BEYOND ‘COUNTING SHEEP’:

ISOTOPIC APPROACHES TO MINOAN AND LATE CYPRIOT SHEPHERDING

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Jeffrey Francis Leon

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BEYOND 'COUNTING SHEEP': ISOTOPIC APPROACHES TO MINOAN AND LATE CYPRIOT SHEPHERDING

Jeffrey Francis Leon, Ph. D.

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This dissertation examines the role of shepherds within Late Bronze Age (LBA, c. 1650-1100 BCE) complex political and economic systems on the islands of Crete and Cyprus. It argues that shepherds were strategic actors within these Minoan and Late Cypriot systems, whose control over domestic animals and domestic animal products made them an important—though often overlooked—group during the period. The study examines the livestock management, product specialization and mobilization decisions made by LBA shepherds that were at once based on ecological, political, social and economic factors, and in turn, shaped ecological, political, social and economic processes that characterized the Late Bronze Age on Crete and Cyprus.

Non-centralized actors (including shepherds) have traditionally been ignored or unexamined in the Minoan and Late Cypriot world, as research has tended to focus on Minoan 'palaces' and Late Cypriot urban centers. This work turns to consider the role of the individuals and groups that provisioned these growing settlements. I examine the focus on centralized places and perform a critical analysis and review of the theoretical underpinnings of such an approach, ultimately arguing for a new paradigm

for considering the agency and role of non-centralized, non-urban groups in the Late Bronze Age. I then proceed to contextualize the agency of Minoan and Late Cypriot shepherds by examining the various environmental, political, social and economic factors that constrained and structured the world in which they made their livestock management decisions. Finally, I turn to original strontium and oxygen isotopic analysis performed as part of this dissertation project to evaluate the actions taken by Late Cypriot shepherds given the historical realities they faced.

This project seeks to blend anthropological and political theory, ancient political economics, archaeological data and isotopic analyses to better understand the role of individuals who have been conventionally overlooked. It is an investigation into the complex ecological political, economic, and social variables that would have impacted Mediterranean Late Bronze Age livestock management, and the strategies employed by Minoan and Late Cypriot shepherds within these systems.

BIOGRAPHICAL SKETCH

Jeffrey Leon received his B.A., *summa cum laude*, from The George Washington University in Classical Humanities and Archaeology in 2007. He has worked on archaeological projects in Cyprus, Crete, Armenia, Israel and Honduras.

For my parents.

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CHAPTER 1

INTRODUCTION

"Of the humbler members of the population we can say less. The variety of trades followed shows a highly developed division of labour, but it is not clear how far the craftsmen were royal servants, or even slaves, or what other status they enjoyed."
– Michael Ventris and John Chadwick, *Documents in Mycenaean Greek*[1]

1.1 In Search of the Humbler Members of Society

History, it has been said, is written by the victors. Often, this refers to military victors who embellish their conquests and dampen the valor of their enemies, but it is equally true of social, political and economic victors whose elite status in a society makes it possible for them to tell their own stories at the expense of the stories of other integral, though often humbler, members of the same society. Historians, therefore, face the significant challenge of trying to tease the realities of the past from these incomplete and often one-sided histories. Indeed, this is the very challenge that Ventris and Chadwick allude to above. While their analysis of administrative documents from Late Minoan elite centers provided an unprecedented glimpse into the inner workings of the Minoan political economy, the documents were hardly interested in the concerns of the "humbler members of the population."

Archaeology provides a complement to the perspective afforded by history.

[1] 1956: 122-123

As a discipline that relies on material culture as its prime source of evidence, it possesses a unique opportunity to investigate the lives of these "humbler" groups. Whereas the texts of history are inherently skewed to represent a specific view from their very conception, the material culture that is the data on which archaeology builds its understanding of the past can be equally deposited by commoners and elites alike. While true that depositional processes and preservation biases do shape the material culture that is available for study so that some groups are more easily 'seen' in that archaeological record, than others (e.g. sedentary groups versus nomads), all past human groups can be accessed by their material impact on the world in some capacity. Archaeology, therefore has a unique ability—and indeed, a unique responsibility—to color-in the outlines of the past and to consider the metaphorical 'losers' of the ancient world, as well as the winners. This is, at once an exciting and unnerving realization. For the optimist, this means archaeology holds great potential for broadening our understanding of the ancient world; for the pessimist this places a considerable responsibility onto the shoulders of the discipline.

Despite the field's potential, archaeological studies have, historically, tended to focus on monuments, temples, tombs and major cities. This holds true for the archaeology of the Late Bronze Age Eastern Mediterranean as much as for any other geographical study region. The excavations at palaces, urban sites or, at best, country villas have delivered material culture that prioritized an understanding of elite individuals at major settlements. Fortunately, a recent combination of theoretical movements including post-structuralism and agency theory (e.g. Hamilakis 2002) have encouraged archaeological research to expand out beyond the walls of the palaces to begin to investigate the interface between the people at the centers and the individuals and groups that supported those centers by producing goods and materials in the hinterlands. This dissertation is a contribution to this movement as an investigation into the challenges, strategies and perspectives of the Late Bronze Age shepherd on Crete and Cyprus.

1.2 Intellectual History and Geographic Scope

The Late Bronze Age (c. 1600-1100 BCE) was a period of substantial social, political and economic complexity in the Eastern Mediterranean (which includes, broadly speaking, the Aegean, Anatolia, Levant, Egypt and Cyprus). International correspondences (e.g. letters from El-Amarna in Egypt and elsewhere; Moran 1992) attest to a high level of interaction within a network of various political entities, including first-tier kingdoms such as the Hittites and Egypt, and regional city-states like Ugarit and Byblos. The rise of urbanism, and concurrent monumental construction in the region (e.g. temples, palaces and administrative complexes), in addition to growing disparities in funeral monuments and mortuary goods attest to mounting inequality and development of social hierarchies (e.g. Fisher 2009). Large-scale production and exchange of various raw and manufactured goods (e.g. copper, textiles, ceramics, and ivory; Muhly 1982; Cline 1994; Knapp 1998; Manning and Monks 1998; Burke 2010), indicate an intensification of economic pursuits. The growing scale of production, exchange and consumption coincides with attempts by institutions to control or influence these economic processes to support their goals. Within these political economies, textiles appear to have been highly prized—perhaps second only to metal in value (Smith and Tzachili 2012). Thus, the manufacture of textiles and the raw materials necessary for their manufacture likely featured as significant economic pursuits in these Late Bronze Age complex societies, especially in the Aegean (Killen 1964, Halstead 1999a).

Minoan palatial complexes on Crete, such as those at Knossos, Mallia, Phaistos and Kato Zakros, are widely accepted as centers for political, economic and social authority and as organizational sites for the redistribution of goods from the hinterland in the Middle Minoan IB through Late Minoan III period (c. 1900-1200 BCE). These complexes are relatively large (between 2000 m^2 and 1 hectare), and are identified as having a number of indicative features including a labrythine ground plan, a central court, a hypostyle hall or Megaron, storage rooms, craft centers and "lustral" basins, the function of which is as of yet unclear (Platon 1967; Nordfeldt 1987). The authority of elites at these palatial centers seems to have resulted from their control over a specialized economy, interfaced with political and socio-ideological sources of power (e.g. Cherry 1983; Manning 1994, Haggis 1996; Knappett & Schoep 2000; Renfrew 2001). Towards the latter half of the Late Bronze Age, (c. 1375 BCE), administrative archives make it clear that the collection, processing and probable redistribution of goods and commodities were a major concern for those living at, and ruling from (at least) the palatial center at Knossos, however the ubiquity of a palatial-controlled economy has been challenged of late (e.g. Pullen 2010; Nakassis, Galaty and Parkinson 2011). Wool and textiles appear to have been material goods that were a crucial part of the LBA economy on Crete.

Our most comprehensive evidence for wool and textile production on Crete comes from the archive of Linear B tablets at Knossos. The archive contains a collection of over three thousand documents, recording the rights and obligations—especially in terms of redistribution of goods and labor requirements—of various Minoan individuals and facilitated by a Knossian bureaucracy. Key among these tablets are those concerned with the production of wool and the maintenance of the sheep flocks that produced that wool, which have been thoroughly studied by Killen (1964, 1993) and Halstead (1987a, 1987b, 1998, 1999a, 1999b, 2001). These texts record economic activity for a relatively short time span—perhaps as brief as one year—likely during the middle of the 14th century BCE, and reveal the basic organization of the wool economy. In total, the palatial flock that produced this wool included between 85,000 and 100,000 sheep, with each individual flock numbering between thirty and four-hundred, and placed into the care of individual shepherds for significant portions of the year. These sheep flocks represent not only significant investment in time and labor, but also substantial land use. If the average sustainable level for shepherding on Crete is 1 sheep per hectare (after Papanastais *et al.* 1990), the Knossosian palatial flock equates to at least eighty-five thousand hectares. A more traditional stocking density of 12 sheep per hectare, still provides a figure over seven thousand hectares. In either case, such large flock populations raise questions about land ownership and control, as well as herding sustainability and land use strategies. All indications, then, are that palatial textile production demanded a sophisticated system of animal husbandry and land control, however, the strategies employed by the shepherds in charge of these flocks are largely unclear.

Whereas on Crete the Linear B documents provide a framework for interpreting the Late Minoan political economy, on Cyprus, archaeological and settlement data provide the primary source of evidence for understanding the Late Cypriot social, political and economic environment. The Late Cypriot (LC) period (c. 1600-1100 BCE) was one of substantial transformation: the island transitioned from "an insular polity to an international player… [as] the economy expanded from a village-based, staple finance system to a more competitive and comprehensive, urban-rural wealth finance system" (Knapp 2008: 144). This economic growth was closely linked to the intensification of copper mining and smelting, the establishment (e.g. Enkomi, Hala Sultan Tekke, Kition) or embellishment (Kalavasos-*Ayios Dhimitrios* Maroni-*Vournes*/*Tsaroukkas*) of a number of large, centralized settlements and an increase in overseas trade with other Eastern Mediterranean polities (Knapp 2008; Keswani 1996). There is considerable debate over the nature of the relationships between these centralized settlements, with some scholars arguing for a "heterarchical" political organization whereby the Cypriot polities vied for economic and political control of various portions of the island (e.g. Merillees 1992; Keswani 1996; Manning 1998), while others support a single-state model with one settlement (often Enkomi) acting as the primary center (e.g. Muhly *et al.* 1988: 294-295; Knapp 1994a; Peltenburg 1996; see chapter 3 for extensive discussion). In actuality, it is likely that the political organization of Cyprus changed considerably throughout the Late Bronze Age and thus does not fit neatly into one model or the other.

No matter the specific political arrangement on Cyprus during the Late Cypriot period, these burgeoning urban settlements would have required an urban-rural network to sustain the populations of the growing centers. Knapp provides a four-tiered model in which primary, coastal centers were linked to secondary inland towns, tertiary inland ceremonial settlements, and finally small agricultural support villages (2008: 138-139). Moreover, the importance of centralized storage, especially in elite contexts at primary centers as a way of controlling surplus is evident at Maroni-*Vournes* (Cadogan 1996: 16-17), Alassa-*Palaeotaverna* (Hadjisavvas 2001: 212), and nowhere more obvious than at Kalavasos-*Ayios Dhimitrios,* where the largest structure on site, Building X, contained the 135 m^2 olive oil storage room called the Pithos Hall. This room features six monolithic ashlar columns, and would have contained up to fifty massive storage jars called pithoi, that were between 1.5 and 2 m tall. The room could have held 33,500 liters of oil in all (Keswani 1992: 141-144; South 1984: 23; South 1989: 321).

Evidence for an increase in animal exploitation on Cyprus during the LC is limited, and is based on faunal assemblages from mostly first-order settlements (e.g. Croft 1988, 1989). What data there are indicate that sheep and goats were generally the most prevalent domesticated animals in Late Cypriot assemblages. However, these assemblages often come from feasting contexts (e.g. Steel 2004b), and therefore may over-emphasize the importance of meat production, making it difficult to identify potential emphasis on secondary products (e.g. dairy, wool, traction). Moreover, age/sex profiles of animals from urban settlements skew towards one aspect of economics, namely consumption, but make it difficult to discern the production (e.g. herding/breeding practices) and/or exchange and transport of the animals.

While the evidence for intensive shepherding on Late Bronze Age Crete and

Cyprus is suggestive, in both cases it has been difficult to track the actual herding systems and productive strategies employed within the pastoral sphere. On Crete this is the result of an apparent focus on textual data and limited faunal datasets, while the latter is also true on Cyprus. Traditional faunal analyses are certainly important in identifying some features of animal exploitation, however by their very nature they emphasize the consumptive aspects of ancient animal economics, and make it difficult to track the processes by which the animals are raised, and by extension the life-ways of the ancient shepherds responsible for their care. Mobility looms large in questions of ancient pastoralism, and it remains unclear whether Bronze Age, Mediterranean shepherds engaged in seasonal transhumance, or herded their flocks regionally (e.g. Chang and Koster 1986; Cherry 1988; Halstead 1996). Because tooth enamel is deposited in sequential layers starting just after a lamb is born (first molar), and continuing through three years of age (third molar), isotopes, specifically strontium and oxygen, sampled from each layer make it possible to identify the approximate location of the food and water incorporated into the lamb's body during each stage of growth. These approaches hold great potential for tracking the movement of flocks (and shepherds, by proxy) and this project uses these techniques from caprine teeth recovered from Late Bronze Age settlements to track shepherding practices within the larger political economies.

1.3 Chapter Organization

The following chapter lays out the theoretical underpinnings of the dissertation.

The goal is to bring a strategy-oriented and historically[2]-contingent understanding of power relations to bear on investigations into the role of the commoner within the Late Bronze Age early complex polities on Crete and Cyprus. The focus is particularly on rural non-elites, and even more specifically shepherds who were responsible for the care, herding and maintenance of domestic animal flocks that provided primary and secondary products to the populations at Minoan palaces and Minoan towns, and the first large-town/urban environments on Cyprus. This chapter argues that archaeological theory would benefit from a re-analysis of power in early state societies, particularly with an eye towards investigating how we consider the power of non-centralized, non-elites, or non-centralized elites within the developing economic facets of these early complex polities. In the first portion of this chapter I argue for a re-evaluation of our understanding of political and economic "centralization" in archaeological thought, advocating for a renewed focus on concepts of individual and group strategy, and historical contingency. In the second portion of the chapter I discuss case studies that illustrate how non-traditional perspectives that focus on spaces outside urban centers, and which emphasize the role and strategy of non-centralized individuals, help better characterize the nature of power relations within the political economies of early complex polities.

Building on the theoretical paradigm forwarded in chapter 2, chapters 3 and 4 bring the critique of centralization in archaeological thought to bear on Late Cypriot and Minoan studies. This begins with the Late Cypriot case in chapter 3, which discusses the focus of scholarship on social complexity on the island during this

[2] I use "historically" to refer to the ecological, environmental, social, political, and economic situation

period, exploring the heterarchy/hierarchy debate and the sources of evidence used to establish the two opposing perspectives. This serves as the foundation for my larger goal: to illustrate how this focus on the high-level political and economic organization of the island during this period is not concerned with an equally important bottom-up and complementary understanding of the rural populations that supported the growing urban populace during the LC. These approaches have focused on large, centralizing settlements, and emphasized a Hobbesian perspective of power as being produced and emerging from these locations, rather than attempting to understand the political and economic relationships between these new urban groups and the rural groups that must have been critical to supporting their subsistence (there are a few notable exceptions that run counter this top-down, elite-centric perspective, e.g. Crewe 2007).

Chapter 4 confronts a similar emphasis on the importance and power of central places (and the individuals situated at, or controlling these central places) in Late Bronze Age Crete. This begins with a discussion of the Minoan palace as the focal point for much of Minoan studies for three-quarters of the 20th century, both regarding questions of Knossian pre-eminence during the LMI and/or LMIII, and in terms of considering other "palaces" (e.g. Malia, Phaistos, Zakros, Galatas) as steady, established sources of political and economic power. I consider the "redistribution" model developed to characterize the political economic systems associated with the palaces. The chapter then expands to explore new theoretical perspectives and sources of evidence that bring the primacy of the palace and palatial elites into question. Three studies are used as evidence that investigations into Minoan society require

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for a given period of time.

expanding outside palaces and their surrounding communities. Studies used to support this argument are: first, Knappett's (1999, and Knappett and Schoep 2000) on an economically de-centralized Protopalatial "Malian" state; second Schoep's textual (1999a, 1999b) and architectural (2004) arguments for multiple LMI polities and discussion of a bias to identify "palatial" features in LMI monumental architectural forms, even when many of the so-called "palatial" attributes (e.g. ashlar masonry, Minoan Hall, lustral basins) are lacking in LMI palatial structures *and* appear to originate in elite residences at Malia. Haggis (forthcoming) provides a preliminary look into the Minoan world outside the palaces to illustrate the potential (and importance) of the hinterland.

Having thus framed the project theoretically and historically, chapter 5, 6 and 7 construct a model for the historical circumstances of the LC and LM periods, particularly from the perspective of shepherds. This begins, in chapter 5 with a discussion concerned with how we define pastoralism, considering various definitions used to study the pre-modern world. Having settled on a definition of pastoralism that emphasizes an approach that accepts historical circumstances as dynamic, and the strategies employed by shepherds in light of those circumstances equally dynamic. The next portion of this chapter uses the seven-point paradigm developed by Nixon and Price (2001) as a way of discussing the variables that impact shepherding decisions. While Nixon and Price provide the framework for this discussion, considerable space is spent filling out their analysis because their heuristic, while useful, is in some cases undertheorized and overly deterministic.

Chapters 6 and 7 consider these 'logics of shepherding' in the context of the

Late Cypriot and Late Minoan ecological, political, social and economic environments, in order to begin to access the perspective of a Late Bronze Age shepherd in these locations. These chapters are aimed at both considering our best evidence for animal management from alternative (i.e. non-isotopic) sources and also builds a model for the likely carrying capacity, potential graze locations, products produced, and societal integration for shepherding populations on Cyprus and Crete. This lays the groundwork for the model of shepherding that incorporates isotopic analyses and is presented in Chapter 8.

The last chapter before the conclusion presents the original isotopic data produced by this project. The chapter begins with a discussion of what isotopic analysis of faunal remains can tell archaeologists about the lives of the animals in question and how this can be expanded to comment on the lives (and indeed the herding, management, and subsistence production strategies) of the humans responsible for their care. It begins by explaining the basic premise behind isotopic analyses: that external climatological and geologic processes impact the isotopes that are taken up by living organisms and used in biological growth. By tracking the isotopic signals present in faunal osteological remains, we can glean details about the environment in which the animals lived and were growing, and from these details and the historical contingencies discussed in the previous chapter, a model of the animals' lives (and, by proxy, the management of these domesticates) can be produced. The second half of the chapter presents strontium and oxygen isotopic data from caprine specimens collected from Late Cypriot sites on Cyprus. It also discusses what these data can tell us about livestock management at each settlement and across the island as a whole.

Chapter 9 concludes the dissertation by presenting opportunities for future work related to the analyses performed here, as well as outlining what this dissertation can contribute to archaeological thought beyond Late Bronze Age Crete and Cyprus.

1.4 Beyond 'Counting Sheep'

At its most basic level, this dissertation project seeks to bring new evidence to bear on questions of animal production and management in Late Bronze Age Crete and Cyprus. The LBA on both islands represents a period of considerable social complexity and political development that would have made the production of economic surplus—at least at a societal level—both possible and desirable. Domestic animals appear to have been of considerable importance in this surplus production (and eventually wealth production) as sources of both primary (meat, hides/leather), as well as secondary products (milk, wool/hair, traction, and as tokens of wealth). Historical documents (including Linear B, but also documents from later Byzantine and early modern periods) and archaeological faunal assemblages indicate that sheep and goats were well represented on Crete and Cyprus, owing to the fact that they are particularly well suited to the relatively dry Mediterranean climate of both islands.

In a larger sense, however, this dissertation is concerned with how the management of these domestic flocks manifests the agency and strategies of shepherds within the developing Late Bronze Age political, economic and social systems on each island. As we will see, the consumption of goats and sheep appears to have been an important aspect of feasting practices at these settlements, dairy products from sheep or goat milk likely contributed to the LC and Minoan diet, and loom weights and evidence for textile products made from sheep wool and goat hair all indicate the importance of these herd animals within these early economies. On Crete, particular attention must be paid to the way domestic animal economies and shepherds functioned in respect to what is conventionally considered a “redistributive” economy centered on the monumental, court-centered “palaces” of Minoan society. On Cyprus, this project attempts to characterize one aspect of the subsistence production systems that supported the first urban centers there. Thus, this thesis aims to address a lacuna in the scholarship by considering the animal management practices (especially with regards to sheep and goat herding strategies) that helped provision the first Cypriot and Minoan “cities”. What follows is an investigation into the complex political, economic and social variables that would have impacted livestock management, and the strategies employed by shepherds within these systems.

CHAPTER 2

CRITIQUING ARCHAEOLOGICAL APPROACHES TO CENTRALIZATION: HOW MACHIAVELLI (NOT HOBBES) EXPLAINS THE LOGICS OF NEGOTIATED POWER RELATIONS

> *"…for, just as those who paint landscapes place themselves in a low position on the plain in order to consider the nature of the mountains and the high places and place themselves high atop mountains in order to study the plains, in like manner, to know well the nature of the people one must be a prince, and to know well the nature of princes one must be of the people."*
>
> Dedicatory Preface, Niccolò Machiavelli to Lorenzo de' Medici, the Magnificent, *The Prince*

2.1 Introduction

This chapter aims to develop a critical approach to an "archaeology of centralization," culminating with an argument that to consider the early or archaic state either from an explicitly top-down, elite-centric perspective, or likewise from a bottom up viewpoint neglects the power relationships that are the material from which political bodies[3] are made. This provides the theoretical framework for Chapters 3 and 4 that highlight the

[3] I use the term "political bodies" here to encompass various groups or factions of individuals within a society that are involved primarily in what A. T. Smith has noted as four relationships that are central to the political: "1) interpolity ties, or geopolitical relationships; 2) relations between regimes and subjects that forge the polity; 3) ties among power elites and their links to grassroots social groups (such as kin groups, occupational associations) that constitute political regimes; and 4) relationships among governmental institutions" (Smith 2003: 104). This project is most concerned with relationships 2 and 3, and particularly how regimes, individuals, elites and non-elites, centralized individuals and groups and non-centralized individuals and groups combine forces for common goals, or compete with one another, either to create and reproduce the political apparatus, or seeking to change the political apparatus (it is not necessarily important whether this occurs through gradual and methodical change, or violent revolution for the sake of this definition).

fact that much of Late Cypriot and Minoan scholarships has focused on power at the centers to the detriment of a substantial portion of the ancient societies. The first half of this chapter considers the nature of power within two strains of western political thought: a predominant tradition based on Thomas Hobbes' *Leviathan* that has explicitly emphasized a focus on centralizing power strategies, and a strategy-based perspective grounded in a Machiavellian conception of recursive power, grounded in historical contingency and individual and group strategy. It is the latter approach that is advocated here, seeking to both acknowledged the recursive nature of successful statecraft and pointing to the real potential for the agency of non-centralized, non-elites as significant political and economic motivators in any given society.

The second half of this chapter is an attempt to both identify and track the "Hobbesian" and centralizing approach of many studies of complex societies and political economies, beginning with a review of James C. Scott's scholarship, and advancing through a series of case studies that range widely across geographic and chronologic terrain. These examples serve to illustrate how an historically-contingent, strategy-focused, "Machiavellian" understanding of power helps to move us beyond the singular perspective afforded by centralization theories. This serves to lay the foundation for a discussion of the pre-eminence of centralization theories in Minoan and Late Cypriot scholarship that follows in the next chapter, and both this chapter and the next provide the context for an argument that views Minoan and Late Cypriot shepherds as individuals and groups making strategic decisions within complex political, economic and social environs.

2.2 Defining Centralization

In his 2001 contribution to a volume entitled *Archaeology at the Millennium*, Gil Stein noted that overt emphasis on "centralization" was a "nagging problem" in archaeological investigations of the state, and one that would need to be addressed in the coming decades. Stein contended that, "the state concept itself needs fundamental rethinking.[4] In doing so, one particularly useful starting point would be an archaeological critique of the concept of 'centralization'" (2001: 369). Such a critique would recognize "the dynamics of conflict between the centralized elites and other social sectors" and would "explore the dynamic, fluid nature of power relationships and their long term transformations" (369). While his argument for the importance of non-elite influence within early archaic states finds resonance with some scholars (e.g. Brumfiel 1994; Gragson 1994; Small 1994; Yoffee 1995, 2005), Stein never explicitly defines the term "centralization," perhaps inadvertently highlighting the fact that centralization as a concept in the study of the rise and maintenance of social complexity is vague and often requires further qualification. Scholars have highlighted the importance of "centralization" as an aspect of the rise of the archaic state or a crucial tenet in the development of urbanism and complex social hierarchies, however "centralization" is hardly a term that is used consistently throughout archaeological literature; sometimes referring to the creation of a centralized political authority (e.g. Cohen 1976; Service 1962, 1975), other times to the concentration of surplus or means of production within a given location (e.g. Earle 1997: 67-68), or

[4] Stein spends most of the 2001 article indicating where that re-thinking might take place, including questions about centers and margins (363, 366) as well as whether "complex society" may actually

used to describe the development of cooperative devotional practices which converge at one ritual site (e.g. Pauketat, 2001). What these understandings of centralization share, however, is a focus on the centralization of *power*—conceived, after Mann, in the simple sense of "the ability to pursue and attain goals through mastery of one's environment" (Mann 1986:6)—in a single location, individual (e.g. monarch or king), political body (e.g. priestly class or oligarchy) or economic institution (e.g. a market). It is not difficult to accept that elites (or charismatic individuals within a given society) would seek to coalesce some aspect of power within a settlement, set of practices or particular institution in order to make control of these power bases simpler, however the very fact that centralization can occur in political, economic, and ideological spheres of social life suggests that the term itself may require fluidity and polyvalency. Additionally, it is becoming clearer that scholars must consider specific processes of centralization employed by any elite or group of elites as contingent upon the non-elites they seek to influence. All this serves to underscore a critical but implicit point in Stein's argument: centralization theories tend to view the process of centralization as one driven and controlled by elites, rather than as a strategy employed by elites, that may have varying degrees of success, based largely on relationships with non-elites. An examination of the history of the term and its use within archaeological thought helps to better contextualize the problem.

2.2.1 Centralizing What?

What exactly is this concept of "centralization" that Stein believes needs re-

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provide a more useful term for complex chiefdoms and archaic states. See also Smith 2003 for a thinking and critical analysis in archaeological thought, and where does it originate? Before embarking on a discussion of the concept and what a re-analysis and critique of it might entail, it seems necessary to first define it. This is no easy task, however, since the term "centralization" is rarely explicitly defined in archaeological literature, having the effect of creating a growing vagueness as the term is deployed in reference to a variety of political, social, ideological, and economic research questions, and in a number of historical, and geographic environments (e.g. D'Altory 1987, Earle 1997, Folan 1992, Fox *et al.* 1996,). This essentially makes it unclear what is being centralized, by whom, when and where. In an effort to bring the concept into sharper focus, it is useful to look to wider sociological, political science and management theory, most of which focus on relatively modern case studies, from the Federalist controversy of the early American Republic (Edling 2003) and 20th century AD Peruvian political organization (Nugent 2009) to modern business and firm management theory (Carruana 1998). These analyses view centralization as the process of concentrating decision-making authority and control within a governing body, board of directors or, sometimes, a single individual. In its most basic form, centralization is an attempt at consolidating power within a signal entity, therefore founded on a conception of power as something that can be collected; as a concrete and material thing that can be taken, given, held, sustained, or, indeed, centralized.

This is a conception of power firmly rooted in the work of Thomas Hobbes. In this Hobbesian paradigm that has come to structure much of archaeological theory throughout the 20th century (see below) power is conceived of "as a locus of will, as a

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detailed critique of the concept of the state in archaeological and anthropological theory (78-102).

supreme agency to which other wills would bend, as prohibitory…in short, power as the negation of the power of others" (Clegg 1989: 4)[5]. Providing a useful critique of the deployment of centralization as a concept in archaeology means turning from a perspective that considers power as both restrictive *and* inherent in the hands of the powerful, and instead views power as a strategic series of historically contingent networks, relations and interactions that can occur at any and all social levels. This allows us to go beyond the rather circular identification of hierarchically privileged individuals and groups as powerful, to ask why these individuals have power, how these individuals employ that power, and whether there are other, less obvious individuals or groups who are also powerful within a given situation. Such an approach to power focuses on strategies rather than universal processes, and sees centralization as a strategy employed by individuals in power, rather than an inevitable result of social complexity. To bring this conception of power to the fore requires a re-evaluation and analysis of the roots of power theory in western thought.

The work of Stewart Clegg (1989, 1994) provides a critical framework for re-evaluating and expanding beyond what has become the traditional, top-down theory of power. Clegg notes a dichotomy in conceptions of power: one vein is inspired by Hobbes' *Leviathan,* while an opposing perspective is provided by Machiavelli's *The Prince* (and, to a lesser extent, his *Discourses on Livy*). Clegg's dichotomy both identifies the root of a centralizing theory of power (Hobbes), and points to an alternative, and ultimately more realistic (i.e. less idealized) approach to understanding power and the interaction of individuals and groups founded on a Machiavellian

[5] In a more basic sense, Pauketat (2001: 80) defines power simply as "the ability to constrain an

conception of power and social relations. Clegg recognizes a division between a framework of power that emphasizes centralization, causality, sovereignty, and order (Hobbes) and, one which considers a "world of flux", and advances a "fascination for shifting, unstable alliances…", and "a disinclination to believe in any single, originating and decisive centre of power" (Clegg 1989: 7). A Machiavellian perspective can thus be described as a 'de-centralization' of power as opposed to a theory that emphasizes the commodification and centralization of power (i.e. Hobbes). Clegg recognizes a preference for a Hobbesian (and therefore centralizing) theory of power in much of modern western thought that grows out of an emphasis on political order and "direct control". Whether from a pluralist, elitest, structuralist, or Marxist perspective, power has been synonymous with order and control: "one could only think of power as occurring when one powerful individual succeeded in imposing his or her will on another," (Clegg 1989: 35). The variable between these theoretical perspectives has been the locus of centralization, whether, for instance, in the hands of the people (democracy), the elites (oligarchy), or those that control the means of production (Capitalism). The definition of power that has grown out of a Hobbesian tradition is one largely concerned with where power is coalesced, rather than how power functions. From this, we can see that Stein's identification of an overt focus on centralization in archaeological theory through the turn of the millennium is akin to the identification of a Hobbesian theoretical perspective on power and centralization. Clegg's juxtaposition of Hobbesian and Machiavellian perspectives of power helps to structure an analysis of centralization within archaeological thought (and indeed in

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outcome."

western social science more broadly), and in the process Clegg's Machiavellian alternative that emphasizes relational theories of power, and which focuses on the strategies inherent in these power relations makes it possible to productively consider the roots of power that are not centralized in either a sovereign (individual or ruling body) or location.

2.3 *Centralization and Aristotle*

The concentration of power and decision-making capabilities within a centralized office or location is a fundamental tenet of Aristotle's *Politeia*. As his work is perhaps the foundational treatise on the organization of the 'state' (what Aristotle considers a amalgamation of villages, and really should be thought of as the city-state *qua* the polis in modern political thought), his thoughts on centralization, and his arguments for the purpose of the *polis* are what laid the groundwork for Hobbes' response via the *Leviathan.* For Aristotle, the primary purpose (the 'end' or τἐλος) of the *polis* (and indeed the offices that make up the *polis* (and the institutions that facilitate the inner workings of the *polis*) is to provide, to each citizen (or, being pragmatic, to as many citizens as possible), access to a good, beautiful and fulfilling life (*Pol.* III.1278b 17-24). Whereas for Aristotle the state and its officers have a responsibility to promote virtue within the burgeoning state, this is critically not the case for Hobbes (nor, indeed for Machiavelli). Instead, the goal for the 'modern' state of Hobbes is "guaranteeing internal peace and the rule of law…" and "it arises out of pressing need and the avoidance of mutual harm, not for the sake of a noble end and to promote a good life" (Ferrarin 2004: 354). For Aristotle, the state is proactive, facilitating a good life for its citizens, for Hobbes the state is considerably more passive, seeking to prevent conflict. Neither paradigm, however, is particularly well suited to making sense of a variegated citizenry made up of many different, likely competing interests.

2.4 A Hobbesian Response

The Leviathan, published by Thomas Hobbes in 1651, and arguably one of the most foundational texts in western political theory and state organization, set the stage for the application of organizational theories and theories of power within archaeological thought, and indeed in the social sciences more broadly. By equating state organization and rule of law (and the concentration of power within the body politic which is one and the same with Hobbes' *Leviathan*) with a structured order that is preferable to his famous "state of nature" in which life is 'nasty, brutish and short' (2003: 89; Chapter XIII, 9), Hobbes established an enduring framework that separated organized human society from the dog-eat-dog world of beasts. Hobbes' fundamental view of human nature shapes a foundational aspect of his political philosophy: "that it is Men, and Arms, not Words, and Promises, that make the Force and Power of the Laws" (2003: 471; Chapter XLVI, 377). This is a crucial difference between Hobbes' understanding of sovereignty and the state and Aristotle's understanding of sovereignty and the state; whereas Aristotle viewed the goal of the state as providing citizens with a opportunity for a fulfilling life, Hobbes viewed the goal of the state as preventing citizens from causing each other harm.

It is worth noting that Hobbes' *Leviathan* is not simply an academic text attempting to describe a state of political organization, but is indeed rooted in the politics and events of the period in which it was written. It is inextricably linked with the historical realities of the 17th century AD, including the *English Civil War*, the trial and execution of Charles I, and the establishment of Oliver Cromwell as Lord Protectorate of England.[6] Thus, in writing the *Leviathan*, Hobbes is creating a political paradigm that was as much meant to do real work in support of his present reality, as it was meant to describe the political organization of a theoretical society.[7]

2.4.1 Creating the Leviathan through Consolidation:

The creation of a sovereign is based on a fundamental philosophy (what Clegg calls Hobbes' "foundational myth") that a centralized, organized society is critical to warding off the brutality and chaos inherent in a state of nature. Within this paradigm, sovereignty is "the expression of power in which a public good [is] achieved through the reproduction of the body politic", and the sovereign (represented by Hobbes' metaphorical Leviathan) "represents a structured, centralized and sovereign order that holds in abeyance the continuous threat of disorder"; that disorder being the chaos of Hobbes' "state of nature" (Fleming and Spicer 2005: 99). Indeed, it is no coincidence that this argument is reminiscent of the organizational and/or beneficent elites in the

[6] For a detailed discussion of the impact of historical events on Hobbes and the writing of *Leviathan*, see Tuck's *Introduction* to the Cambridge edition of *Leviathan* (2003). The specific ways in which the historical realities impacted Hobbes' conceptions of power, sovereignty and organized society, while fascinating, are complex and not critical to understanding how his conceptions of power have impacted modern political and archaeological thought.

[7] To some extent, the fact that Hobbes' own understanding of political apparatuses and the centralization of power is linked to the historical events of the time period in which he was writing, serves to illustrate the importance of historical context. This is both somewhat ironic and worth noting in a chapter that is emphasizing the importance of recognizing and investigating the contingency of history.

writings of Wittfogel, (1957), Service (1962), and Fried (1967) (see below).

The centralization of power and concentration of control within a sovereign body lies at the very heart of Hobbes' goal for government; it is the consolidation of what Hobbes refers to as "will", that brings about the creation of the all-powerful, and sovereign *Leviathan*: the Commonwealth. This is done in order to protect individuals "from the invasion of foreigners, and the injuries of one another," and to secure a peaceful society that enables them to "nourish themselves and live contentedly."[8] But, for this to be the case, each individual must:

> "confer all their power and strength upon one man, or upon one assembly of men, that may reduce all their wills, by plurality of voices, unto one will…and therein to submit their wills, every one, to his will, and their judgements to his judgement" (Chapter XVII; 2003: 120).

Thus, for Hobbes, the centralization and concentration of power within one ruling body (whether a monarch or a group of rulers) is the critical step towards securing the stability and protection necessary to provide for oneself and to live "contentedly."

There is a critical philosophy underlying this juxtaposition of a state of nature with organized society: power is either concentrated in the hands of the sovereign or retained by individuals. Said another way, Hobbes considers power to be zero-sum. This leaves no room for a relational theory of power that seeks to consider power strategies. More importantly, especially for his purposes, Hobbes uses this juxtaposition to stack the theoretical deck: the creation of a legitimate ruling body

[8] This is a philosophy present in the tension between individual and society (or really *polis*) in Thucydides *History of the Peloponnesian War* (noted also by Sahlins, esp. 2004: 139) and is particularly prevalent in Pericles' Funeral Oration. The similarities between Hobbes and Thucydides

brings with it “a world in which modernity, civility, sovereignty and rule flourish…”, and a world in which rationality and logical fairness ensure stability and certainty (Clegg 1989: 25). The alternative (and crucially, in Hobbes’ paradigm, the *only* alternative) is the state of nature, lorded over by violence and raw talent (strength, intelligence, charisma, etc.). The enlightened individual is expected to choose to restrict her personal sovereignty in exchange for the civility and protection that a sovereign can provide, thus agreeing to the so-called social contract.

In this respect, Hobbes’ sleight of hand takes on a very real purpose, lying just below the surface of his juxtaposition of the state of nature with the state of order. This zero-sum relationship between the state of nature and the state of order does two things: first, it ensures that any rational individual will choose a state of order, not just because a state of order will provide them with the best opportunities to thrive, but—more so—because a state of nature will place them in great peril. Second, it encourages individuals within a society to fall in line with the greater good: “instead of each person trying to make his or her own peculiar and particular mark, Hobbes proposes that each should knuckle down to work within a clear set of procedural rules concerning the definition of their terms” (Clegg 1989: 26). Crucial to this is the fact that the Leviathan is a body politic that is actually made up of each individual subject, thus, the “organizing principle of the whole system is the identity of each subject with the sovereign power” (Clegg 1989:27).

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are not particularly surprising seeing as Hobbes’ first publication was a translation of Thucydides into English from the original Ancient Greek.

2.4.2 Identifying Hobbesian Biases:

One-Dimensional Power

For Clegg, a Hobbesian theory of power is problematic in a number of ways (see Fleming and Spicer 2005: 100-101 for a detailed list), and three of Clegg's objections are especially apropos here. First, a Hobbesian perspective considers power as functioning in a strict cause-and-effect system, in what Clegg calls "atomistic" and "mechanical" terms (1989: 7), and what Fleming and Spicer insightfully recognize as akin to a Newtonian understanding of the world (2005: 100). This grows out of Hobbes' desire to provide an architectonic of the rational deployment of power as an ordering force within human society, and is also likely the result of the budding Enlightenment period, which emphasized rational and empirical scientific pursuits and sought to explore, categorize and define the ordering of the universe. Thus, Hobbes' conception of power functions as a precursor to a structuralist theoretical perspective, focused on providing a blueprint for political order, and one which sees power as deriving from a "single…and decisive centre…" (Clegg 1989: 9). Clegg further argues that this understanding of power characterizes the traditional western perspective on power, centered around an "insistence on prime movement and first causes in behavioural and one-dimensional views or power" (1989: 9). This amounts to an oversimplification for Clegg, since his perspective, which emerges out of a post-modern[9] theoretical paradigm, prefers to see power as in

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[9] McPhee notes Giddens' desire to refer to this as "high modernity" or "radicalized modernity" rather than post-modernity, since the theoretical trends in post-modern scholarship are "extended developments of exactly the same trends that generated the key traits of modernity....[such as] challenges to intellectual tradition and skepticism about its authority and foundations [and] incredulity about metanarratives…" (2004: 142). Clegg is indeed driven by a desire to challenge intellectual

flux, negotiated, and culturally and institutionally contingent. Rather than construct broad, sweeping laws about power and organizational theories, Clegg advocates for a conditional theory of power (and a Machiavellian theory of power, see below).

Elite Power:

Seeing power as derived from a single center lays the groundwork for a second objection to a Hobbesian theory of power: "power is automatically assumed to be something that the elite exclusively holds (and is thus reified)…" (Fleming and Spicer 2005: 100). This has two major consequences for archaeological thought: first, it grants elites agency, while at the same time removing agency from commoners[10] and second, it has the effect of making power a tangible *thing*, a commodity that can be collected and deployed, that is "something an actor can 'have', ' hold' or 'keep in reserve'" (Lawrence 2008: 174). For Clegg, "discourse is central; power is not a thing but a relation of flows" (2005:300). By considering power a tangible commodity that can be "held", as a Hobbesian perspective does, power is both zero-sum (i.e. theoretically there is a finite amount of power in the world and that power could be held by one individual, group or institution), and power becomes a static notion. Clegg—building on a Foucauldian logic—prefers instead to see power as relational and historically contingent.

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traditions, growing out of a post-modern and post-structuralist vein that emerges from a "sensitivity to global conditions", a "respect for difference in organizational and socioeconomic arrangements in different cultures," and a belief that "rationalities themselves differ" based on environmental and cultural factors (McPhee 2004: 143).

[10] Baumgold (1988) discusses this at length, noting that in advocating for the concentration of power within a single sovereign (as an ideal mode of government), Hobbes is also attempting to protect commoners from finding themselves drawn into inter-elite conflict (i.e. civil wars). While an interesting insight, this simply serves to underline the fact that a Hobbesian concept of power places agency in the hands of the elite (who might decide to embark on a civil war) and removes agency from

Objective Power:

The Hobbesian assumption that elites are automatically in the business of coalescing power leads to a final objection from Clegg: the idea that we can identify objective self-interests based on an individual's social class. Similar to his disagreement with a universal and unchanging conception of power, Clegg—again, inspired by a Foucauldian argument—bristles at a universal definition of self-interest based on relations of production (or indeed any other social, political, economic grouping): "it is a mistake to assume that interests get fixed by relations of production…", (Clegg 1994: 156) in part because relations of production are themselves in flux, and in part because identities are culturally constructed and contingent on historical circumstances (in a sense, we might say identities are *biographical,* based on historical circumstances, cultural impacts and an individual's own interaction with and acceptance of these historical circumstances and cultural impacts). To define self-interest based on a social class (or even more broadly based on a gender, or ethnicity) requires understanding cultural values and historical events and narratives as contingent, not universalizing theories of power that can be applied to all periods of human history as Hobbes attempts.

For Hobbes, sovereignty—and therefore power, as sovereignty and power are inextricably linked in a Hobbesian perspective—is inherently moral, which is to say, the order provided by a sovereign is morally preferable to the (only) alternative: chaos and disorder. Hobbes, is therefore interested in describing how complex society *should* exist, and how power *should* be used, rather than exploring how power is

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commoners (who, according to this paradigm) have no choice but to partake in said civil war. Clegg actually deployed.

2.5 Hobbesian Centralization in Archaeological Thought

The Hobbesian understanding of agency and power has had considerable impact in archaeological scholarship. The foundation of the application of "centralization" in archaeological thought grows out an Hobbesian paradigm of social complexity and also an argument for the "superorganic" as the primary historical agent, and lies in neo-evolutionary theories put forth by foundational mid-twentieth century scholars: V. Gordon Childe (1951), Julian Steward (1955), and Leslie White (1959). Childe's work proposed an evolutionary paradigm for the development of complex human societies that viewed them as evolutionary responses to external pressures such as competition with other human societies over resources or subsistence crises (1951). White framed social evolution as a function of energy capture, arguing that human societies developed in order to allow more efficient organization for the exploitation of the environment (1959:38). This grew out of White's view of culture and society as a superorganic system or structure that was instrumental in the creation and maintenance of societal norms. For White, an individual's decisions were structured by society, in which "good" behavior (i.e. beneficial for the common welfare) was rewarded, while "bad" behavior, punished. White makes an analogy between an individual and a pilotless, remote-controlled aircraft:

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would likely bristle at this oversimplification.

> “the plane is directed this way and that by impulses external to it. These impulses are received by a mechanism and are then transmitted to motors, rudders, etc. This receiving and behavior-controlling mechanism is analogous to conscience” (White 1959: 157).

White’s understanding of human conscience and societal influence fails to consider this problem deeply however, as it does not explain who or what determines societal norms, and how these societal norms change. To maintain the aircraft metaphor, it seems more appropriate to consider individuals as piloted aircraft that are encouraged to obey FAA regulations, to listen to cues from air-traffic controllers, and to abide by accepted flight rules in order to maintain an orderly system of flight, but with the ability to deviate from these rules under new, unforeseen or extraordinary circumstances.

Steward emphasized multi-linear social evolution via cultural ecology and argued that cultures developed in order to equip humans such that they are best able to adapt to their environment (1955: 30-34). Building on this first generation of neo-evolutionary scholarship within archaeology, Elman Service (1962) and Morton Fried (1967) argued that the evolution of human societies could be best understood as typological rungs on an evolutionary ladder, with the earliest and most simplistic human societies organized along kinship lines into *bands,* progressing in both size and complexity into *tribes,* then *chiefdoms*, and finally reaching the pinnacle of social complexity with the *state.*

Working under this theoretical model, Kent Flannery published a seminal article in 1972 entitled “The Cultural Evolution of Civilizations” which, like White, Childe, Steward and Service sought to use neo-evolutionary theory to explain the development of social complexity and the rise of the state, this time attempting to reconcile “humanist” anthropological views with more “scientific” cultural ecology. Flannery argued that human societies could be considered as complex living systems constantly struggling to best adapt to pressures (largely ecological) found in the surrounding environment (and here Flannery echoes Steward, 1955). Human societies adapt to these stresses via various social systems, made up of a number of subsystems that are organized hierarchically and are regulated in order to maintain homeostasis, therefore preventing system-wide collapse. Within this model, the evolution of human societies advances along two distinct, but linked causal processes: *segregation*, “the amount of internal differentiation and specialization of subsystems” and *centralization,* “the degree of linkage between the various subsystems and the highest-order controls in society” (409). Ruling institutions are set in place to ensure that the systems “output values” match its “goal ranges” which include “not merely subsistence goals” but also “ideological values, the demands of deities and ancestral spirits, ethical and religious propositions” (409). As societies find themselves in situations where external pressures motivate adaptation, the segregation and centralization of subsystems increases such that control becomes more centralized. This progression continues until human societies can be mapped as flowcharts, where over-arching regulatory apparatuses are concentrated at elite-controlled central locations (i.e. the top of the flowchart, see fig. 2.1). Consolidation of these mechanisms of control in one place leads to greater instability within the system and increased potential for collapse (420-421). Within this paradigm, rulers (and, in some cases, elites) serve an essential role by storing and regulating information, which in turn is used to maintain system homeostasis and prevent collapse, on behalf of the non-elite members of society (1972: 412). Thus, within Flannery's model, rulers and elites are cordoned off as the individuals or groups who have agency within society, whereas non-elites (and even perhaps non-centralized elites) are viewed as passive followers.

The evolutionary process of centralization and the conflation of centralization with social complexity align themselves with a number of processual studies throughout the 1970s and 1980s that considered the development of complexity in evolutionary terms (e.g. Carneiro 1970, Renfrew 1972(2011), Johnson 1978; 1981; 1982). What is more, the emphasis on centralization inspired the integration of center-focused theoretical pursuits such as World-Systems Theory (WST) and Central-Place theory. Early work in these theoretical models emphasized the importance of central locales (or for WST, "cores") that were viewed as the driving forces behind the political and economic systems in question.[11]

2.6 A Machiavellian Alternative

A Hobbesian conception of power is zero-sum; views power as a commodity

[11] WST and Central-Place Theory have experienced their own round of critiques that have questioned the primacy of central sites and core regions, emphasizing instead the physical context of settlements (which has manifested itself in a growing interest in archaeological investigations of the ancient landscape as a socially constructed and recursive space) and the importance of the influence of

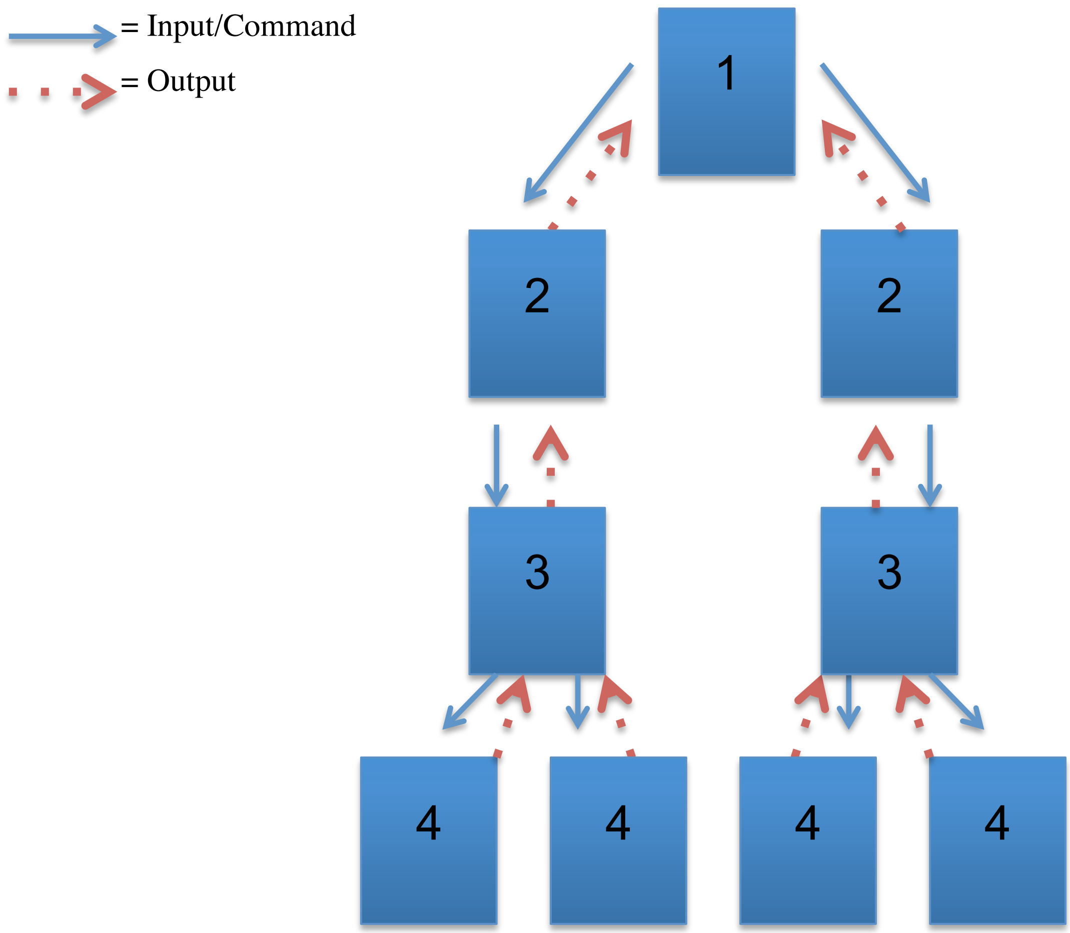

Figure 2.1: Flow chart diagraming hierarchical, centralized system of control based on Flannery 1972.

that can be held, gathered and controlled; fails to effectively characterize the relational

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peripheries on cores, rather than simply the exploitation of the peripheries by the core, e.g. Chase-Dunn aspects of power; is constructed around a universal notion of objective interests and rational thought; and it emphasizes the centralization of power within a sovereign body and/or location. Niccolo Machiavelli provides the basis for an alternative approach. In *The Prince,* published in 1531 CE, over a hundred years before Hobbes' *Leviathan*, Machiavelli outlines a conception of power that emphasizes strategy, relations, and is contingent on historical situations and events. Machiavelli's understanding of power is, like Hobbes', inspired by the historical context and events of his lifetime. A long quote from Clegg details this nicely:

> "[Machiavelli] wrote his work not as a trusted legislator, from a position of intellectual, scientific and political certainty [viz. Hobbes], but as an uncertain explorer for a power which refused him employment and which spurned him to a degree far greater than the prudent Hobbes ever encountered at the hands of his monarch, Charles II of England. Moreover, within Florence there was little to encourage musings on settled social contracts so much as on strategic action…against this backdrop of turmoil in Italian politics Machiavelli forged a new interpretation of power in which one of its most significant aspects 'was that it was unrelated to a systematic philosophy' (Wolin 1960: 211)" (Clegg 1989:31-32).

This fact alone serves to highlight the importance of historical contingency, not only in shaping the environment within which individuals act, but also the environment within which individuals think and develop definitions.

2.7 *Machiavelli's Point of View*

Machiavelli's power is, in many ways, simpler than Hobbes, jettisoning the baggage of morality and "commonwealth" or "greater good" to reflect not on what power *should* do, or how power *should* be deployed, but instead on what power *can* do

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1992, Chase-Dunn and Hall 1993, Kardulias 1999, Stein 1998.

and how power *can* be deployed. What separates Machiavelli from early Enlightenment thinkers such as Hobbes (and likewise separates Machiavelli from his Medieval predecessors) is “a rejection of traditional norms, such as natural law, and the exploration of a pragmatic method of analysis concentrating almost exclusively on questions of power” (Wolin, 1960: 199). For Machiavelli, “the focus is on strategies, deals, negotiations, fraud and conflict...” within a dynamic, ever changing world (Clegg 1989: 30). The foundation of Machiavelli’s realist and cynical approach to power and strategy is this view of constant change. He argues that:

> “… [as] all affairs of men being [continually] in motion and never being able to remain stable, it happens that [States] either remain stable or decline: and necessity leads you to do many things which reason will not lead you to do,” (*Discourses* 1, 6.9).

This contrasts not only with the Hobbesian perspectives of rationality and universal human behavior (i.e. what is responsible for making a ‘state of nature’ nasty, brutish and short), but also brings with it a sense of post-modernity. Where Hobbes’ metaphor is a sovereign Leviathan, Machiavelli’s metaphor is a game of strategy with specific—but constantly changing—rules; rules that are recursive, continually modeled and shaped by the actions of the players and the environment in which the game is being played.[12] Human actors, in a Machiavellian paradigm, are under the constant threat of deception since, “man was truly *homo faber opinionum falsarum,* a spinner of fancies and illusions…” and “even when men…refuse to act on any other basis than what they can actually see, they end up being trapped by their own overly

[12] This metaphor is strikingly reminiscent of Giddens’ structuration framework, where agency (Machiavelli’s game players) and structure (Machiavelli’s rules) are in constant and entangled contact with one another.

simple view of reality" (Wolin 2004: 190). This was a world in which, "everyone sees what you seem to be, few touch upon what you are…" (*The Prince*, XVIII).[13]

Machiavelli also refuses to place "power" in the hands of any specific individual or group of individuals: "the crucial characteristic of [Machiavelli's] new [political] science was that it was detachable from the interests of any party" (Wolin 1960: 202).[14] This argument for relativism, and an implicit advocacy for the importance of understanding one's vantage point and relationships with others, is cleverly borne out in the dedication of *The Prince*:

> "…just as those who paint landscapes place themselves in a low position on the plain in order to consider the nature of the mountains and the high places and place themselves high atop mountains in order to study the plains, in like manner, to know well the nature of the people one must be a prince, and to know well the nature of princes one must be of the people." (*Preface*)

This relativistic perspective was critical for investigating power strategies in what Machiavelli saw as a world of constant flux, and allowed him to see power as manifest in a series of contingent strategies and decisions—decisions of elites and non-elites alike.

Machiavelli's willingness to accept a world of constant change characterizes perhaps the most fundamental difference with a Hobbesian understanding of power. Where Hobbes attempted to create a blueprint for as stable a society as possible that

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[13] Or, as translated in Wolin (1960: 212): "everyone is equipped to see, few can understand…"

[14] Clegg echoes this perspective: ""In *The Price* Machiavelli offers a rich descriptive ethnography of power conceived in terms of its strategies… Power does not belong to anyone nor to any place; it is not something that princes necessarily have; it is no Leviathan. Power is simply the effectiveness of strategies for achieving for oneself a greater scope for action than for others implicated by one's strategies. Power is not any thing nor is it necessarily inherent in any one; it is a tenuously produced and reproduced effect which is contingent upon the strategic competencies and skills of actors who would be powerful" (1989: 32-33).

would provide the greatest good for all members, Machiavelli instead embraced what he saw as an inevitable and constant flux both in societies, and in the larger world, and attempted to provide comparably adaptable advice. This led Machiavelli to "shift away from questions of legitimate authority, with their connotations of a stable political world…"—what Hobbes was aiming at—"…to questions of power, or the ability to exert mastery by controlling an unstable complex of moving forces" (Wolin 1960: 214). The dichotomy is nicely summed up by Clegg: "…where Hobbes founds a discursive framework for analysis of power as motion, causality, agency and action, Machiavelli instead describes an ethnographic research method for uncovering the rules of the game" (Clegg 1989: 31).

These 'rules of the game' are, for Machiavelli, historically contingent and depend on the point of view of the subject of analysis. Machiavelli's understanding of power is relational, and in a sense, dialectical, and thus recalls Bertel Ollman's (2003) reading of Marx and his emphasis on the importance of what he terms "vantage point" within political economic studies. For Ollman, one of the pillars of a Marxian methodology is attention to the vantage point of both the researcher, and the object of study (whether an individual, group, class, or society). "A vantage point," says Ollman (2003: 100) "sets up a perspective that colors everything that falls into it, establishing order, hierarchy, and priorities, distributing values, meanings and degrees of relevance, and asserting a distinct coherence between the parts." It is a fundamentally basic, but critical, realization that the vantage point of an individual or group, structured by their experiences and environment, past and present, will shape how they understand and navigate what they perceive of as their world. In Ollman's words, "within a given perspective, some processes and connections will appear large, some obvious, some important; others will appear small, insignificant, and irrelevant, some will even be invisible" (2003: 100). Specific and unique vantage points will be determined by the historical circumstances in which an individual (or group) finds themselves (itself), and indeed, a Machiavellian approach to history facilitates an approach that seeks to uncover this historical contingency before attempting to analyze agency. Intriguingly, Machiavelli's conception of power fits nicely with Marx's emphasis on vantage point as it encourages us to consider history from varying perspectives and to recognize that a vantage point shapes what is deemed possible within a given worldview. Ollman suggests that "…[people] are generally unaware of how much their points of view affect everything they see and know and of the role played by abstractions in arriving at this result" (2003: 102). It is critical that researchers investigating the agency of individuals in the present or the past are cognizant of the power of vantage point, and seek to identify how the perspective of a shepherd and the perspective of a priest will dramatically shape what is deemed important, and indeed possible.

2.8 A Machiavellian Alternative: To What End?

By now it should be clear that this project advances a Machiavellian theory of power, but this leaves a critical question unanswered: what real theoretical work does employing a Machiavellian theory of power accomplish? Turning to a recent and useful—albeit somewhat eclectic—book by Marshall Sahlins helps to identify the authentic problem that a Machiavellian perspective of power can help to solve; an issue that grows out of attempts to bridge the gap between structure (e.g. culture, society, institutions, etc.) and subjects (e.g. agents, individuals, persons, etc.) in questions of historical determinacy. In *Apologies to Thucydides*, Sahlins associates these two positions with his concepts of leviathanology and subjectology. Leviathanology holds as its thesis "that the individual does not exist as such but only as the expression of an all-powerful system—variously identified as society, culture, or hegemonic discourse…" (Sahlins 2004: 143). Leviathanology is therefore structuralism that views institutions and collectivities (or we might say the "superorganic") as the primary agentive force in history: "an anthropology of subjects without agency, merely reflecting and expressing an omnipotent cultural order" (Sahlins 2004: 144). Subjectology developed as a response to leviathanology, and emphasizes the role of the individual subject as an historical agent, defined as "a complementary positive valuation of the subject, coupled to a political opposition to any sort of superorganic systemacity" (Sahlins 2004: 149).

The intention of this turn in social theory has been to re-integrate the individual, but Sahlins points out that subjectology in recent humanistic scholarship (especially anthropology, but history and archaeology as well) has effectively, and paradoxically, destroyed the individualism of the subject, so that we speak of the ironically generalized experiences of "post-colonial subjects" or "bourgeois subjects", rather than the experiences of real (contemporary or historic) individuals. Archaeology (and especially prehistoric archaeology) is particularly susceptible to this as we rarely have specific individuals that we can identify. What individuals we do know are kings, the highest-level elite, and their retainers (the proverbial prehistoric 'one-percent' or, more likely, 0.1 percent), and even in terms of this minute subset of the ancient population, many are poorly fleshed out. The simple theoretical move for prehistoric archaeology, then, is to employ a subjectological approach that seeks to identify the experience of the "Late Cypriot peasant" or the "Minoan elite", an approach that robs archaeology of the opportunity to legitimately study the lived experiences of specific individuals in the past. Perhaps more frustrating and disheartening, such a theoretical approach runs the risk of making the archaeological version of history one that is full of faceless human units (Or, in Sahlins' terms: "subjects, subjectivities and selves" [2004: 149] [15]), rather than actual people with real, lived experiences. In the process, the shorthand of the "subject" creates an abstract individual, and thus the theoretical progression has been to move from the large abstract entities of structuralism to individual abstract entities of subjectology, without doing much productive work in the process.

To solve this problem, Sahlins proposes to consider historical agency in two veins that attempt to account for social and historical structural variables. On the one hand, he identifies systemic agency, on the other, conjunctural agency. Sahlins uses Napoleon Bonaparte as an example for systemic agency, and Bobby Thomson of the 1951 pennant-winning New York Giant as an example of conjunctural agency. Systemic agency is an historical agency in which the power to impact and determine history is derived from an individual's holding of an institutionally recognized position within a social hierarchy. In Napoleon's case his "singularity was historically empowered by his supreme position in collective entities—France, the army—that

[15] "The effect is an anthropology in the genre of allegory, telling tales of cultural forms and forces in

were hierarchically organized precisely to transmit and implement his will" (Sahlins 2004:157). Conjunctural agency is the power to impact or determine the course of history that emerges out of an individual's involvement in a particular event or situation. For Bobby Thomson, this was finding himself as the decisive batter in the bottom of the ninth inning of a tied game that was to determine the winner of the National League pennant in 1951.[16] For Sahlins, Bobby Thomson's ability to impact history was not determined by power granted to him by an office or institutionally backed societal position, but by the development of the situation itself.

Whether one agrees with and supports Sahlins' approach to historical agency, both systemic and conjunctural agency leave a key issue for prehistoric archaeology unsolved: the problem of identifying specific individual actors in the distant past. In order for Sahlins' concepts to be useful we must be able to key in on either institutional offices/societal positions (and the responsibilities and powers that come with those offices) or key historical events, in addition to the individuals that found themselves in pivot points of conjunctural agency. For some locations, time periods, and events this may be possible in prehistory, but by-and-large within archaeological thought (and indeed due, in large part, to traditional archaeological excavation and

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terms of abstract persons." (Sahlins 2004: 149)

[16] Thomson hit a game winning homerun—the "shot heard round the world" (or, if you prefer, the culmination of the "Mirale of Coogin's Bluff")—off Ralph Branca of the rival Brooklyn Dodgers to win a three-game playoff and propel the New York Giants into the 1951 World Series against the New York Yankees. Sahlins discusses this at length (2004:125-138), arguing that Thomson's historical agency in that moment was the result of an entire seasons hinging on that pitch, rather than Thomson's particular institutional position. If Thomson had been a pinch-hitter, a case could be made that his "institutional position" as a pinch-hitter was what infused him with historical agency (and in that case a systemic historical agency), but Thomson's opportunity to hit the game winning homerun was set up by a series of events, including, for instance, singles by New York Giants Alvin Dark and Don Mueller, and a double by New York Giant Whitey Lockman, which made the score 4-2 Brooklyn, and left two men on base as Thomson came to the plate, meaning a homerun by Thomson would win the game.

preservation biases which have preferentially focused on first-order centers) these events and individuals are central places and elites. In this sense, we return to a "big-man" approach to history; and ironically, the exact position Sahlins is attempting to circumvent.[17] The truth of the matter is that at present, the majority of prehistoric non-elites and commoners exist as faceless individuals in archaeological thought. Thus, an attempt to use either of Sahlins' proposed methods of historical agency to describe prehistory forces archaeological thought to turn back to an elite-centric, and power-centralizing Hobbesian approach to social/political/economic relationships.

Here a Machiavellian understanding of power provides a paradigm for addressing non-elite power and strategies. Such an approach focuses on historical contingency, and an attempt to infer the goals and strategies of prehistoric individuals to advance an understanding of the agency of non-elite prehistoric individuals and collectivities. While such an approach cannot bring a face to these faceless prehistoric people, it moves us far beyond viewing ancient commoners as homogenous individuals. Instead, it encourages us to investigate the contingent historical realities that structured the strategies that were available to and/or attractive to particular prehistoric people and groups.

This approach is reminiscent of Alexander Goldenweiser's concept of a "biographical individual" as an "historical complex *sui* generis", and what Goldenweiser meant as a response to the leviathanological view of historical entities as superorganics. In Goldenweiser's view, "neither biological nor psychological, nor

[17] At the beginning of his presentation of leviathanology and subjectology, Sahlins notes, "The 'Great Man Theory of History' was a nineteenth-century problem, it is said. Yet it is still with us in the twenty-first century" (2004: 138).

civilizational factors exhaust his [an individual's] content… he has partaken of the culture of his social environment, but only certain aspects of it, and these have come to him in a certain individual order…that was unique" (1922: 449). Sahlins sums this up as "living the culture in a specific way, [so that] a person will also uniquely express it" (2004: 152). A Machiavellian approach to power and agency builds on this concept of a biographical individual by accepting the historical contingencies that confront agents and groups, but also by seeking to identify the goals those agents and groups pursue, and the strategies employed to attempt to accomplish those goals. We can then split the difference between the historical specificity of Sahlins *systemic* and *conjunctural historical agency*, and the vagueness of Goldenweiser's *biographical individual* to reach an historically contingent, and yet agentive and strategic prehistoric individual, whether commoner or elite, member of a tribe or state. In this sense we are able to move beyond an idealized "Minoan shepherd" or "Late Cypriot commoner" towards a "Minoan shepherd who practiced transhumance, traveling across known political boundaries, making use of highland pasture, and providing livestock for slaughter or consumption at the palace/town of Malia," or a "Late Cypriot commoner who appears to have maintained a small flock of sheep for wool production and must also have been involved in at least small-scale agricultural production in order to provide subsistence for himself and a modest family." This project attempts to construct these kinds of models of ancient Minoan and Late Cypriot individuals. It is only by weaving these individuals together that we will be able to begin to construct the entire fabric of a given prehistoric society.

