THE ROLE OF ASTRAGALUS DICE IN PROMOTING THE PRODUCTION OF SURPLUS IN BRONZE AND IRON AGE SYRIA-PALESTINE:
A NEW INTERPRETATION FOR KNUCKLEBONES

by

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A THESIS

Submitted in partial fulfillment of the requirements for the degree of Master of Arts in the Department of Anthropology in the Graduate School of The University of Alabama

TUSCALOOSA, ALABAMA

2014
ABSTRACT

Knucklebones, objects crafted from a specific ankle bone (the astragalus) of particular species of artiodactyla (cattle, goats, sheep, deer, and others), are evident in the archaeological record from as early as the Neolithic in Anatolia, and possibly the Epi-Paleolithic in Belgium. The majority of these objects are rightly interpreted as gaming pieces by virtue of a myriad of historical and ethnographic parallels. This is true of many of the finds from ancient Syria-Palestine during the Bronze and Iron Ages, which form the focus of this research. Often, single knucklebones, or small collections of them (usually ten or fewer), are recovered from contexts associated with domestic activities. Such knucklebones are most often unmodified, but many show wear due to prolonged use as dice. Beginning in the Middle Bronze Age, collections of knucklebones in Syria-Palestine changed dramatically. The number of knucklebones found in single deposits is much greater, sometimes reaching the hundreds. Large deposits of knucklebones are not only found in domestic contexts, but also in contexts interpreted as having public, cultic, or funerary functions. This represents a change in the way that ancient Syro-Palestinians utilized knucklebones. The changing role knucklebones played is the subject of the current research. It is this writer’s contention that the changes in knucklebone applications can be explained by the examining socio-economic changes that begun during the Middle Bronze Age (circa 2000 BCE) in Syria-Palestine. Specifically, it is hypothesized that knucklebones functioned as tokens representing animals offered in sacrifice to the palace or temple and redistributed in city-wide feasts. Thus, knucklebones reflected status items that promoted the production of surplus in the redistributive economies of ancient Syria-Palestine.
DEDICATION

To Tonya, Emma, and Sophie.
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>BCE</th>
<th>Before common era</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>Common era</td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

I would like to express my gratitude to my thesis committee. Their mentorship and respective expertise greatly enriched my experience as a graduate student. The quality of this thesis was enhanced due to their efforts. Especially I would like to recognize Dr. Gregory Mumford, my mentor and advisor. Dr. Mumford dedicated much time and energy to advising me, for which I am exceedingly grateful. His encyclopedic knowledge of Near Eastern and Egyptian archaeology as well as his extensive personal academic resources were instrumental to the completion of this research.

I would also like to thank the Department of Anthropology and the College of Arts and Sciences at the University of Alabama at Birmingham for their financial support. I am especially grateful to Dr. Chris Kyle for giving me the opportunity to teach. The financial support that I received from the Graduate Research Fellowship and my salary as an adjunct lecturer supported me and my family while I conducted research for this thesis.

I am also grateful for the patience of my family. This is especially true of my wife and best friend, Tonya. Without her unwavering support and encouragement, completion of this thesis would not have been possible.
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CHAPTER ONE
INTRODUCTION

Since at least the Neolithic people have collected the astragali of certain wild and domestic species for various uses. Henceforth, these artifacts will be referred to by their common name “knucklebones”. A variety of explanations exist for these artifacts. The vast majority of these astragali have been used as dice for playing games. This was the case in Syria-Palestine, where knucklebones are first evident in the archaeological record in the Early Bronze Age around 3300 BCE. These early knucklebone finds consist mainly of single pieces found in refuse pits. In some cases, they are found in small groups below house floors, but always in groups small enough to suggest gameplay as their function. Furthermore, astragali recognized as knucklebone artifacts were usually identified by some telling modifications such as the flattening of the lateral and medial sides (evidently to improve their function as dice), or the smoothing of the prominent features of the bones due to continuous use.

Beginning in the Middle Bronze Age II, circa 2040 BCE through 1555 BCE, knucklebones were being utilized in ways not yet seen in Syria-Palestine. Small groups of knucklebones, as well as single finds, are still common in archaeological sites, but collections numbering in the hundreds are being recovered from suspected cultic contexts as well as burials. Many of the recovered knucklebones show signs of being used as dice, though many do not. The trend of collecting large numbers of knucklebones is first evident at Tel Mardikh-Ebla, in southern Syria. From the Middle Bronze Age II to the Iron Age IIC (2040 BCE-586 BCE) this trait would greatly proliferate in the large urban centers of Syria-Palestine, begging an
explanation. This research assesses why the numbers of knucklebones and the variety of their modifications increased so dramatically in Syria-Palestine from the Bronze Age to the Iron Age. This study proposes that knucklebones functioned as tokens (i.e., symbolic representations) for animals sacrificed at temples and palaces. Such sacrificial offerings were collected by the temples and palaces as provisions for city-wide feasts, where a portion of the collected goods were redistributed to the population at large (Collins 2007: 206). The religious and civic administrators supported these redistributive feasts in order to promote the production of surplus food, labor, and other goods. This surplus supported the administrative and religious specialists. Furthermore, surplus goods and labor were used to construct increasingly imposing civic, religious, and defensive structures. Knucklebones were given to each person who sacrificed certain types of animals (usually sheep and goats). These knucklebones reflected the ability of each person to contribute sacrifices to the temple. Thus, collections of knucklebones served as status items which functioned in a complex centered around competitive giving. By awarding knucklebone tokens for sacrifices, temple officials were able to foster competitive giving, thus enhancing the production of surplus animals. By restricting what types of animals were suitable for sacrifice, the temple could influence the types of animals that were being raised.

This research has multiple objectives. First, it is structured to review critically the existing literature that varies widely in its interpretation of knucklebones and groups of knucklebones from many different contexts. Based on the results of this review, a second objective entails testing competing interpretations against each of the individual knucklebone find contexts, albeit using strategic sampling (see below), in order to identify to what extent the extant interpretations can produce satisfying explanations. The final objective is to posit a new
interpretation of the function of knucklebones that provides theoretically sound explanations for the knucklebone study sample.

Chapter Two introduces the artifact and its various modifications. The nature of knucklebone modifications is very important in interpreting their functions. Each type of modification is described, while the common explanations for these various types of modifications are reviewed.

Chapter Three describes the current study’s methods used in selecting the knucklebone sample and collecting data. This section discusses the methods for gathering information about find contexts and the methods for categorizing them; justifications for these categories are offered. Finally the methods for collecting information and categorizing specific knucklebones are described. The knucklebones in the study sample are organized by their numbers, species, and the types of modifications that were made to them in antiquity. This section also incorporates a description of the methods for categorizing knucklebones by their modifications. This chapter also describes the sample of knucklebone finds and their contexts. The chronological context ranges from the Middle Bronze Age through the Iron Age IIC (see Table 1, on page 6, for the chronological sequence of time periods used in this study), while spatial contexts are organized by site, time period, type of context, and specific locus (when possible). Knucklebones are organized by count, species, and types of modifications. For each context the knucklebones and their modifications are described, including references to any other artifacts found in association with the knucklebones. This research is largely based on interpreting knucklebones according to their function, which means that any associated material is equally important for assessment.
Chapter Four critically reviews the existing literature dealing with interpreting knucklebones from Syria-Palestine and neighboring regions. Most previous interpretations are based, to varying degrees, on ethnographic or historical analogies. The appropriateness of the individual analogies is evaluated on the proximity in time between cultures from ethnographic and archaeological studies, how broadly the trait is distributed in the ethnographic analogy, and to what extent the interpretation (based on the analogy) produces satisfying explanations for the various types of knucklebone finds in the sample. This method of evaluation is adapted from Knight’s (2013) recent work that deals with, among other things, the use of ethnographic material in interpreting prehistoric iconographic systems. Interpretations that are found compelling according to this critical review are considered for their ability to explain the sample.

Two interpretations, which rely less on ethnographic data, are found to be compelling. The first, by Richard Holmgren, suggests that knucklebones may have functioned as a form of limited currency (Holmgren 2002: 212). The second interpretation, by Aharon Sasson, proposes that the knucklebones from Tel Beersheba’s Stratum II may have functioned as “tokens” for the exchange of goods (Sasson 2007: 171). Sasson reached this conclusion by analyzing all of the knucklebones from Stratum II, focusing especially on their spatial relationships and contexts.

In Chapter Five the basic functional component of these interpretations, namely “knucklebones as a medium of exchange”, is evaluated for its ability to explain each context in the study sample. While this interpretation produces satisfying explanations for knucklebone finds within the sample itself, ultimately it is found to be inconsistent with other archaeological evidence from the sites in this and broader knucklebone samples.
In Chapter Six the hypothesis of this project is outlined following a brief review of the Middle Bronze Age findings in Syria-Palestine. It also examines the related roles of the civic and religious institutions of ancient Palestinian city-states in promoting the production of surplus. Included in this discussion are the various functions of redistributive feasting in early agricultural settings. Next, archaeological evidence from Hazor, informed by the Eram texts, is provided to demonstrate how redistributive feasting in Syria-Palestine likely functioned. The current research, since it is used to inform feasting practices in Syria-Palestine, is evaluated for its use of ethnographic material.

The proposed hypothesis is tested in Chapter Seven for its ability to explain knucklebone finds in each type of context. The hypothesis provides mostly satisfying explanations for the knucklebone finds from the sample. Explanations are offered to reconcile some apparent difficulties with the hypothesis.

Last, Chapter Eight provides a more thorough discussion of the strengths and limitations of the study and of the hypothesis. The new interpretation is capable of providing explanations for all types of knucklebones, though it is less useful for generating explanations for related cultural phenomena regarding knucklebone finds in funerary deposits. Furthermore, the hypothesis offers an underlying causal mechanism that is complimentary to other interpretations for the function of knucklebones. Finally, suggestions for future research are offered to address materials beyond the scope of the current study.
CHAPTER TWO
THE ARTIFACT

The astragalus is a bone located in the ankle of most mammals that articulates with the distal tibia at its proximal end and the calcaneus (the heel bone in humans) at its distal end. The astragalus allows flexion of the ankle. Knucklebones are created from the astragali of several species of artiodactyls. Artiodactyls, or even toed ungulates, include species such as cattle, sheep, goats, gazelle, deer, and pigs. In the Ancient Near East, knucklebones are usually taken from domesticated animals, though some come from wild animals as well. The overwhelming majority of these bones originate from sheep and goats, while a small number represent cattle, deer, pigs and dogs. It was thought until recently that one of the largest collections of knucklebones from an archaeological context, namely those recovered from a tenth-century BCE courtyard at Megiddo, represented pig astragali. After closer examination they were found to belong to domestic sheep and goats, as well as two species of wild deer (Gilmour 1997: 168).

Figure 1 Illustration of Worn Astragalus; taken from (Koerper and Whitney-Desautels 1999: Figure 1)

The shape of an unmodified knucklebone is roughly rectilinear with the cranial and caudal ends rounded. Without any modifications, a knucklebone is naturally suited as a four-
sided die. Because of irregularities in the shapes of each side of a knucklebone, the probabilities of any particular side landing upward are not equal. Thus, differential probability is reflected in the rules of many of the games using knucklebones as dice, where sides are assigned particular values corresponding to their probability of landing upward (Koerper 2008: 11).

The astragalus, as well as other tarsals and carpals, are especially dense bones that preserve well in the archaeological record. Thus, it is not uncommon to find foot bones in numbers relative to the number of other carcass parts. However, it is also common to find astragali over-represented compared even with other foot bones that are similarly durable against taphonomic processes. This suggests that astragali were being selected for use rather than discarded during butchery as were other foot bones. Evidence for a conscious selection of astragali for use as knucklebones is found in many sites lacking more overt evidence such as modified astragali. Perhaps some future research should address this, studying collections of unmodified knucklebones that are found in significantly higher numbers than other foot bones. This type of study could even consider astragali found in refuse pits. For the purposes of this narrower and preliminary re-assessment, however, only groups of knucklebones found in more or less discrete contexts will be considered.

Modifications

Though astragali are well-suited to cultural use as knucklebones without any modifications, there nevertheless exists a wide variety of modifications applied to knucklebones by the people who used them. These modifications can be divided into two main categories. First, some alterations are not intentional, but rather are the result of repeated use and handling. The second category concerns intentional modifications that range from simple purposeful polishing of knucklebones to their being filled with metals to alter their weighting. Both types of
modifications have important implications when interpreting knucklebones found in archaeological contexts.

*Simple Wear.* Knucklebones that are modified by simple wear were not the most exciting “artifacts” to many past-recent archaeologists. In fact, they often are not recognized as “artifacts” at all and are instead considered the detritus of animal carcass processing (Minniti and Peyronel 2005: 8). While astragali are ecofacts (*i.e.*, normally taken from the carcasses of slain animals during processing [see Renfrew and Bahn 2012:49, 578]), knucklebones are artifacts (Russell 2012: 137). That is, when the bone is selected to be utilized for a different function beyond butchery refuse, it becomes material culture. Knucklebones that show simple wear demonstrate that they have been used similarly over a period of time. This is important when explaining knucklebones found in archaeological and cultural contexts. For instance, if a cache of knucklebones recovered from a discrete, intentional deposit (*e.g.*, in a burial, or in the vicinity of a temple) are not worn, then it is likely that these were not used as dice for very long if at all before their interment. However their collection and deposit in a cache imply the assignment of cultural significance to them.

Knucklebones that have been intentionally modified are far less common than those that have been modified unintentionally. There is a very wide variety of intentional modifications ranging from simple decorative scoring of the knucklebone to painting or metal-filling. These modifications proliferated especially in the Roman Period, as did knucklebone use in general (Russell 2012: 136). However, intentional modifications to knucklebones have been found in contexts dating as far back as the Neolithic (Russell 2012: 136).
Polishing. The most common intentional modification to knucklebones is usually referred to as “grinding” or “polishing”. For this modification knucklebones are ground on one or more of their sides. A recent study shows that this was likely accomplished by rubbing knucklebones against ceramic vessels (Meier 2010). It is usually assumed that this is done to enhance the knucklebones’ natural rectilinear shape (Gilmour 1997: 171). However, some researchers suggest that changing the morphological features of the knucklebone would detract from its usefulness as a die, since many games are known to incorporate the differential probability of a dice roll using an unmodified knucklebone (Care 2013: 92). In Anatolia, knucklebones with this type of modification have been recovered from contexts dating to the Neolithic Period (Russell 2012: 126-127).

Scoring. Another common modification involved the scoring or cutting of the knucklebones. In some cases superficial parallel cut marks on knucklebones are explained as the result of skinning the animal (Gilmour 1997: 171). Gilmour postulates a possible method of skinning that involves creating an incision into the skin, inserting a tube of sorts, and blowing air using one’s “mouth or (a) bellows” beneath the skin, causing it to come loose from the underlying musculature (Gilmour 1997: 171). While a technique that approximates this method does exists today (albeit using an air compressor), this writer was unable to find any historical or archaeological evidence that would suggest this method of skinning occurred before modern times. Nevertheless, Gilmour contends that this method of skinning may be responsible for some of the light cut marks found on knucklebones. Besides these superficial cuts, there are many examples of deep, intentional scoring on knucklebones (Gilmour 1997: 171). This type of modification is prominent in Anatolia from the Chalcolithic, but is not present in the Syro-Palestinian
archaeological record until the Early Bronze Age at Tell Mardihk-Ebla (Minniti and Peyronel 2005: 7).

**Drilling.** Another type of modification made to knucklebones involves drilling one or more small holes into the surface of the bone. Often these holes were filled with metal, presumably to affect the weight of the knucklebone. Metal-filled knucklebones have been recovered from sites all over the eastern Mediterranean throughout the Bronze and Iron Ages (Holmgren 2002: 213). Sometimes knucklebones that are drilled but not filled with metal are interpreted as personal ornaments, assuming that the knucklebone was strung on a cord through the drilled hole (Dandoy 1996: 53).

**Burning.** Another common modification made to knucklebones is purposeful burning. This is especially true of deposits of large numbers of knucklebones like those that are recovered from supposed cultic contexts and burials. It is suggested that knucklebones used for gaming were subjected to heat to affect their hardness. While this may explain individual knucklebones, or perhaps even small collections, this does not explain the very large deposits of knucklebones in which the bones are often sufficiently charred so that their usefulness as dice would have been compromised.

