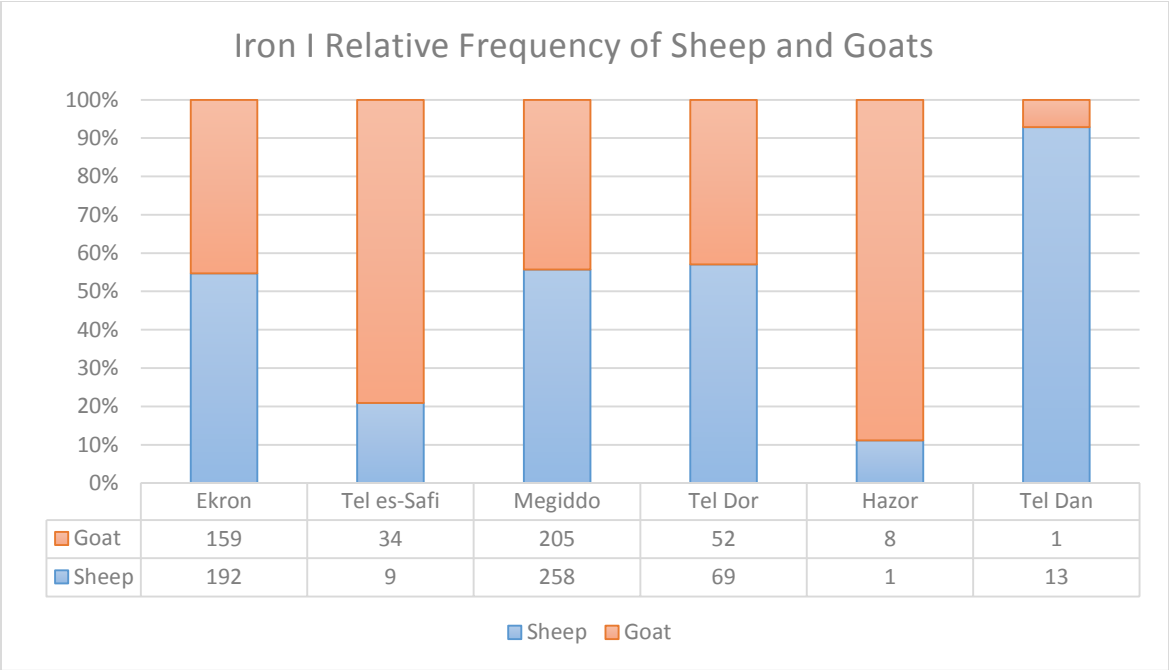


	Ekron	Tel es-Safi	Megiddo	Tel Dor	Hazor	Tel Dan
Pig	1280	38	47	1	1	0
Sheep/Goats	2785	165	2065	529	33	65
Cattle	2393	78	821	118	14	28

Figure 8.2 Iron I relative livestock frequencies, with NISP values.

The frequency of sheep and goats for each site ranges from 43% at Ekron to 82% at Tel Dor. At all sites, sheep and goats comprise the majority of. When sheep and goats are considered separately, the sample size for each is greatly reduced. Figure 8.2 shows ratio of sheep to goats as a percentage of the total number of individually identified sheep and goats. Three sites stand out with extreme disparities. Tel es-Safi, Tel Dan, and Hazor, are the three smallest assemblages

of identifiable sheep and goat bones during this period, NISP=43, NISP=14, and NISP=9 respectively. Looking at the remaining sites, sheep seem to have been slightly favored over goats. Both animals can be utilized for secondary production, as sources of milk and hide. Wool from sheep, however, can be widely transported. One would expect to see sheep being favored in sites that fall along major trade routes due to their wool being used for textile production or even raw material trade. Surprisingly, the data presented here, do not reflect that sort of trend.



	Ekron	Tel es-Safi	Megiddo	Tel Dor	Hazor	Tel Dan
Goat	159	34	205	52	8	1
Sheep	192	9	258	69	1	13

Figure 8.3 Iron I relative proportions of sheep and goats with NISP values.

Mortality profiles of sheep and goats at Ekron suggest a generalized strategy geared toward secondary products. There was no focus on a particular age range for culling sheep and goats, but a bias towards female goats, and male sheep, may indicate production of milk in goats and wool in sheep (Payne 1973: 299-303). Since cattle mortality patterns at Ekron favor males, they were likely used primarily for labor rather than milk production (Lev-Tov 2010: 96-98). Tel es-Safi mortality profiles for sheep and goats suggest goats were primarily being used for meat

and dairying, while sheep were kept into maturity and possibly much longer. Age at death data for cattle demonstrate use primarily for labor, as is common in the region (Lev-Tov 2012a: 594-596).

Mortality profiles suggest a mixed strategy at Dor, where most sheep and goats were kept into adulthood (>2 years). Results are similar for cattle, indicating they were kept into adult hood for milk and labor (Raban-Gerstel et al. 2008: 35-38). At Hazor the combined mortality profile of sheep and goats is reflective of the pastoral settlers that likely occupied the site during the Iron I. 50% of animals were culled before one year of age, with only a quarter surviving more than three years of age. The Iron I at Hazor is represented mostly by refuse pits and a paucity of architecture. For this study, only Area A2 faunal data were used because it represents a more continuous assemblage. Sheep and goat mortality profiles, however, were calculated using both the Area A2 and Area A4 assemblages. Even including both areas, the sample size is small and may not be representative (Lev-Tov 2012b: 593). At Tel Dan, the majority of sheep and goats were kept past one year of age. This is evidenced by the surprising decline in survivorship in the following age range, when the growth curve of the animals begins to plateau. Two thirds of sheep and goats survived until at least thirty months of age. Cattle were poorly represented in this phase but seem to have been kept at least past one year of age (Wapnish and Hesse 1991: Table 10). Additionally, one would expect culling patterns to reflect a secondary or mixed strategy focus for both sheep and goats, as data is rarely comprehensive enough to distinguish the two.

The mixed strategy of herd security, with emphasis on both meat and secondary products was employed when dealing with sheep and goats as well, such as at Tel Beth-Shemesh (Tamar et al. 2013: 7). In this strategy young, unneeded males are the first culled, then older animals that

are no longer producing milk or other secondary products are culled. Cattle profiles are similar. However, a low rate of arthritic pathologies on cattle phalanges indicates that cattle were not heavily used for labor activities (Tamar et al. 2013: 6-7). Finally, at Megiddo, evidence points to an intensive culling of sub-adults in the sheep and goat category. In the Iron I, only 30% of animals survived passed 30 – 42 months of age. The culling of sub-adults in these great numbers suggests a strategy of meat harvesting, although they may have been exploited for secondary products during their lifetime (Sasson 2013: 1140-1141). The Iron Age I at Megiddo presents two differing strategies for cattle. In the early Iron I, most cattle were kept into adulthood, probably for labor. In the late Iron I, 50% cattle were culled before reaching adulthood, possibly reflecting an emphasis on meat production (Sasson 2013: 1144-1145).

At all but two sites listed here, sheep and goats represented frequencies less than 70% of total livestock. The frequencies of sheep and goats, in comparison to other livestock species, at Ekron (43%) and at Tel es-Safi (59%), are uncharacteristically low. This is easily explained by their unique use of pigs in this time period (Hesse 1990: 215-216; Lev-Tov 2012b: 596). Pig rearing in the Iron I and its connection to ethnicity has been hotly debated in the zooarchaeology of the Levant for some time (see Hesse 1990; Sapir-Hen et al. 2013; Zeder 1996; Finkelstein 1996b; Crabtree 1990; Faust and Lev-Tov 2011; Killebrew and Lev-Tov 2008). Archaeological sites dating to the Chalcolithic show evidence for pigs comprising about a quarter of faunal assemblages (Hesse 1990: 206-209). However, in the Early Bronze Age, pig use declined only to then rebound in the Middle Bronze. By the Late Bronze Age pig usage declined but was not particularly uncommon (Hesse 1990: 209-212). However, in the Iron I, pigs are uncommon outside of Philistia (Hesse 1990: Table 3). Many of the pig remains recovered in the Levant outside of Philistia are attributed to wild boar.

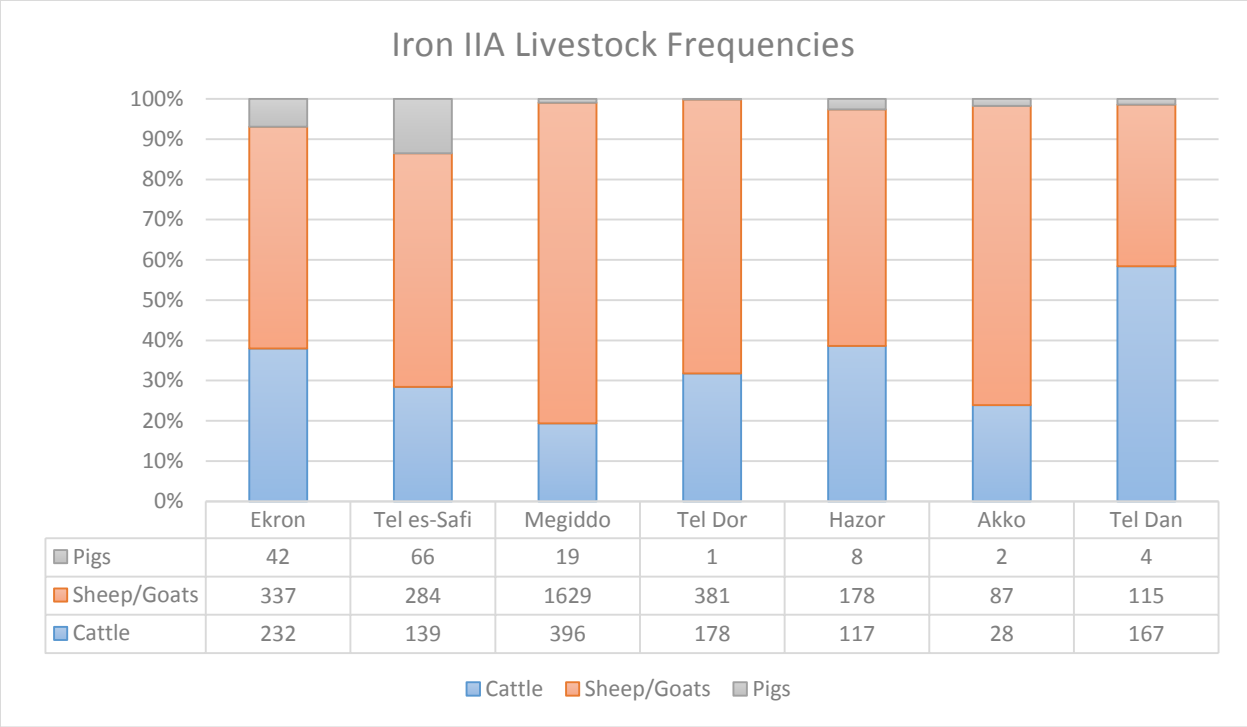
There have been several theories put forth about pig rearing in the Iron I, attempting to explain the rather unique Iron I Philistine phenomenon through origin of peoples or ethnicity (Killebrew and Lev-Tov 2008). Some attribute the lack of pigs, especially in the highlands, to religious taboos against the practice of pork consumption (Finkelstein 1996b: 206). Others suggest non-ethnic factors to explain the phenomenon. According to Zeder (1996, 1998; see also Tamar et al. 2014) pig use tends to increase when the regional economy is weak and decreases when it becomes more regulated and organized. This is because pigs are suited to small scale family operations and serve to bolster food security in the absence of a reliable regional economy that would otherwise serve to fill gaps during stress events. Harris (1987) and Redding (1991) state that pig rearing is higher when agricultural intensity is low, and is lower when agricultural activity intensifies because pigs compete for the food resources agriculture produces (see Tamar et al. 2014 for overview). Hesse (1990) argues that pigs serve as a good food resource when acclimatizing to a newly settled area (Tamar et al. 2013: 9). They can reproduce quickly and provide a sizable meat package compared to the space they require. This approach seems most logical when considering the phenomena of pig rearing in Philistia in the Iron I, as the phenomenon was short lived in most cases. The one exception, however, is Tel es-Safi, which retained evidence of intensive pig use well after the initial phase of settlement and into the Iron IIB.