A number of critiques were leveled against systems theory in 1980s and early

1990s, some of which were precursors to, or central components of, the post-processual movement, which sought, in part, to re-center the individual and subjectivity in archaeological thought[18] (e.g. Cowgill 1975, McGuire 1983, Paynter 1989; Brumfiel 1992; Blanton 1998). These critiques struck at the assumptions inherent to a theory of social evolution based on centralization. Paynter argued that a renewed interest in situating human agency within cultural systems, driven by the works of Bourdieu (1977) and Giddens (1979, 1984), allows us to pose the question "why do people follow leaders?" This offers an alternative to assuming, as neo-evolutionary theory does, that leaders of complex (read: successful) societies are in a position of power because they have effectively guided a given society through the external pressures it has faced.[19] Rather, we might ask whether coercive, ideological or economic sources of power played an important role in establishing elite control (Paynter 1989:378). In addition, Paynter suggests that considering the ways in which elites are capable of *monopolizing* sources of power provides a more fruitful line of thought than asking whether the processes of control are *centralized* (380). Contemplating social complexity as a function of elite monopolization has the benefit of calling forth questions of conflict and resistance that are often present in the relationships between elites and non-elites. Paynter reminds us that tensions exist "between cores and peripheries, civil and kin groups, rulers and ruled, merchants and lords, men and women, and producers and extractors" and that resistance can function as an important (and powerful) tool within these conflicts (386).

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[18] This theoretical turn is precisely what Sahlins (2004) is referring to when he writes about "subjectological" approaches to humanistic studies.

Brumfiel (1992) provided the definitive critique and re-evaluation of neo-evolutionary systems theory, and by doing so, confronts the assumptions inherent to centralization that are critical to a neo-evolutionary paradigm. Addressing systems theory more generally, Brumfiel argues that these approaches (especially what she terms "ecosystem" theories) neglect gender, class and faction in the ancient world. This results from a failure to recognize that "culturally based behavioral 'systems' are the composite outcomes of negotiation between positioned social agents pursuing their goals under both ecological and social constraints" (551). In order to understand these culturally based systems, we must first come to grips with how gender identity and roles, class organizations, and factional associations shape the goals and constraints that social actors pursue and encounter. Within systems theory, the concept of centralization of power makes it such that "elites are viewed as performing managerial functions, and therefore, as being endowed with the ability to impose their decisions on the social system," (555) whereas non-centralized individuals (Brumfiel here refers to commoners and peasants, but this applies equally well to non-centralized elites and sub-elites) are at best granted only the agency to follow ruling elites, and at worst, are "reduced to invisible, equivalent, abstract units of labor power" (552). Considering non-elites in a meaningful way allows us to ask "to what extent did commoner response to state formation determine the structure of hierarchy?" (556) and to begin to address the ways in which non-elites shape the political, economic and social structures of their world from the bottom-up. This requires, however, contextualizing the lives of particular kinds of commoners and non-centralized individuals by

[19] Here we can begin to see the dissatisfaction with a zero-sum, Hobbesian approach to power, and the

identifying the social, economic, political and environmental constraints and affordances that historical situations create, and by seeking to identify the goals and strategies of these individuals and groups within these historical contingencies. In other words, while Brumfiel offers a call to arms, a Machiavellian approach to power and strategy, that views power as "a tenuously produced and reproduced effect which is contingent upon the strategic competencies and skills of actors who would be powerful" (Clegg 1989:33), provides a useful paradigm for answering that call.

Returning to Stein's appraisal of archaeology and centralization, a close reading suggests that he is not encouraging a jettisoning of the concept itself—what might be defined as a process through which individuals seek to agglomerate power at a particular sites through monumental construction, commensal feasting, gift-giving, conspicuous consumption of goods or materials, the control of means of production of various products, or any other number of additional strategies. Clearly ruling elites will attempt to bring important political, social and economic processes under their direct control and close scrutiny by grouping these practices within one place, however, as indicated above, many approaches to centralization within archaeological theory neglect the agency of non-elites as both influential and potentially constraining within this centralization process. Stein likewise acknowledges this limitation in systems theory and instead seeks to critique the *deployment* of centralization in archaeology, arguing for a theoretical approach that understands centralization as a strategy rather than an inevitable process. His call to "recognize that the centralizing strategies of the ruling elites are constrained by the existence of other, opposing

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glimmer of a move towards viewing power as relational.

sectors of society," (369) is thus a rallying cry for more nuanced applications of centralization, as well as an inquiry into how centralization actually works and how it is maintained. Far from dismissing centralization, Stein instead advocates for denying centralization it's pride of place, in the hope of opening a discussion that does not privilege central places or centralized elites as sole sources of power, from which power radiates down and out, but rather as facets in larger, more complex systems of recursive power relationships.

2.9 Moving Beyond Centralization

Stein's comments come in the midst of a general movement in archaeology (and anthropology) to acknowledge the ways in which non-elite and non-central entities, institutions and individuals can impact their world (e.g. Allison 2006; Blanton 1998, Carroll 2002; Scott 1985, 1990,1998; Webster 2001, and those perspectives and case studies considered below). James Scott's work is particularly critical in re-shaping this debate as it holds, as one of its main theses, an argument for the importance of non-elites, commoners and peasants (often acting as collectives) as significant historical agents. Scott encourages us to think about the power of non-elites, and illustrates how that power—particularly in terms of what he calls *"everyday forms of resistance"*[20]—can be impactful and effective in "chang[ing] or narrow[ing] the policy options available to the state" (Scott 1985: 36), or any ruling body.

2.9.1 Scott's Everyday Resistance as Non-Centralized Power

Critically any commoner power and resistance requires a level of strategic thinking that is central to a Machiavellian understanding of power, and also runs counter a centralizing (and thus Hobbesian) conception of power and power relations that places the possibility of strategic thinking firmly in the hands of ruling, centralizing elites. This kind of strategic commoner power is crucial to Scott's analysis of everyday forms of resistance—indeed it is worth noting that the opposite of everyday forms of resistance, large scale resistance and uprising, tend to be the least strategic version of peasant power exertion (and in fact, Scott argues, less effective in the long run). Instead, anonymous, strategic resistance strategies serve to both protect the resisting portion of society, and also are by-and-large more successful than out-and-out revolts. A useful example of this disparity of efficacy can be found with regards to the events leading up to the American Civil War and particularly the freeing of African-American slaves. On the one hand we might think of armed slave rebellions (or attempted rebellions) as compared with the efficacy of the network set up for the safe passage of escaped slaves to the northern, non-slave states and eventually to Canada: the Underground Railroad. Perhaps the most famous slave uprising, the Nat Turner revolt in Southampton, Virginia beginning on August 21, 1831, led to the killing of between fifty-five and seventy-five whites during the forty or so hours that it took place (Aptheker 2003: 54). This was returned in kind—and perhaps up to two-fold—when riots, the Virginia Militia, and executions meted out

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[20] Such as "…foot dragging, false compliance, flight, feigned ignorance, sabotage, theft and, non least, cultural resistance." (Scott 1985: 34)

punishment to the blacks of Southampton in the ensuing months.[21] If Turner's goal was to incite a rebellion that would lead to the widespread forceful emancipation of slaves either in the county, the state or the entirety of the south, his revolt failed. Another attempted slave revolt, led by abolitionist John Brown, that began on the evening of October 16, 1859 with an attack on the U.S. Armory at Harper's Ferry, Virginia, likewise failed to bring about the widespread freeing of slaves. However, the Underground Railroad, a network of safe-houses, secret routes and guides that helped escaped slaves reach the safety of the Northern 'free' states, and often Canada, was active from the founding of the American Republic in the 1780s through the end of the American Civil War in 1865. While this form of resistance is difficult to quantify, it is likely that tens of thousands (if not hundreds of thousands) of slaves were aided to freedom by the Underground Railroad. Harriet Tubman, perhaps the most famous of the Underground Railroad "conductors", was responsible for leading over 300 slaves to safety on her own (Ripley 1998: 47). In this case an anonymous, non-violent and non-confrontational strategy of resistance and defiance succeeded in bringing considerably more slaves to freedom than violent, face-to-face uprisings.

2.9.2 Reconciling Scott's Method and Material Data

While Scott's work is critical to bringing a new perspective to understanding the relational power dynamics within societies from a socio-anthropological and socio-historical standpoint, his anecdotal dataset is considerably different from the incomplete material dataset confronted by archaeologists. True, Scott's concepts of

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[21] Aptheker believes that "it seems accurate to say hat at least twice as many Negroes were indiscriminately slaughtered in that county, as the number of white people who had fallen victim to the vengeance and bondage-hating spirit of the slave" (1967: 301).

“weapons of the weak” and “hidden transcripts” might be intriguing and important ways of thinking about power in the past, but how can we effectively deploy them? As Scott himself admits, “history and social science, because they are written by an intelligentsia… is simply not well equipped to uncover the silent and anonymous forms of class struggle that typify the peasantry” (Scott 1985: 36). Indeed, one of the prime aspects of a peasant’s power of resistance is the anonymity with which the act is performed in order to protect themselves, while overseers are unlikely to call attention to these acts of subordination since that might risk either inspiring, motivating or encouraging further acts of subordination by similar actors.

To access and describe these hidden transcripts and weapons of the weak, Scott has developed a methodology that is part phenomenological, part observational, and part interpretive. His general goal is to investigate class relations by closely engaging with human experience, via observation and interviews to attempt to access the experiences, values, and understandings of the individuals in question. The first critical aspect of this method is that it focuses on lived human experience and human agents, with an eye towards considering and investigating how they function, exist, experience their lives, and pursue strategies within a social and economic context. In other words, what makes the political, economic and social institutions—the entities that create the “rules”—in a given place a reality are the experiences and relationships that individuals and groups have with these institutions (a perspective that is reminiscent of—and likely an inspiration for—Pauketat’s theoretical perspective discussed below). In emphasizing human experience (and human agency), Scott’s approach makes it possible to move beyond the restrictive (and overly deterministic) understanding of class that can typify some structural, Marxist thought; an approach that "entails a highly reductionist leap straight from one or a very few economic givens to the class situation that is presumed to follow from these givens" (1985: 42). Instead, Scott advocates for understanding "the experienced concept of class" as "embedded in a particular history of social relations…" (and indeed one might say embedded in an historical contingency), "…as much a study of meaning and experience as it is of behavior considered narrowly." (1985:43, 45). Scott's method of accessing human (and particularly non-elite) agency within a historically contingent situation, is one that begins with close observation and discussion with the individuals in question (i.e. on-the-ground ethnography), supplements this with knowledge of the larger social, political and economic context, and attempts to interpret the strategies and agency of non-elites within this class system. The emphasis on non-elite agency and historical impact is crucial here, however, the method—particularly the ethnographic approach—is clearly problematic for an archaeological dataset where there is an added interpretive step between material remains and the actions (and thoughts, behaviors, strategies, etc.) of ancient individuals and groups. Perhaps in part because of this challenge archaeological studies have been generally more inclined (with traditional archaeological techniques being better suited for this based on preservation biases) to address the agency of elite individuals who have left a more considerable material record. However, Scott's work makes clear the historical importance of non-elites and their actions, and suggests that to focus solely (or even largely) on the agency of elites in the past leaves our understanding of history woefully incomplete.

The challenges associated with moving from a material, archaeological dataset to a model of past human agency require a heuristic of sorts. To better hone this approach, I turn to a Joyce et al. (2001) and their three-faceted paradigm proposed for exploring and interpreting commoner power and political economic impact and its influence in the ancient world: *engagement, avoidance* and *resistance.* Briefly summarized, engagement involves "compromise achieved in a dominant discourse produced through collective engagement of elites and commoners with divergent interests and dispositions" (Joyce et al. 2001: 368), avoidance refers to situations in which commoners developed strategies to remain as independent as possible from the control of elites (Joyce et al. 2001: 370), while resistance is the active attempt at pushing against the dominant discourse (Joyce et al. 2001: 370). By combining an understanding of power that is historically contingent and emphasizes strategic action, with a paradigm for commoner impact in various political economic situations, this theoretical model aims to provide a framework for investigating how commoners are agentive in ancient complex societies. In the final portion of this chapter, I survey a selection of case studies to illustrate how this heuristic can help improve our understanding of, and interpretation of, non-elite agency in archaeological contexts.

2.10 *Case Studies:*

2.10.1 Negotiating Power in Vijayanagaran India

As an initial example of engagement, I turn to Kathleen Morrison and Mark Lycett, who have argued for a more sophisticated approach to interpreting monumentality and centralization in the material record. They astutely recognize that "the most dramatic and visible aspects of the material record of complex societies are purposively created and manipulated by individuals and institutions to make public 'statements' or 'claims' about power and authority" (1994: 327). Therefore, archaeologists cannot take monumental structures as "reflections" of power, but must rather view them as "negotiations of power", existing within a framework of complex power relationships, competitions and negotiations among various societal groups, including political factions, familial kin, economic classes or status groups.

Using archaeological and textual evidence from the Vijayanagara empire of southern India (ruling between the early 14^{th} and late 16^{th} centuries CE), Morrison and Lycett argue for an intricate network of political and economic power, founded on competition and negotiation between various regional and empire wide elite groups. Their evidence stems from the analysis of monumental architecture from a variety of locations through the Vijayanagara empire, and also epigraphic evidence for the giving of gifts by various donors as a show of social prowess. Morrison and Lycett note that the most substantial monumental architecture, especially temples, which have been shown to act as demonstrations of authority and piety (e.g. Morrison and Sinopoli, 1992), were often constructed outside the "core" of the Vijayanagara empire, and in some cases, even outside the boundaries of the empire itself.[22] The building of these temples, then, was "structured by factors more complex than distance," because these monuments "do not simply reflect extant power, they also constitute claims to power, claims that may potentially be contested by elites and nonelites [*sic*]" (332).

This competition between various social and political groups plays itself out in inscriptional evidence for what Morrison and Lycett call “gift giving”, and what is really a benefaction to temples and the granting of revenue rights from certain villages. These were recorded through inscriptions commissioned by public and private entities, and would have served to fulfill benefactors’ religious obligations, as well as to express social, political and economic clout. The epigraphic evidence indicates a complex system of inter-elite competition between royals, regional and localized elites played out in the granting of rights and gifts to various non-elite groups and temples. Rather than a system of nested responsibilities within which strict hierarchical divisions separated the types of gifts that could be granted by elites according to their social or political position within the hierarchy (akin to a systems paradigm), Lycett and Morrison paint a picture of varying strategies of benefaction by local and royal elites, as well as changing strategies of gift-giving over time (1994: 334-345). This suggest a system of power relations that were in flux and constantly negotiated, with various elite groups competing with one another, and negotiating with commoner populations over social and ideological control and influence. The negotiated power relations of the Vijayanagaran empire appear to have been contested, with commoner and elite engagement playing an important role in establishing the social, political and economic hierarchy. Rather than a system in which Vijayanagaran commoners offered up each of their individual will (and political, economic or social support) to a centralizing ‘commonwealth’ as a Hobbesian

[22] Based on this analysis, Morrison and Lycett conclude, “in the case of Vijayanagara, there is no simple relationship between the degree of centralized political and economic power in a region and the nature of the material record—even monumental structures of a distinct imperial style”(328).

understanding of power would posit, Morrison and Lycett's work highlights a Machiavellian power, where relationships between groups were constantly in flux.

2.10.2 The Collective Power of Cahokia

A second example of historically contingent and negotiated power relations emerges out of Timothy Pauketat's work, and, like Scott, is particularly sensitive to the agency and efficacy of non-elite and non-centralized groups within the archaeological record, and the impact that these groups have on the formation of cultures, political entities, social groups, and practices. Pauketat's investigation into the role of non-elites as individuals whose actions are worth investigating grows out of a discomfort with an emphasis on complexity and centralization (in the Hobbesian sense) as the critical aspects of social, political and economic organization and change in the ancient world. He argues that "there is a problem of exaggerating the importance of political administrations as if they were the sole source of social change" (2007: 32), what is an inherently Hobbesian understanding of power relations, and power creation and maintenance in the ancient world. Thus, much of Pauketat's work seeks to interrogate what he identifies as a default assumption about the processes of social, political and economic organization and change in the ancient world: that they were almost explicitly created and maintained by elites (or 'political administrators' in Pauketat's vocabulary). In an effort to investigate the centralizing nature of Cahokia and the Mississippian mound-building cultures of central North America, Pauketat has been emphatic in arguing for the impact of non-elite actors in complex societies, urging a consideration of elites and centralized places within a larger geographic and societal context. Working from a theoretical perspective that builds on Bourdieu (1977) and Giddens (1979, 1984), Pauketat emphasizes human action as *practice*, the "embodiment of people's 'habitus' or dispositions," that act as power negotiations, "to the extent that power, the ability to constrain an outcome, pervades fields of action and representation" (2010: 142). Crucial to Pauketat's perspective is the understanding that all individuals involved in a social interaction impact that action regardless of their social clout.[23]

Pauketat's practice theory, thus, considers all scales of human action as potentially constitutive of social, political, economic or ideological traditions, and encourages archaeological theory to view social, political and economic institutions as "real" only insofar as they are produced and reproduced via human actions ('practice' in Pauketat's parlance). Because of this, institutions (including cultural or social 'traditions') "are always in the process of becoming…", via "any number of historical forms known to us elsewhere as accommodation, collaboration, communalization, creolization, domination, hierarchization, revitalization, syncretization, transculturation, etc." And yet, it is these variations in human practice in the face of political, economic and social institutions that are constantly changing (i.e. constantly in the process of "becoming") which illustrate the contingency of historical human

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[23] This follows on Giddens argument that "power relations are always two-way; that is to say however subordinate an actor may be in a social relationship, the very fact of involvement in that relationship gives him or her a certain amount of power over the other" (1979:6). Pauketat notes that "The scale of some negotiation is of paramount concern in understanding the contingent outcomes of practice. Moments of interaction that affect only two or three others, for instance, may be of little historical significance. Actions or representations that affect hundreds or thousands of people are likely to be of considerably greater significance. Having said this, it would be easy at this point to factor out the practices of anyone but aggrandizers, charismatic leaders, or 'great men.' This is an error, as the action of any one individual can have no historical consequences unless others participate in the moments of

action; that is to say, the various and complex historical factors (e.g. environmental, political, economic, social, agentive, etc.) that surround an interaction between individuals, groups and institutions are what determine whether a past involves, for example, relations of domination or communalization, what is, critically a process negotiated between the individuals/groups/institutions involved in the interaction. In this sense, a Machiavellian understanding of power that views it as in-flux, constantly changing, and—though he never used these words—constantly in a process of 'becoming', aligns itself strongly with Pauketat's argument for an understanding of historical practice. In Pauketat's words, this is because "any form of [the] practical, negotiative process of becoming is a historical process, and its explanation can only be made with reference to the geneaology of practices of tradition of negotiations" (2001: 79-80).

Pauketat's theoretical perspective can be applied likewise at macro- and micro-scales in the context of the developing Cahokian complexity during the 11th century CE. At the macro-level, Pauketat notes that while previous studies have emphasized the agency of elite members of society in the creation of large (c. 5 hectares) earthen-work mounds through coercion (e.g. Milner 1998) or ideological means (e.g. Kelley 1990), this tells only part of the story, and "fails to capture the process by which giant Mississippian chiefdoms suddenly appeared out of what are usually described as minimally centralized precursors" (2001: 118). Applying an approach that is particularly cognizant of non-elite agency within Mississippian society, Pauketat notes that the earthen mounds were built in stages that can be

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interaction…such an individualist explanation fails to understand that it is the agency of all people interpreted as annual additions, therefore indicating the gradual creation of these structures over decades, rather than as one-time constructions. The picture presented by Pauketat is one of a communal project undertaken by regional farmers, coordinated by a group of individuals at Cahokia, but enabled by cooperation and commitment of resources by various other groups.[24] The process of constructing these mounds at Cahokia was both the manifestation and, at the same time, the creation, of social power, and involved (and was founded upon) the incorporation of large regional population groups. The participation of non-elites and commoners in this process, and the social negotiation represented by the yearly communal construction of these monuments, was thus a relational power dynamic.

When considered at the micro-scale, a theory of practice makes it possible to appreciate how low-level processes such as ceramic production can mirror higher order political changes. Pauketat (2010) argues that a marked change in ceramic temper, particularly the inclusion of shell, maps onto the very substantial political transformations that must have taken place during the construction of the Cahokia site. It is well established that shell-tempered wares increase during the mid-11th century CE, making up only 10 to 30 percent of ceramic assemblages at Cahokia and surrounding sites at the beginning of this transitional period, and accounting for 90 to 100 percent of the ceramic assemblages fifty or so years later. The reasons for the clear change in the paste preparation state of the ceramic *chaîne opératoire* are still hotly debated. Functional arguments rooted in processual theoretical perspectives have been debunked, since no discernable technological benefit has been identified for

involved in negotiation that shapes the meanings of the moment." (2001: 117) shell-tempering. In light of this, Pauketat argues for a link between shell-tempered pottery and the construction of the new Cahokian settlement, positing that micro-scale, seemingly mundane processes, reflect more complex political economic situations, and that the change in ceramic production illustrates one way in which non-elites were effected by, and negotiated with, these higher order transformations.[25]

The two cases considered above serve to illustrate how non-centralized elites have the potential to impact the organization and development of centralized hierarchies. Morrison and Lycett contend that "statements" and "claims" are central to exercising and maintaining power and authority, therefore implying that political hierarchies are about negotiation and competition between individuals and factions. This echoes one aspect of Brumfiel's critique of systems theory, when she asserts that "political competition is never fully resolved," a fact that manifests itself in "commoners frequently support[ing] usurpers or separatists to put an end to oppressive regimes" or "local hierarchies…[that] will posses some organizational integrity and some ability to pursue autonomous goals" (1992:557). In the Vijayangara example, we might consider that enabling regional and local elites to exert their social and political power via gifting-giving and dedications may have provided a more stable power base for royal elites, while at the same time recognizing the empire-wide authority of those same royal groups. Pauketat likewise illustrates the importance of involving collective non-centralized groups in the early formative stages of large-scale cultural movements

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[24] Perhaps including religious groups, regional chiefdoms, or kin groups, see Pauketat 1994: 175

[25] Pauketat's call to consider non-elites as actors that are affected by and affect higher order power systems, recalls Julian Thomas' (2002) argument for considering power in a Foucauldian sense, where "Power is not directed by a single agent but is composed of many shifting strategies that are played out

and developing complexity. By encouraging the consideration of power relations within practice theory, Pauketat's work recalls Patterson (1992) who noted that social complexity is "a continually shifting patchwork of internally differentiated communities, bound together by interacting contradictions and mediations."

2.10.3 Grassroots Power on the Eurasian Steppe

While an increase in social, political and, seemingly, economic complexity was marked by a process of centralization at Cahokia, recent work by David Sneath warns against conflating "complexity" and "centrality" (2007a; 2007b; 2009). Sneath notes a number of factors that led to the assumption that complex societies were sedentary and territorial, and thus the implication that mobile societies were less "complex". This presumption initially emerged from the classic cultural-evolution paradigm of sequential, and increasingly complex, levels of society: bands, tribes, chiefdoms, states (e.g. Service, 1962; Earle, 1997). Such a perspective, combined with a tautological definition for pastoral groups that assumes a kin-based, tribal, social structure, enables (and perhaps necessitates) viewing non-centralized mobile populations as somehow less socially complex—and less agentive, and less potentially powerful in a Hobbesian logic—than sedentary, agricultural populations. The fact that inequality acted as a defining characteristic for complex societies, prompted the teleological assumption that if pastoral nomads were less complex than settled agricultural societies, they must have also been more egalitarian. Thus emerged what Sneath calls the "Pastoral-nomad ideal-type": the presupposition that mobile pastoral societies are organized by lineage and kinship (i.e. tribes), and have "no sharp divisions of rank, status or wealth"

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simultaneously. Sovereignty, domination, and authority are not so much the primordial forms of power

(Evans-Pritchard 1940: 5). As such, a vicious cycle ensued, whereby mobile populations were, by definition, egalitarian, lacking complexity and organized in tribes, which were considered hallmarks of mobile society.

Responding to this cultural-evolutionary narrative, Sneath argues that "centralization" is not necessary for social or political complexity, but simply a strategy for coalescing power (2007a: 235). Using Chandhoke's assertion that "the state is simply a social relation, inasmuch as it is the codified power of the social formation" (1995: 49), Sneath seeks to investigate complexity as defined by human relationships, rather than territorial centralization.[26] In so doing, he places power squarely in the realm of fluctuating and negotiated relationships (a Machiavellian understanding of power). Taking historic records of the pastoral nomads of Mongolia as evidence, Sneath (2009) shows that a complex social stratification, reminiscent of the feudal kingdoms of Medieval Europe, existed perhaps as far back as the 2nd century BCE, under the Xiongnu, and certainly during the 12th century CE under the Kitan and later the Chinggisid Mongol societies, all of which were pastoral nomads. This political system was based on a series of aristocratic elite family groups and their attached commoners who were required to perform military service and corvée labor on behalf of their elite overlords. Key here, however, is Sneath's identification of aristocratic "houses," arbitrarily grassroots political groups that were constructed

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as they are outcomes of it operation." (38)

[26] I have implied above (but want to note explicitly here) that "centralization" can certainly act as a manifestation of developing social complexity, whereby the centralization of power along various political, economic, social or ritual/religious lines can act as a tool for creating, manifesting and maintaining social complexity/social hierarchy. Nevertheless, Sneath's work serves to illustrate how similar social complexity can develop without the physical centralization of power at a particular settlement. Thus, Sneath's work, once again reminds us that the "state" and political complexity are

around a charismatic individual or group of individuals, and acted as the building blocks for the much larger Central Asian empires. What is critical about these groups is the fact that they appear to be constantly negotiating and re-negotiating their relations with one another, and that they are made up of elites and non-elites; akin to the *clans* of Collins' (2004) work which focuses on 20th century informal political organizations in the same part of the world. Collins notes that elites and non-elites within a clan relied on each other for various social and political purposes: "elites need the support of their network to maintain their status, protect their group, and make gains within an overarching political or economic system…" whereas "nonelites need clan elders and patrons to assist them in finding jobs, dealing at the bazaar, accessing education, getting loans, obtaining goods in an 'economy of shortages', and procuring social or political advancement" (2004: 232-233). Thus, lower level 'everyday' engagement and negotiation of power relations both within and between clan groups is an indication of power as in flux and negotiated within a complex polity. Evidence for social and political complexity in nomadic Mongol society comes from a confederacy that existed during the second half of the 17th century CE, which created a series of laws and ranks, and established courts, judges and military conscription. While this political union had neither centralized rule under one individual, a capital, nor a contiguous territory, it describes itself as a *törü*, translated variously as "state," "sovereignty," or "government" (Sneath 2007a: 234). Sneath's work, then, goes to show that the "state" and "complexity" do not necessitate "centralization," nor do these concepts exist in opposition to "mobile populations." Instead, pastoral

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primarily about social relations between individuals or groups of individuals, which can occur in mobile communities that are mobile and potentially wide-spread can have social dynamics that are indicative of social complexity (such as stratification and organizational hierarchy) even if they are not centralized in a place or single head-of-state.

2.10.4 Pastoral Power and the Kingdom of Mari

A fourth, and final, case study based on work by Daniel Fleming brings us closer to the time period and subject matter of my larger project. Fleming's analysis is based on the Mari tablet archive, and particularly more than three thousand letters from the 18th century BCE city-state[27] located on the banks of the Euphrates River in what is now eastern Syria. These correspondences shed new light on the ruling strategy of the kings of Mari, especially the last king, Zimri-Lim. The archives highlight the relatively significant collective aspect of Mari politics, where town elders, regional pastoral elites, and tribal assemblies held significant political power. Mirroring some of Gil Stein's concerns, Fleming notes that:

> "political history for the period of early written evidence…naturally gravitates toward the rulers who stood at the center of these societies, perhaps too quickly assuming a top-down style of authority and ignoring the evidence for a broader exercise of political power" (2004: 14).

More than just drawing out evidence for collective governance, Fleming also highlights a dispute in Near Eastern archaeology between scholarship which has viewed pastoral populations as tangential, relatively unimportant and

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and settled populations.

[27] I am aware of the potential baggage of the term city-state (e.g. Yoffee, 2005), but here I use it simply to refer to a political entity that consists of a large, ruling center and the territory it holds (or purports to hold) sovereignty over, including other smaller sedentary settlements.

backwards,[28] and more recent re-investigations of these claims. Anne Porter's work (2000, 2002, 2009) has argued for the importance of pastoralism in the formation of early Near Eastern polities, noting that in many cases, settlements are located in regions that are not particularly well suited for agriculture, but instead are better exploited as pastureland, thus implying a tangible connection between pastoral life-ways and the development of social complexity in the Near East (2000).

Fleming's own data supports the importance of pastoral societies, not as a driving force in Near Eastern sedentism, but rather as politically important groups in the 18th century Mari kingdom. On the one hand, perhaps as much as half of the population within Mari's sphere of control may have been pastoralist. What is more, at least the last independent king of Mari, Zimri-Lim, was himself descended from the Sim'alite tribes, a large shepherding demographic within the region. Based on his study of Zimri-Lim's letter archives, Fleming has been able to reconstruct a complex political and social hierarchy within the pastoral Sim'alite population, and one that must have required special management and negotiation by Zimri-Lim and his courtiers.

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[28] Referring to questions about the impact of pastoralism on early 3rd millennium settlements in Syria, Fleming notes that: "Aside from the hard evidence for one solution or another, the discussion offers a fascinating synopsis of how pastoralism is viewed by most archaeologists. Glenn Schwartz and Hans Curvers observe that the scale of the storage and sophistication of the architecture indicate an association with complex polities of a sort not found near the sites themselves, and assert that we simply lack the ethnographic parallels for such a large-scale system constructed by pastoralists (1992: 417). Most strongly still, Michel Fortin declares that such elaborate structures could not have been built by nomadic peoples, who are by definition not versed in the art of construction. Nomads would never store grain for the following year, he says (2000, 122-123, 126). Margueron, the excavator of Mari, asks why we have found no such silos for the early second millennium, when we know that 'nomads' were active from Mari textual evidence (2000: 107-108). For the moment, it seems that the Ninevite V

In fact, the most senior individuals in the Sim'alite tribe seem to have had direct access to the king, rather than dealing with royal bureaucrats. The archive, which also contains correspondences from other population groups, makes it clear that Mari's complex and heterogeneous population made a simple, uniform system of tiered government impossible, and instead necessitated various efforts to negotiate control over different demographics in different ways.

Sneath and Fleming alert us to the fact that centralization is not a stand-in for social complexity. Sneath contends that Mongolian nomad populations exhibit similar levels of social hierarchy and political complexity as the sedentary populations that system theorists (e.g. Flannery 1972, Johnson 1978) viewed as the result of the path to complexity via a process of centralization and concentration of power within a particular location and the apex of a socio-political hierarchy. Fleming's work similarly echoes the social complexity of pastoral populations by analyzing the ways in which Zimri-Lim's Sima'lite background affected his ruling strategies. What is more, Fleming highlights the various sources of power present in a Late Bronze Age polity, and the complex (and likely differing) goals presented by each subgroup.

2.11 *Conclusion:*

The four case studies considered above share (at least) one pivotal realization: systems of governance and political control are not one-way processes that emanate from the ruling body outwards, but are instead constantly negotiated systems of

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storage sites provide a stimulus for alternative historical reconstructions, without sufficient evidence to power. Returning to Stein's call for a "critique of an archaeology of centralization," it is clear that this realization plays a critical role in investigating "the dynamics of conflict between the centralized elites and other social sectors," since the first step in this pursuit requires that we recognize the power of non-ruling and non-elite individuals and groups. As Pauketat has shown, an "archaeology of centralization," then, is not inherently problematic, as long as it recognizes the fact that centralization (or better said, an attempt at the centralization of power) can be constrained and resisted or impacted by the multi-faceted nature of political, economic and social power within a given society, and thus places individuals, groups and locations within a larger societal context.[29]

To summarize, relevant critiques of centralization fall along at least two lines. First, centralization is a strategy that can be employed by elites but is impacted by (and aimed at) non-elites. Thus, to understand centralization and the development of complexity that can result from it, it is not enough to consider centralized elites and central locales, but requires an investigation into how centralized and non-centralized groups interact. Secondly, centralization must not be conflated with complexity, nor deemed a necessary process for the formation of the state (see Crumley 1995, Blanton 1998). Rather, we must accept that social complexity can develop in highly diffuse social and political groups, and that diffuse groups can provide considerable sources of power. The examples above serve to illustrate how such approaches can be effectively

allow general agreement on any one of them."

[29] Thus, "centralization" and what I will call "grassroots" approaches run into the same problem Paul Ricoeur has identified with respect to individual agency and structure (or what Marshall Sahlins terms "radical individualism" and "leviathanology", 2004: 142): an "epistemological break" resulting in an inability to reconcile the two dialectically opposed theoretical positions.

deployed. In short, if our goal is to understand the various and complex processes that lead to the development and maintenance of political, economic and social situations in the ancient world, power is better considered as in flux and relational, along a Machiavellian line of reasoning, rather than as inherently centralized as in a Hobbesian perspective.

The question, then, becomes, what are the various and complex strategies that are set in place by not only ruling elites, but other groups and sectors of society, in order to pursue various goals, perpetuate a personally favorable economic, political or social system, or change the current system such that it becomes more advantageous. Due to a number of issues (not least the ones highlighted by the studies cited above) a simple centralization model, which views power and control as both originating in, and emanating from, the center, is poorly suited for this purpose. Instead, a multi-scalar approach, and one that accepts the power of individuals and groups conventionally considered less powerful (or even powerless), is crucial to providing a well-rounded and well-developed political, social and economic analysis. In what follows, this study provides a consideration of a group of individuals who are not well understood in Minoan and Late Cypriot archaeology due, in large part, to the data used to analyze them. As a result, Minoan and Late Cypriot shepherds have not been considered as a particularly powerful or important political and economic force in the Late Bronze Age world.[30]

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[30] As will become clearer below, Halstead's work (e.g. 1990a, 1996, 1998a, 1999) provides an exception here, but due to the fact that he is working from a textual data set, the interpretations this can provide are from a "top-down" perspective, which illuminates only one series of social relationships: those between Minoan shepherds and the centralized bureaucracy at Minoan palatial complexes, and

fails to provide evidence for the strategies the shepherds employed in more localized and regional contexts, both in social (e.g. interpersonal) situations, and in economic (e.g. subsistence) situations.

CHAPTER 3

BEYOND HIERARCHY AND HETERARCHY: A CRITIQUE OF CENTRALIZING APPROACHES TO LATE BRONZE AGE CYPRUS

3.1 *Introduction:*

Questions of centralization during the Late Bronze Age on Crete and Cyprus can be most effectively considered at two different, although nested, scales: the island-wide scale, and the regional scale[31]. At an island-wide scale, the problem is to decipher whether an integrated political system existed across the whole of each island, linking various large town/urban centers under one polity, or whether a peer-polity model (e.g. Cherry 1986; Renfrew 1986) better describes the relationship between the first-order sites. If the former case is correct, a second level of questioning emerges, centered on how such island-wide centralization was brought about and effectively managed. If the latter, we might ask why centralization was either not an effective strategy, or perhaps not a strategy attempted at all.

At a regional scale, an analysis of centralization provides an opportunity to investigate the relationship between a large town/urban center and its hinterland. This raises the potential for site-hierarchies, with the largest settlements representing the most important, top-of-the-pyramid, administrative centers, while resources from smaller settlements in the region are funneled to support these administrative complexes, and the individuals and groups who live at these sites (what is, itself, a

[31] It is worth noting that Keswani (1996:212) prefers to consider "heterarchical" and "hierarchical" socio-political organization at three scales: local, regional and island-wide. Here, I elide the local and regional scale to include socio-political interactions between individuals/groups/factions within

process of centralization). Thus, the regional-scale also allows for analysis of social and political hierarchies, and investigations into the relationship between individuals, factions or kin-groups. On both Crete and Cyprus, considerable debate continues about the nature (and presence or absence of) centralization at each scale, and the available evidence makes this question complex and multi-faceted.

This emphasis on centralization in Cypriot scholarship in particular emerges, most evidently, out of debates over the political relationships between these first-order settlements, and is framed by what we might call "hierarchy" and "heterachy" positions that can equally be applied at the island-wide and regional scales. Some scholars arguing for a "heterarchical" political organization whereby the Cypriot polities vied for economic and political control of various portions of the island (e.g. Merillees 1992; Keswani 1996; Manning 1998), while others support a single-state model with one settlement (often the site of Enkomi on the eastern Cypriot coast) acting as the primary center (e.g. Knapp 1994; Muhly et al. 1988: 294-295; Peltenburg 1996). In actuality, it is likely that the political organization of Cyprus changed considerably throughout the Late Bronze Age.

"Hierarchical" and "heterarchical" perspectives exist at both island-wide and regional scales in order to move beyond some confusion in the literature. The terms "heterarchy" and "hierarchy" were first used to discuss LC socio-political organization by Keswani (1996) to "diversify existing models of socio-political complexity," and to investigate the "range of hierarchical and heterarchical patterns attested at the local,

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settlements (what Keswani would deem 'local') and between individuals/groups/factions within a settlement's wider hinterland and economic network (what Keswani would deem 'regional').

regional and island-wide scales" (211-212; see also n. 1 above). These concepts have been deployed elsewhere in slightly different capacities, for example by Steel at a more local/regional level when discussing the socio-political organization of Enkomi and other settlements in the north-eastern portion of Cyprus: "rather than a single hierarchical organisation, a heterarchy is organized into several competing social groups, each with differential control over a variety of economic, political and religious institutions. The ascendancy of particular groups will vary over time. Instead of centralized control expressed through discrete architectural zones, heterarchies are characterized by dispersed economic, administrative, religious and elite activity areas within one urban centre." (2004: 243-244, n. 217). However, Knapp (2008: 144; 2013:432) moves from the regional-scale to the island-wide scale, when he equates "heterarchical" with a model of an island-wide peer-polity organization. Knapp also links "hierarchical" political organization and island-wide political centralization during the LCI-II, writing that "Enkomi offers substantial evidence for…the emergence of a centralised, *hierarchical*, state level, sociopolitical organisation…" (my italics, 2013:434). Crewe likewise notes similar issues with terminology, especially in regards to "state", "urban" and "hierarchy: "the often mean different things to different researchers and there is no universally accepted definition of the terminology" (2007).

3.2 *Centralization on Cyprus*

The Late Bronze Age on Cyprus (or the Late Cypriot [LC] period, c.

1680/1650-1100/1050 BCE[32], see table 3.1) is conventionally considered a time of substantial transformation, with the island transitioning from "an insular polity to an international player… [as] the economy expanded from a village-based, staple finance system to a more competitive and comprehensive, urban-rural wealth finance system" (Knapp 2008: 144). This economic growth was likely linked to the intensification of copper mining and smelting, the establishment (e.g. Enkomi*,* Hala Sultan Tekke, Kition) or embellishment (e.g. Kalavasos-*Ayios Dhimitrios* and Maroni-*Vournes*/*Tsaroukkas*) of a number of large, centralized settlements and an increase in overseas trade with other Eastern Mediterranean polities (e.g. Keswani 1996, 2004; Manning and DeMita 1997; Knapp 2008, see fig. 3.1). The emergence of these large settlements (often described as the first 'urban' settlements on the island, see e.g. Fisher 2014) lays the groundwork for the "centralization problem" in Cypriot prehistoric archaeology—what is an overt emphasis on, search for, and focus on the consolidation and concentration of power within specific centers and elites.

This teleological emphasis on centralization—a theoretical perspective that has the effect of limiting investigations into the historical impact of non-elites or

[32] See table 3.1. The Late Cypriot period corresponds with the latter three-quarters of a period Knapp chooses to call the *Protohistoric Bronze Age* (see e.g. Knapp 2013, and Manning's Appendix therein, pp. 485-521). According to Knapp's terminology, the *Prehistoric Bronze Age* coincides with the traditional Philia, Early and Middle Cypriot periods ending before the Middle Cypriot III, while the *Protohistoric Bronze Age* includes Middle Cypriot (MC) III through the end of the Late Cypriot period. As the archaeological samples considered here all come from Late Cypriot contexts (to the best of the excavators' knowledge), and as this dissertation is concerned with the animal husbandry, shepherding practices and political economies that existed *after* the formation of the first Cypriot cities (and not during the developmental/transitional MCIII period), I have chosen to refer to this as the Late Cypriot period rather than the *Protohistoric Bronze Age.* Manning's Appendix in Knapp 2013 provides the most detailed and up-to-date chronological sequence for Cypriot prehistory, and notes that that the MCIII to LCIA transition "is not well defined…with the data to hand…" (2013: 513). Despite this, on current data, the Late Cypriot period can be placed at 1680/1650 Cal BCE to 1050 Cal BCE (based on modeling published in Manning 2013: 513-514), with the LCI period running 1680/1650 Cal BCE

Period	Approximate Dates	Comments
Philia Period	2400-2200 BCE	
Early Cypriot	2300/2250-2100/2050BCE	
Middle Cypriot I-II	2100/2050-1750BCE	
Middle Cypriot III	1750-1680/1650 BCE	Beginning of Knapp's *Protohistoric Bronze Age 1,* Emergence of Enkomi,?
Late Cypriot I	1680/1650 BCE-1450 BCE	Continuation of Knapp's *Protohistoric Bronze Age 1,* Beginning of HST, Main occupation at KAD?
Late Cypriot IIA-IIC	1450 BCE-1220 BCE	Knapp's *Protohistoric Bronze Age 2;* Main occupation of Maroni-Vournes?
Late Cypriot IIC(late) - IIIA	1220-1100/1050 BCE	Knapp's *Protohistoric Bronze Age 3*

Table 3.1: Approximate Dates for the various periods mentioned in the text

through ~1450 Cal BCE (no C^{14} available for this boundary), the LCII from ~1450 Cal BCE through 1220 $\pm$ 33 Cal BCE, and the LCIII 1220 $\pm$ 33 Cal BCE through 1100/1050 Cal BCE.

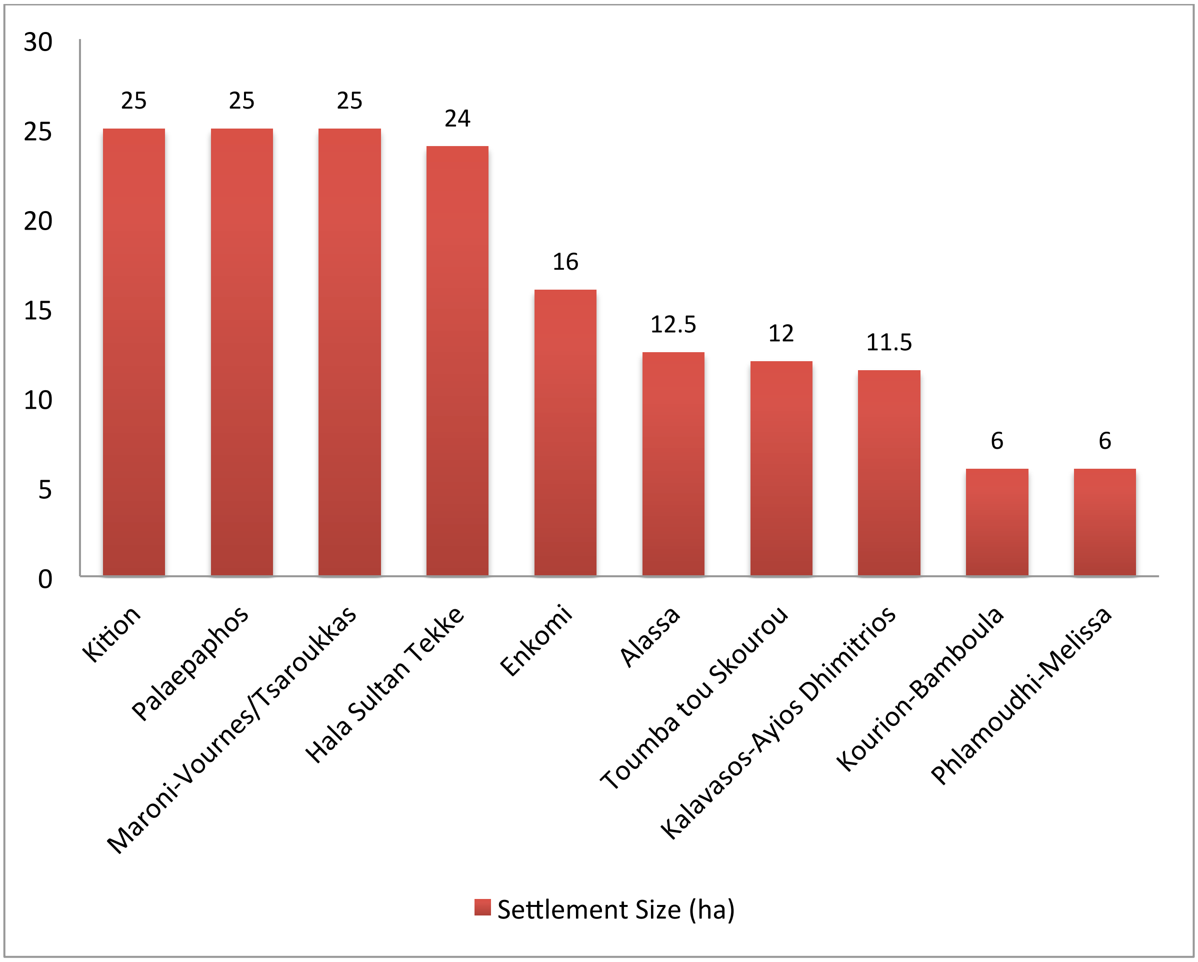

Figure 3.1: Estimated size of select large Late Cypriot settlements (after on Knapp 2013).

individuals outside “central” places, deemed important by a centralization theory—continues even as current archaeological evidence appears to undermine it. Extensive and detailed study of early LC ceramics by Crewe (2007), with a particular eye towards “focus[ing]… the extant archaeological evidence in an attempt to disentangle the often conflicting interpretations of the earlier LC period” (159), indicates a relatively decentralized ceramic economy throughout Late Bronze Age Cyprus. Potters across the island—in both larger coastal settlements and smaller inland fortresses and village sites—in Crewe’s estimation, had considerable autonomy in their choice of fabric, production technique (wheelmade or handmade), and decorative style. These decisions—especially a commitment to concurrent handmade production even after the potters wheel was introduced—were likely made in response to “internal and external market demand” (Crewe 2007: 149). Despite growing archaeological evidence for agentive, non-elite ceramic producers, a tendency to search for politically and economically centralizing elites, operating in a social vacuum, and driving the foundation of substantial, polities remains pervasive in the literature. Brown (2013) provides the most recent albeit somewhat inadvertent example. The goal of Brown’s work is to evaluate the role of landscape (and particularly the Gialis River and surroundings) in the establishment of a LC polity in south-eastern Cyprus, however he begins by assuming a Cypriot polity centered at Enkomi. Brown’s “aim is to examine the implications of this equation…”—the equation of Cyprus, Alashiya and Enkomi, see below for more detailed discussion—“…as it pertains to settlement patterns in south-east Cyprus, with particular reference to the environmental context in which these developed" (2013: 121).[33] Thus hierarchical/heterarchical view still holds considerable sway in the literature, with Brown, as recently as 2013, arguing for the preeminence of Enkomi during this early LC period.

3.3 *An Island-Wide Hierarchy?*

The "hierarchical" viewpoint in this debate argues for a single-state model with one settlement[34] acting as the primary center (e.g. Knapp 1994; Muhly et al. 1988: 294-295; Peltenburg 1996), while the contrasting view supports a "heterarchical" political organization in which Late Cypriot polities vied for economic and political control of various portions of the island (e.g. Merillees 1992; Keswani 1996; Manning 1998; Peltenburg 2012; akin to a peer-polity model, e.g. Renfrew and Cherry, 1986). While this debate is well trod and thoroughly discussed elsewhere (see, e.g. Knapp 2013:432-447 for a very recent re-analysis, and also Peltenburg 2012), a review of the evidence deployed in this debate is useful before considering how an uncritical and overly simplified application of a "Hobbesian centralization theory", a perspective that sees power as inherently and (nearly) exclusively created and maintained within

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[34] This primary settlement is often thought to be the urban settlement of Enkomi, situated in the eastern portion of the island, approximately 3.6 km from the coast at Famagusta Bay; but note Fisher's (2007:48) important caveat: "Enkomi's supposed preeminence is likely due as much to the fact that it has been more thoroughly investigated than any of its contemporaries, than to any real power that it held over the entire island." Crewe (2007:158) echoes this: "Enkomi is often cited as the 'only' LCI coastal centre to display extensive evidence of copper production at this time [LCI] (Knapp and Cherry 1994:137) but is also the *only* site to have extensive exposure of the earlist occupation." Brown (2013: 131) despite beginning with an explicit assumption that equates *Alashiya* with a polity centered at Enkomi, does open the door for contemporary, independent polities in addition to his Enkomi-centric *Alashiya* on Cyprus: "If the present supposition regarding a Levantine-oriented *Alashiya*n polity is

centralized centers and political apparatuses, actually characterizes both positions, in slightly different ways.

Hierarchical models, (the most foundational being Knapp 1986 and Peltenburg 1996) rely on three main sources of evidence: texts from outside the island, archaeological data for a substantial intensification in copper production (e.g. Muhly 1989; 1991), and an internal, material dataset, where a generally similar 'élite artifact package' is found at the largest LC settlements (e.g. Webb 1999: 307-308).[35] Knapp 1986 clearly argues for a large, centralized polity incorporating multiple urban centers on Cyprus during the LC: "refining of metallic copper may thus have occurred chiefly in the major coastal cities, suggesting the existence of a centralized administration and at the same time the coordination of production geared to the export market" (41). In 1988, Knapp noted that archaeological data from the Middle Cypriot (MC) to Late Cypriot (LC) transition indicates "new social organisation, hierarchically arranged along economic and political lines", and but later asks, "how did the emergent Cypriote elite(s) organize control in what must have been an island culturally if not politically divided?...If regional polities existed, was control organised in similar ways?" (1988: 141). Here we should recall "hierarchy" existing at two nested scales.

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correct, this implies that a contemporary occupation at Morphou represents a parallel development largely independent of this geopolitical context."

[35] Peltenburg 2012 (1-2) identifies three similar methodological approaches to the hierarchy/heterarchy question for LBA Cyprus: "Most archaeologists privilege material culture in their reconstructions. A second group, comprised largely of Assyriologists, refers almost exclusively to textual evidence (e.g. Malbran-Labat 1999; Singer 1999, 721; Steiner 1962). Lastly are those researchers who attempt a combination of the two (e.g. Steel 2004; Eriksson 2007)". Later in the same paper, Peltenburg notes a disparity between the textual and material evidence for LC Cyprus, identifying "an apparent conflict between textual evidence which projects *Alashiya* as comparable to other great states of the Ancient Near East and the contemporary material record which lacks so many features evidence in neighbouring archaic states, that is entities that have left us explicit paraphernalia of formal institutions of government" (2).

One a more local/regional level, Knapp wonders how the social/economic/political hierarchy at various settlements was established and maintained (arguing in this article for ideology and religion as the prime mover). Knapp also addresses the island-wide scale in arguing for an island-wide hierarchical political organization (1986, above).

The textual evidence useful for deciphering the political organization of LBA Cyprus comes from three primary sources (see fig. 3.2). First, Egyptian records which include both the 15th century BCE *Annals of Tuthmosis III* inscribed on the temple walls at Karnak and the 14th century BCE archive from Amarna, Egypt that records correspondences between the Pharaoh and various Eastern Mediterranean kings and vassals.[36] An archive of international letters from the king of the Levantine city-state of Ugarit (Ras-Shamra) and documents from the Hittite capital at Bogazkoy, Turkey, which record a Hittite version of interactions between the king of the Hatti and the king/land of Alashiya make-up the second and third groups of textual evidence. Collectively, these groups of texts serve as evidence for a complex political and economic system that existed between various political players in the Eastern Mediterranean during the Late Bronze Age. The region was organized into a number of larger and smaller kingdoms and city-kingdoms, jockeying for political and economic control. The most prominent and powerful political entities were the kings (and kingdoms) of the Hatti (the Hittites) in Anatolia, New Kingdom Egypt in the Nile

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[36] The Amarna tablets record international correspondence between the Egyptian Pharaoh and the kings of Babylon, Assyria, Mittani, Arzawa, *Alashiya* and Hatti, all of which appear to be considered political equals to the Pharaoh. Additional correspondences between the Pharaoh and various Syro-Palestinian vassal kingdoms such as Ugarit/Ras Shamra and Gubla/Byblos (see Moran 1992:xiii-xxxix) make up a considerable portion of the corpus as well.

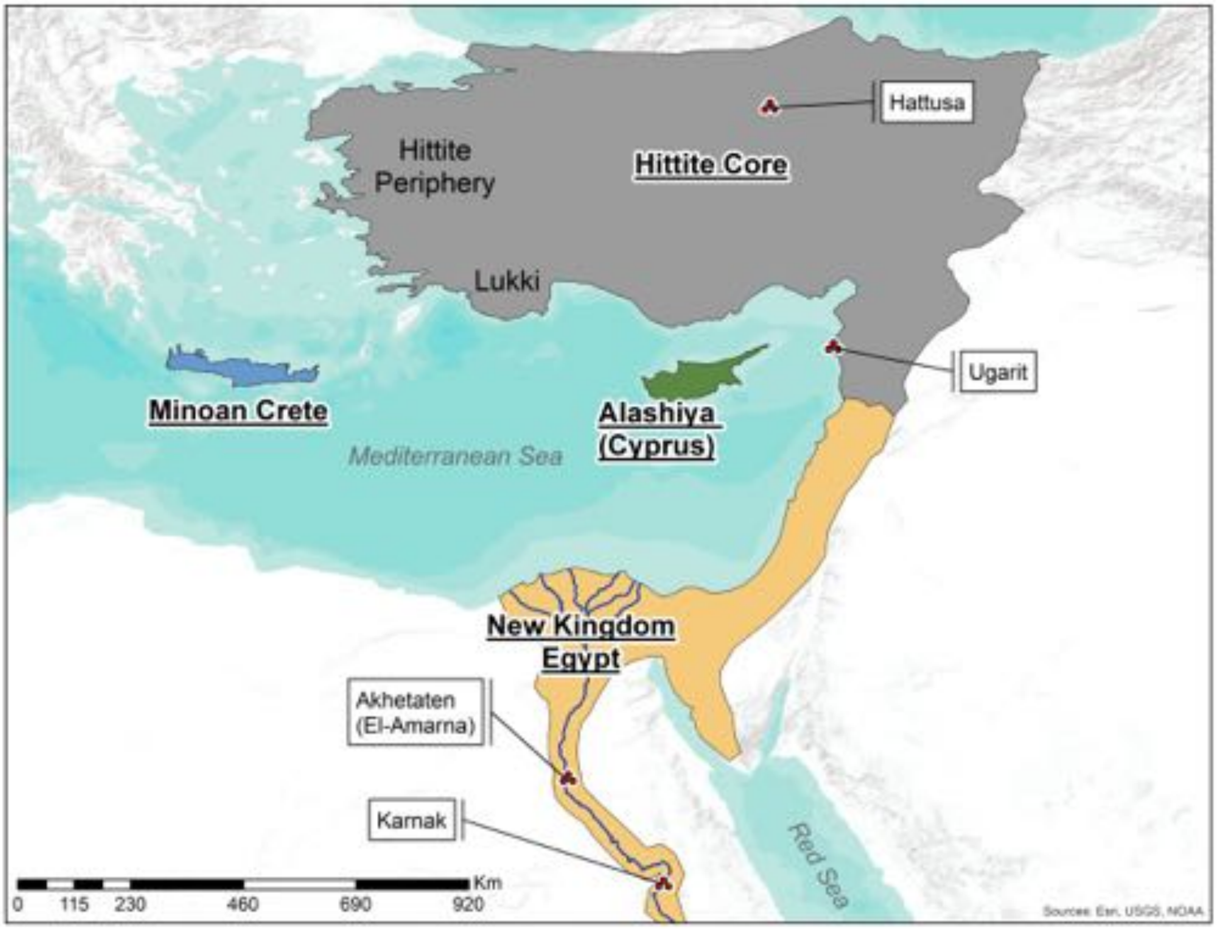

Figure 3.2: Location of major international players in Late Bronze Age Eastern Mediterranean with sites discussed in the text highlighted.

Valley and Delta, Babylon in southern Mesopotamia, both the Mittani and the kingdom of Assur (Assyria) vying for power in northern Mesopotamia, and Alashiya (what is almost undoubtedly a polity on, or incorporating, modern Cyprus; see fig. 3.4 for a map of the region during this period).

The textual evidence is not without its challenges, especially locating *Alashiya* geographically, a topic of considerable debate since the late 19th century (e.g. Maspero 1888; Wainwright 1914-1915; Schaeffer 1952). Holmes (1971) provides a thorough and level-headed argument for equating *Alashiya* with—at least part of—Cyprus. Holmes' perspective has three main tenents: geographic cues that place *Alashiya* in the north-eastern Mediterranean, the fact that Hittite troops attacking *Alashiya* during the reign of *Suppiluliuma* II (c. 1200 BCE) were transported by ship, and association between *Alashiya* and copper production. Independent support for identifying *Alashiya* as Cyprus comes from Goren *et al.* (2003, see below) who, using petrographic analysis, source (even from a rather incomplete sample) the Amarna and Ugaritic Alashiya tablets to the island of Cyprus (and more specifically suggest an origin in the south-central or south-western portion of the island).[37] This debate, however, highlights an important—and on currently available evidence largely unanswerable—complication with the textual evidence: how much of the modern day island of Cyprus was incorporated as part of *Alashiya*? If part of the island was incorporated into another polity or series of polities (as, for instance, the northern portion of Cyprus functions as a *de facto* polity today despite the illegitimacy of its incorporation), it is possible, and indeed likely, that different levels of centralization and political control characterized these political entities.

3.3.1 Texts from Egypt

The Egyptian textual references to the king or kingdom of Alashiya are the chronologically earliest political texts[38] that reference Alashiya, and –especially in the case of the Amarna Letters (below)—help to better conceptualize the Eastern Mediterranean political and economic systems of the Late Bronze Age. The initial mention of Alashiya in Egyptian texts occurs in the *Annals of Tuthmosis III*, a complete record of the military achievements and conquests of Tuthmosis III (c. 1493-1440 BCE[39]), and the tribute/plunder acquired during those conquests, inscribed on the internal enclosure walls of the great Karnak temple of Amon (Breasted 1906:163-166). Cyprus (called *Isy*, in the text) appears three times (years 34, 38 and 39/40[40]), as a supplier of mostly copper (but also horses, ivory, lead, and lapis lazuli).

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[37] Also see Knapp (1996: 1-13) who provides a thorough argument detailing much of the textual and archaeological evidence for equating *Alashiya* with Cyprus.

[38] The earliest text to reference *Alashiya* is actually an Early Bronze Age (c. 2300-2200 BCE) document from Elba, and additional texts from the Old Babylonian Period at Mari (c. 1800-1761 BCE) likewise list goods, especially copper or bronze coming from *Alashiya*. In both cases, however, these texts are exclusively concerned with listing goods and their origins, and provide little in the way of evidence useful to interpreting the political organization of *Alashiya* during this period.

[39] Dates associated with the reigns of Egyptian Pharaohs (and especially early New Kingdom Pharaohs) are hotly debated, however Aston (2012) provides a recent and thorough evaluation of archaeological data and C14 dates and reaches a conclusion for Tuthmosis III's reign that is used here (1493-1440 BCE). This is not without some margin of error, but is important to provide historical context for the Egyptian-Cypriot relations of this period. Comparing Aston's analysis with Manning's (2013) best dates for the Late Cypriot period, Tuthmosis III's reign corresponds to the second half of the Late Cypriot period (something like the second half of the Late Cypriot IB).

[40] Breasted (1906: 212, §520-521, and note f) explains that some text is missing here, so it is difficult to determine with absolute certainty, whether this discussion of goods acquired from *Isy* (Cyprus) should fall at the end of the 39th year, or the beginning of the 40th year. Judging by the amount of space lacking text, Breasted finds it "probable that the long lacuna [nearly the whole l. 1 west wall) contains the conclusion of the fourteenth expedition…" so that "…Line 1 of the west wall, therefore, begins the fifteenth expedition" (the fifteenth expedition corresponding with year 40 of Tuthmosis III's reign). Knapp (2008), however, chooses to identify this as occurring during year 39. All this said, the precise

Unfortunately, these references tell us little about the political organization of Cyprus/*Alashiya* during the 15th century BCE, and leave few clues to address questions about the unification of the island under one ruler. What they do tell us, however, is about the relationship between Egypt and Cyprus that made the acquisition of copper and these other goods possible.[41] Based on the labels given to the goods acquired by the Pharaoh from various locales, Liverani (1990) organizes the places supplying goods into three geopolitical "belts". The inner-most belt, associated with the term "production"(*b$_3$k*) being under direct control of the Egyptian administration, the middle belt, associated with "supply" (*inw*) representing most of the Eastern Mediterranean and Near Eastern kingdoms in the purview of Egypt, and the outer-most belt, associated with "marvels" (*bi$_3$t)* representing locations outside the reach of Egyptian military coercion, and outside the scope of the Egyptian world (e.g. Punt). Cyprus is counted amongst the various large and small kingdoms that made up the middle belt, and what is more or less the Late Bronze Age Mediterranean world system, as we know it.

The kind of goods that Tuthmosis III received from Alashiya is also indicative of the role Alashiya played in this LBA world system. Liverani (1990: 258, especially n. 20) crucially notes that Cyprus (*Alashiya*), contributed the same kind of high-status commodities (including metals and precious stones) as Hatti, Assur and Babylon. This provides further (though admittedly circumstantial) evidence for the inclusion of

dating to year 39 or year 40 of Tuthmosis III's reign makes little difference in how we interpret the relationship between Cyprus and Egypt during this period.

[41] Knapp, for instance, suggests that "the many towns and regions of the Levant, the Aegean and Cyprus mentioned in the Annals of Tuthmosis III should not be seen as tributaries but rather as polities

Alashiya in the highest level of eastern Mediterranean hierarchy, by the 15th century BCE. Chronological considerations are critical here for cross-cultural comparison, thus underscoring the importance of a firm and well-researched chronological framework that ensures that contemporary political, economic and social issues and events are connected. The balance of evidence (especially evidence which incorporates C14 dates from across the Mediterranean, see Manning 2014, especially pp. 4-7) supports a "High Chronology" with the Late Bronze Age beginning sometime around 1700 BCE, and putting the Hyksos period in Egypt, at something like 1700-1550 BCE. If this is the case, the LCIA (and thus, the establishment of the first 'cities' on Cyprus) is contemporary with this Hyksos period, making the 40th year of Tuthmosis III some 200 years later. Analyzing the relationship between the Hyksos and Cyprus during this period (and attempts at evaluating a potential impact of Hyksos rule on international trade, consumption of copper, and the related development of these first large urban settlements) is outside the scope of this project (but see Manning 2014 for an initial attempt at this), and indeed could be an entire dissertation unto itself, nonetheless it seems important to note that the Cyprus of Tuthmosis III is, on best evidence, the Cyprus of LCII; and thus a relatively mature, complex Late Bronze Age society.

It is difficult to push evidence from the *Annals* further seeing as the mentions of *Alashiya* are few. It may be preferable to conclude, as Knapp does, that "we should probably understand that Egypt and Cyprus were well aware of each other as potential sources for a range of goods and materials in demand, and that Cyprus, familiar with

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ruled by kings or princes involved in complex and intricate political, economic and ideological the military might of Tuthmosis III, wisely chose not to oppose it"[42] (2008: 327). More than this, while internal archaeological evidence (see below) makes it clear that Cyprus was producing copper at this stage of the LBA, the fact that Tuthmosis III received copper from the island implies that it was producing this copper, at least in part, for export elsewhere. This seems a critical point as it supports the view that Cyprus had developed a political and economic situation, at least at some location across the island, where copper could be mined, processed and smelted to an extent that would make export possible. The actual location of this copper production—or equating this intensification of copper production with the creation of a centralized, island-wide (or near island-wide) polity is a stretch. It is worth noting that, while not necessary copper focused, a significant amount of settlement activity appears to have been occurring in both the southwestern (i.e. Episkopi-*Bamboula,* and the probable pre-cursors to Kouklia-*Palaepaphos,* and Maa-*Palaekastro*; Keswani 1996:232-234; Georgiou 2012) and the northwestern (definitive evidence for occupation at Tomba tou Skorou during the LCII and LCIII, and circumstantial evidence for a potential copper supply chain from e.g. Mitsero, Akaki and Akhera during the LCI, see Keswani and Knapp 2003) during this period as well. This suggests that copper was not necessarily the sole prime mover for social complexity.

The second group of Egyptian documents, the Amarna Letters, presents an additional corpus of Egyptian texts that can help to elucidate the political organization

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relationships with the Egyptian state and its ruler" (2008: 326).