**Incising.** Perhaps the rarest type of modification made to knucklebones involved incising a word, usually the name of a deity or hero, onto the smooth cranial side of the knucklebone. Only one such knucklebone has been recovered in Syria-Palestine (Bar-Oz 2001: 215). An incised knucklebone bearing the name EPMH (Hermes), dating to the Hellenistic Period, was recovered from Sha’ar-Ha’amakim in the Lower Galilee, Israel (Bar-Oz 2001: 215). A few other incised
knucklebones have been recovered from sites in the Aegean and Anatolia: most of these date to the Hellenistic-Roman Periods (Gilmour 1997: 170-171).

Skeuomorphs

The most convincing indicator regarding the cultural significance of knucklebones is skeumorphs. Skeuomorphs of knucklebones were crafted from a variety of materials. The earliest forms of non-bone knucklebones have been recovered from New Kingdom (i.e., Late Bronze Age) elite Egyptian tombs accompanying game boards such as senet (Tyldesley 2007: 11). In the tomb of Tut’ankhamun, replica knucklebones were recovered made of materials like resin, stone, and ivory (Tait 1982: 38). During the Roman and Hellenistic Periods, skeuomorphs proliferated all over the Greek and Roman world (Gilmour 1997: 169-170). In addition to skeuomorphs that were intended to function similarly to bone knucklebones, two ceramic vessels in the shape of knucklebones exist. One of these, held at the Metropolitan Museum of Art, is attributed to an Athenian potter from 460 BCE (Ritcher 1941: 123). The other, whose provenience is 440 BCE, from Attica, is a black glazed askos with a wheel-spun spout (Hermann 1984: 48-49). The Athenian vessel was thought to be a container meant to hold knucklebones, while the vessel from Attica was intended to hold a small amount of liquid such as oil or perfume. Another class of knucklebone skeuomorphs includes metal balance weights crafted in the shape of a knucklebone. One such weight, currently held at the Louvre, is a bronze knucklebone replica with a handle weighing approximately ninety-three kilograms. This skeuomorph was recovered from the acropolis at Susa (Iran) and dates to the sixth century BCE (Curtis 2013: 362). An inscription on the object relates that it was dedicated to Apollo in the oracle temple by two visitors from Miletus. It was likely taken from Miletus to Susa by the army of the Persian king, Darius, when they destroyed Miletus in 494 BCE following an uprising.
CHAPTER THREE
METHODS AND THE SAMPLE

Choosing the Sample

A sample of twenty archaeological sites was chosen for analysis. To be eligible for inclusion in the sample the site needed to meet certain criteria. First, the site must be located in Syria-Palestine. Second, the site must have positive archaeological evidence for occupation or use dating between the Middle Bronze Age and the end of the Iron Age. The third criterion deals with the way that the data from the archaeological site was reported. The site report must include data dealing with faunal material, small finds, bone tools/objects, or grave goods. Until recent decades, few archaeological reports on sites in Syria-Palestine dealt with commonplace objects, and rarely included less obvious artifacts, instead focusing on architecture and exceptional finds. Thus, it is likely that much data on knucklebones have been irretrievably lost. Thankfully, this tendency is far less common today, with artifacts such as knucklebones becoming increasingly recognized and sufficiently published.

To obtain the study sample, many archaeological site reports were consulted for evidence of knucklebones. Evidence for knucklebones may or may not have been explicitly recognized by the excavator(s)/author(s). In some cases the author recognized the knucklebones as artifacts and they were included in the “small finds” section of the report. In a few reports the knucklebones were not recognized as artifacts and appeared with other faunal material. In such cases, the astragalii were considered artifacts only under certain circumstances. First, they were considered
artifacts if a number of them occurred in isolation from other faunal remains in a discrete context. A discrete context is one that was physically bounded (as in a room, pit, or container) in a cultural setting. Second, they were considered artifacts if they were found among some other animal bones but were significantly over-represented compared with other bones from the same species. Third, they were considered artifacts if they bore modifications that are unlikely to have been caused by butchery. In some cases groups of astragali that otherwise met these criteria were excluded from this study sample because they were found in a context interpreted as refuse or construction fill.

After the sample was identified, background literature was compiled for each of the sites and the contexts associated with the knucklebones. The contexts were described according to their functions. Other artifacts found in the same contexts as the knucklebones were assessed if the data were available. Contexts were described as having either a domestic, ritual, funerary, or public function. Domestic contexts include well-defined residential houses, cellars, or storage areas. Ritual contexts include obvious cult shrines and temples with distinct features, such as altars and votive items. Funerary contexts include tombs and graves. Public contexts include centrally located storage areas, courtyards, civic/administrative buildings, and defensive structures. These categories reflect the ways that such structures and contexts were interpreted in the original site reports. Thus, for better or worse, all contexts are categorized according to the interpretations provided in the site reports, but those original assessments seem fairly secure.

The published information about individual knucklebones was also examined and described. The data collected on these knucklebones included their numbers, species, and types of modifications. The categories for modifications are “unworked”, “polished”, “ground medio-laterally”, “smoothed”, “pierced”, “filled”, “skeuomorph”, and “burned”. Unworked
knucklebones display no modifications or signs of wear from use. Polished knucklebones are those that are worn so that the surface of the bone is glossy (this often occurs when bones are used as dice). Knucklebones that are ground medio-laterally are ground on the medial and lateral sides so that they are flat (this often exposes the spongy bone). Smoothed knucklebones are intentionally worn so that the prominent morphological features on the sides are smoothed flat. This type of modification is similar to those that are ground medio-laterally, the difference being that in smoothed knucklebones the sides are not worn to such an extent that the spongy bone is exposed. Knucklebones that are pierced have either been perforated or drilled. Often the hole completely penetrates the knucklebones. Also common are knucklebones with multiple perforations that intersect within the bone. Filled knucklebones are those that have been perforated and the resulting channels through the bone filled with molten metal. Skeuomorphs are replicas of knucklebones crafted from some non-bone material such as glass, metal, or clay. Some knucklebones and groups of knucklebones are burned. Often knucklebones have more than one type of modification. Knucklebones are classified by modification according to descriptions provided in the site reports or other literature.

Groups of knucklebones have been recovered from archaeological sites all over the Aegean, Anatolia, Syria, Palestine, Egypt, and the Near East. In Syria-Palestine, groups of knucklebones are found in contexts including graves, civic structures, cultic structures, defensive installations, storage rooms, domestic houses, and refuse pits (the latter context will not be considered here). The following chapter surveys the distribution of groups of knucklebones in Syria-Palestine and provides brief descriptions of their respective contexts. A list of the sample sites and their locations are displayed in Figure 2. Table 3 summarizes the knucklebone context data.
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Dates BCE</th>
<th>Historical Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neolithic</td>
<td>10,200-3500</td>
<td>Predynastic</td>
</tr>
<tr>
<td>Chalcolithic</td>
<td>3500-3300</td>
<td>Late Predynastic</td>
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<td>3300-3050</td>
<td>Naqada II-III</td>
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<td>3050-2622</td>
<td>Dynasty I-III</td>
</tr>
<tr>
<td>Early Bronze Age III</td>
<td>2622-2191</td>
<td>Dynasty IV-VI</td>
</tr>
<tr>
<td>Early Bronze Age IV/ Middle Age</td>
<td>2191-2040</td>
<td>Dynasty VII-XI</td>
</tr>
<tr>
<td>Bronze I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Bronze Age IIA</td>
<td>2040-1998</td>
<td>Late Dynasty XI</td>
</tr>
<tr>
<td></td>
<td>1998-1991</td>
<td>civil strife</td>
</tr>
<tr>
<td></td>
<td>1991-1786</td>
<td>Dynasty XII</td>
</tr>
<tr>
<td>Middle Bronze Age IIB</td>
<td>1786-1665</td>
<td>Dynasty XIII</td>
</tr>
<tr>
<td>Middle Bronze Age IIC</td>
<td>1664-1555</td>
<td>Hyksos Dynasty XIV-XV; Theban Dynasty XVI-XVII</td>
</tr>
<tr>
<td>Late Bronze Age IA</td>
<td>1555-1482</td>
<td>Early Dynasty XVIII (Ahmose-Hatshepsut)</td>
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<tr>
<td>Late Bronze Age IB</td>
<td>1482-1410</td>
<td>Early-Mid Dynasty XVIII</td>
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<td>1410-1323</td>
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<td>Late Bronze Age IIB</td>
<td>1323-1201</td>
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<td>Iron Age IA</td>
<td>1200-1149</td>
<td>Early Dynasty XX</td>
</tr>
<tr>
<td>Iron Age IB</td>
<td>1149-1000</td>
<td>Late Dynasty XX-Early Dynasty XXI</td>
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<tr>
<td>Iron Age IC</td>
<td>1000-900</td>
<td>Israelite United Monarchy</td>
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<tr>
<td>Iron Age IIA</td>
<td>900-841</td>
<td>Jehu pays tribute to Shalmaneser III</td>
</tr>
<tr>
<td>Iron Age IIB</td>
<td>840-701</td>
<td>Jerusalem sacked by Nebuchadnezzar</td>
</tr>
<tr>
<td>Iron Age IIC</td>
<td>700-586</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Dates Used in the Text (see Redford 2005: 361 for Neolithic-Bronze; Richard 2003: 85-86 for Iron Age)
Archaeological Sites in the Sample

Figure 2 Distribution of Sample Sites
<table>
<thead>
<tr>
<th>Site</th>
<th>Period</th>
<th>Context</th>
<th>Area</th>
<th>Locus</th>
<th>Modification</th>
<th>Unworked</th>
<th>Scored</th>
<th>Polished</th>
<th>Ground medio-laterally</th>
<th>Smoothed</th>
<th>Pierced</th>
<th>Filled</th>
<th>Skeuomorph</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>L.7112 L.7108 M.7419</td>
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<td>LB</td>
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<td>Storage room in temple</td>
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<td>5 D</td>
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<td>Level IV a</td>
<td>Lower House</td>
<td>2 O/C</td>
<td>1 O/C</td>
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<td>10 O/C</td>
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<td>Lower House</td>
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<td>Civic/Cult</td>
<td>Building 2081</td>
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<td>660 O/C, 21 G, 3 D</td>
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<td>Iron II</td>
<td>Cultic</td>
<td>‘cultic structure’</td>
<td>Three groups on floor</td>
<td>76 O/C</td>
<td>44 O/C</td>
<td>20 O/C</td>
<td>in a vessel</td>
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<td>Ekron</td>
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<td>40 O/C</td>
<td>40 UN, some scored and/or polished</td>
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<tr>
<td>orbat Rosh Zayit</td>
<td>Iron II</td>
<td>Domestic</td>
<td>Stratum IIIb</td>
<td>Beaten-earth floor</td>
<td>71 O/C, all burned</td>
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<td>Beer Sheeba</td>
<td>Iron IIB</td>
<td>Public</td>
<td>Stratum II</td>
<td>Storebuilding</td>
<td>355 O/C, all burned, variously modified</td>
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<td>Beer Sheeba</td>
<td>Iron IIB</td>
<td>Public</td>
<td>Stratum II</td>
<td>Casemate storage room</td>
<td>72 O/C, all burned, variously modified</td>
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<td>Beer Sheeba</td>
<td>Iron IIB</td>
<td>Domestic</td>
<td>Stratum II</td>
<td>Cellar of private house</td>
<td>62 O/C, all burned, variously modified</td>
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<tr>
<td>Beer Sheeba</td>
<td>Iron IIB</td>
<td>Domestic</td>
<td>Stratum II</td>
<td>Various domestic houses</td>
<td>Several groups of 10 to thirty O/C</td>
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| O= Sheep; O/C= Sheep or Goat; D= Deer; S= Pig; B= Cow; G= Gazelle. |

**Table 2 Distribution of Finds by Context**
Figure 3 Knucklebones by Period; n= 1,875 (excludes cases missing exact count)

Figure 4 Sample Knucklebones by Context; n=1,896 (excludes cases missing exact counts)
Figure 5 Knucklebones by Species; n=1,832 (excludes cases missing exact count)

Figure 6 Sample Knucklebones of “Other” Species; n=34 (excluding Sheep/Goat; excludes cases missing exact counts)
Figure 7 Sample Knucklebones by Modification; n=72 (excludes unworked knucklebones; excludes cases missing exact counts; excludes “burned” knucklebones)

Figure 8 Percentage of Burned Knucklebones; n=1,816 (excludes cases missing exact counts)
Figure 9 Modifications by Context; n= 448 (excludes burned bones and cases missing exact count)

Figure 10 Percentage of Contexts by Time Period; n=30

Figure 11 Percentage of Modifications by Time Period; n= 68
The sample consists of over 1,859 knucklebones (exact counts are missing from some cases and are thus excluded from this number) from 12 archaeological sites in Syro-Palestine. Nearly half (49.8%) of the specimens were recovered from contexts dating to the Iron Age II followed by 36.5% recovered from Iron Age I contexts, 5% taken from Late Bronze Age Contexts, and 8.7% recovered from Middle Bronze Age contexts (Figure 3). The majority of the specimens (43.8%) were found in cultic contexts (Figure 4). Knucklebones taken from public contexts made up 27.6% of the sample, followed by those from domestic contexts (16.2%) and those from funerary contexts (12.3%).

Six species are represented in the sample. These include sheep (Ovis aries), goats (Capra hircus), cattle (Bos Taurus), gazelle (Gazella gazelle), deer (Dama dama) and pig (Sus scrofa). It is often difficult to distinguish sheep and goat astragali, especially in specimens that have been modified. Thus, sheep and goat knucklebones have been combined into a single analytical category making up 98.14% of the sample (Figure 5). Other species represented in the sample are gazelle (61.76%), deer (32.35%), cattle (2.94%), and pig (2.94%) (Figure 6).

Modifications to the knucklebones included burning, polishing, scoring, grinding on the medial and lateral sides, smoothing, piercing, filling with metal, and crafting from non-bone material (skeuomorphs). Of the knucklebones in the sample, 55.71% are smoothed, 31.43% are polished, 4.29% are pierced, 2.86% are scored, 2.86% are filled with metal, 1.43% are ground medio-laterally, and 1.43% are skeuomorphs (Figure 7). Of the total number of worked and unworked knucklebones in the sample, 26.69% are burned (4.48% of the sample are burned with at least one other modification) (Figure 8). An analysis of the types of modifications found in each context yielded no discernible pattern (Figure 9). This is because many knucklebones from
Beersheeba and elsewhere were reported as “variously modified” or exact modification information was otherwise missing. These were thus excluded from this analysis.

**Bronze Age Distribution**

Knucklebones were first used in Syria-Palestine in the Middle Bronze Age. In the first half of the Middle Bronze Age, knucklebones were distributed as a scattering of individual pieces and occasionally were found in small groups. However, starting in the Middle Bronze Age at Tel Mardikh-Ebla, ancient Syro-Palestinian people began using knucklebones in a new way. Knucklebone collections proliferated in number and frequency and were collected in many contexts besides domestic structures. Knucklebones from the sample dated to the Bronze Age make up 13.02% of the sample (Figure 3). These are described in the following section.

**Tell Mardikh-Ebla.** Knucklebones have been recovered at Ebla in contexts ranging from the Early Bronze Age to the Iron Age (Minniti and Peyronel 2005: 7). A sample of 202 specimens was taken from a variety of contexts at Ebla dating to the Middle Bronze I-Middle Bronze II. The majority of these (N=147) were recovered from a child’s burial dating to the Middle Bronze Age II. This date was assigned via a faience juglet that was also part of the funerary assemblage. Based on osteometric data, the child is estimated to have been between 18-24 months of age at death. The knucklebones were apparently grouped near the body of the child and the juglet placed near the head. Another group of knucklebones was recovered sitting directly atop a floor layer in the “Western Fort,” which represents a huge public structure. This floor layer had been sealed due to a roof collapse. Interestingly, the presence of balance weights, as well as its “particularly fortified” entrance, have led some to interpret this structure as serving an administrative function. More knucklebones were discovered in a small pit dug into the floor.
of a room in Northern Palace P, and are interpreted as having a “ceremonial” function (Minniti and Peyronel 2005: 10-11). Many of the knucklebones from these different contexts were modified in a variety of ways including being “cut, smoothed, or polished”. All of them showed signs of wear from use. Furthermore, all of these bones were found in contexts where they were isolated from other animal bones.

Megiddo. A group of seventy knucklebones was recovered from Tomb 251, a Late Bronze burial, at Megiddo (Guy 1938: 177, plate 115:11). Other artifacts associated with this tomb consisted of ceramic vessels, a gold earring, a bone pin and a bronze pin. In nearby Tomb 258 one faience knucklebone skeuomorph was recovered. These findings were initially thought to be contemporaneous with the Middle Bronze Age finds from Ebla (Minniti and Peyronel 2005: 13-14). However, the Megiddo tombs and contents have been reinterpreted as belonging to the Late Bronze Age (Gonen 1992: 88).