Iron IIA

At the beginning of the Iron IIA period, territorial states rose in the Southern Levant. Notably, in the highlands, the United Monarchy became a power that rivaled and eventually usurped the Philistines, as demonstrated by a shrinking of Philistine settlements (Shai 2011: 120-121). At this time, Ekron contracted to the acropolis of the site, roughly ten acres, while Tell es-

Safi expanded to 50 acres. This was possibly due to a shift in attention towards the Israelite border at the time to deal with the increasing pressure from the Israelites (Shai 2011: 121-122). In the northern valleys of Israel, major urban centers, including Megiddo, experienced episodes of destruction (Finkelstein, Fantalkin, and Piasetzky 2008: 32-33). There was a shift in power toward sites such as Hazor, which flourished in this time period (Ben-Tor, Ben-Ami, and Sandhaus 2012: 2). Shifts in power and more centralization of authority could change the strategies associated with animal economy.

Figure 9.1 shows livestock frequencies for seven sites in the Iron IIA. Sheep and goats still dominate most assemblages, and cattle are the second most abundant of the livestock species. Interestingly, it seems that wild taxa become more important in this period for several sites. This is the case at Hazor (Lev-Tov 2012a: 588) and Tel Dan (Wapnish and Hesse 1991: 34), while other sites are marked only by subtle increases such as at Tel Dor (Sapir-Hen et al. 2014: Table 1). At Megiddo, wild taxa use decreased slightly (Sasson 2013: Table 27.4). This is likely due to the destruction the site experienced during this time period, resulting in a smaller cultural sample.



	Ekron	Tel es-Safi	Megiddo	Tel Dor	Hazor	Akko	Tel Dan
Pigs	42	66	19	1	8	2	4
Sheep/Goats	337	284	1629	381	178	87	115
Cattle	232	139	396	178	117	28	167

Figure 9.1 Iron IIA relative frequency of livestock and NISP values.

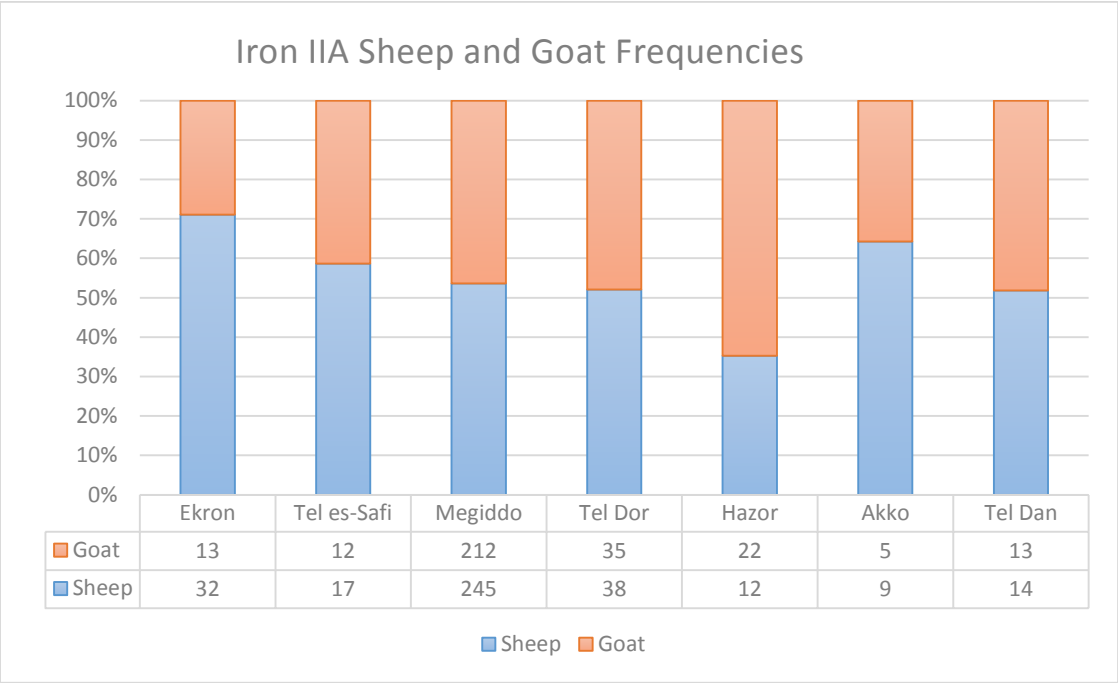
Cattle seem to increase in importance in this period. Frequency of cattle for the selected sites ranges from 19% to 58%. This increase may be an indicator of increased agricultural activity in the region, as a greater number of animals would have been needed for labor. Surprisingly, cattle outnumber sheep and goats in this period at Tel Dan (60%). Mortality profiles indicate that ca. 75% of cattle were kept past three and a half years of age (Wapnish and Hesse 1991: 34). Cattle kept for this length of time usually indicates their use as labor or milk producers (Sasson 2013: 1144). Though Megiddo has the lowest frequency of cattle in this period, mortality profiles suggest they were being kept into adulthood as well (Sasson 2013: 1144). At Ekron, cattle frequency remained stable, and use as traction animals is well attested by the number of arthritic phalanges found during this period and a culling strategy that favored older animals (Lev-Tov 2010: 99-100).

Similarly, the frequency of young cattle found at Dor during this period is low, which suggests that the cattle were being kept to older ages (Sapir-Hen et al. 2014: 88). Along with this observation, cattle frequency increased at Dor during this period from the Iron I, corresponding with the expansion of the site and increased trade contacts throughout the Levant (Gilboa and Sharon 2008: 161-166). Despite having a relatively small sample size of cattle bones attributable to age, evidence from Tel es-Safi also suggests that cattle were being kept into adulthood in order to take advantage of one or more economic functions, primarily labor (Lev-Tov 2012b: 599-600).

The opposite phenomenon is seen at Hazor. During the Iron IIA, the majority of cattle were culled before reaching the third year of life. Only 50% of the total cattle survived past their first year, and the majority of those that survived that milestone were culled before their third year of life. This pattern changes in the following period, which shows a more stable pattern of culling (Lev-Tov 2012a: 594). Hazor was undergoing a rebuilding period in the Iron IIA as an Israelite settlement, which perhaps explains the meat-focused culling practices.

The sample size at Akko during the Iron IIA is relatively small compared to the other sites under study (NISP=61). It displays similar livestock frequencies to the other sites, sheep and goats dominate the livestock assemblage. Cattle comprise 30% of the livestock species at Akko. Mortality profile data for cattle at Akko in the Iron IIA are also limited. A first phalanx and distal tibia respectively were from cattle 1.5 to 2.5 or more years of age. From the relatively small sample size, the mortality data for sheep and goats in this period at Akko suggests a mixed strategy. Half of individuals that attained ages of more than eighteen months survived past that age. Animals younger than eighteen months were not targeted for culling, or do not make an appearance in the current sample.

Pig use decreases at Ekron and all other Philistine sites where data are available, except for Tel es-Safi (Hesse 1990: Table 3). At Tel es-Safi pig use remained a significant part of the animal economy well into the Iron Age (Lev-Tov 2012b: 598-605). However, pig remains are found in greater quantity in sites throughout the Levant in the Iron IIA.



	Ekron	Tel es-Safi	Megiddo	Tel Dor	Hazor	Akko	Tel Dan
Goat	13	12	212	35	22	5	13
Sheep	32	17	245	38	12	9	14

Figure 9.2 Iron IIA relative proportions of sheep and goats and NISP values.

Figure 9.2 shows the relative proportions of sheep and goats. In the Iron IIA, sheep tend to be favored at most sites with the exception of Hazor. Increases in the number of sheep, compared to the Iron I, occur notably at Tell es-Safi, Hazor, and Ekron. This may indicate a possible shift in the direction of the animal economy towards more durable secondary products such as wool. The sheep and goat mortality profile for Tell es-Safi during this period indicates their use as secondary product producers. Many of the animals were kept past one year of age, and a large percentage of them were kept passed two and three years. This is a continuation of the culling strategy employed during the Iron I at the site (Lev-Tov 2012b: 599). At Ekron, the

mortality profile of sheep and goats also suggests a culling strategy geared toward the production of secondary products. However culling was focused mostly on prime-aged male animals, which could suggest an emphasis on meat harvesting as well. Evidence of both strategies at Ekron, then, points to a more generalized herding economy (Lev-Tov 2010: 98). At Hazor, the earliest phases of the Iron IIA show signs of pastoral settlers practicing a culling strategy focused on dairy production. Later in the Iron IIA, the strategy changes to one of herd security and more generalized production (Lev-Tov 2012a: 593-594).

Tel Dan presents a mortality profile that suggests a herding strategy focused on herd security. Almost no animals were slaughtered before one year of age. Gradually more are slaughtered by 30 months of age, with about half slaughtered before reaching more than 30 months in age (Wapnish and Hesse 1991: Table 10). At Megiddo, sheep and goat culling profiles are indicative of milking strategies by the end the Iron IIA. Young animals are being culled in high numbers, while prime-aged sheep and goats have high survival rates. Culling increases again at older ages, which may be indicative of a mixed strategy of milking and meat production after the prime years of life (Sasson 2013: 1140-1141). Mortality profiles at Tel Dor for this period are rather limited, but suggest that animals were being slaughtered in their older stages of life (Sapir-Hen et al. 2014: 88).

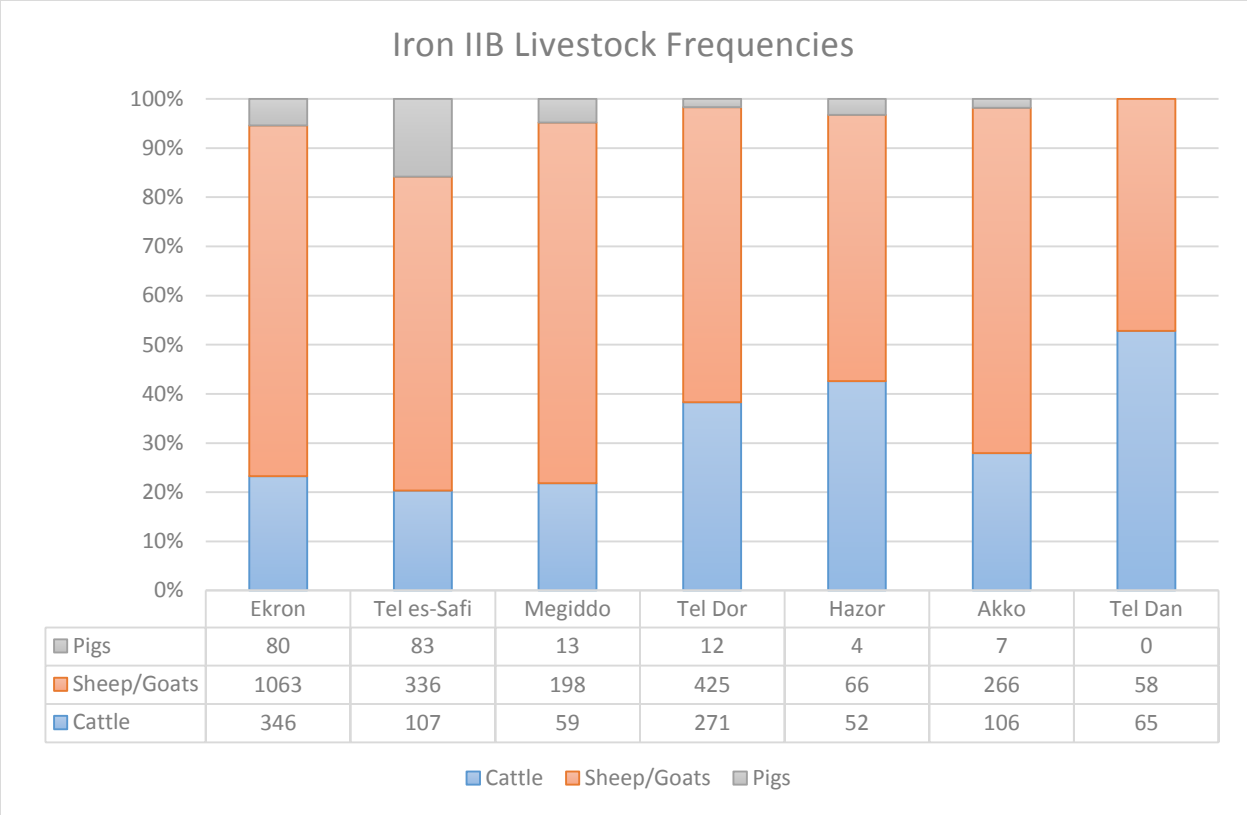
In the Iron IIA, cattle increases in importance at most sites outside of Philistia, with exception of Megiddo where cattle frequency decreases. Mortality profiles suggest an increased use of cattle for labor during this period. At Ekron, the importance of pig rearing appears to be reduced, shifting the emphasis towards a generalized herding economy focused on sheep and goats. Tell es-Safi livestock frequencies remained practically unchanged from the Iron I, one of a few Philistine settlements unaffected by the transition into the Iron IIA. The prevalence of sheep

increases at most sites, indicating more mixed herds than in the Iron I. Culling strategies varied, generalized strategies were more common than strategies geared toward secondary products. Wild taxa use increased slightly, which may explain the appearance of pigs in small numbers outside of Philistia.