[42] Note again the subtle "centralization" in Knapp's thinking here: Cyprus is considered a uniform polity that can "choose" not to oppose Tuthmosis III's military might, despite the fact that what "Cyprus" or "*Alashiya*" represent (in terms of the entirety of the island, one individual polity within a larger, island-wide peer-polity network, or something in between) is not clear.

of Cyprus. The corpus comes from the New Kingdom site of Akhetaten (el-‘Amarna), a city founded by the Pharaoh Akhenaten (Amenhotep IV), the so-called “heretic king”, who ruled during the mid-14th century BCE,[43] and both changed the focus of the Egyptian religious system to worship Aten, the Sun-Disc, and in the process moved the capital of his kingdom from Thebes, to a new city at Akhetaten. This makes the 382 tablets, likely written during the reign of Akhenaten[44], about a century later than the *Annals of Tuthmosis III* and therefore provides some time depth for considering the international countenance of *Alashiya* throughout the LBA. The corpus is predominantly letters received by the Pharaoh/Egyptian Bureaucratic system, from the kings and rulers of the various regional kingdoms and city-states around the Eastern Mediterranean. Eight of the letters (EA 33-EA 40) in the Amarna archive are concerned with Cyprus, either written by the king of *Alashiya* himself (EA 33-39) or by one of his lieutenants[45] (EA 40). The letters correspond to the conventions of the Late Bronze Age Eastern Mediterranean political system, (see Liverani 1990: 13-29),[46] in which politically equal kings referred to each other as “brother”, while

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[43] Aston (2012/2013) gives a date of 1344-1328 BCE for Akhenaten’s reign.

[44] Some of the *Alashiya* letters may also date to the reign of Smenkhare or Tutankhamun, and thus may come from just after the reign of Amenhotep IV/Akhenaten; see Moran 1992: 104 n. 1 and also Kühne 1973: 86, though *cf.* Hellbing 1979: 8-20, who argues that all letters concerned with *Alashiya* date to the reign of Amehotep IV/Akhenaten**.** The precise dating, while important in understanding wider trends in Egyptian/*Alashiya*n relations, is not critical for attempts at understanding the political organization of Cyprus during the LBA however.

[45] The term used in the letter is *rabishu*, the same title attributed to *Eshuwara, Shinama* and *Shangiwa* in the Ugaritica correspondences. It is translated as governor (Moran 1992: 113) or senior prefect (Knapp 2013: 438).

[46] Liverani describes this as a period when “relations…[are] more clearly structured into a system (encompassing the whole area) that takes into account the co-existence of different political units of regional extent, the opportunity to establish a fixed hierarchy inside the regional units but a conventional parity of rank between the units themselves, the aim to preserve the existing balance of powers” (1990: 13). The argument here essentially being that the conventions exhibited in the Amarna letters are the result of decorum of interaction between the major and lesser powers of the Late Bronze Age eastern Mediterranean.

subordinate relationships were indicated by titles of "father" and "son". The Amarna letters are particularly instructive since, in every case, the king of *Alashiya* refers to the Pharaoh as his "brother," indicating a political parity between *Alashiya* and Egypt.

The content of the Amarna letters also speaks to the relationship between the kingdom of *Alashiya* and Egypt. EA 33, 34, 35, 36 and 37 make it clear that the king of *Alashiya* is both well-aware of, and a major participant in the "gift-giving", hierarchical economy of the Eastern Mediterranean LBA. This "economy" appears to have essentially been based on a reciprocal agreement of exchange, as much about creating and maintaining international relations and international prestige as about acquiring material goods. Liverani notes that as opposed to tribute, "which increase the prestige of the receiver, the supplies in gift-exchange (reciprocative) [sic] partnership should increase the prestige of the sender" (1990: 214). At the same time, Liverani also identifies an attempt at receiving as much as possible in a given exchange, while giving as little as possible. The fact that Cyprus is involved in sending raw material (i.e. copper and likely timber) and not simply prestige goods (e.g. art, jewelry, precious metals) might imply a slightly more practical bent to gift-exchange relationships with *Alashiya*, however. Almost all tablets involve the sending of some amount of copper from *Alashiya* to Egypt, and while the King of *Alashiya* also makes reference to sending other "gifts" such as horses, jars of perfumed oil, ivory and lead, copper is far and away the most prominent and, apparently most coveted, commodity that *Alashiya* could provide.

3.3.2 Texts from Hatti

Hittite texts that refer to the political unit of *Alashiya* date to the latter half of the Late Bronze Age, spanning the 14th and 13th centuries BCE.[47] This corresponds with a period when the kingdom of the Hittites significantly expanded its international presence, coinciding with the advent of the royal line firmly established by Tudhaliya I/II[48], and including Suppiluliuma I, arguably the most influential military and political Hittite leader of the Late Bronze Age. By and large, these texts are annals that document the accomplishments of various Hittite kings, though some (e.g. KUB XIV 1 rev. 84-90) are correspondence between the king (or his representatives) and Hittite vassals. Fourteen texts make reference to the kingdom or land of *Alashiya* directly or indirectly, as a location that was variously raided (e.g. KUB XIV 1) and conquered (e.g. KBo XII 38), or as a client state paying tribute to the Hittite capital at Hattusa (e.g. KBo XII 38; and also perhaps IBoT I 31 and KBo XVIII 175). These texts, thus, highlight what appears to have been a complex relationship between the kingdom of the Hittites and the kingdom of *Alashiya*.

The earliest Hittite text referencing *Alashiya*, KUB XIV, likely dates to the reign of Arnuwanda I (early 14th c. BCE), and chastises a Hittite vassal, Madduwatta for a recent raid on *Alashiya,* noting that '[the land] of *Alashiya* belongs to My Majesty, [and the people of *Alashiya*] pay [me tribute]…" (Beckman and Hoffner,

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[47] See Beckman and Hoffner, 1996 for the comprehensive catalogue of Hittite documents from Hattusa that discuss *Alashiya*.

[48] Debate continues over whether the Hittite king Tudhaliya who reigned during the beginning of the 14th century BCE is the first or second Hittite king to carry that name. Collins (2007: 42 no. 40) prefers to identify this king as Tudhaliya II, accepting the existence of an earlier Hittite king named Tudhaliya who ruled during the Hittite Old Kingdom, while Bryce (2006: 123) prefers to label this king Tudhaliya

1996: 31). Included in this letter is a quotation from an earlier letter of Madduwatta to the Hittite king telling that Madduwatta was unaware of the Hittite claim over *Alashiya,* which perhap suggests that the Hittite control over *Alashiya* was either not complete or inconsistent and not widely known. Other texts (IBoT I 31 obv. 2-4 and KBo XVIII 175 i 5) are inventories of the palace at Hattusa that list "*Alashiyan* linens" amongst the various commodities stored there. Intriguingly, some texts (e.g. KUB XIV 14 obv. 16-22; KBo XII 39 rev 3'-7'; and KUB I 1) indicate that Alashiya was a place for sending Hittite political exiles, and testify to the fact that this practice of banishing political rivals to *Alashiya* took place a number of times over more than a century, from the reign of Suppiluliuma I (c. 1350-1322 BCE) through the reign of Tudhaliya IV (c. 1237-1228, and perhaps also 1227-1209 BCE), and therefore during the LCII period.[49] At the very least, these texts show (as do the Amarna letters) that *Alashiya* was a political unit during this period that had the ability to take responsibility for Hittite exiles and actively participate in tributary payments.

Two of the later Hittite texts (KBo XII 39 rev 3'-7' and KBo XII 38) speak directly to both the existence of an *Alashiyan* state (in the sense of an autonomous political unit), and also the existence of an *Alashiyan* king, royal family and a senior official or prefect. Both texts date to either the reign of Tudhaliya IV (c.1237-1228 BCE and perhaps also 1227-1209 BCE) or Suppiluliuma II (c. end of 13th century BCE). The first (KBo XII 39 rev 3'-7') appears to be a treaty between the kingdom of

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I/II (and so preserve the numbering of later Hittite rulers) until more definitive proof can be found to determine the existence of a Tudhaliya I and Tudhaliya II.

[49] Textual references for Hittite exiles in *Alashiya* come from the reign of Suppiluliuma I (KUB XIV 14 obv. 12-22), Murshili I (KUB I 1 and duplicates), and Tudhaliya IV (KBo XII 39 rev 3'-7'). Dates for

the Hittites and the king of *Alashiya,* both establishing a military alliance and placing Hittite exiles under the control of the king of *Alashiya* (Otten 1963:10-13; Güterbock 1967; Beckman and Hoffner, 1996:32). Critically, this texts makes reference to a king (LUGAL) of *Alashiya* and also a prefect or senior official (a $^{\text{LÚ}}$*pidduri*, perhaps of a similar rank to the *rabishu* of the Amarna letters and the $^{\text{LÚ}}$MAKSIM[GAL] of the Ugaritic letters; see Kühne 1973:85-86 n. 421 and Moran 1992:113 n. 1). A second tablet, KBo XII 38, perhaps a generation later than KBo XII 39, tells of the invasion and subjugation of the kingdom of *Alashiya* by Hittite forces, likely under Tudhaliya IV and his son and heir, Suppiluliuma II. Two sections of the tablet are of particular interest to understanding the political organization of Late Bronze Age Cyprus. The opening reads:

> [The king of *Alashiya*] with his wives, his children, [and his….] I seized; all the goods, [with silver, g]old, and all the captured people I [re]moved and [brought] them home to Hattusa. The country of *Alashiya*, however, I [enslaved] and made tributary on the spot… (trans. Güterbock 1967:77)

After listing, at length, the tribute that was imposed on *Alashiya*, the text explains how Tudhaliya IV and Suppiluliuma II were able to subdue the *Alashiyans*:

> My father [….] I mobilized and I, Suppiluliuma, the Great King, immediately [crossed/reached(?)] the sea. The ships of *Alashiya* met me in the sea three times for battle, and I smote them; and I seized the ships and set fire to them in the sea. But when I arrived on dry land (?), the enemies from *Alashiya* came in multitude against me for battle. I f[ought] them… (trans. Güterbock 1967: 78).

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these kings comes from Bryce, 2006. Knapp (2007: 327-329) notes six total documents which refer to the exiles sent to *Alashiya*, these three from the Hittites and three additional texts from Ugarit.

Two key points can be taken from these texts. First, there was a king of *Alashiya* during the reign of Tudhaliya IV (corresponding to the very end of the LCII, and/or the beginning of the LCIII) that could both ratify treaties with the Hittites, and also who could be captured (along with his family, entourage and retinue) and delivered to Hattusa. Second, the land of *Alashiya* apparently maintained (or was capable of drawing up) military forces (naval and land-based) to challenge the Hittite invasion. At the very least, then, the king of *Alashiya* was an individual who could both participate in the political world of the Late Bronze Age eastern Mediterranean, and who also commanded a military force (of admittedly unknown size or strength).

3.3.3 *Texts from Ugarit*

The Ugaritic texts that mention or deal with the King/Kingdom of *Alashiya* are, like the Amarna and Hittite corpuses, few—only eight tablets from Ugarit provide evidence for the Kingdom of *Alashiya*[50]— and the tablets themselves are poorly preserved and far from straight forward, but they do provide a few clues for the political organization of LBA Cyprus. The texts mention either the "King of *Alashiya*" or the "King of Ugarit" and, importantly, make clear that the King of *Alashiya* was an international player by at least the late 13th century BCE, on par with, and likely of a higher socio-

[50] Four letters between individuals at Ugarit and *Alashiya* were found in the House of Urtenu (RS 94.2173; RS 94.2177+2491; RS94.2447+2588+2590; RS 94.2475) and four more come from the House of Rappanu (RS 20.18, RS 20.168; RS 20.238; and RS L.1). N.B. that a number of additional texts (e.g. RS 18.042, RS 18.113 A+B, RS 18.119, RS ; see Walls 1996: 36-40 for a comprehensive list) mention the polity of *Alashiya* or individuals from *Alashiya*, concerning themselves with trade in oil (e.g. RS 18.042; an inventory list for the transport of oil to, among others, "'Abrm to *Alashiya*n") or ritual (e.g. RS 18.113 A+B) which lists

political status than, the King of Ugarit. The strongest evidence for this comes from the fact that the Ugaritic king (likely Ammurapi, c. 1215-1180 BCE), refers to the King of Alashiya (an individual named *Kushmashusha)* as "my father". Additional evidence for placing *Alashiya* on a superior political level comes from three letters (RS 20.18, RS 94.2173, and RS 94.2447+), sent from an *Alashiyan* officials (who are referred to as $^{\text{LÚ}}$MASKIM [GAL]; perhaps ministers or governors) named *Eshuwara, Shinama* and *Shangiwa* respectively, each writing directly to the King of Ugarit, rather than corresponding from one king to the other (Yon 2007: 18).[51] The subject of these letters are various, including the transport of copper ingots from *Alashiya* to Ugarit as a greeting gift (Kushmashusha writing to Ugaritic King Niqmaddu III, RS 94.2475), but also a reporting of the raiding of the Ugaritic coast, and a request that the *Alashiyans* keep the Ugaritic court abreast of any information about enemy ships heading towards the Syrian coastline (RS 20.238).

3.3.4 *Interrogating the Texts*

Together, these Egyptian, Ugaritic and Hittite texts provide critical, but also limited, information concerning the political organization, and the international positioning of *Alashiya* between the 15th c. and 12th c. BCE. To briefly summarize, during the reign of Tuthmosis III (c. 1502-1470 BCE),

[51] We might contrast this with EA 40, where a *Alashiya*n *rabishu* (governor?) corresponds with an Egyptian governor concerning a cargo of greeting-gifts from one governor to the other, and requesting the safe return of the ship and men that accompanied the cargo (Moran 1992:113), but not with the Egyptian Pharaoh. Kühne 1973 (85, n. 421) also equates MASHKIM with *rabishu*, identified as a senior official ("hohe Amtsträger") whose responsibilities might include overseeing tribute collection and small military undertakings ("überwachte die Tributabgabe…" and "führte kleinere militärische Unternehmungen").

Alashiya appears to be a largely independent entity that was capable of producing enough copper for export to Egypt. During the reign of the Hittite king Arnuwanda I (early 14th c. BCE), *Alashiya* was considered (at least by Arnuwanda I and his vassls) to be under Hittite jurisdiction, even if the raiding of the island that is cited in the letter implies that Hittite control and protection of *Alashiya* was neither extensive nor particularly effective. Slightly later (by perhaps about a generation), the king of *Alashiya* sent correspondence, along with greeting gifts, to the Pharaoh Akhenaten, addressing the Pharaoh on equal terms and thus placing the land of *Alashiya* in the uppermost level of the Late Bronze Age eastern Mediterranean political hierarchy. This might imply a period of *Alashiyan* autonomy outside the scope of the kingdom of Hatti. From the mid-14th century until the end of the 12th century BCE, *Alashiya* is used as a location for exiling Hittite political threats, and, during the reign of Tudhaliya VI, we have our first documented Hittite-*Alashiya* treaty. However, within twenty-five years of this treaty, Tudhaliya VI and his heir, Suppiluliuma II, apparently bring the island under the Hittite yoke once again. By the beginning of the 12th century BCE, *Alashiya*, appears to act with relative autonomy in its dealings with the king and kingdom of Ugarit, who view the king and land of *Alashiya* as superior.

Despite providing a relatively long (*circa* three-centuries) perspective on *Alashiyan* political relations with other Mediterranean polities, it is critical to recognize (as Peltenburg does, 2012: 3) that these textual sources provide a view of the political organization of Late Bronze Age Cyprus from a very specific, external standpoint. Peltenburg correctly notes, "documentary evidence regarding Alasiya mainly concerns external relations and so it tells us little about domestic[52] socio-political arrangements" (2012:3). What little can be inferred about internal political relations, Peltenburg (2012: 11) notes, comes from Amarna Letters 38 and 40: EA 38 tells of the seizure of a number of villages "year-by-year" by a group called the *Lukki*, while in EA 40, the king of *Alashiya* acts as an advocate on behalf of individuals in his country that are owed payment for a shipment of timber. For Peltenburg these provide evidence for a king of *Alashiya* whose power was less centralized, and more negotiated than his contemporaries in Hatti and Egypt.

It is important to remember that the texts themselves must be considered within the context of international relations of the period. Even those texts that are written by the king of *Alashiya* to either the Pharaoh or the king of Ugarit, are written within the confines of standard and specific conventions, conforming more to the expected relations between LBA eastern Mediterranean kings, and the ideologies associated with international correspondence and political interaction of the period, and less with the political actualities of *Alashiya* (see e.g. Liverani 1990 for extensive discussion of this). We can, however, glean basic political facts from the texts: the land of *Alashiya* had both a "king" who acted as a figurehead for international relations, and also a series of additional (though perhaps not necessarily lesser)

[52] "Domestic" here refers to those socio-political arrangements that are internal to LBA Cyprus/*Alashiya* and therefore *not* foreign-relations, rather than referring to the "household" or socio-political aspects of the "household".

officials termed “prefects” (e.g. KBo XII 39 rev 3’-7’) or “governors” (e.g. RS 20.18, RS 94.2173). Whatever political organization did exist, it made it possible for the king of Cyprus to send greeting gifts (especially copper) to other Near Eastern and Mediterranean kingdoms, to maintain a standing army, and to participate in the complex political relations of the region, negotiating on the behalf of powerful individuals (merchants or other political officials) from *Alashiya*. Reading between the lines, however, allows Peltenburg—citing mainly EA35, EA 38 and EA 40—to argue that “*Alashiya* functioned as a develoved polity with decentralised councils and negotiation to resolve conflicts. The exact nature of the *Alashiy*an political system remains unclear, but the evidence to hand allows an interpretation of LBA Cyprus as a political, economic and social system with various sources of and methods for establishing power. Beyond this, however, these texts unfortunately provide little information to model or reconstruct the specific internal political organization and machinery of LBA Cyprus, as they are meant to function within the political world external to the kingdom of *Alashiya*.[53]

3.4 *An Archaeological Approach to Hierarchy*

3.4.1 Copper Production

With the external view of the textual sources providing at least a loose

[53] Interestingly, *Alashiya* is conspicuously absent in Liverani’s (1990: 291) discussion of the LBA eastern Mediterranean political world, and the relationships between what he called ‘great’ and ‘small’ kingdoms and the importance of ideologies that emphasize “centralized” or “symmetrical” international relations. This might suggest that *Alashiya* does not fit neatly into either a centralized, great kingdom or a symmetrical small kingdom, but exists as some hybrid of the two. Even so, Liverani earlier refers to *Alashiya* explicitly as a “minor” kingdom, arguing that “the Egyptian kings …the metaphor as a necessary diplomatic tool, and even tolerated to be addressed as ‘brother’ by the independent but certainly minor king of Alashiya” (1990:201).

framework for a hierarchical political model for LBA Cyprus (namely that there was indeed an externally-recognized king of *Alashiya* who appears to have facilitated interactions with the other major LBA polities of the eastern Mediterranean), a more detailed understanding of the political organization of the island requires turning to material datasets, especially evidence for copper exploitation and production. Knapp notes that the textual sources indicate that Cyprus was producing an average of 500 kg (about half a ton) of copper *per annum* (and a total of about 25,000 kg) over the fifty or so years represented by the Amarna letters (Knapp 2008: 309-310; 2013: 444); certainly a substantial undertaking and a level of considerable production.[54] Muhly et al. (1988) note, however, that is it difficult to date evidence for copper exploitation in the archaeological record, especially slag heaps and mines, and so our best material evidence for copper production comes from the material artifacts used in the refining process. There is, considerable evidence for substantial (and what Dikaios [1969-1971] and Muhly [1989, following Dikaios] would call "industrial") copper smelting during the early Late Bronze Age, with tuyères necessary for copper ovens pervasive in Level IA and IB deposits at Enkomi (which likely date to the LC IA period, c. early 17th century BCE; Muhly 1989: 299; Dikaios 1969-71: 443; Crewe 2007: 127).[55] The presence of tuyères is especially important in indicating a high degree of specialization

[54] Key here is work by Zaccagnini (1986), which sets the average weight of a talent at approximately 28 kg. The king of *Alashiya* claims to send 942 units of copper (assumed to be talents of copper in each case since the unit is mentioned in EA 34 and EA 37, the unit associated with copper is a talent) over the course of the Amarna correspondence.

[55] While Dikaios [1969-1971] argues for copper production in Enkomi Level A, which he claims to correspond to the MCIII (some fifty to a hundred years earlier than LC IA), Muhly (1991:184) prefers to see this as "nothing more than some sherds of Bichrome ware and a few tuyeres buried under foundations of the Level IA building." Crewe's (2007:127-143) recent re-assessment of Enkomi ceramics and the presence of Red-slip/Black-slip Wheel Made, Plain White Wheel Made, and White Painte Wheel Made II wares supports Muhly's claim that the earliest levels at Enkomi are LCIA.

in copper refining, as it implies the use of forced-air furnaces, which make it possible to bring furnace temperatures to 1200°C, and in turn make smelting and refining more efficient than at lower temperatures capable with natural-draft furnaces (Muhly et. el 1980: 90).These data led Peltenburg (1996) to develop an argument for the hierarchical/centralizing organization of an early LBA (i.e. before the 14th century BCE) polity centered at Enkomi, based on a theory that copper production there provided the necessary impetus for structuring a centralized early state.

3.4.2 Late Cypriot "Fortresses"

Aside from the artifactual evidence for intensified copper production at Enkomi, Peltenburg also cites the construction of the large (600 m^2)[56] "Fortress" at Enkomi as evidence for the development of a centralizing, elite-controlled polity (see fig. 3.2): "this enormous building and its contents is [*sic*] a material isomorph of a

[56] Fisher (2009: 200) gives the dimensions of the Level 1A Fortress as 45m by 11-13m, making the structure between 495 m^2 and 585 m^2. He also notes that the when the Level 1A structure was violently destroyed, it was reconstructed (Level 1B) almost exactly to the dimensions of the Level 1A fortress, so not quite Peltenburg's 600 m^2 figure.

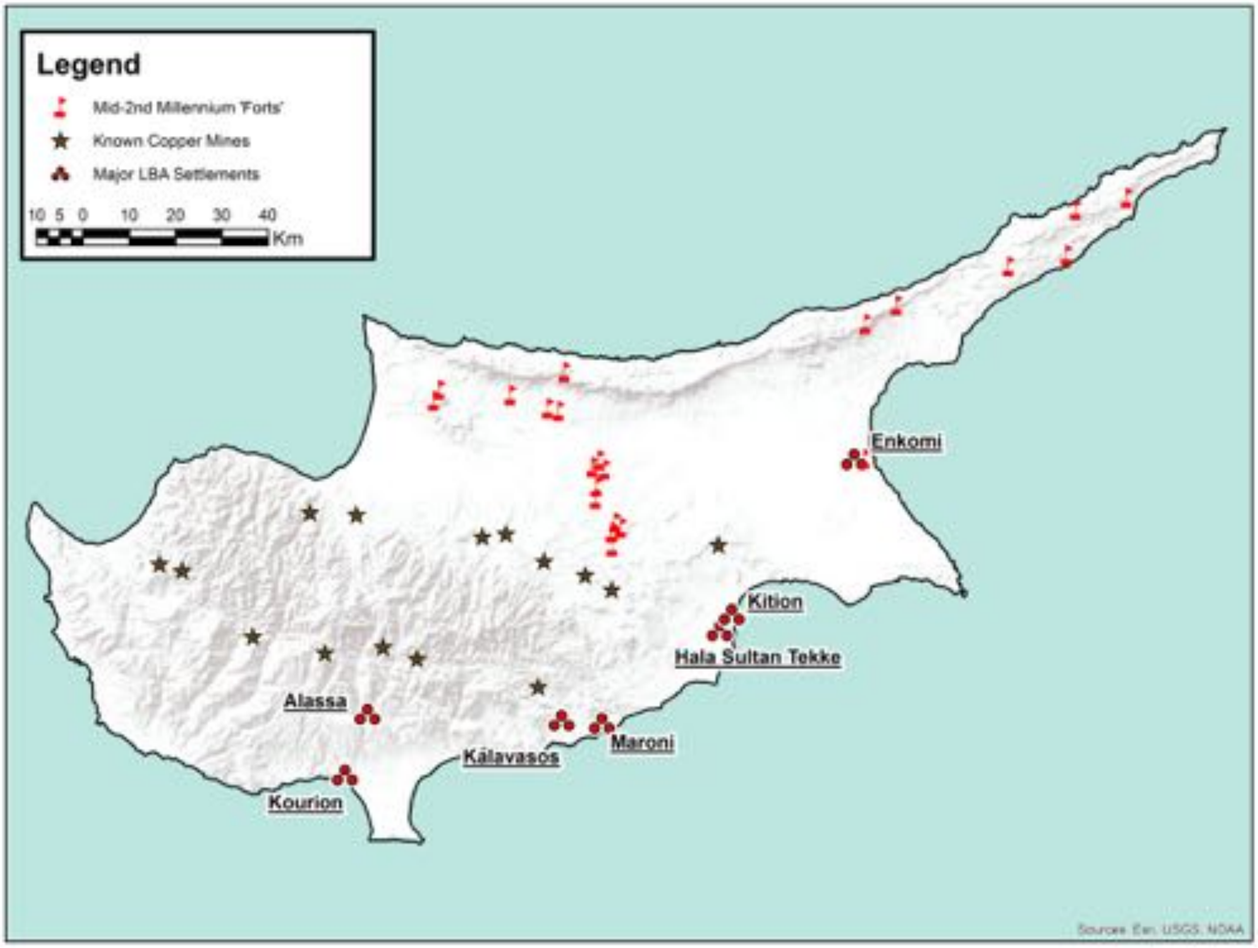

Figure 3.3: Location of LC 'fortresses' and copper mines in relation to select large LC settlements. (after Peltenburg 2008 and Keswani 1993).

hierarchically organised society, profoundly at odds with the architectural remains from preceding small-scale settlements on the island" (29). Peltenburg thus posits a "deliberate policy of long-term copper exploitation that… required a regional infrastructure to ensure stable production at the mines and uninterrupted consignments of partly smelted copper between the mines and the refinery and transshipment locales within Enkomi itself" (30). A number of smaller early LBA "fortresses" scattered throughout Enkomi's hinterland provide the primary evidence for this infrastructural system. The trouble with this interpretation, however, is that there is little evidence to explicitly link control of these smaller hinterland fortresses to the individuals in control at Enkomi. Indeed, the material culture from these sites indicates regional affinities. Crewe (2007:65-66) notes that the ceramic assemblages from the fortreses are far from uniform. The overall assemblage from *Nitovikla*, for instance, with a substantial amount of Red-slip/Black-slip wheel made (13.4%) and Bichrome wheel made (5%) pottery types and a local coarse ware type imply a regional material culture independent from Enkomi. Alternatively, the ceramics from the second period of occupation at Ayios Sozomenos-*Glyka Vrysis*, though unpublished, were composed of significant amounts of base-ring and white-slip, indicative of central or western LCI ceramic tradition (Gjerstad 1926; Crewe 2007: 60).

Outside the purported Enkomi sphere of influence, many of the fortresses located in the Kyrenia mountains or along the northern coast of Cyprus sit in the Turkish-occupied portion of island and so have not been excavated, nor are they likely to be investigated in the near future. This being said, the location of these fortress sites is worth noting (see fig. 3.3, based on Peltenburg 2008), as most of the fortresses do not occur exist within vicinity of known LBA copper exploitation. Moreover, the fortresses in the eastern portion of the island are not spaced out along presumed transport routes from Enkomi to the Troodos as one would expect if these were built as control points and weigh-stations, but are instead clustered just east of the eastern-most Troodos foothills.[57] For the time being, then, without additional evidence, it seems prudent not to follow Peltenburg (1996), and assume that these settlements are linked to Enkomi without any real evidence for such a situation.

3.4.3 An Elite Artifact Package

A final source of evidence is forwarded to support a hierarchically organized political model for Late Bronze Age Cyprus, namely a largely homogeneous assemblage of elite artifacts that exhibit iconographic similarities across the island. For scholars like Knapp (2008: 153-172; 2013: 428-432) and Webb (1999), a common iconographic system or a shared style of funerary treatment might mark off the upper echelon of society that was linked across the island, therefore suggesting a unified political elite. However, the presence of a common iconographic system or style is not enough to prove a centralizing political system. In order to do so, we should expect to see an iconographic system that was actively controlled as a political apparatus, as those individuals or factions who were cognizant of the iconographic system would be included as political elites. Webb identifies zoomorphic rhyta from mortuary contexts, female terracotta models from 15th century BCE domestic and

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[57] See, however, Brown (2013), which sketches a model for the control of the Gialis River corridor, from a series of MCIII-LCI settlements and cemeteries around Ayios Sozomenos (actually on the Alykos River, a tributary of the Gialis), down through Enkomi, including Sinda-*Siri Dash* and Kalopsidha. But, again, chronology is critical here, as Sinda, on present evidence, dates to the LCIIC-IIIA, a period of considerably greater regionalism on the island.

funerary contexts, and the presence of stone seals that contain similar iconographic representations of deities, heroic/semi-divine figures, and various fictional and real-world animals (1999:307; 2002) as common elite assemblages. Two-hundred and nine base-ring bull rhyta are known from almost entirely funerary contexts dating to the LCI-II periods (Webb 1999: 200).[58] Over two hundred provenienced cylinder seals are known from Enkomi (but, notably fewer at HST, Kition, and *Toumba tou Skourou*, which had 12, 6, and 4 respectively), which perhaps implies a high level of specialized trade, and might also indicate a way to mark group affiliation (Webb 2002: 135). Moreover Steel (2004: 154; see also: Overbeck and Swiny 1972:8; Masson 1976: 153-157; Philip 1991: 78-83; Keswani 2004: 121-124) notes the emergence of elaborate weapons and military paraphernalia during the MCIII-LCI transition, especially socket-head axes and maces, which originated on the Levantine coast, and suggest a rising warrior elite and emphasis on military prowess as a path to political power.

Despite the fact that an elite assemblage, that included ritual objects (e.g. zoomorphic base-ring rhyta), female terracotta figurines, metal objects (especially weapons), and exotica from other eastern Mediterranean locales (e.g. jewelry, faience), and was largely associated with funerary deposits and monumental buildings emerged on the island during the early LBA, it is not entirely clear how this proves the pre-eminence of Enkomi (or any settlement, for that matter) during the LBA. To be sure, these luxury objects and exotica do appear to indicate the growth of a status-oriented society, with elites developing the ability to control access to production and exchange of unique, specialized goods. However, while these objects do speak to a

[58] The two exceptions coming from a well deposit at Episkopi *Bamboula,* Room 11, Level IV at

broadening social disparity throughout LC society, it is difficult to connect this to a hierarchically organized, centralizing island-wide polity. Peltenburg (2012:4-5) reasons:

> The widespread distribution of the stone seals could be due to a number of reasons, but in the absence of sealings they remain equivocal signs of centralised administration of the island. Without independent supporting evidence, other material indicators marshaled for centrist interpretations such as standardised bull rhyta, female terracotta images, repeated depiction of deities, ashlar masonry, monumental complexes and common imagery on prestige goods (Webb 1999, 307; Knapp 2008, 339-340) seem too precarious a basis for concluding the existence of a sovereign state that controlled the whole island.

Coincidentally, Peltenburg's 2012 chapter also provides a useful opportunity to turn to the argument for a heterarchical model of LC political organization, as Peltenburg's earlier work (1996 especially[59]) was one of the main foundational works for a hierarchical perspective. This said, a 1998 paper co-authored with Pickles indicated Peltenburg's slight change of opinion, and his most recent 2012 paper shows a full-fledged about-face, providing a compelling and well-reasoned argument against a hierarchical position that will be returned to below.

Myrtou *Pigadhes* and an Iron Age ritual deposit from a sanctuary near Gypsou (Webb 1999: 200).

[59] In this paper, Peltenburg states: "…I shall argue that a fledgling state emerged before the 14th century B.C. and that evidence is scarce because most LC settlement archaeology comes from the LC IIC-III" and also, "Keswani's arguments against the existence of a unified, island-wide kingdom, perhaps founded and dominated by a paramount centre at Enkomi, are irrelevant to the present discussion since they pertain to the later LC period when fragmentation is evident, and island-wide status is not an issue here" (28). His recent 2013 re-evaluation of the political organization of Cyprus during the LBA period largely reverses this perspective, however. See below for a detailed discussion of Keswani's (1993; 1996; 2004) arguments.

3.5 *An Island-Wide Heterarchy?*

Arguments for a heterachical political organization of the island during the protohistoric period develop from a perspective that considers a number of large Late Bronze Age settlements across the island as independent from one another or, at most, loosely connected. If the "hierarchical" model can be said to provide a politically-oriented view based on outwardly-focused political correspondences, the "hetarchical" model is founded on an economic perspective, advancing artifactual evidence, and considering political-economic jockeying amongst the various elite groups and settlements that existed during the LC. Building on ideas first advanced by Robert Merillees (1987, 1992), Priscilla Keswani (1993) offered the most concerted argument against a hierarchically organized LC Cyprus, noting four major problems with such an argument. She observed, first, the lack of a consistent style of architecture at the major LBA centers on the island, suggesting that an island-wide, centrally-organized polity would likely have stylistically (and functionally) similar structures at these first-order settlements.[60] Second, Keswani pointed to the absence of both iconographic evidence for a centralized authority on the island and any administrative apparatus to facilitate the centralization of ideological, political and economic power (e.g. written records).[61] Third, the substantial variability in LC settlement size (see fig. 3.2), with

[60] Note that the construction of monumental structures at various sites across the island especially those that employed ashlar masonry and gypsum facing (e.g. Enkomi, Kalavasos-*Ayios Dhimitrios*, Maroni-*Vournes*, Alasa-Paliotaverna) were critical to the Late Bronze Age elite material culture, and served to indicate and maintain a status-based social hierarchy. However, the lack of shared traits in terms of architectural plans, location at settlements, and structured spaces, does not appear to indicate a common architectural form on Cyprus like the so-called 'palaces' of Minoan Crete. See Fisher 2009.

[61] It is worth noting the presence of the un-deciphered syllabic language "Cypro-Minoan" here. The earliest Cypro-Minoan tablet comes from Level A at Enkomi (dating to LCIA based on Crewe's [2007] recent reassessment of ceramics at Enkomi; *cf.* Ferrara 2012: 40, who associates this with MCIII). In addition to tablets, Cypro-Minoan is also featured on small *boules* or roundels, a stone basin, a votive

sites ranging from c. 10 ha to more than 25 ha, calls the prominence of Enkomi into question, especially if we take site size to be representative of political importance.[62] Finally, Keswani observed that high-prestige, elite goods were not concentrated at the highest order settlements and distributed in a way consistent with a hierarchical political organization, but were, instead, relatively evenly distributed across large settlements across the island.

3.5.1 Inter-site Competition

More recently, Keswani (2004) has argued for (at least) two, unique trajectories towards political complexity and urbanism during the Late Cypriot Period, building on the concepts of wealth and staple finance (after D'Altroy and Earle 1985; Brumfield and Earle 1987). She notes two distinct groups of urban settlements on Cyprus; the first is made up of near-coastal settlements focused on international trade and interaction with other polities around the eastern Mediterranean, a system that could be exploited by enterprising elite merchants (or "aggrandizers", the term offered by Manning and DeMita 1997:108, borrowing from Clarke and Blake 1994) who could facilitate international transactions, bringing about a new level of economic specialization in the process. These settlements—chief among them Enkomi, Hala

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kidney, a figurine, and a plauque (Ferrara 2012: 31). While this form of writing is certaintly present on Cyprus during the LC period (it is, however, concentrated at Enkomi, with 133 of the 243 Cypro-Minoan inscriptions found there), the importance of this writing as an administrative tool or form of political or economic control—what is really at stake for Keswani's point—remains difficult to address on present evidence. Even Ferrara (2012), whose work emphasizes the importance of Cypro-Minoan inscriptions on LC Cyprus, is reticent to claim the presence of a centralized authority based on Cypro-Minoan: "It would be dangerous to infer whether or not this signified a level of control. We have no means of identifying mecahnisms of systematic coercion through the circulation and exchange of highly prestigious objects written in Cypro-Minoan…" (2012: 41).

[62] This is especially true when we consider that Enkomi is estimated at between 12 and 16 ha (see Merillees 1992:319; Knapp 1994: 417; Iacovou 2007: 6), making it only the fifth-largest settlement on

SultanTekke (HST), Kition and probably *Toumba tou Skourou*—provided elites in these locations with the opportunity to funnel (and perhaps even monopolize) access to exotic markets. Thus, the political power of these elites was essentially founded on commercial ventures, based on their ability to exchange "lower-order exotic goods, ceremonial paraphernalia, finished metal items, and possibly other urban workshop products" for raw materials coming from the large inland centers (Keswani 1993: 78). According to this model, a more centralizing process existed for the "inland" (and really the south-central and south-western portions of the island) settlements at sites like Kalavasos-*Ayios Dhimitrios*, Maroni[63] and Alassa-*Paliotaverna.* These settlements "appear to have had more pyramidal or centralized administrative structures," which would have "facilitated a more monopolistic control over copper supplies and production" (Keswani 2004:155). According to Keswani's model, these "pyramidal" centers would have functioned as locations for the collection and redistribution of staple goods (e.g. olive oil, grain, and raw materials such as timber or unrefined copper ore).

Building on Keswani's identification of eight potential LBA polities on

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the island (and likewise the fifth largest of the first-tier settlements on the island, as categorized in Knapp 2013 (355).

[63] While two monumental structures at Maroni-*Vournes* (called the "Ashlar" and "West" buildings) provide evidence for a significant investment in labor and conspicuous construction, excavations at Maroni-*Tsaroukkas*, a likely extension of the Maroni settlement approximately 500 m south of *Vournes* and along the Mediterranean coast, revealed a significant amount of various White Slip and Base-ring pottery types representative of cross-island trade (with northwestern and southwestern types recognizable, see Manning *et al.* 2002; Manning, Crewe and Sewell, 2006, and Mycenaean (i.e. likely Aegean imported) pottery). New archaeological prospection work also has revealed evidence for a number of large (on par with the Ashlar and West buildings at *Vournes*), in a farmer's field less than 250 m to the southwest. These findings raise questions about Maroni's roll in international, perhaps Aegean-focused, trade, and also the primacy of *Vournes* (and the inhabitants of *Vournes*) at the site (as argued by Cadogan 1984).

Cyprus[64] (1993:76), Manning and DeMita (1997) developed an argument that viewed elites at these locations as merchants (referred to as 'aggrandizers'). Finding it unlikely that one individual or elite faction could control the whole of the island during the LBA (and citing the diverse ecology of the island, which makes it difficult to monopolize one critical resource), Manning and DeMita argue for a network of competing polities, driven by elites steeped in trading and exchange. Key to this argument is the fact that the eight polities in Keswani's model all appear on, or within short distance of, the Cypriot coast. According to Manning and DeMita, elite groups at these sites would have maintained their power base by controlling access to both external, esoteric and exotic goods, and also external sources of demand (i.e. external 'markets' for Cypriot raw goods like copper, timber, and perhaps foodstuffs).[65]

Smith's (1994) study considered the LBA seal, sealings and inscription record for Cyprus in an attempt to decipher the administrative system, and links between Bronze Age communities, and especially from LCII and LCIII contexts. Her work is an attempt at interrogating what she identified as an argument over the political organization of LBA Cyprus, with a historical model (essentially the "hierarchical" model detailed above, though focused only on textual evidence), and an opposing body of archaeological evidence that supports a more regional political organization. Smith's analysis indicates regionalized economic and political systems, with

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64 Based around the settlements at Tomba tou Skourou, Enkomi, Kition, Hala Sultan Tekke, Maroni, Kalavasos-*Ayios Dhimitrios*, Kourion/Alassa and Kouklia.

65 Manning and DeMita also suggest a relatively simple method for testing for centralized, 'state'-controlled trade versus a heterarchically competitive trading environment, that has found surprisingly little traction amongst scholars of Prehistoric Cyprus: "Were prestige exchange a purely political phenomenon, controlled by a central ruling authority, we would expect to find a consistent distribution pattern of imported artefacts radiating outwards from a central point. But, if instead different

variations existing at the site-level and likely being regionally determined. Her model therefore provides further support for a heterarchical organization of Cyprus during the LCII and LCIII periods. A recent reconsideration of seals and sealings by Webb (2002) builds on Smith's work, and while noting the power of iconographic media to support and solidify hierarchical societies and elites status, Webb appears to agree with Smith's assessment that during at least the second half of the LBA (LCII and following), Cyprus was likely broken up into largely autonomous political entities.

Intriguingly, Knapp (2008:153) reiterates this, noting that "Smith's [1994] overall analysis of seal use, sealings and Cypro-Minoan inscriptions shows a great deal of variation between sites, and offers some support for the notion of decentralized, regional polities during the ProBA2 period." The chronology is critical here, as Smith's work appears to show that a decentralized administrative system (and thus circumstantial evidence for a number of competing polities) exist during the ProBA2 period, but this leaves the possibility of a united, *Alashiyan* political entity in at least the central and southeastern portion of the island during the ProBA1 period intact.

3.5.2 The Tangible Texts

Recently, Goren *et al.* (2003; 2004:70-75) have attempted to use the textual evidence from an innovative material perspective; namely performing petrographic analyses on the fabric used to produce the *Alashiya* tablets (that is to say the Amarna tablets and the correspondences between Ugarit and *Alashiya*) in order to source the fabric and determine the origin of the tablets, and therefore *Alashiya* (see also *supra*.

assemblages are found in different regions, there is reason to argue that this is the result of separate and

n. 8). Equally important, their work provides an opportunity to move beyond the potentially restrictive hierarchy/heterarchy debate. Their analyses show that two different fabrics were used to make the *Alashiya* tables, a Miocene Pakhna marl and a volcanic-derived fabric from the Moni mélange, therefore identifying the tablet sources as the south-eastern edge of the Troodos mountains, where these geologic formations converge. Based on this evidence, Goren *et al.* consider the only possible origin for these tablets as either the administrative center at Alassa *Paliotaverna/Pano Mandilaris* or that at Kalavasos-*Ayios Dhimitrios* (KAD). This conclusion is not without issue, however. The petrographic method employed by Goren *et al.*, being focused on the presence of indicative inclusions, cannot effectively determine whether the clay matrix used for these clay tablets is a mixture from various sources across the island. Indeed, the mixing of clay from various clay beds throughout the island for use in the king's correspondence might make an effective ideological metaphor for the unity of the island. While this is a circumstantial suggestion, and remains to be tested using additional sourcing techniques, it serves to illustrate the limitations of Goren *et al.*'s dataset.

Nonetheless, Goren *et al.* (2004) view this as evidence for interpreting the LBA political organization of *Alashiya* along one of three lines: 1) a single, centralized, island-wide polity that existed from the 16th through 13th centuries BCE, with the central—and as of yet, undiscovered—administrative site located in the southern foothills of the Troodos, or perhaps even in the mountains themselves; 2) a single, largely centralized island-wide, economically and politically hierarchical

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independently-evolved trade relationships" (1997:114) polity, with the primary center moving from its original location at Enkomi (founded during the 16th c. BCE) to Alassa or KAD at some point in the 14th century BCE; 3) essentially the heterarchical model championed by Merillees (1992) and Keswani (1996): a competitive environment of peer polities that existed on the island for at least the latter half of the LBA, and perhaps the LC period.

Despite the somewhat tenuous nature of the data they are built on, the models proposed by Goren *et al.* have the benefit of incorporating a diachronic element in a nuanced way that allows for change throughout the LC. Knapp nicely sums up the importance of this diachronic model: "Goren and his colleagues are prudent in adopting this stance, and are almost certainly correct to assume that the nature of Cyprus's political organization will have changed over the course of four centuries" (2008: 329). It is unclear, however, why Knapp views this as an insufficient working model, as he goes on to argue that the available evidence "demand[s] a more definitive, even if still tentative interpretation." Admittedly, Knapp's (2013) more recent re-evaluation of the political organization of LBA Cyprus has been tempered and is more accepting of a compromising position, perhaps encouraged by Peltenburg's (2012) re-consideration, and indeed, movement towards, a heterarchical view for at least part of the LBA. Despite this, the loyalty to the hierarchy/heterarchy debate, especially when one model likely does not characterize the political organization of Cyprus during the entirety of the LBA, is indicative of similar problems in the uncritical application of a centralizing theory in both hierarchical and heterarchical perspectives.

3.6 *Problematizing Hierarchical and Heterarchical Perspectives*

The centralization of power within a single ruling entity, or a single ruling place as a concept (i.e. what is essentially a Hobbesian conception of power) is inherent to both hierarchical and heterarchical models, and yet is rarely addressed explicitly, problematized, or critiqued in reference to the presentation of these models. This grows out of the pervasive goal of explaining the blossoming social complexity of the LC period—a goal that underlies nearly all of the studies cited above—combined with the conflation of centralized power with complexity that is characteristic of a theoretical basis with its roots in a Hobbesian perspective of power. Knapp's 1986 article provides an illustrative example: in an attempt to explain Cyprus' relatively slow urban development, he notes that "implicit in the concept of social complexity is the development of political and economic power, usually institutionalized in a centralized, hierarchically-arranged, administratively-specialized, decision-making organization" (1986: 49). It thus stands to reason that if a theoretical perspective inherently links social complexity with a centralization of power, any investigation into social complexity within this paradigm will attempt to identify the centralization of power as a building block of complexity. However, as the case studies in Chapter 2 above aim to illustrate, an uncritical association between social complexity and centralization is not necessarily possible or even preferable.

With regards to LBA Cyprus, both heterarchical and hierarchical positions are guilty of what Stein pointedly referred to as "exaggerating the degree of centralization and its importance in defining a state…" as they fail to "recognize that the centralizing strategies of the ruling elites are constrained by the existence of other, opposing sectors of society" (2001:369), or at least fail to actively investigate the degree and mechanisms of centralization. While heterarchical models—especially Manning and DeMita's (1997) 'aggrandizer' model—integrate the concept of competition amongst groups, these are essentially elite groups that are at the top of the metaphorical social, political and economic pyramids. What Stein is calling for requires, instead, an attempt at understanding not only how various elite factions compete and interact, but also how individuals and groups from different social strata interact with, compete with, compromise with, and deal with one another.[66]

But, how do we "explore the dynamic, fluid nature of power relationships and their longer term transformations" (Stein 2001: 369) in Late Cypriot archaeology? This project argues that an important first step is to shift the theoretical paradigm from a Hobbesian conception of centralized power, towards a historically and situationally contingent and strategy-focused Machiavellian conception of power (a concept explored in greater detail in Chapter 4). This has the effect of encouraging a move beyond what are almost entirely elite-related bodies of evidence; an emphasis that has been pervasive despite the fact that, according to Crewe, "the extant archaeological record of the early LC is inadequate for providing explicit information on the relationship of elites to the wider social sphere…they consequently retain a shadowy, yet ubiquitous presence in Cypriot archaeological discourse" (2007: 7). On the

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[66] Stein also advocates for "think[ing] about the specific ways that short-term, goal-oriented decision making by individuals and small groups (such as leaders, elites, or disenfranchised sectors of society) can have unintended long-term consequences for the organization of the polity as a whole" (2001: 369). This approach is reminiscent of the Machiavellian understanding of power at the that sets the theoretical paradigm for this project in that analysis of short-term, goal-oriented decision making is akin to analyzing and prioritizing the study of strategy within specific, contingent historical situations and relationships.

hierarchical side, textual evidence for international correspondence between kings are the epitome of an elite-centric source of evidence, and, as Liverani (1990) has noted, these function according to very specific and arbitrary set of rules that exist largely outside the scope of the normal functioning of the societies in question. Arguments advanced especially by Knapp (2008: 153-172) and Webb (1999), emphasize the presence of an elite artifact package, and are then inherently focused on elite-controlled goods. Even studies that focus on the exploitation, production and exchange of copper find it difficult to address the process of production until it reaches centralized settlements—and essentially the purview elites—at sites like Enkomi. The majority of what we know of copper production comes from studies of the finished product during elite-facilitated exchange (e.g. studies of copper ingots, sourcing of copper products, identification of copper in texts detailing exchange) or smelting, which appears to occur within the larger, and therefore relatively centralized, LC settlements.

The heterarchical perspective, while arguing for a different political organization, has a similar propensity for deploying elite-centric evidence. All four datasets that Keswani (1993) employs to critique a hierarchical perspective are essentially elite- produced or elite-controlled, and three very explicitly so: the lack of a consistent architecture for elite buildings, the absence of common elite artifact packages, and the absence of an administrative writing or recording system. Following this elite-focused line of research, Manning and Demita's (1997) 'aggrandizers' are a specific kind of elite whose foundation for power originates from their ability to monopolize access to external trade connections.[67] Smith's (1994) work that noted a regionalization in the seals from various LC contexts, and therefore ran counter to an island-wide management system, likewise relies on objects that would have functioned within a particular, centralizing and elite context. It is worth noting here that, to some extent, this emphasis on elite-focused datasets is both the result of the research question these studies are trying to address, but also the result of conventional approaches to archaeological research, with excavation focused at major settlements—and indeed the largest buildings/elite-centers of these settlements. As such, it is not particularly surprising that much of the data available for evaluating the political and political-economic situation of LBA Cyprus has been structured around elite-based datasets (with Minoan studies presenting, until very recently, a similar case, see Chapter 4).

Another critical move towards improving our investigations of the Late Cypriot political economy would be to expand the focus from the arenas of consumption (and storage) at administrative centers, and look to the stages of production and exchange.[68] As a result of their emphasis on the large, centralized settlements, both heterarchical and hierarchical models tend to focus on evidence for consumption within the LC political economy (see, e.g. Steel 2004; Hamilakis and Sherratt 2012) or the final stages of production that require access to specialized

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[67] It must be noted here that Manning and Demita's conception of power is considerably more Machivellian than it is Hobbesian. They view these "aggrandizers" as agentive individuals who develop strategies to take advantage of the political, economic and social realities of the period.

[68] Here we might again turn to Stein who suggests that a re-evaluation of centralization should accept that "the dynamics of conflict between the centralized elites and other social sectors not only define the structure of the polity, but also help explain when and why evolutionary change takes place" (2001: 369).

technologies or techniques (e.g. the pressing of olives or crushing of grapes, rather than production in terms of the growing of olive trees and vines [Hadjisavvas and Chaniotis 2012] or the techniques associated with forming or painting pottery, rather than the collecting of clay and paste preparation). However, a real understanding of the political organization of LBA Cyprus (accepting that the political economy was a crucial source of power in the organization of LC polities) requires engaging with production and exchange within Cyprus itself. Indeed, Feinman is explicit that the concept of political economy is concerned with all aspects of the economic system, including production, exchange and consumption at an extra-household level where "economic relations can…be channeled through a diverse set of means to support integrative and/or hierarchical institutions or relationships" (Feinman 2004: 2). This said, the productive and exchange sectors of the ancient economy (as compared to consumption) are admittedly more difficult to access as they likely exist in smaller settlements, and in some cases outside the scope of larger, centralized settlements. These processes may also be considerably more ephemeral, leaving fewer and less instructive evidence (consider, for example, the potential preservation of limestone ashlar masonry at a first-order Cypriot settlement as compared to a mud-brick farmer's hut). Production and exchange are critical, however, to providing a holistic understanding of the LC political economy. Expanding our focus to consider these sectors of the ancient economy requires us to include (and indeed, to focus critically on) non-elites and non-centralized sectors of LC society.

Such an approach also allows us to expand our understanding of wealth and staple finance economies on LBA Cyprus, and particularly to ask how these types of economies—and the goods that were the foundation on which they were built—were mobilized to support power networks to allow individuals (both elites and non-elites) to pursue goals. In order to address this, studies must turn to focus on the mechanisms by which surplus staples were produced and collected, and the mechanisms that made the production and exchange of high-status, elite objects possible. Rather than simply identifying evidence for "staple" or "wealth" economies (and indeed, we should note that these likely functioned in tandem, affected different sectors of society in different ways, and could be mobilized at different times to pursue unique ends), we must begin to ask how different kinds of "staple" and "wealth" economies functioned, and how this provided the framework for economic decisions in the ancient Cypriot world.

It is important to realize that while Cyprus has a relatively diverse ecology, with opportunities for surplus production (noted also by Manning and DeMita 1997:107), it is not clear what the various strategies for that production were. Moreover, does the process of centralization (and hence the negotiated agglomeration of political economic power) follow a uniform trajectory at each large LC settlement? Based on arguments by Keswani (1993) for the importance of wealth and staple finance models at different LC urban settlements, it seems unlikely. Indeed, if the centralization of power is at least partially founded on the centralization of goods, and the goods that can be (and will be) produced vary considerably across the island (as can the strategies for exploitation of these goods), including grain, olive oil, meat, dairy products, wool, etc., the strategies of centralizing and the processes by which the productive and consumptive aspects of the economy can be mobilized and transformed into sources of political power will likely vary as well. Thus, considering the productive strategies employed by individuals associated with Enkomi (an urban settlement based on copper production and smelting) and a place like Kalavasos-*Ayios Dhimitrios*, whose best evidence for regional control appears to be staple financed based (if the 30,500 liter pithos hall, olive oil press, and evidence for large-scale public feasting are any indication), then the actual processes of centralizing (and the systems set in place to guarantee the production of goods for centralization) must have differed. Thus, the process of centralization on Cyprus (and in this sense it does not much matter whether this was a hierarchical or heterarchical process) likely varied from ecological zone to ecological zone and from one urban settlement to another. At the same time, we might expect variance to a greater or lesser degree depending on the structure of the societies in question, emphases on wealth finance (and trade) or staple finance (and production). The variety of strategies, then, opens the door for individual agency—both elite and non-elite, and makes it possible to first structure the situations within which elites and non-elites made decisions, and then to attempt to identify these decisions and to interrogate them.

3.7 *Conclusion: Towards a New Approach*

One study of the production of LC ceramics (and critically not the consumption of LC ceramics) serves as a harbinger of change and provides a useful example of a way forward, founded on an approach that is both skeptical and constructively critical of theories that emphasize centralization. By focusing on the process of LC ceramic production, Crewe (2007) sought to move "towards an understanding of the mechanisms of change occurring in the entire spectrum of material culture," and not simply the elite-centric, prestige sector. She revealed an important conclusion: "The evidence from my analysis of the Enkomi ceramics and the limited evidence from other LC sites suggest that production during LCI was *not centralised* or under rigid controls"(2007:7; italics added). It is within this context that this dissertation seeks to turn to a new source of evidence in order to provide a similar focus on productions and exchange sectors of the LC economy, and to investigate the productive strategies of shepherds within different ecological, political and economic constraints. By tracking herding strategies and the movement of flocks, in reference to presumed political boundaries, and by considering the movement of the animals consumed at a number of the large LC settlements on the island, this project seeks to link consumption to the processes that made it possible (i.e. production and exchange), and to build a foundation for understanding the centralization of the political economy on LBA Cyprus. By investigating an agentive non-elite and viewing political economy as a negotiated process that was historically contingent and strategy-oriented, it becomes easier to reconcile the centralization of power, since this centralization can provide benefits for both elite and non-elite groups (and importantly not only in an altruistic way as suggested by e.g. Service [1962], Fried [1967] but in a more complex system, that at least entertains the possibility for non-elites pursuing goals and having intentional strategies to fulfill those aims).

CHAPTER 4

STEPPING OUTSIDE THE PALACE: A CRITIQUE OF CENTRALIZING APPROACHES TO LATE BRONZE AGE CRETE

> *"It is such a steep maze of gorges and crags that distances as the crow flies have no meaning; the islanders themselves measure them by the time taken to smoke cigarettes, by hours gauged by the climb or decline of the sun, and days reckoned from daybreak to sunset; or, more often during the Occupation, by the duration of nights. Thirty miles, in some parts, meant three days (or nights) of scrambles up rocks and breakneck, treacherous descents of landslides. Only in the rare plains is the reckoning normal, and even there, the multiplicity of Germans made journeys a chain of detours that falsified all normal computation. All this expands Crete into many times its real size, and sometimes, in the central valleys, the sea seems as remote as from the heart of the continent."*
>
> Introduction (by Patrick Leigh Fermor) to *The Cretan Runner: His Story of the German Occupation* by George Psychoundakis

4.1 *Introduction*

The Nazi occupation of the island that began after the Battle of Crete in May 1941 and lasted until the British liberation in the fall of 1945 set the backdrop for one of the great resistance movements in Mediterranean history. The British Special Operations Executive, working with (and in many senses, relying on) Cretan locals, coordinated a considerable resistance that sought to both disrupt German control of the island[69] and to maintain a toehold in the event of a British re-invasion and coordinated

[69] This is especially true for the western portion of the island, south of Chania, including the White Mountains. *The Cretan Runner* (Psychoundakis 1998) provides a first-person account of the Cretan resistance movement of World War II and chronicles the events that took place south of Rethymno and Chania. See also *Hide and Seek* (Fielding 2013a) and *The Stronghold* (Fielding 2013b).

uprising.[70] A number of individuals played prominent roles as co-protagonists, disrupting and undermining the German occupation of the island—for example, British soldiers like Xan Fielding and Patrick Leigh Fermor, or locals like George Psychoundakis—but, these men would have been woefully outmatched by the Nazi presence without a willing accomplice: the mountains of Crete. Accounts of the Allied resistance emphasize the role of geography—and really, topography—in limiting the extent of Nazi control both on Crete and in Greece, and the usefulness of this same topography for the resistance movement. "Nothing matters so much in this story as the Greek mountains," wrote C. M. Woodhouse, the leader of the Greek resistance in an unpublished report on the mission, "…without [the mountains] no guerilla movement could have been born." Other British resistance officers (including Xan Fielding, the *de facto* leader of resistance operations on Crete) echo a similar sentiment: "the question of whether British officers could operate under the Nazi yoke was answered affirmatively thanks to the White Mountains [of western Crete]" (Messenger 2013: xix).

Taking a cue from history, however, it should come as no surprise that the mountains of Crete served as an incubator and protector to the resistance movement of World War II. Indeed, during the last millennium the mountains of Crete, most prominent in the center and western portions of the island, were the roots of the most notable rebellions against the Venetians and the Ottomans. The history of Crete,

[70] An event that never came to pass, despite the fact that Fermor (in his introduction to Pscyhoundakis' book) says that "the Cretan Resistance movement was one of the most successful in Europe. It was never put to the final test—island-wide revolt in co-operation with an allied landing—for which the whole of Crete was longing. Unfortunately for the Balkans and Europe, the allied attack in the south of

Fielding suggests, is "mainly a chronicle of alternating phases of insurrection[71] and retribution, as repetitive and indigestible as a pickled onion"[72] (2013a:104). The mountains played an important role in these resistance movements, as they were difficult for Venetian and Ottoman forces to infiltrate, providing both a place of retreat and a base of operation for organizations that enacted the revolts and raids that struck out against the overlords. The mountains were at once difficult to traverse, and also difficult to surveil, with gorges, gulleys, hidden highland plateaus and—especially—caves, all providing natural refuge. A cave just outside Asi Gonia, in the mountains between Rethymno and Chania, for instance, acted as a long-term hideout for the rebellious anti-Turkish *Khainides,* that raided and killed Turkish occupiers in the 17th century CE (Fielding 2013a: 100).

Thus the mountains of Crete have functioned as a valuable sanctuary for resistance movements on Crete throughout history, despite the fact that the history of these mountains remains somewhat foggy and anecdotal. Anecdotes about *Khainides* raiders and Cretan bandits remain important aspects of the highland Cretan culture, and this independent (and in many ways, anti-government) spirit lives on not only in stories of anti-Nazi campaigns during the World War II resistance, but in more modern examples as well. Illicit marijuana farming in and around the small mountain

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Europe was launched on Italy, and the Balkans were by-passed; but such an attack on Crete would have found the island united and organized to the last detail" (1998: 11).

71 Because Fielding is concerned with 'modern' history that begins after the Byzantine period, he is referring to insurrection against Venetian overlords, who invaded the island in 1204 CE, and then the Ottoman Turks who begin their 'control' of the island in 1646 CE, lasting until 1898 CE. The accompanying retribution was likewise by the Venetian or Ottomans against the local Cretans.

72 The layers of occupation and resistance on Crete can similarly be compared with an onion, as a Byzantine occupation took over from the Romans, was supplanted by the Venetian kingdom of Candia, and this in turn was taken by the Ottoman Empire, until 1898 CE when the island was given independence, and later joined the kingdom of Greece in 1908.

village of Zoniana in western Crete has brought about police raids, and an on-going tension that led one modern journalist to refer to the region as a "Cretan Colombia".[73] The fact remains that in the 21st century, just as in the mid-20th century, and the 19th, 18th, and 17th centuries before that, the Cretan mountains function as bastions of relative independence from the nation-states that have seats of power along the coast and in the coastal plains. If, in the 21st century, the mountains and their people represent something different than—and in some cases fiercely opposed to—the centralized cities and settlements of the coasts, it seems likely that a similar phenomenon existed throughout Cretan history.[74]

The importance of the Cretan mountains also suggests an importance of a group of individuals that are, more than any other, from and of those mountains: Cretan shepherds. In discussions, newspaper articles, or books about Crete, the term "shepherd" is colloquially synonymous with "mountain-dweller". No other group of people[75] is so linked with the mountainous regions of the island; indeed, in a book that chronicles a year spent traveling the White Mountains in the 1950s, Xan Fielding mentions various unnamed shepherds no fewer than twenty-four times; as if the

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73 http://www.telegraph.co.uk/news/worldnews/europe/greece/2207277/Drug-dealing-shepherds-set-up-Crete-crime-empire.html

74 The argument I am presenting here is something akin to James Scott's argument that the South-asia region of Zomia exists as a refuge from the 'state', and potentially as a place where groups that are unwilling to conform to or participate in state-run societies can retreat to (Scott 2009).

75 How we 'define' a Cretan shepherd is a complex issue that is reserved for the following chapter (chapter 4); but in a very basic sense, on Crete, a shepherd refers to an individual who herds flocks of sheep or goats, and relies on these domesticates for a primary source of income. Whether this is a dairy/cheese-based emphasis, a wool-emphasis, or a meat emphasis is historically contingent and no one production strategy can be said to characterize "Cretan shepherds" throughout history. However, these are people that are hardy, braving the elements and severe terrain of the Cretan mountains, and therefore people that are predisposed towards being willing and able to readily endure hardship, especially for a cause they believe in. In a sense, it is an ideal population from which to draw resistance fighters or *guerillas.*

shepherds are the ever present extras that set the backdrop for travel in the Cretan countryside. It is thus surprising—and problematic—that, with shepherds and mountains playing considerable roles in the Cretan identity for at least the past millennium, Minoan archaeological research has done little to engage with the shepherd outside the purview of central places.[76] In what follows, I explore the theoretical and methodological underpinnings of Minoan scholarship to illustrate how a centralized conception of power has separated Minoan scholarship from the mountains and the mountain people that are at the very heart of Crete.

4.2 *Minoan Society: A Hobbesian Perspective*

Studies that have attempted to analyze power dynamics and the development of social complexity on Crete have tended to occur at similarly nested, dual-scales as on Cyprus: an island-wide scale, and a regional scale. At the same time, centralization has a considerably longer theoretical parentage and consequently, more analytical baggage in Minoan studies. This is due, in large part, to the paradigm of the Minoan *palace,*[77] which has been prevalent from the very advent of investigations into Bronze Age Crete over a hundred and twenty years ago (as Driessen notes, "*The Palace of*

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[76] Paul Faure's survey of the Cretan mountains (Faure 1965) is an important exception, and one that will be dealt with in detail in the following chapter. It is critical to recognize, however, Faure and his work in the mountains of Crete. It is telling that it has received little attention in Minoan scholarship until quite recently (e.g. in Driessen 2004), and serves to very succinctly make the point of this chapter.

[77] The very term itself is problematic as "palace" inspires thoughts of Victorian royal estates, insinuates a primarily residential purpose ("the abode of a king" as Driessen 2002 puts it), implies a royal hierarchy with a king or queen at the top, suggests feudal land-holdings and hereditary succession, and basically imbues these monumental Minoan buildings with a very specific purpose, most at home in Imperial Rome or early modern Europe. See Shaw and Shaw 1993:186, who advocated for the term "court-centered civic building", Schoep 2002 for a deconstruction of the "palatial model" that emphasizes the hierarchy inherent in a society centered on a palace; and Driessen 2002 and 2004 who argues for the importance of the central-court as a communal (and therefore less hierarchical) space.

Minos? Even before the monumental court complex at Knossos was actually excavated, Kalokairinos, Schliemann and, indeed, Evans himself, had already identified the visible ruins as a 'palace,' the abode of a king." [2002a]).

Two main research perspectives illustrate how a Hobbesian understanding of centralization of power is a foundational concept (however inadvertent this may be) in investigations that seek to understand the function of the Minoan palace: 1) an inquiry into the pre-eminence of Knossos as the primary settlement and capital of an island-wide polity during (at least) the Late Minoan III period and 2) the regional importance of the so-called other "palaces" scattered across Crete at (at least) Malia, Kato Zakros, Phaistos, and Chania (with smaller potential "palaces" perhaps—and at least substantial settlements—at Haghia Triada, Galatas, Petras, Tylissos). Chronology is critical here (see table 4.1), as the pre-eminence of Knossos is most likely (based on Linear B evidence, see below) during the LMIII period,[78] whereas the emergence of the first palatial structures at Knossos, Malia and Phaistos occurs during the EMIII or MMIA period.[79] Considerable debate exists over the relationship between these regional centers during both the Protopalatial (MMIA-LMIB) and Neopalatial periods

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[78] See table 4.1 for complete dating scheme and calendar dates for the relative dating abbreviations used here. While concerns with dating are not the primary the goal of this chapter, it is worth noting that while I include the "High" and "Low" chronology dates for ease of comparison, the preponderance of recent evidence, especially the relatively strong correlation between dendrochronology and C14 dates (with ice cores and speliothems as additional, though less robust datasets) supports a "High" Aegean chronology and suggests that the relative ceramic chronologies (and indeed Evans' tripartite Early, Middle and Late Minoan chronological framework) deserves considerable re-analysis and re-thinking.