Baq’ah Valley. A group of sixteen knucklebones appeared in Cave 3 in the Baq’ah Valley in central Jordan. Three of these were modified; none were burned. Cave 3 is a burial cave dating to the Late Bronze II. Although this burial had been robbed, it nonetheless yielded several grave goods including beads, various pieces of copper jewelry, a dagger, an alabaster vessel, lamps, and several ceramic vessels for cooking and storage (McGovern and Brown 1986: 48-53). Of the sixteen knucklebones recovered, three had been smoothed on their medial and lateral sides (McGovern and Brown 1986: 319). Two of the knucklebones, beside the three that had been modified, had cut marks interpreted as butchery marks made during the removal of the animal’s skin. Of interest, there were very few teeth from sheep or goats, suggesting that only parts of the animals were actually brought into the cave (McGovern and Brown 1986: 317). The three modified knucklebones were interpreted as “game pieces”, while the unmodified ones were
interpreted as the detritus of unburned offerings to the deceased (McGovern and Brown 1986: 319).

**Ugarit.** A single knucklebone was discovered in a pit near the Bronze Age Royal Palace. This knucklebone (from a cow) was filled with lead. It was interpreted as a game piece by the excavator. However, Minniti and Peyronel note that its weight (280 grams) fits well into a local metrological system based on a shekel (9.4 grams). The authors suggest that this knucklebone may have functioned as a 1/30th shekel weight (Minniti and Peyronel 2005: 14).

**Lachish.** An unspecified “large number” of knucklebones appeared in the Late Bronze Age *Fosse Temple* at Lachish (Tufnell, Inge and Harding 1940: 94). These were found near the altar of the temple along with several ceramic vessels and other animal remains. Tufnell *et al.* believed that these should be interpreted as items used for divination (Tufnell, Inge and Harding 1940: 94).

More recent excavations at Lachish have yielded other groups of unmodified knucklebones. Five groups from Late Bronze Age pits were considered artifacts in the site report. These were recognized due to their high proportions compared to other bones of the same species (Croft 2004: 2439-3440). Two of these groups, numbering ten and eight astragali, respectively, will not be considered because they were found in a context interpreted as habitation debris. The other groups each contained six knucklebones. One group came from a “deep pit” with a plastered bottom (Barkay and Ussishkin 2004b: 395). This pit also held pottery fragments, a clay model shrine (or “wall bracket fragment”), a clay “stopper”, a spindle whorl, a flint scale weight, three flint bladelets, forty-three mollusk shells, some wood from an olive tree and a single olive pit. Other animal bones associated with this find included sixteen cattle bones,
fifty-five goat bones, one pig bone, five bird bones, a fallow deer bone, a dog bone, and a tortoise bone. The other two groups at Lachish were found in layers associated with courtyards. The interpretation of the latter three groups as artifacts must be viewed with additional caution since none of the bones are modified and because they were found among other animal remains, but their purposeful collection and deposit still implies a cultural significance.

*Tel El-Ajjul.* Petrie reported groups of knucklebones dating from the Middle Bronze to the Late Bronze at his excavation at Tel el-Ajjul. One was said to be pierced and filled with copper (Petrie 1933: 11, 71-72). Unfortunately, few details were provided and their occurrence in group deposits only confirms a cultural significance.

*Beth Shen.* Five knucklebones of fallow deer were recovered beneath the stairs to the “Altar Room” in the Late Bronze Age temple precinct at Beth Shen (James, McGovern, and Bonn 1993: 198). The associated artifacts include numerous ceramic and glass vessels, faience beads, gold jewelry (and other gold objects), scarabs (crafted of a variety of semi-precious stones), cylinder seals, shell fragments, and a few nails. In a room located in the northern portion of the temple, a single modified cow knucklebone was noted. Associated artifacts include much pottery, jewelry, seals, a scarab, copper-base weapons, flint blades, and various animal bones (James, McGovern and Bonn 1993: 48). This room was interpreted as a storage room for an altar in a nearby outer courtyard.

**Iron Age Distribution**

The tradition of collecting knucklebones into large groups first seen in the Bronze Age proliferated even further during the Iron Age. Groups of knucklebones numbering in the hundreds have been recovered from Iron Age civic and religious structures in Syria-Palestine.
Additionally, the numbers of knucklebone from Iron Age domestic contexts in Syria-Palestine were larger than those from the Bronze Age. Knucklebones in the sample dated to the Iron Age make up 72.01% of the sample. The following section describes these finds.

**Megiddo.** The largest single group of knucklebones from Syria-Palestine comes from the Iron Age Ib at Megiddo. Making up one-third of the sample, a group of 684 knucklebones were found in situ together in a deep clay bowl in a recess in the southwest corner of Building 2081 (Loud 1948: 45). Other objects found in this room were various ceramic vessels, lamps, a “limestone offering-stand”, stamp seals, clay game pieces, jewelry made of bronze, iron, and silver, and various tools. This building was interpreted as serving a cultic function (Loud 1948: 45). The knucklebones were originally thought to have been crafted of pig astragali. A more recent reexamination by Brian Hesse has corrected this, finding that the vast majority of the bones belong to sheep or goat and a small number belong to gazelle and fallow deer (Hesse 1990: 215).

**Lachish.** A group of thirty-two knucklebones (five of which were worked) were recovered from Level Iva (Iron Age II) in two rooms of the Main Building (Croft 2004: 2439-3440). The Main Building is situated in the inside, northwest corner of Lachish’s city wall. It is interpreted as a domestic structure by the vast number of broken, but restorable, pottery vessels scattered atop the floor layers. This structure and other associated buildings were destroyed suddenly and contemporaneously, but not by fire. Evidence of extensive structural damage to some buildings suggests that this destruction may have been due to an earthquake. There is biblical evidence for this earthquake in the books of Amos and Zechariah and it has been placed around 760 BCE (Barkay and Ussishkin 2004: 447). Destruction of this kind is recorded at other sites in the region, dating to around the same time (Barkey and Ussishkin 2004: 447). This is
important for showing why these homes may have been abandoned suddenly, and thereby retain more items than are normally found in reused or abandoned dwellings.

In some rooms of an adjacent structure, the Lower House, groups of knucklebones have been found numbering nine (with two worked pieces), twelve (with two worked examples), and seven (only one worked piece) (Croft 2004: 2439-3440). Even though these groups were made up of mostly unmodified astragali, they were considered artifactual and significant in the site report because astragali accounted for an abnormally high proportion of sheep and goat bones.

Other groups of knucklebones came from occupation Layer III of the Lower House in the Iron Age II. A group of sixty-five knucklebones (about half of those displayed modifications) were recovered from a room in the Lower House (Croft 2004: 2436). The Lower House in this period comprised a domestic complex with ten rooms situated on the inside of Megiddo’s city wall in the northwest corner; it was interpreted as a domestic residence. No jewelry or other valuables were found in these houses, a condition ascribed to pre-destruction looting (Barkay and Ussishkin 2004: 452-453). Still, an unusually high number of Judean stamped storage jars and loom weights were found in the rooms, suggesting that if they were domestic houses they also functioned as facilities for storage and textile manufacture (Barkay and Ussishkin 2004:453). A further nineteen astragali were recovered from another room in the Lower House (Croft 2004: 2436). Unfortunately, eighteen of these were lost prior to analysis and there is no record of whether they were modified in any way. The nineteenth, however, was found to be ground on its lateral side. An additional room in this complex has a group numbering fifteen knucklebones (8 of which were worked).
Tell Ta’annek. A group of 140 knucklebones were recovered from a very small room in the “Cultic Structure” at Tell Ta’annek (Lapp 1964: 26-32). The structure is dated to the late tenth century BCE (Iron Age IIa). Only the southeast corner of the structure was intact at the time of Lapp’s excavation, with two rooms remaining. The small room in which the knucklebones occurred is interpreted as a storage room because of its very small size in comparison with estimates of the original structure’s total size. This interpretation was also based on the other artifacts found in the room: eighty ceramic vessels (some of which still contained grain), lamps, a strainer, fifty-eight complete loom weights and fragments of many others, knives, a sickle blade, an iron javelin head, several stone grinders, weights, beads, an arrowhead, a mace head, a toggle pin, and one complete figurine mold (Lapp 1948: 27-28). Like the large collection from Megiddo, the knucklebones were first thought to have been crafted from pig astragali. More recent analysis show that they came from sheep and goats (Gilmour 1997: 163).

Tell el-Hammah. A “large number” of knucklebones were recovered from Room 406 of the Iron Age Western Complex at Tell el-Hammah (Minniti and Peyronel 2005: 16). Room 406 is a large room interpreted as having a ritual function. The associated artifacts included forty ceramic vessels, a molded figurine, a ceramic amulet, a stamp seal, and gypsum.

Tell Migne-Ekron. A group of forty knucklebones appeared in a context dating to the eleventh/tenth century BCE (Iron Age IB/IIA) in Ekron’s Field III. Several of these knucklebones had modifications including scoring and polishing (Gilmour 1997: 168-169). More exact data for the context of these knucklebones are unavailable, as the site reports concerned with this Stratum are still in various stages of preparation and publication.
ขาบะโรช זַיִּית. A group of eighty-two knucklebones was recovered from a beaten-earth floor of an Iron Age II house from Stratum IIIb ofขาบะโรช זַיִּית (Horwitz 2000: 225). All of the knucklebones belonged to sheep or goat. Of interest, forty of the knucklebones came from the right side of an animal and forty-two from the left. This suggests that the bones were pairs. Many of the knucklebones had cut marks consistent with butchery. Two of the knucklebones (a left and a right side set) were perforated, while nine were smoothed on their medial and lateral sides (eight left, one right). All of the knucklebones were burned or “scorched” (Horwitz 2000: 225). Other artifacts associated with the knucklebones consisted of a large basalt mortar, several stoppers, and a few pottery vessels (Gal and Baruch 2000: 8).

Беерсехе. A total of 694 knucklebones (all sheep or goat) came from Stratum II at Beersheba (Sasson 2007: 172-173). Stratum II dates to the eighth century BCE (Iron Age IIC) and was the final occupation phase of this small town in the northern Negev Desert. The smallest groups of knucklebones numbered about ten specimens; the largest group made up about half of the total sample at 345 knucklebones. All of the knucklebones in Stratum II were burned, a condition Sasson attributes to a destruction of the settlement by fire (Sasson 2007: 172-173). Modifications to the knucklebones from Stratum II include burning, drilling, cutting, grinding and polishing (Sasson 2007: 174). Most cut marks appear to be the result of butchering.

The largest group of knucklebones (345 specimens) was recovered from a room in the Storehouse Complex (Sasson 2007:174). The Storehouse Complex was situated northeast of the city gate and is made up of three long rooms separated by two rows of stone pillars (Herzog 1973: 23). Elsewhere, this structure is debated to be a stable reused as a storehouse (see Currid 1992 for an outline of this debate). The edges of the storehouse were lined with ceramic vessels, while the center of the structure was practically devoid of artifacts (Herzog 1973: 25). In an
adjacent room, in this same Storehouse Complex, another group of twenty knucklebones was found.

A group of seventy-two knucklebones occurred in a storage room in the northern portion of the town’s casemate city wall (Sasson 2007: 174). Other artifacts found here include some small juglets, a bowl, a cooking vessel and a storage jar.

A group of sixty-two knucklebones lay in a cellar room of a house (Sasson 2007: 174). The other artifacts from this context were ceramic vessels similar to those in the other domestic contexts: a few loom weights, and iron arrowheads.

Several small groups of knucklebones (ten to thirty specimens each) were recovered from domestic contexts throughout the site (Sasson 2007: 174). The other objects associated with these finds were similar to those from the other domestic contexts at Beersheba.
CHAPTER FOUR
LITERATURE AND THEORIES

Methods for Evaluation

Given the enormous geo-temporal range of the knucklebone culture trait it is little surprise that interpretations of how knucklebones functioned are varied and often widely divergent. Often, these interpretations are formulated with a heavy emphasis on context for determining the function of a collection of knucklebones. While this may seem like the ideal way to interpret knucklebones, these “common sense” explanations are often made without evaluating how closely the archaeologist’s common sense approximates the rationale of ancient cultures. In addition, some interpretations of prehistoric knucklebone finds depend too heavily on analogs from later historic periods. This is problematic for several reasons. First, the prehistoric contexts are removed by a vast amount of time from the earliest analogs referenced in historic literature, namely from the Roman and Byzantine periods. This alone should cause concern, but in addition to this most of the ethnographic data on knucklebones is based on the art and history of the ancient Romans, a culture that is neither ethnically nor culturally descended from the people of Bronze Age or Iron Age Syria-Palestine. This fact alone disqualifies the use of the direct historical approach. The direct historical approach requires that the modern culture used for ethnographic analogies be culturally descended from the ancient culture under investigation (Lyman and O’Brien 2001: 303-305). Therefore, the current study assumes that the later knucklebones of the historic period are actually cognates (items that appear similar but may not be related functionally) and not analogues (and certainly not homologues) to those from
prehistoric contexts unless there is some compelling reason to assume that they are analogous. This assumption is justified by the fact that the ethnographic and historically based analogues employed are only capable of explaining a few of the knucklebone finds from prehistoric contexts. Evidence for this will be offered below. These explanations can hardly stand against the many dissimilarities of the more ancient knucklebone finds. Last, many of the prevailing interpretations of knucklebones are only adequate in explaining certain types of finds.

Given such considerations, a few researchers have posited theories as to the function of knucklebones based upon their archaeological sites. The current study will evaluate these explanations according to the characteristics outlined here, which are adapted from Knight’s (2013) recent work on the method and theory of prehistoric iconography. Interpretations will be evaluated on based several factors: proximity in time, breadth of the comparative base, and goodness of fit. Compelling cases will also be considered for their generative quality, or their ability to inform regarding related cultural phenomena. Based on these criteria a new interpretation, or a synthesis of existing interpretations, will be devised that should provide a satisfying explanation for the most variable knucklebone finds with the least number of contradictory cases. This interpretation will be tested against the sample of knucklebone finds from Syria-Palestine described above.

Proximity in time refers to the duration of time between the ethnographic or historical homology/analogy and the entrance of the material culture under investigation into the archaeological record. For the purposes of this research, the analogous evidence should be close enough temporally to mitigate the likelihood of significant changes to the function of knucklebones. An acceptable proximity in time will depend on several factors that are quite
subjective and rely greatly on detailed knowledge of the history of both the analogous culture and the culture under investigation.

It is well established that cultures in the Levant were not static, but instead changed unceasingly in the face of shifting political, economic and environmental conditions. In spite of this fact there is little doubt that ethnographic analogies, some removed by centuries from the archaeological subject matter, can indeed inform interpretations of archaeological materials. It is expected, however, that the ethnographic evidence will be collected from a society in a similar ecological setting and with a similar level of technological complexity (Roux 2007: 169-172). First, this requires that one incorporates a detailed knowledge of the ancient environment and the subject culture’s level of technological and socio-political complexity. Many ethnoarchaeologists argue that if this knowledge can be established, later ethnographic analogies (often removed by centuries or even millennia) can be used to interpret the function of ancient cultural materials. It is this writer’s contention that this practice of using temporally far-flung analogies is inadequate to interpreting the collections of knucklebones that are the subject of this research. First, much evidence suggests that these knucklebones served at least two functions before they were eventually interred or discarded. Most knucklebone modifications, though certainly not all, seem to be aimed at accentuating the general cuboid shape of the bone, making it a more reliable die. It is often assumed, rightly I believe, that these knucklebone dice are often used for gaming, especially when they are recovered from domestic fill deposits as single artifacts or in small numbers. However, knucklebones with these same modifications were often intentionally buried in funerary and cultic contexts in numbers that are unnecessary and/or impractical for gameplay. This may suggest a separate or added symbolic function. Ethnographic analogies that are temporally far removed may be fit to inform interpretations of
utility items like domestic ceramic wares and knapped stone tools but it is my contention that the possibility that these knucklebone collections served a symbolic function requires that an analogous culture have more in common with the culture under investigation than a similar environment and types of technologies. Instead, such proposed analogies require some level of cultural relatedness. Therefore, the most trustworthy interpretations will be based on homologies from a direct historical ancestor of the ancient culture under investigation. Like analogies, using the direct historical approach becomes problematic when investigating sites of greater antiquity, or those that are poorly understood historically.