Iron IIB

In the Iron IIB, territorial states and their ethnic groups were established throughout the region. Several independent city-states were reduced to vassals at the beginning of this period, changing the way they operated within the greater regional economy (Lev-Tov 2010: 100). The Southern Levant had come to be controlled by several polities jostling for power. The strongest of these polities was Northern Israel, which had great influence over the region, followed by Judah, Phoenicia, and Philistia. Despite the internal bickering, the Southern Levantine kingdoms came together to face the common threat of the Assyrians, until they eventually came to dominate the area (Herr 1997: 132-134).

Figure 10.1 shows the relative livestock frequencies in the Iron IIB period. Sheep and goats still dominate most sites, with the exception of Tel Dan where cattle still dominate the faunal assemblage. Pigs continue to be represented in low frequency across the region. There is little change in animal economy from the previous period. Cattle frequencies decreased slightly in the southern sites of Tell es-Safi and Ekron.



	Ekron	Tel es-Safi	Megiddo	Tel Dor	Hazor	Akko	Tel Dan
Pigs	80	83	13	12	4	7	0
Sheep/Goats	1063	336	198	425	66	266	58
Cattle	346	107	59	271	52	106	65

Figure 10.1 Iron IIB relative livestock frequency and NISP values.

More telling are the mortality profiles of sheep, goats, and cattle for this period. While no significant change in frequency is present for the selected sites, shifts in how the animals were exploited can indicate different economic pressures. At Ekron, pig exploitation continues to decrease, along with cattle. The rising importance of sheep and goats suggests a shift to an animal economy focused on these animals. This strategy appears in stark contrast to Ekron during the Iron I two centuries earlier. The ratio of sheep and goats drops from 70% sheep to 60% in this period. This could be explained by normal variation and the amount of identifiable elements in this assemblage. The mortality profiles for both sheep/goats and cattle remain the same for this period. This analysis pooled Iron II strata together in order to create a more complete dataset (Lev-Tov 2010: 98-101).

At Tell es-Safi, pigs remained a large part of the diet. It is one of the few sites associated with Philistia where this phenomenon continues for most of the Iron Age. But along with Ekron, sheep and goats increased in frequency at the expense of cattle. The shift towards sheep and goats at Tell es-Safi may be for reasons similar to Ekron, as Tell es-Safi's power waned in the region and the site began to contract. Judahite material culture increased at the site, indicating foreign influence on economic behavior (Lev-Tov 2012b: 602-603). However, mortality data for sheep, goats, and cattle are not currently available.

Livestock frequency at Megiddo was largely unchanged since the previous period. The assemblage for the Iron IIB strata at Megiddo is around ten times smaller than the sample size for the Iron IIA (see Figure 7.2). The slight shift in focus towards the exploitation of sheep and goats is followed by a change of strategy as well. While the ratio of sheep and goats at Megiddo stays roughly the same, as seen in Figure 10.2, culling of very young animals is reduced. Sheep and goats between 1 – 2 years of age were culled at a higher rate earlier in the Iron IIB, but reduced later in the period. Overall, sheep and goats rarely lived more than three and a half years (Sasson 2013: 1140-1141). The brief rise in culling of 1 – 2 year olds seems to point to an increased focus on meat production for at least part of the Iron IIB, before returning to a more mixed strategy of secondary production and meat harvesting. Cattle mortality data is limited to just ten bones with age data during this period at Megiddo. These bones indicate cattle were being kept well into adulthood.

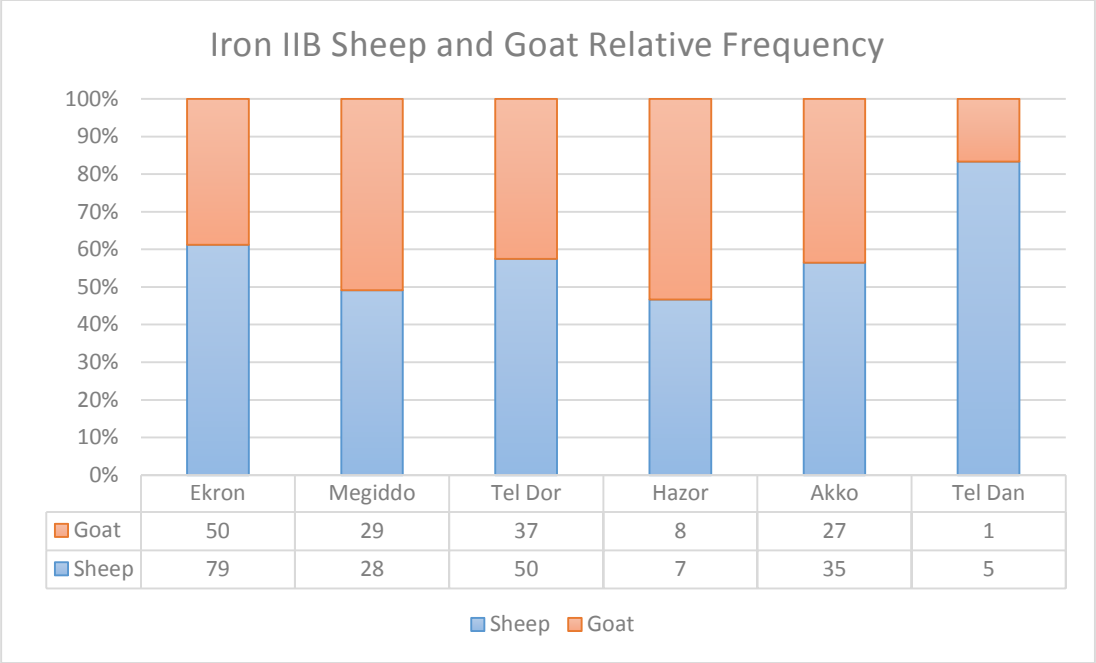


Figure 10.2 Iron IIB relative proportions of sheep and goats and NISP values.

At Tel Dor, there was little change in the faunal assemblage over-all with the exception of a slight increase in cattle frequency. There was also a slight increase in the number of sheep during this period, but this does not constitute enough of a change to comment on shifts in herding strategies. The Iron IIB at Dor is a period of constructive expansion. A new city wall and gate were constructed, and the ceramic evidence points to an Israelite influence on the city during this period (Gilboa and Sharon 2008: 163). This may explain the slight increase in cattle frequency during this period, as the demand for labor increased with the expansion of the town. Hazor showed little change in livestock frequency from the previous period. It was still a thriving city during this period, serving as an administrative center for the northern kingdom of Israel. Construction occurred steadily across all strata in various contexts, and domestic buildings were replaced with administrative ones and vice-versa (Sandhaus 2012: 287-327). The ratio of sheep and goats was nearly balanced at Hazor during this time. However, culling strategies did not change significantly from the last period, indicating a mixed strategy focused on versatility (Lev-

Tov 2012a: 594). Cattle mortality at Hazor shows that there was a shift towards the preservation of cattle in this period. Significant numbers were kept past three and a half years of age, possibly indicating an expanded population, as the construction trends might suggest, or participation in the regional exchange of agricultural goods (Lev-Tov 2012a: 594).

Livestock frequency did not change significantly at Tel Dan. Dan experienced a time of prosperity in the late Iron IIB, evidenced by new construction and an abundance of finds in strata during this time period (Biran 1994: 255). Cattle mortality profiles at Dan are similar to those at Hazor, Dor, and Megiddo during this period. The majority of cattle lived beyond 42 months of age, indicating their secondary use as labor or milk providers. The mortality profiles of sheep and goats at Dan during this period remained relatively similar to the previous period. The ratio of sheep and goats changed dramatically to favor sheep, but the data may be skewed due to a small sample size (NISP=6).

At Akko, livestock frequency changed very little from the previous period. The sample size increases at Akko from the Iron IIA to the Iron IIB, and will continue to do so as excavation continues. Cattle frequency remained roughly the same since the last period. Figure 5.1 shows cattle mortality data through the Iron Age at Akko. Mortality data for this period, based on epiphyseal fusion, is more abundant than previously, though early fusing bones are underrepresented in all periods. The data indicate that most cattle were kept beyond 42 months of age. The ratio of sheep and goats reversed in this period compared to the last, favoring goats over sheep. Mortality profiles for sheep and goats suggests a focus on secondary products: very few individuals under 30 months of age were culled and over 60% survived past 48 months.

Iron IIC

The Iron IIC is not well represented in many of the sites chosen for this study. Only the sites with faunal data readily available from this period are addressed here. The campaigns of Tilgath Pileser III in 733 – 732 B.C.E., and later Sargon II, resulted in the destruction of major population centers in Israel. Hazor was completely destroyed by the king of Assyria, and not inhabited again (Ben-Tor, Ben-Ami, and Sandhaus 2012: 3). Megiddo was subdued, and its population deported and resettled by groups loyal to Assyria (Singer-Avitz 2014: 124). While it remained inhabited, faunal data is not available from these strata. Tell es-Safi was in significant decline and minimally or, possibly, not inhabited at all during this period (Uziel and Maeir 2012: 177). Tel Dor was important port town under direct Assyrian control during this period (Gilbao and Sharon 2008: 166-167), but faunal data specifically from these strata were unavailable for this study.

Akko, Ekron, and Tel Dan have faunal data associated with the Iron IIC (see Figure 11.1), a time where each of the sites was either heavily influenced by, or under control of the Assyrian Empire. At Ekron, cattle frequency increased slightly in this period. Otherwise, livestock frequency at Ekron remained fairly similar to the previous period. The small increase in cattle could be indicative of the renewed expansion at Ekron under the Assyrians, but the change is not dramatic enough to say definitively. Mortality and pathology data for cattle indicate that the late Iron II is a period of intensification of secondary exploitation of cattle. This period had the highest prevalence of pathology in cattle phalanges compared to earlier periods at the site (Lev-Tov 2010: 99). The ratio of sheep and goats changed dramatically in this period as well (see Figure 11.2). Sheep outnumbered goats 3:1. In addition, a significant amount of loom

weights were found in contexts not before related to industrial activity of this sort, suggesting a shift towards a focus on the production of wool under imperial direction (Lev-Tov 2010: 98).