[79] It has been challenging to settle on a firm relative date for the construction of the first palaces for at least two primary reasons: first, the renovation and construction of new features over these Protopalatial remains after subsequent destructive episodes, and second, because the palaces may have initially been constructed in a piece-meal fashion, with different (eventually tell-tale) attributes added onto the first palatial complexes at different times. See MacGillivray 1994: 49-51 for a discussion of this phenomenon at Knossos.

Period	**Approximate Dates**	**Comments**
Middle Minoan III	1750-1700 BCE	*Neopalatial Period (Second Palace Period)*
Late Minoan IA	1700-1580 BCE	Theran Eruption circa 1628 BCE
Late Minoan IB	1580-1490 BCE	
Late Minoan II	1490-1430 BCE	*Final Palatial Period* (Mycenaean Influence?)
Late Minoan IIIA1	1430-1470 BCE	
Late Minoan IIIA2	1370-1320 BCE	Knossos Destruction
Late Minoan IIIB	1320-1200 BCE	*Postpalatial Period* (Knossos Final Destruction/End of Palatial Period)
Late Minoan IIIC	1200-1100 BCE	
Subminoan/Transitional	1100-1000/975 BCE	

Table 4.1: Approximate dates for figures discussed in the text (adapted from Rehak and Younger 1998 and Manning 1995).

(LMIB-LMIIB/LMIIIA).[80]

Critically, however, both of these research questions, which are responsible for structuring much of our investigation into Minoan political and economic structures—and indeed the existence of Minoan "state(s)"—hold palatial structures as their primary foci. It is not an exaggeration to suggest that the archaeology of Minoan society has, until quite recently, largely been the archaeology of Minoan 'palaces.' This is not an insignificant bias, particularly in a place where the natural topography of the island makes it a maze of gorges and substantial mountain ranges, which collectively have the effect of "expand[ing] Crete to many times its real size" (Fermor 1998: 22, see figure 4.1). It is not sufficient to structure our understanding of the Minoan world through the lens of centralized 'palaces' despite the fact that these were likely ideological, ceremonial, political, economic and social centers (see e.g. Hagg and Marinatos 1987); the complexities of the island require us to look deeper into the complicated relationship between these (proto-) urban places (and their occupants) and the rural environment and population. However, this presents archaeologists with a fundamental problem: how can we expand our methodology to investigate the ancient hinterland? Traditional archaeological surveys (and more recently, GIS and remote-sensing techniques, e.g. Bevan 2010) have brought new data to bear on questions relating to ancient hinterlands, and the relationship between centers and peripheries. These approaches are certainly effective at determining the location of archaeological sites, however they fall short of peopling those spaces.

In the portion of this chapter that follows, I provide a brief summary of the

[80] See below, as well as Knappett and Schoep 2000 for a useful summary.

Figure 4.1: Minoan ‘Palatial’ Settlements and Minoan land above 400m

concept of the Minoan ‘palace’, and the redistributive economic model that grew out of evidence for the storage of large amounts of agricultural products at these sites, and the Linear B documents that appear to have functioned as an administrative tool. Then, I critique this model by exploring recent studies that provide evidence for decentralized Minoan societies that appear to have what Driessen (2002) refers to as a “flat” or “horizontal” hierarchy characterized by factional competition. This highlights how the static nature of the Minoan palatial model limits our understanding of the interaction between the regions that directly surround these palaces and the rest of the island. I explore the slippage that exists between archaeological survey data and more traditional excavation data, and the centralization bias that has grown out of an inability to usefully reconcile these two sources of evidence. This has resulted in a skewed understanding of Minoan society, and one that has neither had the evidence, nor, it appears, the theoretical underpinnings, to thoroughly investigate the relationship between palace and hinterland. Indeed, my goal here is to suggest that Minoan palaces may be less important than they seem, and at the same time, the rural populations of Minoan Crete more important (or at least more impactful).

4.3 *Developing the “Minoan Palace” Paradigm*

The primary entity in the debate over centralization on Crete is not a ruling figure –surprisingly little evidence exists for constructing a model of Minoan rulers, kings or political figures, despite appeals to tangential and circumstantial evidence[81]

[81] We do not have any textual evidence or correspondences between royal figures that would suggest a king of Cyprus who is on par with a king of Alashiya or the other Bronze Age kingdoms (at least until

(see *e.g.* Rehak 1995; Driessen 2002)—it is rather an architectural paradigm and institution: the Minoan "palace".[82] Thus, in order to effectively address (and critique) the impact of centralization theory within Minoan archaeology, we must first come to terms with a working definition for the Minoan "palace". Minoan palatial complexes (i.e. the monumental structures at the heart of Late Bronze Age settlements on Crete), such as those at Knossos, Mallia, Phaistos and Kato Zakros, are widely accepted as centers for political, economic and social authority and as organizational sites for the redistribution of goods from the hinterlands in the Middle Minoan IB through Late Minoan III periods (c. 1900-1200 BCE). These complexes are relatively large (between 2000 m^2 and 1 hectare), and are identified as having a number of indicative features including a labrythine ground plan, a central court, a hypostyle hall or Megaron, storage rooms, craft centers and "lustral" basins, the function of which is, as of yet, unclear (Platon 1967; Nordfeldt 1987). The authority of elites at these palatial centers seems to have been rooted in their control over a specialized economy, interfaced with political and socio-ideological sources of power, including the control over the facilitation of religious and cultic activities (e.g. Renfrew 1972 [2011]; Cherry 1983; Manning 1994, Haggis 1996; Knappett & Schoep 2000). By the Late

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the Linear B documents of the LMIII, and even then the evidence is thin and still debated, see e.g. Palaima 1995, especially pp. 120-124; but also see Killen 1985 for a model of how Mycenaean—and by extension LMIII Cretan—political organization probably worked with regards to a wanax and other elite individuals).

[82] Schoep (2002:121), who argues that a heterarchical model which involved competition between various factions within the larger society ('factionalism') better characterizes the Protopalatial society at Malia, notes that "a tendency towards factionalism usually requires some sort of unifying agent (Stone 1997:17), which in Mesopotamian society was a king without autocratic power, who was spatially separated from the religious focus of the city; the power of the king was in counterpoise with a city council and with other separate urban institutions (Postgate 1992: 268-270). The Minoan 'court-center building' [what Schoep prefers to call a Minoan 'palace'] as a ceremonial centre and as an arena or factional competition could perhaps have functioned as a kind of unifying agent."

Bronze Age (c. 1375 BCE), administrative archives (the Linear B documents) make it clear that the collection, processing and probable redistribution of goods and commodities were major concerns for those living at, and ruling from the palatial center (at least) at Knossos, however the ubiquity of a palatial-controlled economy has been challenged of late (e.g. Pullen 2010; Nakassis, Galaty and Parkinson 2011). Indeed, John Bennett has argued that while the administrative structure of this political economy visible in the Linear B archive from Knossos can be used to reconstruct the political framework for the period (1990), there is a real question as to how far this political control extended across the island.

There are some important caveats that are worth noting. First, the Minoan "palace" as a definition is really nothing more than a heuristic tool that describes a variety of large, monumental structures that share architectural—and likely functional aspects—but no two palaces are exactly the same. Second, as some of these "palaces" existed for at least six-hundred years, their layout and the function of specific spaces almost certainly changed based on the specifics of the time period, and its political, social and economic situations (i.e. historical contingencies not unlike those discussed in chapter 2). Schoep usefully notes, "a comparison of the actual remains of the Middle Bronze Age [i.e. Protopalatial] court palaces reveals a number of differences in size, arrangement, number of courts, and architectural elaboration and layout of the architecture bordering of the courts" (2010: 115; see below for further discussion on this point). Schoep's point raises the important potential for variations in the way these palatial structures were put to use, both throughout Minoan history and at different places across the island.

Indeed, we might push this point further. Schoep identifies two root causes for the difficulties and confusions associated with identifying and understanding Minoan "palaces." First, there is a "desire to establish island-wide homogeneities, patterns and typologies and a reluctance to acknowledge the apparent variation and regionalism that existed within the island throughout the Bronze Age" (2010:115). There is a something of a sense that Crete's proper political organization is a unified polity across the entirety of the island—this despite the fact that Homer's catalog of ships famously refers to Crete as "ἑκατόμπολις," a land of a hundred cities (Hom. Il. 2.649),[83] and the impression one gets from Homer's description is a loosely connected island confederacy, not necessarily a tightly controlled centralized state.[84] Second, Schoep notes that "the traditional definitions of 'palace' were created on the basis of a single palace (i.e. Knossos) and a single phase (i.e. the latest and best-preserved phase), and any variation in time, form and scale were not taken into account, thereby generating confusion as to whether some buildings should be identified as palaces or not" (2010: 115). This quote highlights some of the implicit aspects of a "Hobbesian" conception of power that have typified Minoan studies for the better part of the last century, especially the assumption that a period of considerable political, social and economic complexity should naturally correspond with a period of considerable political, social and economic centralization.

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[83] Homer says that Idomeneus was the leader of the Cretan contingent at Troy, with Meriones seemingly serving as a second in command. Knossos, Gortyn, Phaistos, Rhytium (Rethymno?), Lyctus, Lycastus and Miletus are all listed as examples of the many cities of Crete (n.b. if the Miletus of Homer is equivalent with modern day Miletus, it is not actually on Crete, raising questions about the boundaries of Crete during the Homeric period, and perhaps also in the Bronze Age).

While it is likely that all palaces were the focus of overlapping activities, the variation between these palaces (e.g. the rather limited storage areas at Kato Zakros as compared to the heavy emphasis on storage space at Knossos, Malia and Phaistos), implies a flexibility in the events that took place in these spaces, the political, economic and social institutions that were expressed in these locations, and perhaps a variation in these political, economic and social institutions themselves. And yet, the trajectory of Minoan scholarship—and the intrinsic focus on the Minoan palace—finds its roots in the very first archaeological expeditions on the island, and has only faced sustained critique and re-evaluation in the past fifteen years. It is, therefore, worth tracing that trajectory of scholarship in order to place these more recent re-evaluations of the Minoan political model within context.

4.3.1 Arthur Evans and The "Palace"

By the time Arthur Evans began excavating at the Kephala Hill in 1900—the site that would become famous as the largest and most comprehensive Minoan "palace" on Crete—the concept of "palatial" sites in Greece and the Aegean had long been en vogue. Heinrich Schliemann's excavations at Hissarlik (Troy) and Mycenae in the 1870s had gone a long way towards affixing the terminology in Aegean prehistory, and what is more, Schliemann's excavations had done much to change the way contemporary scholars interpreted early Greek history. The excavations at Mycenae and Hissarlik (Troy) impacted the way "Homeric poems were being read, albeit with caution, as history" (MacGillivray, 2000: 85). In the context of the times,

[84] Of course the historical accuracy of Homer is questionable at best, however this chapter aims to show that the assumption of a centralized island-wide polity in Late Bronze Age Cyprus is likewise tenuous, and deserves re-analysis.

then, it was only natural to identify monumental constructions as the palaces of Homeric heroes. This was a clear divorce from previous and preliminary academic work by George Grote, who, writing in 1846 had argued that Thucydides' Minoan Thalassocracy was "derived from the analogy of the Athenian maritime empire of historical times, substituted in place of the fabulous incidents and attached to the name of Minos" (331). The discoveries at Mycenae and Hissarlik, however, rekindled the possibility that Minos' Labyrinth may have actually existed, and set in motion a series of preliminary excavations searching for it.[85]

Already in 1878 the aptly named Minos Kalokairinos, a local lawyer and businessman, was aware of the monumental structure buried in the Kephala Hill just outside the city of Candia (modern Herakleion) and begin an excavation there. However, it appears that Heinrich Schliemann was first responsible for referring to the extant architecture on the Kephala Hill in palatial terms (Evans 1899/1900: 4). Writing to a friend in 1886, Schliemann referred to the archaeology on site as "a vast edifice similar to the prehistoric palace at Tiryns" (Driessen, 1990: 24-25). One cannot help but think, however, that Evans was also competing with Schliemann's ghost, and was attempting to carve out for himself, a piece of archaeological fame by

[85] The Kephala Hill had long been associated with ancient remains and was apparently part of a tour of ancient sites in the vicinity frequented by travelers from the 16th through 19th centuries (MacGillivray, 2000: 92). As noted in the body of the text above, excavations at the site were initially undertaken by a local merchant and businessman named Minos Kalokairinos in 1879, but he was stopped by local authorities shortly after work had begun, having exposed a row of large pithoi and associated artifacts (Hood, 1987: 87). The site had often been linked to the ancient city of Knossos (or Gnosus), and Kalokairinos referred to it as "le Palais Royale du Roi Minos" in his personal letters written twenty-two years later (MacGillivray, 2000:92). It is difficult to know, however, whether Kalokairinos was using Evans and Schliemann's terminology (Evans had published his first excavation report in the *Annual of the British School at Athens* in 1900) or had, in fact, referred to this building as the "Palace of Minos" in 1879 to begin with. For a detailed account of the early attempts at acquiring excavation rights at Kephala Hill, see Evans 1899/1900: 4-5 and Hood, 1987.

finding palaces on Crete that corresponded to Schliemann's Mycenaean citadels. Was he, therefore, also seeking to find a 'palace' when he began excavations at the site?

While it is impossible to know whether Evans truly expected to find the "Palace of Minos" when he began his excavations in March of 1900—or whether he chose to use the term "palace" as shorthand for monumental structure, rather than expecting to find a royal residence—by May of that year it was clear that he did indeed believe he had found an ancient seat of centralized political power. Furthermore, he had bought into what he referred to as the "substantial truth of early tradition," that the Minotaur (probably just a man in a bull-mask) had actually lived at Knossos and the site had been the ancient Labyrinth (MacGillivray, 2000: 192). Evans was thus intent on interpreting his excavation through a palatial lens. The unearthing of a gypsum chair, and Evans' subsequent interpretation of the surrounding chamber as a "throne room" is clear evidence that by the end of the excavation season of 1900, the existence of a hierarchical kingdom centered at Knossos was at the heart of Evans' model of Minoan society.

Schliemann's interpretation of the archaeology at Mycenae as evidence for Homeric truth, and Evans' use of the term, and coincident discovery of "throne rooms" and a labyrinthine plan at Knossos served to further cement the term in Aegean archaeological circles. By the following excavation season when Evans had uncovered the fresco fragments that he would restore as the "Priest-King Fresco", it appears that Evans' work was firmly on the way towards interpreting the archaeological evidence through an epic lens.

Clear evidence for this comes by way of a brief report Evans published in the

London Times (May 28, 1901) describing the excavations of the 1901 season, noting evidence for the 'royal' character of the structure. He describes a "single room [that] may well have been reserved for Royal use…it is natural to imagine the King here, seated at the gate in the Oriental fashion and giving judgment before the assembled people in the Agora beyond." He also tells of fresco fragments that "supplies insignia or still more Royal purport…[and] display the upper part of a head wearing a crown which terminates above in a row of five sloping lilies of varied metal-work, with a higher one rising in the centre. That the *fleur-de-lis* of our Edwards and Henrys should find a prototype in prehistoric Greece is a startling revelation; but it was perhaps fitting that, as last year's excavation in Knossos brought to light 'the oldest throne in Europe,' so the more recent researches should produce it most ancient crown." It is also worth noting that Evans refers to the "prehistoric palace at Phaestos" in comparison with Knossos, suggesting that by 1901 there was already a sense that these monumental structures found across the island were all royal residences of one sort or another.

4.3.2 Pendlebury's "Palace"

The Minoan "palace" and, critically, a related interpretation of Minoan political organization, hierarchy and kingship that placed the palace at the center of the Minoan world, quickly became an enduring concept in Minoan studies. This was, in part, encouraged by Evans himself, who published the excavations at Knossos in a multi-volume monograph titled "The Palace of Minos" beginning in 1921. The Minoan "palace" had become such an influential concept that even J.D.S. Pendlebury, who both identified and recognized the potential importance of small-scale Minoan sites scattered across the island (admittedly, mostly in the central and eastern portion), was allured by the concept. While his 1939 book on the archaeology of Crete is extensive in its listing of Minoan archaeological sites, from cave shelters, mountain-top peak sanctuaries and sherd scatters to established town settlements and 'palaces' at Knossos, Malia, Tylissos(?), and Phaistos,[86] Pendlebury's understanding of Minoan society is largely informed by, and slanted towards the 'palaces' and the inherent political monarchy/hierarchy that he believed they represented.

Pendlebury's work exists in a tension—on the one hand, he attempts to provide an island-wide context for the monumental 'palaces' that had become synonymous with Minoan society, and yet he remains enamored with the "haut-couture" of the palaces and the elites (i.e. kings in his understanding) that they represented. Much of the book is spent discussing the artistic styles of finewares, architecture of monumental structures and the fineness of Minoan painting styles and craftsmanship of elite goods. Pendlebury is keenly aware that the mountains and the "spaces in between" major settlements carry considerable importance on Crete: "the island is divided up by great blocks of mountains…no one who has passed Crete *en route* for Egypt can forget the forbidding appearance of this coast" and "to these mountains resorted in Turkish times, and I can add of my own knowledge, still resort to-day, those with a price on their head" (1939: 4).[87] And yet, even with this perspective as a

[86] Other 'palaces,' most notably those at Kato Zakros, Gournia and Petras, among other potential 'palaces' or at least monumental court-centered buildings at Makryghialos and Galatas, were yet to be excavated when Pendlebury published his survey of Cretan archaeology.
[87] The full quote reads: "The island is divided up by great blocks of mountains. Perhaps it would be truer to say that a single chain with but two considerable breaks runs the whole length of the island. Along its southern side the mountains come close down to the sea and the various settlements are approaches by wild gorges which split the chain. No one who has passed Crete *en route* for Egypt can

backdrop, Pendlebury's paradigm for Minoan society (at least in the LMI and LMIII) is a hierarchical Minoan kingdom (modeled perhaps on the British Empire[88] with which Pendlebury, as a Brit, was quite familiar), centralized at Knossos, and most productively understood through the lens of the palace: "the impression we get is of an ordered state with a highly centralized bureaucracy, the whole being ruled from the royal city of Knossos, where, as all Greek legends agree, was the seat of Minos, lord of Crete and many overseas dominions" (1939: 285). Additional clues to Pendlebury's implicit linking of Minoan Society and the British Empire (a sentiment also forwarded by Evans as evidenced by his comparison between the fragments of the "Priest-King" fresco and the "Edwards and Henrys" of English Royalty) are found in his use of the British occupation of India as a comparison with a supposed Minoan thalassocracy and influence in the Aegean (a concept that is debated, see e.g. Wiener 1990 and Knapp 1993): "Just as in the palace of an Indian Prince European artists will be employed on the condition that their subject-matter is of interest to the Indian, so with the Mainland dominions of Crete the style is Minoan, but the subjects are Mainland" (1939: 226).

This version of Minoan society is not in keeping with the rather rebellious

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forget the forbidding appearance of this coast. These mountains throw off spurs to the North which divide up the more habitable parts. In the West are the White Mountains, the Λευκά Ὄρη of the ancients. The summits of these, Agios Theodhoros, Soros and Agion Pnevma, run up to 8000 feet and are among the wildest parts of Europe. The ἀγρίμι, wild goat or Cretan ibex, still survives in some of the practically inaccessible gorges. To these mountains resorted in Turkish times, and I can add of my own knowledge, still resort to-day, those with a price on their head. The men of Sphakia, the champions of the Cretan revolution, are still a race apart. I have met there a white-bearded Καπετάνιος, who was at the storming of the fort near the village in 1866" (1939: 4). The text continues to detail the importance of mountains for the following pages, through p. 7, and also highlights—on pp. 5-6 the importance of the upland plains of Crete—locations that have been important, historically, for pasturing of sheep and goat flocks in the summer.

history of Venetian and Turkish Crete (and indeed, Occupied Crete of World War II which would bear out a similar rebellious nature five years after the publication of his book, and which would cost Pendlebury his life). The tension is between the rebellious island of which Pendlebury was no doubt aware and the rather orderly hierarchical Minoan society he presents. It is somewhat surprising, given his extensive travel across the island that he chooses to turn a blind eye towards the importance of the history of mountain villages and the peasant population outside the major settlements in shaping Cretan society and culture. Pendlebury serves as an indicator that even with knowledge of the importance of mountains and rebellious factions, any contextualization of the Minoans within the larger island was not nearly strong enough to push back against the growing theories of centralization driven by a focus on Minoan palaces and the settlements that surrounded them. As such, much of his book is centered on archaeological remains from these 'palaces,' which has the effect of reinforcing the importance of these settlements as apparently the sole critical loci for change, development, and power within the Minoan world.

The prevalence of the Minoan 'palace' continued to grow over the ensuing decades. With Knossos given its pride of place, similar court-centered compounds at Phaistos (e.g. Graham, 1956) and Malia (e.g. Chapouthier, 1930) were the major focus of investigations into Minoan society. The discovery of the palatial complex at Kato Zakros by Nicholas Platon provides yet another example of the uncritical application of the term, though it is somewhat unclear whether "palace" had simply become shorthand for describing these structures or was meant to imply royal residence. It is worth noting that Platon's initial publication of the "palace" at Kato Zakros makes no mention of a throne-room or ruler, aspects that were central to Evans' original understanding of the Minoan "palace" at Knossos (Platon, 1971). With the prevalence of these monumental structures across the island, and the implicit assumption that these were the key to unlocking the political, economic and ideological drivers of Minoan society, the function of Minoan palaces—and especially their role in the redistributive economic system (see below)—became an important focus of scholarship. This culminated in the 1984 conference on the function of Minoan palaces organized and edited by Robin Hägg and Nanno Marinatos (1987). There was, however, another source of evidence outside strict archaeology that was critical to understanding the role of the *palaces*: various archives of administrative documents found at those sites and written in the Linear B syllabic script.

4.3.3 Linear B Deciphered

The decipherment of Linear B by Michael Ventris in 1952 did more than unlock the proto-Greek syllabic script that was used by the 'palatial' institutions at sites like Knossos, and Pylos and Mycenae on the mainland, to organize and administer at least one aspect of the Cretan and mainland Greek Bronze Age economy; it ushered in evidence for a new redistributive paradigm of Minoan economy. This grew out of Karl Polanyi's concept of economic redistribution, which was itself a tenet of his argument for a substantivist ancient/pre-modern economy—an economy that is "as a rule…submerged in [man's] social relationships" (1957: 46).[89] For Polanyi,

[89] It is worth noting that Polanyi did comment directly on the Mycenaean economy, arguing that "the authentic core of the Mycenaean economy was the palace household with its storage rooms and its household accounts which listed personnel, land-ownings, and small cattle, assessed deliveries in wheat or barley, oil, olives, and a number of other staples (largely unidentified) and handed out rations" (1960: 342). His understanding of the Mycenaean economy was almost entirely informed by the Linear B

redistribution served as a strategy in non-market-based societies for ensuring the exchange and distribution of goods, and was primarily the responsibility of social leaders. The storage of durable or non-perishable goods in centralized locations by social elites or leaders is often linked with redistribution, as storage provides some chronological flexibility in the process of exchange. Critical to Polanyi's concept of redistribution are more foundation building-blocks of *symmetry* and *centricity*; symmetry ensures a sense of (real or imagined) reciprocity, where the goods that are exchanged in a redistributive economic process are viewed as generally equivalent, whereas centricity denotes a location or an individual (or group of individuals, e.g. a council of elders) through which the distribution is facilitated. The importance of *centricity* to a redistributive economy highlights the inherent specter of a Hobbesian understanding of power within a redistributive model.

Linear B documents from Knossos (and elsewhere, including Pylos and Mycenae on the mainland, while more recently Linear B documents have been found at Chania, Malia and elsewhere) appeared to represent an economy characterized by the collection of goods and materials at centralized places (i.e. the 'palaces') where they were cataloged, stored, and ultimately redistributed to other members of society. The Linear B tablets served as the administrative apparatus for keeping track of the influx and outflow of goods to the palaces. They would record the individual or location from which a good was collected or received (or, in some cases projected collection of goods from an individual or location), and the amount, and particulars of

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documents deciphered by Ventris and Chadwick, and contained little dialogue with actual archaeological evidence—especially archaeological evidence from outside the palaces where a non-palatial economy would exist.

the goods that were sent out from the palaces to the surrounding, reliant countryside. The 'palace' became the economic clearinghouse of Minoan society, and the key node of "centricity" within an economic paradigm inspired by Polanyi; sites that facilitated the processes of tax and exchange in this redistributive paradigm.

4.3.4 The Emergence of a "Palace" Civilization

A combination of the archaeological evidence for 'palaces' and the philological evidence from the Linear B documents was synthesized by Colin Renfrew in his monograph on the development of complex civilization in the Aegean world, first published in 1972 and then again in 2011. Renfrew linked the substantial storage facilities that characterized some (but, N.B. not all, e.g. Kato Zakros) of the palatial structures on the island with the Linear B documents. This allowed him to flesh out the evidence for a redistributive economy on Late Bronze Age Crete. Renfrew suggests that, "these storage facilities…underline the great importance of the subsistence system in the palace economy," and that "the redistributive system presupposes some central authority, and the provisions of this authority and the administration of the redistribution was the most significant function of the palace" (2011: 297). So much so that "the [historical] growth of the palace[90] has to be seen in the first instance as the development of redistribution centres for subsistence commodities, controlled by a well-defined social hierarchy" (2011: 297).

Renfrew also argued for the importance of redistribution as a mechanism for exchanging goods produced in ecological areas that were predisposed towards specialization. This appears to have grown out of a concept proposed by Service in a more generic anthropological paradigm (1975: 75). Service argued that ecological niches provided more favorable environments for the production of various goods (e.g. fertile bottomland for high-maintenance crops versus coasts providing marine products), and that redistributive nodes provided locations to facilitate the exchange of these goods. This emphasis on specialization is undermined, however, by the work of Forbes (1976) who shows that considerable variation is possible (and preferable, as a risk-buffering measure) at the household level in the Aegean landscape.[91] Shelmerdine (1973) also noted that the Mycenaean "taxation" scheme from the Linear B documents at Pylos expected a similar contribution of goods from towns scattered across the province. The taxation scheme therefore does not appear to account for ecological diversity as one might expect if a redistributive system had been set in place to facilitate localized agricultural specialization and exchange.

The conventional argument for the Minoan economy was at once one that relied on centralization and redistribution, easily summarized by the analysis of the palaces and the economic system administered by the bureaucracies associated with them, without much concern for the world outside their scope. This paradigm continued to be featured, in various forms, by influential Aegean Bronze Age scholars such as Cherry (1986), Halstead (1992) and Killen (1985). The 'redistributive' model that resulted from the interpretation of the Linear B documents was an essentially

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[90] Renfrew is here referencing the growth of the palace size (especially at Knossos)

[91] "The management of crops on Methana is very complex, reflecting the large range of microenvironmental factors involved in the widely scattered holdings of household units. Such factors include: insolation; shelter, or lack of it, from strong drying winds; the depth, fertility and porosity of the soil; altitude, etc. Distance from the village also affects crop management practices. One of the basic factors of agriculture on Methana is polycropping—the growing of two or more crops on the same plot at the same time."

Hobbesian understanding of centralized power expressed through an economic mechanism. Despite the fact that some scholars—such as Halstead (1992)[92]—attempted to further interrogate and fine-tune the redistributive model, the paradigm left little room for (and did not encourage an investigation into) a non-palatial economy functioning alongside (or perhaps even at odds with?) the redistributive palatial economy. This was despite the fact that a handful of studies (e.g. Shelmerdine 1973 and Forbes 1976, cited above) suggested that specialization and redistribution were at odds with the risk-buffering peasant economy likely to have existed in the Aegean environment.

4.3.5 Palatial Anachronisms

Finally, it is worth noting that, on a fundamental level, the Minoan 'palace' model fails to match Minoan chronology. Minoan palaces can be grouped into three broad chronological periods based on architectural evidence (also used to describe three different political organizations on the island, see below): the Protopalatial (MMIB/II-MMIIB, c. 1800-1625 BCE), the Neopalatial (LMIA-LMIIB, c. 1450-1375 BCE) and the Final Palatial (or "Mycenaean" period, LMIIIA-LMIIIB, c.1375-1250 BCE). The Protopalatial period is the advent of "true" palatial construction on the island, and coincides with the construction of the first of these monumental buildings

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92 Halstead (1992, and again in 2011) argues that "redistribution" can be effectively considered in two ways: pooling (i.e. the physical collection of resources in a given location, e.g. in the palace storerooms) and surplus mobilization (i.e. facilitating the use of surplus by elites and attached specialists, but not necessarily the physical collection of goods at a centralized location). By 2011, however, Halstead (based on Christakis 2011) found reason to support a theory that considered the 'redistributive' (however defined) palatial economy only one facet of a much larger and more complex economy: "it is also clear that Linear B texts record only part—arguably a minor part—of resource flows to and from Mycenaean palaces, let alone within Mycenaean regional polities. Consequently, there is a strong possibility that most so-called economic activity took place outside the recorded redistributive system—whatever we understand that to mean" (2011: 233).

at Phaistos, Malia and Knossos. Neopalatial constructions at these sites have obscured the Protopalatial constructions making it difficult to reconstruct the older versions of the 'palaces'. The Final Palatial period corresponds with the period of the Linear B archives from Knossos, and other Linear B evidence from Chania. This period may correspond with a Mycenaean kingdom on the island—what is clear is that there is a considerable uptick in the Mycenaean material culture in these stratigraphic layers. The situation is further complicated by the fact that these monumental structures appear to have developed in a gradual fashion perhaps without an explicit goal of building a multi-faceted palatial structure. As noted above, it is also important to recognize that the 'life' of these monumental structures is something on the order of six-hundred years, and therefore may have evolved or changed its use over that period of time.[93]

The redistributive economy evidenced through the Linear B documents likewise can only be directly applied to the last portion of the Bronze Age (Finley 1957, is quite clear on this, esp. pp. 132 and 134[94]). Thus the economic model should

93 One need go no further than the Parthenon in Athens or the Pantheon in Rome to find examples of monumental structures that were used in various capacities during their history, from Classical temples to churches, tombs, and in the case of the Parthenon (unfortunately) munitions stores.

94 Finley argues, "The peculiar circumstances of survival [of the tablets] give us a plane surface without depth. We can learn something about Mycenaean institutions at the moment of their death, but nothing in the tablets reveals their history—not even a five-year history, let alone a five-century history. To be sure, the relative constancy and uniformity of the texts may seem to suggest that little had changed from Knossos in 1400 BC to Pylos and Mycenae in 1200. Even if that were the case, however, it is not a proper inference that similar lack of change characterized the Bronze Age ever since 2000 BC" (1957: 132). Regarding the paradigm of a 'palatial economy,' Finley has this to say: "All the tablets were found in (or in close conjunction with) the palace ruins. That is an archaeological fact of basic importance, for it leads to the hypothesis that we are here in contact with a far-reaching and elaborately organized palace economy of a broad type, well attested and heavily documented all over the ancient Near East. Such an economy was unknown in Greece after the fall of Mycenae, and, logically enough, equally unknown were archives and administrative texts of this character and the large, complicated palace structures with their great magazines and archive-rooms. How far the Mycenaean palace economy actually reached, whether it covered the whole of the economy of left some areas to

not be uncritically projected backwards into early Minoan periods, and it is possible (though, according to Finley's interpretation, unlikely) that these documents only represented one state-run portion of a larger, more complex economy (a concept only recently being explored, and the central theme for a forum on redistribution in Aegean palatial societies in 2010; see e.g. Nakassis, Galaty and Parkinson [2011], Lupack [2011], Pullen [2011]). And yet, despite Finley's cautions, the concept of a "redistributive" economy, and the role of the 'palaces' as central locations for the organization of a redistributive bureaucracy became critical to an understanding of Minoan political and economic spheres. This is largely the result of a combination of the archaeological research that had focused on the discovery and interpretation of central places (monumental Minoan 'palaces') and the philological research agenda encouraged by the decipherment of Linear B and the bureaucracy it appears to represent. Below, I explore how, and why a concept that places palaces at the center of it's political economic paradigm without searching for non-palatial economic drivers as well, fails to effectively explore (and ultimately characterize) Bronze Age Minoan society.

4.4 *Beyond the Palaces*

4.4.1 Making Sense of "Non-Palatial"

A new theoretical perspective emerged in the late 1990s that was founded on a desire to interrogate the centralizing model of Minoan society that focused importance of the palaces and that emphasized a redistributive economy as the only (or at least

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independent 'private' activity, is not now determinable, but I suggest that the former is the better primary) aspect of the Minoan economy. The seeds of this theoretical turn can be found in the work of Shelmerdine (1973) and Forbes (1976), but perhaps most readily in Halstead (1992). While Halstead was still working within a paradigm that considered centralization mechanisms and redistribution important drivers in the Linear B economy, he also attempted to explore how these mechanisms actually worked on the ground. He argued that redistribution was best considered as a process of mobilization of resources (and, particularly surplus) for elites and their servants/attached specialists. More importantly, Halstead recognized the potential for a non-palatial economy that existed parallel to the centralized, redistributive economy of the 'palaces', although his description of this non-palatial economy was largely based on conjecture.[95]

Halstead's discussion of a non-palatial sector recalls an often forgotten tenet of Polanyi's economic paradigm. While Polanyi's concept of "redistribution" garnered considerable attention in discussions regarding the Minoan economy, another critical concept did not: "householding." Polanyi (1957: 53) defines this as "production for one's own use," within the context of a small kin or household grouping. This is not a driving aspect of Polanyi's model for economic organization in ancient societies, however it plays a critical role in structuring how reliant various households and kin-groups are on the redistributive mechanisms within non-modern societies. In other words, if a household can be largely self-sufficient, and can find a way to access

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working hypothesis" (1957: 134-135).

[95] One quote nicely sums up Halstead's position on the potential importance of the non-palatial sector in the Minoan economy: "Widespread exchange within the non-palatial sector is implied by the ubiquitous distribution of wheel-made pottery, surely the product of craft-specialists but not apparently

luxury goods without participating in a redistributive economy, what is to keep it from doing so and remaining outside the pull of redistribution? This "householding" potentially serves as a key driver in the Minoan economy outside the 'palaces', but has not received nearly as much thought in Minoan scholarship as palatial redistributive models have.

This undercurrent of a non-centralized economy that ran parallel to the palatial economies of Bronze Age Crete and mainland Greece has received considerable focus of late. Nakassis, Parkinson and Galaty (2011) provide a definitive review. They note that arguments by Renfrew, Finley and, Ventris and Chadwick "emphasized redistribution as a hypercentralized economic system that controlled virtually all aspects of economic production and distribution" in the Minoan and Mycenaean world (2011: 180), but without any real searching for other "non-traditional" economies. One of the key criticisms for this kind of Hobbesian model is the fact that it is inherently top-down, and does little to describe how or why a redistributive model might actually work within Minoan society (which is why, in their critique of a 'redistributive model, Nakassis, Parkinson and Galaty argue that it is "more fruitful to describe how specific prehistoric social institutions were used to organize and allocate goods and services and thereby to study how political and economic systems interacted with one another" [2011: 237]). Said another way, we should be asking: what are the mechanisms, incentives (or disincentives), and/or social, political, ideological and economic forces at work that make a 'redistributive' model function within the historical context of Minoan Bronze Age society? And, more to the point

made under palatial control. Household produce, both agricultural and craft, will surely have been for this project, how does a ‘redistributive’ model encourage individuals who are not within the direct purview of the institutional center (in this case, the ‘palace’) to fall in line and act according to the top-down directive?

4.4.2 New Models for the Minoan State

The model for Minoan society that places Minoan kingship, political hierarchy and ‘palaces’ at the center has also received considerable re-evaluation of late.[96] Knappett (1999), Schoep (1999, 2002), Schoep and Knappett (2004), Driessen (2002, 2004), and Adams (2004[97]; 2006) have raised questions about the legitimacy of the palatial model that has been central to Minoan archaeology for so long. Indeed terms such as “decentralized state” (Knappett 1999: 615), “loose network of regional centers” (Schoep 1999:201), “heterarchy” (Schoep 2002: 105; Knappett and Schoep 2004: 23), “corporate society” (Driessen 2004), and “contextualizing the Palace” (Adams 2004: 216) have become focal points for arguments that seek to nuance the power of the palace, and begin to look outside the redistributive economic system towards something like agent-based models. These recognize the various individuals and incentives that structure a society from the bottom-up, while hierarchical institutions attempt to do so from the top-down.

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exchanged within the non-palatial sector and palatial craft goods may also have circulated” (1992: 72).

[96] N.B. these studies are not the first to suggest that Minoan studies might benefit from expanding their focus outside the direct purview of the ‘palaces,’—see e.g. Poursat 1988, Cadogan 1988, 1990 and 1994. The studies discussed in detail here do, however, appear to be inspiring a gradual change in Minoan studies to accept the importance and effect of the hinterland (and the people that inhabited it) in Minoan studies in a way that Poursat and Cadogan—though ahead of their time in advocating for a look to the hinterlands—did not.

[97] It is worth noting that in this article Adams quotes Foucault in a very anti-Hobbesian approach to power relations: “I intend to offer a more nuanced interpretation of Neopalatial Knossos and Malia by exploring the power relations that existed within these sites. ‘Power must be analysed as something which circulates, or rather as something which only functions in the form of a chain. It is never

Knappett (1997, 1999) argues that there has been a "spatial bias" in archaeology in general, that has focused research at the urban cores, and that has been "inevitably accompanied by a 'power' bias, such that total economic, ideological and political power is thought to reside in the institutions (temple and/or palace of the state center, while the rural sector is largely overlooked" (1999: 618).[98] Critically, Knappett also suggests that archaeological studies would benefit from recognizing that "in many early states the rural economy is barely affected by a centralized administration, and that the state control over economic affairs may be weak and irregular," with the result that "a state may not be quite so effective and all-pervasive as its central authority may wish it to be" (1999: 619).[99]

Focusing on Minoan studies in particular, Knappett highlights the tautological relationship between redistributive economic models, and 'palace'-centric approaches: "the traditional view, that the state center exercises considerable economic and political control over its entire territory, is fundamental to the model of the state espoused by those who argue for a redistributive economy in the palatial systems of Minoan Crete" (1999: 620). This is a considerable departure from the 'palace'-centric Minoan archaeology of the early and mid-twentieth century. Indeed, Knappett calls into question the overly systematic, largely static, model of interaction between the Minoan countryside and the 'palace' that has characterized much of Minoan studies, even into the 1990s, where 'palaces' are said to vaguely serve as "storage centers" and

localized here or there, never in anybody's hands, never appropriated as a commodity or piece of wealth' (Foucault 1980:98)." (Adams 2004: 194).

[98] Knappett cites Stein (1994), which is hardly surprising given Stein's (2001) critique of "centralization" in archaeology discussed at length in the previous chapter.

redistribution "facilitators" (*pace* Cadogan 1990, 1994, see footnote 27). Without specifics, this sort of vague characterization of 'palatial' and 'rural' sectors has the effect of artificially emphasizing over-arching, systemic processes (e.g. centralization) and de-emphasizing individual agents, and does not effectively account for dynamism or change.[100]

Beyond railing against an urban-centric (i.e. 'palace'-centric) approach to Minoan archaeology, Knappett's examination of Protopalatial ceramics from settlements in east-central Crete (in the region generally associated with the 'palatial' settlement at Malia) led him to argue for a decentralized (at least an *economically* decentralized) model. Knappett notes that while finewares tend to show considerable similarity at Malia as at outlying sites such as Myrtos-Pyrgos, a substantial Protopalatial settlement 30 km from Malia, as the crow flies, on southern (opposite Malia) coast of Crete, much of the fineware at the settlements outside Malia is of local production. Moreover, a significant portion of the cooking vessels and functional ceramics at Myrtos are likewise of local manufacture. Indeed, it appears that while styles were radiating from the center, the actual production of the vessels consumed outside the 'palatial' center was local. At the very least, Knappett's work encourages a deeper dive into the world outside the 'palatial' settlements and the economic systems that support consumption there, and encourages us to problematize a redistributive model.

The sentiment that the palatial model deserves considerable re-thinking (and

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[99] Though not explicitly cited by Knappett, this sentiment strongly echoes James Scotts' view of the State and 'weapons of the weak' discussed earlier in Chapter 2.

especially with an eye towards the hinterland) holds for Schoep (1999b, 2002). She has similarly been concerned with critically examining the applicability of a model that emphasizes centralization, both at a regional and island-wide scale. While these two examples of her work refer to two different time periods in Minoan history (the Neopalatial LMIB [1999b] and the Protopalatial MMII [2002]), both studies emphasize the potential importance of non-palatial sectors of the Minoan economy. Schoep posits that Neopalatial Linear A tablets, sealings and roundels (a largely undeciphered syllabic script that proceeded Linear B and likely was used in basic administrative functions) from Kato Zakros, Chania and Haghia Triadha all show a distinct regional character and usage. These regional variations led Schoep to argue that however politically centralized the island may have been in the LMIA around Knossos (and even this is up for debate), by the LMIB, "rural areas acquired (yet again) a high level of political and economic autonomy" (1999b: 221).[101] At a more regional level, Schoep (2002) argues that the architectural layout of MMII Malia, with various important buildings and nodes throughout the site, is better understood as a heterarchy of competing kin-group factions, than as a hierarchically organized kingdom. Power, then, would not be centralized in the 'palace,'[102] but instead, negotiated and competitive, built on kinship ties.

Given these research trends, it is not all together surprising that Knappett and Schoep (2004) together, in a chapter re-evaluating the impact of Renfrew's *Emergence*

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[100] "Indeed, relations between palace and territory are frequently assumed to be of a certain fixed character once the term 'state' is invoked" (Knappett 1999: 625).

[101] This is somewhat unsurprising given the difficulties of bringing the Cretan mountains under a political yoke, as suggested at the beginning of this chapter.

of Civilization thirty-years on, argue, simultaneously, for a re-analysis of hierarchy, and the development of heterarchy as a theoretical concept applied to Minoan societal organization. They note that "archaeological theory [at least until 2004] has consistently tended toward a top-down" perspective, and they instead argue for developing a theoretical paradigm that both accepts the importance of systems and institutions, but one that is sufficiently 'agent-based' to account for the impact of individuals (2004: 31).

Driessen (2000, 2002) and Adams (2004, 2006) both echo this sentiment by advocating for approaches that are attentive to factional competition among kin groups ('clans' in Driessens parlance) and elites within the settlements surrounding the 'palaces'. For Driessen (2000, 2002), the lack of true royal iconography and the architectural layout of the 'palaces' organized around arguably the most important aspect, the central court, implies the potential for a more corporate society (*sensu* Blanton 1998)—at least until LMIB. At this point Driessen (2002) detects a restriction of access to the central court at Knossos, where "additional measures were taken to reduce the accessibility of the compounds in general, the courts in particular." This contrasts with Schoep's (1999b) study of the Linear A tablets (above) which suggests that "…Crete may have been more of a politically and administratively centralized state in the LMIA, with its center at Knossos," but that by the LMIB, "rural areas acquired (yet again) a high level of political and economic autonomy" (221). These seemingly contradictory perspectives serve as yet another reminder that what is happening at the 'palaces' (Driessen's restriction of access to court-centered

[102] What Schoep prefers to refer to as a "court-centered building," in the hope of avoiding any baggage

compounds and perhaps at attempt at an increasing centralization of power) do not necessarily mirror what is happening across the island, and especially in the hinterlands (Schoep's growing rural political autonomy and de-centralization). In other words, this is a nicely bounded example of how studying the 'palaces' is not equivalent to studying Minoan society at large.

Thus, for Driessen, 'palaces' are no longer nodes for centralizing control from which power radiates outwards, but instead locations for re-affirming communal ties through ritual and ceremony. Driessen's work, while somewhat conjectural, serves to illustrate the growing discomfort with what he calls the "interpretative 'strait jacket'" that a centralizing approach to Minoan archaeology imposes on the discipline (2002).

Adams (2004, 2006), advocates for a perspective that recognizes Minoan political hierarchy, however she notes that the context of the settlement within which the 'palaces' developed, and the potential factional competition between various (kin?) groups is likely critical to understanding the power dynamics of these first-order Minoan towns.[103] What is more, Adams (especially 2006) is open to developing various trajectories of centralization, both in terms of the *kind* of centralization (e.g. ideological, political, economic) and the strategies employed by elites attempting to consolidate power over these various spheres of control. Rather than assuming that all Cretan 'palaces' functioned in the same way, and as the driving political entities of the Minoan world, Adams seeks to explore how political and economic trajectories at Knossos and Malia developed differently during the Neopalatial period. The key point here is that even studies (likes Adams) that are investigating centralization as a key

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associated with the term 'palace'.

force in the development of social complexity and political economy are moving in the direction of interrogating what 'centralization' actually means. They are recognizing the historically contingent nature of centralization as a strategy that existed within the context of the times.

4.5 *The Populations Outside the "Palaces"*

There are good reasons to both extend a similarly 'agent-based' and historically contingent approach to the Minoan population outside the direct palatial sphere, and to question the importance of the palaces as the primary agents in the narrative of Minoan history. The likely settlement demographics of Minoan society provide an importance piece of framing evidence. While urban settlements on Crete appear to have grown considerably during the Middle and early Late Bronze Age, it is worth wondering whether the Minoan rural population remained considerable, in both quantitative and qualitative terms. In a quantitative sense, what size of Minoan rural population should we have in mind? In a qualitative sense, how important was this rural population as a supplier of raw goods and materials for craft production and consumption in these growing urban centers? The former is relatively straight forward, and therefore dealt with below, while the latter, while important, is more conjectural and therefore I will return to it in later chapters.

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[103] This echoes Schoep 2002, see pg. 10 above.

4.5.1 A Shotgun Approach to Demographics

Branigan (2001: 45-49) makes an attempt at reconstructing second-millennium Minoan urban and rural demographics, and while admittedly quite speculative (due to the fact that much of the survey data for the island is still unpublished, and relative population densities and site sizes are little more than educated guesses), his discussion provides what M. H. Hansen (2006) has called a 'shotgun method': a broad-brushstrokes approach to reconstructing ancient demographics that essentially builds a plausible framework of the ancient population. Branigan's estimations, based on extrapolations on survey evidence, comparative evidence from similar populations in the Middle and Late Bronze Age Levant, and educated guesses about population densities, puts between fifty-eight thousand (an urban population density of 150 people per hectare) and seventy-eight thousand (an urban population density of 200 people per hectare), individuals in urban/town settlements, and eighty-two thousand in rural villages, hamlets or farmsteads. In percentages, this is 42-49% of the Minoan population in 'urban' environments (settlements that are, on average, larger than four hectares), while the remaining 51-58% of the population was living in small villages, hamlets or farmsteads. If nothing else, the implication here is that a considerable portion (perhaps well over half) of the Minoan population was not in contact with the 'palaces' on a regular basis. This contrasts starkly with the balance of Minoan scholarship that has focused not on attempting to characterize the lives of the majority of the population that lived outside the settlements surrounding the 'palaces', but instead has focused on understanding the lives of the (relatively) few individuals who would have been sequestered inside these monumental structures (here again, the specter of a Hobbesian conception of power).

A comment on the size of these largest urban centers is worth a brief aside, particularly in relation to the importance of Minoan 'palaces.' Branigan (2001: 44) also estimates that the largest, oldest and most elaborate 'palaces' at the largest Minoan settlements of Knossos, Malia and Phaistos appear to only account for 2% of the settlement, while smaller palaces at Gournia, Petras and Kato Zakros (at likewise smaller settlements) made up 4-5% of the urban landscape. If nothing else these estimates cast a shadow of doubt on the overwhelming nature of the 'palace,' and remind us that these buildings, while monumental, were themselves surrounded by even larger urban entities/populations. Gesell's estimates (1987: 126) place the capacity of the central-court at Knossos (the largest court on the island) at 1,698 moving people, or 5,435 standing individuals. Compared to Branigan's population estimate of the entirety of the island, this represents between approximately 1%-3.3% of the Minoan population—an important and influential 1-3% to be sure, but only 1-3%.[104] This, again, highlights the very Hobbesian nature of a focus on the 'palaces' in Minoan scholarship. If our goal in this archaeological research is to best represent the political, economic and social aspects of the ancient societies we are attempting to study (and I believe this should be our goal), then we are missing a very substantial portion of the population—no matter how 'powerful' they might be by the standards of modern anthropological theory—by focusing so heavily on the palatial compounds.

[104] The Occupy Wall Street protests and recent debates over the 99% and the 1% may help put these percentages in context, and while it is difficult to quantify the wealth gap of the Minoan world, it is

4.5.2 Looking to the Hinterlands

The traditional archaeological method for analyzing non-urban settlements is surface survey, and indeed, survey holds some promise for recovering data on the relatively substantial Minoan population outside the palaces. A series of surface surveys have been performed across the island beginning, in a sense, with Pendlebury's work (above) that noted the non-palatial settlements on Crete, however, surface survey found more purchase in the 1980s and 1990s. Important Minoan surveys have been performed across the island, and provided clear evidence that to get a complete picture of the Minoan world and the island during the Bronze Age, it is critical to expand beyond the palaces (e.g. Branigan 1972, 1998; Broodbank 1999; Haggis 1996; Hayden, Moody and Rackham 1992; Hood and Smyth 1981; Nixon, Moody and Rackham 1988; see Driessen 2001 for an extensive list and discussion). However, the survey data for Minoan Crete is frustratingly neither extensively published, nor all-encompassing.[105] Moreover, there are inherent challenges with surface survey as a method, most notably that it provides a shallow understanding of the sites identified, and lacks the time depth of traditional archaeological excavation, and because of this, it distances the lived experience (and, more to the point of this project, the economic strategies) of ancient individuals.

Haggis (forthcoming) serves as an indication of the importance of 'stepping

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probably heuristically useful to consider how problematic it would be to try to characterize the 2014 population of the United States by predominantly looking at the top 1%.

[105] "Reconstructing the political geography of Crete on the basis of survey data is an exercise which has to remain largely hypothetical partly because the inferences from as yet unpublished or largely unpublished survey data may be far off the truth, and partly because these surveys only relate to a tiny fraction of the island which has been intensively studied." (Driessen 2001: 51). Driessen points out that only approximately 12.5% of the island has been surveyed, and of that, only approximately 5% (an area equivalent to 437 km^2) of the island is published. This means that

outside' the largest, 'most-important' Minoan sites to detect the patterns of regional settlement. Despite the fact that Haggis is concerned with the Prepalatial period—at least three centuries before the chronological scope of this project—his point is a critical one. Even in 2010, Haggis recognized the tendency in Minoan scholarship to "want to link integration to a hierarchical and centrifugal expansion of settlement from a notional center, into a hinterland whose hypothetical carrying capacity determines the extent of viable geopolitical identity and complexity" (2010: 2). In other words, in 2010 Haggis still felt that to Minoan archaeology, small settlements are only as important as their link to large, centralizing settlements. The problem with this inherent bias is that when surface surveys are compiled and analyzed (notwithstanding the inconsistent coverage and publication issues noted above), the pattern of settlement during the Prepalatial period is one that indicates the overwhelming importance of not centralized settlements, but villages, hamlets and farmsteads. Haggis identifies this as a "persistent lower-level expansion, continued reuse, or growth from within specific micro-regions [that] seems structurally unrelated to or at least spatially disconnected from the nearest primary or first order centers" (8).[106] When considered alongside the importance of mountain hamlets and small villages in more recent Cretan identity (see above, pp. 117-121), Haggis' suspicion is that the hamlet is actually a basic "fractal-like" component of Cretan society. These hamlets are founded on "a strong social component, that is, motives of cultural production and

[106] More from Haggis (8), especially concerning Minoan sites on the Ierapetra isthmus: "we might reconstruct the gradual growth and dispersal of lower-order sites (again the hamlets and farms) but there is little compelling evidence to suggest a centrifugal process of concentric settlement expansion from higher-order centers, such as the first order 'villages', filling out a center-periphery model. What we

social practice rather than merely agricultural dependence, environmental variability, or population growth" (8). Given this and the evidence cited above for the importance of the mountains and the 'spaces-in-between' on Crete, one wonders whether small scale settlements are more representative of the Cretan *ethos* than large, centralizing urban locales.

Despite the potential of surface survey to expand our understanding of the importance of the Cretan hinterland in the Minoan world, it is not without its challenges. Driessen (2004: 53) notes that less than 12.5% of the surface of the island has been surveyed. Given the tendency of Minoan archaeology to focus on central places and 'palaces' it is clearly not all that surprising that only a small portion of the island has been surveyed. Moreover, Driessen (2004: 53) provides an important caveat that indicates that even as the hinterland is coming to be accepted as an important part of Minoan society, the mountains are still thought of as less critical:

> "if we take into account that 61% of the island is between 0 and 400 m asl (with 26.6% between 400 and 800 m asl, 12.3% over 800 m asl) we observe that, relatively speaking, the Sitia area has more land below 800 m asl than the other three modern provinces. Most of the surveys indeed relate to land below 800 m (i.e. 87% of the island *and it is indeed doubtful that, apart from some highland plateaux, occupation was anything more than sparse in the mountains, which results in a somewhat more positive picture."* (italics added for emphasis)."

While attentive to the fact that the highlands are under-represented in surface survey data, Driessen is also dismissive of the potential importance of settlements and groups that might have occupied the highlands.

In addition to the incomplete nature of survey on the island, the actual

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see instead is entrenchment in the use of specific localities—that is a connectedness to specific places—

details recorded by the surveys are rather rudimentary and leave considerable questions unanswered. In many cases the surveys simply identify the potential for an archaeological site without providing much characterization of the architecture, kinds of finds scattered across the site, density of artifacts, etc., making it difficult to draw any real conclusions about the functionality of the settlements in question.[107] Without information on functionality, site surveys are relegated to size comparison and inevitably the development of site hierarchies, what is implicitly an exercise in organizing settlements into a centralizing (or at least pyramidial) paradigm, where size equates to centrality and importance. Interpreting artifact scatters presents the same challenge in Crete as Graeme Barker identified for rural sites in Italy: "…the identification of types of rural settlement from concentrations of surface artifacts—in Roman Italy, for example, villas, farms, cottages, shepherd camps—is extremely problematic" (1989:4).[108] So, even as surface survey attempt to help qualify the hinterland, unless properly applied, they can reinforce centralizing paradigms.

Even while highlighting some of the issues with surface survey, Driessen's review also indicates the potential of the mountains as a "zone" in Minoan history,

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conceivably for hundreds of years and probably for the better part of the third millennium."

[107] "The drawback here is that only very few of the published surveyed areas provide information on settlement extent and the exercise conducted here will need to be redone once all the information is published. Until then it is impossible to present proper rank-size distributions for the island or to examine how the number of sites varies in each hierarchical level with each chronological period in each region (cf. Cherry 1987)" (Driessen 2004: 60).

[108] Indeed, surface survey may be less effective still for investigating the settlements/camps of pastoral populations—a point considered in greater depth in chapter 5; "Studies of modern hunter-gatherers and pastoralists show that their subsistence activities often create discontinuous spreads of surface material over many hundreds of metres rather than discrete artifact clusters (Foley 1981)…" (Barker 1989:4).

albeit in a footnote (1):

> "D. Haggis (pers. comm.) reminded me that the area between 400 and 800 m is still largely unknown but may eventually prove to be an important ecozone as shown by a highland site such as Zominthos on the way to the Idaean Cave and the defensible and pastoral sites identified by e.g. Faure 1962 and Nowicki 1991 and 1992."

This is a particularly important realization when combined with the seeming importance of Minoan textile and wool production (see discussion in the following chapter). This ecozone is likely the precise space that was employed by shepherds for grazing purposes, as it was up through the 20^{th} century AD (Blitzer 1990). While more intensive survey through this area is a critical step towards expanding our understanding of the mountains and their role in shaping Minoan society, the isotopic methodology employed in this dissertation serves as a novel approach to peopling the hinterlands by exploring the herding strategies and use of the mountains that are a central part of Crete.

4.6 *Conclusion*

The mountains of Crete are omnipresent, a constant backdrop to the coasts and plains of the island. When the narrator of *Zorba the Greek* first sees the island of Crete, it is the mountains that personify it: "at daybreak I awoke, and there, to our right, lay the proud wild and lordly island. The pale-pink mountains were smiling through the mists beneath the autumnal sun" (Kazantzakis 1952: 25). The experience of traveling both by ship and now by airplane has not changed significantly: on approach to Herakleion it is the mountains that first come into view and welcome the traveler to Crete. Indeed, no matter where one stands on the island, the mountains are in view; they are literally inescapable, in some parts of the island appearing to emerging immediately from the Mediterranean. It is somewhat surprising, therefore, that the mountains are just a footnote in Minoan scholarship, with centralization and investigations into the "palaces" and their surrounding polities having pride of place. The proximity of the mountains to the sea means any and all hinterlands incorporate some portion of the Cretan mountains, and yet the role of these mountains, especially in the Bronze Age, and the people that populated them, is poorly understood.

The shepherds of the Minoan world are a significant population that likely took to the mountains. The Linear B tablets that serve as evidence for a considerable Late Minoan administrative and economic system also allude to the importance of shepherds, sheep flocks and, implicitly, grazeland, some of the best of which can be found in the Cretan highlands, in the Lasithi or Omalos, or any number of smaller highland pastures that even today host flocks of sheep in the summers. The Lasithi plateau, at least, was the focus of an extensive surface survey by Vance Watrous (1982) that revealed evidence for considerable Late Bronze Age settlement across the highland plain. The lives of the individuals who used these plains, and the links between the highlands and highland settlements and the palatial settlements of the coastal plains are murky at best. Rather than assume the centripetal pull of the palaces, this project seeks to investigate the decisions that structured the lives of the individuals and groups that moved between coastal centers and highland peripheries in order to develop a more complete understanding of the Late Minoan political economy as a whole.

CHAPTER 5

THE LOGICS OF LATE BRONZE AGE SHEPHERDING ON CRETE AND CYPRUS

> "[*Amongst the Karimojong] great differences in herding practices were found. Some herd owners and their families looked after their own livestock; others pooled their labor and cattle resources with friends and relatives, and herded jointly. Some men kept their cattle in a single herd; others divided their cattle into a herd which stayed in the settlement for most of the year, and a herd which remained in stock camps throughout the year. The differences in herding practices revealed by these two studies cast doubt on the value of the simple notion 'semi-nomadic' as adequate description of Karimojong behavior.*"
>
> \- Dyson-Hudson 1972: 31

5.1 *Introduction*

In Chapter 2 I argued that archaeology and anthropology find themselves turning away from studies that consider centralization outside of a larger societal context, and that a Machiavellian understanding of power and agency as contextualized within a series of contingencies should help us to better model strategic shepherding behaviors in the past. This theoretical discussion helped contextualize the central tenets of chapters 3 and 4: that Minoan and—to a lesser extent—Late Cypriot studies have suffered from an over emphasis of centralization and central places (i.e. palaces/urban centers), at the neglect of other non-centralized, though potentially powerful, social, political or economic groups. Chief among these oft-unacknowledged groups are Minoan and Late Cypriot shepherds, in the former case featured in the Linear B tablet archives, and described from the perspective of the palatial center at Knossos, and in the latter case, largely invisible to traditional archaeological and historical approaches. This chapter turns to focus on the shepherds themselves, beginning with a survey of literature related to pastoralism, unpacking the term and exploring the nuances associated with what is often too simplistically defined as a mode of subsistence that focuses primarily on the exploitation of animal resources (see e.g. Porter 2000; see below). Beginning with broad definitions based on theoretical and idealized concepts, the chapter gradually tightens the geographic and temporal scope, to consider the viability of a concept of "Mediterranean" pastoralism, and then focuses on Cypriot and Cretan pastoralism and particularly Late Cypriot and Late Minoan pastoralism, in an attempt to identify what is known about pastoral practices during these periods. In the process, I aim to raise a number of questions to help structure a model of Late Cypriot and Late Minoan pastoralism, some of which I propose answers for based on new isotopic data in the chapters that follow. Building on the Machiavellian paradigm of power and agency advanced in Chapter 2, the goal here is to draw out the historical, social, political and economic contingencies for the Late Bronze Age Minoan and Cypriot shepherd, in order to set the stage for investigating potential shepherding strategies.

A central theme of this chapter is the consideration of the benefits of pastoral production and the constraints placed on pastoral communities, in order to identify the roles that pastoral populations might have played within the political economies of Late Bronze Age Crete and Cyprus. I seek to characterize the kinds of decisions that shepherds and pastoral groups might have faced within these economic systems. As part of this goal, special emphasis is given to the relationships that can develop between agriculturalists and pastoralists, the concept of "secondary products" (and the ways in which herd management plays an important role in making these products sustainable), livestock as "objects of wealth" or "indicators of status" within regional and local social spheres, the ecological constraints of livestock management in Aegean and Eastern Mediterranean environments, and the affordances of mobility within a pastoral way of life.

5.2 *Defining Pastoralism*

Pastoralism, as a rule, is defined in relation to agriculture. At the most basic level, agricultural is a production strategy that is largely sedentary and relies on the care and management of domesticated plant species to provide subsistence, whereas pastoralism provides the potential for mobility, and relies on the productive capacities of domesticated animals for subsistence.[109] Of course, pastoralism and agriculture often work in tandem (and agriculture has come to include sedentary animal management, particularly when pigs are concerned) within larger societies, in part because animal and plant based economies have various constraining factors, provide different products, and afford diverse benefits.[110] However, agricultural and pastoral practices and strategies also vary considerably based on a number of social, political,

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[109] But, as will become clear as this chapter develops, it is not sufficient to simply analyze pastoral societies based on "economic" factors, i.e. the ways that they organize, maintain and manage their flocks/herds. As Salzman notes, "Pastoralism is the raising of domesticated animals on natural pasture. Pastoralists are people who engage in pastoralism. This much is fairly well agreed upon. The sociological [*and to this we might add political correlates as well*] correlates of pastoralism and the many varieties of pastoralism [are] perhaps less well established…" (2004: 103).

[110] Whittaker notes: "Pastoralism is an ideal type that has never existed in pure form, not even among Masai or Berbers. That is to say, there is always in every agrarian community a mixture of agriculture and animal breeding and always a spectrum in the relative importance of one towards the other" (1988:1). Khazanov provides a similar sentiment, noting that except for in the case of *pastoralism nomadism proper*: "Even limited occupation with agriculture exercises a considerable influence on

ecological, and economic factors, therefore the specifics of a given version of pastoralism must be contextualized within its unique political, economic and social context in order to understand how these groups functioned within that productive scheme. Idealized definitions of pastoralism present a foundational—but not altogether unproblematic—starting point to aid in identifying the multiple variables associated with pastoral production, and to facilitate an examination into the relationship between individuals or groups who focus on pastoral production within their society at-large.

Goldschmidt (1979: 15-16) provides a basic definition of both pastoralism and nomadism. For Goldschmidt, both concepts are essentially environmentally driven, with pastoralism referring to "the attendance upon and husbandry of ruminant animals", while nomadism is "the utilization of natural grasses as fodder".[111] Leaving aside nomadism (and questions of what constitutes "natural grasses" and whether foddering with domesticated plant species makes for less nomadic lifeways), Goldschmidt also provides two related ecological criteria for pastoralism: "the availability of such domesticates suitable for such exploitation" and "available arid lands that are adequate for sustaining flocks or herds, but are not amenable to 'higher' (in the economic sense) productive uses under prevailing levels of technological competence." These characterizations, and additional attributes that Goldschmidt includes later in his chapter, including military prowess, *machismo*, "a positive value on the capacity to suffer physical endurance and hardship and to be stoic in the face of

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many aspects of the life of semi-nomads, in particular on species-composition of herds, the routes and seasonal prevalence of pastoral migrations, etc." (1984: 19) pain," all provide rather subjective—and somewhat superficial—characterizations of the people that make up pastoral populations, and therefore do little to provide us with a useful framework to consider the nature of pastoral lifeways.

Khazanov's work on nomadism provides a more structured approach to idealized concepts related to animal-based subsistence production (1984: 19-24, see Table 5.1). In a survey of various forms of nomadism throughout history, Khazanov finds it important to first define multiple avenues of pastoralism in order to single out nomadic strategies as one amongst a number of other basic pastoralist forms. For Khazanov, the relationship between pastoralists and agriculturalists is the key factor in defining different groupings of pastoralists, and this manifests itself along two axes.[112] First, Khazanov notes the degree to which a pastoral group relies on animal and plant (i.e. agricultural) products for subsistence: pure nomadic pastoralists[113] do not rely on agricultural produce as a means of subsistence, whereas all other versions of pastoralism do involve some agricultural reliance. Second, Khazanov considers the use of land, especially as it is tied to mobility, or the lack of mobility (e.g. animal migration, transhumance, or localized herding) in herding

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[111] Contrast this with Salzman who groups both aspects of Goldschmidt's definition under 'pastoralism'(2004: 103), "pastoralism is the raising of domesticated animals on natural pasture."

[112] "…in the opposition between nomadism and sedentarism, according to which the essence of many of the forms of pastoral economy and its changes is often defined, the agriculture at stake is one of the most important criteria: (Khazanov 1984: 25)

[113] It is worth re-iterating that these are ideal classifications that are intended to provide some structure to a comparison of pastoral populations and societies. Khazanov is well aware that this kind of classification is a heuristic device that runs the risk of pigeon-holing pastoral groups and implies a static pastoral strategy and a static relationship between pastoral and agricultural groups (as well as between various pastoral groups). In the case of "*pastoral nomadism proper"*, Khazanov appears to be aware that this is a rare and likely overly idealized category, noting "…pure nomads are only recorded in certain regions of pastoral nomadism (North Eurasia, High Inner Asia, the Eurasian steppes, Arabia, the Sahara), but even in these regions pastoral nomadism co-exists as a rule with other forms of pastoralism. Semi-nomadic pastoralism is much more widespread throughout the world" (1984:19).