Beyond the inherent tendency for culture to change steadily over time, there are certain catastrophic events that one must consider when evaluating the appropriateness of an analog’s proximity in time. Events such as conquest or population displacement could cause a given culture to change abruptly. Phenomena like these must be taken into consideration when evaluating the acceptable proximity in time of an ethnographic or historical analogy.

Another way to evaluate the appropriateness of an analogy is consider the breadth of the comparative base. If a historically or ethnographically known culture trait is shared over an exceptionally broad culture area, it is possible that this trait has ancient origins (Knight 2013: 137). This concept is rooted in the idea that technologies and concepts take some time to diffuse throughout populations because of geographic, linguistic, and/or ideological barriers. Therefore, if a technology or concept is spread very far afield, then it stands to reason that its original invention took place at a distant time. Of course, this is not always the case; many cultural practices (especially things like games) have been shown to spread very quickly over a very large geographic area. Consider how tobacco use spread throughout the world once Europeans observed its use by Native Americans. Also, one must consider the possibility that a given trait
was invented simultaneously in several locations or at different times (e.g., emergence of agriculture globally; rise of complex state societies). For an artifact like the knucklebone this is a distinct possibility when considering that knucklebones have been recovered from archaeological sites all over the world in great antiquity. The astragali of certain species of wild and domestic cervids and bovids are naturally rectilinear and require very little, if any, modification to function as dice. However, the modifications applied to these astragali are a different matter. Many modifications to astragali are quite peculiar and would not likely be invented independently. Examples of this are the filling of knucklebones with metal or the crafting of skeuomorphs from various materials. Therefore, considerations of the comparative base of the knucklebone analogs will focus on certain diagnostic modifications.

Another method for evaluating the appropriateness of an ethnographic or historical analogy, adapted from Knight, is to consider its goodness of fit. The goodness of fit refers to the extent that an interpretation integrates the various characteristics of a culture trait. For the purposes of this research, an interpretation’s or an analogy’s goodness of fit will depend on extent to which it is able to explain the varying types of knucklebone finds. Most existing interpretations seem very plausible when considering only one type of knucklebone find. For example, when only considering knucklebones found in small numbers in domestic contexts and with smoothed sides it seems perfectly reasonable to interpret these as gaming pieces. However, this interpretation becomes much less convincing when one considers that in the same archaeological site knucklebones are found in groups numbering in the tens or hundreds, in burials and/or funerary contexts, with modifications that would either not facilitate or even impede their function as gaming pieces.
Last, any interpretations and analogies that are compelling according to any of the criteria mentioned (*i.e.*, proximity in time, breadth of the comparative base, and goodness of fit) will be considered for their ability to inform other culture traits that are related to the knucklebone culture trait under study here. In other words, if an interpretation of the knucklebone culture trait is correct then this explanation may inform some related culture trait or institution. This consideration is not an evaluation of the appropriateness of an explanation like the first three criteria. Instead, considering the generative quality of explanations will be an exercise in formulating a new interpretation (or a combination of existing interpretations) that more fully explains the variables regarding knucklebone modifications in their contexts with the least amount of contradiction.

Game Pieces

While varied interpretations of knucklebones exist, the fact that knucklebones often served as game pieces is universally accepted. In ancient Egypt, knucklebones and skeuomorphs were being used as dice in a game, *senet*, for which there are depictions dating to the Old Kingdom, *circa* 2700-2160 BCE (Picionne 1980: 1). Knucklebones have been recovered in several New Kingdom (*circa* 1550-1077 BCE) elite tombs leading researchers to a dual interpretation: By the 18th Dynasty, *senet* boards or depictions of them were being included among the funerary objects and scenes in elite tombs (Decker 1993: 128-131). Following E. B. Pusch, *senet* is interpreted as having a sacred aspect, in which one’s luck is determined by the outcome of the game, and that in a way the game is a representation of the ancient Egyptian journey to the afterlife (Decker 1993: 129). In this way, the knucklebone would serve as a component part of a sacred activity. However, while the game of *senet* has been interpreted as having sacred significance, there is no evidence that the knucklebone retained sacred status in
isolation from the board game. In Egypt, it seems that the knucklebone was used mainly for games, though this does not necessarily exclude their having some spiritual significance.

While most archaeological contexts do not give such obvious evidence for the function of small collections of knucklebones, there exists a plethora of historical and ethnographic information documenting a long tradition of using knucklebones as game pieces in cultures all over the world (Dandoy 2006: 131). An example of ancient knucklebones being interpreted as game pieces comes from the archaeological and subsequent ethnographic investigations at Gordion. Gordion, or Gordium, is located in the Central Anatolian Highlands in Turkey and has long been regarded as the capital of the ancient Phrygian Empire and home to King Midas (Dandoy 2006: 135). The site consists of a large mound surrounded by a low-lying settlement that had an urban area of approximately one square kilometer in some periods. Major occupation of the mound dates from the Early Bronze Age through the Roman and Medieval Periods (Dandoy 2006: 135). Astragali at Gordion were recovered in all strata, but only those that met certain criteria were considered artifacts (Dandoy 1996: 53). To be considered as artifacts, astragali or collections of astragali had to meet one or more of the following criteria: evidence for purposeful modification, a presence in groupings larger than astragali forming part of food remains, a coincidence with human remains where the astragali appear to have been interred as funerary objects or ornaments, or their inclusion in contexts missing other mammal bones from the same species (Dandoy 1996: 53). Most of the finds at Gordion were interpreted as gaming pieces based on ethnographic evidence from a nearby village, where knucklebones are used in their games (Dandoy 1996: 53-55).

The majority of knucklebones from Gordion originated from contexts dating to the Early Iron Age (1100-950 B.C.) through the Late Phrygian period (500-300 B.C.). Five hundred and
six knucklebones occurred in a burial mound for an elite child dating to the Middle Phrygian period, which roughly corresponds to the Iron Age IIB- Iron Age IIC in the Near East (Dandoy 1996: 53). Modifications to these knucklebones included some being dyed and/or pierced. These were tentatively interpreted as functioning as personal ornaments (Dandoy 1996: 53). Earlier finds include fifteen or sixteen knucklebones found in a mug on the floor of Megaron 3, four hundred and ninety-four from a pot on the floor of Megaron 1, and an unspecified number placed in another pot on the floor of Megaron 1. These loci date to the Early Phrygian period, which roughly dates to the middle of Iron IC through the mid-Iron IIB in the Near East. These floor levels correspond to a well-documented destruction layer at Gordion. Dandoy asserts that most of the knucklebones from these floor levels were burned, but at a low temperature, as is evidenced by their black color (Dandoy 1996: 53). He proposes that these knucklebones were burned during the destruction of the site. Other small groupings and single knucklebones (totaling 107 artifacts in Dandoy’s report) have been recovered as well, the majority of which were modified by a combination of drilling, grinding down edges, and/or filling with metal. For purposes of this study, only the large collections of knucklebones will be discussed.

To inform his interpretations of knucklebones from ancient Gordion, Dandoy collected ethnographic data on the games played currently by young boys and some men at an agricultural village near his excavation site (Dandoy 1996: 55-58). One game, called Aşik Oyunu (“the knucklebone game”) requires four players or more to throw knucklebones in order to be assigned a role, which corresponds to a hierarchical social system (Dandoy 1996: 54). These roles, namely a slave, servant, vizier, and Sultan, correspond to different sides of the four-sided knucklebone. In this game, the Sultan tells the vizier what punishment is to be doled out to each of the unlucky slaves; often this punishment comes in the form of a slap or rap with a stick.
After the punishments have been meted out, the slaves and servants roll their knucklebones again and assume new roles as determined by their roll of the dice (Dandoy 1996: 54-55). Thus, the Sultan can become a slave and will be subject to punishment by a boy to whom he ordered be punished in a previous turn. The game is over either at a predetermined time, or when there are less than four players left in the game; players can also drop out of the game at any point during play (Dandoy 1996: 54).

Another game observed by Dandoy is called Çizgili (marked with lines) and is similar to the Western game played with marbles (Dandoy 1996: 55). In this game, knucklebones are lined up, placed on end in a line, and then a circle is drawn in the sand around the knucklebones. Players stand back about ten feet from the circle and attempt to topple the knucklebones by throwing a heavier knucklebone at the line. The goal is to knock the knucklebones outside the circle. If, on a throw, any knucklebones are knocked outside the circle, they are kept by the player and he continues to throw. If none are knocked outside the circle, then the pieces are moved back into their line and another player takes his turn. The “shooter” (i.e., a heavy, metal-filled knucklebone) is called the şaka and it is considered a highly prized and personal item (Dandoy 1996: 55). This piece is often filled with metal, polished, ground on two or more sides, and sometimes painted. In this and two other games described by Dandoy it may be customary for the winner of the game to keep all, or some portion, of the other players’ astragali that are accumulated during gameplay.

Based on the games observed by Dandoy, many of the knucklebones from Gordion were interpreted as game pieces (Dandoy 2002: 135). Upon further analysis, Dandoy noticed a change in the modifications to knucklebones at Gordion between the tenth and eighth centuries BCE (Dandoy 2002: 135-136). A great number of knucklebones from Gordion and nearby sites from
this period where ground on one of more side (Dandoy 2002: 136). To date, no explanation has been offered as to what cultural phenomenon may coincide with the change in knucklebone modification. It is noteworthy, however, that this change is evident in the archaeological records of Kaman-Kalehöyük (Anatolia), Kommos (Crete), and the Amanthus Tombs in Cyprus at roughly the same dates (Dandoy 2002: 136).

Dandoy’s ethnographic analysis of the games played in the present near his excavation site is considered an analog for explaining the many modifications made to knucklebones in antiquity. To Dandoy, the modifications observed in the present-day seem to mirror those evidenced in the archaeological record (i.e. smoothing the sides of the pieces and applying metal to affect their weights).

Proximity in Time. The ethnographic data that Dandoy employs postdates the cultural material under investigation by nearly three millennia. During this long duration there must have been countless opportunities for the knucklebone culture trait of the ancient Phrygians to be abandoned, readopted, renegotiated, or otherwise modified. Slow and steady changes in culture are a well-documented phenomenon. Furthermore, Gordion’s long history is punctuated by catastrophic events that make the possibility of uniform cultural continuity all the more unlikely (Thronemann 2013: 1-40). The initial Phrygian occupation of Gordion began in the eleventh century BCE (Muscarella 1995: 91). By at least the sixth century BCE Gordion had been conquered by the Anatolian Kingdom of Lydia and later was conquered by the Persian Empire. It was a Persian territory for two centuries. Gordion underwent more cultural transformation in the Hellenistic period when masses of Greeks and many other peoples settled there, among them the Gauls. In 186 BCE, Roman general Manlius Vulso marched on Gordion in a campaign against the Gauls. Vulso found Gordion empty, its inhabitants having fled in anticipation of his
arrival. After its eventual reestablishment as a Roman town in the first century CE, Gordion was abandoned and resettled no less than four more times (Goldman 2007: 6-12). These events make it all the less likely that any cultural continuity can be expected between the ancient Phrygians and the modern day inhabitants of Gordion unless one looks beyond Gordion for a broader regional continuity.

*Breadth of the Comparative Base.* Dandoy’s interpretation of knucklebones as gaming pieces is also based on a very broad ethnographically recorded tradition of astragali being used as dice. On every continent, historically recent groups have been recorded using knucklebones in games of chance and/or skill (Dandoy 2006: 131). In fact, there is evidence that suggests that knucklebones were a prototype for the metal objects used in the modern game of jacks. Though not explicitly argued in his article, Dandoy’s ethnographic analogy has a very broad ethnographic base, lending credence to his interpretation.

*Goodness of Fit.* Dandoy variously interprets the knucklebones from Gordion as game pieces and/or personal ornaments depending on their context and types of modifications. The large groupings of knucklebones recovered from pots on palace hall floors (are mostly smoothed, and/or pierced and filled with metal, and are interpreted as game pieces). Likewise, those knucklebones with inscribed personal names or the names of deities are also interpreted as game pieces. Furthermore, the dyed and/or pierced knucklebones recovered from a child’s burial mound were interpreted as game pieces, which may have served as personal ornaments as well.

Dandoy’s interpretations rely heavily on observations in the present, but are not well incorporated into similar knucklebone finds that were contemporaneous (or nearly so) with his archaeological context. For example, knucklebones that have been intentionally smoothed have
been recovered in funerary, cultic, civic, and domestic contexts throughout the Aegean, Anatolia, and Syria-Palestine. These finds date from the Middle Bronze Age through present day. There is no archaeological evidence at present that supports the grinding down of the sides of knucklebones for gaming. Furthermore, in some modern games the shape of the sides is integral to the game (Care 2013: 92). The sides of the knucklebone have different values when tossed like a die. Obvious morphological features on these sides are necessary for both the differential probability of a roll and the recognition of the roll. Pierced knucklebones, a more specific modification, are found in funerary and civic contexts at Megiddo (Palestine), a house floor at Enkomi (Cyprus), a cultic structure at Ta’annek (Anatolia) and at funerary contexts at Palaepaphos (Cyprus) and Salamis (Cyprus) (Gilmore 1997: 167-170). Even more specific are the metal-filled knucklebones interpreted as game pieces because of their modification and context in pots on the palace hall floors. Metal-filled knucklebones have been recovered from a civic context at Tel el-Ajjul (Palestine), a cultic context at Kition (Cyprus), and a cultic context at Corycian Cave on Mt. Parnassus (among many other examples). Notwithstanding the clear ethnographic parallels for these metal-filled knucklebones (see Dandoy 1996), an interpretation of them as game pieces does not fit well when considering other Bronze and Iron Age findings from Syria-Palestine that are found in cultic and funerary contexts and in numbers far greater than would be necessary for gameplay.

The knucklebones from pots on the palace hall floors were burned, but at a low temperature, according to Dandoy. He asserts that these were likely burned during one of Gordion’s early destruction events (Dandoy 1996: 53). However, when considering other archaeological knucklebone finds, the burning of groups of knucklebones is a trend found in sites...
where the burning is clearly not due to a destruction event. An example of this is a group of eighty-two burned knucklebones found beneath the floor of a structure at Garbat Rosh Zayit.

Like Dandoy, other researchers have concluded that their knucklebones were game pieces (e.g., Minniti and Peyronel 2005, Bozbay 2012, and many others). These interpretations, however, make no effort to support their claims except to cite other researchers who have done the same. This practice has resulted in astragalus artifacts being interpreted broadly as game pieces, even when they are found in contexts that warrant further or different explanations.

**Ritual Activity**

Another common way that knucklebones are interpreted is as having “ritual” significance (Minniti and Peyronel 2005, Lapp 1964). This is because knucklebones are often found in large numbers in contexts interpreted as having a cultic function, sometimes collected together and buried in small pits. These “ritual” knucklebones are found in several sites throughout Syria-Palestine, starting in the Middle Bronze Age and proliferating in the Iron Age. However, interpretations of knucklebones as having ritual function actually do very little to explain the knucklebone finds themselves. Most often, the knucklebones are simply said to have ritual significance, with no explanation to the actual function of the artifacts. If a function is attributed, it is usually that of divination.

Garth Gilmour posits that the presence of large collections of knucklebones may be used as a marker for “ritual activity” (Gilmour 1997: 173). In his study, Gilmour provides a survey of sites from which he concluded that knucklebones functioned as ritual offerings spanning the Aegean, Anatolia, Syria, Egypt and the Levant. Temporally, these finds range from the Chalcolithic through the Iron Age. One of the sites that Gilmour highlights is the Corycian Cave
on Mt. Parnassus. At the Corycian Cave, over 23,000 knucklebones were recovered from a meter-thick floor layer, ranging in date from the sixth century BCE through the third century BCE. These knucklebones were modified in a variety of ways including painting/dying, piercing, sawing, filling with metal, gilding, and polishing. Furthermore, several replicas of knucklebones were crafted of semiprecious metals, clay, wood, glass, and marble. Thirty-one of the knucklebones were inscribed with the name of a person or deity.

Besides the preponderance of archaeological data, Gilmour bases his ritual interpretation on two assumptions, which he believes explains why knucklebones would be used as ritual objects. First, Gilmour says that the astragalus is a “distinctive” bone (Gilmour 1997: 172). He explains that the shape and size of the astragalus make it “small, easily worked, and handy.” Second, Gilmour proposes that knucklebones tend to be used as ritual objects because of a particular method of skinning an animal. This technique involves cutting a small hole in the skin of the animal near the ankle joint (where the astragalus is found), inserting a tube, and blowing air either by lung or bellows into the skin. The result of this is to loosen the skin from the underlying carcass of the animal, making the skin much easier to remove. Gilmour suggests that this may have given the astragalus bone a special status among bones, since it is where the knife is first inserted into the animal during skinning (Gilmour 1997: 172). He argues that this practice was apparently fueled by ancient people’s reverence for animals and acknowledgement of the sanctity of the animals’ lives.