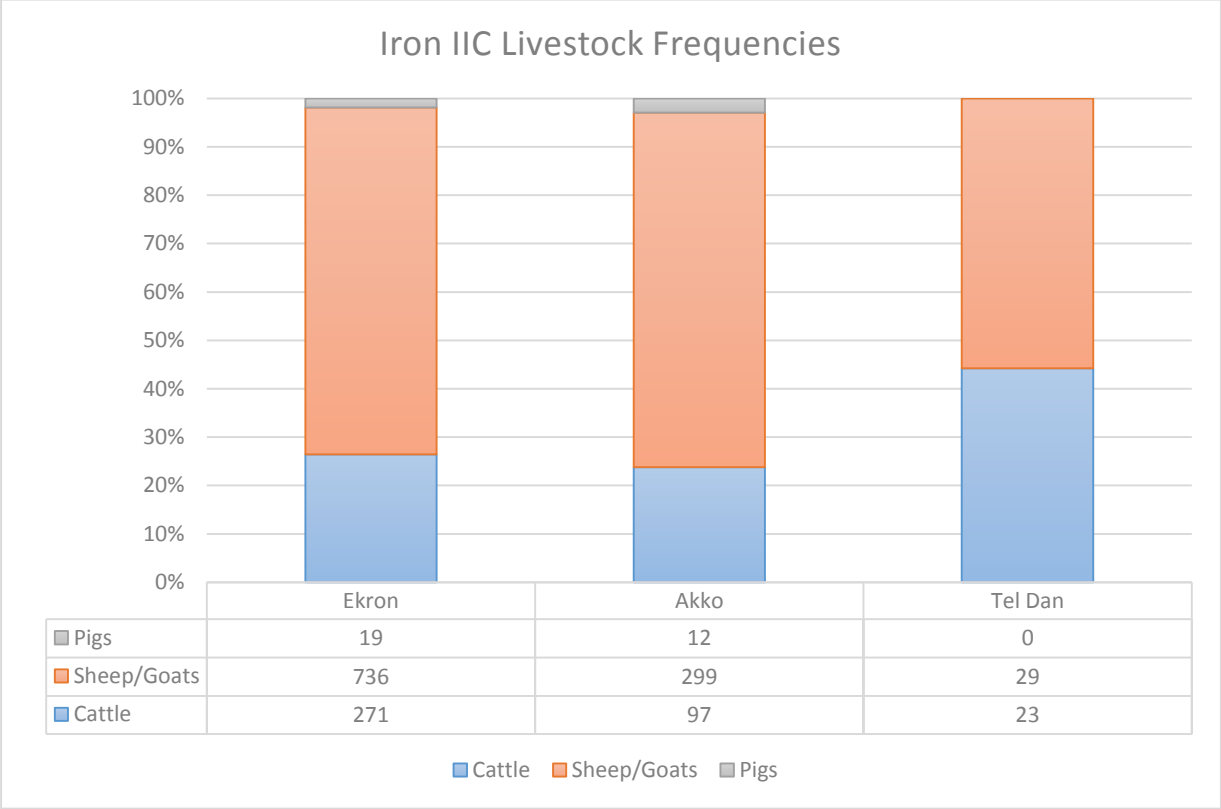


Figure 11.1 Iron IIC relative livestock frequencies and NISP values.

At Tel Dan, the Assyrian conquest is marked by destruction. However, the site, and its population were quick to recover and became the main center of population in the Hulah Valley, replacing Hazor. Dan experienced its greatest period of expansion, where all available space was used (Biran 1994: 261). The faunal assemblage from the non-cultic area, Area M, at Dan was fairly small in this period (NISP=52). However, this is the first period since the Iron I where cattle were not the dominant livestock species and sheep and goat increased in importance in the late Iron IIC. Mortality profiles for sheep and goats, overall, did not change much since the previous period, indicating an adherence to mixed and secondary product focused strategies. At

the end of Iron IIC, cattle mortality profiles show a shift from secondary focus, possibly labor, to more of a mixed exploitation (Wapnish and Hesse 1991: 79).

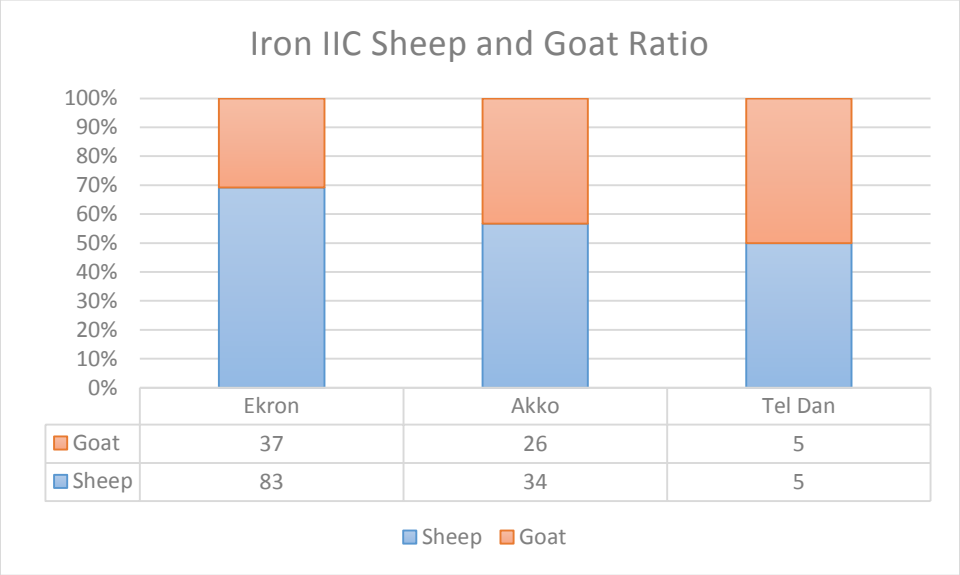


Figure 11.2 Iron IIC relative proportions of sheep and goats and NISP values.

At Akko, cattle frequency declined and the importance of sheep and goats increased. There is no evidence, thus far, of destruction at Akko at the time of the Neo-Assyrian conquest of northern Israel. Under Neo-Assyrian control, Akko gained prominence as a port city within the empire (Artzy and Beeri 2010: 18). Cattle mortality data show fewer cattle were being kept past 42 months of age, but 70% still survived to this age group, suggesting a lesser demand for animal labor than previously. The sheep to goat ratio in this period favored sheep. The mortality data for sheep and goats suggests a mixed strategy, similar to the Iron IIA, of secondary production and meat harvesting.

Examining the changes in livestock frequency across seven sites during the Iron Age delivers mixed results. Aside from the scarcity of pig bones in the Levant outside the Philistines cities of Tel es-Safi and Ekron during the Iron I, regionally, livestock frequencies are fairly

similar. Sheep and goats dominate the assemblages with cattle making up 20 – 30% of livestock at each site. During the Iron IIA, pig frequencies remained high in southern Canaan, similar to the Iron I. Cattle frequencies increased at all sites but Megiddo, drastically so at Tel Dan and Hazor. During the Iron IIB cattle decreases at the southern sites of Ekron and Tel es-Safi, but increases or remains stable at all other sites. The Iron IIB also witnessed the appearance of pigs in small quantities at all sites except Tel Dan. The Iron IIC is only represented at three sites. At each of those sites sheep and goats dominate the assemblage and other frequencies do not change much in comparison to the previous period. Sheep and goat ratios varied wildly between sites during the Iron I, with Tel es-Safi and Tel Dan at the extremes. Beginning in the Iron IIA, these ratios tended to balance out and predominantly favor sheep over goats. Sheep outnumbered goats at all but two sites (Hazor and Megiddo) during the Iron IIB, a trend which continued into the Iron IIC where sheep outnumbered or equal goats at all sites. For a graphic summary of trends in livestock frequency across all sites, see Figures 11.3 – 11.6 in Appendix B. The implications of these trends and how they tie in with context, the regional roles of these cities, and the development of the regional economic development of Canaan are discussed in detail below.

CHAPTER 5: DISCUSSION

In order to better understand the variation in Iron Age livestock management practices, the identified trends must be examined within the historical and archaeological contexts in which they occured. Each site selected had a regional role, whether that role be a commercial hub, cultic center, or industrial center. The site's location and cultural identity affected the decision making associated with animal economy. The regional role of the site dictated the focus of animal economy, focusing on secondary or primary products for example. Intra-regional relationships are also important as sites in proximity to each other interact more closely than with those further away. Looking at site proximity, three local groups are identifiable. These are the Carmel group, the northeast highlands group, and the Philistia group.

Tel Akko belongs to the Carmel group, so named for its location near the Carmel mountain range, which also includes Tel Dor and Megiddo. These sites are characterized by their commercial nature and Canaanite historical background. The port of Akko served as one of the coastal gateways to inland trading. Trade routes led towards Megiddo and other inland areas, with trade flowing both inland and to coast for export. The degree of Akko's involvement in this trading network fluctuated. A rise in importance of Tel Dor or other port cities diminished Akko's role. The focus on secondary products at all three sites supports Akko's commercial nature and reinforces the similarities between sites in the Carmel group.

The sites within each group show similarities. How these similarities were generated tends to differ between the sub-groups and sites within them. The Philistia group (Tel es-Safi and Ekron) share similar livestock frequencies, sheep to goat ratios, and mortality profiles. This sub-group is characterized by Philistine material cultural and identity. The ontogeny of the similarities in livestock frequency could be the result of the sub-group's characterization or due

to other factors, an issue that is explored later in this section. Tel Dan and Hazor, part of the northeast highlands sub-group, share similar material culture and regional roles. The similarities in livestock frequencies between these two sites are the result of several factors. Their location in the highlands and Israelite identity were significant factors in the development of their similarities. The placement of sites within their appropriate sub-groups is explored below.

When put against the background of other sites in the Iron Age Tel Dan is peculiar. After the Iron I, cattle bones represent more than half of identifiable livestock specimens at the site. The reason behind the relatively high frequency of cattle bones compared to other livestock species may be due to the ceremonial context of Area T. This area boasted a large sacred precinct dating to the Iron Age II, with temple-like architecture. Features within the precinct include a large 18m x 18m raised platform along with a 5.25m x 8m stepped porch. In addition a monumental horned alter adorned the center of the area (Greer 2013: 43-45).

The cultic nature of the area is supported by finds such as figurines, Egyptian cultic inscriptions, incense stands, large *pithoi*, the altar, and by biblical evidence. The choice of King Jeroboam I to set up a golden calf in the settlement of Dan, was a deliberate attempt to prevent people from going to the temple in Jerusalem and swearing allegiance to the Davidic dynasty. While also representing the northern border of the kingdom, it also attests to the religious significance of Dan. The sacred precinct was dated using ceramics to the reign of Jeroboam I, correlating with the 10th and 9th centuries B.C.E., or the Iron IIA (Biran 1994: 165). It is also during this time that the precinct is active with the sacrifice of cattle, as seen with the increase from 30% to 59% frequency from the Iron I to the Iron IIA. The ratio of cattle to sheep and goats at Dan remains roughly equal into the Iron IIC, demonstrating continued use of the sacred precinct area. However, faunal analysis conducted on material from seven other deposits in the

sacred precinct not included in this study show cattle frequency to be around 17% overall, a much more comparable number to other sites in the region (Greer 2013: 62). The domestic context samples used in the Wapnish and Hesse (1991) study provide a more generalized snapshot of the site, and are thus a better fit for the current study. When comparing frequencies at different sites, anomalies, such as at Tel Dan, become more clearly visible. The cultic nature of the site stands out in comparison to the other sites during the Iron Age.

In contrast, the high frequency of cattle after the Iron I at Tel Dor is likely due to a different reason. Dor is one of the few sites that experienced an expansion at the beginning of the Iron I, while others either saw a reduction in size or destruction. Though it should be noted that Area D of Dor experienced a conflagration during the Iron I that did not significantly interrupt building or occupation (Gilboa and Sharon 2008: 153-155, 160). Like Akko, Dor was a major commercial center. It is perhaps this fact that is behind the increased cattle frequency in comparison to other sites during the Iron II. By using sheep and goats for secondary products, they were not readily available for meat, and other sources needed to be exploited. In the case of Dan people relied more heavily on cattle rather than pigs or wild game (Sapir-Hen et al. 2014: 90-91). This phenomenon could have also occurred at Ekron or Tel es-Safi. However, cattle can also be used for traction, and extensive cultivation or building enterprises could account for some of the increased frequency of cattle bones, although one would expect to see arthritic pathologies on the toes of these animals if intensive traction had been the case. The high cattle frequency at Hazor may be partly due to the frequent construction episodes seen in multiple Iron Age strata. Hazor too suffers from a small sample size, so this interpretation is tenuous.