Basic Pastoral Forms	**Characteristics**
Pastoral Nomadism Proper	- Absence of agriculture (not even supplemental) - Where it exists (rare), often interacts with other forms of pastoralism
Semi-Nomadic Pastoralism	- Extensive pastoralism - Change of pasture periodically most or all of the year - Agriculture serves as a secondary/supplemental capacity
Semi-Sedentary Pastoralism	- Agriculture predominates in basic subsistence considerations, with animal products secondary/supplemental - Implies either: 1) Seasonal migration or 2) Specifically pastoral groups or families - Often involve use of fodder as part of animal management strategy
Herdsman/Distant-Pasture Husbandry	- Small portion of population acts as pastoral specialists and maintain animals, often in pasture, sometimes at great distances from settlements - Majority of population is settled agriculturalists and support specialists herders with surplus agricultural production - Transhumant (or, for Khazanov, *yaylag* from the Turkic) pastoralism is often featured in this form.
Sedentary Animal Husbandry	- Localized animal pasturing - Supplements agriculture and may include use of stables, or localized free-grazing

Table 5.1: Pastoral Ideal Categories (after Khazanov 1984).

strategies. Thus, Khazanov's categorization of pastoralism links the degree to which a society relies on animal products to sustain itself, with the land use strategies that such reliance encourages. Underlying these two considerations is also the matter of herd size and pastoral scale, with an implicit assumption that large-scale herding likely involves specialization and some aspect of migration or mobility.

Anne Porter prefers to consider pastoralism as essentially a food-production practice, using a continuum of subsistence with *pure pastoralism* at one end, and *pure cultivation*—an economy with a minimal animal-product contribution—at the other (2001: 30-31). A society that is involved in *pure pastoralism* is focused entirely on the production of pastoral products. Importantly, however, Porter notes that pure pastoralists are "most reliant on other communities to supply essential or desired commodities" due to the highly specialized nature of this version of pastoralism. Other benchmarks along this sliding scale include *supplemental pastoralism,* where pastoral productive strategies are supplemented by other strategies that might include wage labor or craft production.[114] *Supplemental pastoralism* likely encompassing the vast majority of pastoral societies; as Salzman points out, "almost every population heavily involved in raising livestock on natural pasture is seriously engaged in other productive activities, whether cultivation, hunting and fishing, caravanning, smuggling, predatory raiding and extortion or sale of labor"(2004:139 and references).

[114] Intriguingly, while Porter considers subsistence the main variable separating these variations on pastoralism, with this scale representing "the totality of food producing subsistence practices (as opposed to mineral exploitation or long distance trade), within which may be distinguished four principal systems—pure pastoralism, supplemented pastoralism, supplemented cultivation, and pure cultivation" (2001: 30), one of the main factors that separates *pure pastoralism* from *supplemented pastoralism* is a pastoral groups involvement with non-subsistence practices such as wage labor or craft production.

Last, *supplemental cultivation* refers to subsistence strategies in which "the numbers of animals kept are insignificant in terms of caloric intake or subsidiary economic activities such as textile manufacturing" (31). Porter's paradigm is an attempt at separating pastoralism (in the sense of an economy based on animal production) and nomadism (which involves mobility), to move beyond the conflation of the two that is characteristic of Khazanov, however in the process she sets up a tenuous dichotomy between agricultural production and pastoral production, two economic strategies that often functioned in tandem.

In both cases, Khazanov and Porter choose their definitions of pastoralism for specific purposes; for Khazanov, pastoralism provides a platform from which to address nomadism,[115] whereas for Porter, the goal is to use a juxtaposition of agricultural and pastoral production strategies as a way of investigating how economic strategies impact social relations between groups. Khazanov admits that a number of complex factors, including biological peculiarities of various species, natural ecological and geographical variables, economic, social, political and cultural factors, are involved in determining the size, scale and make-up of herds within various pastoral societies.[116] However, his categories for pastoralism are not productive for investigating the recursive nature of these various natural and anthropogenic factors in structuring the context within which pastoral populations develop (and develop

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115 And in the process, as Porter notes, to "understand the type and nature of interaction between pastoralists and the 'outside world'" (2001:31).

116 Two quotes serve as examples to illustrate Khazanov's sensitivity to multiple variables impacting flock size or composition: "uniquely specialized types and variants of pastoral nomadism are almost always imposed by ecological necessity…" and "the biological particularities of herding animals which nomads have to take into account have a bearing not only on the species composition…but also on ways in which the herds can be split up and pastured in specific ecological conditions" (1984:27).

themselves). Porter's approach, by emphasizing the productive nature of pastoralism, neglects to successfully conceptualize non-economic aspects of pastoral societies (an issue she addresses more effectively in her more recent work; see Porter 2011, and especially chapter 1). As Rissman (1985: 17) correctly notes, "any given pastoral society will face its own constellation of ecological, economic and political factors…[and] each individual herd owner will be confronted with a choice in which personal circumstances…figure into decisions about nomadism." The task, then, is to develop a model that can best approximate the myriad of choices that shape the strategies employed by both a herding society, and individual herders.

5.3 *Factors of Pastoralism*

In such an undertaking, a more useful way of "defining" pastoralism is not to come up with idealized classifications, but instead to note the multiple factors that impact the formation and development of pastoral groups and attempt to model a specific pastoralism within the framework of these factors.[117] Critically these factors include ecological and environmental drivers as well as cultural, economic and political drivers; in other words, "natural" impetuses and human-made impetuses. Foundational work on pastoral populations and human-animal relations by Eric Higgs and others (Higgs 1976, Jarman 1971, 1972) experienced an important course

[117] Nixon and Price employ this heuristic model in order to aid in a comparative history of pastoralism, and especially in response to the emphasis on transhumant pastoralism, which is a hallmark of scholarship on Mediterranean pastoralism (see below). They note: "…comparative historians have to ensure that they are comparing like with like, and that cases are not compared simply because they have been given the same label by scholars," and so they offer seven aspects of pastoralism that are not "specific to periods of places, and are deliberately broad, so as to ensure useful comparability between very different kinds of information (material, written, directly observed), over long, as well as short,

correction and criticism, with Lewthwaite (1981) noting that historical, economic and political factors were at least as instrumental as natural factors in shaping the long-distance Medieval transhumance on Sardinia and Corsica. Markets, political decrees by the state, and the production and exchange of animal goods made particular strategies more attractive in one social, economic and political situation as compared to another.

Nixon and Price (2001) provide a useful paradigm by which to consider pastoralism and pastoral societies across time, proposing seven factors for analysis: the environment; the location and movement of animals; scale; product specialization; links with agriculture; gender and division of labor; and cultural integration. These analytical factors include, but also expand beyond, Khazanov's considerations of the relationship between pastoral and agricultural groups, and associated strategies of land use. They also incorporate several social and political variables that are missing in Porter's paradigm. Exploring Nixon and Price's seven factors establishes a framework for considering Late Bronze Age Cretan and Cypriot pastoral practices later in this chapter.[118] It should be noted that Nixon and Price are mostly concerned with transhumance in the ancient Mediterranean world; thus, their consideration of these seven factors is specific, and often requires some additional expansion in order to develop an effective paradigm for analyzing the various factors that contribute to different kinds of pastoral practices more broadly.

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periods of time" (2001: 397). In what follows, I seek to actually broaden these categories slightly to lay a foundation for the numerous decisions and vectors of change that impact pastoralists.

[118] While I find Nixon and Price's seven factors of pastoralism a useful device for considering the various types of pastoralism, I do not simply summarize their seven categories here, but instead provide

5.3.1 Environment

At a basic level, “environment” refers to the natural surroundings in which a pastoral community operates. However, “environment” should not be taken to simply refer to pastureland and access to water, as “surroundings” is a concept that must include complex ecological, geological, climatological, and topographical aspects of the natural environment that are layered onto one another. Ingold’s analysis of human interaction within their environment provides a useful corollary here. We cannot, Ingold argues, simply view environment as a set of affordances; we should instead view environments as groups of raw materials that can be strategically employed “in accordance with a project of our own devising” (Ingold 1986: 3). The agency of humans within a natural system is a key underlying principle in Ingold’s conception of environment, and therefore in the case of the pastoralist, the environment is not a static system of affordances, but a complex grouping of raw materials and processes that can be strategically used in pursuit of a goal (e.g. the maintenance and growth of a flock, the production of dairy products, or the production of animal-based wealth; Ingold 1986: 72-73).

Thus, the environment is a set of ecological, geological, climatological and topographical facets that are all processes which function at different rhythms and time-scales, and impact the usefulness of a grazeland environment in tandem. A highland pasture, for example—an ecological environment, topographically elevated—might become inaccessible either due to seasonal climates or larger multi-year climatological events (e.g. the Little Ice Age). The usefulness of a given

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my own perspective on what these various factors mean and the major concerns that environment to pastoral pursuits is therefore not simply a matter of whether it can provide food and water for herds but how much food and water, when, and how reliably.

More than this, it is critical to realize that these environments cannot be considered "pure" natural environments, since human interaction with the environment inevitably causes changes to the natural systems, however large or small. In a pastoral context, then, it is important to note that pastoralism is not necessarily ecologically determined based on the availability of pasture and water resources (Bonte 1981:25). Indeed pastoralism can sometimes act as an ecologically deterministic process, as an economic impetus for specialized pastoralism (such as a desire to produce wool or milk products) can be the reason for shaping the landscape into a particularly favorable pastoralist environment (Geddes 1983). Further, the modification of an environment for the intensification of agriculture, specifically the clearing of forestland, often also leads to the creation of an ecological niche that can be favorable for pastoralism as well.

With regard to the environmental factors for pastoralism, the most basic considerations are whether food (i.e. pasture or fodder) and water are available to sustain the herd animals. Salzman (2004:105) refers to this as *nurturance:* "…consistent and timely access to pasture and water." Environmental considerations and nurturance are, however, inextricably linked with land-use practices among the pastoral populations in question, and also among other neighboring agricultural (and indeed other pastoral) groups. Where populations find themselves interacting with

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impact/characterize these factors.

sedentary groups or societies, animal mobility and migrations provide a unique tool for enabling access to pasture and water for animal herds without disrupting agriculture practices. The use of the environment by pastoralists is determined in part by the natural affordances of the region, but also contextual social, political and economic factors. It is in precisely this sense, that Claudia Chang noted that the "tactics and long-term strategies used by herders in organizing activities over the regional landscape are shaped by both ecological/economic aspects of stock raising and a set of cognitive rules regarding the location of herding activities in relation to village habitations, agricultural activities, and physical attributes of the landscape itself" (1992: 66).

5.3.2 Location and Movement of Animals

For Nixon and Price this category essentially pits localized, non-mobile pastoralism against regional (a distance of a few kilometers) and long-distance (75+ km) seasonal transhumance. Thus, these variables serve to divide their considerations of herd mobility and movement into three basic categories that are reminiscent of Khazanov and Porter: i) localized herding in and around sedentary agricultural settlements; ii) a "mobile economy within a restricted area", involving regional transhumance with travel over a few kilometers, and iii) long-distance, specialized and intensive transhumance. These typologies, however, run into the same problems as those of Khazanov and Porter: they are built from ideal categories and do little more than pigeon-hole historical examples of pastoralism.

Instead, it seems more useful to consider how the location and movement of animal herds and pastoral populations might be structured or determined, by identifying some reasons for locating herds in specific areas, or employing mobile pastoral strategies. With respect to the location of herds, a basic starting point returns us to environmental considerations, specifically the supportive capacity of a given area. In a very real sense this has the potential to determine the productive location of herds and therefore pastoral communities. If herds can be supported within environments around a settlement, a localized herding possibility exists; however, once pastoralism intensifies to an extent that is no longer locally sustainable (or, agriculturalists begin to occupy local, fertile land and crowd out animal production), pastoralists face a challenge of finding a location (or locations, when mobility is employed) to support these greater grazing and water demands. Estimated stocking densities provide one way of modeling the supportive capacity of a given location, however this also presents a number of challenges and assumptions, particularly that a given geographic location or climate will provide uniform grazing capacity; a herd of a certain size could be supported on smaller plots of land, perhaps closer to settlements given an environment well-suited for pastoralism, whereas in the case of marginal land, greater amounts, and therefore greater degrees of mobility might be required to sustain the same sized flock. In these situations, and based on pressures associated with the location of various pastoral strategies the size (and composition) of a herd is of considerable importance.

More than environmental considerations, location and movement are critical in maintaining the security of livestock. Animal herds represent the critical asset for pastoral individuals and communities and the location of these flocks, and their ability to move and migrate enables pastoralists to protect their livestock. Salzman (2004: 105) is explicit about the importance of mobility as a tool for protecting livestock within pastoral communities and societies. The Yomut Turkmen of north-eastern Iran serve as a clear example of how the mobility that livestock rearing provided could be used as a political strategy that both supported livestock security and ensured political autonomy for the Yomut (Irons 1974). The ability to move north from traditional grazeland in the Gorgon River Valley into the hills, and if necessary, across the Qara Qum desert to join their relations that made up the Khiva Yomut, enabled the Yomut to retreat from Persian coercion and political occupation. Effective Persian government control over the Yomut historically was largely impossible until the military innovations of the mid-twentieth century.

5.3.3 Scale

The size of herds is a major contributing factor to the organization of pastoral societies since the size of herds is the main variable in determining the suitability of a given location for grazing. Said more simply, "the larger the size of flock, the harder it is to provide year-round supplies of fodder in one place" (Nixon and Price 2001: 405). Herding pressures can become especially pronounced when land under crop effectively limits the land that can be used (at least year-round) for grazing, and when pastoral production expands beyond the scope of subsistence. In general, where agricultural land exists near settlements, large-scale pastoralism requires some sort of mobile herding to access suitable grazeland outside the agricultural land, thus, the presence of large-scale (e.g. significantly beyond subsistence and livestock buffering levels necessary to sustain flock/herd sizes) herding is a critical clue to identifying intensive herding practices such as mobile or transhumance pastoralism. But, what drives increases in herding scale?

Nixon and Price observe two critical, external factors that significantly affect the scale of pastoralism: state organization and markets (2001: 406-408). States impact pastoral scale by encouraging the intensification in pastoral economies in both passive and active ways. Passively, states encourage a politically competitive culture in which economic outlays provide opportunities for increasing political power including via sponsoring feasts or controlling a substantial aspect of the animal economy. States might also function as active members within the pastoral economy, either by facilitating pastoral production so that an increase in animal products increases the taxes reaped by the state, or as an economic actor unto itself, with the state owning and managing its own herds and flocks. In the former case, indirect, tax-related interest can greatly improve the scope for large-scale pastoral production, as evidenced by the unequivocal state support of the Mesta, a large scale, state-sponsored shepherding economy in 15th and 16th century Spain that facilitated large scale transhumance (Klein, 1920; Braudel 1972: 91-94). In the latter case, states act as pastoral producers themselves. The Linear B documents from Knossos and the Late Minoan shepherding economy that these texts represent provides one such example. It would not be surprising, therefore, to find palace-sponsored building projects on Crete, which had the goal of enhancing the ease of shepherding. Indeed, Judith Reid argues that Middle and Late Bronze Age road networks built in eastern Crete—many of the roads which make up this network are especially steep and have steps, and would have facilitated livestock movement—presents just such an example of a state driven building project meant to aid transhumance (Reid 2007: 72).

Nixon and Price identify the presence of economic markets as the second external variable that impacts scale. Nixon and Price use the term "markets" rather broadly to refer to any institution that facilitates the consumption of animal products above the subsistence level. Following this logic, they group the Late Bronze Age Minoan palaces and their wool-production economy with Renaissance-period cheese production and export to Europe under the same heading. While their point is important—the size and nature of the consumption of animal productions at a given point in time, within a given society is a critical consideration in animal product circles—to refer to both Minoan palatial economies and early Renaissance economies as "markets" is both reductive and problematic.

A central component of a market is the concept of exchange, and the fact that one economic actor receives some sort of payment in exchange for a good or service provided, thus institutionalized consumption or collection is not a sufficient determining factor for a market to exist.[119] Turning to one example forwarded by Nixon and Price, it is entirely unclear at present what benefits Late Minoan shepherds were receiving for herding pastoral flocks (and indeed a question that this dissertation considers and attempts to provide some answers for in the following chapters). Nonetheless, with respect to herding scale, the basic point remains: the presence of

[119] Plattner, for example, uses market to describe "the social institution of exchange where prices of exchange equivalencies exist" (1989: 171, n. 1). Polanyi notes that from a catallactic perspectives market are the "locus of exchange", and "market and exchange are co-extensive", where "exchange is thus described as *the* economic relationship, with the market as *the* economic institution", however even for Polanyi's definition of a market, exchange is a critical factor (even if exchange can happen in non-market, redistributive or reciprocal situations): "market institutions shall be defined as institutions comprising a supply crowd or a demand crowd or both. Supply and demand crowds, again, shall be

Nixon and Price's "markets" (what might be defined as accumulations of the forces of consumption within one institution or sphere), are a critical component in determining the scale of pastoral production. Without extramural, extra-household consumption on a significant level, there is little reason to increase flock size (above buffering against loss due to disease, drought, etc.). Thus, markets, but also other institutionalized consumption such as feasts, requirements for religious sacrifice, and requirements for bride wealth, serve as important social, political and economic drivers in determining, and expanding pastoral scale. In all of these contexts the specific animal products emphasized within a given pastoral community (e.g. wool, dairy, blood, meat, hides, etc., or likely some multi-product strategy)—i.e. product specialization—is an integral factor in structuring the organization, movement and location of herds at specific times of the year.

5.3.4 Product Specialization

Traditional domesticates (i.e. pigs, cattle, sheep and goats) can provide a number of different products: meat, milk, manure, wool/hair, hides, traction and transport. Of these, meat, milk, manure, wool/hair and hides are of particular concern to pastoralists (whereas traction is an important aspect of agricultural intensification and transport an important aspect of trade and exchange, but the keeping of one or two head of oxen for plowing traction, or a number of donkeys for copper ore transport does not indicate a pastoral mode of production). Product specialization among pastoralists refers to taking the necessary steps to ensure a surplus production of at least one of these animal-based products (Salzman 2004: 105). Focusing on specific

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defined as a multiplicity of hands desirous to acquire, or alternatively to dispose of, goods *in exchange*" products necessitates organizing the demographics of the flock or herd in a particular way. In the case of sheep, for example, a specialization in wool production might emphasize the number of castrated adult male sheep (wethers) which provide more and better quality wool than rams or ewes, whereas dairy and meat specialization would encourage flocks that are predominately female sheep in order to provide lambs for meat and milk to produce dairy and cheese products.[120] Nixon and Price (408) suggest that demographic flock or herd structures can be developed either through breeding or herd management. Breeding might include the selective breeding for particular traits (or cross-breeding with populations that are larger, produce better quality wool/hair/hides or produce more milk), whereas herd management would involve the selective culling of undesirable animals (e.g. male sheep in a pastoral scheme that emphasized dairy production).

In a specifically archaeological context, these trends appear as age-profiles[121] within faunal assemblages from sites. Broadly speaking, the age-profiles from faunal assemblages can be grouped into three major groupings that emphasize either meat, dairy or wool/hair production in the case of caprines, though not applicable to cattle (Payne 1973). Assemblages that show a high rate of kill-off sometime between the second and third year are indicative of a meat-emphasis as animals approach maximum meat yield at that age. The kill-off of most very young animals (beyond

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and "market institutions, therefore, are exchange institutions"(1957: 261).

[120] It is worth noting (and see also below regarding strategies for the diversification of risk that run counter strategies for product specialization) that meat and dairy production strategies can work in tandem: both require a high proportion of female animals, and the killing off of immature animals for meat does not necessarily interfere with milk production in female animals.

[121] And, indeed, sex-profiles, however sexing animal bones is considerably more challenging than aging bones, as the bones that vary with sex are few. Size dimorphism may indicate sex, however it

the amount of animals required to maintain the size of the flock) often represents a focus on dairy production allowing human consumption of the milk meant for the young animals. Older age profiles that appear to have substantial amounts of adult animals are indicative of wool or hair emphasis. Male animals, save a small number of rams necessary for reproduction, will be castrated to become wethers that produce greater quantities of better quality wool.

Product specialization is not, however, a static characteristic of a particular pastoral strategy; indeed, variability and the ability to transition between emphasizing specific products based on the demand for those products is an essential factor in successful pastoralism (e.g. Nixon and Price note changes in flock demographics as a strategy for rebuilding flock or herd numbers in response to crisis or significant flock loss). A number of additional factors, not least extra-household consumption, which might include markets for exchange, tribute payments, taxation, and redistributive economies, are critical factors in encouraging specific product specialization.[122] Without demand for a specific product, emphasizing the production of that animal-based good serves little purpose for the pastoralist. Labor constraints and logistics might make certain specialized production more or less attractive. Halstead notes that dairy production requires more consistent labor than wool production since the milking of sheep, goats and cattle needs to be performed multiple times a day, whereas

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also may indicate different breeds of a particularly species or feral animals. Thus, for pratical reasons, age-profiles are more readily available for analysis.

[122] The importance of extramural demand/consumption for animal products is an additional argument against the juxtaposition/tension between pastoral and sedentary groups. Porter, in arguing against the notion that pastoralist/agriculturalist relations are often characterized by the former raiding the latter, notes "though pastoralists need agricultural products, they also, and equally, need an outlet for their own production" (2011: 22).

the shearing or plucking of sheep only a few times a year. In such a scheme, “a single herder might comfortably look after 240 sheep or goats in open pasture…but one milker may only manage 200 head if several households pool labour” (1996: 26).

The availability of labor is a related constraint on flock or herd demographics, shepherding/herding strategies, and the product that are emphasized. For example, Dyson-Hudson (1972: 35) documented a cattle herding practice amongst the Karimojong of north-eastern Uganda that involved a rotation of cows in order to ensure that milk-yielding cows were kept in the settlement and therefore available for milking, whereas “male stock, dry cows, and enough milch cows are kept in the peripheral area to support the men and boys who guard them.” This strategy would address the labor deficiency issues. A sedentary “base-camp” would seem to be an important pre-requisite for dairy production, however: “nomadism and the sale of milk do not go very well together, because nomads do not stay in good proximity to a market, and because milk cannot be stored or transported easily” (Salzman 1987: 46). Ghee or cheese production would, thus, be a more effective strategy for dairy exploitation amongst nomadic groups.

Product specialization also has the effect of potentially reducing the reproductive capacity of a flock or herd: in a wool production economy, castrated male sheep—which are clearly unable to reproduce themselves—serve as a significant portion of the flock, whereas dairy or meat production encourages the predominance of ewes, therefore providing the potential for increased animal production. An alternative pastoral strategy might include risk-buffering through diversification of products, or through the exchange of surplus animals. Halstead and O’Shea (1989: 3-

4) identify both diversification and exchange as two of the primary strategies for risk buffering against variable and unpredictable year-to-year production.

The emphasis of one product and one species of livestock is associated with large-scale animal production; Halstead notes: "small-scale mixed farmers commonly keep a range of livestock…to reduce the risk of wholesale loss…" while "most large-scale pastoralists specialize in sheep or goats or horses" (1996: 24).[123] Nixon and Price echo this sentiment: "Specialization is characteristic of large-scale transhumance. Indeed the greater the scale, the greater the degree of specialization; it is worth increasing the risk entailed by specialization only for the sake of a large market or greater profit" (2001: 409). Again, extramural consumption plays a critical role in establishing the demand that makes taking the risks associated with specialized production worthwhile.

Nixon and Price note that "specialization was a matter of choice, not environmental determinism" (409). Multiple kinds of pastoralism are likely overlaid onto one another with potentially different products or strategies applying to different herds of domesticates. Shepherds may choose to participate in various pastoral production schemes depending on a number of social, economic and political factors. Indeed, Salzman (1987) discusses two Bharawad pastoral groups in India that transitioned from a largely subsistence-focused nomadic existence to a sedentary

[123] Waters-Bayer and Bayer (1992), whose analysis focused on pastoral groups in the modern world, shows a similar propensity for diversification among small-scale herders (what they term "smallholders"): "small holders seek diversity rather than specialisation. They care for numerous different plants and animals, to provide for their various household needs and to ensure against production risks. Moreover, their agricultural output is often supplemented by off-farm activities, such as crafts, trade, wage labour." (6).

existence emphasizing dairy production for market consumption,[124] as a response to localized urban growth. This is a key example of a pastoral society's "openness to socio-economic opportunities and their voluntary selection among available courses of change" (44). In this context, the settling-down of Bharawad pastoralist, and a change from ghee to dairy production has made for a more profitable and secure existence. This being said, the key to this more predictable existence is a link to an institutional demand for animal products that pastoral groups can provide. Said another way, investigating the links between agriculture and pastoralism within a society or region is necessary to understand the economic decisions made by pastoral groups.

5.3.5 Links with Agriculture

Nixon and Price (2001: 409-410) importantly argue against an inherent opposition between agriculture and pastoralism; indeed in all but the most nomadic and isolated contexts, pastoral production and agriculture must function in concert. The degree to which pastoralists involve themselves in the agricultural sphere is based on a number of related factors (intertwined with those factors of pastoralism discussed above), but involves, at the very least, negotiation over land usage and exchange.

Pastoralism makes it possible to usefully employ land that is not under crop. This may be for a number of reasons, including because the land in question is not particularly fertile and is not worth the effort to undertake agricultural pursuits (either

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[124] Salzman (1987:46) details the effects that a transition from nomadic pastoral to sedentary pastoralism had on Bharawad herd demographics: "…the family herd has changed from a mixed small and large stock profile to a large stock profile, because the small stock do not do well in the west season…the main productive activity is no longer the making of ghee, but the supplying of milk. This also has an effect upon the herd profile. For one thing, it makes small stock less useful, for goat milk has a very strong taste and a low fat content, and is thus not very saleable, and sheep produce only a small quantity of milk, making them not very profitable. And for another thing, the demand in Surat

because of soil deficiencies or lack of sufficient water), because land is being laid fallow, because land is too steep or forested to be effectively cultivated or because a piece of land lies too far outside of a settlement to make agricultural production possible. In these cases, pastoralism can provide a way of using marginal land in a productive way without interfering with agriculture (e.g. Dyson-Hudson and McCabe 1983). In this sense, agricultural and pastoral production function in tandem, and provide different strategies for making use of a varied and complex environment. Agricultural production and pastoralism can also be symbiotic in the same location, with manure providing valuable fertilizer[125] and agriculturalists providing fodder, access to fallow fields, or water resources in return. Waters-Bayer and Bayer (1993:12) note that Bambara farmers in Mali have drilled wells in their land to attract transhumant pastoralist and their flocks. The resulting manure has increased millet production yield by up to seven times.

Sedentary agricultural communities are also consumers of animal products, therefore presenting pastoral groups with opportunities for exchange. The presence of sedentary agricultural communities makes product specialization possible as demand for certain animal products can be gauged and predicted, and decisions about flock size, demographics, and location can be made in order to emphasize animal products in demand. In this way, the pastoral/agricultural divide really represents a division of labor across a society or region, and supports a view that considers pastoralism and agriculture in tandem, rather than as opposing life-ways in constant tension. This is a

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[the urban center] is for buffalo milk, with its high fat content, so there has been a shift from cows to buffalo."

[125] Sheep, Lewthwaite (1981) notes, can produce up to 500 kg of manure annually.

perspective argued for by Anne Porter (2011: 2-3), leading her to posit a "rearrangement of some deeply embedded principles of Near Eastern archaeology and history: instead of understanding that sedentary agriculture…is the source of cultivation," she suggests that urbanism, political structures and writing developed in the Near East as a response to the tension of "the constant risk of fragmentation and dispersal of a social group [that exist] when large parts [of that social group] constantly move." Said another way, sedentary agriculturalists and pastoral nomads, in this view, are part of a larger society.

In cases where groups maintain both agricultural and pastoral modes of production, herds provide opportunities for surplus storage, investment and risk buffering. Domesticated livestock are both a "major capital resource" for the production of exchangeable goods, and thus they are "repositor[ies] of value" (Salzman 2004: 104). Halstead (1990: 152) observes the banking of agricultural surplus by feeding livestock as an investment mechanism in Amorgos, Greece. Livestock can either be slaughtered later in times of need, or can provide saleable products (e.g. meat, milk, wool, etc., and therefore acting as a "capital resource"). The use of surplus as fodder thus acts as an investment, with livestock serving as a "savings account, producing offspring[126] as interest" (Water-Bayers and Bayers, 1992:7). Keeping livestock presents an opportunity to make use of surplus agricultural products (or, in the case of land laid fallow, fallow crops and/or weeds that have no convertible value themselves) that might otherwise spoil. In this way, livestock functions as a risk buffering and investment mechanism, essentially translating present surplus into future potential. Water-Bayers and Bayer (1992:8) echo this: "livestock serve as a buffer for the variations in crop yield: when crop harvest is not enough to meet family needs, animals can be sold to buy food or slaughtered to eat."

5.3.6 Gender and Division of Labor

Nixon and Price provide yet another critical re-examination of the traditional assumption that pastoral production relies on the labor of adult male shepherds.[127] This attempt at re-analyzing gender roles within pastoral societies acts as an investigation into the division of labor along gender lines. To facilitate this, Nixon and Price identify *direct divisions of labor*, where men and women are involved in aspects of pastoral production such as herding management, flock movement, or the collection and production of animal-based products, and *indirect divisions of labor,* where the work performed by women in other economic spheres frees up male labor for pastoral pursuits. Three case studies (two modern, one ancient) allow them to indicate the variability in the division of labor within the pastoral context.

Beginning with an analysis of modern (twentieth-century CE) Sphakia in south-western Crete, Nixon and Price argue against the relatively simplistic view that men herded flocks of sheep, and women did "nothing of economic importance", and show that even where women are not directly responsible for the care of livestock, they are important indirectly, maintaining "agricultural momentum" around the

[126] Or, indeed, wool, dairy products, blood products.
[127] For example, Beaman (1983:20) notes, "there is an old cliché, best expressed by Goldschmidt [1965:404] that pastoralism as a subsistence economy relies so closely on male physique and mobility that women, often burdened with pregnancy and small children, have relatively reduced social and economic roles in pastoral societies."

lowland homesteads, while men and boys were watching over the sheep in the upland summer pastures. In this way, the division of labor made it possible to diversify the productive capacity of each family, and to improve agricultural and pastoral production by making transhumance possible. Moreover, Nixon and Price recognize that while cheese was the main animal product in the region, textile production was also performed by women in Sphakia. While the men manage the sheep and were responsible for the shearing of the flocks, the women were the individuals transforming raw material (wool) into commodities (textiles).

A second modern (again, twentieth-century CE) example, the Vlachs of northern Greece, echoes Sphakia's clear division of labor: the Vlachs emphasized textile production. Men were responsible for the herding and management of the flocks of sheep, while the Vlach economy really relied on "wool and its transformation by women into usable and saleable items" (413). To ignore the role of women's labor in this case, then, arguably dismisses *the* critical practice of production within the Vlach economy, where raw material becomes a much more valuable commodity for exchange. This process of textile production is what facilitates a specialized economy, and the organization of the flock demographics that emphasize wool production. In a sense, we might consider the role of women as weavers as the most critical variable that establishes the possibility for a specialized wool production economy within Vlach society—more so than the flock management and organization performed by Vlach men. Indeed, without the conversion of raw wool into textiles, it is unlikely that a specialized wool production economy would have emerged amongst the Vlachs, and in this sense, the potential for textile production serves as the crucial pivot point for the strategies of shepherding employed within Vlach society.

The third example presented by Nixon and Price focused on Late Bronze Age Crete and the Linear B documents that provide evidence for this wool and textile economy. Seeing as this is the subject of much more detailed analysis below, suffice it to say that Nixon and Price both emphasize the importance of a division of labor that would facilitate the same transformation of raw wool into textile commodity that occurred amongst the Vlachs, while also arguing that gender is not necessarily a useful variable for predicting divisions of labor. Nonetheless, the labor of women within pastoral communities is absolutely critical to understanding the structuring of pastoral strategies of production and subsistence.

Anne Beaman (1983) made a similar case for the importance of female labor in pastoral societies, arguing for important indirect impacts on pastoral production, outside direct livestock management, including: "control and distribution of products, the provision of support services, and all the means whereby the domestic unit meets with subsistence needs" (20). Beaman's study considers the role of women within the Rendille society of northern Kenya, but is indicative of the ways in which the division of labor might occur within a pastoral group. The Rendille females have different roles as children, responsible to herd and milk small livestock (sheep and goats), but once married, Rendille women act as "managers of the products of their husbands' livestock" and are responsible to provide and maintain subsistence for the family. In this system, men are responsible for animals on the hoof, while women are in control of and distributed the products of those animals (e.g. milk or meat). Thus, the demographics of particular flocks might be impacted by the needs of the family as communicated via Rendille wives.[128]

Equally important, however, is the recognition that a number of external aspects (nearly all of which have been touched on in the six other factors of pastoralism) affect the division of labor, based largely on the labor available. Nixon and Price argue that, "pastoral societies, like others, may be strongly gendered, but it is analytically important to know what the women, as well as the men, are doing" (410). Nixon and Price importantly note that gender is not necessarily a useful predictive variable for the division of labor: "it is crucial for scholars to realize that…we cannot predict precisely how each production system will be organized, and who did what, in terms of gender." However, it seems equally important—if not more so—to identify whether labor is divided along gendered lines (as opposed to a number of other variables by which labor could be divided, including age, social status, experience, and choice of vocation), and why.

5.3.7 Cultural Integration

Nixon and Price's final category is something of a catch-all aimed at identifying the ways in which pastoralism has impacted various aspects of certain larger societies. Examples include: "seasonal calendars, religion, metaphor and symbol (both iconographic and written), consumption, the status of pastoralism, and attitude to pastoral landscape" (416). They point to, for instance, the link between religious calendars/feast days and herding events in Vlach society, where "St. George's day (23 April) and St. Demetrios' day (26 October) took on a special significance among transhumant groups in some parts of Greece because they

[128] See also Waters-Bayer and Bayer 1992: 9-10.

coincided with the annual movement of the flocks (417)." Moreover, herds and flocks could provide a political and religious symbol, likely borrowed by Near Eastern societies,[129] where kings were metaphorically considered the shepherds the flock of commoners (a metaphor repeated in Christian teachings, which emphasize the role of either the Lord God or Christ as a shepherd of the Christian community). Nixon and Price point out the incorporation of animal products (especially meat, wool and dairy) into important social processes, such as the sacrifice of animals and consumption of meat during festivals or feasts, and the importance of finely woven woolen textiles as elite objects. Finally, pastoralists provided a convenient trope for an urban-rural, or lowland-highland dichotomy, with shepherds standing in for rugged, mountainous, uncouth, and uncivilized groups, compared with the urbane, settled, refined city-dweller, whether this dichotomy actually represents reality or not.

With all of these examples of how pastoralism is integrated into a wider regional grouping or interfaced with sedentary society, we are left wondering why pastoralism and pastoral products were employed and integrated in different ways in different societies.   Having shown that pastoral groups and pastoral products are often integral aspects of societies, even when these societies are predominantly sedentary agriculturalists, the next step is to investigate the processes that bore out the integration of pastoralism within a larger cultural group, via religious holidays, feasting practices, or an urban-rural dichotomy. Put another way, the question turns from "how were pastoralists integrated into larger societies" to "why were these pastoralists integrated into larger societies in these specific ways".

[129] See Murray 1990 for an expanded discussion on the metaphor of the shepherd-king in Near Eastern,

By way of summary to this section, a quote from Rissman provides a useful call-to-arms:

> "…modern anthropological approaches to pastoral mobility and settlement emphasize variation and change, while archaeology, hampered by the use of negative evidence and other limitations of technique, is forced to remain typological in outlook, grouping diverse aspects of settlement into broad, undifferentiated classes." (Rissman 1985: 25)

The lengthy discussion above regarding the various factors that affect and structure pastoralist production is crucial encouragement to recognize the numerous and multi-faceted decisions available to shepherds and shepherding groups. This should alert us to the complex agency that must be afforded to pastoralists. This is not to say that pastoralists have the ability to impact every option discussed here, but rather to point out that shepherds are neither a uniform group of producers that can be considered under a particular typological heading, nor should they be thought of as pursuing a uniform strategy of production throughout their lives. The numerous variables, and numerous facets of these variables discussed above indicate the complex relationships that pastoralists have with other groups (sedentary agriculturalists, other pastoralists, markets, governments, institutions), and the local ecology and environment.[130] An archaeology of pastoral production on Crete and Cyprus, then, must first be aware of the numerous variables that would have affected herd management decisions, and then

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especially Persian, sources.

[130] Porter provides a similar perspective: "Despite popular opinion, pastoralist societies possess no innate nature that causes them to behave in any particular way. Even the type of structural dynamics imputed by Evans-Pritchard…is neither original nor inevitable, but a product of the time and place in

seek a dataset that can account for change at some scale.

5.4 Modeling Minoan and Late Cypriot Pastoralists:

Pastoralists have long been a challenge for archaeologists—both because of the areas that they are likely to have inhabited and the material record (or lack there of) that they left behind. Pastoralists often inhabit semi-arid, arid or mountainous ecological niches; locations that are not commonly (or indeed, easily) explored in archaeological research (recall, for example, that on Crete, an island that is known for its mountainous character, the ecozone between 400m and 800m is poorly explored by archaeological survey). Even when archaeological survey does expand into these agriculturally marginal areas, the methodology is poorly suited to identify the presence of, and characterize the behavior of pastoral populations. This is because, as Eric Higgs (1976: 159) pointed out, "sites are usually valued according to the quantity or quality of their artefacts and in mountain regions they [durable, high quality artifacts] appear to be few and insignificant."

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which Evans-Pritchard encountered his subject group, the Nuer, as well as a product of the particular prior history of that group (Hutchinson 1996)" (2011: 23)

CHAPTER 6

MODELING LATE CYPRIOT PASTORALISTS

6.1 *Introduction*

The seven facets of pastoralism identified by Nixon and Price, and discussed at length in Chapters above, provide a useful paradigm for considering the numerous variables that both afford and restrict pastoral production within a given social, environmental, political and economic situation. Thus, the following chapter employs this rubric to construct a model of pastoral production first for the Late Cypriot period, then the Minoan period on Crete. In many cases the evidence is, unfortunately, ill-suited to identify subtle variations in pastoral strategies. This is because, as Rissman suggests, "the kinds of [archaeological] evidence available at seasonal settlements, and the methods for evaluating that evidence, conceal all but the gross outlines of nomadic activity [and, indeed, all pastoral activity]" (1985:7).[131] Ephemeral pastoral settlements are difficult to identify and effectively interpret from traditional archaeological data, nevertheless, it is hoped that the following discussion will provide the foundations for a model that can be whittled and shaped as more evidence becomes available in future endeavors. Drawing the 'gross outlines' of Late Cypriot and Minoan shepherding practices in what follows enables a more detailed use of the rather focused isotopic data for flock movements in the next chapter.

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[131] Halstead also notes the difficulty of detecting and qualifying pastoralism in the prehistoric Mediterranean: "…unclear are the expected archaeological correlates of pastoralism, however defined" (1996: 21).

6.2 *Environment:*

Reconstructing the environmental and ecological niches of Late Bronze Age Cyprus is challenging for two main reasons related to available data. First, archaeological data useful for reconstructing local and regional environments are relatively scarce, either because excavations have failed to place a high priority on paleobotanical, phytolyth and faunal data, or because these sources of evidence have preserved poorly. The lack of marshes or sediment traps on Cyprus considerably limits the locations where ancient pollen has been collected (Butzer and Harris 2007:1937). Because of an immature data set, the conclusions that can be drawn about the ancient environment are, in most cases, at an island-wide or regional scale, and make it difficult to identify smaller microregions or ecosystems that likely existed.

The second challenge builds on the first. Due to limited and macro-scale palaeoenvironmental data, we must turn to more modern environmental data as circumstantial evidence for an indirect approximation of what the ancient environment may have been like. It must be admitted that extrapolating the ancient environment and climate from modern data is somewhat problematic as it assumes a uniform environment unchanged by human and natural processes. Nevertheless, any attempt at understanding Late Cypriot shepherding requires as accurate a reconstruction of the ancient herding environment as possible.

As noted above, such a reconstruction can be most effectively considered as aspects of the natural environment layered onto one another. This begins with a discussion of the geologic/topographical regions of the island of Cyprus, expands to consider the paleoclimate, including precipitation and temperature regimes, and finally discusses how climate, geology and topography may have combined to afford particular ecological niches for flora and fauna. Therefore, in order to consider the Late Cypriot environment through a pastoral lens, it is useful to focus on three nested and linked facets: geology/topography, paleoclimate and ecology.

Two caveats should be noted at the outset of this endeavor to characterize Late Cypriot pastoral environments. First, this analysis is centered on considerations for sheep and goat herding. There are three primarily reasons for this: first, the semi-arid Cypriot environment appears to have been more suitable for caprine herding than for other livestock; second, what faunal data are available from Late Cypriot contexts shows a clear preference for sheep and goat (see below); and third, the goals of this project are to analyze the role of sheep and goat within the larger Late Cypriot and Minoan contexts, leaving cattle, pigs and other livestock aside.[132]

Second, this argument considers the natural environment not only as a factor in shepherding practices but as a component of a recursive relationship between pastoral strategies, shepherds, and the surrounding environment. This perspective neither interprets the environment as *the* prime mover for pastoral strategies, nor does it consider the environment a passive background on which pastoral activities took place. Instead, the totality of the landscape is seen to be "dynamically and recursively created" (Scoones 1999:492) in an interplay between humans and their surroundings; shepherds' experiences, perceptions, and imaginations of landscape are shaped by the relational affordances they encounter (Gillings 2012), and they may in turn alter or

[132] This is not meant to suggest that this study is not applicable to studies of the potential herding of *Bos Taurus* on Cyprus (in fact, it is hoped that some of this study can provide a useful springboard for

transform this landscape through their actions.

6.2.1 Geology and Topography:

Geology and topography, in a very real sense, lay the groundwork for the other environmental factors. Moreover, because of the deliberate pace of the geologic timescale, the geology and topography of Cyprus is the least likely environmental factor to have experienced a substantial variation since the Late Bronze Age. While a survey of the geological formations that make up the island is possible, what is really at issue here is how localized geology shaped (and still shapes) land-use practices across Cyprus. In any discussion of Cypriot land and environment that considers natural and anthropogenic factors, Demetrios Christodoulou's volume on rural land use patterns in Cyprus provides a fundamental starting point. Christodolou (1959) divides the island into 9 distinct zones (see fig. 6.1, 6.2), based on geologic and topographical characteristics. These zones can essentially be grouped into three main types: the mountains (the Kyrenia and Troödos ranges); the lowlands (the Central lowlands/Mesaoria, the Polis Lowlands, the Ktima Lowlands, the Limassol Lowlands, and the Larnaka Region), and the Chalk Plateaus. These three zones act as broad categories in framing the environmental factors associated with shepherding.

The lowlands provide the greatest potential for intensive agricultural production. Conventionally the *Mesaoria,*[133] the largest of the lowland areas situated in the center

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such an analysis in the future), but only that this study is meant to focus on demands specific to caprine shepherding.

[133] A Greek term which translates as something like "[that land] between the mountains," thus referencing the Kyrenia and Troödos ranges, and highlighting the ingrained juxtaposition between the highlands and the lowlands on Cyprus.

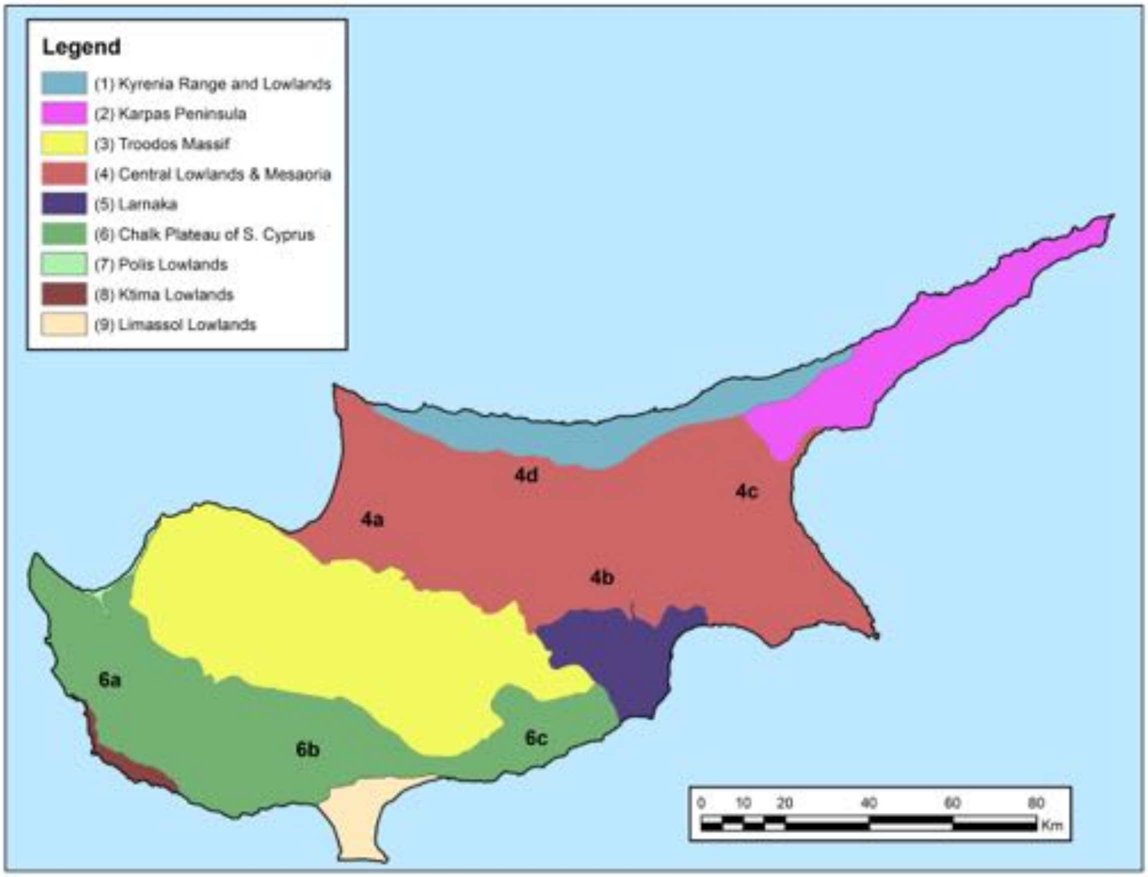

Figure 6.1: Cypriot land form regions based on Christodoulou 1959.

1. *Kyrenia Range and Kyrenia Lowlands:* Includes the island's short (< 4km wide) north-central coastal plain (the 'Kyrenia Lowlands') and the steep, wall-like Kyrenia mountain range (highest peak: 1023m) that separates the coastal plain for the Central Lowlands. Water drainage has cut steep valleys, especially on the northern side of the range, through softer geologic formations trapped between the harder Hilarion limestone during the range's formation. In most cases, north and south flowing streams rarely run together, instead emptying into the sea in the north, or the northern portion of the central lowlands. Passes do exist through the Kyrenia, created by fault lines in the mountain chain at locations such as Panagra, St. Catherine's Pass and Akanthou.
2. *Karpas Peninsula:* The Karpas peninsula juts over 80 km north-east from the main body of the island, and is made up of mostly Kythrea limestone and is a milder extension of the Kyrenia range, with the highest peak rising to only 364 m. This creates a geology structure around a minor hogback outcrop, scattered with flat-top plateaus, wide basin-like valleys, and few streams as drainage is mostly incorporated into the regional geology. The western portion of the Karpas resembles the relatively arid north-east portion of the Central Lowlands.
3. *Troodos Massif:* Making up the back-bone of the island, the Troodos Mountain range rises to an elevation above 610m, with most of the range existing between 610 m and 1220m (but the tallest peak on the island, Mt. Olympus is 1952m). The Troodos are an igneous range, stretching a bit more than halfway across the island from the central-west, and being thicker north-south in the west than they are in the east. Two plutons make up the core of the range, one almost dead-center, the other to the south-east, with the diabase extending almost exclusively to the north and west, and the pillow lavas encircling the volcanic formation in all directions, and below 610m. The weathering of these softer pillow lavas has created rolling "dome-shaped" foothills, and wide valleys, especially in the south and south-west. Drainage occurs mostly north-south, and gives way to the largest river valleys on the island, and downcut aggressively, dropping 1500m-1800m vertically over 20 km horizontally.
4. *Central Lowlands (Mesaoria)*: The Central Lowlands are comprised of a series of geologic sub-features, ranging in elevation from 30m to over 215m, and extend 90km from the central portion of the island to the eastern coast, being 56 km north-to-south in the west, while 29 km in the east. Colloquially referred to as the *Mesaoria*, Greek for "between the mountains", in fact this region sits to the south of the Kyrenia range, and north, northeast of the Troodos. Christodoulou divides this region into four distinct sub groups:
    a. The Alluvial Fan Region: Created by the down-flow of a number of rivers and streams from the western Troodos and into Morphou Bay, this region is made up of mostly igneous material, intermixed with conglomerate sediments from ancient marine terraces. Two main rivers, the Akaki and the Peristerona flow through this region today, however, Christodoulou notes, "in earlier days the drainage must have

had enormous carrying powers judging from the volume and coarseness of the material and perhaps a more pluvial stage should be postulated" (1959: 12).

  b. Kafkalla limestone-capped Plateaus: Limestone plateaus are pervasive across the lowlands of Cyprus, both in this region and elsewhere (e.g. the western Karpas). The Dhiorios (in the north-west), Kokkini Trimithia (in the center), and Kokkinokhoria (in the east) represent the most substantial of these, with the Dhiorios over 300m in some locations. Two of the more significant river-basins on the island, those of the Pedieos and the Yialis Rivers, flow east from the Troodos, cutting through the chalky limestone of this region Pedieos and Yialias basin. The Pedieos and Yialis alluvial basin also cuts the Peristeronopiyi Trakhonas, an extension of the Kokkinokhoria from its mother formation.
  c. The Bottomlands: This is essentially the alluvium that is built up by and surrounds the Pedieos River as it flows towards the sea on the eastern coast. This area extends to triple in width where the Pedieos and Yialis Rivers flow towards one another, likely forming a swamp or marsh near Enkomi at some point in the past. This region is the most fertile soil on the island, with an almost yearly flooding that spreads alluvial deposits and renews the soil. Christodoulou notes that the deposition is something on the order of two feet (0.6m) per century (1959: 16).
  d. The Kythrea Belt: These limestone beds separate the Kyrenia range from the Bottomlands, and are easily eroded, making for small hillocks or "hummocks". In between limestone outcrops, silt groves have developed due to erosion, making it possible to grow winter wheat here, however, the aridity and lak of substantial drainage in the region makes this a barren and harsh area in the summer.

5. *Larnaka Region*: This region is made up of a number of small geologic formations linked by a common drainage. These include the Pakhna and Lapithos scarps, pillow lavas from the eastern Troodos at Troulli and Stavrovouni, and the coastal plain around the modern city of Larnaka. A number of small rivers run southward from the scarpland and into Larnaka Bay.
6. *Chalk Plateau of S. Cyprus:* Making up a substantial portion of south-western Cyprus, the Chalk Plateau is a series of light-colored, stepped plateaus that descend from the Troodos Massif towards the coast. They are cut, to varying degrees, by deep and severe gorges where water drains towards the sea. Christodoulou recognizes three main areas:
  a. The Paphos Plateau, the western most of the Chalk plateau sub-regions, exists to the north and west of the modern day city of Paphos (hence the name). A number of drainages from the Troodos have cut remarkably deep canyons in the Paphos plateau, some up to 300m deep, exposing not only the Pakhna and Lapithos chalk, but the darker

Mamonia complex as well. Being dissected by these rivers means the Paphos Plateau is actually divides into a number of smaller plateaus at varying elevations (e.g. the Akamas, highest point: 610m; the Lyso, highest point: 660m, the Phiti, highest point: 698m, the Panayia, highest point: 1142m, the Kelokedhara, highest point: 823m; and the Ayios Nikolaos, highest point:1066m).

b. The Limassol Plateau: This tallest of the Chalk plateaus in southern Cyprus with it's highest point at 1153m, the Limassol plateau is relatively homogenous, without the Mamonia complex intrusions of the western Paphos plateau. This plateau is a combination of Pakhna limestone and Pissouri Marl, but the valleys in this region tend to be more open. The Kouris River is the most active of the drainage systems and cuts a major north-south river valley to the coast.

c. The Lefkara Plateau: This eastern most region of the chalk plateaus sits between modern Lemesos and Larnaka, with larger landforms, and buffered from the steeper parts of the Troodos, so that drainage has dissected this area less than the chalk plateaus to the west. It reaches an elevation of 760m, and Christodoulou cites the Pendaskinos as the major stream in the region, though the Vasilikos and its river valley are of a similar size.

7. *Polis Lowlands:* The region around the city of Polis in the north-western portion of the island, and around Chrysokhou Bay, this includes a small coastal plain and a river valley running down from the western Paphos Plateau. The coastal plain is made up of an accumulation of raised beaches, and alluvial soils.
8. *Ktima Lowlands:* A series of lowlands, mostly limestone, that run along to coast between Kissonerga and Kouklia, with the Athalassa formation (calcarenites and fossilferous marls) near the coast, and the Mamonia formation (a combination of igneous, sedimentary and few metamorphic rocks) are in the west, and Pakhna limestone in the east. The coastal plains are backed by a series of plateaus to the north and east (and thus, towards the center of the island), creating scarps in which many tombs have been dug. These were likely created by a series of raising seabeds.
9. *Limassol Lowlands:* This area marks off the Limassol (Lemesos) peninsula, and is divided off from the rest of the mainland by a Pakhna scarp, and some smaller, rolling hills that are part of the Athalassa formation. The remainder of the peninsula was created as a result of erosion into the sea, especially in the north-west which is the alluvial fan/delta of the Kouris River. Christodolou believes the peninsula to have been a tombolo at some point in the past that has been uplifted to create the full on peninsula.

Figure 6.2: Regional Landforms (after Christodoulou 1959)

of the island, is and has been, the primary agricultural production area on Cyprus, and therefore is often referred to as the "bread basket" of the island (Hadjianastasis 2009; Yerkes 2000: 27; though Yerkes also suggests that the chalk plateaus would provide fertile land when used in a crop rotation cycle). However the lowlands also include smaller pockets of agriculturally fertile geology that are cross-cut by seasonal river drainages. These are the coastal plains of the island and have alluvial deposits (including the thin [<4km wide] Kyrenia lowlands that separates the Kyrenia Range from the north coast and the sea). The lowlands are a considerable portion of the island, and make up well over one-third of Cyprus' 9250 km^2 (the *Mesaoria* alone accounts for approximately 3000 km^2). Therefore, considerable lowland areas would have been available for grazing in the past. Examples from modern Greece (notably Koster 1977) also alert us to the fact that the grazing of flocks on agricultural land while the land is not under crop would provide fertile manure, creating something of a symbiotic relationship between shepherds and farmers. The primary concern for grazing in the lowlands is access to consistent water (see fig. 6.3).

There are two major mountain ranges on the island: the Kyrenia Range along the northern coast and the Troödos Massif, which makes up the heart of the island. The Kyrenia are steep, rising to a maximum height of 1053 m only 5 km from the coast, and separate the northern coast of the island from the central lowlands. The Troödos are considerably larger in area, covering at least one-third (and, depending on where one draws the lines, perhaps up to one-half) of the island. The highest Troödos peak, Mt. Olympus, is also the highest peak on the island, reaching 1952 m. These mountains, and especially the forests of the Troödos, could have been used for herding

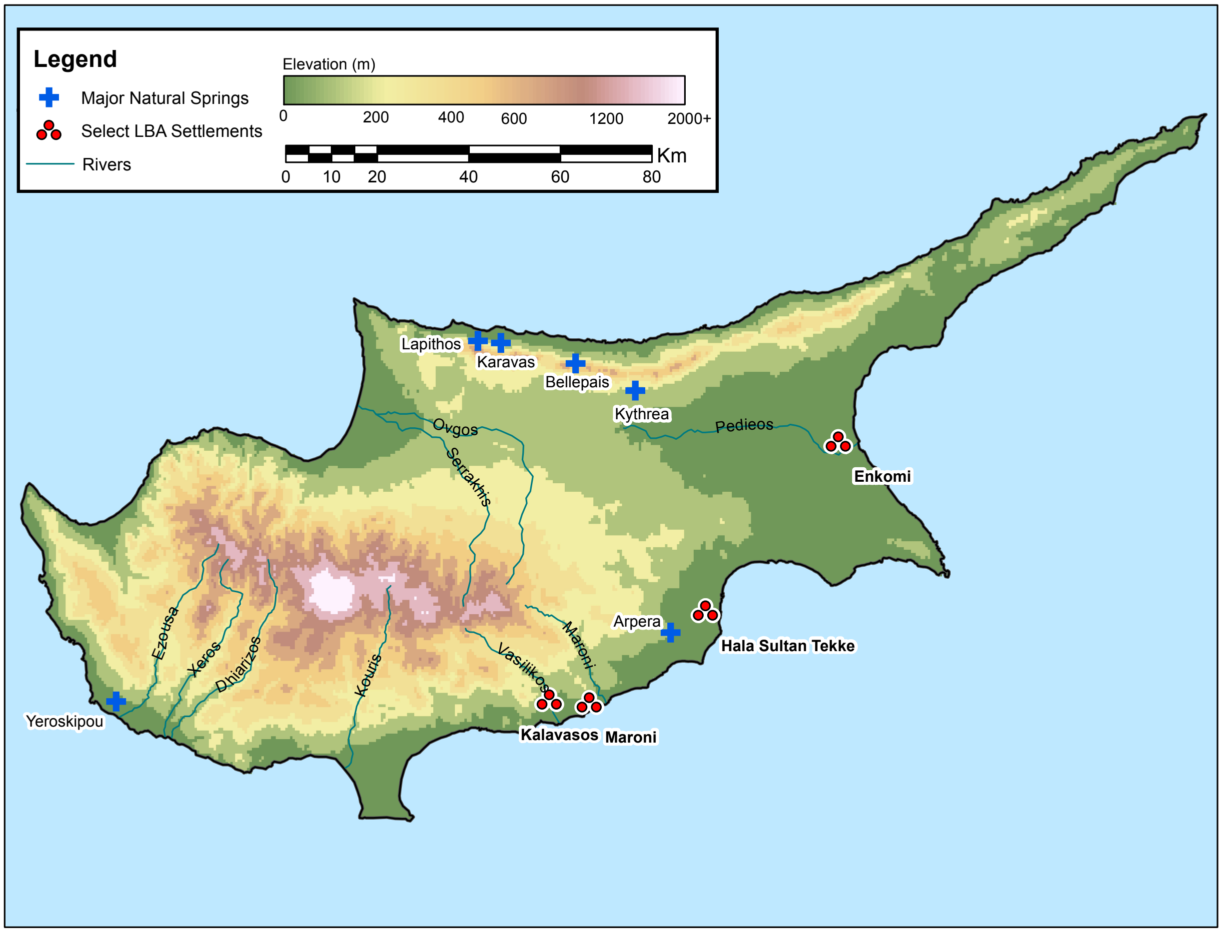

Figure 6.3: Topographic map of Cyprus with watercourses and year-round springs.

purposes, though they lack large, highland meadows.[134] The probable dominance of forests during at least the early parts of the Bronze Age may have made the environment preferential towards goats as they are browsers and will consume tree leaves as forage, whereas sheep require pasture.

Indeed the highland forests on Cyprus appear to have been important for grazing goats during the Ottoman period, both for small-scale household and village production (on the order of 8-10 animals per family) and for larger-scale specialization linked with monasteries (on the order of 60-80 animals per shepherd) (Given 2000: 221-224). Ottoman period goat-folds were built at elevations between 400m and 800m above sea level, making use of the steep landscapes of the Troödos where agriculture and settlement would have been difficult. The mountains on Cyprus also provide the greatest amount and most consistent access to water sources, a primary concern for pastoralists. At present, the highest elevations receive up to 1100mm of rain every year, and between December and April, and snow falls in the Troödos above 1000m, prolonging water flow from snowmelt (Christodoulou 1959:39-40; Pashiardis and Michaelides 2008: 59).

The Chalk Plateaus of the south and southwest of the island are a series of large plateaus "falling step-like seawards, but cut into gigantic slices by deep canyon-like valleys" (Christodoulou 1959: 16). The plateaus provide an opportunity for agriculture as well as grazeland, and function in both capacities today. Like the *Mesaoria* (which is, itself, partially made up of plateaus and buttes, especially towards the eastern coast) these chalk plateaus see seasonal access to water, however even the

[134] The Troödos do not have the small highland plateaus that are scattered throughout the Cretan

largest of the rivers that cut the canyons through these soft geologic formations rarely can contain water year round. The southern, and especially the western plateaus receive most of the available surface water on the island, owing to runoff from the Troödos massif. This being said, these limestone regions do not hold water well (see below), so while surface water may be available, wells and aquifers are not plentiful. In short, the chalk plateaus—and especially the chalk plateaus of the southwest—provide both pasturage (and not just marginal land, but legitimate grazeland environments) and probable access to at least winter water. It is worth noting, however, that modern sheep are found in the Cypriot lowlands, and Christodoulou notes a Cypriot saying that supports this: "a sheep likes the dry plain even if it eats earth" (1959: 189).

6.2.2 Climate:

Accurately describing the Bronze Age climate on Cyprus can be tricky, due, in large part to the lack of available evidence for palaeoclimatic reconstructions. The primary climatological aspects that are of concern to pastoral pursuits are access to reliable water and pasturage, and seasonal temperature regimes that make raising and maintaining livestock possible. The modern climate of Cyprus provides a benchmark against which to consider the Late Bronze Age climate on the island and its potential impacts on livestock management practices. During the 20th century Cyprus had an arid Mediterranean climate that is characterized by a rhythmic oscillation between hot, dry summers from May/June through September, and mild and wetter winters from November through March (see table 6.1). The predominance of precipitation

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mountains and provide ample opportunity for upland pasturage.

(approximately 60%), on average, occurs between December and February, and the winter months (November through March) contribute nearly all the precipitation for the island (Price et al. 1999: 88). The short spring and fall seasons from March through May and late-September through November are fickle and transition rapidly between the dominant summer and winter seasons.[135]

The balance of Cypriot and Levantine precipitation is provided by the 'Cyprus Low,' a term given to Mediterranean cyclones that originate off the northern coast of the sea between Italy and Greece and progress eastward over Cyprus and the Eastern Mediterranean (Lionello 2012: 313-316; Saaroni *et al.* 2010). Precipitation varies considerably across the island—from an average of 300mm per annum in the lowlands, to over 1000mm per annum in the Troödos highlands, and therefore tends to be largly orographic. Griggs *et al* (2014) note that windward slopes of the Troödos tend to receive approximately 10cm more rainfall, on average, than leeward slopes. Topography, and prevailing winds, therefore act as the primary drivers for this variation in precipitation.

It is instructive to evaluate recent data on water resources and availability in order to similarly set a baseline for considering the Late Cypriot water availability. "Water is by far the most precious resource on Cyprus," notes Christodoulou (1959: 36)—a situation that is largely shaped by the rarity of consistent access to water throughout the year, and the variation in available precipitation across the island. Surface water is particularly variable because, at least in the modern period, all rivers

[135] Christodoulou (1959: 33-34) lists a number of peasant sayings that describe the erratic nature of the Cypriot climate in March, perhaps the most colorful of which is "March in the morning killed the foal and at noon made it putrid," according Christodoulou, "a reference to the cold nights and warm days".

on Cyprus experience intermittent flow during the summer months ("intermittent flow" defined as periods of zero flow value during some portion of the year; Adamowski and Sun 2001: 85). This is due, in part, to the extreme levels of evaporation on the island: only 10% (275 million of the 2.75 billion cubic meters) of the precipitation that falls on the Democratic Republic of Cyprus[136] is available for use, as 90% of the precipitation is evaporated or transpired through vegetation.

The southwest of the island receives the greatest surface run-off from the comparatively wet Troödos massif, while the central lowlands and northern portions of the island receive considerably less; a situation that Christodoulou refers to as "a well-watered west and south mountainous Cyprus and a thirsty lowland Cyprus" (1959:40). The unreliability of surface water is further highlighted by the Water Development Department of Cyprus, which places the ratio of surface to ground water at 1:3, with one-third of the underground water flowing into the sea.[137]

Aquifers are, therefore, critical to water management strategies on Cyprus. The highly seasonal nature of precipitation and inconsistent access to surface water places a premium on water capture and storage of water for use during the dry summer months. However, not all geologic regions across the island capture water with equal effectiveness. Christodoulou (1959: 40) identifies five main geologic areas that are particularly good for subsurface water storage: the Kythrea silt beds that flank the Kyrenia range, the north-west Alluvial Fan region that borders Morphou Bay, the

[136] N.B. that this figure refers to the southern portion of the island and does not take into consideration the northern, Turkish-occupied portion of the island that includes the Kyrenia range and the Karpass peninsula.

Lemesos Lowlands including the Akrotiri Peninsula, the alluvial deposits of the Kokkinokhoria in the southeastern corner of the island, and the Kokkini Trimithia plateau west of modern Nicosia. Because of this subsurface water availability, we might expect agricultural and localized pastoral activities to have historically taken place in these regions during the summer months.