Proximity in Time. An evaluation of whether Gilmour’s evidence share an appropriate proximity in time is aggravated by the fact that Gilmour is not interpreting knucklebone finds from a single site, but instead is attempting to explain knucklebones found in a variety of contexts, both funerary and cultic. Gilmour’s evidence spans no less than three continents, many
cultures, and at least six millennia. According to the criteria laid out in the introduction to this section, most of Gilmour’s evidence is too distant geographically, temporally and culturally to be considered as analogous to Syro-Palestinian knucklebone finds from the Bronze Age.

**Breadth of the Comparative Base.** Gilmour’s interpretation of a ritual function for certain groups of knucklebones is based on archaeological evidence from Classical Greek sites, such as Kition in the Aegean, and Near Eastern sites such as Lachish, Tel Dor, and Tel Miqne-Ekron in Palestine (Gilmour 1997: 172). However, the interpretations of the knucklebones from each of these sites are based solely on later textual evidence in Pausanias from the second century CE, when astragali are attested as being used in divination. Thus, while Gilmour is considering a vast number of archaeological sites for the occurrence of knucklebones, his interpretations for the knucklebone functions from each of these sites rests on a very narrow ethnographic base. Despite this poorly formed interpretation, it cannot be ignored that knucklebones are recovered from cultic contexts over a very broad geographic and temporal range. Interpreting these finds as having a ritual function is likely warranted: what these collections have in common is that they are recovered in association with other ritual artifacts. It is the interpretation of knucklebones from ritual contexts in Syria-Palestine based on historical data from Greece that postdates the Syro-Palestinian material by several centuries that is not warranted.

**Goodness of Fit.** Gilmour asserts that knucklebones tend to be used as ritual objects because they are “distinctive” and because of the way he presumes that animals were skinned in antiquity. Gilmour’s assertion that there is some intrinsic quality in the “unique” shape and size of the knucklebone is difficult to accept. The astragalus is a tarsal bone, and is similar to other tarsal bones in density and size (versus other non-tarsal bones). Perhaps the most “distinctive” characteristic of the astragalus is that it is roughly rectilinear. Gilmour’s second assertion is that
the knucklebone gained sacred status because of its position on the ankle where a particular skinning technique begins. Gilmour posits that the skin of the animal was loosened by blowing air through a tube into a hole cut in the skin of the animal. Though this writer is aware of modern practices where mechanically compressed air is used to loosen the skin of animals, there is no evidence of such a practice in antiquity. Furthermore, this second proposition is based on the idea that ancient people held a special respect for the life of an animal, an assumption that requires more evidence. Also, why would only the astragali of a limited number of species (i.e., mainly domesticated sheep, goats, cows, rarely pigs, and some wild artiodactyls) be selected for ritual status?

Gilmour’s assertion that groups of knucklebones may be ritualistic in nature is plausible because they are so broadly represented in ritual (cultic) and funerary contexts. However, acknowledging knucklebones as ritual objects and providing an explanation for their function are very different matters. Gilmour’s explanations for why knucklebones tend to be selected as ritual objects are questionable and based on little more than conjecture.

Minniti and Peyronel also interpret some of the knucklebones from Middle Bronze Age Ebla (Syria) as having a ritual function. They interpret most of their worked knucklebones, found throughout the site, as being used as game pieces based on unspecified ethnographic data and well-known analogs from Classical texts. However, Ebla also yielded a faience jug and a group of 147 knucklebones interred with a young child. This, according to the authors, suggests that knucklebones served some ritual or symbolic function beyond their role in game play (Minniti and Peyronel 2005: 7). The authors also recognized that large collections of knucklebones may have served to reflect the wealth of the owner.
Minniti and Peyronel begin by studying the spatial and temporal distribution of knucklebones from Ebla. Knucklebones were classified based on their modifications: Type 1: unworked; Type 2: unworked but manipulated; Type 3: polished; Type 4: smoothed or cut lengthwise; Type 5: pierced; Type 6: pierced and filled with metals; and Type 7: replicas in precious or semi-precious materials. Based on their analysis, the oldest collections of knucklebones actually came from small caches in private, elite houses. Knucklebones are not found collected in shrines or temples in the Near East until the Late Bronze Age (Minniti and Peyronel 2005: 19). The Middle Bronze Age infant burial had knucklebones of Types 2, 3, and 4. They were the only animal bones in the burial and they were interred alongside a “precious” faience vessel. The child was under two years of age at death, so it is unlikely that these knucklebones were the child’s former playthings. At other parts of the site knucklebones were found in caches in private homes and defensive structures. Only Type 1, unmodified, knucklebones were recovered from cultic contexts.

The authors suggest that the origins for the ritual functions (divination, casting lots, and so on) of knucklebones seem to have developed in Anatolia and Syria-Palestine rather than the Aegean or Cyprus (Minniti and Peyronel 2005: 19). They caution, though, against the over-reliance on “diffusionist” theories. They also warn researchers to be wary when drawing connections between Syro-Palestinian ritual knucklebones and those found in ancient Greek temples. In addition, they do not use ethnographic data to inform their interpretations. Thus, no evaluation is needed for the appropriateness of \textit{proximity in time} and \textit{breadth of the comparative base} for the Ebla material.

\textit{Goodness of Fit.} The knucklebones from the infant burial are considered to be ritual objects. This interpretation does fit well with some other finds from Syria-Palestine, but not with
the archaeological evidence within Ebla. At Ebla, no knucklebones are found in the shrines and temples contemporary with the burial of the child. Furthermore, in later Late Bronze and Iron Age shrines and temples at Ebla the knucklebones that are recovered are not modified. In contrast, all of the knucklebones in the Middle Bronze Age child burial are modified in some way. Finds that are contemporary with the child burial include scattered knucklebones interpreted as game pieces and small caches in houses and defensive structures. The authors suggested that these items might have been used to reflect the wealth of their owner. Perhaps then, a better fitting interpretation would be that the knucklebones interred with the child were valuable status items. This interpretation would be strengthened by the fact that the only other artifact associated with the knucklebones in the child burial was an expensive faience vessel.

Tools

Astragali were also used as tools. In later times and a far distant region, the Copper Eskimo have been observed to use caribou astragali as drill set “mouthpieces”, where the pit on the distal side of the astragalus is used to support and stabilize a bow and shaft drill (Koerper and Whitney-Desautels 1999: 74). A bovid astragalus that has been interpreted similarly as a “drill cap” was recovered from unstratified fill at Megiddo in Palestine along with crucible fragments and loom weights (Finklestein, Ussishkin, and Halpern 2006: 395-396).

Jaqueline Meier has suggested that smoothed astragali recovered from the Middle Bronze Age sites of Zagyvapálfalva-Homokbanya and Kisterenye-Hársas in Hungary were used for burnishing pottery and treated hides (Meier, 2010). In an experimental study Meier provided evidence that smoothed astragali were likely modified by rubbing them against ceramics. However, as the author admits, the goal of this activity could have been either the burnishing of pottery (in which case the astragalus would be a tool), or the smoothing of the astragalus for use
in another activity such as gaming. Nevertheless, it is possible that astragali were being used to
burnish pottery given that they were well suited for the task and were readily available to people
who subsisted by raising animals (neither ethnographic nor historical data were involved in the
formulation of this interpretation).

*Goodness of Fit.* While novel, interpreting knucklebones as tools for burnishing hides
and ceramics does not fit well with the archaeological evidence from Syria-Palestine. This
interpretation does not explain the compilation of groups of knucklebones in any context for
several reasons. First, not all groups of knucklebones are made up of polished astragali; this
interpretation does not explain the many other types of modifications. Second, it does not
explain the need to retain these knucklebones once they have been used. If knucklebones had
been strewn across a floor layer, or found in large numbers outside of certain structures, then this
interpretation might make sense. Pottery and hides are normally processed in relatively few
places in ancient settlements (*e.g.*, potter’s workshops; lithic workshops). Thus, higher
concentrations of the detritus from this work should be, and often is, found in only a few areas on
a site (*e.g.*, potter’s workshops often appear outside or near the periphery of settlements).
However, in some cases knucklebones are held in containers or placed in niches. This suggests a
treatment of knucklebones as something more than discarded tools. Another context that this
interpretation does not quite fit is that of burials. While it is common to find people buried with
certain tools (*e.g.*, weapons), it would be quite uncommon to find a person buried with tens or
even hundreds of examples of the same tool. While knucklebones may have been smoothed by
being rubbed against pottery, this could as easily have been done to polish the knucklebone as to
burnish the pottery vessels. The latter proposition does not suit the archaeological evidence.

*Medium of Exchange*
Another interpretation of the function of knucklebones was formulated by Richard Holmgren who proposed that astragaloi may have been used as a form of limited money (Holmgren 2002: 212, abstract). Holmgren’s proposition is based on an assumption that primitive games were usually derived from religious or cultic practices (Holmgren 2002: 212). Holmgren posits that the astragalus was a symbol for the life-sustaining (and profit-generating) force of one’s herds. This suggestion, along with the games’ roots in religion and divination, assigns the astragalus an intrinsic value and positions it to develop into a form of primitive money (Holmgren 2002: 212).

The basis for Holmgren’s interpretation rests on two phenomena. First, that games and magic are often linked. Holmgren cites ethnographic evidence collected by Kabsizska-Stawarz on the symbolic and magical nature of games with knucklebones among modern Mongolian pastoralists (Holmgren 2002: 213). To the Mongolian pastoralists, knucklebones are symbolic of “fertility and manifoldness”, both very important aspects to an economy that relies on large herds (Holmgren 2002: 213). The second phenomenon upon which Holmgren’s interpretation rests deals with astragali changing hands as winnings in games (Holmgren 2002: 213). This is well attested in ethnographic and historical data (see Dandoy at Gordion), but would be much more difficult to observe in the archaeological record. Taking these two assumptions together, it is easy to see how the knucklebone could come to have some intrinsic value and could be used as a form of money like that of dog’s teeth (i.e., Solomon Islands), cacao beans (i.e., Mesoamerica), and cowry shells (Holmgren 2004: 215). Of special interest are the parallels between cowries and knucklebones. Like knucklebones, cowries have been included as grave goods in great numbers, copied in precious materials, and filled with metal (Holmgren 2002: 217).
Though many of the large deposits of knucklebones found in Syria-Palestine are said to be found in cultic installations, it is important to realize that sometimes these areas are interpreted as such because of the presence of large caches of knucklebones (i.e., the “cultic” storeroom at Ta’anneck). In these cases, interpreting knucklebone collections as stored valuable goods is not without warrant, as they are often found among other valuable, but not necessarily sacred, goods. Holmgren’s interpretation is partly supported in the Aegean in the fourth and fifth centuries BCE, when knucklebones made a rare, but well documented cameo on the coinage of ancient Greek cities (Tahberer 2012: 8-20).

Proximity in Time. Holmgren’s interpretation is based largely on ethnographic data collected from modern Mongolian pastoralists. Thus, it is separated by a vast amount of time from the archaeological contexts that he is attempting to understand. Exacerbating the difficulties with using this ethnographic analogy is the fact that Holmgren’s interpretation rests upon these pastoralists having placed a symbolic value on these knucklebones. It is this symbolic value that supports the knucklebones’ use as game pieces and a medium of exchange among the Mongolian pastoralists. As discussed previously, special care must be taken when using ethnographic analogies for symbolic subjects as these are known to change over time and changes in meaning do not necessarily equate to changes in material culture.

Breadth of the Comparative Base. The ethnographic base for Holmgren’s interpretation is based on one ethnographic account of a people that covers a very small geographic area. Also, no other ethnographic example is known of knucklebones functioning as a medium of exchange from my survey of the literature. Thus, Holmgren’s comparative base is very narrow and less secure.
Goodness of Fit. Holmgren’s interpretation of knucklebones as a primitive currency is similar to Sasson’s interpretation of groups of knucklebones as “tokens”. These interpretations will be considered together for their goodness of fit.

Aharon Sasson has interpreted knucklebones from his site similarly to Holmgren. He interprets the collections of knucklebones from Beersheba’s Stratum II as functioning as “tokens” that could be exchanged for certain goods. Stratum II at Beersheba dates to the Iron Age IIIB in the Near East. A very large number of sheep and goat astragali (n=694) appear in Stratum II compared to the number of cow astragali (n=25). About three-quarters of these knucklebones were either partly or completely burned, a condition that Sasson attributes to a well-attested destruction event. Only seven of the knucklebones were drilled: these were found in isolation leading Sasson to believe that they were of more value than the cached knucklebones. Many of the knucklebones had cut marks, all of which Sasson attributed to butchery. Thus, even though knucklebones were thought to have some value, they were not treated as special during the processing of animal carcasses. Over thirteen percent of the knucklebones were ground or polished.

Sasson studied the spatial distribution of the astragali from Stratum II using a GIS (geographic information system). He found that approximately half of the astragali lay in a single locus located near a structure most commonly interpreted as a “storehouse” (some interpret this structure as functioning as a stable). Another twenty astragali were found in an adjacent “storehouse”. Seventy-two more astragali came from a room in the casemate wall, along with several complete juglets, a bowl, and a cooking pot. Sixty-two knucklebones were recovered from a cellar room of a house along with domestic wares, loom weights, and iron arrowheads. Several groups numbering from ten to thirty knucklebones were found in houses
that also had great numbers of bowls, jugs, cooking pots, and storage jars. According to their overall distribution throughout the site, Sasson states that it is more likely that the knucklebones were used for gaming rather than divination. If divination did occur, it would likely have taken place at the household level, at multiple locations, and not been officiated by a single “distinguished figure” (e.g., a priest or ruler).

Sasson asserts that the two most common interpretations of knucklebones, namely gaming and divination, are not directly supported by the spatial distribution of finds from Stratum II at Beersheba (Sasson 2007: 179). Because of the tendency for large groups of knucklebones to be found in structures interpreted as storage areas, Sasson suggests that they may have functioned as “tokens” for either exchange or the counting of merchandise. Unfortunately, Sasson does not build a further case for his interpretation and omits any ethnographic or archaeological parallels.

**Goodness of Fit.** While Holmgren’s use of ethnographic data is problematic and Sasson does not provide comparative evidence to support his claim, these interpretations of knucklebones as having intrinsic value fit very well with the existing archaeological evidence from Syria-Palestine. In this way, knucklebones found in groups in domestic complexes, often buried beneath the floor, can be viewed as stored wealth: the equivalent of burying money. Knucklebones are generally found in larger collections in civic/cultic complexes. This is explained by the fact that in redistributive economies, which predominated in Syria-Palestine during the Middle Bronze to Iron Ages, wealth tended to accumulate in the institutions that oversaw the collection and redistribution of goods; such as temples or palaces. Since objects of value were often included as grave goods in burials from the time period under investigation, this interpretation is compatible with groups of knucklebones included as grave goods. However,
this interpretation does nothing to diminish the interpretation of knucklebones as game pieces. In fact, according to Holmgren the value placed upon the knucklebones may have been a key factor to their role in games. Because this assessment of “knucklebones as items of exchange” seems to fit well with the sample, it will be tested against the individual contexts.
CHAPTER FIVE
TESTING “MEDIUM OF EXCHANGE” INTERPRETATION

Holmgren (2002) suggests that knucklebones may have functioned as a form of limited “currency” (Holmgren 2002: abstract). Likewise, Sasson (2007) suggests that the many caches of knucklebones from Beersheba’s Stratum II may have functioned as “tokens” for the exchange of certain goods (Sasson 2007: 179). Each of these interpretations rests on the idea that knucklebones had some form of assigned value and could be used as a medium of exchange. Even a cursory glance at the archaeological evidence seems to support this assumption. First, groups of knucklebones are often found in similar contexts (and often the same contexts) as valuable items (e.g., storerooms of temples; palaces). Second, knucklebones are often included in graves with other prestige objects that reflect the wealth of the deceased. Third, the numbers of knucklebones found in domestic complexes compared to the numbers found in civic/cultic complexes resemble the distribution of wealth in redistributive economies, where wealth tends to accumulate at the institutions that facilitate the collection and redistribution of goods.