Tel es-Safi is different in that there was little change to livestock frequency during the Iron Age. Beginning in the Iron IIA, Tel es-Safi had the highest pig frequency of all other sites

considered in this study, while Ekron had a higher frequency of pig among its livestock during the Iron I. Tel es-Safi in the Iron Age was marked by three transitions in construction and material culture. The first was its transformation into a Philistine settlement at the beginning of the Iron I. The second was the growth of the settlement to its peak in the Iron IIA, marked by new building, dense architecture, and almost complete use of space on the tell. The end of this phase was marked by a site-wide destruction layer transitioning into the Iron IIB. In this last phase, the material culture shifted towards Judahite styles as opposed to Philistine styles, signaling a new foreign control over the settlement.

Throughout the three transitional phases at Tel es-Safi, livestock frequency varied less than one would expect, especially in the Iron IIB. The Iron I to Iron IIA transition saw no change in cattle frequency, only a slight decrease in pig frequency, and little change in the frequency of sheep and goats. The Iron IIA to Iron IIB transition saw the most change, as it is the most radical shift for Tel es-Safi in the Iron Age. The site went from a predominantly Philistine settlement to a Judahite one, as supported by the appearance of four room house style buildings associated with the early Israelites in the highlands. Eventually the southern Levant as a whole was characterized by the four room house, though ethnic ties to the architectural style are debated (Faust and Bunimovitz 2003: 22-23; Finkelstein 1996b: 204-205). The change was not likely caused by assimilation or acculturation, but conquest by an outside power, as was the case for the majority of Philistine sites in the late Iron Age II (Stone 1995: 24-25). The result was the same, a change in architecture and likely ethnic residency. However, the frequency of livestock did not change much. Surprisingly there was an increase in pig frequency, along with sheep and goats, and a 10% decrease in cattle frequency during the Iron IIB. Higher frequencies of pig as part of livestock NISP was not uncommon in the Iron IIB, but Tel es-Safi boasted one of the highest

frequencies in Palestine during that time (Sapir-Hen et al. 2013: 6-10). Either the preference for pig lingered locally after the ousting of the Philistines, or the pig husbandry infrastructure remained and thus continued at the site.

A shift towards a more dedicated economy occurs at Ekron in the late Iron IIB and Iron IIC. The animal economy was reorganized from a subsistence based on a generalized herding strategy to one focused on the possible wool production. This is evidenced by several hundred loom weights found in the corresponding strata of the Iron IIC at Ekron, and a significant shift towards sheep in comparison to goats, a ratio of 3:1. Slaughter profiles switch to prime-aged animals over one year of age, indicative of a secondary product focus (Lev-Tov 2010: 98-99). The increase in sheep to goats is not new to Ekron, as the ratio has traditionally been in favor of sheep over goats, but the shift in mortality profile suggests a stronger emphasis on secondary products. The same trend in mortality profile is seen since the Iron IIB at Akko, lending support to the interpretation that a secondary product focus was of benefit to an export industry. Unlike Akko, Ekron transitioned into this economic focus later in the Iron Age due to Assyrian imperial administrative actions.

Regional comparison of several Iron Age sites in the Southern Levant provides a tool for understanding differences in the ontogeny of herding strategies. It allows the comparison of trends in animal economy on a large scale and through time, serves to elucidate possible connections between sites, and highlights differences and anomalies that may not otherwise be obvious when considering the site alone. This was clearly demonstrated by the consideration of livestock frequencies at Tel Dan, Hazor, and Tel es-Safi that differed considerably from other sites in the area. Regional comparison prompted new lines of inquiry as to the nature of these anomalies by highlighting differences between sites in the area. Detailed examination of herd

management trends was needed to fully understand the differences between sites both outside and within the designated sub-groups.

CHAPTER 6: CONCLUSIONS

The importance of examining archaeological and historical context along with faunal assemblages is demonstrated here. Trends in herd management strategies at individual sites not only reflect internal decision making, but are also influenced by a site's regional role, location in the landscape, and the site's around it. Livestock frequencies during the Iron I were generally uniform at sites that were in proximity to one another. This is a trend that is continues throughout the Iron Age and allows for the identification of operational sub-regions within the greater region of Canaan. These sub-regions correspond to the site groupings seen on Figure 1.1. Each sub-region became associated with a larger state during the Iron II, increasing political unification that eventually led to more administrative control over production as was seen at Ekron, Megiddo, Tel Dor, and Tel es-Safi after the Neo-Assyrian conquest.

The coastal sites of Tel Akko and Tel Dor survived the Late Bronze Age/Iron Age transition relatively undisturbed, possibly even benefiting from the destruction of other ports along the northern coast. Their maritime location and heavy involvement in trade makes for an obvious comparison. Megiddo, situated on a major inland crossroads, was similarly subject to intensive commercial activity and the center of an inland trade route that extended to the coast via Tel Dor and Tel Akko. Livestock frequencies at these sites stayed relatively stable over time, experiencing gradual rather than dramatic change (see Figures 1.3 and 5.2). Each of these three sites maintained a stable sheep to goat ratio in addition to their general livestock frequencies (see Figures 8.2, 9.2, 10.2, and 11.2). The lack of dramatic change at these three sites suggests that the Late Bronze Age/Iron Age transition did not greatly affect economic function within the sub-region that these sites occupied. The intense commercial nature of the cities perhaps generated an organized animal economy in northern Canaan early and throughout the Iron Age. While the

shared commercial nature of Akko, Dor, and Megiddo is notable, their close proximity in the northwestern coastal/inland region of Canaan cannot be understated. Their proximity promoted the sites' participation in the local economic system thereby generating the similar livestock frequencies and herd management strategies presented above.

The placement of Tel Akko within the Carmel group highlights its role in the Levant. Akko's regional role can be inferred by the likeness it shares with Tel Dor in terms of material culture, species selection, and coastal location. Akko served as an important port city, and likely served as a stopping point on voyages along the Levantine coast from all over the Mediterranean. During the Late Bronze Age, Akko and Tel Dor were the coastal components of an inland trade network centered on Megiddo (Artzy 2006: 50-51). The involvement in this trade likely continued into the Iron Age resulting in the similarities among the three sites. Livestock frequencies at Akko remained virtually unchanged during the Iron Age. This may be due to the site's continuity of occupation by the same culture group during the Iron Age. Alternatively, its role as a major port may have led to a general fluidity of the population that created the need to appeal to a rather broad, ethnically diverse audience of consumers. A long-term economic strategy of producing wool, or other secondary products, for refinement and export may have been more likely of an explanation considering the relative continuity of material culture, habitation at the site, and the mortality profiles of sheep and goats. The identification of a sub-regional economic zone, in this case the Carmel group, within the greater region of Canaan is a trend that follows with the remaining four sites as well.

Tel es-Safi and Ekron share a Philistine identity in the Iron I and later. They are located close to one another and occupied the southwestern inner region of Canaan, a piedmont zone known as Shephelah. Shephelah is generally described as the region between the highlands and

the coastal plain, and was the border zone of Philistia and Judah during the Iron Age. The two sites shared similar regional functions and reflected similar trends in animal economy throughout the Iron Age, especially in the Iron I. Both were the only sites to feature pigs prominently in their livestock frequencies (see Figures 8.1, 9.1, 10.1, and 11.1). Pigs, in this case, were a reflection of Philistine identity and material culture which separated them from rival groups, and those that came before them in the region (Killebrew and Lev-Tov 2008: 342-343). This distinction remained into the Iron IIA even as the two sites separated in terms of size and importance. They formed another sub-regional economic zone, the Philistia group, in the south of Canaan that can be seen in the early Iron Age and throughout.

Hazor and Tel Dan are sites in the northern highlands associated with the Israelites. They both served significant regional functions and shared trends in livestock frequency along those lines. Tel Dan's Area T served demonstrates the site's cultic regional role while Hazor's ceremonial palace signifies its administrative role in the region. The ceremonial palace at Hazor could also have served as a means to collect and store taxes levied from the surrounding area. Their functions were associated with the United Monarchy, and later the Kingdom of Israel. This "ethnic state" may have influenced species selection at both sites, but the pig taboo of ancient Israel is debated and complicated (see Sapir-Hen et al. 2013 for discussion). If one considers the presence of pigs in high quantities at the Philistine sites as an ethnic marker, then the lack of pigs at the northeast highland and Carmel sites should also be considered an ethnic marker. The lack of pigs is especially evident in the northeast highlands sites. Hazor's faunal assemblage had a very small percentage of pigs among the livestock and Tel Dan had none. Their similarities appear to be the closest in comparison to the other sub-regional zones discussed above. The similarity of the sites was established in the Iron I, though Hazor was sparsely populated during

this time, and continued through the Iron IIB without much change. These similarities in livestock management suggest a third sub-regional economic zone, the northeast highlands group, within the northern highland region of Canaan.

These sub-regional economic zones appeared immediately in the Iron I and persisted through the Iron Age. They likely existed in the Late Bronze Age, and possibly were never greatly disturbed by the upheavals of the political collapse. The slow development of the overall regional economy of the southern Levant was largely the result of the political disunity documented in the region. Regional economic unity does not appear to have been fully realized until the administrative actions by the Neo-Assyrians in the Iron IIC. Theirs and subsequent conquests of the region restored centralized administrative control and again focused the regional economy to meet goals assigned by the administration. A site's regional role could be manipulated and exploited to fit the goals of this imperial system. Commercially focused cities remained relatively unchanged when integrated into the imperial systems with some sites, such as Tel Dor and Megiddo, having their regional administrative roles elevated. Cultic and administrative sites generally have their roles diminished as the "new order" was established. The external political influence during the Iron IIC is evident, but that political influence had to overcome geological boundaries to unify the region.

Development was significantly influenced by the political and ethnic factors. Environmental zones, demarcated by geological boundaries, impacted the development of animal economy as well. Increased local autonomy bolstered the sub-regional economic zones outlined by geological barriers. The economic sub-groups persisted through the Late Bronze Age and into the Iron Age after the retreat of imperial powers during the last decades of the 13th century B.C.E. resulted in political disunity and disrupted the regional economy. Settlements

participating in these sub-regional economic systems influenced each other not only through material culture but also in herd management practices and species selection. When administrative control over production increased, herd management strategies shifted towards secondary products and economies became more focused. Once these sub-groups were reintegrated as a periphery in an imperial system, they served not only to support themselves and other polities within the group, but also participated in the larger regional system. The result of this was focused management strategies designed to maximize the production potential of each site under the direction of the imperial ruling class.

The data and conclusions presented here supports the idea that the collapse of the Late Bronze Age palace/elite exchange network affected Canaan's regional economy through the dissolution of political cohesion and reorganization of the economic system into one centering on entrepreneurial mercantile activity. This, in turn, affected herd management decision making by refocusing it, at first, to support the city itself, then to participate in the economic sub-groups discussed above. The data support the claims that herd management strategies, and livestock species selection were influenced by neighboring cities and towns participating in the local economic sub-group. This is demonstrated by the similarities in mortality profiles and livestock frequencies at sites within these sub-groups. Additionally, these sites shared ethnic and political associations that served to strengthen the degree of influence shared among the sites in each sub-group. The evidence presented here supports the interpretation that animal economic decision making was impacted by a site's regional role as it directed economic focus, influence, and economic context. Future research on this topic could be applied to any region where wide spread regional reorganization occurred. Exploring how an animal economy developed over time and the factors that influenced it, provides insights into how the economic systems operated on

both a local and regional scale. Fine detail studies requiring larger sample sizes and more uniform reporting procedures could be performed in order to elucidate the regional mortality trends. This could be helpful for the study of the development of early farming communities and rise of secondary production on a regional scale.

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APPENDIX A: Mortality Data

Figure 12.1 Akko cattle mortality in percent unfused per age group.