With the modern period as a baseline, what did the Late Cypriot environment look like? At a macro-scale, palaeoclimate data for the eastern Mediterranean indicates a gradual transition from a wetter to a drier climate during the middle Holocene (c. ~9000-2500 cal. BP; 7000-500 BCE). This trend especially holds for the Eastern Mediterranean, whose climate parallels that of northern Africa and Asia (Roberts 2011a: 9). $\delta^{18}O$ values from lake cores at sites in modern Greece and Turkey (see fig. 6.4) show an approximate decrease in precipitation by about 4% between roughly 2000 BCE and 1000 BCE—changing from relatively moist conditions in the early-to-mid second millennium BCE, to a much drier situation during the closing centuries of the second millennium BCE (Roberts 2011a: Fig. 5). Bar-Matthews et al. (1998) and Bar-Matthews and Ayalon (2004) detected a similar 2nd millennium BCE aridification event in $\delta^{18}O$ values in speleothems from the Soreq Cave in the Judaean hills of Israel. Indeed, these data imply that the Late Bronze Age eastern Mediterranean experienced a climate that was somewhat drier than the present broadly speaking. The Soreq Cave isotope data suggest a broad trend towards a

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[137] Both of these water statistics come from the Water Development Department of the Democratic Republic of Cyprus and can be found at: www.moa.gov.cy/moa/wdd/wdd.nsf/resources_en/resources_en?OpenDocument

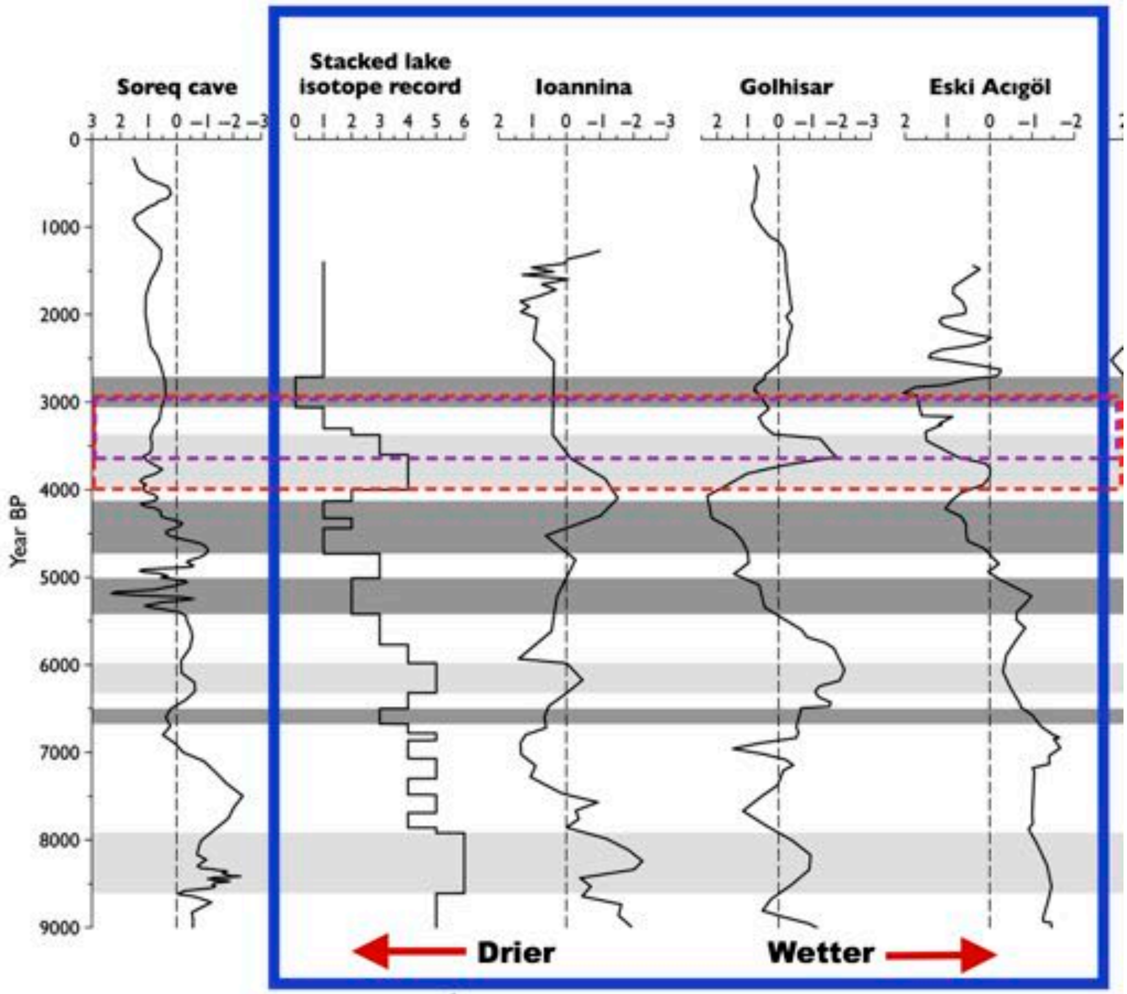

Figure 6.4: Standardized $\delta^{18}O$ records from carbonate sediments taken from Greek (Ioaninna) and Turkish (Golhisar and Eski Acigöl) lake cores, with a stacked lake isotope record included. The dashed orange box delineates approximately 2000 BCE-1000 BCE. (adapted from Roberts et al. 2011, figure 2). Note, especially the period of drying between roughly 1500 BCE and 1000 BCE marked by the purple dashed box.

climatic drying during the Late Bronze Age (c. 1750-1100 BCE), moving away from a generally wetter Middle Bronze Age, with a relatively severe aridity event occurring around 2200 BCE, and a slightly less severe aridity event c. 1950 BCE. There are rainfall fluctuations between 1750 BCE and 1100 BCE in Bar-Matthews, Ayalon and Kaufman's precipitation model, but the values varying by less than 20mm, considerably less than modern year-to-year precipitation disparities (see table 6.1).

This would have been a considerably arid period, generally on par with the water scarcity on Cyprus during the 20th century CE. It is important to keep in mind, however, that slight regional climate variations throughout the island are possible, if not likely, even if a general trend toward a drier climate (and thus towards considerable water scarcity) appears to have been occurring in the central and eastern Mediterranean during the Late Bronze Age.

On Cyprus paleoclimate studies are just beginning to find purchase, however one recent sediment core from the Larnaka Salt Lake[138] in south-central Cyprus suggests that the Late Bronze Age climate was similar to the dry climate of the present (Kaniewski et al., 2013). Early Late Bronze Age layers in the core contain olive, cedar, evergreen (holm) oak, juniper and pine pollen, indicating the presence of "Mediterranean Woodland" near the southern Cypriot coast in the 16th century BCE. However, pollen samples from core layers that date to c. 1450 BCE show the beginning of a transition to plant species indicative of a drier "Coastal Steppe" environment. Pollen from "Coastal Steppe" species, including members of the celery

[138] Within very close proximity of the LBA site of Hala Sultan Tekke from which one group of sheep teeth samples analyzed for this project come.

Year	Annual Average Precipitation (mm)	Difference from previous year (mm)
1991-1992	637	N/A
1992-1993	509	128
1993-1994	417	92
1994-1995	493	76
1995-1996	383	110
1996-1997	399	16
1997-1998	388	11
1998-1999	473	85
1999-2000	363	110
2000-2001	468	105
2001-2002	604	136
2002-2003	561	43
2003-2004	545	16
2004-2005	412	133
2005-2006	360	52
2006-2007	479	119
2007-2008	272	207
2008-2009	527	255
2009-2010	546	19
2010-2011	465	81

Table 6.1: Average Cypriot Precipitation for Years 1991-2011 (source: www.moa.gov.cy/moa/ms/ms.nsf/DMLcyclimate_en/DMLcyclimate_en?OpenDocument)

(*Apiaceae*), sagebrush (*Artemisia)*, honeysuckle (*Scabiosa)*, and legume (*Fabaceae*) families, dominate the layers of the core that Kaniewski et al. date to approximately 1200 BCE.

It should be noted that dating of this pollen core is low-resolution, with only three ^{14}C samples from 1630-1500 BCE (2σ-95% confidence), 1450-1380 BCE (2σ-95% confidence), and 1160-1270 CE (2σ-95% confidence). While the first two samples do provide some benchmarks for the LBA, Knapp and Manning (*in press*) are correct to refer to this as "very coarsely dated." Kaniewski et al. (2010) have similarly misrepresented the precision of this sort of coarse dating for a pollen core taken from the Syrian site at Tell-Tweini, which shows an aridification period that they position firmly at 1200 BCE. In fact, as Knapp and Manning (*in press*) point out, the c. 1200 BCE date, is actually modeled to 1278-1160 BCE (68.2% confidence) or 1310-1106 BCE (83.6% confidence), and thus labeled by Knapp and Manning as "loose dating—within one or two centuries, at best—and hardly the basis for a refined historical reconstruction" (11). Despite the confusion and imprecision of the ^{14}C dates for these pollen cores, the broad argument remains intact: the end of the Late Bronze Age, both in the Eastern Mediterranean, and on Cyprus, does appear, on current evidence, to have experienced a period of climatic drying.

A pollen core from the Sea of Galilee (in the Mediterranean climate region of Israel and a region that has similar weather patterns to Cyprus' Mediterranean climate) provides additional evidence for a climatic drying at the end of the Late Bronze Age in the Eastern Mediterranean and the Levant (Langgut *et al.* 2013). Levels of this core corresponding to ~1250-1100 BCE show the lowest percentage of Mediterranean tree and olive pollen in the entire core sequence (13.5% of all pollen was fro Mediterranean trees, 1.8% from olive trees). This contrasts with sediment levels from *circa* 1350 BCE which contain 48.5% arboreal pollen, suggesting a considerably wetter phase and a "well-developed Mediterranean forest/maquis in the area" (2013: 160). Neugeubauer *et al.* 2015[139] have proposed a mechanism for this climate dry period: the dampening and eastward migration of the "Cyprus Low," the key source of precipitation for the north-eastern Mediterranean and the Levant (Saaroni *et al.* 2010).[140]

This aridification event does not appear to have been inconsequential on Cyprus, as the palynological data (though admittedly quite limited at present) show a change of floral species in the last centuries of the Bronze Age. The low-resolution dating of these data, however, preclude being any more specific about the timing and duration of this drying period—we are limited to noting that Cyprus appears to have experienced a period of aridification, of unknown length, and beginning at an unknown time, between the early 16th century and the 12th century BCE.

The drier climate that developed throughout the Late Bronze Age may have been punctuated by periods of severe water scarcity. Precipitation and access to water have been of considerable concern on Cyprus in more recent times, with droughts happening relatively regularly. A 250-year precipitation reconstruction based on tree-ring growth data from *Pinus brutia* trees, covering the period between 1756-2006 CE

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[139] Neugeubauer *et al.* 2015 also collected and analyzed a sediment core from the western coast of the Dead Sea—which lies approximately 110 km to the south of the Sea of Galilee—that indicated a climatic drying from ~3500-3300 cal BP (~1550-1350 BCE). This matches the current arid climate of in the Dead Sea region, and suggests that the region around the Sea of Galilee to the north (which tends to also correspond to Cypriot climate) experiences opposite precipitation trends to the Dead Sea region.

illustrated that annual droughts[141] occur once every 5 years on average, while three clusters of more substantial 2-6 year droughts occurred between the years 1806-1824, 1915-1934 and 1986-2000 (Griggs et al. 2014). While these data cannot be used to reconstruct droughts in the Late Bronze Age (i.e. we cannot say with confidence that droughts occurred on average every 5 years in the Late Cypriot period), this study is instructive in that it illustrates the frequency of droughts on Cyprus during a period when the climate was similar to—and, indeed, slightly wetter than—that of the Late Bronze Age. This is another line of evidence that underscores the importance of strategies that would mitigate or at least dampen water scarcity in the Late Cypriot environment.

Sheep and goats are relatively adaptable when it comes to water intake—and certainly more so than cattle, which require up to ten-times as much water per head of livestock (Markwick 2007:3, table 2).[142] The amount of water each animal requires is determined by any number of factors including the life-stage, size, environment/climate, and quality and composition of the pasturage. For female sheep, pregnancy and lactation can nearly double water requirements from 4-5 liters per day to 10 liters per day. Even at the high end (~10 liters/day), however, the ~200,000 goats that we know to have been on the island of Cyprus since the late 19th century CE would only consume two thousand of 275 million cubic meters of water available on the island per annum. Therefore, there appears to have been enough water available

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141 For this study 'droughts' were defined as years of growth one standard deviation less than average.
142 There are, of course, different water intake demands depending on the age of the animal, whether it is a lactating or pregnant female, the quality of the water that is being consumed and the quality (and

on Cyprus to sustain a substantial population of sheep and goat livestock, though maintaining consistent access to water throughout the year may have required seasonal movement of flocks.

Seasonal temperatures raise a related question about the grazing of sheep and goats at various locations across the island during different periods of the year. While the Late Bronze Age appears to have been a slightly drier period, it may also have been slightly cooler based on evidence for cooler Mediterranean Sea surface temperatures during the period (Drake 2012). Temperature data derived from the GISP2 ice core in Greenland likewise indicates that the northern hemisphere experienced a decline of 1.5-2 degrees Celsius (2.5 degrees Fahrenheit) on average during the Late Bronze Age (see table 6.2, developed from data by Alley 2004). It is difficult, however, to quantify how this cooling may have translated to air temperatures at various locations across the island of Cyprus, and it seems unlikely that an air temperature change of 1.5-2 degrees Celsius spread across a period of at least two centuries would have made a substantial impact on shepherding practices. These cooling sea-surface temperatures will, however, have had an effect on evaporation rates and could have resulted in progressively drier conditions throughout the eastern Mediterranean basin between c. 1694 and 1197 BCE (Drake 2012: 1865), a situation which may have encouraged the use of mountain resources. Nevertheless, in order to estimate LC temperature regimes, is it useful to again turn to modern temperature data in order to develop a baseline model.

Modern temperature data for Cyprus is, perhaps surprisingly, somewhat

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dryness) of the food consumed, however, in all cases when comparing sheep/goat (and cattle at similar

Years BP	Approx. Year BCE	GISP Temp. (C)	Change from Prior Year
3.05323	1103	-30.614	-0.1548
3.06401	1114	-30.7688	-0.1116
3.07477	1125	-30.8804	0.0832
3.08533	1135	-30.7972	0.204
3.09639	1146	-30.5932	0.2916
3.10803	1158	-30.3016	0.1508
3.12079	1171	-30.1508	0.0672
3.13329	1183	-30.0836	0.1016
3.14554	1196	-29.982	0.1568
3.15823	1208	-29.8252	0.1356
3.16981	1220	-29.6896	0.0812
3.18111	1231	-29.6084	0.0572
3.1932	1243	-29.5512	0.0312
3.20403	1254	-29.52	0.0772
3.21458	1265	-29.4428	0.1728
3.22761	1278	-29.27	0.1392
3.23771	1288	-29.1308	0.0848
3.24864	1299	-29.046	0.0544
3.26018	1310	-28.9916	0.0796
3.27439	1324	-28.912	0.11
3.2861	1336	-28.802	0.054
3.29707	1347	-28.748	-0.1112
3.30847	1358	-28.8592	-0.2928
3.32032	1370	-29.152	-0.3852
3.33111	1381	-29.5372	-0.19
3.3432	1393	-29.7272	0.078
3.35472	1405	-29.6492	-0.0624
3.36737	1417	-29.7116	-0.1992
3.37868	1429	-29.9108	-0.092
3.37868	1429	-30.0028	-0.0392
3.39053	1441	-30.042	-0.026
3.40228	1452	-30.068	-0.0056
3.41073	1461	-30.0736	-0.0304
3.42556	1476	-30.104	0.014
3.43744	1487	-30.09	-0.0624
3.44934	1499	-30.1524	-0.1268
3.46206	1512	-30.2792	0.2416

life stages in similar situations, cattle consume between eight- and ten-times as much water as sheep

3.49126	1541	-30.0376	-0.366
3.51028	1560	-30.4036	-0.1588
3.52252	1573	-30.5624	-0.0168
3.53388	1584	-30.5792	0.0944
3.54495	1595	-30.4848	0.1384
3.55781	1608	-30.3464	0.0892
3.56909	1619	-30.2572	0.1024
3.58158	1632	-30.1548	0.1736
3.60574	1656	-29.9812	0.1824
3.61751	1668	-29.7988	-0.0416
3.62631	1676	-29.8404	-0.0556
3.63624	1686	-29.896	-0.0424
3.65183	1702	-29.9384	-0.1752
3.66517	1715	-30.1136	-0.166
3.6769	1727	-30.2796	-0.1164
3.68897	1739	-30.396	-0.08
3.70128	1751	-30.476	---
Difference between min and max temperature values (°C):			2.1324

Table 6.2: Select northern hemisphere temperature data from GISP2 ice core (after Alley 2004)

limited. Temperatures vary across the island owing to changes in humidity in addition to changes in topography, and since the Late Bronze Age was drier than present, it would have also been less humid. Maximas and minimas across the island will vary with elevation[143] as well as distance from the coast. Recent temperature data is available for a series of locations across the island and can be broadly broken into highland and lowland locations (see table. 6.3 for specific temperature data). In the lowlands, winter minima hover between 8-10°C, with maxima between 16-20°C. In the mountains temperatures are considerably cooler, with winter minima in the lower elevations (e.g. Saittas) between 4 and 5°C, while the higher elevations (e.g. Prodromos) hover just above freezing. Highland maximas climb to 15°-16°C at lower elevations, and are between 6°C and 12°C at higher elevations. Summer temperatures in the lowlands are hot, with minima at 15°C-23°C, and maxima reaching between 27°C and 33°C. In the highlands summers are milder only at higher elevations: minima between 12°C and 19°C are consistent with both low and high elevation lowland environments, however maxima reaching 34°C are recorded at lower elevations, while higher elevations crest at around 28°C.

Sheep and goats are relatively tolerant to changes in temperature (hence their value in variable Mediterranean climates) and can moderate their core temperatures through panting, sweating and shivering (Alexander 1974; Marai et al. 2007). Sheep have the added benefit of having a fleece that can act as an insulator against external heat (Alexander 1974). The fact that sheep can also be shorn (some goats, e.g. the

[143] Elevation lowers temperatures by about 5°C for every 1000m of elevation:http://www.moa.gov.cy/moa/ms/ms.nsf/DMLcyclimate_en/DMLcyclimate_en?OpenDocument

Location	**Elev (m)**	***Jan.***	***Feb.***	***Mar.***	***Apr.***	***May***	***June***	***July***	***Aug.***	***Sept.***	***Oct.***	***Nov.***	***Dec.***
Athlassa mean daily temp	162	10.6	10.6	13.1	17.1	22.3	26.9	29.7	29.4	26.2	22.3	16.3	12
mean maximum daily temp		15.5	15.9	19.2	24	29.7	34.3	37.2	36.9	33.5	29	22.1	17
mean minimum daily temp		5.7	5.2	7	10.2	14.8	19.4	22.2	21.9	18.8	15.6	10.4	7.1
Larnaka (mean daily temp)	1	12.1	11.8	13.9	17.1	21.2	25	27.3	27.6	25.4	22.6	17.5	13.7
mean maximum daily temp		16.8	16.8	19.1	22.5	26.5	30.3	32.4	32.7	30.9	28.1	22.6	18.3
mean minimum daily temp		7.5	6.9	8.7	11.7	16	19.8	22.2	22.6	19.9	17.1	12.5	9.2
Limassol (mean daily temp)	8	13.2	13.1	15.2	18	21.8	25.5	27.8	28	26	23.2	18.5	14.5
mean maximum daily temp		17.6	17.8	20	22.9	26.9	30.8	33.2	33.3	31.3	28.6	23.5	18.9
mean minimum daily temp		8.8	8.5	10.4	13.1	16.7	20.1	22.4	22.7	20.6	17.7	13.5	10.1
Paphos (mean daily temp)	10	12.5	12.3	13.6	16.3	19.5	22.8	25.2	25.7	23.8	21.5	17.5	14.2
mean maximum daily temp		17	16.9	18.5	21.3	24.4	27.7	29.9	30.4	28.8	26.6	22.4	18.6
mean minimum daily temp		8	7.6	8.7	11.3	14.5	17.8	20.4	21	18.8	16.4	12.6	9.7

Location	**Elev (m)**	***Jan.***	***Feb.***	***Mar.***	***Apr.***	***May***	***June***	***July***	***Aug.***	***Sept.***	***Oct.***	***Nov.***	***Dec.***
Paralimni (mean daily temp)	70	12.3	12	14.2	17.4	21.8	25.7	28.2	28.5	26.1	22.8	17.6	13.7
mean maximum daily temp		16	16.1	18.7	22.2	26.8	30.8	33.1	33.3	31.2	27.7	21.7	17.3
mean minimum daily temp		8.6	7.9	9.7	12.5	16.8	20.6	23.4	23.7	20.9	18	13.4	10.1
Polis Chrysochous (mean daily temp)	15	12.1	11.8	13.5	16.3	20.4	24.7	27.6	27.6	24.6	21.4	17.2	13.6
mean maximum daily temp		16.4	16.3	18.5	21.5	26.1	30.5	33.5	33.3	29.9	26.5	21.9	17.8
mean minimum daily temp		7.9	7.3	8.6	11.1	14.7	18.8	21.6	21.8	19.3	16.3	12.4	9.4
Prodromos (mean daily temp)	1380	3.5	3.5	6.6	10.7	15.8	20.1	23.3	23.1	19.6	15.4	9.5	5.3
mean maximum daily temp		6.3	6.6	10.3	15.1	20.5	25	28.1	27.9	24.4	19.6	12.8	8
mean minimum daily temp		0.7	0.3	2.8	6.3	11.1	15.2	18.4	18.2	14.9	11.3	6.2	2.5
Saittas (mean daily temp)	640	8.4	8.5	10.9	14.8	19.6	23.8	26.8	26.5	23.4	19.7	14.1	10
mean maximum daily temp		13.6	13.9	17.1	21.5	27	31.5	24.6	34.3	31.2	26.8	20.2	15.2
mean minimum daily		3.2	3.1	4.7	8	12.2	16.1	18.9	18.7	15.7	12.5	8.1	4.7

Table 6.3: Mean monthly temperatures in degrees C for selection Cypriot locations, 1991-2005 CE

Kashmir, are similar to sheep in this respect) helps make it possible to further regulate their body temperatures in response to climatic variations. Despite relative temperature flexibility sheep and goats do have lethal cold and hot temperature tolerance limits that vary according to whether the animals are shorn, whether they are dry or wet, and with wind chill (see table 6.4). With a moderate wind of 20 km/h (a "gentle breeze" on the Beaufort Wind Scale[144]) unshorn sheep are able to tolerate temperatures well below 0°C (enduring temperatures up to -50°C in dry conditions, Bennett 1972), wet unshorn sheep, however, will show hypothermic conditions at 0°C, while shorn sheep can become hypothermic at 13°C.

The real temperature factor that limits shepherding however, is lamb temperature tolerance. On present evidence we do not know the exact lambing season for the Late Cypriot period, however in seasonably arid climates such as Cyprus, mating traditionally occurs between June and September. With a gestation period of 142-152 days (~5 months), this would put lambing between November and February. This provides the ewes with the spring season to recover body weight after the winter and before another pregnancy. Newborn lambs are sensitive to temperature. With 20 km/h breezes, small/newborn lambs may have difficulty tolerating temperatures as high as 24°C, while larger lambs will develop hypothermia quickly at temperatures below 4°C. Heat stress (even in shorn animals) has negative effects on biological processes, metabolism, dairy yield and reproduction beginning at 26°C and having critical negative impacts on animal well-being at 36°C (Silanikove 2000; Finocchiaro

[144] The Beaufort Wind Scale characterizes the wind effects associated with wind speed. For the full scale see http://www.spc.noaa.gov/faq/tornado/beaufort.html. A 20km/h wind is equivalent to 12 mph

	Cold limit[1] (shorn)	Cold Limit[1] (fleeced)	Minor Heat Stress (fleeced)[2]	Critical Heat Stress (fleeced)[3]
Adult Sheep	~0°C	-50°C	27°C	36°C
Lamb	N/A	10°C	25°C	27-31°C
Adult Goat	N/A	-5°C	37°C	40°C
Kid	N/A	10°C	25°C	27-31°C

Table 6.4: Cold and Heat Tolerance of Sheep and Goats in Still Air (No Wind)
(data derived from Appleman & Delouch 1958; Alexander 1962, 1974; Marai et al 2007)
[1]Cold Limit is the temperature below which animals are likely to have difficulty maintaining their core body temperature.
[2]Heat stress is defined as the temperature at which normal anatomical heat loss may not be sufficient to maintain a steady core body temperature (i.e. core body temperature begins to rise).
[3]Critical heat stress refers to heat stress that impacts other bodily functions.

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or approximately 10 knots, and is characterized on the Beaufort scale as a "gentle breeze" that causes leaves and small twigs to be constantly moving and light flags to be extended.

et al. 2005; Marai et al. 2007).

When considering these temperature prescriptions with reference to known, modern Cypriot temperature data, a transhumant mode of pasturing makes good sense. Maintaining herds in the lowlands during the hot summer months, especially in the center of the island where temperatures in June, July and August routinely approach (and often surpass) 36°C no doubt would put herds under substantial stress and make breeding difficult. Scarce water resources during those months might also make a diversification of land use preferable to concentrating water demands for both livestock and agricultural pursuits in one place. Retreating to the highlands and the Troödos during the hot, dry summer months where temperatures are milder and surface water is more readily available would have the potential to limit flock stress and increase productivity. A return to the lowlands in the early fall would seem necessary in order to reduce the impact of cold temperatures on adult animals, and also to make lambing possible. Average winter temperatures in the Cypriot highlands would likely have made lambing at those elevations all but impossible. Considering water and temperature variables a seasonal transhumant strategy would seem preferable, but this neglects to consider access to good forage, a matter of localized ecology.

6.2.3 Ecology:

Ecology refers to the interactions between organisms and the environment in a recursive system in which the environment is produced by the organisms, and organisms are either reproduced or adapted within their environment. Ecology thus refers to both the animal and plant species that develop to exist within a given climate and topography. This affects grazing and shepherding in two primary ways. First, plant species determine available forage and location of potential natural grazing, and second, faunal species determine natural competition and potential predators. Again, because of limited pollen core data, it is difficult to reconstruct the Late Cypriot ecology, so what follows is a discussion of the ecology of late 19th and 20th century Cypriot as proxy.

Cyprus' location, climate and topography combine to create three distinct ecological environments: i) a Mediterranean environment on terra rossa soils in the coastal plains and foothills of the Kyrenia and Troödos ranges, ii) an Irano-turanian environment resembling a steppe ecology on the Chalk Plateaus and other internal lowlands, iii) an Euro-siberian environment in the mountainous regions (Christodoulou 1959: 45). These environments support different ecological niches, of which the steppe, mountain fields and forest niches are of direct concern to grazing species.

The lowlands and Chalk plateaus are primarily steppe ecological zones. These are areas with dry soil and shallow coverage, unattractive to woody species that require deep root penetration. The steppe plant societies can be divided into three primary groupings: grass, rock/garigue, and dwarf-shrub/*maquis*. Christodoulou identifies the grass steppes as "heavily grazed uncultivated areas of Cyprus..." noting that "their ecology is important as they are a main source of feed for Cyprus livestock" (1959: 48). Wild grasses, particularly wild wheat species (*Triticum ovatum*), wild oat species (*Avena barbata*), wild barley species (*Hordeum murinum*) and other grasses (e.g. *Langurus ovatus* and *Stipa tortilis*) predominate. Thin soil cover, often on hillsides and low mountains are what set the rock steppe/garigue apart from the grass steppe. These regions have considerably less vegetation owing to the thin soil layer, with small shrubs (e.g. *Pistacia lentiscus, Onosma fruticosum,* and *Cistus villosus*), herbs and small tuberous or bulbous perennials predominating. Dwarf-shrub/*maquis* steppes have less vegetation still, and are characterized by small (often less than a foot tall) shrubs, punctuated by periodic, lone, dry-tolerant trees such as wild olive, hawthorn, carob and terebinth. Rockrose (*Cistus villosus*) and especially Shinia (*Pistacia lentiscus)* are characteristic of maquis on Cyprus.

Cypriot forests are most prevalent in the highlands, especially in the Troödos and Kyrenia ranges. These are largely pine forests in which Turkish pine (*Pinus brutia*) and Black pine (*Pinus nigra*) predominate. Cedar, cypress and Cyprian oak (*Quercus alnifolia*) forests are also present on the island but in less significant numbers. Cedar are only found in Cedar Valley on the western slopes of the Troödos in the Paphos District, while cypress are in the north, particularly in the Kyrenia and along the Karpas peninsula. In antiquity, at least the Cedar forests would have been more substantial (Rich et al. 2012). The Troödos pine forests, in particular, have been used for grazing goats during the 20th century, and a general lack of human oversight led to the blaming of goat grazing for forest destruction. This eventually, brought on the passage of laws prohibiting goat grazing in the forests (Christodoulou 1959; Harris 2007). Despite this,[145] the importance of the forests as locations for goat pasturage during the 19th and 20th century suggests that a more substantially forested Late Bronze Age Cyprus would have made a suitable environment for supporting substantial flocks of goats.

On Cyprus, sheep and goats have no natural predators. Faunal datasets from Early Aceramic and Ceramic Neolithic, as well as Chalcolithic levels at sites across the island do indicate possible natural competition for grazing land and water resources, however. In these early levels at Kissonerga-*Mytholoukia,* Kalavasos-*Ayious,* Kalavasos-*Tenta,* Khirokitia-*Vounoi*, Erimi-*Pamboula* and Lemba-*Lakkous* fallow deer (*Dama mesopotamica*) remains are the most prevalent (Croft 1991). *Dama* are relatively adaptable, and while they prefer to graze, they will also browse shrubs and trees, meaning they would likely adapt well to most of the ecological niches of Cyprus, save the densest of the highland forests. Fallow deer were almost certainly brought to Cyprus by early Neolithic settlers and probably were allowed to roam free, loosely managed via hunting strategies (Croft, 1991). Fallow deer decline in importance to the Cypriot diet by the Late Bronze Age (see below), and this may imply a combination of over-hunting due to a growing human population, sustained grazing pressure from domesticated sheep, goats and cattle who would have occupied the same ecological niche, and environmental changes that limited the environments in which *Dama* thrived. While these deer would have consumed the same food that free-grazing sheep and free-browsing goats would consume, we have no evidence that the population had become so large that it was having adverse effects either on available grazeland for domestic animals or destroying the floral environment. In other words, while Late Bronze Age Cyprus appears to have had a somewhat marginal environment for livestock, competition from natural species probably was not considerable.

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[145] For a detailed discussion of the "goat issue" on Cyprus, see Harris 2007, especially Chapter 6.

6.3 *Location and Movement of Animals:*

This shepherding variable is precisely what the isotopic data discussed in the following chapter aims to consider, however, this section provides an overview of more traditional data sources. This—like most of the discussion of this chapter—is meant to provide a model for LC shepherding against which the isotopic data can be considered. Location and movement of animals is precisely what is at stake when strontium analyses are performed.

While the location of sheep and goat flocks on Cyprus would be, in part, determined by the various environments across the island, location *and* movement are at least as concerned with the pastoral mode of production in reference to agricultural practices. The essential question is usually framed as "transhumance or not?" Nixon and Price (2001:405) structure transhumance as a three-part typology of flock movement: 1) localized pastoralism with herding done within 3-6 km of a permanent settlement; 2) a mobile shepherding strategy with a limited transhumant range, less than a few days travel time, and often making use of different ecosystems that exist with substantial changes in elevation; 3) long-distance transhumance covering 75+ km.

Assuming an environment that might make transhumance attractive—the Cypriot environment, for instance, with considerable variation in the pasturage and water availability among regions and between seasons—this becomes a matter of scale, both in terms of flock size and in terms of the distance that must be traveled to reach superior resources. Household herds of ten animals hardly make transhumance across a hundred kilometers worthwhile, in part because local resources can be pressed to support those ten animals, and in part because the time and energy to travel a hundred kilometers may not be worth the value provided by the ten animals in question. However, once the flock size is increased from ten animals to a few hundred, or the distance traveled is decreased to five kilometers, transhumance becomes a much more appealing proposition.

While flock scale is discussed in the following section, the distance between Late Cypriot settlements and improved seasonal resources helps frame our understanding of LC shepherding strategies. The faunal samples analyzed in this project come from four large, Late Cypriot settlements distributed across the southern and eastern portions of the island: Kalavasos-*Ayios Dhimitrious* (KAD)*,* Maroni-*Vournes* (Maroni)*,* Hala Sultan Tekke (HST), and Enkomi-*Ayious Iakovos* (Enkomi), and all are situated in the island's lowlands. KAD and Maroni are on the Lefkara plateau, a subdivision of the Chalk Plateaus of Cyprus, Hala Sultan Tekke is on the Larnaka lowland, and Enkomi in the alluvial Bottomlands of the Pedieos River. These areas would have had available winter water and grazeland, but likely experienced water scarcity and high temperatures (a daily constant of ~30-35°C) during the summer months (as they do now). To move a flock from the heat of the lowlands and into a slightly milder climate towards more consistent water sources would require migrations of different lengths from each settlement: 10-15 km from HST, 10-20km from KAD and Maroni, and 25-30 km from Enkomi to the Kyrenia foothills, or 40+km to reach the spring at Kythrea (see fig. 6.5). Limited transhumance thus might have some appeal if shepherds kept their flocks around the settlements at KAD, Maroni and HST during the winters, while the distances from Enkomi might make transhumance less attractive unless flocks were of a considerable scale.

It is worth recalling the tendency to assume a uniform method of shepherding both within a given environment and across different social, economic and political groups. This paradigm neglects the rather likely possibility that at least localized household scale herding and a large-scale, institutionalized herding existed in tandem. In fact, this is precisely the situation that existed during the Ottoman period. Given (2000) identifies two systems of animal management: a household-scale, localized strategy with 8-10 animals per family, and a considerably larger (60+ animals/shepherd), institutionally-driven husbandry on behalf of Christian monasteries. On current faunal evidence it is difficult to detect these multi-layered animal husbandry strategies, but this example reminds us that evidence for multiple flock movement strategies may be an indication of different scales of production as well.

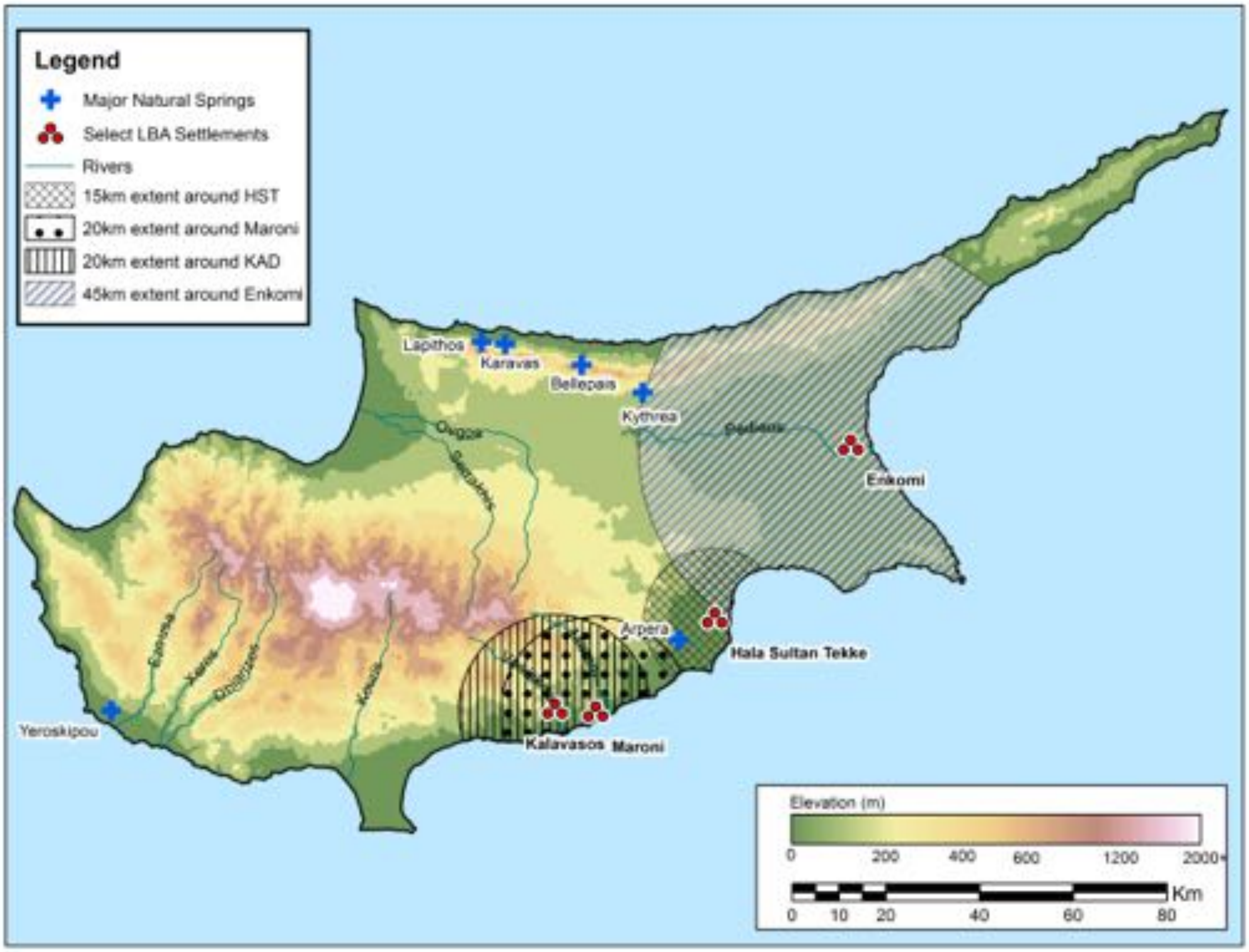

Figure 6.5: Major modern water resources on Cyprus and potential transhumant distances for each settlement discussed.

6.4 *Scale:*

Scale is a fundamental factor in determining whether transhumance is necessary, but it has proven extremely difficult to quantify in the ancient world. Halstead (1987b:79) has stated:

> "transhumance is a necessary response to the Mediterranean environment *if livestock are kept on a sufficiently large scale*…husbandry on the necessary scale in the past cannot be assumed and has rarely, if ever, been demonstrated."

In reference to livestock management, scale can be taken to refer to two related, but different concepts. First, scale simply refers to the number of domesticated animals under management of a given society—which, if it can be accessed or estimated, can serve as a way to evaluate how important animals and animal products were to that society. This, however, assumes that the importance of animals was uniformly spread across a society, and that animals and animal products were used in the same way across social groups; a fact that has already come under question above. This raises the second consideration of scale: the scale of production within a society, which can be thought of as a continuum from the maintenance of 1-5 animals for small-scale, household subsistence production, to the management of thousands of animals for institutional consumption and the marketing of animal products. As Given's Ottoman example illustrates above, it is not unlikely that these two scales (and any number of strategies that exist along this continuum) existed at one time.

The first of these two scales—the question of the number of livestock maintained within a society overall—is largely a function of two factors: upper limits are set by the ability of the environment to support a given livestock population, and lower limits are created by the demand for animal products within a given society (which can be encouraged or limited by state institutions or markets). While critical to understanding the nature of pastoral strategies of production, scale is challenging to address from archaeological datasets alone. This is because archaeological data sets are, by default, an imperfect material subset of a series of larger ancient processes. It is difficult to know the social, political and economic processes that led to the deposition of datasets linked to flock size and scale. Despite this, scale plays a critical role in shaping the strategies employed by shepherds because it is a prime determinant in whether mobile shepherding is required to support a livestock population of a given size in a given location.

Determining the scale of shepherding from archaeological data alone is particularly challenging. Indeed, it is worth briefly noting that our most comprehensive data for the very substantial (100,000+ animal) sheep and goat economy on Crete during this period comes from textual documents and not faunal datasets (see pg. 297-305 for a lengthier discussion of this). Without these Linear B texts it is unlikely that we would be aware of the true scale of the Late Bronze Age wool economy on Crete. This should alert us to the fact that the Late Cypriot livestock economy might very well have been more significant than the faunal data appear to suggest.

Modern data illustrate that the island can support a total of approximately five-hundred thousand sheep and goats (see table 6.5, based on Christodoulou 1958, table 1). Of course, the Late Cypriot caprine population was nowhere near this number, but may very well have been in the tens of thousands. Coming to a firm estimate for

Year	**1896**	**1900**	**1910**	**1920**	**1930**	**1940**	**1946**	**1957**
Sheep	272,100	287,000	301,500	288,600	290,200	309,000	273,000	381,100
Goats	251,800	242,900	275,100	211,000	235,600	191,200	163,600	158,700
Total	525,796	529,900	576,600	499,600	525,800	500,200	436,600	539,800

Table 6.5: Sheep and goat populations on Cyprus in the 20th century CE (based on Christodoulou 1958, table 1)

the number of livestock on the island during the Late Cypriot period is exceedingly difficult because we do not have a good grasp on how faunal datasets correspond to live animals. Moreover, because the demographics of the flocks are also speculative, it is difficult to reconstruct flock numbers based on demands for cheese, dairy products or wool. Even estimates for human populations at the largest of the LC settlements are notoriously difficult to construct, and our estimates for livestock are even more challenging owing to the fact that the data we have is only from consumption sites and not from herding settlements. With these caveats in mind, however, it is worth attempting a thought experiment to provide a very coarse—and perhaps low—estimate for the Late Cypriot sheep and goat population.

First, taking an estimate for the LC human population at Maroni that Manning et al. (2014) place at between 1000 and 2000 persons, and extrapolating that out across at least KAD, HST, Enkomi, and Kouklia/Palaepaphos (other similarly sized, or perhaps even larger LC settlements), and adding another two-thousand individuals to account for the populations of other large settlements like Toumba tou Skourou and Alassa, we reach a baseline population of twelve-thousand individuals. This number, of course, ignores whatever non-centralized and non-urban individuals lived outside the direct scope of these settlements, but it becomes impossible to estimate the rural groups as well and this is only meant to provide a very coarse baseline estimate. We can guess that cheese and dairy consumption could have averaged as the equivalent of 40 gallons of milk per year (this equates to 20-30 lbs. of cheese a year, which is on the low side of modern international cheese consumption).[146] Assuming that sheep and goats produced similar milk yields in the LC as they did in the mid-20th century CE on Cyprus (200 lbs./~23.5 gallons per annum for goats, 100 lbs./~11.7 gallons per annum for sheep[147]), this would require ~20,000 female goats, or 41,000 female sheep, or, if a population of goats and sheep, each contributing half of the dairy yield, ~10,200 female goats and ~20,500 sheep. Assuming that these ewes represent 75% of the caprine population, the total population of livestock would be something like 26,600 goat, or 54,600 sheep, or a mixed population of 13,600 goats and 27,300 sheep.

While this exercise is admittedly extremely speculative and based on an assumption that dairy contributed in a significant way to the Late Cypriot diet, it does give a sense of the scale of livestock management that likely existed on Cyprus. Indeed, these numbers will likely change somewhat depending on the variables at play (e.g. if the flocks demographics were set to emphasize wool rather than milk production, if ewes accounted for less than 75% of the caprine population, and if we were to incorporate rural population numbers if we had any sense of what they might be, etc.), nonetheless, an estimate of something like 25,000-50,000 sheep and/or goats on Cyprus during the LC seems reasonable, and in line with the better estimates we have for Minoan livestock populations (see below, pg. 297).

[146] Padgham (2014) estimates that LBA Cyprus dairy consumption (as a combination of cheese and milk) would have averaged in the 17 kg (~37.5lbs) range .
[147] This may be overly generous, as Halstead (1996: 34) prefers to assume between 25 and 40 kg of milk yield (approximately 55-88 lbs.) per ewe or doe exploited in a mixed-farming paradigm. If 100-200 lbs. of mix yield is optimistic, the number of LC sheep and goat might move close to 75,000 animals.

6.5 ***Product Specialization:***

Product specialization refers to the development of particular flock management strategies in order to produce a significant surplus of a specific set of animal products. Keeping a population of non-reproducing castrated wethers for wool production serves as just one example. The first step in this process, however—and a suggestive clue in the archaeological record—is an emphasis on herding one type of livestock. While an animal economy that focuses on meat or dairy production might choose to herd both cattle and caprines in large numbers, the difference in water requirements and a competition over pasturage makes this a complex strategy. Indeed, if one species of livestock is the main focus of an animal economy, it helps to frame the product specialization during a particular period.

A survey of the Bronze Age faunal assemblages from a series of Early, Middle and Late Cypriot sites by Spigelman (2008) indicates a transition from a largely diversified animal economy in the Early and Middle Cypriot periods to a heavy emphasis on caprine during the Late Cypriot. In the Early Cypriot (EC) datasets from Sotira-*Kaminoudhia* and Marki-*Alonia*, caprine are the most prevalent making up 30% and 50% of the assemblages respectively, however, cattle and fallow deer are present in significant numbers at both sites, as well. Cattle make up more than 25% of the assemblage at Sotira, and close to 20% at Marki. Fallow deer are present in similar percentages (~15%) at both sites. Intriguingly, pig contributes in very small numbers at both settlements. This diversification of species continues at Marki during the Middle Cypriot I, with fallow deer and cattle contributing almost equally to the sample at 20%. Faunal data from Middle Cypriot levels at Politiko-*Troulia*, a community in the eastern foothills of the Troödos, at the edge of the *Mesaoria*, has 68% caprine remains, while wild faunal (presumably fallow deer) make up 20% of the assemblage, and cattle (8%) and pig (4%) are relatively insignificant (Falconer and Fall 2013: 128). The diversification in exploited species across all these sites appears to represent a risk buffering strategy in which domesticated and wild species contribute in comparable percentages. This also suggest that the primary purpose of these animals was meat consumption.

The Late Cypriot (LC) assemblages reveal a stark contrast in animal management and usage strategies. At Phlamoudhi, Kalopsidha and Athienou (three of the four LC settlements considered by Spigelman 2008) caprines account for over 90% of the sample (compared with 30-60% of EC and MC datasets). At the remaining settlement at Nitovikla, caprine remains make up approximately 55% of the assemblage, while cattle make up 40%. This emphasis on caprine persists at a number of other LC settlements including some of the settlements that provided the samples analyzed for this project. LC levels at Kalavasos-*Ayios Dhimitrios* show a high proportion of sheep and goat remains. Croft (n.d.) notes that while caprine bones account for 43% of the KAD assemblage by weight, nearly all of the hundreds of fragmentary bones that are unidentifiable to species, are of a size consistent with caprine. This suggests that sheep and goat are by far the most common animal consumed at KAD. Additionally, the (admittedly preliminary) analysis of faunal remains from Maroni-*Vournes* indicates a similar propensity of caprine (Cadogan 1983: 161). At Hala Sultan Tekke, caprine remains make up over two-thirds of the sample (Ekman 1977, Jonson 1983). This trend continues at Kouklia where 67.5% of the faunal remains from the LC layers are caprine (Halstead 1977).

The predominance of caprine remains, especially in comparison with the more diversified EC and MC faunal assemblages highlighted by Spigelman, suggests a clear shift in the ways in which animals and animal products were being managed, produced and consumed in the LC world.[148] Age profiles have also been constructed from the faunal data from these LC sites and can be used to suggest the primary emphasis of LC animal management strategies. As noted above the age profiles of a herd can be used as evidence for kill-off patterns, which, in-turn, may be the result of culling strategies consistent with an emphasis on particular secondary products. Modern product specialization can also act as a guide here, as sheep were herded in the 19th and 20th centuries for wool, dairy and meat production (in that order), while goats were kept for dairy and meat (in that order). The average milk yield per sheep ewe was approximately 100 lbs. per annum, while double—200 lbs.—per goat ewe. Wool yields during the mid-20th century were 3.5 lbs. per ewe and 4.9 lbs. per ram, though it is unclear whether these were predominantly intact or castrated male sheep (Christodoulou 1959: 188, 190).

It is worth noting that trends in these data can be caused by factors other than culling strategies that emphasize particular secondary products. In addition to preservation biases and multiple depositional factors that can impact the presence or

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[148] Note that Croft (n.d.) raises an important point that the distribution of species in the faunal assemblage from the LC levels at Maa-Palaekastro resembles the diversification of the EC and MC assemblages discussed by Spigelman. At Maa, caprines make up less than a third of the assemblage, while cattle and fallow deer make up the difference (Croft 1988). Croft notes that this perhaps "reflects a mode of subsistence appropriate to the particular ecological conditions which prevailed in this locality in the remote western part of the island." In addition to this, Schwartz (1973: 216-217) notes the decline of pig (*Sus scrofa)* beginning in the Middle Bronze Age on Cyprus and continuing through the

absence of particular bones within an archaeological site, these data tell us only about the places where animals were being consumed. It is something of a leap to extrapolate herd management strategies from consumption data. There is a very real possibility that shepherds served multiple settlements from the same flock, providing, dairy products to one site and young lambs for slaughter to another based on localized demand. Despite this, it is worth considering the demographic trends present in the faunal data.

Age profiles can be reconstructed based on two main age-dependent anatomical processes: the eruption of teeth from the jaw (and the wear of those teeth), and the fusion of the epiphyses (ends) of long bones with the shafts of those bones. Long bones are present in greater quantities than teeth in archaeological assemblages, thus epiphyseal fusion data are more readily available even if it is less precise in terms of the ages at which the bones fuse. Intriguingly, while there is a clear movement towards caprine rearing across the island during the LC, age profiles suggest that these sheep and goats were being managed in different ways at different locations.

Halstead (1977), for instance, interprets data from Kouklia as representative of a localized wool production economy, with sheep being herded for wool production, while goats were herded for meat. He notes that young animals are not killed early enough (i.e. as infants) to have an appreciable impact on dairy production. The 20% kill-off rate of animals in their fourth year indicates that animals are allowed to live well past the point at which they reach maximum meat weight (sheep and goats reach maximum size around 2 years), and ewes are reproductive into their 6th or 7th years.

Late Bronze Age. This further highlights the likely growing importance of secondary products during

Thus, these animals, slaughtered during their fourth year, presumably represent wethers that have contributed at least two years of good wool production before being killed for meat. This strategy first emphasizes wool production, and then maximum meat weight.

At Kalavasos-*Ayios Dhimitrious*, Croft (n.d.) argues that the relatively high percentage (37%) of lambs culled at the infant stage is suggestive of an emphasis on dairy production. Ewes would begin lactating after giving birth, and by slaughtering the lambs, the milk yield per ewe that was available for human consumption is increased. In other words, killing off lambs makes it such that lambs and humans are not competing over milk. This contrasts with Hala Sultan Tekke, where 29% of the animals are allowed to reach the juvenile stage of growth before being slaughtered. This matches a meat production strategy as these lambs would approach maximum meat yield before slaughter, and would do so at the cost of dairy production, since they would consume milk during their growth. All indications are that different settlements dealt with their livestock differently, even if these conclusions are based on coarse evidence in small samples sizes. There does appear to be a clear trend towards product specialization during the LC, even if the products being emphasized vary from site to site.

The reasons behind this shift are likely complex. Initially, it is worth recalling the changing environment. The fact that the LBA was a period of climatic drying would have made caprines—and especially goats—attractive livestock as their requirements for water and high-quality pasturage are considerably less than cattle.

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this period as pigs do not produce secondary products.

Demand for secondary products, and a process of product specialization to provide those products likely contributed as well. This shift is a clue that the LBA on Cyprus witnessed the development of a complex economic system that may have required shepherds to adjust their animal management strategies relatively quickly based on a changing demand for particular products. Sheep and goats are flexible livestock that enable shepherds to oscillate between particular products, as needed. Caprines also reproduce relatively quickly, which enables shepherds to adjust their production strategies and flock profiles quickly: "even specialized pastoralism retains flexibility: it is relatively easy to change the balance of production from, for example, wool to cheese within a short time" (Nixon and Price 2001: 409).

The turn was probably spurred on by the development of institutions that Nixon and Price identify as prime movers in product specialization: the market and the State. The rise of "urbanism" on Cyprus, manifest through the emergence of a number of larger settlements across the island—including KAD, Maroni, HST and Enkomi—consolidated relatively large populations (a few thousand per site or more[149]). This growing urban population would likely have encouraged a broad process of economic specialization, as markets and developing processes of exchange allowed individuals and groups (kin-groups?) to begin to further specialize craft production as potters, fullers, carpenters, etc. An economic turn towards product specialization would provide demand, and the commodification of animal products, thus incentivizing specialized production of those goods.

6.6 *Links with Agriculture:*

Evaluating the relationship between herding practices and agricultural production in LC Cyprus is challenging, largely because the picture of agricultural production and the "rural hinterland" is limited. This is in part because of an emphasis on the largest and most centralized settlements on the island (see Chapter 3 for a longer discussion of this), and in part because the process and modes of agricultural production on Cyprus are poorly understood. Most of the scholarship that has discussed Late Cypriot agriculture has been concerned with centralized agricultural storage (e.g. Keswani 1989, 1993; Pilides 1996), the processing of agricultural products after harvest (Hadjisavvas 1992; Hadjisavvas & Chaniotis 2012) or the relationship between agricultural support villages and either centralized settlements (KAD, Maroni, HST, and Enkomi, for instance) or mining communities. Where the scholarship has been concerned with agriculture it is either speculative—for example, Manning (1993)[150], who constructs a model for developing complexity on Cyprus based on an assumed monopolization of plow-teams and extensive agriculture by

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[149] See Manning et al. 2014 for a recent exercise in estimating the population of large LC settlements.

[150] A substantial portion of Manning's argument is based on the assumption that feeding oxen would be cost prohibitive for individuals farming the least productive land on Cyprus. The argument proceeds that productive landowners were able to support teams of oxen, therefore further increasing their production and agricultural surplus and thereby separating themselves from the subsistence farmers on less productive land. This would eventually lead to the separation between elites and non-elites and the development of hierarchy. However, the assumption at the heart of Manning's model is questionable. First, it assumes land scarcity and population pressure, a situation that is hardly likely during the Early and Middle Cypriot periods when the island-wide population could not have been more than a few tens of thousands at the very most. The idea that feeding oxen is high-cost on Cyprus is based on Halstead 1987 (especially page 83-85), who cites Christodoulou 1959: 182-183 who actually says that feeding oxen is prohibitively expensive, unsurprisingly, during droughts ("In times of drought the problem of feeding them [oxen] is very acute and in the past large numbers were shipped abroad or slaughtered…"). Of course oxen do demand more water and food than sheep and goats, for instance, but they do not appear to be so difficult to maintain that normal peasants could not support them. Indeed, Christodoulou explains that in the lowlands of Cyprus many 20th century CE farmers coped with the capital expense of oxen by maintaining one ox and sharing oxen amongst neighbors to form plow teams. This serves as just one example of the rather speculative nature of the models of Bronze Age agriculture on Cyprus.

elites—or circumstantial—for example, Knapp and Held (1994: 397) who note that there were "no unexpected components in the agropastoral economy of the ProBA [as it included] cereals, pulses, domesticated cattle and ovicaprines; oxen and equids (used as draft and transport animals)." Late Cypriot scholarship has generally been less interested in (and, based on available evidence, hard pressed to reliably comment on) the actual process of in-field agricultural production, the scale of this production, and the land-use patterns associated with Late Cypriot agriculture.

Despite this, a broad overview of agriculture in Late Bronze Age Cyprus is possible. It is generally accepted that the secondary-products revolution occurred on Cyprus at the advent of the Early Cypriot period and, along with the development of copper mining and smelting, was a major driver in the development of social complexity on the island (Knapp 1990, 1994; Manning 1993). The secondary-products revolution refers to the more sustainable raising of animals for products other than meat (e.g. wool, milk, traction). Plow traction, through the use of oxen and mules, is the secondary-product usually highlighted as critical in developing agricultural strategies, as it allowed extensive—and, it is assumed, rightly or wrongly, more productive—agriculture (Manning 1993; Knapp 1994). Perhaps the most obvious evidence for the existence of plow agriculture during the EC/MC is a Red-Polished terracotta model (and perhaps offering table) of a four-oxen plow team from Bellepais-*Vounous* (see fig. 6.6 and discussions below).

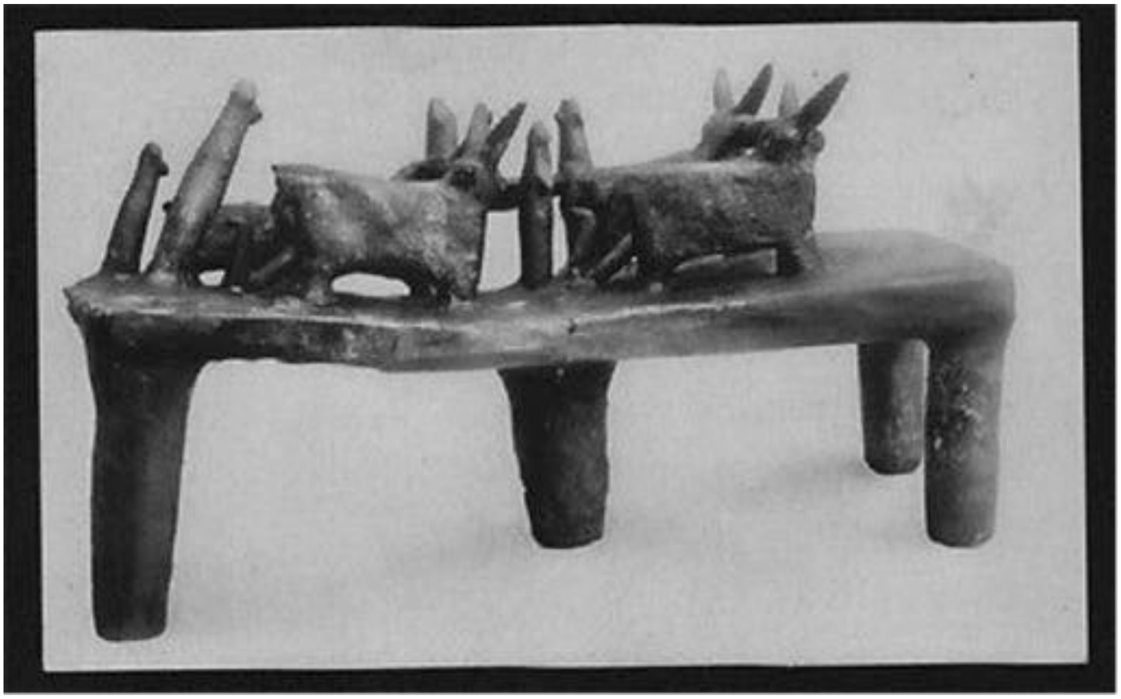

Figure 6.6: Terracotta model of ploughing scene from Vounous, Cyprus.

Intriguingly this Red-Polished "offering table" also features what appears to be an caprine (a ram?) standing to the left of the figure steering the plow. The implication here may be that agricultural production (i.e. plowing) actually occurred alongside livestock rearing (i.e. sheep-herding), though it is difficult to extrapolate an entire relationship between agriculture and pastoralism throughout the entirety of the Bronze Age from one representation. Even though this "offering table" illustrates the presence of the oxen and plow on Cyprus, it does not allow us to determine how wide spread its use actually was.

Paleobotanical evidence has been collected and analyzed from Episkopi-*Phaneromeni*, Enkomi, Kalopsidha, Aplika, KAD and HST (Hansen 1991). These data indicate the importance of domesticated emmer wheat, barley, lentils, and olives, augmented by (perhaps wild?) grapes, fig, pomengrate, almonds, hazelnuts and pistachio. Intriguingly cereal and pulses make up only a small amount of the recovered paleobotanical remains from the MC settlement at Politiko-*Troullia* (Fall et al. 2012: 2338). If this is at all representative of the MC diet, the intensification of cereal and pulse agriculture may be a Late Cypriot addition. The prevalence of querns and groundstones at sites such as KAD, HST, Episkopi-*Phaneromeni*, and Arediou-*Vouppes* (Swiny 1986; Steel 2009), combined with an olive press from Maroni-*Vournes* (Cadogan 1987; Hadjisavvas 1988) underscores the importance of cereal and olive oil as staples in the LC diet. Keswani (1993) notes the substantial olive oil storage capacity (perhaps up to 33,500 liters) of pithoi within the monumental structure, Building X, at KAD. These data give a basic overview of the kinds of agricultural products that were being farmed during the LC, but the actual process by which that farming occurred is poorly understood.

A critical question in determining the relationship between herding and agricultural is whether farming practices during the LC were extensive or intensive. Intensive agricultural is essentially large-scale gardening and involves careful and dedicated cultivation to produce greater yields on smaller plots of land. It often involves considerable labor per land unit and land improvement strategies such as irrigation, manuring, and annual rotations between cereal/pulse planting. Extensive cultivation makes use of plow agriculture and teams of oxen or mules to cultivate large plots of land. It requires lower human labor investment and limited land improvement. The secondary-products revolution and adoption of animal traction has the potential to bring larger plots of land under crop, therefore making extensive cultivation possible. It also, however, requires considerably higher demands on cereal and forage production in order to maintain oxen. The Vounous plowing-model cited above does suggest that plowing technologies existed on Cyprus by the Middle Cypriot, and this process has conventionally been viewed as a way of maximizing yield and increasing surplus agricultural production during the Late Bronze Age on Cyprus. However, as noted above, the evidence for the advent of extensive agricultural is rare and largely speculative.

Intensive agriculture may, in fact, better describe Bronze Age farming practices on Cyprus, even as the island's population grew and began accumulating in large settlements. Intensive agriculture provides a higher seed-to-yield ratio and makes a dispersed settlement pattern[151] attractive, with farmsteads and field-houses near land under cultivation. What limited—and indeed somewhat circumstantial—evidence there is for the actual farming practices of LBA Cyprus in fact suggests that intensive agriculture may have been a critical component to productive strategies. Indeed, smaller villages dispersed across the landscape such as Kalopsidha, Episkopi-*Phaneromeni*, Analiondas-*Palioklichia*, and Aredhio-*Vouppes* may be suggestive of this kind of smaller-scale, intensive farming.

It is also unlikely that one farming strategy (extensive or intensive) characterizes all of the farming that occurred on Cyprus during the LC. A variety of factors including the environment, the kinds of crops being farmed, the distance to market, and land ownership policies or claims would have impacted how a piece of land was brought under cultivation. The reality is that we simply do not have enough evidence to effectively characterize the nature of farming practices during the LC. Steel (2009: 136) notes, "…the possibility of villages and farmsteads likewise needs further exploration." Unfortunately, this state of affairs has not changed considerably since Knapp (1994: 286) noted, over twenty years ago, that "because the bioarchaeological record is still very limited and thus biased as well as non-representative, any conclusions about the role of subsistence in the overall economy can only be provisional."

Given the limited progress that has been made via traditional techniques for evaluating ancient agricultural production on Cyprus, the shepherding models

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[151] Note that Manning et al. 2014 argue for a dispersed settlement plan even at Maroni-*Vournes*, one of the larger settlements on the island. Perhaps the spaces between known architecture at the site represent intensively-farmed agricultural plots within the community.

proposed in the next chapter may provide some context for LC agriculture. The differences between large-scale and small-scale shepherding can also structure the relationship between shepherds and farmers. Institutionalized, large-scale shepherding that emphasizes a particular product for market is linked to agriculture via the market or exchange mechanism. This is because surplus agricultural production makes it possible to exchange specialized animal products for specialized or surplus agricultural products. Evidence for transhumance implies a greater level of competition between shepherds and farmers or, at least a limitation of available resources to sustain both agricultural and pastoral pursuits in one location. Alternatively, localized, small-scale shepherding, is likely to exist in tandem with agriculture, where shepherds are also agriculturalists (or at least the labor is divided up within the family, household or community) in order to diversify methods of producing surplus. Moreover, localized shepherding may suggest a greater symbiosis between shepherds and farmers, such as the pasturing of livestock in fallow fields to improve those fields through natural manuring. Manuring may have been an important aspect of maintaining soil fertility; Padgham notes that a typical small farm with a family of six people, two oxen, one cow, one donkey, three pigs and twelve sheep or goats could produce 270.4 m^3 of manure annually. Using Roman estimates, this would be enough manure to cover an area of 3.9 hectares (2014: 18). Based on Padgham's estimations, each sheep or goat would produce approximately 650 kg of manure annually, meaning 9-10 caprines, would produce enough manure to fertilize 1 ha per year.

Natural manuring and transhumance, however, can work at cross-purposes.

Removing large populations of livestock to the highlands during the summer months considerably decreases the amount of manure that can be laid down (Semple 1932: 300; Halstead 1987b:79). Because main Mediterranean crops such as wheat and barley grow during the winter months, livestock cannot be expected to graze in those fields during the winter. Thus, if agricultural pursuits and pastoralism are to work together, this system requires periodically placing fields under fallow, allowing winter lowland pasture for flocks and in turn replenishing those fallow fields with manure.

Importantly, and especially in an intensive and symbiotic situation, we should not assume that farmers and shepherds are discrete groups. Taking another cue from more modern studies of shepherding and pastoralism on Cyprus, Harris (2007: 232) notes that during the late 19th century CE, “there was not a dichotomy between the farmer and the shepherd.” There are apparently numerous examples of individuals and families owning flocks of sheep, but hiring full-time shepherds to pasture the flocks collectively. This raises a related point: if shepherds and farmers can be one and the same, it is perhaps wrong to assume an inherent competition between farmers and shepherds. Proxy data for shepherding strategies may help to fill in what is a poorly understood about the relationship between farmers and shepherds in the Late Bronze Age.

6.7 *Gender and the Division of Labor:*

Pastoralism has traditionally been considered a male pursuit. The default assumption is that shepherds are men or boys, owing to the physical demands placed on the shepherd while grazing flocks and defending livestock from predators (see no.

19 above). In general, this may not be too far off the mark (though note that Harris 2007: 246 points to the existence of female shepherds on Cyprus during the 20th century), and pure shepherding may often fall under the auspices of male members of a community. Gender and a gendered division of labor become important, however, when a pastoral mode of production is placed within a larger economic, social and political context. Nixon and Price (2001) point out that pastoral production is not simply dependent on shepherding grazing animals, but also involves the harvesting and processing of animal products (e.g. milking, shearing, cleaning and spinning wool, etc.). Gendered division of labor provides a convenient way of divvying up these responsibilities.