The following chapter examines to what extent an interpretation of knucklebones as mediums of exchange fits with the sample of knucklebone finds considered in this study. This study re-assesses the “exchange” theory’s applicability to knucklebone finds beyond Sasson’s knucklebones at Beersheba. Next, some of the challenges with this theory will be examined. Finally, a new hypothesis will be offered that both addresses these difficulties, and incorporates the findings from this re-assessment.
Funerary Contexts

Knucklebones recovered from funerary contexts are variously interpreted as game pieces and ritual items. However, when considering the large numbers of knucklebones interred in a single deposit explaining them as game pieces is often untenable. Likewise, when considering other grave goods associated with the knucklebones, an interpretation of knucklebones as a form of currency seems more justifiable than explaining them as ritual items.

It is common to find valuable items among grave goods. Regarding the child’s burial at Ebla, this interpretation suggests that the knucklebones placed in it were included as valuable items. Although, one might say that it could be common to find a child’s playthings from life buried with them, the osteometric data suggest that this particular child was too young to have played with the knucklebones (Minniti and Peyronel 2005: 8). Furthermore, the great number of knucklebones (n=147) included in the burial exceed the number necessary to play any knucklebone game attested in the archaeological, historical, and ethnographic records.

The seventy knucklebones recovered from Tomb 251 at Megiddo were associated with ceramic vessels and jewelry. If only a few knucklebones had been interred here one might rightly interpret them as game pieces. However, a group of seventy knucklebones begs another explanation. Thus, a more fitting interpretation is that the quantity of knucklebones represented a value or status, similar to the other precious materials and items in the tomb. The other Late Bronze Age tomb at Megiddo (Tomb 258) had a single faience skeuomorph of a knucklebone. Faience replicas of knucklebones were common in ancient Egypt as game pieces, but are less common in Syria-Palestine (Tyldesley, 2007 p. 11). In the Egyptian game of senet, only a single knucklebone was used by each of the two players. Thus, interpreting this isolated find as a game
piece is sound, while the material itself does imply a high status item, and possibly also an import from Egypt.

The group of knucklebones recovered from a Late Bronze Age II burial cave in the Baq’ah valley accompanied beads, jewelry, a dagger, lamps, an alabaster vessel, and assorted ceramic vessels. The high value nature of many of these buried goods supports that these knucklebones also had value, possibly as “currency.” However, the small number of knucklebones, and the modification of only three of them, could permit a function as game pieces. One might also suggest a dual function as game pieces and status items.

Cultic Contexts

Groups of knucklebones in cultic contexts are usually found in large numbers and may reflect multiple offerings. These groups are often recovered from storage rooms among many artifacts that would have had considerable value in antiquity. The most typical artifacts associated with knucklebones include ceramic vessels, jewelry, beads, weapons, and various tools. The following discussion examines each cultic context in the study sample as well as other artifacts associated with the knucklebones.

Though the British excavations at Lachish did not pay much attention to the knucklebones, other finds in the “Fosse Temple” were described. For instance, a “large number” of knucklebones occurred alongside items such as carved ivory, imported Cypriot and Egyptian pottery, Egyptian metal objects, fish bones (i.e., fish would have been imported from the coast), a gold plaque depicting a naked Canaanite deity standing on a horse, and other artifacts (Ciamer 1980: 152). In this context, an explanation of the knucklebones as “currency” seems more fitting than an explanation of them as divinatory tools.
At Lachish, the group of five knucklebones recovered from a small storage room beneath the stairs to the “Altar Room” lay amongst a similar assemblage of artifacts, including numerous ceramic vessels, glass vessels, faience beads, gold jewelry (and other gold objects), scarabs (with various semi-precious stones), cylinder seals, shell fragments, and nails. In another room a single modified (smoothed) knucklebone was recovered among items that included pottery, jewelry, seals, copper-alloy weapons, a scarab, flint blades, and animal bones. This room was also interpreted as a storage room for the temple. Hence, once again knucklebones appeared among votive offerings containing a range of low to high value items.

The group of 684 knucklebones placed in a clay bowl found in the corner of Room 2081 in a cultic structure at Megiddo was interpreted as serving a ritual function. However, these knucklebones accompanied a very large cache of jewelry, lamps, stamp-seals, assorted ceramic vessels, and a limestone offering stand (Loud 1948: 45). The only object in the cache that has an explicit cultic function is the ritual stand. Once again, the knucklebones’ presence and numbers imply a certain value or symbolic significance.

Likewise the group of 140 knucklebones recovered from a very small room in the “Cultic Structure” at Tell Ta’annek is better explained as stored currency. Other items included eighty ceramic vessels, lamps, a strainer, loom weights, knives, a sickle blade, an iron javelin head, several stone grinders, balance weights, beads, an arrowhead, a mace head, a toggle pin, and one complete figurine mold (Lapp 1964: 26-32). The figurine mold is the only object among these that might be considered cultic in nature. These votive are not in themselves high status items, but many have value via their materials (e.g., metals), craftsmanship (e.g., jewelry), and intrinsic and ritual significance (i.e., as offerings).
The unspecified “large number” of knucklebones recovered from Room 406 at Tell el-Hammah can also be interpreted as currency. Other items found in this room include forty ceramic vessels, a molded figurine, a ceramic amulet, a stamp seal, and gypsum (Minniti and Peyronel 2005: 16). Once again, these votives are not luxury items, but rely more upon quantities and the associated offering rituals.

Domestic Contexts

Knucklebones are often recovered from domestic contexts, though in smaller numbers than in cultic contexts. Some domestic contexts have groups of knucklebones where none or only a few of the knucklebones are modified. This suggests that gameplay is not the only function of the knucklebones. In addition, knucklebones from domestic contexts are often buried beneath the floor. Such hidden deposits undermines interpretations of these items serving as game pieces. Instead, these artifacts could be interpreted as having some ritual significance (and value), as ritual objects (and wealth) are sometimes found buried beneath the floors of ancient houses. An example of this is the “lamp and bowl” tradition first recognized by Petrie a century ago, in which a lamp was placed in a bowl and buried beneath the floor of a house (Bunimovitz and Zimhoni 1993: 99). This tradition has been observed in Late Bronze and Iron Age strata in several Palestinian sites including sites in this study: Lachish, Beth Shan, and Tel Miqne (Bunimovitz and Zimhoni 1993: 99, 111-112, 115). However, small groups of knucklebones, and even groups larger than necessary for gameplay, are also found unburied in domestic contexts, but instead are stored alongside other items (Sasson 2007: 174). This implies that knucklebones in domestic complexes do not always or only serve as ritual items or game pieces in domestic contexts. The following discourse examines knucklebone finds in domestic contexts from the study sample and evaluates to what extent they can be explained as “currency.” Some
of knucklebone groups from domestic contexts at Iron Age Lachish should be similarly interpreted. For instance, some groups of knucklebones from houses can (and perhaps should) be explained as game pieces. Groups of knucklebones that consist of less than ten individuals parallel knucklebone games that are otherwise well-attested in the historic literature of later periods. This is especially true if such small groups are consistently made up of knucklebones that have been modified in such a way as to facilitate their use as dice, or show signs of wear from repeated use. However, other groups of knucklebone from the domestic houses at Iron Age Lachish do not fit these criteria. The knucklebone groups Lachish range in number from seven to sixty-five individuals. The group of seven is made up of at least six knucklebones that are unmodified and unworn (i.e., there is no data on the modification of the remaining knucklebones). The other groups consist of knucklebones numbering thirty-seven (thirty-two unmodified), nine (seven unmodified), twelve (ten unmodified), fifteen (seven unmodified), nineteen (eighteen of these were lost and lack modification data; one was ground medio-laterally), and sixty-five (thirty-three unmodified) (Croft 2004: 2432). The latter three of these groups came from a context with an abnormally high number of Judean storage jar fragments and loom weights. The rooms of this structure (“Lower House”) were ultimately considered domestic houses that may have doubled as storage rooms (Barkay and Ussishkin 2004:453). Since these groups of knucklebones do not uniformly contain individual pieces with modifications and signs of wear (which one would expect to find on game pieces), do not occur in association with cultic items or structures, and cluster in large groupings these artifacts seem more consistent with symbolic status items, namely some form of “currency.”

The group of eighty-two knucklebones from the floor of a domestic house at orbat Rosh Zayit occurred in association with pottery vessels, several stoppers, a large basalt mortar, and a
rock-cut cistern. All of the knucklebones were burned, while some were described as “scorched.” Two of the knucklebones are drilled, another nine are smoothed medio-laterally, while the rest are otherwise unmodified (other than the uniform “burning”) (Horwitz 2000: 225).

The high number of knucklebones recovered suggests that the group did not function as game pieces. Whether these bones had become brittle due to burning is not reported. If so, this would weaken an explanation of these knucklebones serving as currency. If not, then an explanation of knucklebones as symbolic tokens or value items could be appropriate. Another difficulty in interpreting them as “currency” is the fact that these knucklebones are nearly equally represented from the right and left side of animals. This suggests that the bones were paired (two from each of 41 animals). This means that this group of knucklebones was likely collected during the processing of animals. If knucklebones were currency, then one would expect that they would be exchanged between people. In this case, it is unlikely that the knucklebones were exchanged, since this would more likely have resulted in actual pairs being split up. Thus, an explanation of knucklebones as “currency” does not fit the archaeo logical evidence in this case, and perhaps in other situations as well.

Public Contexts

“Public contexts” is assigned to structures that represent administrative, defensive, or publicly accessible areas (such as public storage areas). The occurrence of groups of knucklebones in public areas varies from small collections (i.e., less than ten) to large collections (i.e., more than ten). Defining public areas can often be difficult. Large buildings (“palace” structures) are often considered “public structures” because of their implied administrative function, while they may have held domestic quarters as well. For the purposes of this research,
the original excavators’ interpretations of “public structures” are accepted generally unless a compelling reason arises to consider another possible function.

The group of seventeen unmodified knucklebones recovered from the Middle Bronze Age Northern Palace at Ebla lay in a pit in a floor of one of the palace’s rooms. These pieces were interpreted as possibly serving a “ceremonial” function (Minniti and Peyronel 2005: 10-11). However, these knucklebones did not show signs of wear and, thus, they likely had not been used as divinatory tools (i.e., dice used as an oracle, which normally show signs of wear from use). In addition, no other cultic objects are associated with the knucklebones. When considering other knucklebone finds from Ebla, it seems likely that these knucklebones were kept because they had a symbolic value like Beersheba’s knucklebone “tokens”. Some evidence for this is found in the knucklebones from the Western Fort at Ebla. These knucklebones occurred alongside balance weights in a well-fortified structure that may have had an administrative function.

At Lachish, three groups of knucklebones (six individual pieces in each group) appeared in pits in the courtyards of public structures. One of these pits was lined with plaster and contained a clay model shrine, a flint balance weight, a spindle whorl, over forty mollusk shells, flint blades, and various pot sherds. The knucklebones were unmodified and found in isolation from other bones from the same species. Despite their lower quantities, interpreting these pieces as “currency” is warranted because of their association with other valuable objects and because they were unmodified. However, their placement in a pit in the courtyard of a public structure makes this interpretation less compelling, unless they represent caches of buried “wealth” versus some form of ritual burial.
Challenges to Knucklebones as Medium of Exchange

While the idea that knucklebones can have value is clearly supported, there are also archaeological arguments that challenge knucklebones serving as “currency” with a specific charge or general value. First, only the astragali of certain species (namely, sheep, goats, and cows) are selected to provide knucklebones. Second, a significant number of knucklebones are modified in a variety of ways that suggest their use as game pieces. Third, even in sites where knucklebones have definite associations as artifacts and are collected in groups they still often appear in refuse pits as the byproducts of animal butchery. Although the first two factors do not necessarily disqualify an interpretation of knucklebones as currency, the third factor is irreconcilable. However, these issues can be addressed if one considers that an item can have value that is not transferable, but instead is personal.
In this chapter, the socioeconomic developments of Middle Bronze Syria-Palestine will be reviewed briefly. This review focuses on the role of the palace/temple and how it functioned to promote the production of surplus and subsequently extract and redisperse this surplus. Furthermore, it summarizes how the palace/temple required broad participation in infrequent redistributive feasts to promote and redisperse such surplus (Cohen 1993: 37). To gather food for such feasts, the palace/temple would require sacrifices to be brought to the temple for ritual slaughter. A portion would be sacrificed to the deity(ies) and the rest would be redistributed to the population in attendance. Such interpretations are bolstered by the archaeological evidence from Hazor and by Bronze Age texts from Emar (a prominent site on the Euphrates), while the role that knucklebones played in this redistributive system will be examined in Chapter Seven.

Economies in Middle Bronze Age Syria-Palestine

For about two to three hundred years prior to the Middle Bronze Age, during the Early Bronze Age IV, Palestine was politically fractured and its population largely rural (Dever 1987: 147). Most, if not all, large urban centers had been abandoned and were replaced by a scattering of small hamlets and villages. This collapse of the previous urbanized society was once attributed to a mass invasion of Syrian pastoralists called the “Amorites” (Richard 1985: 34-35). This proposition has been largely replaced today by theories of environmental changes in the Early Bronze Age IV (also called Middle Bronze I, Early Bronze-Middle Bronze, and Intermediate Period) that are thought to have undermined agricultural efforts across the globe.
(Rosen 1995: 26-28). Around 2,000 BCE, the political and social institutions of the Palestine began to solidify. Suddenly, new urban centers were being constructed. This urban renewal and expansion marks the beginning of what archaeologists call the Middle Bronze Age in Syria-Palestine, namely Middle Bronze Age IIA-C.

The Middle Bronze Age represents the zenith of urban and political development in Bronze Age Palestine. There is broad consensus that Palestine became much less isolated than it had been during the Early Bronze Age. In fact, there is such increasing cultural continuity between Palestine and Syria that it is during this period that we can first refer to the two entities together as Syria-Palestine, to which ancient texts offered the term “Canaanites.”

Many of the large urban sites received massive defensive fortifications. This is thought to have been in response to internal rivalry over territory as the city-states grew (Dever 1987: 154). Starting around the Middle Bronze Age II, nearly every city (and even some very small towns) invested in substantial and varying defensive structures (Dever 1987: 154). Some of these fortifications, including city walls with a rampart and glacis, would have required the gathering and organization of a vast amount of materials and labor. This reveals a system of socioeconomic organization that could have produced surpluses, not only for skilled workers and tradespersons, but also for a city-state bureaucracy and authority to facilitate and organize the redistribution of food and goods. Cities subsisted off the surplus food produced by the large, albeit varying, agricultural systems in their hinterlands. Further evidence of a redistributive economy is seen in urban planning at many sites, where space is carefully set aside for separate administrative buildings, food storage facilities, temples and public structures (Dever 1987: 154).
The roles of the religious and civic institutions in Middle Bronze Age Syria-Palestine are thought to have been related, if not altogether inseparable (Ahlström 1982: 6). Archaeologically this is attested by civic and religious buildings that are built as part of an acropolis that is separated from the rest of the city by either their elevation and/or a wall. Of note, in Early Bronze Age III Palestine, nearly half of the cities had an acropolis that was separated by a wall (Ahlström 1982: 5-6). Evidence for cooperation between “church” and “state” can be found in Sumerian texts dealing with divine rule, where the gods were said to make their will for foreign policy known to the king while it was the king’s responsibility to carry out this will (Munn-Rankin 1956: 69-71). Later, biblical references also describe a similar type of relationship between a king and the priesthood/divinity (Ps 45:7; I Chron 28:5). Thus, civic and religious functions could originate at either the palace or temple in this region from the Early Bronze Age through the Iron Age. Hence, the roles of the civic authority (i.e., often a king or similar authority) and the elite class of religious specialists (i.e., priesthood/cult) often have overlapping and complementary functions.

The Palace

A review of the textual and iconographic materials of ancient Near Eastern cultures provides evidence of the roles of their kings. First, the king is often considered the organizer and overseer of the temple cults (Ahlström 1982: 6-8). This is illustrated in a description of Hammurabi’s role with the cult, which dates to the early Middle Bronze Age:

the exalted supporter of E-kur;

the wise king, who restored Eridu to its place;

who purified the cult of E-apsu,

(Code of Hammurabi, Codex I:60ff)
The Middle Bronze Age Mari texts from Syria describe their king as making sacrifices and deciding the dates of festivals and religious sacrifices (Ahlström 1982: 7). In Mesopotamia, king Nābū-āpla-iddina of Babylon was given the right by Marduk, the patron deity of Babylon, to organize the cult, its rites, and its sacrifices (Ahlström 1982: 7-8). The other key duties of such kings were to act as the administrator and builder of the city-state or larger nations. It was the king who was responsible for building the temples and often these temples acted as administrative and financial centers, often responsible for levying and collecting taxes (Stevens 2006: 96-97).