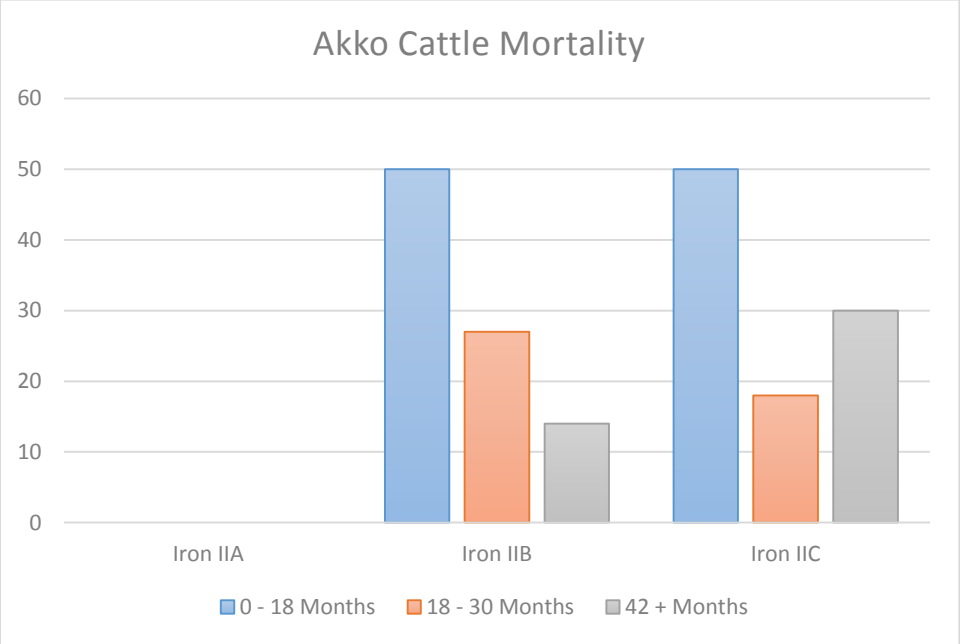


Figure 12.2 Akko sheep and goat mortality in percent unfused per age group.

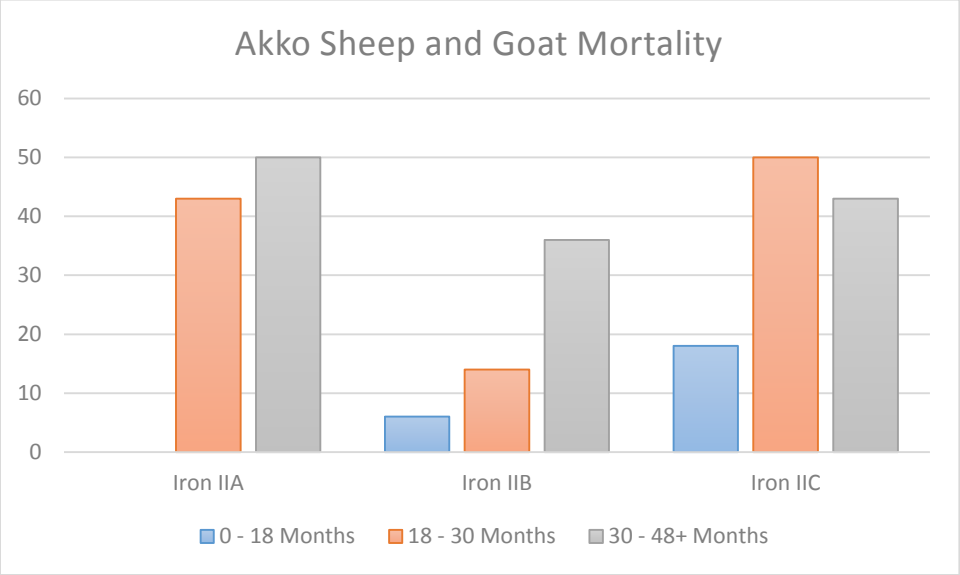


Figure 13.1 Tel Dor cattle mortality in percent unfused per age group (Sapir-Hen et al. 2014: Table 3b).

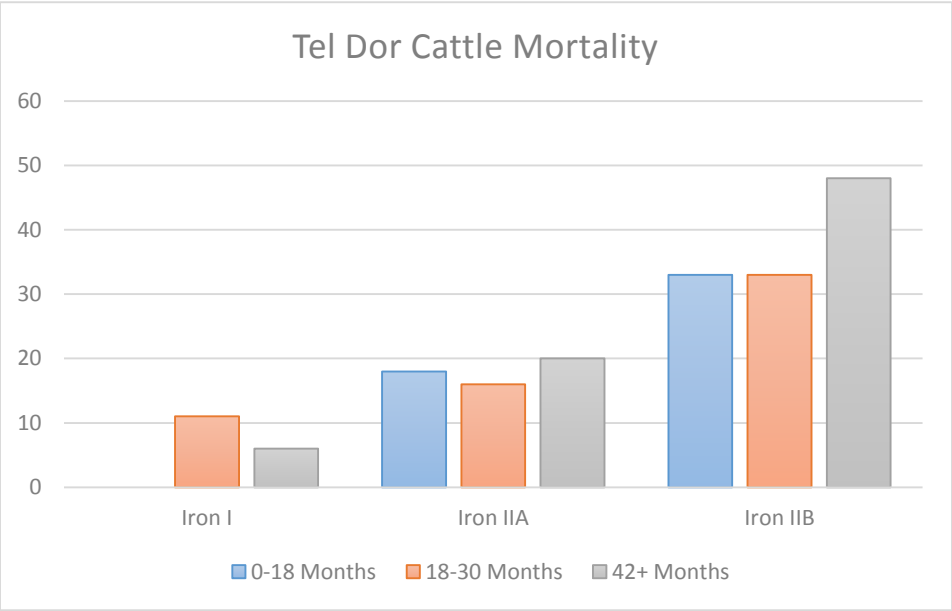


Figure 13.2 Tel Dor sheep and goat mortality in percent unfused per age group (Sapir-Hen et al. 2014: Table 3a).

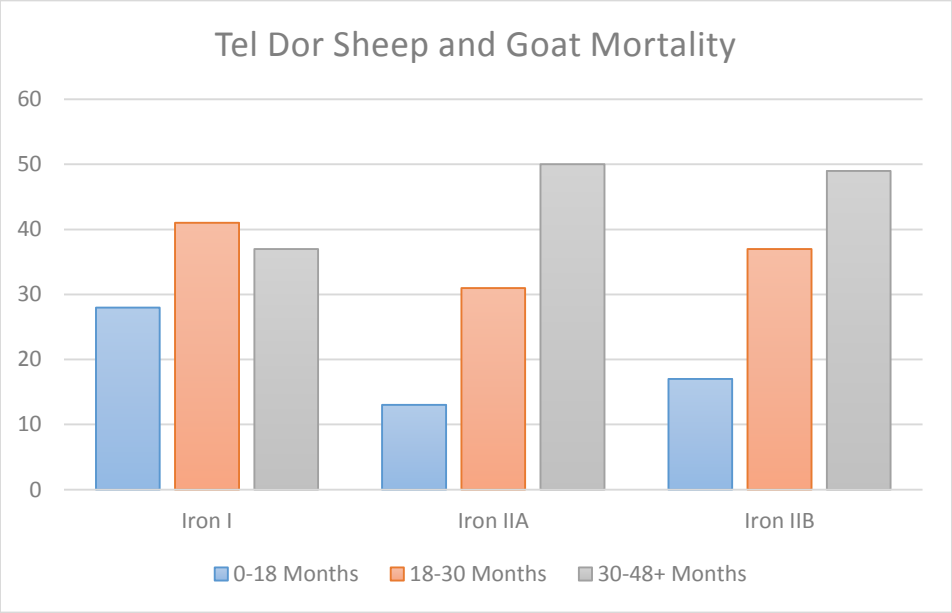


Figure 14.1 Ekron cattle mortality in percent unfused per age group (Lev-Tov 2010: 97, 99-100).

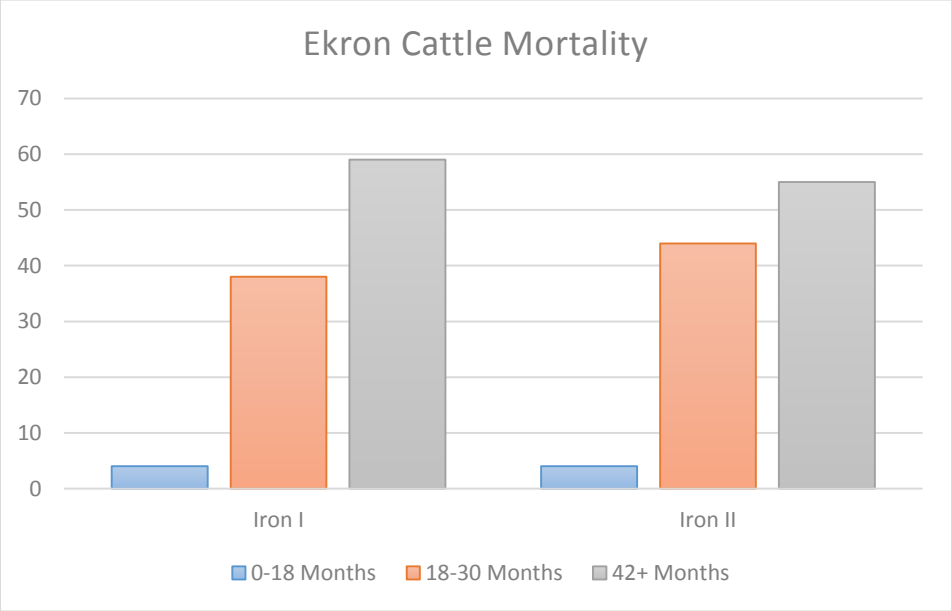


Figure 14.2 Ekron sheep and goat mortality in percent unfused per age group (Lev-Tov 2010: 97, 99).

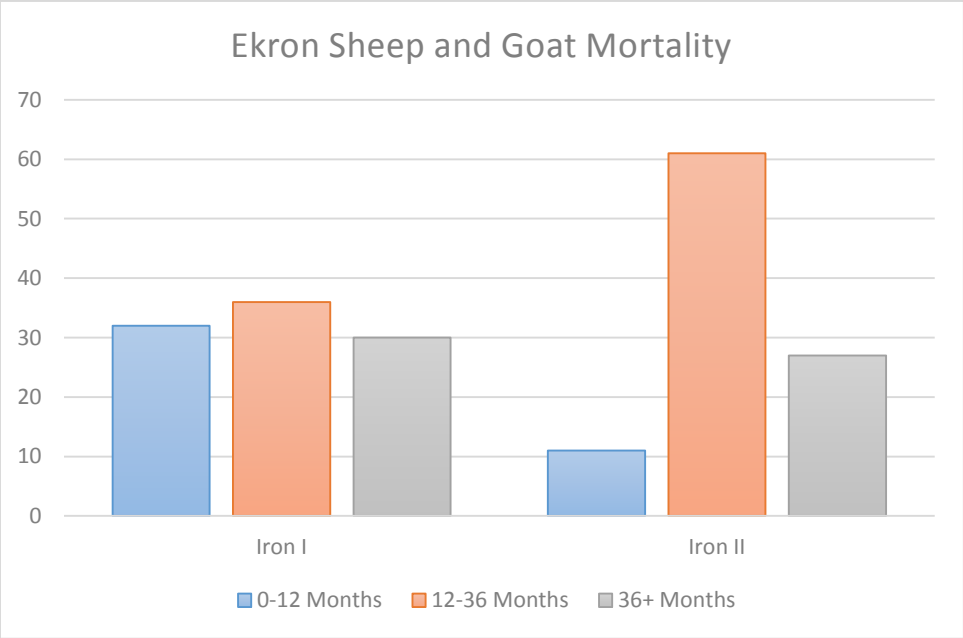


Figure 15.1 Megiddo cattle mortality in percent unfused per age group (Sasson 2013: 1144-1145).