A gendered division of labor is especially useful when wool production is emphasized, as it requires the processing of the wool as well as the maintenance of the sheep. Wool and textile production can take place separately from the animals producing the wool/goathair; animals can be shorn and then returned to pasture at a distance from a settlement or workshop where textiles are produced. Alternatively, dairying (and, indeed, meat production and consumption), require relatively quick processing and consumption of milk or meat.

Ethnographic studies of traditional Greek pastoralists show just such a division of labor within the household, where men function as shepherds and women are responsible for spinning and weaving (Nixon 1999). Barber (1991: 283-298) reinforces this notion by making an extensive case for women as the primary spinners and weavers in the Aegean, eastern Mediterranean and Near East during the Bronze Age.

Smith (2002) provides the most concerted exploration of textile production and the gendered division of labor on Cyprus. Evidence is somewhat limited, however, so Smith turns to a model developed by Barber (1991) that relies on comparative evidence from Aegean and Near Eastern textual and pictorial references to suggest that textile production was divided into “male” and “female” jobs. According to this paradigm, men were responsible for “repulsive” jobs that would have required the use of urine (used as a dye-setting agent or mordant), rotten mollusks (murex snails for dye), and bone grease and bone ash (as a washing agent). “Male” wool processing jobs would have included washing/fulling and dyeing raw textile materials. Women, on the other hand, were responsible for spinning and weaving. Despite the slightly normative bent to this division of labor, with men responsible for physically difficult or disgusting parts of production, and women responsible for the finer, more detailed aspects, Barber’s model is developed out of comparative evidence from Bronze Age Egypt, the Near East, the Aegean and Anatolia.

With this setting the backdrop for potential gendering of labor, Smith looks to two sources of evidence that are useful in helping to model the gendering of Late Cypriot textile production. The first is the presence of spindle whorls in Early and Middle Cypriot funerary contexts, and the apparent progressive disappearance of these in Late Cypriot funerary deposits. The second is the apparent development of textile workshops in large, centralized settlements. Smith notes that Fischer (1986:42) argues that spindle whorls from EC and MC tombs are only present in female burials based on the sexing of skeletal remains. The implication here is that during the EC and MC the spinning of material for textile production was linked with women. The trouble with this analysis is that, in fact, Fischer's work only found four human skulls[152] (out of a total of 88 analyzed) could be positively linked with spindle whorl finds, and one of these (FCL 11 from Lapithos Tomb 406/I) dates to the Cypro-Geometric I and therefore has no direct bearing on EC or MC weaving practices. In fact, of the remaining three skulls found with spindle whorls, two (Skull II from Vounous Tomb 69 and Skull FCL 4 from Lapithos Tomb 306 C/2) were male. Thus, despite Fischer's attempt at identifying gendered labor in the Bronze Age, the current evidence simply can not support Smith's conclusions.

Textile production also appears to intensify during the Late Cypriot period, moving from smaller-scale household production into workshops at larger settlements (evidenced by the presence of loom weights in non-domestic contexts such as at Kition [Karageorghis, 1985] and Maroni-*Tsaroukkas* [Manning and DeMita, 1997]). Smith argues that this may have involved a shift from spinning and weaving as largely women's work to including men as well. Beyond this, it is worth recalling that labor and textile production can be divided along a variety of other lines within a given society including age, social status, experience, and choice of vocation. Considerable work remains to be done on this topic, however the nature of the division of labor in the LC are crucial in helping to shape our understanding not only of shepherding practices, but the demand for animals products as well.

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[152] These are Skull II from Vounous Tomb 69; Skill FCL3 from Lapithos Tomb 322 B/1; Skull FCL 4 from Lapithos Tomb 306 C/2 and Skull FCL 11 from Lapithos Tomb 406/I

6.8 *Cultural Integration:*

Despite receiving limited scholarly attention, Late Cypriot shepherds and the livestock that were under their care likely played important direct and indirect roles in the LC world. Most of the discussion above has focused on economic and ecological considerations such as resource allocation and use, symbiotic or competitive relations between shepherds and farmers, the emphasis of particular secondary products, and the division of labor in the processing of those products. While considerable evidence illustrates that livestock and shepherds would have played a vital economic role in LC society, it is likewise important that they not be thought of in strictly economic and economizing terms. There can be a tendency in archaeological circles to view shepherding and livestock management through a lens that focuses on "optimizing calculations of productivity or energy extraction versus costs of feeding and maintenance" (Keswani, 1994: 255). Such an utilitarian and functional analysis of shepherding and livestock management neglects the potential social and ritual importance of individual animals and herds. Ethnographic studies illustrate that the maintenance and ritualized consumption of livestock can play important roles in establishing, maintaining, and reinforcing relationships between individuals and groups within a society (e.g. Malinowski 1922; Strathern 1971; Damon 1989; Hayden 1990). A model that attempts to understand the importance of livestock and shepherds within Bronze Age Cypriot society must therefore consider these non-economic factors as well.

Human relationships with animals appear to have had important social and ideological impacts, in addition to providing avenues for basic subsistence on Cyprus, from at least the Late Neolithic, and probably earlier (Manning et al. 2010). During the Neolithic and Chalcolithic, hunting was important as a way of incorporating protein into the diet. Croft (1991: 63) notes that hunting Mesopotamian fallow deer (*Dama mesopotamica*) was a critical aspect of subsistence on the island from about 7000 BCE to 2000 BCE. Beyond food procurement, hunting also acted as a way of creating, sustaining or displaying community ties in public settings (what Falconer and Fall [2013: 114] refer to as "group economic endeavors"). Especially in the western portion of the island, where the foothills and forests of the Troödos hunting would have provided environments to sustain wild goats and fallow deer, members (likely men) of small Neolithic and Chalcolithic communities would have been able to display their physical and mental prowess.[153] The sharing and distribution of meat after a kill would, moreover, provide a way of tangibly creating or affirming social ties within the community.

Croft (1991) notes that the shift from a predominance of deer to caprine in the archaeological record may have begun as early as the late Chalcolithic. This implies that during the 3rd millennium BCE, animal exploitation on Cyprus began to transition from a largely hunting economy to a husbandry economy.[154] The social importance of

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153 Halstead interprets the fallow deer remains from LC levels at Kouklia as a reflection of "hunting for sport by an upper leisured class" (1977: 270). If this is correct, the importance of hunting as a way of indicating physical prowess continues, unsurprisingly, into the LC.

154 Croft (1991: 73-75) makes a strong case that caprines (largely goats) from Chalcolithic settlements across the island are domesticated by the 3rd millennium BCE. Sex-profiles, especially from Kalavasos-*Tenta*, in which 9 out of 10 animals are female (a male-to-female sex ratio of 0.11), indicate an animal exploitation strategy that emphasized reproduction and maintenance of flock size, with most young males culled from the herd for meat. This contrasts with natural populations of wild goat (*Capra pyrenaica*) and moufflon (*Ovis aries*) which show sex-ratios of 0.23-1.09 and 0.35-0.98 respectively, depending on the season, with lower rates detected during the spring after parturition and higher rates

livestock appears to have emerged during this period, and certainly by the beginning of the Early Bronze Age. Keswani (1994) and Croft (1991) argue, however, that the animal economy (even when domesticated) could have still functioned as an arena for illustrating social importance and prestige. Faunal datasets from the south-western late Chalcolithic sites at Mylouthkia, Lemba and Mosphilia show an almost balanced ratio between male and female caprines. Since one ram can service between fifteen and thirty ewes, this balanced sex-ratio is not necessary for strictly reproductive purposes. Both Croft (1991) and Keswani (1994) argue that the predominance of rams actually indicates the maintenance of male animals within a herd in order to serve as markers of the wealth and status of the herd owner. Moreover, the maintenance of a high number of rams provides the owner of the flock with the ability to slaughter an animal for ritual or feasting purposes without impacting the reproductive capacity of the flock.

Two artifacts from funerary deposits at the late Early Cypriot/early Middle Cypriot site of Bellepais-*Vounos* on the northern coast of Cyprus offer some insight into the relationship between livestock and humans during the beginning of the Bronze Age. The tombs from which these deposits come date to the ECIII-MCI (ca. 2000 BCE), and have multiple interments. Tomb 22 contained a Red-Polished (—the so-called "Vounous Bowl"—in which a dramatic scene is created with human and animal figures molded from clay. The bowl is 37 cm in circumference and 7 cm tall, and the rim of the bowl appears to represent a structure or enclosure of some sort (complete

detected during rut in the fall (Torres et al. 2014). The almond-shaped horncore cross-sections from the Tenta dataset are also indicative of domestication (versus diamond-shaped horn cores from wild animals).

with a post-and-lintel door to the outside). The scene is made up of 18 human figurines and four cattle (see fig. 6.7).

Figure 6.7: EC-MC transition (c. 2000-1850 BCE) Red-Polished bowl from cemetery at Bellepais-*Vounous* (the 'Vounous Bowl') with livestock (cattle) marked.

The nature of the scene has been discussed and debated in detail elsewhere (see e.g. Manning 1993, Peltenburg 1994, Bolger 1996, Knapp 2013: 334ff; Steel 2013), and is at least suggestive of the organization of an EC/MC household, but may also be indicative of a developing community-wide social hierarchy. The presence of cattle, paired off and kept in pens that flank the exterior door, is clear evidence for animal domestication by the end of the EC, and also suggests both the everyday presence, and the importance of domesticated animals within EC/MC society. The inclusion of these livestock suggests that cattle were both integral to the late EC/MC way of life at Vounous, and their inclusion may serve as a way of indicating the status of the household that is portrayed. Four cattle would also represent two teams of plough-oxen, though the plough itself is conspicuously absent in the scene.

A second Red-Polished artifact from Vounous does, however, display a plow and—intriguingly, given the four oxen in the two pens represented on the Vounous bowl—a team of four oxen. The "offering table" (also discussed briefly above) shows five human figures and five livestock (the team of four oxen and what appears to be a sheep or goat to the left of the human-figure steering the plow-team). The four other humans are apparently involved in various other agricultural tasks. Together, the Vounous bowl and the Vounous "offering table" serve to illustrate the importance of domesticated animals in subsistence practices, and perhaps as status or wealth indicators, by at least the beginning of the Middle Cypriot period.

Other zoomorphic representations from various funerary artifacts at Vounous underscore the growing importance of domesticated animals in EC/MC society.

Modeled clay heads of cattle, sheep/goat (and perhaps moufflon?), and deer are a common feature on the rim of ceramic vessels (Webb and Frankel 2010: 198-200). Many of these ceramic vessels appear to have been used in feasting and drinking funerary rites, either as individualized 10-12 cm tall 'tulip' bowls (or cups), or as part of large, deep-bowls, or open pedestal bowls, all of which could have been used in collective drinking activities.

Incised decoration on the shoulder of a deep-bowl (from Tomb 91-14, Hennesey 1974) and a large jug (Tomb 160A.16, Hennesey 1974) from Vounous feature quadruped figures on their hind legs. Webb and Frankel (2010: 200) note that the posture of these figures is suggestive of dancing. Two other attributes are intriguing: each figure has a distinctive depiction of either antlers or horns. The antlers presumably represent deer, the v-shaped horns are indicative of cattle, and the curved horns imply a ram (see fig. 6.8), The incised decorations of domesticated and wild ungulate species alongside one another implies an ideology that sees these quadrupeds as akin to one another. Moreover, the incised decorative style, combined with the artist's design, make the figures appear skeletal; a particularly *apropos* rendering for funerary deposits. The primacy of the cattle motif is maintained at Marki-*Alonia* where bovine figures are the predominant zoomorphic figurine type from EC and MC deposits (Webb and Frankel 2001). Finally, a shrine model from Kostiatis/Marki features at least two bucrania at the top of stele, and perhaps a wild goat or moufflon on at the top of the third (see fig. 6.9).

Faunal evidence from the tombs at Vounous further supports the case for a growing importance of domesticated livestock at the EC/MC transition. Cattle bones (and, to a lesser extent sheep and goat) were found amongst the grave goods of many

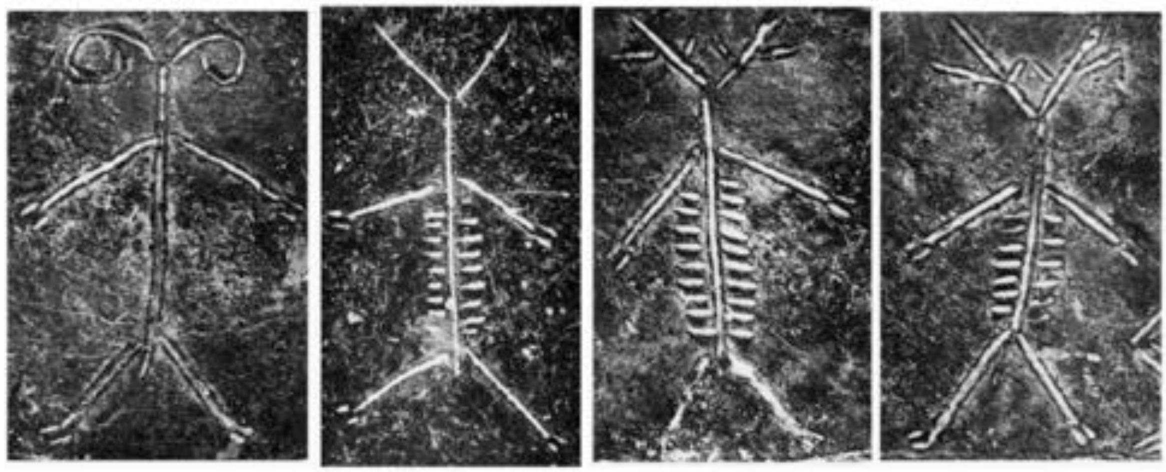

Figure 6.8: Incised decoration on shoulder of vessel from Bellepais-*Vounous* with ram, cattle and deer figures (after Webb and Frankel 2010, figure 15)

Figure 6.9: EC/MC shrine model with bucrania and caprine (?) head elements from Kotsiatis/Marki (after Webb and Frankel 2010, figure 7).

of the tombs at Vounous (Stewart and Stewart 1950: 122, 130, 141). Webb and Frankel argue that funerary rites involved the slaughter (and likely communal consumption/feasting) of cattle (2010: 196-197). The bones recovered from the tombs were both meat-bearing (e.g. long bones and vertebrae), but also included cranial, ankle, and lower leg fragments, implying that a large portion of the animal skeleton was present when deposited in the tomb. This therefore raises the possibility that livestock were sacrificed tomb-side (Stubbings 1950; Webb and Frankel 2010: 196), perhaps again as a display of wealth, as a way of reaffirming communal ties via feasting, or perhaps both. It is worth noting, that the faunal remains at Vounous were not comprehensively collected or studied, so the predominance of cattle bones may be a result of preservation or analytical bias. Nevertheless, the sacrifice of livestock does appear to have been a significant aspect of funerary practice during the late EC and MC, at least at Vounous.

The social importance of livestock may have shifted during the LC period, in part because of—or, perhaps, as the result of— the transition towards an emphasis on caprines (e.g. see Spigelman 2008, and above). Communal feasting, however, still appears to have played an important role in LC society and would have linked the raising of livestock to social practices. In a review of feasting evidence from Prehistoric Cyprus, Steel (2004) argues that faunal deposits from the LC wells at Kouklia and the apparent one-time deposition event at Kalavasos-*Ayios Dhimitrios* indicate that meat was elite managed: "consumption of sheep and cattle was strictly controlled" (290). This led Steel to the assumption that meat did not make up a substantial portion of the "everyday" Late Cypriot diet, and that meat was reserved for special occasions. This may have been the case, however on present evidence such a claim is largely unfounded—we simply do not have faunal data from smaller Late Cypriot farmstead or "household" contexts to test this suggestion. True, the faunal collections from both Kouklia (particularly from well TEIII) and Kalavasos appear to come from one-time feasting deposits and illustrate considerable meat consumption, but we do not have substantial faunal data[155] from non-centralized settlements (e.g. farmsteads, smaller households, etc.) that can confirm or deny the importance of meat consumption in the everyday Late Cypriot diet. This serves as yet another example of the tendency to take data from centralized settlements and project them onto the entire ancient society at large.

Indeed, Halstead's (1977) study of the faunal remains at Kouklia suggests that the two wells (TEIII and TEVIII) represent two distinct animal bone depositional processes. Halstead calls the TEVIII deposit "scrappy" with "few and fragmentary bones," and interprets this as "a partial record from a long time-span of bone material which, prior to deposition in the well, had been lying around long enough to become widely scattered" (1977: 270). In other words, this deposit is something like a representation of "average" faunal detritus. TEIII, on the other hand, contained faunal material that was "unusually well preserved" and was likely "the food debris of either a socially elevated class or of a major festival at which everyone ate more meat than usual" (1977: 270). Intriguingly, TEVIII contained a considerably higher percentage

[155] As noted in Spigelman (2008), there is faunal data from the LC levels at the smaller, perhaps agricultural settlements at Phlamoudhi-*Melissa* (Hesse et al. 1975) and Kalopsidha (Åström 1966). However, because the nature of the LC settlement at Kalopsidha is unclear (see Webb 2012), it would be optimistic to attempt to characterize the diet of LC farmers based on evidence from Phlamoudhi alone.

of cattle remains than in TEIII (42% in TEVIII versus 6% in TEIII), whereas caprine remains were predominant in TEIII (71%). None of this is to say that cattle were a major aspect of the everyday LC diet, or that sheep and goat were only (or even primarily) consumed at feasts or festivals. Instead, this highlights the fact that the faunal evidence is simply not available to reliably comment on the typical animal consumption during the LC at present. Nevertheless, based on the high concentration of animal bones from these singular deposits at KAD and Kouklia (especially well TEIII), it seems reasonably to suggest that LC feasting events did involve considerable meat consumption.

6.9 *Summary*

The considerations above make it possible to sketch the potential livestock usage and domestic animal management strategies during the LC period on Cyprus. The climate on the already marginally arid island appears to have dried gradually during the Late Bronze Age, which may be partially responsible for the marked emphasis on caprine husbandry during the period. Sheep and goat would have been more tolerant of the inconsistent access to water and could have made use of marginal land (or, in the case of browsing goats, forest) leaving more fertile land for agricultural pursuits. We should expect that livestock spent at least part of the year in the lowlands, either along the northern coast between the Kyrenia mountains and the sea, in the alluvial fan regions around Enkomi or along Morphou Bay, or in the south-central and western lowlands along the coast. Annual migration into the foothills of the Troödos or Kyrenia ranges, particularly during the driest summer months, seems likely, especially if flocks were extensive in number. While browsing goat populations could have subsisted in the upper parts of the Troödos, it is unlikely that sheep populations would have done well there as natural pasturage was probably not readily available. Thus, we should probably expect that if animal mobility did occur on LC Cyprus, it involved medium-length (<35km) seasonal travel.

Domesticated livestock were quite important on Cyprus throughout the Bronze Age. The transition from wild to domesticated ungulates between the Chalcolithic and Middle Bronze Age noted by Halstead (1977), Croft (1991), Keswani (1994), and Spigelman (2008) laid the foundation for much greater animal exploitation and the collection and exchange of secondary-products that continued into the LC. As caprine became the predominant domesticate consumed at large LC settlements, it is likely that considerable flocks of sheep and goat were necessary to provide wool, dairy and meat to a growing urban populace: an island-wide population of sheep and goats greater than twenty-thousand is probable.

The precise seasonal location of these flocks, and the nature of their relationship with agricultural production is, at present, largely unclear. This is in part due to our rather vague understanding of agricultural production during the LC. It seems likely that multiple livestock rearing strategies—from small-scale, household level maintenance of circa ten animals, to institutionalized or community wide herding of hundreds of sheep and goats—occurred, varying in part with localized ecology, but also with land-use in various portions of the island. A deeper understanding of livestock location and movement may, in fact, help to frame a model of LC agricultural production. Demand for particular secondary-products in particular places, the availability and division of labor, and the advent of workshop production (at least at Kition, but likely in other larger settlements as well), would also have impacted the best places to raise and pasture large flocks of sheep and goat.

Beyond strictly economic considerations, livestock played social roles as well. From a socio-economic perspective, if an individual or household owned large herds of livestock, that would serve as a conspicuous display of their wealth (and importance). Moreover, feasting on livestock provided an opportunity to conspicuously consume that wealth, and it appears that at KAD and Kouklia feasting, replete with meat consumption, was a fundamental activity during the LC. Livestock, therefore, served important economic and social roles in Late Bronze Age Cyprus, a fact that makes the general scholarly disinterest in the management of livestock herds all the more glaring. Shepherds, their management strategies and ability to maintain consistent supplies of animal products appear to have been quite important to the functioning of LC society, both in terms of purely economic goods, and as tools for highlighting and sustaining social relationships. Thus, the investigation into herding strategies that is the focus of the following chapters has considerable implications beyond the LC sheep or goatfold.

CHAPTER 7

MODELING MINOAN PASTORALISTS

7.1 *Introduction*

In general, the Late Minoan textile and wool production economy has received more scholarly attention than the Late Cypriot. This can be directly attributed to the fact that wool procurement and textile production are of considerable concern to the scribes writing in the Linear B archives at Knossos (and, to a lesser extent, in the archive of Linear B documents at Pylos on the mainland). The importance of sheep, wool, and textile production was recognized by Ventris and Chadwick (1973) during their comprehensive study of the archives at Knossos after the decipherment of Linear B in the 1950s, but it was Killen (1964) who solidified the importance of this wool production economy, and who identified and discussed the intricacies of managing the flocks that likely tallied more than 100,000 animals. Considerable additional research has attempted to better characterize this wool production economy, both in terms of animal management strategies (Enegren 2002, Halstead 1987a, 1987b, 1990a, 1990b 1991, 1992, 1997a, 1997b, 1999a, 1999b, 2003, Killen 1964, 1998, 2001, 2004) and in terms of the wool and textile processing and manufacture (Barber 1993, Nosch 2011, 2014). Others have recognized the need to expand the study of wool, textile and animal husbandry practices outside the scope of the Late Minoan period when Linear B acts as the primary data source, more notably Militello (2014; but see also Isaakidou 2006 who considers the early use of oxen for traction in the Neolithic on Crete). However, despite these more recent studies, research into animal management on prehistoric Crete has tended to center on re-analysis and re-study of the evidence from Linear B documents (e.g. Rougemont 2004, Nosch 2014), with a few faunal datasets and modern ethnographic studies as guides. These data have provided a very particular perspective on Late Bronze Age shepherding, and one that—not unlike Late Cypriot scholarship—has privileged a view of shepherding practices from the center, and has not considered the nature of hinterland production processes. Militello's analysis, however, notes that the earliest evidence for wool production on Crete (EM-MMII) in the form of wool dyeing installations at sites in east Crete like Petras, Kommos, Kouphonisi Palaikastro, Pefka and Pachia Ammos are largely independent of the budding palatial centers at Knossos, Phaistos and Malia (2014: 266). He further suggests that, at least during the Proto-palatial and Neo-palatial periods, the production of wool as a raw material likely "occurred outside of the major centres, probably at household level" (2014: 277). This perspective, builds on the de-centralizing analysis forwarded by Schoep, Driessen and others (see chapter 4). What follows is an attempt to build a model of Minoan shepherding practices similar to the Late Cypriot model created above, in an attempt to tease out the practicalities of a wool production economy from the perspective of Minoan shepherds. This is based on present evidence and again uses Nixon and Price's rubric as a way of structuring this discussion.

7.2 *Environment*

7.2.1 Geology and Topography

The topography of the island of Crete is, essentially the result of two major factors: the shape of the island and the location and relationship between mountainous regions and the lowlands. Briefly summarizing these two factors: the island is longer east-west (about 260 km) than is it wide north-south (60km at the widest point, and ~12 km at the narrowest). A more-or-less continuous mountain range runs west to east, creating a high-elevation spine that separates the northern coast of the island from the southern coast, and stretches from the western coast about two-thirds of the way east (see fig. 7.1). At this point, the isthmus at Ierapetra cuts a swath across the mountains, however they rise again to the east of the isthmus. This spine of Cretan mountains is conventionally divided into four parts: the White Mountains in the west (the *Lefka Ori*; reaching a maximum elevation 2453m); Mt. Psiloritis and its surrounding massif in the central portion of the island (also know as Mt. *Idi*, highest elevation 2456m); the Dikti Mountains to the east of Psiloritis (highest elevation 2148m), and the Thripti Range (highest elevation 1476m) to east of the lowland isthmus that runs between Pachia Ammos on the northern coast and Ierapetra on the southern coast. Smaller mountains with elevations between 600-1000m link these four major uplifts. A fifth massif, the Asterousia or Kofinos Range (highest peak 1230m) skirts the south-eastern coast of the island, separating the largest inland plain, the *Mesara*, from the Libyan Sea.

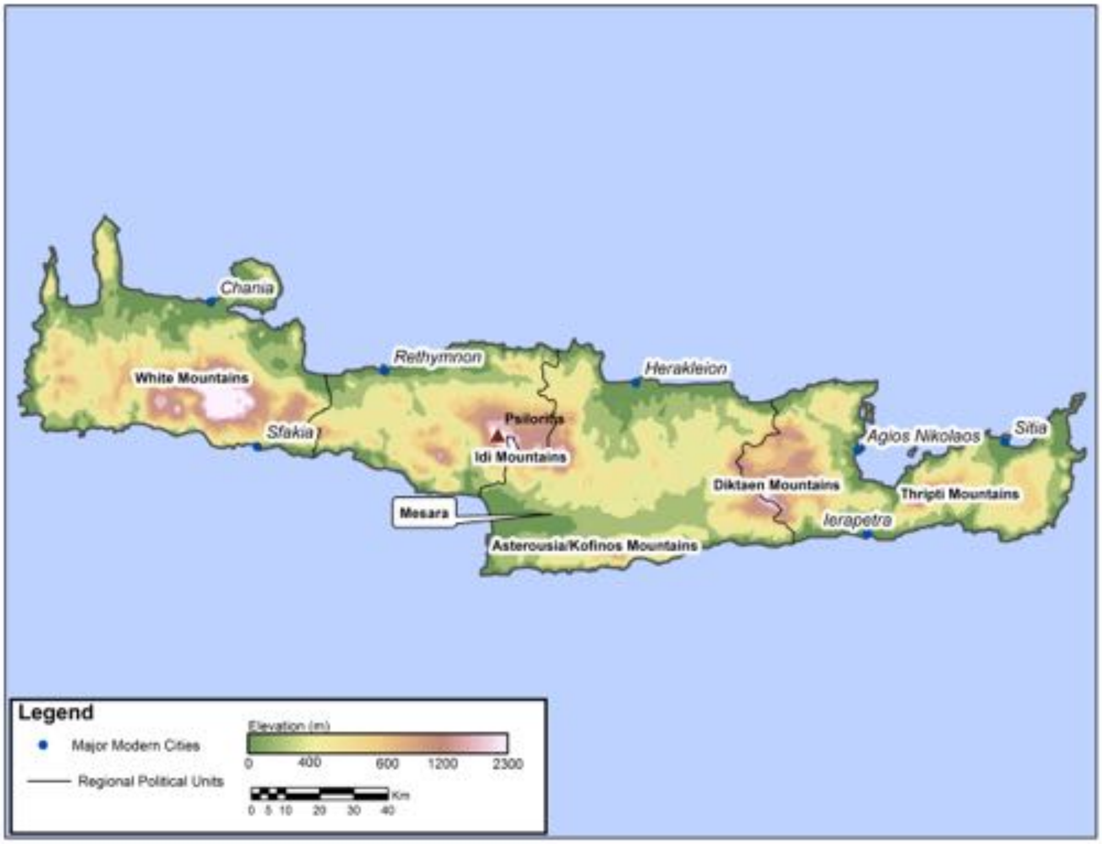

Figure 7.1: Topographic map of Crete with mountain ranges and modern major cities.

Together, these mountains are pervasive; only ten percent of the island is at an elevation less than 100m, and more than half of the island (approximately 55% of the landmass, equating to 4584 km^2 of the island's 8336 km^2) is at an elevation greater than 400m (Allbaugh 1953: 42).The island has an average elevation of 460 m (Vrochidou and Tsanis 2012). To further underscore this point, slightly less than two-thirds (~65.6%) of the island was identified as "mountains and hills" during a 1929 land-use survey performed by the Greek government (5.5 million out of a total landmass of 8.378 million *stremma*[156]; Allbaugh 1953: 264).[157]

The shape of the island and the prevalence of the mountains make for narrow coastal plains. In fact, in many places the coast is formed by mountains dropping directly into the sea, which create a striking landscape, and make land-use in those locations challenging or impossible.[158] Four regions stand out as substantial coastal plains: a small costal plain at Kissamos-Kastelli, that rings the southern edge of Kissamou Bay in the far west; a plain to the south and west of modern Chania, a third, thin coastal plain that starts as a ribbon along the northern coast around Rethymno and progressively widens toward the east, and the Pediada plain that begins south and east of modern Herakleion, and stretches to Mallia. Two other lowland regions are worth highlighting: the north-south running isthmus of Ierapetra, where the island is at its

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156 A Greek *stremma* is about a quarter of an acre.

157 Morris (2002:3) notes that 10% of Crete is less than 100m above sea level, 35% is 100-400m, 30% is 400-800m, and the final 25% is 800m or more.

158 This is a fact that is noted by Allbaugh (1953: 42): "in many parts the mountains form a virtual wall along the sea," and put a bit more poetically by Rackham and Moody: "Like Athena bursting fully-armed from the head of Zeus, the mountains of Crete spring from the sea to their full height in less than 10 km. Looking at the White Mountains off the south coast, one faces a wall of rock 2,200 m high. This is about the same amount of relief one sees from the foot of the Alps, but about 700m higher than the Rocky Mountains as seen from Denver" (1996: 12)

thinnest, and finally the largest plain in the south-center of the island, the alluvial Mesara, where the basement rocks and steep mountains flanking to the north and south produce “conditions especially favorable to the accumulation of ground water” (Crosby 1949: 5).

This interplay between mountainous topography and small lowland plains appear to have played a major role in determining political boundaries both in the Late Bronze Age, and also in later history. Bennet notes that at least the primary palatial settlements at Knossos, Chania, Malia and Phaistos exist in topographically bounded regions that contain plains that would have provided an agricultural subsistence base (1990: 203). The palatial settlement at Kato Zakros serves as the exception to the rule as it is not positioned to have command over any substantial agricultural region, though its position on the eastern coast does imply an importance in inter-island—and likely inter-Mediterranean—trade. The natural topography provided convenient divisions between Classical polities on the island, as well (Bennet 1990, n. 50). Later, Venetian administrators, having originally divided the island into six political districts, eventually settled on four administrative districts, which better match the natural topography. In fact, the four Venetian districts, which laid the template for the modern political units of Crete, correspond closely to the four major massifs, as well.

Lowland plains where agriculture was both possible and productive are conventionally considered critical areas for the rise of complex civilization on Crete. Indeed, the main palatial settlements at Knossos, Malia, Chania, and Phaistos are in, or very near to, lowland agricultural regions. This is not surprising, as large sedentary settlements are often associated with agricultural areas. The flat, relatively open expanses of agricultural land would have made extensive plough-agriculture possible in these locations, and limited evidence both from textual sources (Palaima 1992) and a small faunal dataset (Isaakidou 2006) from Knossos suggest that cattle-driven plough agricultural did exist from the Neolithic onwards.[159] The importance of agricultural production (and therefore, the lowland plains) can be further inferred from the substantial storage areas in the Minoan palatial sites, and an apparent slight increase in storage at Knossos between the Proto and Neopalatial periods (Christakis 2004).

Interactions with these hinterlands, however, appear to have occurred in different ways across the island, especially early in the Bronze Age. Schoep argues that during the Protopalatial period, the growing settlement at Knossos had a more centralizing and directly controlling relationship with its hinterland, whereas Phaistos emphasized an indirect facilitation of exchange and distribution with the agricultural settlements in the Mesara (2001: 88-92). The organization of landholdings and the processes by which surplus agricultural produce were collected during the Late Minoan III period (the period corresponding to the Linear B documentation at Knossos) is also a matter of considerable debate. It is unclear whether the surplus agricultural products collected and administered at Knossos were farmed on "palace-owned" or "publicly" owned land (see e.g. Killen 1998; and also discussion of Minoan agriculture below).

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[159] Note, however, two important caveats that Isaakidou underscores: 1) the faunal sample set from Knossos is both small and somewhat skewed, seeing as it comes from a major centralized elite settlement and therefore leans toward animals that were likely consumed in feasting events; 2) evidence for arthropathies that are consistent with ploughing demands are present, but might also be the result of increase body size or usage in other traction activities (e.g. pulling carts or driving presses).

Despite these uncertainties, the high settlement density in the areas that have been surveyed illustrates the critical nature of the lowland plains as agricultural production centers as well as arteries for travel. The Mesara is the largest continuous lowland plain on Crete and covers an area of 362 km^2. It is situated on the south-central coast of the island, and runs approximately 43 km from west-to-east, and approximately 10 km north-to-south. As the largest alluvial lowland on the island and what Allbaugh estimate to be two-thirds of the better soil on the island, it has traditionally been the "bread-basket" of Crete (1953: 48). The Pediada is a similarly important alluvial plain, which was highlights by an early survey of Cretan soil and water resources as "a great depth of alluvium" (Crosby, 1949: 3). Unsurprisingly, this fertile plain appears to have been an important region during the Bronze Age as Panagiotakis (2004) has identified over 130 Proto-palatial and 100 Neopalatial settlements in the Pediada lowlands, south and east of Knossos (and west of Malia).[160] The lowlands of the Akrotiri Peninsula, to the north and east of Chania would have been an important hinterland for the substantial Minoan settlement at Chania. Moody (1987) identified over 287 Minoan settlements, with the densest periods of occupation occurring during the MMI-LMI (with approximately 150 settlements on Akrotiri), and a population that Moody et al. (1996) place as high as 13,000 individuals. The importance of the region appears to have been maintained into the LMIII, even though settlement numbers decreased to 76. The significance of Chania is evidenced in part by the Linear B administrative documents found at Chania (Hallager, Andradhaki-

[160] Panagiotakis's survey methodology and how he defined a "site" is unclear, so it is important to realize that the character of these settlements is likewise unclear (recall this as a common problem in Minoan archaeology, identified by Driessen [2004]; chapter 4, n. 107).

Vlazakis and Hallager, 1990) and the fact that it likely represents the settlement of *Ku-di-no-ja* (Cydonia) featured in the Linear B documents.

While the plains and lowlands clearly were important agricultural regions during the Minoan period, as discussed at length in chapter 4, mountains play an important role in shaping the way humans interact with the Cretan landscape. A quote from Pendlebury captures the importance of the mountains and the circuitous and complex travel routes they mandate: "…only those who have actually walked the mountains can tell how misleading a map may be [on Crete]… distances are useless. Times alone matter" (1939: 7). Generally speaking, wherever one stands on the island of Crete, mountains are at least an ever-present backdrop. As such, the mountains presented something of an economic challenge for the Bronze Age societies—to make the mountains a productive and useful landscape would have required ingenuity and persistence, and a wholly different production strategy than that employed in the agricultural plains. Whereas slope, elevation and short-growing seasons in the highlands make agriculture difficult or impossible, livestock, especially sheep and goats to make these more marginal environments productive.

Small highland plains that are scattered throughout the island punctuate the Cretan mountains. There are at least eight that are large enough to be notable, and include the Omalos, Anopolis, Askifou, Nidha, Anogeia Krousonas, Lasithi, Katharos, Limnarkos, Zyros, Katalioni and Lamnioni plateaus, as well as a number of smaller, less consequential plateaus (Pendlebury 1939: 5-6; also see fig. 7.2)[161].

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[161] It is worth noting that the spelling of these plateaus often vary throughout the literature due in part to differing conventions for transliterating Greek into English, and in part to the inflection of the Greek

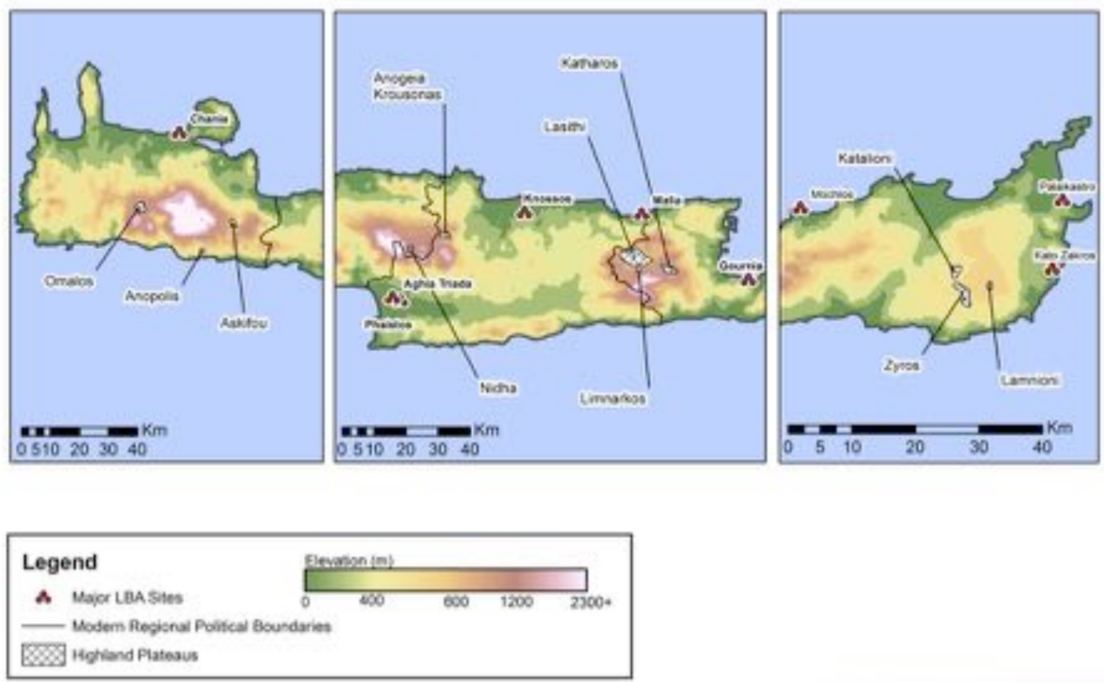

Figure 7.2: Topographic map of Crete highlighting major LBA settlements and major highland plateaus (highlighted in the text).

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language. Examples including Zyros/Ziros, Katalioni/Katalionas, Lamnioni/Lamnoni, Askifou/Akyfou, Nidha/Nida.

During the 20th century these highland plains served two purposes: the highest (above 1000m/~3500 ft; including the Omalos, Nidha, Katharos and Limnarkos) were seasonal summer pastures for sheep and goat flocks, and have been the site of

numerous cheese-producing/dairying shepherd huts (*mitata).* Lower plains (such as the Lasithi, Anopolis, Zyros, Katalioni and Laminioni) are cultivated and occupied year-round, but also maintain a substantial livestock population. The extent of highland forests in these uplands during the Bronze Age is a matter of some controversy (see *"Ecology"* below), but it is generally accepted that at least parts of these upland plateaus and the surrounding mountainsides probably had some woodland. Watrous (1982) notes the presence of stone axes at four Late Neolithic-Early Minoan I settlements on the Lasithi plateau, and he takes this as evidence for the clearance of woodland during that period. The high elevation of these plateaus, and the seasonal weather patterns that existed there would have made settlement in these locations uncomfortable and difficult during cold, snowy winter months, making a seasonal occupation more likely.

The topography of Crete likely impacted shepherding practices in two ways. First, the prevalence of mountainous landscapes with highland plateaus raised the potential for seasonal transhumance as an important strategy in livestock management. Transhumance of varying degrees was still an important approach to shepherding during the mid-20th century on Crete. Allbaugh explains that "…herds [of sheep and goats] moved up into the mountains in the early spring and returned to the coastal plains in the late fall…" (1953: 279). Lambing occurred either in the highlands from

August to September or in the lowlands from February to April. 19th and 20th century Cretan shepherds in east Crete used the Limnarko plateau in a similarly seasonal fashion, occupying the highlands between April and November, and returning to lowlands landholdings for the winter months (Blitzer, 1990: 38). Seasonal transhumant routes linked the Limnarko plateau with Chersonissos on the north coast (a distance of approximately 19 km), Myrtos or Tsoutsouros on the southern coast (a distance of approximately 16 km and 30 km respectively), or the central Pediada lowlands (a distance of approximately 30 km - 45 km depending on the location in the Pediada). A second pastoral strategy would have involved remaining in the lowlands year round and existing in concert with agricultural production during the summer months. See below (*Relationships with Agriculture*).

7.3 *Climate:*

Climatological requirements for shepherds on Crete are the same as those on Cyprus: access to reliable water and grazeland resources, and temperature regimes that are amenable to keeping sheep and goats. Precipitation and seasonal temperature are therefore of considerable importance to shepherding practices on the island. Crete also shares with Cyprus the paucity of paleoclimate data available to effectively characterize the climate of the Minoan period, as only five sediment cores have been collected across the island, and only four of these have ^{14}C dates that can tie them to the Late Bronze Age climate (see below; Moody et al. 1996, Bottema and Sarpaki

2003).[162] While broad climate proxies such as data from the GISP2 Greenland ice core and an Aegean Sea sediment core provide access to general global trends in climate, more localized commentary on Minoan climate requires data with a tighter geographic resolution that is not, at present, available. Modern climate, therefore, provides a baseline from which to evaluate ancient climatology, and to which the paleoclimate data sources can be compared in order to create a broad climatological context for the Minoan period.

Generally speaking the Cretan climate is a Mediterranean climate with hot, dry summers and mild, wet winters, and therefore, not dramatically different from the climate on Cyprus. Perhaps unsurprisingly, given the severity of the terrain, topography plays a considerable role in shaping localized climates on Crete (a situation that is not unlike Cyprus; recall, for instance, Christodoulou's

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[162] While not directly related to the larger goals of this project, this is an opportunity to deconstruct a recent overly optimistic and overly ambitious publication by Moody (2005). Moody's attempt at a synthesis of broad-scale climate data, localized pollen cores and archaeological data leads her to construct a "Late Bronze Age Climate Changing in the Aegean" timeline, with apparent hundred-year accuracy. This is quite optimistic considering that sediment cores from around the Mediterranean rarely have ^{14}C dates that can provide that kind of centennial resolution (in fact, these cores rarely have ^{14}C dates that can provide 500-year resolution!). Moreover, Moody appears to completely mis-interpret data from the Soreq Cave (Bar-Matthews, Ayalon and Kaufman 1997; but also see Bar-Matthews, Ayalon and Kaufman 1998; Bar-Matthews and Ayalon 2011, especially because the 2011 paper provides much higher resolution dating). She also cites somewhat ambiguous and coursel dated data from the salt caves at Mt. Sedom in Israel (Frumkin et al. 1991). Based on these two studies, Moody writes, "Data from the Dead Sea area (Israel) indicate warmer and wetter conditions from c. 1800/1700 BC to c. 1300 BC" (2005: 467), however Bar-Matthews, Ayalon and Kaufman's data show a general drying trend between 1750 BCE and 1100 BCE, with only a very slight wetter period (though still drier than the present) between 1450 BCE and 1100 BCE. Frumkin et al. note that the width of the salt cave passages actually decreased between 4200-3200 BP (2884/2760BCE- 1449/1443BCE), increased again slightly around 1410 BCE, and then decreased by 1300 BCE. Decreasing cave width is an indication of fewer rainstorms over Mt. Sedom, and therefore a drying climate—indeed they specifically refer to this as a period of "aridity" between 4200-3200 BP (1991: 198). A period of drying until the mid-15th century BCE, then a slightly moister period, followed by continued drying is a trend matches the isotope-data from Bar-Matthews, Ayalon, and Kaufman. It is therefore somewhat unclear how Moody comes to her conclusions, though one might conjecture that she performed a ^{14}C correction on the BP dates provided by Bar-Matthews, Ayalon and Kaufman, and Frumkin et al., when the dating method used by both studies was Uranium-Thorium dating and not ^{14}C.

characterization of "a well-watered west and south mountainous Cyprus and a thirsty lowland Cyprus" [1959: 40]).[163] Mountains rising hundreds of meters over just a few horizontal kilometers can produce highly variable weather systems, so that weather, and especially precipitation regimes on Crete are heavily orographic (i.e. strongly correlated to elevation, such that highlands receive more precipitation than the lowlands). This is the is result of two main ways that mountainous terrain can impact atmospheric flow: first as obstacles that either halt or force directional change in weather systems, and second as sources of radiated heat that warm atmospheric flows and cause condensation and precipitation (Naoum and Tsanis 2003: 1900).

The length of the island west-to-east, and the presence of the substantial White Mountains in the west contribute to the considerable variation in climate. Prevailing weather patterns in the Mediterranean move from west to east, and as weather systems make landfall in west Crete, the mountains there force an uplift and condensation, leading to precipitation. The mountainous backbone of the island causes this orographic effect to continue as weather systems progress across the island, such that the eastern two-thirds of the island exists in a rain-shadow.[164] As storms dump this rainfall over the western portion of the island, there is little rainfall left in weather systems by the time they reach the east coast (Reiter 1975, especially section III-85).

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[163] Broadly speaking, the islands of Crete and Cyprus receive similar amounts of rainfall, even when size difference is taken into account. Crete, the smaller of the two at 8336 km^2 receives 2650 million cubic meters of precipitation annually (an average of nearly 318,000 m^3 per km if extrapolated across the whole island), whereas Cyprus receives 2750 million cubic meters over it's 9250 km^2 (an average of 298,000 m^3 per km if extrapolated across the island). This exercise is obviously artificial as it fails to take into account the numerous variations that would have impacted localized precipitation, but it serves as a useful exercise in illustrating the similar amounts of rainfall received by the islands, and the slightly drier conditions on Cyprus.

The Mediterranean climate is compounded by the seasonal nature of precipitation on the island.[165] Seven-eighths of the average annual rainfall on Crete occurs between October and March (see table 7.1). The island has an estimated mean annual precipitation of 750mm, though rainfall varies substantially, geographically and temporally. Rackham and Moody observe that precipitation can fluctuate year-to-year from half to double the average in a given location (1996: 35). Thus, the western portion of Crete is considerably wetter than the east, though the island gets more rainfall, on average, than Cyprus, even in the dry east. Average annual rainfall for the early 20th century differed by 500mm between the west and east of the island, with Chania in the west receiving an average of 706.89 mm, while Ierapetra in the east received 206.74 mm (see Table 7.2). Naoum and Tsanis (2003) estimate a maximum rainfall of 928mm in the east (at Petras) and 1875mm in the west (Tavronitis) for a 10-year return period.[166] In other words, this model predicts that within a period of ten years, the west of Crete will receive 1875mm of annual precipitation in its wettest year, while the east of Crete will receive 928mm of rainfall during its wettest year. This nearly 1000mm difference between 10–year maximums illustrates that during wetter years the precipitation disparity across the island is even more pronounced than average years.

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164 Rackham notes: "[Mediterranean] Islands with mountains higher than 600m intercept rainfall, giving rain-excesses on the north-west side of the mountains and rain-shadows on the south-east, as in Crete" (2008 :37).

165 This is the result of winter winds, the"cold and dry westerlies [that] sweep in and absorb water vapor evaporating from the warmer Mediterranean" (Drake 2012: 1864).

166 A more recent study provided evidence showing that mean annual precipitation (as opposed to 10 year return period cited above) decreases 400mm between west Crete and east Crete (Vrochidou and Tsanis 2012).

	Khania	Iraklion	Sitia	Ierapetra	Anoyia	Mesara
April-Sept. (Dry Season)	82.55	82.30	42.42	23.37	156.21	42.67
Oct.-March (Wet Season)	624.88	433.07	413.77	183.39	967.49	606.30
Annual Total	706.88	515.37	456.18	206.76	1123.70	648.97

Table 7.1: Average annual rainfall (in mm) on Crete between 1894 and 1929 (for the Mesara 1936-1939) [adapted from Allbaugh 1953:44, Table 1].

Month	**Khania**	**Iraklion**	**Anoyia**	**Sitia**	**Ierapetra**
April	28.95	27.18	54.36	15.24	8.13
May	15.24	27.43	62.48	16.51	4.32
June	2.29	1.78	6.1	1.78	5.84
July	0.51	1.02	2.03	0	0
August	3.3	7.11	14.22	0	0
September	32.26	17.78	17.02	8.89	5.08
October	37.59	38.61	70.87	39.88	14.22
November	121.67	99.57	157.23	78.23	31.24
December	168.66	91.95	232.41	93.22	39.62
January	128.78	85.6	215.14	89.15	52.32
February	100.58	71.63	172.72	68.33	28.7
March	67.06	45.72	119.13	44.96	17.27
Dry Season (April - September)	82.55	82.3	156.21	42.42	23.37
Rainy Season (October-March)	624.34	433.08	967.5	413.77	183.37
Total	706.89	515.38	1123.71	456.19	206.74

Table 7.2: Average monthly rainfall Crete (1894-1929) in mm [Adapted from Allbaugh 1953; Table A3, p. 467)

With these characterizations of the modern Cretan climate as a backdrop, we can turn towards qualifying the Cretan climate during the Bronze Age. The evidence for modeling the Bronze Age Cretan climate is rather limited amounting to proxy data for sea-surface temperatures, five sediment cores, and a series of paleobotanical studies (see *Ecology* below). Weaving these data together, however, makes it possible to broadly characterize the Cretan climate duringthe Late Bronze Age, which appears, like on Cyprus, to have been a period that trended towards slightly drier and cooler than the present.

Proxy data for northern-hemisphere cooling and Mediterranean sea surface cooling during the Late Bronze Age offer evidence for broad climatological trends during this period. The percentage of warm- and cold-water formanifera from an Aegean deep-sea core off the north-east coast of Crete indicates that the sea was experiencing a period of cooling between 1700 and 1150 BCE (Rohling et al. 2002)[167]. This is matched by a 3°-4°C cooling in the Ionian Sea between approximately 2000 BCE and 1100 BCE (Emeis et al. 2000, fig. 4c) and similar general cooling in the Adriatic culminating around 1250 BCE (3.2kyr BP; Sangiorni et al. 2003: 727). The cooling of these sea surface temperatures, and, in turn a reduced disparity between sea surface and air temperatures would have led to less evaporation, and therefore less precipitation in the Mediterranean basin.

Speleothems from the Soreq Cave studied by Bar-Matthews, Ayalon and Kaufman (1997; 1998), and the water level in Dead Sea salt caves near Mt. Sedom in

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[167] Drake (2012) places this cooling event at 1694-1197 BCE; however the modeling of these dates is not necessarily precise enough to change the broader "cooler and wetter" trend during the LBA.

Israel (Frumkin et al. 1991) underscore the progressively drier Mediterranean climate during this period. Oxygen and carbon isotopes sampled from speleothem layers in the Soreq cave provide proxy data for a progressively drying climate in the eastern Mediterranean between c. 2150 BCE and 1100 BCE (Bar-Matthews, Ayalon and Kaufman 1997; 1998, Bar-Matthews and Ayalon 2011). These data indicate that the period between c. 1750 and 1100 BCE was slightly drier than present. The study by Frumkin et al. (1991), which analyzes the width of salt caves as proxy data for water levels in the Dead Sea region, reiterates this trend—a general progression from wetter to drier between 1750 and 1100 BCE, with a slightly wetter period during the mid-15th century BCE.

Thus, the broad trend for cooling and drying evidenced by the GISP2 Greenland ice core and Soreq Cave speleothems were likely part of general climatic cooling and drying that also affected the Aegean and Crete. Like on Cyprus, the island of Crete seems to have experienced a climate that was roughly similar to—if slightly drier than—the present during the Late Bronze Age.

Reconstructing a more localized paleoclimate for the Bronze Age on Crete is challenging because, like on Cyprus, sediment traps are rare, and only a few sediment cores have been sampled (Bottema 1996). A small collection of sediment cores corresponds to periods of the Bronze Age, however, it is worth noting, as Angelakis and Spyradakis do, that these come from "marginal or lowland regions and consequently do not appears to reflect accurately mountainous areas" (1996: 165).

One core sampled from Aghia Galini represents a period from ~10,090-4650 BP[168] (9811/9699BCE- 3500/3369BCE; 95.4%[169]; Bottema 1980); two additional cores were taken from around Lake Kournas. The first from the Delphinos stream bed dated to ~8300-3200 BP/7375-1470[170] BCE, while the second, from the lake itself, dating to 3500BP-present/2118-1690BCE (95.4%)[12] to the present (Bottema and Sarpaki 2003). The third selection of cores comes from Akrotiri peninsula north-east of modern Chania: the Tersana core which has two ^{14}C dates: 5800 ± 130 BP/4954-4364 BCE (95.4%)[171]and 2110 ± 130 BP/411 BCE-213 CE[13]. The Limnes core did not provide any ^{14}C dates, and is therefore difficult to attribute to specific ancient periods with any confidence.

The chronological resolution of these cores is quite course, similar to those published by Kaniewski et al. (2010; 2013) on Cyprus and in the Levant. Despite this, broad paleoclimatological trends can be detected based on the pollen from these cores. However, given the micro-climates and difference in climate between the western and the eastern portion of Crete, the fact that the cores have been taken from the central and western portion of the island makes it difficult to extrapolate a Bronze Age climate for East Crete.

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[168] The dating for this core is tenuous at best. Only one ^{14}C date was acquired, and this date came from organic clay, not a short-lived ^{14}C sample. The BP dates provide here are extrapolated by Bottema based on this date and estimated rate of sediment deposition, while the BCE dates are calculated from these by accounting for 1950 CE start date of BP dating system.

[169] These cal BCE dates were not provided in the original Bottema & Sarpaki article and are calculated using OxCal v.4.2.4 and the IntCal13 calibration curve (Reimer et al. 2013).

[170] Bottema and Sarpaki provide dates for this level as "3600-3200 BP (1935-2470 cal BC)", but this must be a typo and 1935-1470 cal BCE is actually correct.

[171] Original ^{14}C calibration performed by Moody et al. used the ^{14}C calibration tables of Klein et al. (1982), and provided 5070-4415 cal BCE dates. Like those above, the cal BCE dates used here use OxCal v.4.2.4 and the IntCal13 curve (Reimer et al. 2013).

The Aghia Galini core provides something of a climatological baseline for the remaining pollen cores as its most recent layer is dated to 3500/3369BCE, and therefore well before the Late Bronze Age on Crete. This is a period that experienced a wetter climate than present according to the $\delta^{18}O$ and $\delta^{13}C$ isotope values from Bar-Matthews, Ayalon and Kaufman (1998). Bottema notes a dominance of broad-leafed deciduous trees that are characteristic of more northerly European forests, especially oak towards the most recent end of the pollen core (1980: 211). This is unsurprising due to a wetter climate, and Bottema finds an "almost complete absence of Mediterranean elements…in striking contrast to the vegetation today" (1980: 193).

The more recent cores from Lake Kournas and the Delphinos drainage have a high percentage of arboreal pollen in the Early Bronze Age, including oak and olive pollen. However, from c. 2200 BCE onwards, arboreal pollen gradually decreases in the core from 70% to 50%. The course resolution of especially the Delphinos core makes it difficult to pinpoint this transition, but judging by the macroclimate models, it is likely that this decrease, and a general trend of decreasing deciduous tree-pollen is due to a drying climate. Nevertheless, Bottema and Sarparki describe the region as partially "open forest…on parts of the hills surrounding Lake Kournas" with some land that "had already been turned into farmland many centuries earlier" (2003: 742).

The Tersana core published by Moody et al. (1996) provides additional support for a general drying trend towards the end of the Bronze Age. This is despite the fact that Moody et al. argue for a "Neolithic and Bronze Age climate on Crete [that] was significantly less arid than the modern climate" (294). In fact, the evidence from the Tersana core is more complex: deciduous Central European tree pollen (especially

Tilia, commonly known as the Linden or Basswood tree) are present in the sediment cores through the Middle Bronze Age, but decline and then disappear by the end of the Late Bronze Age. Moreover, Moody et al. suggest a Bronze Age trend from a woodland-garigue to a drier woodland-steppe environment (not unlike Kaniewski et al. 2013 who detect a Bronze Age transition from Mediterranean woodland to coastal steppe near Larnaka, Cyprus). In fact, the pollen evidence from the Tersana core falls nicely in line with the Aghia Galini, Lake Kournas and Delphinos pollen cores, and indeed with the general regional climate indicators: the Early and Middle Bronze Ages generally appear to have been periods that were somewhat wetter than present, while the Late Bronze Age shows a marked drying trend, culminating in a final two-to-three centuries that were drier than present.

Archaeological data also supports a Late Bronze Age Crete that was as dry as (or slightly drier than) the present. LMIB wells at Palaikastro, a Minoan town on the north-eastern coast of the island, were constructed to access a water table that is nearly the same depth as at present (3m above sea-level; Flood 2012: 33).[172] Wells at or near Knossos (e.g. in the "Caravanserai" at Knossos, and at Mavrokolybos, about 700m from central Knossos) are still a source of water at present indicating a similar water table during the LBA (Angelakis and Spyradakis 1996).

Climate must have been a key variable in shaping the way pastoralists interacted with their environment. Moody (2005) notes that the emergence of Minoan peak sanctuaries, mountain-top sites characterized by the presence of ritual objects, especially votive figurines—at the transition between EMIII and MMI corresponds with the apparent aridity event ~2200 BCE. In an already semi-arid environment, this event may have encouraged a change in pastoral strategies, either forcing a change from localized herding to a more transhumant pastoralism in order to access better grazeland in the highlands or, if a transhumant mode of herding already existed, this aridity may have driven pastoralists higher into the mountains. These climatological pressures, which in turn forced changes in economic strategies, Moody argues, would have created cultural stress and led to religious fervor and the founding of peak and cave sanctuaries in the highlands of Crete to appeal to supernatural weather forces.

It is worth noting here that the c. 2000 year Bronze Age was not a period of uniform climate on Crete—this is a fact that is easy to gloss over or forget, but important to recognize. Present evidence suggests at least two major aridity events that would have taken place during the Bronze Age. The first around 2200 BCE may have been responsible for the initial use of the highest upland pastures and the intensification of settlement in Lasithi (Moody 2005; Watrous 1982: 12). The second aridification event, which appears to have begun at the onset of the Late Bronze Age, carrying through to the early first millennium, may have contributed to the "collapse" of the palatial civilization on Crete (Drake 2012). This was followed by an apparent retreat to mountain "refuge" settlements at the very end of the LMIII (Nowicki 1996; Nowicki 2001). These two climate events—and the untold number of smaller/more regional events that may have occurred throughout the period for which we have no

[172] Contrast this with the initial excavation of these wells at the turn of the 20th century, which was halted by a water table 8m above sea-level (Gifford 1992).

evidence[173]—could have encouraged at least generational changes in agricultural and pastoral strategies. There is great scope for future paleoclimate work to better flesh out the environmental drivers that would have undoubtedly shaped agropastoral strategies.

7.3.3 Ecology:

The intricacies of Cretan topography and climate combine to create a unique and quite variable ecology on Crete. Moody sums this up: "Crete, more than any other Mediterranean island, is a mini-continent with environments ranging from sub-tropical (Preveli, AV), to temperate (Derés, Ky), to artic (Mt. Páchnes, Sf)—all within 30 km of each other" (1997: 62). Reconstructing the ancient ecology—and especially the highland ecology that is of particular interest to an investigation into the possibilities of transhumance on the island—is further complicated by the fact that much of the paleobotanical data that is available comes from lowland sites. Moreover, most of the "Minoan ecology" scholarship has considered the Minoan environment via an art historical lens, focusing on the depiction of various natural themes on ceramics, in frescos, and seal-stones (e.g. Hood 1976; Immerwahr 1990; Doumas 1992), but fewer studies have considered nature from an ecological perspective.

Bronze Age Cretan environments can be grouped into five main "Mediterranean vegetation" categories: 1) forest, 2) savanna, 3) maquis, 4) phrygana/garigue, 5) steppe (Rackham 2008: 37). *Forest* refers to land densely covered in trees so that ground vegetation receives little or no sunlight; *savanna* is

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[173] The fickle nature of precipitation regimes on Crete has persisted into the 20th century. Average total rainfall at Ierapetra for the period 1894-1929 was 206.76 mm, but the same location received 464.06 of rainfall between 1932-1939 (based on Allbaugh 1953, Tables A3 and A4).

land that is covered by phrygana/garigue or steppe punctuated by large, often solitary trees; *maquis* is made up of trees (often evergreen trees) that have been reduced to shrubs due to local climatological or soil stress; *phyrgana/garigue* is land dominated by vegetation that can only occur as shrubs, and *steppe* is land covered by grasses and other herbaceous and bulbous plant species. The land below the tree-line on Crete (which exists between 1600 and 1800m depending on the underlying soil morphology and localized precipitation) can experience any or all of these vegetation regimes.

The Cretan landscape is, therefore, variegated and variable. Phyrgana, maquis and steppe exist in a "mosaic rather than as large areas of one type," in part because of the highly localized nature of precipitation on the island, and in part because of differences in island geology and sedimentology (Vogiatzakis and Rackham 2008: 255). Lowland areas, especially those with decent access to water and relatively fertile soils (i.e. the lowlands that would eventually become agricultural regions beginning in the Late Neolithic/Early Bronze Age) likely were forested or steppe landscapes before human intervention. Forests, which also would have been prevalent in mountains up to the tree-line (see below), consisted of Turkish Pine (*Pinus brutia*), Mediterranean Cypress (*Cupressus sempervirens*), and Evergreen or holm oak (*Quercus ilex*). Maquis landscapes included shrub versions of these trees, while phrygana/maquis environments, which are also resistant to grazing (and will only be consumed by livestock when other graze is not available) include plant species such as Spiny Broom (*Calicotome villosa*), Thorny Burnet (*Sarcopoterium spinosum*), Thyme

(*Thymus capitatus)* and *Genista acanthoclada.*[174] With the climate similar (if somewhat drier) than present, the ecology on the island was probably also similar. Limited by available evidence, the general picture of Bronze Age Crete is an environment that was savanna or steppe-land in lowland areas that received reliable precipitation, phrygana/maquis in mid- and higher elevation regions, especially in the drier east, and highlands punctuated by forests, with more woodland in the wetter west.

Deforestation is a topic of considerable debate concerning the Bronze Age Cretan environment. Traditionally it has been assumed that parts of Crete—especially the mountains—were heavily forested during ancient times, and the present lack of major woodland is a result of human actions. Pendlebury, for instance, suggests, "there is a strong probability that in Minoan days at least the whole island west of Ida was a great virgin forest which precluded the advance of civilization except on the coast" (1939: 6). More recently Chew argued that the development of urbanism and growing Bronze Age population led to intensive natural resource exploitation, including deforestation. "Deforestation generated soil erosion and flash flooding…wood scarcity at Knossos forced changes in production locations or resulted in the closure of facilities" (2001: 49).

Despite these claims, the evidence for deforestation on Crete is largely circumstantial, and the implication that the disappearance or reduction in woodland could only be attributable to anthropogenic factors is overly simplistic. Moody (1997) makes a convincing argument for the resilience of the Cretan landscape, noting

[174] There is not common name for this species.

that flash floods, droughts, fires and over-grazing are as possible to occur because of natural processes as they are to be caused by human hands. Moody and colleagues have observed that stressors—drought, flooding, browsing livestock, woodcutting, or burning—whether man-made or natural do impact the environment, but "as soon as the stress disappears, the vegetation rebounds" (1997: 72). Thus, assuming a process of island-wide deforestation (or at least deforestation of the island west of Ida, as Pendlebury did) fails to take into account larger climatological events that may have impacted the ability of forests to thrive in the Bronze Age environment. Vagiatzakis and Rackham further reason that the lack of endemic predators on the island during the Pleistocene and Holocene would have caused heavily grazing no less disruptive than caprines during historical periods. Because of this, "native plants, especially the endemics are adapted to avoiding or resisting browsing to an even greater degree than in the rest of the Mediterranean" (2008: 256).

Like Cyprus, a significant "mountain woodland" exists at present in the west and small parts of central Crete, and given evidence for woodland clearing in the Lasithi Plateau, perhaps woodland existed in eastern Crete during prehistory. Mountain ecology would have been of particular concern for shepherds who may have used (or perhaps even created) mountain meadows for summer pasture.[175] These regions are defined as "more or less densely wooded pastures between (500-)800-1400(-1600)m, frequently interrupted by stretches of dwarf-shrub dominated Aegean

[175] Vogiatzakis and Rackham note "occupational burning every few years, to reduce the undershrubs and improve the pasture, has been linked to shepherding for centuries if not millennia. Burnt areas generally have the richest flora, with many annuals and short-lived perennials sprouting from seed laid down after the last fire" (2008: 260).

phrygana[176]" (Bauer et al. 2011: 73). This ecological niche presents an opportunity for silvopastoralism: the grazing of livestock in forested environments, in a way that is "largely an opportunistic activity that makes beneficial use of forest herbs and shrubs which would otherwise go unused by humans" (Sharrow 1998: 211). Silvopastoralism exists in many modern temperate environments including the Alps (Mayer & Huovinen 2007), New Zealand and Australia (Mead 1995; Benavides et al. 2009), and the Pacific Northwest in North America (Sharrow & Fletcher 2003), and in these cases silvopastoralism provides an opportunity to grow trees for lumber resources, while also pasturing livestock. While an attempt at preserving of timber may play some role in the use of silvopastoral strategies in Mediterranean environments, it provides a way of using steep, mountainous terrain that would otherwise be unable to be farmed.

In sum, the shepherding of sheep and goats present an opportunity to put land that would otherwise be marginal for agricultural purposes to use. This includes three ecological niches on Crete: 1) the maquis and phryagana/garrigue regions that make up a substantial portion of the Cretan landscape, especially in the dry, eastern portion of the island, 2) the mountain woodlands and meadows that are more characteristic of the western portion of Crete, whose steepness and distance from coastal settlements make agricultural unattractive, and 3) the highland plateaus such as the Lasithi, Omalos, Nidha, and others, whose elevation and cold winter climate would make year-round occupation and agriculture difficult. Livestock management—and especially the relatively mobile, relatively hardy and relatively adaptable sheep and goat—make it possible to bring these areas under production.