The Temple

Temple officials played very important roles in the administration of certain key civic functions. One important function of the temple was to promote the production of surplus food and goods by levying taxes (Stevens 2006: 98-113). Surplus food was used to support the administrative civic and religious class, specialist laborers, and military forces. In addition, surplus food and labor were necessary for the construction of large public works such as temples, palaces, and defensive fortifications.

Another way that the temple promoted the production and receipt of surpluses was by requiring sacrifices to the deities. In Canaanite religion nearly any unfortunate event, from poor agricultural conditions to an invasion, could be blamed on an angry deity (e.g., Num 11:33; Potegal and Novaco 2010: 9-10). To appease the gods, civic and religious figures required sacrifices of food and other essentials to be made at the temple. Some sacrifices were made infrequently as either an atonement for some wrongdoing, or as a payment for temple services such as healing or divination (Stevens 2006: 93-94). However, the more socially and economically important sacrifices were made on special occasions that required the donation of a
great amount of food and other goods by a broad segment of the overall population (Hayden 2010: 399-400). Often, these events took the form of redistributive feasts, which were important drivers behind the production of surplus.

Redistributive Feasts

Redistributive feasting is a well-known phenomenon in ancient stratified societies. The ancient Greeks practiced redistributive feasting as a mechanism for promoting surplus in their redistributive palatial economies (Nakassis, Parkinson, and Galaty 2011: 180-183). Likewise, it is clear that the temple played a formative role in the redistributive economy of the Hittite Empire (Collins 2007: 206). The basic mechanics of redistributive feasting involve the gathering of food from the population at large in the form of sacrifices and the subsequent redistribution of a large portion of this food back to the donors.

Emic rationales for redistributive feasting usually deal with honoring deities or commemorating culture heroes. However, redistributive feasting has more tangible social and economic functions. A useful list of the social functions of feasting has been offered by Brian Hayden: (1) the mobilization of labor; (2) creating cooperative relationships within groups of people and excluding certain groups; (3) creating cooperative alliances between groups; (4) attracting mates, labor, or allies; (5) soliciting favors; (6) compensating for transgressions; (7) investing surpluses and generating profits; (8) creating political power; and (9) extracting surplus from the general population for elite use (Dietler and Hayden 2010: 29-30). This study focuses on the latter four functions. These will be discussed by examining Lev-Tov and McGeough’s interpretation of Late Bronze Age feasting at Hazor (informed by the Emar texts).
Communal feasting is evidenced in the archaeological record at Late Bronze Age Hazor (Zukerman 2007; Lev-Tov and McGeough 2007). Lev-Tov and McGeough’s article focuses on the ways identity was constructed and renegotiated at ancient redistributive feasts (Lev-Tov and McGeough 2007: 85). To examine this, the authors interpreted the zooarchaeological remains from the Late Bronze Age temple at Hazor by drawing parallels from a collection of Bronze Age cuneiform ritual texts from Emar, a Mesopotamian city similar in relative size and economic importance (Lev-Tov and McGeough 2007: 88).

Feasting at Hazor in the Late Bronze Age

During the Late Bronze Age, Hazor was likely the most powerful city in Palestine. In this period, while other cities were unfortified and served as Egyptian vassals, Hazor remained fortified suggesting that it may have been more politically independent (Beinkowski 1987: 50-61). During the Late Bronze Age, Hazor’s Upper City (the acropolis) held several of the city’s palaces, temples, and cultic installations (Lev-Tov and McGeough 2007: 89). A large palace and associated structures have been the focus of archaeological efforts since 1990. In front of the large Late Bronze Age palace is a paved courtyard with a raised stone structure interpreted as an altar. On one side of the courtyard lay a Late Bronze Age temple. Archaeological investigations of the courtyard have yielded artifacts that have led researchers to believe that it served a special function. The excavations in the courtyard have produced nearly 17,000 animal bones (among them six polished knucklebones), the majority of which come from contexts directly adjacent to the altar. This collection of faunal material is intriguing because of its large quantity and context, and also because it lay immediately below a thick destruction layer. This burned layer attests to a destruction event when the entire Upper City of Hazor was destroyed, possibly by Israelites, or others (e.g., rebelling Canaanites; nomadic populations; another city-state) (Lev-
Tov and McGeough 2007: 89). The bones below the destruction layer have been left largely undisturbed since their original deposition in the Late Bronze Age.

Because of the size of the zooarchaeological corpus and its context, the faunal remains from Hazor’s temple courtyard were interpreted as reflecting the detritus of sacrifices and feasts. Hazor’s faunal corpus is similar in species’ diversity to offering lists from other sites in the Near East (Lev-Tov and McGeough 2007: 96). The most abundant species consisted of sheep, goats, and cattle, respectively. Sheep and goats make up about one third of the corpus, while cattle make up nearly the entire remaining third. Other species present include (in descending order of total elements): deer, gazelle, domestic horse, ass, domestic pig, dog, duck, catfish (imported from Egypt), birds, bony fish, and “small mammals.” Collectively these species make up less than one percent of the total distribution of identifiable bones. However, an examination of the carcass part distribution suggests that cranial and foot elements are over-represented. This suggests that while the animals were butchered in this context, much of the meat-bearing parts were taken elsewhere—presumably in a redistribution of meat.

According to the Emar texts, the responsibilities for contributing to redistributive feasts were prescribed according to one’s profession. Thus, shepherd’s provided sheep and goats, while townspeople provided sheep, goats, and other food and animals (Lev-Tov and McGeough 2007: 99). Only the king, however, is expected to make more specific and larger contributions. In one account the king is said to have given two calves and six sheep, while the townspeople only contributed two sheep. The king is routinely cited as providing the largest contribution compared to other groups, and he is always the only donor specifically named in the Emar texts. Thus, it is likely that the king, as the “patron of the feast,” takes a financial loss for the event in hopes of gaining political and religious capital for his magnanimous public gesture.
The Emar texts suggest that the temple kept flocks for ritual purposes, as well as part of a
general economic strategy (Lev-Tov and McGeough 2007: 100). Thus, it is likely that the
animals provided as sacrifices were selected according to culling practices consistent with a
strategy for maintaining a productive herd or cattle. The same may be true of shepherds
regarding their flocks.

The distribution of species at Hazor, though seemingly rather narrow, was found to be at
least as diverse, if not more so, than other faunal assemblages from similar contexts (Lev-Tov
and McGeough 2007: 103-104). Likewise, the Emar texts record a great diversity of foods
included in their redistributive feasts. The Emar texts record with great specificity how the food
ought to be distributed to the guests. In terms of meat, different carcass parts were provisioned
to different types of people, usually according to their profession. Sometimes this followed a
logical system, such as when the singers were given the lungs of animals. At other times the
conventions called for distributions that are not as clearly understood, such as the king receiving
the kidneys and the diviner being given “the half-cut plus his share, the head, the intestines, the
fat, and the hide” (Flemming 1997: 431). At Hazor, it is likely that if any specific portion was
taken by the temple officials, it was the head, as it is overrepresented in the faunal corpus (Lev-

This demonstrates the nature of feasting in Late Bronze Age Hazor. Hence, a shepherd
or farmer must produce more food than is needed for basic subsistence if they are to sacrifice
food to the gods. Often, redistributive feasting becomes competitive, as the elite members of
society attempt to out-do one another in hopes of gaining political capital (Hayden 2001: 400-
401). This research aims to demonstrate that such status-climbing efforts were not limited to the
upper classes, but also promoted the production of surplus even among the food producing
population. It is the hypothesis of this research that knucklebones were status items whose value was rooted in their use as tokens representing the sacrifices contributed to these redistributive feasts. Since this hypothesis is partly built upon evidence from Lev-Tov and McGeough’s interpretation of feasting at Hazor, their use of textual analogies will also be evaluated (below). This interpretation will be evaluated by the analogous culture’s cultural and temporal proximity to Hazor and whether or not the comparative base is appropriately broad to support the interpretation.

Proximity in Time. This research was designed to describe the way that the selected knucklebones may have functioned using contemporary supporting data with minimal reference to and/or reliance upon ethnographic materials. This is because the sources of the ethnographic evidence are too far removed and unreliable, both culturally and temporally, from the contexts addressed in the sample (see literature review). This hypothesis contends that knucklebones functioned as a part of a temple-based redistributive feasting complex, as informed by a study of religious feasting at Hazor. Interpretations of Hazor’s feasting relied mainly on an article by Lev-Tov and McGeough, which explained feasting at Hazor using Bronze Age texts from Emar, a vassal city to the Late Bronze Age Hittite Empire. Since these materials play such an integral part in this hypothesis, it is necessary to evaluate the appropriateness of these texts as an analogy for redistributive feasting in Middle Bronze to Iron Age Syria-Palestine.

The Emar texts are argued as being an appropriate parallel for several reasons. According to earlier administrative records recovered from Ebla, Emar lay under Ebla’s political influence in the Early Bronze Age (Pettinato 1976: 50-52). Thus, Emar shares a direct cultural, or at least political, link with one of the sites in the sample. During the Late Bronze Age, most of the southern Levant lay under the political influence of Egypt. Hazor may, however, have
been a bit more autonomous. Late Bronze Age Hazor was a fortified city, unlike most other cities in the southern Levant, which suggests that it had more independence from Egyptian rule, or at least favored status. This evidence, along with some materials from New Kingdom Egypt, may suggest Hazor had more cultural affiliation with the adjacent Hittite or Assyrian states (EA 148:41 in Beinkowski 1987: 145-146; Lev-Tov and McGeough 2007: 87-88). On the other hand, Hazor, which traditionally had strong ties with Syria (e.g., Mari) in the Middle Bronze Age did lie well within Egypt’s sphere of domination of Palestine throughout the Late Bronze Age IB-IIA and into the Iron Age IA. Notwithstanding, the Emar texts are also contemporaneous with Late Bronze Age Hazor, and the two cities (which are similar in relative size and economic importance) are at least part of the same greater Canaanite culture of Syria-Palestine, outside Egypt’s political sphere of domination. Therefore, the Emar texts on feasting are appropriate as an analogy for feasting in Syria-Palestine as a whole.

**Breadth of the Comparative Base.** Lev-Tov and McGeough’s interpretation of the faunal material from Late Bronze Age Hazor is based mainly on a collection of over 200 texts, some of which describe specific people and events (Lev-Tov and McGeough 2007: 88-89). In this respect, the comparative base can be considered broad. On the other hand, the occurrence of all of these texts from a single site might diminish some of this confidence. However, one can also note that feasts make up a preponderance of the subject matter in ancient Near Eastern art and iconography (Hayden 2010: 392-401). Thus, it is likely that the Emar texts are indeed representative of a larger economic and sociopolitical complex in the redistributive economies of ancient Egypt, Syria-Palestine, and Mesopotamian city-states. The breadth of the comparative base used by Lev-Tov and McGeough to interpret feasting at Hazor is arguably narrow, but only because they did not utilize the very wide iconographical, textual, and archaeological
comparative evidence that exists. Hence, the comparative base for the interpretation of ritual feasting at Hazor is actually sufficiently broad.
CHAPTER SEVEN
KNUCKLEBONES AS A TOKEN FOR SACRIFICES

The hypothesis purporting the application of the knucklebones as “currency” produced a level of satisfaction for the majority of the sample, but some challenges remained regarding their relative value and role in exchange. First, the preponderance of knucklebones comes from a relatively small number of species (especially domestic sheep and goats). This suggests that the knucklebones were widely accessible and, thus, not likely rare. The second challenge involves knucklebones being often modified in such a way as to suggest they functioned as game pieces. The third issue concerned the observation that even at sites where the populace collected and stored knucklebones, astragali are still found in refuse pits. In other words, only a selected number of astragali were used as artifacts. Each of these challenges can be reconciled by the hypothesis that knucklebones could serve as status items with an associated value that is not transferable, but personal. Selected knucklebones could serve as tokens representing the actual animals that a person contributed to a redistributive feast. Thus, a group of knucklebones could reflect a tally and status symbol. It is by awarding such knucklebone tokens that a temple and/or palace was able to foster competitive giving, without having to make any meaningful material investment in producing a token. Hence, a given person provided a useful, material product (i.e., meat) as a gift/sacrifice and would receive in return a symbolically valuable (but materially worthless) token that came from the donated animal offering(s). The following section demonstrates how this hypothesis reconciles many of the difficulties listed above and evaluates this interpretation based on the same criteria used to assess previous interpretations in the
literature review. Specifically, this will examine the hypothesis regarding its use of ethnographic parallels (*proximity in time*), the *breadth of its comparative base*, and its *goodness of fit* concerning the archaeological evidence in the sample.

**Reconciling Apparent Challenges to the Interpretation**

*Astragali of only Certain Species.* If knucklebones were taken from sacrificed animals, as this hypothesis posits, then it is little wonder why only astragali of certain species are selected for retention. First, the main species represented by knucklebones are sheep, goats, wild deer, and cattle. The main reason why knucklebones reflect these particular species is not surprising since they represent the most easily available animals. This species distribution is also paralleled by the faunal assemblage from Hazor’s Late Bronze Age temple deposits. The only difference between knucklebone and animal bone proportions is that cattle were more abundant in the temple assemblage at Hazor. Lev-Tov and McGeough suggest that this peak in cattle bones might reflect the Hazor elite making contributions of cattle for sociopolitical reasons. Regarding wild animals, though Middle Bronze Age and Iron Age urban centers relied mainly on agriculture, small amounts of wild game are normally present in the zooarchaeological record (*i.e.*, hunting). One potential problem with this hypothesis is the suspicious scarcity of pig astragali in the study sample. Pigs, though not common, are found in the faunal assemblages of almost all archaeological sites in Syria-Palestine. However, it is recognized that they do become rarer starting in the Middle Bronze Age (Hesse and Wapnish 1998). This is likely because pigs became considered increasingly inappropriate for sacrifice in many ancient Syro-Palestinian cultures (Hesse and Wapnish 1997: 207). There are at least three possible reasons for this, one environmental and one cultural (and these are not mutually exclusive).
Marvin Harris theorized that the root of the pig taboo common in Semitic cultures was essentially ecological (Harris 1989: 40-42). According to Harris, the pig was not suited to eating the foods naturally available in Syria-Palestine, which contains mostly grasses and shrubs. Pigs need foods that are low in cellulose, namely nuts, tubers, and grains. Thus, pigs would be direct competitors with people for staple foods. In addition, pigs are not useful for their secondary products, except maybe leather. Furthermore, pigs are maladapted to the hot and dry climate of Syria-Palestine because they do not sweat. In the absence of other options, pigs will wallow in their own excrement in order to stay cool. Thus there may be some truth to the idea that pigs were avoided because they were considered “dirty.” Besides all of these factors, the way that pigs eat, by uprooting plants, would be damaging to the already marginal environment in Syria-Palestine (Harris 1997: 72-73). Most, if not all, of these problems could be mitigated if a settlement only raised a small number of pigs. However, in cities where the economy is based on promoting the production of surplus, the authorities and administrators would likely find it necessary to address the problems caused by too many pigs. This might be accomplished by disqualifying pigs as candidates for sacrifice at temples. Hence, even if people were not barred from eating pigs, it would be economically unfeasible to keep very many pigs if they were excluded as acceptable sacrificial animals.

Another explanation for why pigs are often excluded in Syro-Palestinian sacrificial offerings, particularly in the Late Bronze Age, may concern the cultural conventions of the elite in Egypt, who dominated much of Canaan during this period (Lev-Tov and McGeough 2007: 97). Richard Redding has suggested that the relative rarity of pig bones in Egyptian New Kingdom faunal assemblages in cultic and elite settings was due to an elite distaste for pig (Lev-Tov and McGeough 2007: 97). On the other hand, pig-raising and consumption is well attested
among the lower classes in Egypt (e.g., Amarna) (Kemp 1987: 40-41). Thus, perhaps the pig avoidance in the Late Bronze Age Levant reflects elite persons in Levantine vassal cities mimicking the cultural preferences of their Egyptian overlords. This explanation, however, does not account for the fact that the decline in pig raising in Syria-Palestine coincides with Egypt’s preceding Second Intermediate Period (1800 BCE to around 1550 BCE), when Egypt was politically fractured and dominated by Canaanite-derived Hyksos in northern Egypt.