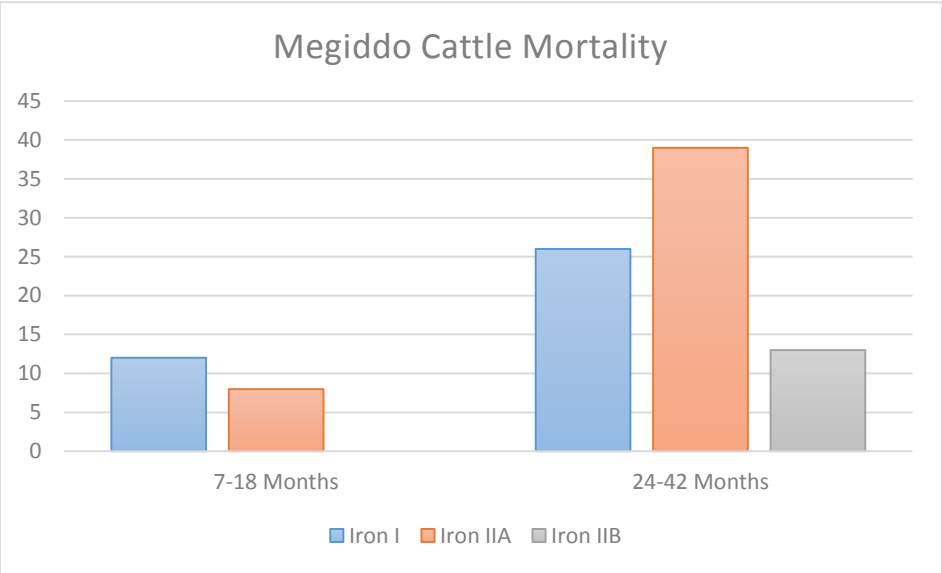


Figure 15.2 Megiddo sheep and goat mortality in percent unfused per age group (Sasson 2013: 1141-1142).

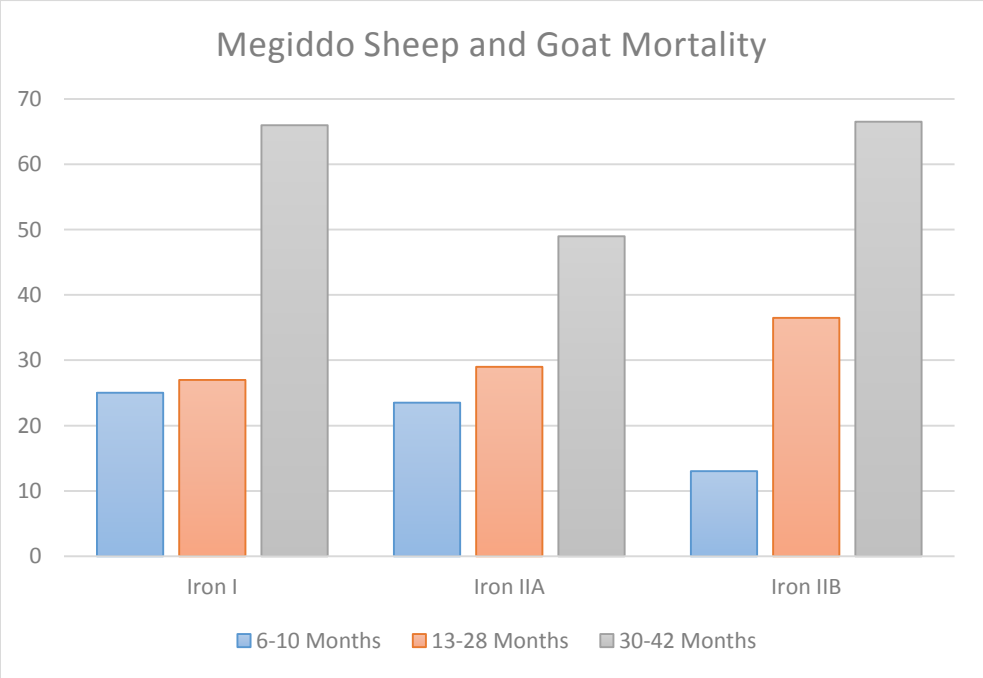


Figure 16.1 Hazor cattle mortality in percent unfused per age group (Lev-Tov 2012a: 589-595).

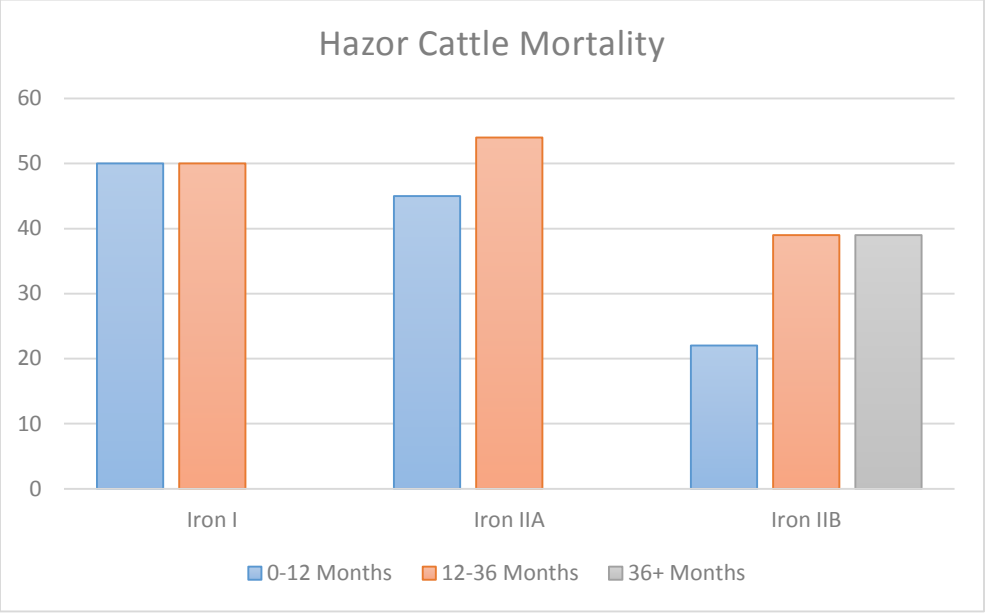


Figure 16.2 Hazor sheep and goat mortality in percent unfused per age group (Lev-Tov 2012a: 589-595).

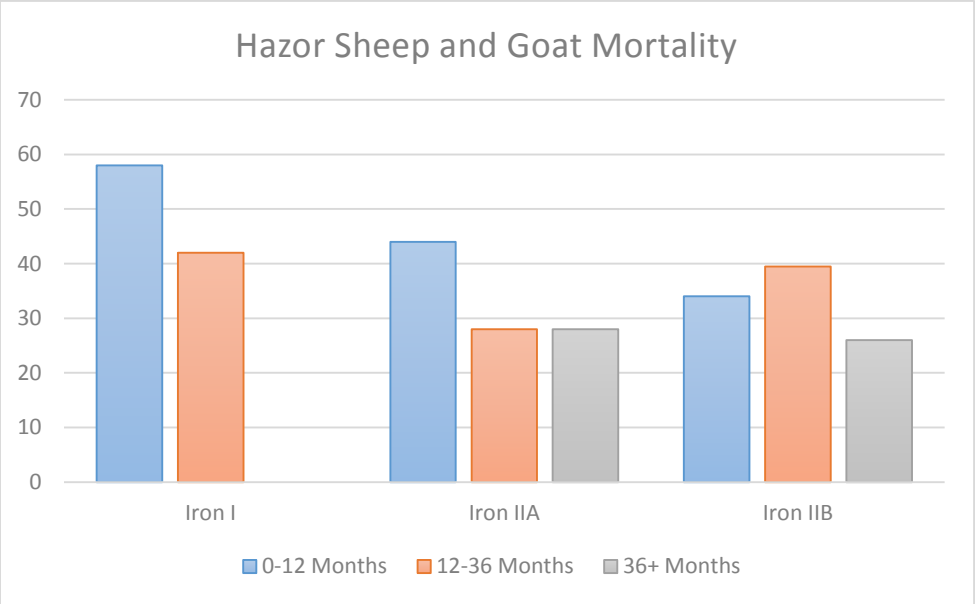


Figure 17.1 Tel Dan cattle mortality in percent unfused per age group (Wapnish and Hesse 1991: 79).

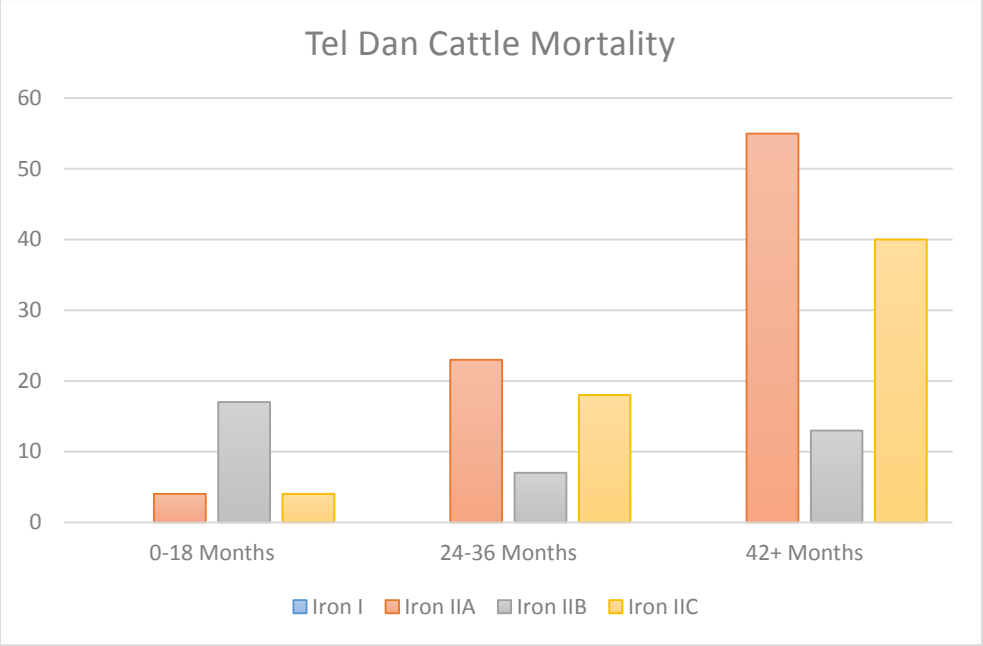
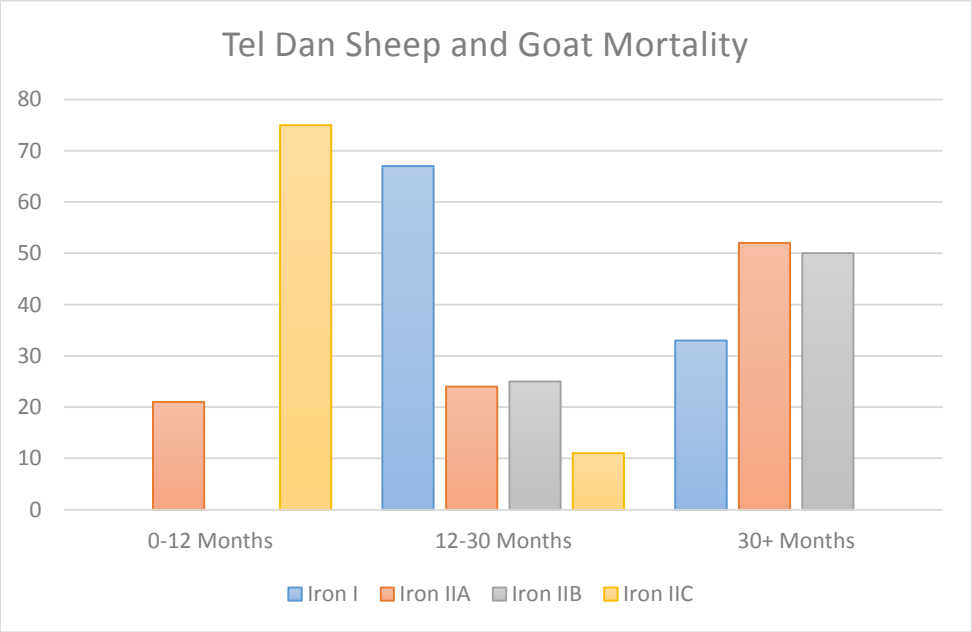


Figure 17.2 Tel Dan sheep and goat mortality in percent unfused per age group (Wapnish and Hesse 1991: 79).



APPENDIX B: NISP Values and Other Data

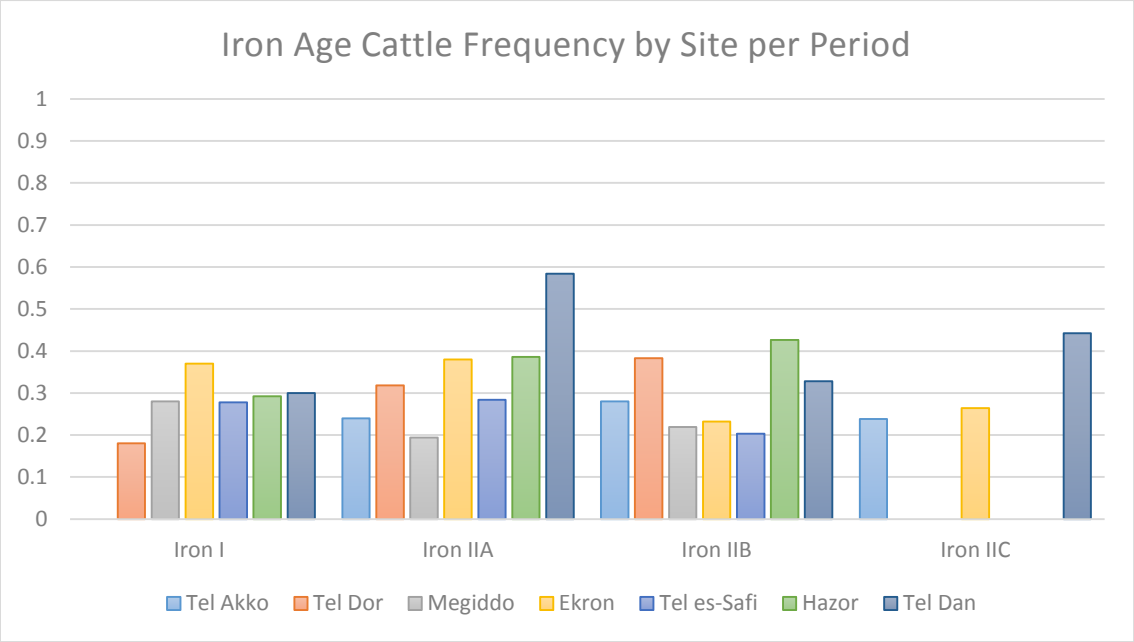


Figure 11.3 Iron Age cattle frequency by site per period as a percentage of total livestock NISP.

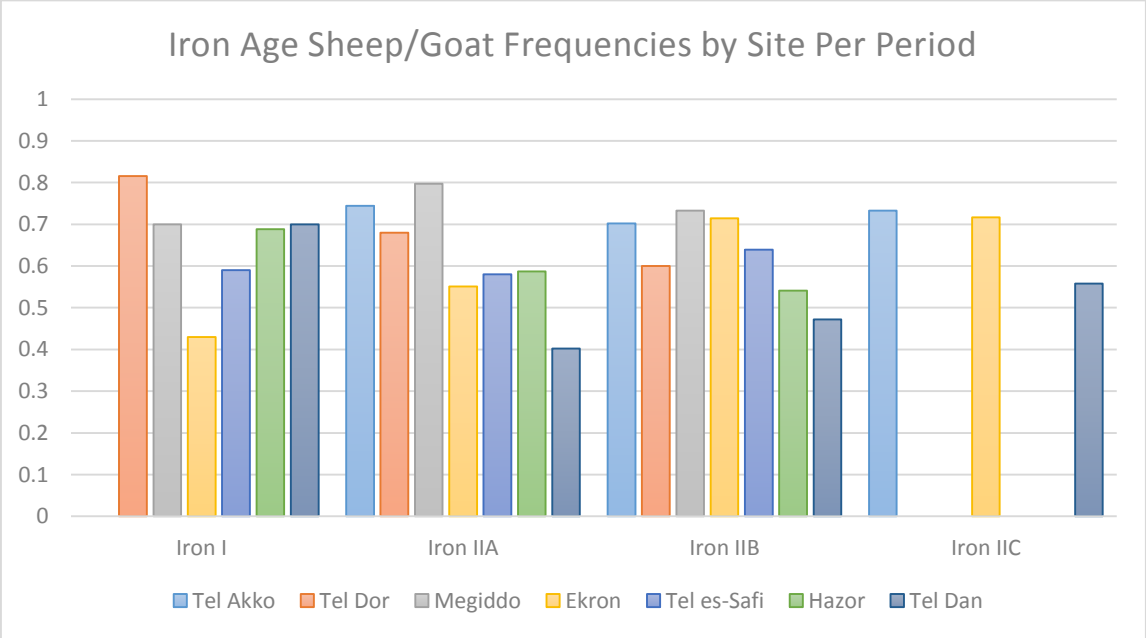


Figure 11.4 Iron Age sheep/goat frequency by site per period as a percentage of total livestock NISP.

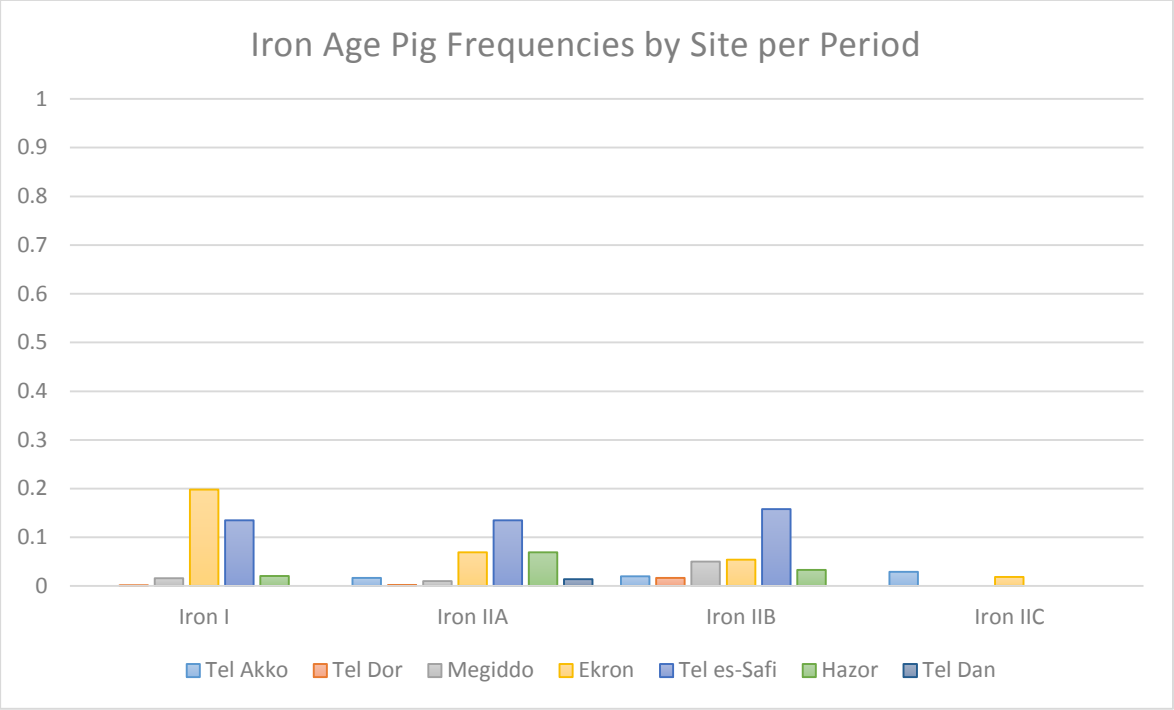


Figure 11.5 Iron Age pig frequency by site per period as a percentage of total livestock NISP.

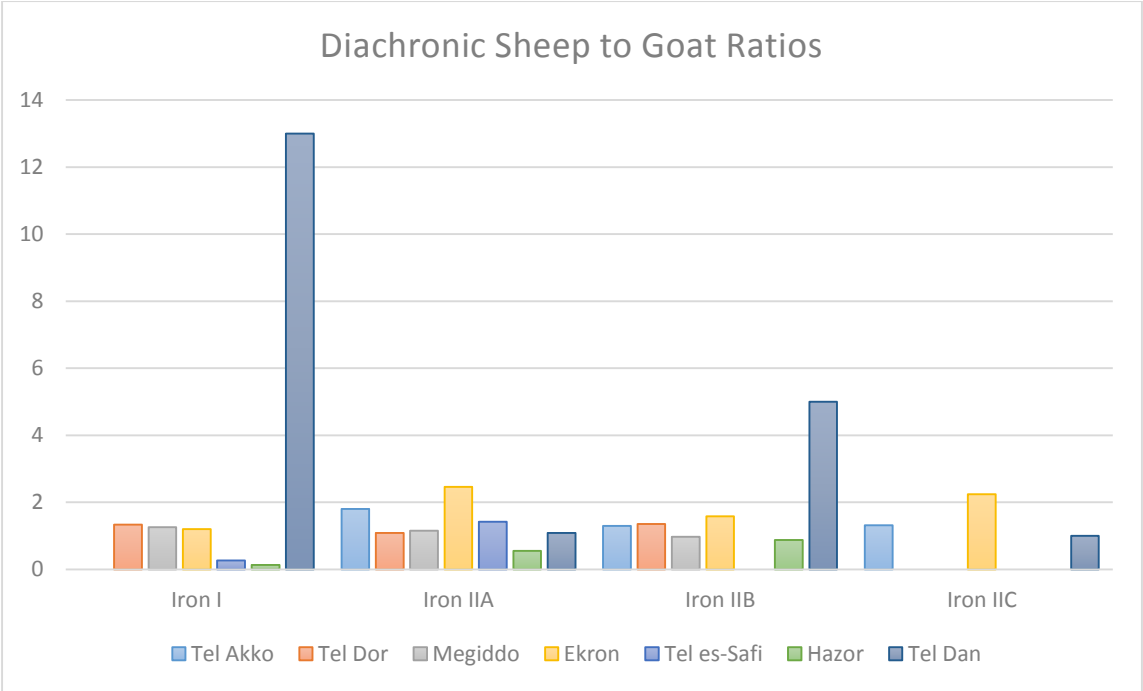


Figure 11.6 Diachronic sheep to goat ratios by site per period.

	Cattle				Ovicaprid Total				Pig			
	Iron I	Iron IIA	Iron IIB	Iron IIC	Iron I	Iron IIA	Iron IIB	Iron IIC	Iron I	Iron IIA	Iron IIB	Iron IIC
Tel Akko	-	28	106	97		87	266	299	-	2	7	12
Tel Dor	118	178	271	-	529	381	425	-	1	1	12	-
Megiddo	821	396	59	-	2065	1629	198	-	47	19	13	-
Ekron	2393	232	346	271	2785	337	1063	736	1280	42	80	19
Tel es-Safi	78	139	107	-	165	284	336	-	38	66	83	-
Hazor	14	117	52	-	33	178	66	-	1	8	4	-
Tel Dan	28	167	65	23	65	115	58	29	0	4	0	0

Table 2.1 Livestock NISP values through the Iron Age.

	Sheep				Goat			
	Iron I	Iron IIA	Iron IIB	Iron IIC	Iron I	Iron IIA	Iron IIB	Iron IIC
Tel Akko	-	9	35	34	-	5	27	26
Tel Dor	69	38	50	-	52	35	37	-
Megiddo	258	245	28	-	205	212	29	-
Ekron	192	32	79	83	159	13	50	37
Tel es-Safi	9	17	-	-	34	12	-	-
Hazor	1	12	7	-	8	22	8	-
Tel Dan	13	14	5	5	1	13	1	5

Table 2.2 Sheep and goat NISP values through time.