A third possible explanation for the apparent pig avoidance in Canaan has to do with administrative influence on household production. Diener and Roblin explain the root of the Islamic taboo on eating pork as a political device used to shift power from the household to the centralized political power in the early Islamic Empire (Diener and Roblin 1978: 502-503). The authors argue that this developed as a way to more effectively convert and control peasants in newly acquired settlements. Perhaps the apparent pig avoidance in earlier Canaanite settlements was part of a similar effort by the temple or palace administrators to wrest political power from the household level. Though originally formulated to refute Harris’ theory explaining pig avoidance as an adaptive strategy to the Near Eastern environment, these two theories need not be at odds. Since pig avoidance in the Near East is so pervasive and represented so broadly, it is likely that there are multiple underlying factors in play.

The reason why only certain species’ astragali were selected for use as knucklebones can be explained as an administrative proscription by the temple that made pigs unfit for sacrifice, and thereby absent as tokens in Syria-Palestine. Likewise, by giving knucklebone tokens for only certain species, a given temple could influence the productive efforts of livestock owners and shepherds. Since herding is generally a much more productive subsistence strategy than hunting in Syria-Palestine, it would be in the interest of temples to encourage people to raise and
offer animals rather than hunt wild game. This explains why the astragali of certain (mostly domesticated) species are used as knucklebones and why the relative abundance of knucklebones recovered is biased to small domestic ruminants. On the other hand, the more limited access by urban populations to wild animals would also self-govern the proportions of animal types offered. This is reflected in knucklebone tallies.

**Knucklebones Modified as Game Pieces.** Another challenge that this hypothesis overcomes is the fact that knucklebones are often modified for use as game pieces. The hypothesis that knucklebones represented status items is easily reconciled with this well-attested interpretation. In fact, the two interpretations are actually complementary. Dandoy observed that some knucklebone games involved the victor winning a portion of the loser’s game pieces. This implies that the knucklebones had some value. Knucklebones require no modification for use as dice, so long as the game incorporates the natural difference in probabilities of the sides by assigning faces of the die different points (or perhaps different combinations of “face-up” sides). Dandoy noted that people also use knucklebones to play games of skill, where it is advantageous to wear down the medial and lateral sides of the bones. This is a simple modification (unmodified and smoothed knucklebones are the most common types in the sample). Since it takes little or no investment of time to make the most common types of game pieces and because the bones themselves are not intrinsically valuable, to lose some of them in a game would not harm the original owner(s). However, if the knucklebones did contain some personal intrinsic value that was based on cultural knowledge shared by players, then one would have an increased incentive not to lose the game: the game only becomes more interesting when the stakes are higher. Naturally this remains conjecture, but it could help explain why groups of knucklebones are normally composed of mixed groups of unmodified and variously modified
pieces. These different types of groups imply that the knucklebones are being exchanged in gameplay. Accepting this hypothesis, however, does not mean that all knucklebones must be status symbols. For instance, knucklebone games could be played just for sheer fun without anything but pride on the line. Hence, game pieces need not be status symbols, nor must the opposite be true.

Knucklebones in Refuse Pits. The hypothesis that knucklebones functioned as some sort of status items also reconciles the coincidence of both groups of knucklebones and non-artifactual astragali found in trash deposits. If knucklebones functioned as items with general value for the exchange of goods (e.g., like later cowrie “currency”) this would be an insurmountable inconsistency. However, when the value of a knucklebone becomes more personal, the presence of astragali in trash pits becomes much less troublesome. For instance, knucklebones that functioned as tokens from a specific sacrifice would have a value that could not transfer to another knucklebone from a non-sacrificial animal. This type of value is similar to that of a symbolic trophy, or medal, awarded for some accomplishment. The item in question can be sold, stolen, or otherwise transferred, but the value of the item itself is symbolic and tied to some personal accomplishment. Thus, selected knucklebones that represented status items were not appropriate as mediums of exchange. Instead, they were valuable only to their owners because they reflected their level of contribution to such things as a city-wide feast. One possible problem with this is the ease of counterfeiting. If knucklebones reflect the actual contribution that a person made to feast, then what would stop someone from claiming value to astragali taken from regular butchery refuse? Archaeologically this cannot be answered. However, it is this writer’s contention that if counterfeiting did take place (which it likely did) it was uncommon enough not to diminish the value of knucklebones as status items. If the
knucklebone tokens were considered to have some supernatural quality, and this was only effective in knucklebones from actual sacrifices, then this would likely minimize counterfeits. While a tempting proposition, this possibility must remain speculative in the absence of archaeological/textual evidence.

Testing the Hypothesis

This research aims to explain knucklebones from various contexts in the sample by evaluating their function(s). The contexts of the finds as well as other artifacts associated with the knucklebones were considered. The use of ethnographic and historical analogies for knucklebone finds was avoided, but was discussed in their applications to other theories about knucklebones. This is because the ethnographic and historic data dealing with knucklebones is too far removed, temporally and culturally, from the contexts for the study sample to be reliable analogs. Hence, no evaluation is needed for either proximity in time or breadth of the comparative base. Instead, this study’s hypothesis will be evaluated for its ability to provide satisfying explanations for knucklebones found in the various context types encountered in the sample, and the goodness of fit. A discussion will follow as to the generative quality of the hypothesis, namely its ability to inform interpretations of artifacts, contexts, or other cultural phenomenon.

Temple Contexts

The hypothesis that knucklebones are status items functioning as “tokens” representing the sacrifice of animals at the temple explains most knucklebone finds in the sample very well. Following the logic of this hypothesis, groups of knucklebones found in temples can be explained in three ways (and these are not mutually exclusive). First, knucklebones in temples may attest to a tradition of the temple collecting one of the knucklebones from each animal that a
person brought for sacrifice. This could have been motivated by a need to account for the number of animals collected (see Sebesta 1993 for a similar conclusion). To this end, a knucklebone would have been preferable to more abstract means of accounting (such as written records) because the knucklebones provide greater authenticity. This also could have been motivated by the use of knucklebones as ritual paraphernalia; this explanation is strengthened by the fact that knucklebones in temples are often found in large numbers in storage areas. On the other hand, one might expect that only the knucklebone from a specific side of the animal be collected (not unlike the Egyptian offering of the right foreleg of an animal), versus knucklebones being attested from both sides of an animal (Ikram 1995: 50-51, 129-30). A second explanation for knucklebones found in temples could be that the temple kept flocks for ritual and/or general economic purposes. Some evidence is found in the Emar texts, in which temples are said to contribute to feasts from their own flocks (Lev-Tov and McGeough 2007: 100). This explanation would suggest that temple officials engaged in competitive giving along with the rest of the population. However, the temple would have an advantage in that they would essentially be giving to themselves (although temple flocks may also have been built up by donations as well). This second hypothesis is not necessarily in conflict with interpretations of knucklebones as divinatory items; it is clear that knucklebones functioned in various ways. This hypothesis has an added advantage, though, in that it explains both the small and very large groups of knucklebones in temple contexts.

Public Contexts

Public contexts are more difficult to explain because of the nature of their function. Palaces are often considered as “public” structures because they are believed to serve an administrative function. However, it is often difficult to extract archaeological evidence
revealing the difference between large structures that mainly acted as domestic quarters and ones that functioned mainly for public administration. Furthermore, this dichotomy assumes that a single structure cannot be used for both functions simultaneously (even though this is probably often the case). Hence, public structures, such as the palaces at Ebla, are categorized as “public” contexts according to the original excavator’s interpretation. In reality, it is probable that findings in “public structures” actually represent elite domestic activity that includes administrative activities. Nevertheless, despite such quibbles over functional labels, the proposed hypothesis provides a satisfying explanation for the knucklebone finds from public contexts. Elite officials could have practiced competitive giving in the hopes of gaining influence with the temple and the population of the city at large (Hayden 2010: 400-401). This was especially true of kings, who, according to the Emar texts, were the most magnanimous contributors to feasts (Lev-Tov and McGeough 2007: 107-108). On the other hand, knucklebone tokens may also reflect a “donation receipt” between temple and state.

According to the proposed hypothesis, one would expect to find larger collections of knucklebones in “public contexts” than private “domestic contexts.” This would reflect the enhanced access to surplus resources that the elite would have enjoyed. This is supported by the finds from public contexts at Beersheba. Public contexts account for over 50% of the sample from Beersheba, while these contexts reflect only two deposits from adjacent complexes. The other knucklebones are distributed among several domestic contexts (Sasson 2007: 172-174). The Western Fort at Ebla was considered a public structure that was likely to have had an administrative function. It yielded a group of seventeen knucklebones with a variety of modifications. The finds from the Northern Palace at Ebla consisted of groups of two and seventeen individual knucklebones. The exact function of this context is unclear, but it was
either an administrative palace, or it may have served a “ceremonial” function (Minniti and Peyronel 2005: 10-11). The group of two knucklebones came from an earlier occupation layer and could be incidental; the group of seventeen lay in a pit in the floor of one of the rooms. However, these finds are consistent with the collection of knucklebones as status items representing animals contributed to feasts.

Other finds in the sample are more difficult to interpret for various reasons. The three pits at Lachish only contained six knucklebones each (much less than one might expect to find in a public context). These were considered artifacts because they represented sheep/goat astragali found in proportions higher than other bones from the same species. None of these astragali were modified or worn. It is possible that these astragali were not artifacts, but that their inclusion in these pits (which did contain other animal bones) was incidental. Another problem with these pits is their interpretation as “public contexts”: Each of these pits is associated with the courtyard of a structure. Thus, it is possible that these pits actually contained items from a domestic complex. Hence, these contexts are less useful in evaluating the hypothesis’s goodness of fit. The single copper-filled knucklebone from Ugarit, because of its insecure provenience, can neither strengthen nor weaken the proposed hypothesis.

The proposed hypothesis fits most of the study sample very well, but does not adequately explain other finds. This is likely the result of difficulties inherent in interpreting each structures’ function. Nevertheless, the hypothesis’s goodness of fit for explaining knucklebones from public structures is somewhat less compelling than for other contexts.
Domestic Contexts

According to the proposed hypothesis, one would expect to find the smallest groups of knucklebones in domestic contexts. However, the fact that ancient people had differential access to animals for sacrifice due to their professions and socioeconomic statuses ensures an expectation for some variation in the size of knucklebone groups. This is observed in the sample. Domestic contexts have groups of knucklebones ranging in size from ten to eighty-two individuals. Most domestic houses at Beersheba have between ten and thirty knucklebones; two of the houses have groups of sixty-two and seventy-two, respectively. Each of these knucklebone groups is found in larger groups with other artifacts that suggest purposeful storage. The Iron Age domestic context at Ḍorbat Rosh Zayit has eighty-two burned and paired knucklebones. Some domestic contexts at Lachish from Level III have groups of fifty-five, nineteen, and fifteen knucklebones. Other domestic contexts from Level IVa at Lachish have groups of seven, twelve, nine, and thirty-seven knucklebones. In each of these contexts the knucklebones are found among other artifacts commonly found in domestic houses.

In all of these domestic contexts the groups of knucklebones represent mixed groups of variously modified (or unmodified) pieces. This suggests that the knucklebones were definitely being used, likely for gaming, and might also suggests that they are changing hands as a result. A hypothesis of knucklebones as status symbols is consistent with these findings.

Funerary Contexts

The hypothesis of knucklebones functioning as status items is consistent with knucklebone finds in funerary contexts in the study sample. Items of both symbolic and intrinsic value are often included as grave goods in ancient Syria-Palestine. Also, funerals were often the occasion for feasts and other religious rituals (Goring-Morris and Horwitz 2007). Some
investigations of burials from Middle Bronze Age and Late Bronze Age Ashkelon have demonstrated that the goods involved in their “funeral kit” were not meant to convey wealth, but instead represented objects inherent to the mortuary rites officiated by the temple (Baker 2002: abstract). Thus, knucklebones may have been dedicated to the deceased as symbolic tokens for the sacrifices that were made on their behalf. Thus, the number of knucklebones may indicate how many guests were involved in the feast, and/or how many animals were sacrificed at the feast. In this way we can explain why many knucklebones are found in burials associated with valuable objects. For instance, the study sample’s burial contexts include groups of 147 knucklebones in the child’s burial at Ebla (suggesting a major sacrificial feast for a young child) and a group of seventy knucklebones in Tomb 251 at Megiddo (suggesting another significant sacrificial offering for the individual, or individuals, in this burial context). Another example of this may be the group of sixteen knucklebones recovered from the cave burial in the Ba’qah Valley in Central Jordan. This latter context must be interpreted with caution, however, because it was found heavily looted and may reflect multiple burials over time. The proposed hypothesis can explain the presence of groups of knucklebones in funerary contexts. However, so little is known about ancient funeral rites in ancient Syria-Palestine that the explanation must heap conjecture upon the very scant archaeological evidence. The presence of knucklebones in funeral deposits does nothing to diminish the proposed hypothesis, but unfortunately the proposed hypothesis does little to inform other aspects of ancient funerary practices.
CHAPTER EIGHT
DISCUSSION

The hypothesis proposing knucklebones as status items deriving their value as tokens for sacrificial donations to redistributive feasts has a few advantages over previous interpretations of knucklebones. Perhaps the most important advantage is that it provides a causal mechanism that helps explain a wide variety of knucklebone modifications. The proposed hypothesis is complementary to interpretations of knucklebones as oracular tools, game pieces, personal ornaments, and grave goods because it explains the underlying value of knucklebones. For example, the proposed hypothesis clarifies why some knucklebones are pierced and appear to be worn as personal ornaments. Also, the proposed hypothesis explains large groups of knucklebones that other approaches have been unable to interpret. Many large groups of knucklebones have been interpreted as having “ritual” or “cultic” functions without any attempt to address how the artifacts actually functioned. Thus, “ritual” or “cultic” have become common labels for large groups of knucklebones that are poorly understood, while an interpretation of them as game pieces would be inadequate. The proposed hypothesis attempts to explain the function of knucklebones, and the value behind them, in a way that is testable against the archaeological record. In addition, the proposed hypothesis explains knucklebones by examining their configurations within diverse contexts and in association with other objects instead of relying on far-flung ethnographic and historical analogies. In this way interpretations of knucklebones are formulated without depending on ethnographically biased explanations. Finally, another benefit of the proposed hypothesis is that it accounts for the great proliferations
of large groups of knucklebones in the Middle Bronze Age through Iron Age. If knucklebones functioned to promote the production of surplus, it stands to reason that they could be collected in large numbers in periods of urban expansion.

Though the proposed hypothesis is suitable to explain most contexts in the sample, it does lack explanatory value in interpreting the function of knucklebones from graves without depending too heavily on inference and conjecture. In addition, the proposed hypothesis depends greatly on knowing the actual function of a given context. Thus, when the function of a structure is unknown, the hypothesis’s explanatory value is greatly diminished. However, the same can be said for interpreting most artifacts. Last, the hypothesis is still unable to explain why knucklebones are sometimes found buried in pits in domestic houses. It is not uncommon to find various items buried beneath the floors of houses. An example of this is the “lamp and bowl” complex at Ashkelon and several other Bronze Age sites in Palestine, where a lamp and inverted bowl are found buried beneath the floors of many domestic houses (Bunimovitz and Zimhoni 1993: 99-125). This undoubtedly has a symbolic or religious reason, as do the knucklebones buried beneath house floors. In a recent examination of knucklebones from Iron Age I Tel Afis, Giorgio Affanni posits that the knucklebones often found beneath the stone foundations of walls and beneath house floors served a propitiatory function (Affanni 2008: 77). Affanni also recognizes the possibility that knucklebones may have been collected to “remember the wealth destroyed and the pious act which transformed the animal into meat” (Affanni 2008: 87).

Future research should be aimed at providing more detailed explanations for groups of knucklebones from funerary deposits and domestic floor pits. Other future research might attempt to identify the retention of astragali in site reports that do not specifically report them as
artifacts. In compiling this research, it was recognized that several contexts in urban sites have
counts for astragali from sheep and goat that far exceed the number of other foot bones from the
same species (Hesse, Fulton, and Wapnish 2011). An interesting study would be to find if the
numbers of astragali from contexts were overrepresented compared to other foot bones within
discrete contexts. This study would have the advantage of being capable of analyzing astragali
found in refuse pits and among habitation debris.

In conclusion, the hypothesis that some knucklebones were tokens of sacrifices donated
at the temple as food for redistributive feasts is sufficient for explaining finds from the various
contexts in the sample. This hypothesis explains the greatest number of cases in the sample with
less contradiction than any other existing interpretation. Hence, the hypothesis is confirmed and
should be tested further against a larger sample of archaeological sites. In addition, since this
hypothesis explains knucklebones as mechanisms for promoting the production of surplus in
agricultural city-states, it should also be tested against knucklebone finds from other cultures
with similar technologies, environments, and patterns of social organization.
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