[176] A term that is interchangeable with "garrigue".

7.4 ***Location and Movement of Animals:***

Environmental data illustrates that shepherding could have been practiced in a variety of locations across Crete, with varying degrees of productivity and seasonal movement. Just as in the case of Late Cypriot shepherding, the question of location and movement of sheep and goats on Crete is based in part, on a question of "transhumance or not?" This is something of any overly simplistic approach to shepherding strategies, however, as ethnographic research by Halstead (1991) has shown that there have been at least three distinct shepherding strategies at play in the Pindhos Mountains of north central Greece in the 20th century. One the one hand, the Sarakatsani are described by Halstead as "nomadic specialized pastoralists" characterized by large sheep flocks and fewer goats, whose primary emphasis is on animal productions, namely dairy, supplemented by wool. The Sarakatsani required access to a market as an institution for exchange in order to convert their animal products into other staples goods they needed but did not produce on their own. Sheep and goats were grazed in the lowlands on uncultivated or fallow fields during the winters and early spring, and driven to the highland mountain pastures during the summer months where they built up fat reserves. Sarakatsani have traditionally lived in tents and travel to where pasture is available, and can therefore be labeled as nomads.

Vlach pastoralism is similarly focused on animal products, but is slightly more diversified as livestock include horse and mules in addition to substantial sheep and goat flocks. Vlach shepherding is characterized as what might be called "reverse transhumant" as permanent homes are in the highlands and are returned to every summer, while winter grazing locations shifted year-to-year as they were determined by where grazing rights could be secured. This seasonal summer sedentarism allowed the Vlach economy to involve craft production, especially textile and leather goods, as well as small scale summer cultivation in their permanent mountain homes. Craft production provided supplementary income, while agricultural products augmented food acquired from market exchange of animal products.

Halstead's third category is high-altitude mixed farming. These sedentary agriculturalists live year-round in the mountains, and have adjusted their crop rotation and farming strategies accordingly. Their mixed-farming relies on livestock as well as cultivation, and families often own small numbers of sheep, goat and cows which are used for traction, milk, and rarely, meat. Local mixed farming takes advantage of communal highland pasture during the summer, and livestock are stall-fed for the five- or six-month winter. This requires growing, collecting and storing fodder for the winter and represents another strategy—beyond transhumance or animal movement—for keeping livestock. This kind of mixed-farming does limit the scale of animal production, however, and the complications of foddering would make large-scale livestock management challenging.

The Linear B archives from Knossos contain tablets concerned with the location and movement of livestock (and especially sheep flocks), and are a considerable resource for characterizing shepherding strategies that is not available on Cyprus. The tablets that deal with sheep are the single largest thematic group of tablets in the archive—a point that underscores the apparent importance of sheep (and wool) in the Late Minoan Knossian economy. The tablets are written in a consistent organization, with the name of an individual, often identified as the flocks' shepherd, written in a large hand on the left side of the tablet, and a horizontal line dividing the top and bottom of the right side. Above the line is usually recorded another name of an individual variously referred to as a "collector" or an "owner" followed by a tallying of animals, which are differentiated by sex (i.e. rams/wethers and ewes). Below the line is a place name and any commentary, including the relative age of animals in the flock (new, young, old) and the relatively frequent recording of what seems to be a deficit of animals delivered (Palmer 1963: 177; Ventris and Chadwick 1973:201). While the tablets contain a great deal of information both as individual tablets and as a group, the place names provide the most useful data for deciphering the location of Minoan flocks. The primary challenge with these place names, however, is that many have not been positively identified with known geographic places, thus locating the Minoan flocks cannot be done with perfect confidence. Moreover, it is not entirely clear what the place name associated with specific flocks is meant to signify. More than likely, these place names are regional identifiers that help to structure the Linear B system, but flocks are probably pastured outside—but within a few days vicinity of—the places recorded on the tablets.

Thirty-eight different place names are present on the Linear B livestock tablets that discuss sheep or goat flocks. These are divided into the C-series and the D-series, both of which contain tablets that are concerned with herd composition and delivery (or the failed delivery, i.e. deficit) of specific animals, however the D-series, especially the Dk and Dl tablets are also concerned with wool deliveries. Of these thirty-eight place names, at least Amnisos (Linear B: *A-mi-ni-so/A-mi-ni-si*-ja), Phaistos (LB: *Pa-i-to)*, Lato (LB: *Ra-to*), Lyktos (LB: *Ru-ki-to*), Tylissos (LB: *Ti-ri-to*), Siteia (LB: *Se-to-i-ja*), Itanos (LB: *U-ta-no*), Aptara (LB: *A-pa-ta-wa*) and Kydonia/Chania (LB: *Ku-do-ni-ja*) can be positively linked with known geographic locations. Bennet further speculates that the Linear B toponym *Ra-su-to,* which appears on a number of D-series tablets[177] might correspond to Lasithi (1985: 240). Halstead (1999a, 1999b; and also Killen 1977) note that these nine toponyms can be organized into two groups: East/Central Crete (Phaistos, Lato, Lyktos, Tylissos, Siteia, Lasithi, and Itanos) and West Crete (Chania, Aptara). Aside from Phaistos, all of these locations are on the north coast of the island, and while this list is hardly exhaustive as twenty-nine place names remain to be deciphered, even in this small sample, sheep flocks are associated with mountainous areas (Lasithi, Lato, Lyktos) as well as coastal locations (Siteia, and especially Itanos). The D-series texts refer to only central or eastern locations while the C-series texts refer to both central and western locations.

The texts, therefore, attest to the fact that shepherding and livestock management was an important productive strategy in a number of locations across the island. Livestock (and specifically sheep and goats) appear to have been herded and maintained in many of the varied environments present on Crete, and were not restricted to a specific location or region of the island. Toponyms listed on the Linear B documents are likely somewhat arbitrary administrative regions, and the boundaries between these regions or the reasoning behind dividing the island into these administrative districts is not yet well understood. This means that while these

[177] Tablets Da 1189, 1194, 1197; Db 1198; Dl 1046; Dm 1175; Dn 1200; Dv 1033, 1049, 1196, 1199,

toponyms can give a sense of the geographic location that flocks were linked to, the tablets are not so specific as to indicate where the flocks were pastured during most of the year—indeed, it is likely that some flocks were herded close to settlements (especially in lowland areas where pasturage might be readily available in fallow agricultural fields), while other shepherds may have engaged in transhumant pastoralism.

Given the varied locations of these sheep—a fact that is not all that surprising given the large-scale of shepherd on the island and the amount of land that this would have required (see below)—it is likely that shepherds employed any number of locations and movement strategies across the island. The Lasithi, Omalos, Nidha, Limnarkos and other highland plains remain important highland grazing locations into the 20th century (Blitzer 1990, Allbaugh 1953, Nixon et al. 1990) and would likely have provided ample opportunity for summer grazing in the Bronze Age. About three-fifths of the sheep and goats on Crete were herded in a transhumant fashion during the mid-20th century; Allbaugh explains, "these herds moved up into the mountains in early spring and returned to the coastal plains in the late fall" (1953: 279). However, transhumance and flock movement would only have made sense for the more specialized pastoralists (ancient versions of the Sarakatsani and Vlachs), and the remaining two-fifths of the mid-20th century caprine population were herded as part of a localized mixed farming strategy. Moreover, certain locations would have made transhumance into the highland plateaus more attractive. While shepherds at Phaistos may have pastured their flocks in the fallow fields of the Mesara, shepherds

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1502, 5213, 5295 and 5357.

at Lato or Lyktos may have chosen to make a 15 or 20 km trek to the Lasithi pastures. It is tempting to wonder whether flocks attributed to "collectors" were more likely to be herded in a large-scale, specialized transhumant strategy (not unlike the goatherds of the more recent Cypriot monasteries), while smaller flocks not connected with collectors were more likely to remain closer to a farmstead as part of a mixed farming strategy. Without additional evidence, however, this remains a largely speculative suggestion.

7.5 *Scale:*

The scale of Late Minoan shepherding is a critical consideration for two reasons: first, as noted above in reference to Late Cypriot shepherding, the size of sheep flocks is one of the primary variables that would effect land-use, location and movement. Second, characterizing the scale of shepherding helps to quantify the economic importance of livestock and wool production on the island during the Late Bronze Age. Scale exists at two, related but ultimately distinct, registers: an island-wide scale which is concerned with the total number of domesticated caprine flocks on the island and the primary concern of the palatial economic system at Knossos (which results in C- and D-series of the Linear B archive), and a more localized scale. This smaller-scale production can be considered in terms of individual shepherds and their flocks, or at the register of so-called "collectors" whose role appears to be something along the lines of localized palatial administrators or regional elites who oversaw and directly managed some of the shepherds and their flocks.

Allbaugh's study of agricultural production on Crete during the 20th century

CE provides something of a baseline for considering livestock carrying capacity at the island-wide scale. In fact, the management strategies available to shepherds probably did not change considerably over the course of the four millennia that separated the Late Bronze Age from the mid-20th century CE.[178] Allbaugh's figures are estimates produced from survey data acquired by interviewing various selections of the Cretan population, and are not particularly precise. The estimated livestock populations have a standard deviation equal to 21% of the population estimate for sheep, and 26% of the population estimate for goats. Despite this imprecision, the data do give a sense of the size of island-wide flocks possible for Crete: between 162,463-248,837 (205,650 $\pm$ 43187) sheep, and 129,870-221,130 (175,500 $\pm$ 45,630) goats. A more recent stocking density for 1992 CE produced similar number: 255,235 sheep and 84,993 goats (Lyrintzis 1996). While it might be argued, that mechanization and industrialization of Crete during the second-half of the 20th century CE may make these numbers less representative of Late Bronze Age livestock populations.

The Linear B archive is the logical starting point for considering the larger of two scales during the Late Bronze Age. The archive is incomplete, however it can still give a sense of the size of the sheep population that the palace of Knossos was concerned with. Killen (1964, 1993) and Halstead (1999a, 1999b) estimate that the flocks recorded in the Linear B tablets represent at least 85,000 sheep, and accounting for missing tablets, probably just shy of 100,000 sheep. Killen also highlights the fact that a substantial portion of these sheep (likely more than 80,000 animals, see below) were wethers—castrated male sheep most suitable for wool production. Halstead

[178] The most influential exception to this might be the use of shearing rather that more primitive

further noted that these palatial flocks, made up of predominantly castrated males would have been unable to reproduce themselves, and these palatial flocks must have relied upon additional flocks to subsidize their population.

The maintenance of palatial flock populations presents a unique problem: approximately 80%[179] of the sheep recorded in the Linear B tablets are wethers. An additional 8000-9000 ewes were run in these wool flocks as well and appear not to have been used for breeding (Olivier 1988: 264; Halstead 1991:344). These flocks were unable to reproduce themselves, thus additional breeding flocks would have been required to maintain the population of the wool flocks. Killen (1964: 87) estimates that wool sheep could have provided 5-6 productive years before being culled from the flock. This would mean a deficit of 14,750 - 17,700 sheep culled from the wool flocks each year.[180] Assuming an 80% lambing rate, this would require approximately 18,000 -22,000 breeding ewes, while the Linear B documents can only account for about 5,800 (Halstead 1991: 353, see table 3).

Where are these missing 12,000-16,500 breeding ewes? Halstead (1991, 1997, 1999) provides the most elegant and clever solution by proposing that private,

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plucking to remove wool from sheep.

179 Because the Linear B archive at Knossos is incomplete –and Olivier 1967, n. 3 estimates that the Dn series may be 80% complete, so this gives a sense of how complete the entire archive may be—the exact number of animals that this percentage represents is unclear. The fact that the Linear B archives likely represent one—or at most a few—years of record-keeping, means that this 80% is really only a ballpark value that could have shifted from year to year based on the ratio of male-to-female lambs born in a given year. Nevertheless, the rough estimate that this percentage provides is useful. The best estimates for the population of the collective palatial flock is something near 100,000 animals, meaning wethers likely amounted to approximately 80,000 animals. A precise number is not critical, however, as the general fact remains that the c. 12,000 breeding ewes documented in the Linear B documents would not have been nearly enough to produce a reliable stock of lambs to maintain the wether population size.

180 I reach this numbers by dividing an estimated 88,500 wool sheep by 5 (equaling 17,700) or 6 (equaling 14,750). I group weather and wool-producing ewes together as “wool sheep” here, because

non-palatial flocks not recorded in the Linear B archives actually subsidized the non-reproductive palatial flocks. The 12,000-16,500 missing ewes are therefore part of a much larger group of private flocks that are invisible as they are of no direct concern to Linear B adminstrators. Clues to this system are scattered through the archives, however. One of the primary purposes of the Linear B sheep texts appears to have been the recording and/or monitoring of the size of the palatial flocks returned after a year of care by shepherds. Deficits in the flock populations are recorded, but these are considerably lower than expected natural mortality rates; Linear B documents show a deficit of approximately 4%, when a natural death rate of around 15% is to be expected (Killen 1993). Halstead thus recognizes this 4% deficit as something other than a mortality rate. Instead, he propose a system by which the palatial bureaucracy expected a 100% return of the animals it put into private hands each year. In such a system, shepherds would have been required to use animals from their personal flocks to supplement the inevitable deficit due to unavoidable livestock deaths in the palatial flocks under their care. The 4% deficit that remains in the tablets likely represent situations where shepherds essentially went "bankrupt," unable to make up the livestock loss in the palatial flocks under their care.

Halstead's private-flock subsidy raises the question: how many sheep were in private flocks on Crete in the Late Bronze Age? This is a challenging question given the fact that private flocks do not appear in the Linear B documents. The lack of studied and published large-scale faunal datasets from Minoan settlements on Crete compounds this. Estimates are, however, possible with a bit of guesswork and

ewes in wool-producing flocks do not appear to have been expected to bear lambs as well—this would extrapolating out from a small section of the tablet archive. Halstead notes (like Killen 1964, 1993) that the flocks in the D-series can be divided into two groups, those with ewes (42.5% of the flocks recorded) and those without ewes (57.5% of the flocks recorded). However, wethers are further divided into yearling and old sheep. Halstead surmises that yearlings, old sheep, ewes and deficits can be grouped together to represent the animals that were drafted into palatial flocks to make up for the deficits incurred during the year under the shepherd's care—a total of 32.5% of the sheep in wool flock that contained wethers and ewes. These animals would be pulled directly from private flocks. Some shepherds would have had personal flocks that had a large enough population of wethers to replace lost palatial sheep with wethers from their personal flocks, and so in the purely wether-flocks, these deficits would not be detectable since the new sheep would be recorded as wethers, just like the lost sheep. However, smaller shepherds may have had to replace lost palatial wethers with whatever personal sheep they had on had, including yearlings, ewes and old sheep. Halstead therefore argues that approximately a third (the 32.5% of wool flocks that are ewes, yearlings, old or deficit) are sheep drafted from private flocks to cover deficits in palatial wool flocks. Based on this logic, and the fact that palatial wool flocks average 112 animals, Halstead reasons that shepherds must have maintained private flocks that were 120-150 animals to buffer against having to potentially contribute 35-40 animals to a palatial wool flock. The Linear B archive records 600 flocks, and is approximately 80% complete, meaning there were something like 750 flocks. If each of the shepherds maintaining these flocks had private flocks between 120-150 animals, that puts the

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have effectively diminished the quality and amount of wool the could produce.

private sheep number at between 90,000 and 112,500 head. When the palatial estimate (100,000) and the private estimate (90,000-112,500) are combined, the total of 190,000-212,500 is quite similar to Allbaugh's estimate for the mid-20th century.

The size of these flocks is substantial, both in terms of raw animal production, labor necessary for effective animal management, and the amount of land required to support these flocks. A stocking capacity estimate of 1 sheep per hectare led Bennet (1985) to conclude that the palatial flocks would have required 100,000 hectares (1000 km^2) of good graze-land, or 200,000-300,000 hectares (2000-3000 km^2) of more marginal pasture. Despite the fact that this density of one animal per hectare seems to be the general supportive capacity of the Aegean environment, 20th century Greek stocking densities have been observed at between 6.1 and 12.3 animals per hectare lowlands, and 4.3 animals per hectare in the highlands (Ispikoudis & Chouvardas 2005). It is not unlikely that Late Bronze Age stocking densities were closer to something like 5 animals per hectare. If this were the case, palatial livestock would have required approximately 20,000 hectares, or 200 km^2. If private flocks accounted for an additional 100,000 animals, they would have required an additional 200 km^2, bringing the total to approximately 400 km^2 of pasturage required for the approximately 200,000 Late Bronze Age caprines on Crete, a little over 12% of the island's landmass.

Two additional points are worth discussing briefly in relation to scale: first, the size of the individual flocks and the number of animals under the care of a given shepherd, and second, the scale of wool and dairy produced. Palatial flocks range in size from 30 to 400 sheep, but the most common flock size is 100 animals, and the average size was, as noted above, 112 animals (Killen 1964: 8; Halstead 1999). If, for the sake of simplicity, we assume a private flock that mirrored the size of the palatial flock, a shepherd could have been responsible for 60 to 800 animals, a spectrum that suggests small-scale, localized mixed farming on one end, and a substantial operation that would have required multiple shepherds and would certainly have been large enough for a transhumant strategy. The general point that Knossian wool flocks were subsidized by private flocks, however, is the most critical point as it indicates that Late Minoan shepherds—whether looking after 30 palatial sheep or 400—were "individuals of sufficient economic standing that they could supply significant numbers of sheep to the palace" (Halstead 1997: 188), and this likely encouraged them to pursue their own goals concurrent with their responsibilities to the palace.

The scale of production for these flocks is also worth briefly considering (though see *"Product Specialization"* below for more detail). In addition to flock population demographics, the Linear B tablets also record wool production targets for the wool flocks and lamb and wool targets for the breeding flock. Wool yields are set at 3kg of wool per four head of sheep (0.75 kg per sheep) for the wool flocks, and 3kg of wool per five ewes (0.6 kg per ewe) in the breeding flocks (Ventris and Chadwick 1973: 203; Halstead 1999: 145-146). The reduced yield from breeding ewes is presumably to account for the nutritional stress of lambing. The collective wool yield then would reach something close to 67,200 kg (approximately 60,000 kg from the 80,000 wethers and 7,200 kg from the breeding ewes).[181]

[181] Smith and Tzachili (2012: 141) have suggest that the wool yield for the Knossian flocks would have been 52,000 kg, however it is unclear how they reach this figure and they provide no citations to indicate this. Killen (1964: 9) explains that wool-flocks were responsible to produce 1 units of wool per

The potential scale of dairy and cheese production is an oft forgotten aspect of Minoan shepherding that is worth considering. While the majority of the palatial flocks were focused on wool production (and the wethers would obviously have bee unable to produce milk), the circumstantial evidence for private flocks raises dairying as an important possibility. Dairy and cheese production has traditionally been an important product produced by sheep and goats on Crete (e.g. Blitzer 1990), and remains so today (e.g. Volanis et al. 2007). A production strategy that emphasized dairy production would have had an important benefit over meat production strategies as a buffering mechanism against both demands to supplement palatial flock deficits and leans years in the private flocks. The scale of this production was probably significant, based on the assumption that at least half of the private flock population would have been ewes, milk production could have been more than 3.15 million kilograms annually.[182] If all this milk were made into cheese, this would produce between 400,000 and 630,000 pounds of cheese per year. This appears to be a large number, but if the population of Crete during the LBA was somewhere between 50,000 and 75,000 individuals,[183] this would equate to an average of 5.3-12.6 pounds of cheese per person, per year (recall

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four sheep, where one unit of wool was approximately equal to 3 kg, or one animals was expected to produce 0.75 kg of wool. This doesn't account for the 0.6kg expectation per breeding ewe cited by Halstead (1999). Thus, how Smith and Tzachili came to a yield of 0.52kg per animal in the collective 100,000 palatial sheep is not obvious.

[182] I reach this number by assuming 45,000 private ewes producing 70 kg of milk per year, which is somewhat less than the average annual milk-yield of 87.75 kg/ewe recorded by Valonis et al. 2007 for modern flocks on Crete. This figure is a low-estimate based on these values; if the private stock on the island was closer to 112,500, which would equate to ~56,000 ewes, and milk production was closer to modern rates around 85 kg/ewe per year, dairy production could have 4.7+ million kg annually.

[183] This is simply a ballpark figure that is based on Whitelaw's (2004) argument that Knossos had a population of between 14,000 and 18,000 during the Neopalatial period. If we lower this population estimate slightly for Knossos during the Late Minoan period (a period that appears to have been slightly less populace that the Neopalatial), and extrapolate across the island, a shotgun approach brings us to between 50,000 and 75,000 individuals.

that low estimates for modern cheese consumption are 20 pounds per year). Of course, there was likely considerable variability and inequality in access to cheese, however milk and cheese production numbers of this capacity would be indicative of a substantial and important dairy production on Crete in the LBA.

7.6 *Product Specialization:*

The wool-production emphasis of the Late Minoan palatial flocks means that product specialization is a theme that shapes many of the other variables of shepherding discussed here. In a sense, this emphasis on wool is a type of centralization, as a top-down directive to focus the management and production strategies toward maximizing wool output. However, the scale of this undertaking, both in terms of the amount of land[184] that would have been required for grazing, as well as the size of the flocks and the number of shepherds involved, combined with the fact that the wool flocks could not reproduce themselves on their own, creates a system that is, at the same time, inherently decentralized. In other words, without shepherds participating in an exchange of sheep between palatial and private flocks from the bottom-up, the control and management of the production specialization would not have been possible from the top-down. The vast land area potentially at play and the difficulties of control in the Cretan mountains also complicate viewing

[184] The fact that most of this land would have been mountainous and therefore quite difficult to control by coercive means underscores this point. A centralized system implies a lack of agency in the hands of decentralized individuals, however the landscape of Crete and the scale of the wool production economy would have made direct and coercive control implausible if not impossible (recall, for example, the largely ineffective attempts by the Nazi occupation of Crete during World War II to quell the Cretan resistance movement exemplified by George Psychoundakis, Xan Fielding and others).

this as a strictly centralized system.[185]

From this perspective, the emphasis on wool production is a prime example of an institution (the palatial bureaucracy) driving product specialization. The overwhelming number of castrated male sheep, and the targets for lamb and wool yields illustrated by the Linear B documents show a controlled and well-regulated livestock economy. The documents also contain evidence for the management of wool processing, spinning and textile production (see *Gender and the Division of Labor* below), and therefore illustrate control and management of the textile production economy by the palatial bureaucracy from start to finish, with dependent and independent laborers playing important roles (see Killen 1984, 1988, Barber 1993 and discussion below).

Product specialization presents unique challenges: it increases exposure to risk as it decreases variability among livestock, and concentrates productive capacity into a specific species and, often, a specific herd. This is especially true at the scale of the individual shepherd, as catastrophic herd loss is a much more severe situation if a shepherd only maintains one large flock of sheep, as opposed to four smaller herds of sheep, goat, cattle and pigs. The former represents a strong degree of species specialization; the latter represents a strong degree of species diversification. Therefore, an emphasis on one primary production strategy might be thought to

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[185] Halstead argues: "…at least at Knossos, central control of 'palatial' sheep flocks was so loose that it might realistically be regarded not in terms of ownership but as a mechanism for ensuring use rights to the wool clip." (2003: 259). The logical extension of that suggestion is that meat (in the case of wethers) or dairy (in the case of ewes) use rights of the same sheep may well have belonged to the private shepherds, a right that was 'paid' for by the shepherd returning to the palace the same number of sheep they received each year, thereby sustaining the palatial flock population through decentralized means.

function as a risky, -rather than as a risk-buffering—strategy. By logical extension, the instance of the Linear B bureaucracy on wool production should be a risky strategy, especially because the flocks that are producing the wool are unable to reproduce themselves. In the event of a catastrophic palatial-flock loss, surviving wethers would be little help in restoring population numbers.

However, the palatial/private 'partnership' in the Linear B tablets may have created a *de facto* diversification of livestock resources, therefore creating an island-wide risk buffering strategy, even given the high degree of product specialization. We might think of this as the result of a type of economy of scale: the vast number of sheep spread across the island insulated the collective flock from catastrophic loss. Given the variability in climate and weather regimes on Crete, spreading grazing across the island, and making good use of changes in elevation would serve as a way of mitigating annual climatological variations. Entrusting the 750 or so shepherds with palatial flocks—in effect de-centralizating the palatial flock—therefore functioned as a risk-buffering strategy in the face of highly specialized production.

This palatial/private partnership may also have provided a benefit for shepherds, though the evidence for this is somewhat circumstantial and speculative. The flock deficits recorded in the Linear B documents appear to function as a sort of "livestock debt" that individual shepherds are expected to pay back in the future (Halstead 1997). This is a difficult theory to test empirically as the Linear B archive represents one or, at most, two years of livestock production and therefore does not provide the time-depth necessary to follow 'livestock debts' and their repayment. Nevertheless, livestock debt is an intriguing possibility, since this would make the palatial flocks a sort of "sheep bank,' in addition to its better known function within the wool economy. Perhaps individual shepherds could draw from the palatial flocks during lean economic times or during times of celebration where animals would be slaughtered for feasting, with the intent of making up those debts whole in the future when these shepherds had excess private animals available.

The palatial emphasis on wool production would have also steered private shepherds towards meat and dairy production in an effort to avoid directly competing with palatial production. Once again, the Linear B archives provide circumstantial evidence that is suggestive of the importance of meat production. The scale of culling that would have been possible—if not required—each year to maintain a healthy collection of wool-producing wethers is substantial. Halstead estimates that 20,000 wethers would have been culled each year, but only 1000 animals are requisitioned for slaughter or sacrifice in the Linear B tablets. This implies that "the livestock texts record management of animals, the carcasses of which were ultimately consumed in the 'non-palatial' sector" (Halstead 2003: 258).

Dairy production appears to be of even less concern to the palatial bureaucracy. If palatial flocks were indeed subsidized by private flocks, private flocks were likely predominantly female in order to make them as productive as possible, a demographic profile that would be compatible with privatized dairy production. Milk production would also be the most diversified small-scale strategy, with ewes producing some wool for household use/small-scale production and meat available from lambs, or even the occasional slaughter of an adult ewe depending on the nature of the consumption event.

Faunal datasets for Late Bronze Age Crete show a clear prevalence for caprine over other livestock during the entirety of the Bronze Age (see table 7.3). Caprine remains account for more than 70% of every available faunal dataset from Late Bronze Age contexts on Crete except for at Kommos (where Caprine account for 55.7% of the LMI-II sample and 54.4% of the LMII sample). Indeed, in many cases sheep/goat account for more than 80% of a site's faunal sample. Reliable faunal data come for a variety of sites: notably from residential contexts including houses and the Unexplored Mansion at Knossos and the coastal town at Kommos. It is important to note that these datasets probably come from residential and feasting refuse and so represent those animals that were culled from the herd, therefore representing a'deadstock' profile, rather than the 'livestock' herd structure. Nevertheless, the faunal data underscore the fact that caprines were prevalent on Crete, and that they were the preferred source of animal protein, at least among large ungulates.

Unfortunately age-data is relatively scarce making it difficult to create age profiles and extrapolate production strategies from the faunal data. Nevertheless, the age data that is available suggests a mixed production strategy across Late Bronze Age settlements. At Kommos a small sample set of age-able bones (a total of 40 age-able individuals for all LMIII occupation levels) shows a very young deadstock population with only 7 individuals living to 2.5 years or older, and therefore suggesting an emphasis on meat consumption, or perhaps a mixed milk-meat economy (Reese 1995).

Site	Date Period	Sheep/goat NISP	%	Sheep/Goat MNI	Pig NISP	%	Pig MNI	Cattle NISP	%	Cattle MNI
Kommos	EMII-III	1	100%	N/A	0	0.0%	N/A	0	0.0%	N/A
	MMI-III	296	61.9%	N/A	160	33.5%	N/A	22	4.6%	N/A
	LMI-II	318	79.7%	N/A	75	18.8%	N/A	6	1.5%	N/A
	LMIII	517	71.6%	N/A	171	23.7%	N/A	34	4.7%	N/A
Ayia Triada	EM	133	68.6%	N/A	26	13.4%	N/A	35	18.0%	N/A
	MM	146	67.3%	N/A	58	26.7%	N/A	13	6.0%	N/A
	MMIII/LMIA	110	55.0%	N/A	63	31.5%	N/A	27	13.5%	N/A
	LM	224	74.4%	N/A	58	19.3%	N/A	19	6.3%	N/A
Phaistos	LN	541	51.0%	38	252	23.8%	10	268	25.3%	8
Knossos - Unexplored Mansion	LMIA	104	69.8%	N/A	34	22.8%	N/A	11	7.4%	N/A
	LMII	1665	62.8%	N/A	658	24.8%	N/A	330	12.4%	N/A
	LMIIIA2	117	64.3%	N/A	43	23.6%	N/A	22	12.1%	N/A
Kavousi-Vronsa	LMIIIC	838	77.1%	N/A	190	17.5%	N/A	59	5.4%	N/A
	Average:		69%			21.5%			9.0%	

Table 7.3 Caprine, pig and cattle faunal datasets from Minoan settlements; note: '%' refers to percentage of combined sheet/goat, pig and cattle (data drawn from Reese 1995, Wilkens 1996, Bedwin 1984, Klippel and Snyder 1991).

About two-thirds of the caprine remains from LMIIIC contexts from Kavousi-Vronda were killed before two years, indicating a meat maximization strategy, rather than a culling of lambs in order to benefit from both meat and milk (Klippel and Snyder 1991). The general trend in this small sample of age-able caprine bones from LBA contexts on Crete suggests a pattern of meat or mixed meat/milk production—a complement to the heavily wool-focused production of the palatial flocks.

Other livestock species—cattle, pigs, and goats—in the Linear B documents provide circumstantial evidence for a strong non-palatial aspect of the livestock economy, as well. Halstead (2003) notes that "deadstock" Linear B records, which record animals that are meant for slaughter and consumption, do not appear concerned with how these animals were raised or bred. This lack of interest in the breeding and maintenance of herds of these livestock by the palatial bureaucracy suggests that management strategies were of little concern to the palatial administrators, as long as livestock were available for slaughter when needed. This implies that while a high-level emphasis on wool production existed from the palatial perspective, there was likewise a considerable (and largely invisible in the present) non-palatial livestock production economy that was actually functioning in tandem with palatial management. Rather than creating an unsustainable and overly risky strategy, this product specialization may actually have facilitated an island-wide risk-buffering and diversification strategy.

7.7 *Links with Agriculture:*

The link between plow agriculture and the shepherding of caprine flocks on

Crete is essentially a question of cooperative land-use: were flocks grazed in fallow fields or areas that could have been brought under production through plow agriculture? There are a number of additional questions and assumptions built into that problem, including: were shepherds and their flocks *de facto* relegated to the highlands and a transhumant way of life because the lowlands were reserved for agriculture? Or, was there, in fact, enough coastal plain available throughout the island so that grazing and farming could function alongside one another, or at least in tandem via fallow fields? In order to address these fundamental questions about Late Bronze Age agricultural production, we must first summarize the model for farming in the Late Minoan period.

The basic model for Late Minoan agriculture (and, indeed agriculture for the entirety of the Bronze Age) revolves around the concept of a Mediterranean polyculture: the triad of grape, olive and wheat proposed by Renfrew (2011: 280). Growing, in part, out of a systems-theory approach to the rise of civilization in the Aegean, Renfrew identified agriculture, and the stabilization of supply and the production and storage of surplus as prime foundational events that allowed for the development of a complex society. Each member of the Mediterranean triad served a slightly different purpose; wheat fulfilled basic subsistence needs, the olive complemented wheat by providing a substantial portion of the fat in the Mediterranean diet, as well as acting as a cleansing agent and fuel for lamps, while the vine made wine production (and distribution) possible. Wine could have served as a "social lubricant," facilitating interaction between groups, and also the control of and distribution of wine by elites may have provided an opportunity to underscore their power by making wine from their stores periodically available.

With Renfrew's model as a starting point, Linear B documents, once again, provide additional evidence for evaluating the production of agricultural foodstuffs in the Late Minoan world. The palatial administrations actually appear to have been most concerned with extensive agriculture that produced grains, as well as olive oil. Halstead argues that the palatial authorities were particularly selective about their interest in grain production, appearing to be most concerned with glume wheats and barley, both of which are "tolerant of adverse growing conditions and capable of long-term storage" (1995: 233). The former would make glume wheats and barley particularly effective grain crops in the highly variable Cretan climate, and the latter characteristic helps to account for the massive storage areas with pithoi that could hold, on average, 550 liters of grain, and the Neopalatial storerooms at Knossos that could have held up to 231,000 liters of grain and foodstuffs (Christakis 2004: 300).

The ox-drawn plow would have been a key tool in the large-scale, presumably extensive, production of wheat and barley. A number of tablets from the Linear B archive are concerned with oxen and their use in plow-teams. The Ch-series in particular indicates that oxen were owned (or at least managed) by the palatial administration and were loaned out to specific herdsmen and/or communities to plow the fields. Oxen are described as *we-ka-ta*, a term that may translate as something like "working," and oxen are grouped together and associated with specific toponyms in the texts: 6 oxen to the settlement at *Da-wo*, 6 oxen for *Ma-sa*, 10 oxen for *Ku-ta-to*, 6 oxen of *Tu-ri-so*, and 50 oxen for *Ku-do-ni-ja* (Enegren 2002: 14).[186] The fact that oxen are given to each community in even numbers is an additional piece of circumstantial evidence for their use as paired plow-teams. Oxen are also described by specific coloring characteristics, such as white-muzzled, wine-like, or ruddy[187], perhaps as a way of identifying a specific ox for return the palace at the end of plow work (Killen 1992-1993). Extensive grain production with plow- agricultural clearly seems to be an important productive activity facilitated by the palatial administration.

Given the fact that oxen appear to be supplied by the palatial administration for plowing, it is often assumed that the land used for agricultural production would have been owned by the palace as well. This theory applies a feudal model to the Minoan world, essentially assuming that the means of production (oxen and land) must have been concentrated in the hands of the "centralized elite," while the Minoan "peasants" supplied farm labor, and paid taxes for the privilege of working the land. In fact, Killen (1995) notes that while some of the farmland is marked as "of the king" or in the hands of particular elite individuals, much of the land under crop is called *da-mo*, an early correlate to the Greek δὴμος meaning "public" or "of the people." Killen thus proposes a model in which various village communities used palatial oxen for farming, and in return, provided the palace with a portion of the yearly harvest. The symbiotic nature of this model is reminiscent of Halstead's hypothesis for the

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[186] The much greater number of oxen given to *Ku-do-ni-ja* (probably the large Minoan settlement in modern Chania) is further evidence for the importance of this settlement in the western portion of the island, and suggests that *Ku-do-ni-ja*/Kydonia was one of the most important Late Minoan settlement west of Knossos.

[187] Chadwick translates this into more colloquial names such as "Dapple, Darkie, Whitefoot, Winey, Blondie and Bawler…" but notes that "the names of colours are notoriously inexact in the ancient languages" (2003: 110).

interaction between private and palatial flocks, and suggests a palatial philosophy founded on cooperation between elites and village communities rather than one founded on strict coercion or exploitation.

Olive oil production may also fall under the purview of the palatial sector of the economy, however it is unclear whether the olives that were harvested, collected and recorded in the Linear B documents were used as foodstuffs, in the production of olive-oil-based perfume/unguent or perhaps both. Hamilakis (1996) notes the importance of small stirrup jars towards the end of the Late Bronze Age, especially in LMIII. These ceramics are reminiscent of modern day perfume bottles and would have been the appropriate size for storing and transporting perfumed oil, a commodity that may have been produced in the Late Minoan palatial workshops (Hallager 1987). While perfumed oil does appear to have been an important trade good, present evidence does not allow us to model the olive production regime. This is made all the more complicated by the fact that wild olives were certainly growing on Crete during the Bronze Age, and it is neither impossible nor particularly surprising that Minoans may have simply tended and harvested wild olives. Land usage would therefore be based around where natural olive groves existed.

This extensive agricultural production of olive and grain appears to have been matched by a more intensive, garden agriculture. While paleobotanical evidence from Minoan archaeological sites is limited (see Hansen 1988 for an extensive discussion of the lack of reliable evidence), pulses, fruit, and vegetables appear in the Linear B tablets (Palmer 1999). In the past decade, Minoan archaeology has slowly grown more interested in farmsteads and their role in the larger Minoan economy. Sites like

Chalinomouri near Mochlos (Soles et al. 2003), Chrysokamino (Betancourt et al. 2006), and Zominthos (Sakellarakis and Panagiotopoulos 2006) as well as larger-scale surveys such as the Phaistos/Mesara survey performed by Watrous et al. (2004) have all investigated the role of smaller scale farming in the Minoan world. The picture that is slowly emerging from these sites is a coeval extensive and intensive agricultural production scheme, with grain and olives farmed at a distance from residential sites, while relatively large (for example, c. 100m x 110m [~ 1ha] at Chrysokamino; Betancourt 2006: 244), intensive, "garden-plots" were kept closer to the farmhouse or hamlet.

The highland Minoan country-villa[188] at Zominthos appears to have engaged in mixed farming as well. Sakellarakis and Panagiotopoulous argue that subsistence strategy on site was limited by its considerable elevation (1187m above sea level; elevation of modern year-round settlements on Crete is usually below 800-900m). The "Central Building", which is the most extensively excavated and therefore best known structure in the settlement is large, 54m x 37m, and well-built such that it appears to have been built for year-round, rather than seasonal, occupation. The site is in close proximity to good water resources (one of the three sources of water on the small Zominthos plain is situated near the "Central Building") and access to considerable pasturage, both in the smaller Zominthos plain and the nearby Nidha Plateau. These factors, combined with the "masses of animal bones" found on site (exact numbers are not given and must wait for directed faunal analysis), lead

[188] This term—not unlike "palace"—has some theoretical baggage and uncertainty. See e.g. van Effenterre and van Effenterre 1997; Cadogan 1997; Rehak and Younger 2001. Sakarellakis and

Sakellarakis and Panagiotopoulous to argue for a mixed agricultural economy that primarily revolved around caprine animal husbandry.

The settlement data from the Mesara survey further highlights the importance of smaller scale production, especially in villages (defined by Watrous et al. as archaeological survey sites of between 1-10 ha), hamlets (0.2- 1 ha) and farmsteads (0.1-0.2 ha) during the entirety of the palatial period. Larger settlements such as villages and hamlets appear slightly more important during the protopalatial (MMIB-MMII), as they account for 58.3% (8 villages, 27 hamlets) of the identified settlements, while hamlets and villages account for only 41.2% (3 villages, 18 hamlets) of the settlements in the Neopalatial. Farmsteads become slightly more prominent, with 21 sites during the Neopalatial, up from 14 in the Protopalatial. These are relatively minor changes, and the general settlement trend remains the same: smaller, diversified settlements scattered across a relatively productive agricultural area. Combined, these data point to smaller settlements that emphasized a combination of agricultural strategies, and may have mixed extensive and intensive production to pursue different goals. Despite this, extensive plowing of less fertile, dry-farmed land would have provided grain and olive production, some of which could have been sent to the larger "palatial" settlements in return for the use of traction animals. Intensive, small-scale farming may have served individual household needs.

How would livestock fit into this model of Minoan farming? As noted above in the discussion of Cypriot farmer-herder interactions, one particularly symbiotic way in which agricultural production and pastoralism can function in tandem is if livestock

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Panagiotopoulous point out that the term villa has a "broad semantic range," that is useful given the are pastured in fallow fields. This provides localized grazeland for animals (even if this is likely to be slightly degraded grazeland due to heavy farming), and animal manure fertilizes and replenishes these fallow fields. Cretan soils (and, indeed, most Greek soils) tend to be deficient in nitrogen and phosphorus, a condition that can be ameliorated by adding animal manure which is high in nitrogen content (Allbaugh 1953: 49; Pratt and Castellanos 1981). Caprine manure is a good source of both nitrogen and phosphorus as a grown sheep or goat contribute 8-10 kg worth of nitrogen and 2-3 kg worth of phosphorus to soil via manure annually (Sheldrick et al. 2003).[189] One geoarchaeological study on the island of Pseira, just off the north-eastern coast of Crete at the edge of the Bay of Mirabello, shows biochemical evidence (particularly the presence of coprostanol and epicoprostanol soil levels) that suggest manuring practices using human and perhaps suid waste at terraced agricultural locations (Bull et al. 2001). While not direct evidence for the use of caprine excreta as fertilizer, this practice does indicate that manuring was a potential part of the Minoan agricultural repertoire. It also is suggestive of the kind of land improvement strategy that would have been employed if intensive (rather than extensive) agriculture was taking place during the Minoan period.

Beyond this, olive groves and more marginal land could have been used as pasture, especially during the winter months when highland pasture would not have been available. The benefit of transhumance, especially to a mixed farming economy,

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"inability to define the character and function of this building type with certainty" (2006: 63).

[189] These numbers are estimates as the nutrient contribution of manure is dependent on a number of factors that are difficult to quantify including type of animal, animal weight, diet, and livestock production strategy. As a result, "although the importance of livestock excreta as a source of nutrients

is the ability to use marginal or seasonally available land in animal production, while fertile land can be brought under agricultural production. Indeed, while largely circumstantial, Betancourt (2006: 255) argues that the lack of archaeological finds in the Kambos plain outside Chrysokamino, combined with the plain's poor moisture retention, suggest that it was not a viable agricultural area, but would have been a prime region for the winter pasturage of seasonally transhumant flocks.

While the picture of Minoan farming is still coming into focus (and, indeed, requires considerably more evidence to do so), the variegated and flexible nature of Minoan agriculture is a key point. This is especially the case with considerable links between farming and livestock management. Minoan production appears to have mixed large-scale extensive agriculture, with smaller-scale intensive 'gardening' in order to make subsistence possible for small farmsteads as well as growing proto-urban centers. We should be careful not to take this as evidence for a benevolent elite that characterized Arthur Evans' model of Minoan society (see e.g. Papadopoulous 2005), but instead we might recognize a sort of agricultural cooperation that is similar to the cooperation that was required to maintain the population of the castrated palatial flocks (see above). In such a system, cooperation between livestock managers and agriculturalists to create a system of manuring, fallow grazing and exchange for mutual benefit would not be surprising.

7.8 *Gender and the Division of Labor:*

Whereas our understanding of the gendering of the Late Cypriot pastoralism

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is well known, relatively little quantitative information is available at national or regional levels" and textile production is largely circumstantial and based on scarce (and somewhat problematic) archaeological evidence, the Linear B documents go a long way towards providing a much clearer picture for Late Bronze Age Crete. In the most basic sense, the Linear B archives conform to the traditional gendering of wool and textile production: the shepherds and fullers are men, women are spinners and weavers, while children are also recorded as participating in textile production (Nosch 2014, especially pp. 388-392). Barber (1993: 289) argues that a division of labor along gender lines would make good sense, as spinning and weaving are domestic activities that could be performed in the home during child-rearing. Judith Brown posits that tasks that can rely on women as a primary source of labor must be compatible with raising children, and therefore "do not require rapt concentration and are relatively dull and repetitive; they are easily interruptible and easily resumed once interrupted; they do not place the child in potential danger; and they do not require the participant to range very far from home" (1970: 1075). Spinning and weaving correspond to these characteristics, and at the same time, shepherding does not; it would both put the child in potential danger of being injured by the livestock or potential predators, and also could require considerable movement away from home and reliable shelter, especially if transhumance is practiced. For these reasons wool production labor is conventionally thought to be divided by sex, with men responsible for rearing and protecting flocks and potentially plucking or shearing sheep, while women were responsible for spinning and weaving.

Intriguingly, the Linear B tablets tend to support this division of labor.

(Sheldrick et al. 2003: 102).

Women play a prominent role in the Linear B tablets from Knossos, especially in the personnel texts (series Ai, Ak, Ap) and the wool/textile production texts (the L-series, especially L(1), Lc, Ld and Le). Indeed, of the 349 personnel texts that make up the A-series, women are featured in about 40% (140 tablets). Killen (1984) estimates that the Knossian textile economy employed at least 1000 women when the Linear B tablets were written. Olsen underscores this point: "…at Knossos every woman whose duties can be identified [in the Linear B tablets] works in the sphere of textile production" (Olsen 2014: 164). Indeed, female spinners and weavers were critical to the production of Late Minoan textiles: "…while men seem to have been involved in the initial and final stages of textile production…all the intermediate work of producing cloth was assigned to women" (Olsen 2014: 164).[190]

The role of women as weavers and spinners may, indeed, have been based on their child-care responsibilities. The personnel tablets of the A-series record not only the women laborers, but their children as well. The Ak series lists not only the number and sex of the children accompanying each female worker, but their age as well, dividing them into "older boy", "younger boy", "older girl" or "younger girl categories. Perhaps these texts acted as a census as well, helping the "palace" to keep track of its potential workforce from year to year. Children categorized as "older girl"

[190] Barber (1993: 289-291) suggests that Bronze Age textile production in the Near East and Egypt was likewise organized along gendered lines, though she also notes that in the Late Bronze Age (New Kingdom Egypt, especially) we begin to have evidence (particularly depictions in tomb paintings) for men as weavers using a new technique (a vertical loom, perhaps introduced from Syria), and the advent of new weaving techniques, and the subsequent production of high-quality textiles for sale or exchange. Women continue to be depicted as weaving on the ground-loom and producing domestic textiles. Based on this, other ancient examples from Classical Greece and Rome, and ethnographic studies from Africa, Barber argues that "we may expect to find men becoming involved with the weaving when something radically new is being added to the technology, and/or when new prestige goods are being developed and exploited fairly rapidly."

are also described as either “undergoing training” or “training completed”, implying that they are ready to be drafted into the workforce (Olsen 2014: 165). In the Linear B archive from Pylos, the tallying of workers and children appears to be linked to rations paid out to each worker to support her family, however evidence for this practice is limited at Knossos. Only five tablets in the Ai-series record the distribution of grain as food rations, however the small sample size, and fragmentary nature of these texts makes it difficult to discern why specific workgroups are receiving rations.

As keeping track of rations does not appear to be the main concern of this selection of the Linear B documents at Knossos, the purpose seems to have been largely economic. Killen argues that the goal of these texts was to keep track of the labor available for textile production in the palatial workshops: “The Ak tablets…are likely to have provided the information about the working strength of each group…” (1988: 168). This would have allowed the palatial bureaucracy to model its textile production targets, and could have provided information fed back into the organization of the wool flocks and the management of the shepherds. In other words, the palatial bureaucracy appears to have been concerned with streamlining its wool production economy. By setting textile production targets based on the number of laborers available, wool production targets could be set, the size of flocks could be determined and decisions made about culling particular flocks or specific breeding strategies. The fragmentary nature of the Linear B archive, and the fact that it only records one or two fiscal years make it impossible to evaluate how this data would have been incorporated into production strategies from year to year, however.[191]

The production targets in the Knossian textile tablets are suggestive of yet another important aspect of the Late Minoan economy. Textile production targets are entirely absent from the Pylos tablets, but feature prominently in the Knossian tablet set. Olsen notes that while at Pylos the tallying of laborers appears to be in order to provide workers with rations, at Knossos tallying laborers allows the administration to best estimate production targets (2014: 186). Women at Knossos also appear to be doing most of the textile production in their homes or home villages. Olsen further points out that these production targets give the women working for the palatial economy some autonomy to reach their mark and then quit producing textiles for the palace until the next fiscal year (2014: 255-257). The production targets for the women working for Knossos might take up to six months to meet,[192] leaving the remainder of the year for other pursuits. While it is unclear what these women might receive from the palace in return for their labor, the fact that female laborers could structure their time to reach production targets each year implies a level of agency, autonomy and de-centralization. Olsen prefers to see this as corvée labor, but it is worth wondering if these women are actually receiving some benefit from the palatial

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[191] Nosch (2003) has noted that while we might expect it to be the case, the size of sheep flocks associated with a particular place does not always match the amount of wool that would be required to fulfill the textile production requirements of that same place. There are a number of reasons why this might occur, including the 'carrying-capacity'/available pasturage in a particular location, or the number of shepherds willing or capable of managing palatial flocks. What this does indicate, however, is a reliable (and probably complex) system for distributing wool to textile producers across the island once it was collected from shepherds.

[192] Nosch 2003 suggests 6 months on average, while Killen 2001 suggests three months. In either case, the textile production would have been a finite target, as opposed to the apparently never-ending textile obligations at Pylos.

administration in return for there labor[193] (just as shepherds appear to receive tangential benefits of access to fattened wethers for managing palatial flocks).

One group of laborers in the archive who appear to have considerably less autonomy are the *do-er-a*, the Linear B term for slave. These women are not prevalent in the texts, amounting to only four tablets recording the existence of 39 total female slaves in the preserved archive (Olsen 2014: 185). Even though these texts represent a larger, unrecovered corpus, slavery does not appear to have been an important, or even a consequential source of labor. The overwhelming majority of textile production, therefore, would have been done by ostensibly free individuals who were, by-and-large, women.

While women could own property, they were not shepherds or collectors (at least as far as the Linear B tablets show). Over 300 different shepherds are listed on the Linear B tablets, with names that come from traditional Greek roots, but also appear to be linked with Hittite, and perhaps a local non-Greek language that was spoken on Crete earlier in the Bronze Age. None of these shepherd names are feminine. This matches nicely with Barber's model for a pastoral division of labor, with men performing the more physical tasks that potentially require movement, herding and shearing the sheep, while women remained at home and processed the wool/wove textiles while raising children. Collectors are also exclusively male,

[193] Olsen (2014, Chapter 8) notes that some women in the Linear B tablets from Knossos own land, have large food-stores, slaves, luxury goods and are responsible for various economic interactions, including owing textiles to the palace when laborers under their management miss production targets. Olsen explains, "…it would seem that at least some women in the Knossos economy were consider to have had an independent economic identity, and that this was the expected norm. It would seem that Knossos did not require the presence of any social institution to justify the lifting of restrictions on women's economic activities, because the economic activities of women at Knosos were not significantly restricted along lines of gender in the first place" (2014: 257).

implying that while women could function as landowners and overseers as private individuals, men were the primary members of the palatial institutional structure.

The Linear B tablets paint a picture that matches Barber's proposed model for a gendered division of labor in a wool-producing society. A gendered division of labor enables families to maintain a substantial livestock herd, while also processing the products of those livestock. It is worth noting that the this division of labor likely also enabled the men who were shepherding the sheep to produce cheese and dairy products concurrent with their herding duties. Milk and cheese production would require processing near the animals and perhaps occurred in the highland plains as it did in the 20th century. At the same time, women could remain at home raising children and processing the raw wool, by spinning and then weaving textiles. The palatial administration took advantage of this division of labor, expecting men to participate by herding palatial flocks, and setting wool production targets (perhaps as corvée labor) for female weavers. In both cases—and by now this should begin to emerge as an undertone in the management strategy of the palatial bureaucracy—shepherds and weavers appear to have had some autonomy in reaching the targets projected by the palatial administration, a fact that encourages archaeologists and ancient historians to consider the strategies that these non-elites individuals may have employed.

7.9 Cultural Integration:

Late Minoan shepherds—like Late Cypriot shepherds—were more than strictly economic actors; they played an important role in ideological and ritual aspects of the

Minoan world as well. The best known shepherd-related aspect of Minoan culture are the peak sanctuaries, mountain-top shrines that were first created and used at the end of the Early Bronze Age (EMIII, c. 2300 BCE; Peatfield 1994). Peak sanctuaries were first recognized during the advent of Minoan archaeology at the turn of the 20th century. In 1903, Myres excavated a sanctuary at Petsophas in the east of the island, a peak sanctuary that appears to have been linked with the large, Minoan coastal town at Palaikastro (1902-1903). Pendlebury notes the potential importance of the peak sanctuary on Mt. Juktas, and its apparent relationship with the palace at Knossos, as well as the peak sanctuary at Petsophas and its connection with Palaikastro, and the possible sanctuary on Prophetis Elias and its connection with Mallia (1939: 102-103). The construction of mountain roads and the exploration of the island during the 1950s and 1960s led to the eventual discovery of 25[194] peak sanctuaries scattered across the island at elevations between 200 and 1000m. The twenty-five sanctuaries were all in use during the Protopalatial period (MMIB-MMIIB), but only nine have evidence for use during the Neopalatial period (MMIIIA-LMIB), and two after LMI (Peatfield 1990; Briault 2007). Peatfield (1994) notes that these sanctuaries are generally associated by line of sight with a substantial settlement, and further argues that these were "not places of remote and arduous pilgrimage, but were the ritual response to the landscape exploited by a rural population of peasant farmers and shepherds" (91).

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[194] This is the tally given by Peatfield (1994), who is arguably the most well-versed scholar regarding peak sanctuaries. This being said, the identification of a "peak sanctuary" is based on interpretation of a variety of characteristics and the definition being used, and therefore has not always been constant. Briault highlights this fact: "The number of peak sanctuaries identified in Crete has over the last century fluctuated between two (Evans 1921: 153-9), four (Nilsson 1950: 68-76), eleven (Platon 1951), fifty-two (Faure 1967, 1969), thirty-seven (Rutkowski 1986: 96-8), twenty-three (Peatfield 1987: 90) and twenty-five (Peatfield 1990: 119). This disparity in numbers is largely a problem of the variable criteria employed to identify sites as peak sanctuaries." (2007: 124).

Along with Kristof Nowicki (1994), Alan Peatfield has made the most concerted study of these peak sanctuaries, eventually developing seven criteria that can be used to identify peak sanctuaries (2009). These criteria include: 1) elevation between 200 and 1200 masl, 2) location of the sanctuary site at a mountain or hill summit or prominence, 3) sight lines between the sanctuary and local settlement(s), 4) accessibility from local settlements, 5) proximity to settlements, 6) proximity to other areas of human activity/exploitation, and 7) sight lines with other peak sanctuaries. Critical to these criteria are the links between settlement areas, exploitation areas and peak sanctuaries. Shepherds, by nature of their identity and economic pursuits would have moved in and out of these three aspects of the cultural landscape. It seems likely that shepherds would have had an important relationship with these ritual spaces.

Clay votives found at these sites provide additional evidence that herders may have had a unique relationship with these sites. Male, female and animal terracotta figurines are a key component of the peak sanctuaries and are suggestive of their ritual nature, but animal votives appear to be the most common. At Petsofas, Myres notes that faunal figurines are "by far the most frequent figurines on the site," (1902-1903: 376), and at Atsipadhes, over 5000 figurine fragments were found, the majority of which were animal (Peatfield 1992: 72). Artifacts from most of the other peak sanctuaries have not been comprehensively studied, but the importance of animal figurines remains a constant for all (Peatfield 1994; Briault 2007).

These animal figurines are predominantly quadrupeds and are conventionally interpreted as cattle, however this interpretation may be based on the apparent importance of the bovid in palatial contexts (i.e. bull-leaping frescos, bulls-head rhyta, and other representations of cattle on signet rings, ceramics, etc.).[195] However, these quadrupeds could, in many cases, be sheep or goats. Many of the votive figurines are fragmentary making definitive species identification complicated, and indeed some of the figurines that Peatfield has identified as cattle appear to have helixing horns, like those of a ram (see fig. 7.3). While this is not an exhaustive study of peak sanctuary votives by any stretch, it is worth noting that a substantial portion of these quadruped votives might indeed represent rams, therefore aligning more closely with what appears to have been the primary livestock species on Late Bronze Age Crete.[196] Peatfield offers an alternative view, suggesting that the prevalence of cattle is linked to a reverence for the animals as traction in cereal cultivation (1992, 2000), though the location of these peak sanctuaries high on prominent hills, separated from the most fertile areas of cultivation, raises questions about this interpretation. The apparent abandonment of the peak sanctuaries by the middle of the Late Minoan period raises questions about the nature of religion and cult during the end of the Bronze Age. Perhaps rituals became more centralized during this period.

One avenue for the centralization of ritual would have been through large-scale feasting—a practice that likely involved the sacrifice of livestock and therefore would have linked to herders and shepherds. As we might expect in light of the Late Cypriot evidence in wich caprines were the major meat source, faunal analyses from Minoan settlements appear to show this as well. This analysis is admittedly restricted by the lack of a detailed faunal analysis from Minoan settlements, however what data do

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[195] See e.g. Scanlon 2014 for a detailed discussion of the importance of the bull in Minoan ritual, sports and ideology.

Figure 7.3: Bovid (ram and cattle) figurines from peak sanctuary at Atsipadhes-*Korakias*, Crete (after Peatfield 1992: figure 17)

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[196] Rutkowski offers a similar argument that the peak sanctuaries are ritual locations for herders (1972: 185)

exist point to the importance of caprine for human consumption. At Kommos, Reese notes that only 24.2% of the age-able assemblage is 2.5-3 years or older, implying a strong emphasis on meat production, especially the slaughter of lambs and young sheep[197]; Reese also notes a prevalence of butchered caprine remains, and bones that are unidentifiable because of butchering, but are consistent with sheep/goat sized animals (1995: 177). Age-able sheep/goat bones from Kato Syme show that a majority were slaughtered before 2 years, while at Kavousi, over two-thirds were slaughtered before 2 years (Nobis 1988; Klippel and Snyder 1991). This limited dataset suggests that lambs and young goat and sheep were consumed as meat, none of these contexts appear to be large-scale feasting deposits such as those from the wells at Kouklia or Kalvasos-*Ayios Dhimitrios* on Cyprus.

7.10 *Summary*

Using Nixon and Price's seven factors of pastoralism, it is possible to sketch a model for Late Minoan shepherding practices. The island of Crete is slightly moister than Cyprus, but still appears to have experienced a drying Mediterranean climate during the Late Bronze Age. This climate would have been at least as dry as—and, evidence suggests, likely somewhat drier than—the present. Mountains are key aspects of the Cretan environment, and are pervasive across the island. They are, however, more significant and more heavily wooded in the western portion of the island; and therefore create an environment that would have encouraged silvopastoral

[197] N.B. this meat emphasis is a strategy that corresponds with a complementary dairy strategy since culling the young lambs makes milk available for human consumption.

exploitation. Highland plains and plateaus are also prevalent. Some of these are at elevations low enough that year-round occupation would have been possible (and many of these are occupied year-round today), while others (e.g. Zomithos) are high enough that overwintering there would make little sense. Seasonal exploitation would have been possible especially for shepherds, and such a strategy would have left lowlands for agricultural purposes during the summer months.

The Linear B archive from Knossos makes it clear that wool production was the main purpose of the approximately 100,000 palatial sheep on the island. The archive also indicates that these sheep were spread across Crete and linked with various locations, some of which have been identified as known geographic regions, but many still remain unknown. Sheep were thus not herded in the direct geographic scope of the palatial settlement at Knossos. A complex (and, still somewhat poorly understood) political and economic structure appears to have been developed in order to keep track of these sheep, their locations, and their production. This specialization on wool production appears to have determined flock demographics manifest most notably by the fact that the majority of the palatial flocks are castrated male sheep that produce the most and best quality wool. This presented a unique problem as castrated males have no way to reproduce themselves, and palatial breeding flocks would only have produced a fraction of the sheep required to replace annual losses and turn-over. To address this issue, textually-invisible private flocks may have acted as the productive engine, as shepherds drew on the productive capacity of their own (presumably largely female) flocks to cover any losses to palatial flocks under their care. This system can be interpreted as cooperative, rather than coercive, as the palatial flocks might have offered a sort of “sheep bank” that shepherds could draw on at certain times of the year, making their debts whole later in the fiscal year (or perhaps in future fiscal years) when they returned palatial sheep to be reckoned by administrators.

This emphasis on wool production required a wool-processing industry that is also well documented in the Linear B archives. These illustrate a gendered division of labor between male shepherds and female textile-workers that would have made efficient use of the available workforce. Intriguingly, however, female weavers appear to have been given targets for production that would have been possible to complete within three to six months, implying a cooperative relationship between decentralized laborers and the centralized system reminiscent of the decentralized management of the palatial flocks. Minoan wool production has received the balance of scholarly attention, although dairy production, especially in private flocks that were likely mostly ewes (in order to produce the sheep necessary to cover palatial flock losses) was likely also important, even if archaeological evidence for dairying might be difficult to identify.

While certainly significant in an economic sense, Minoan shepherds and flocks also appear to have been ideologically and ritually important. Minoan peak sanctuaries were critical components of the Minoan world-view and relationship with their environment. Shepherds likely used (and perhaps even created) these sanctuaries, and would have been a group that linked the highlands and the promontories that housed these sanctuaries with other settlements. Identifying the location and movement of Minoan flocks, and the association between settlements where caprines were consumed and areas where the animals were pastured holds considerable promise for evaluating the relationship between particular settlements, their hinterland, and the Minoan highlands that are so prevalent across the island. Shepherds were more than faceless laborers, but were instead critical (and perhaps cooperative?) contributors to the Late Minoan wool textile economy. The difficult terrain across the island and the scope of the palatial flock would have made a coercive approach to managing this system incredibly complex and fraught. A better understanding of the geographic and seasonal distribution of the flocks and the shepherds managing them should help to better characterize the Minoan economic system.

CHAPTER 8

WHAT THE ISOTOPES HAVE TO SAY: NEW APPROACHES TO LATE BRONZE AGE SHEPHERDING

8.1 *Introduction:*

Having provided the backdrop for shepherding practices on Minoan Crete and Late Bronze Age Cyprus, this chapter presents the data used to model the agency of Minoan and Late Cypriot shepherds. I begin with a discussion of the foundational concepts behind isotopic analyses, providing examples of how and where these methodologies have been successfully deployed in archaeological research, and explaining the methodology employed here (see Appendix A for a more detailed explanation of the laboratory methodology that was used to analyze these samples). The second portion of this chapter provides a detailed look at the collection of samples analyzed, both in terms of archaeological context and isotopic values. The isotopic analysis performed here encompasses two sample groups: one group of samples is strictly a collection of modern landsnail shells that serve as a baseline for strontium values for comparison with the archaeological samples analyzed. The second group of samples is from sheep and goat teeth from Late Cypriot contexts, and acts as a case study for analyzing LC shepherding practices. This provides a foundation for the interpretive and narrative discussion of what these values might mean for modeling Minoan and LC shepherding practices and strategies (and the engagement between shepherds and the LC and Minoan 'centers') that concludes the chapter.

8.1.2 Archaeological Isotopes:

In recent years, isotopes, particularly from human and animal bones, have become more and more useful in answering archaeological questions related to mobility, movement, exchange and the exploitation of the environment. Chemical elements exist at different atomic masses based on the number of neutron particles in the nucleus of a given atom. While all atoms of a specific element must contain the same number of protons, the number of neutrally-charged neutron particles in a given atom's nucleus varies. This has the effect of changing the atomic weight of the atom. Atoms of a certain element with different numbers of neutrons are called isotopes. Each element exists in nature with a distinct ratio of certain isotopes. Climatological and geologic processes impact the elemental isotopes that are taken up by living organisms and used in biological growth. By tracking the isotopic signals present in faunal osteological remains, we can glean details about the environment in which the animals lived and were growing, and from these details and the historical contingencies discussed in the previous chapter, a model of the animals' lives (and, by proxy, the management of these domesticates) can be produced.

Isotopic analyses have proven powerful techniques for use in archaeological studies that attempt to evaluate diet (e.g. Balasse *et al*. 2001; Balasse, 2002; Kellner and Schoeninger 2007; Knudson *et al*. 2010), seasonality (Blaise and Balasse 2011; Frémondeau *et al*. 2012) and mobility of both human (e.g. Price *et al*. 1994; Schweissing and Grupe 2003; Knudson *et al*. 2004; Buzon *et al*. 2007) and animal populations (e.g. Hoppe *et al*. 1999; Britton *et al*. 2009; Towers *et al*. 2010). This is because isotopic signatures present in regional food and water sources are incorporated into human and animal skeletal tissue. Mammalian tooth enamel is made up of a calcium phosphate bioapatite with the chemical formula $Ca_{10}(PO_4)_6(OH)_2$ plus organic compounds (which contain Carbon) and water (H_2O). Strontium (Sr), oxygen (O), carbon (C) and nitrogen (N) isotopes are the most common isotopes analyzed based on access to information about the natural processes that made these isotopes available for uptake, and the biological processes that incorporated these isotopes into living tissues. Carbon and nitrogen are not discussed here, however.[198] Strontium replaces for calcium in some bioapatites (see below), while carbon and oxygen are present in bone collagen, tooth dentine, and tooth enamel. Table 1 contains the different naturally-occurring isotopes of each of these elements and their relative abundances in nature.

Tooth enamel is the most useful skeletal tissue for isotopic analysis for three primary reasons. First, enamel is not remodeled during an animal's life, therefore the isotopes incorporated into the enamel are directly related to the isotopes in the body at the time of tooth growth (Balasse 2002). Second, enamel is resistant to diagenesis so that it does not incorporate the isotopes from the surrounding soil after burial, but instead preserves the isotope ratios from the living specimen (Lee-Thorp and van der Merwe 1991). Third, tooth enamel in the hypsodont teeth of ungulates (e.g. sheep, goats, cattle) is laid down in sequential layers as the tooth is formed, therefore preserving a progressive record of body water isotopic composition across the growth of the tooth (Fricke and O'Neill 1996). In sheep and goats, molars develop over the first two years of life. The enamel of the first molar (M1) begins to form just before the lamb is born, and the enamel of the tooth continues to develop until approximately nine months; the second molar (M2) begins to form just after birth and the enamel is completely formed at about one year; the third molar (M3) begins forming around one year and is completed at approximately two years (Hillson 2005: 230-232). Therefore, sequential sampling of these teeth makes it possible to track the incorporation of specific isotopes into the tooth enamel matrix with time depth, representing the isotopic ratios present in the animal's body at the time of tooth production, which in turn reflects the isotopes ingested via diet and water intake.

8.1.3 Strontium Isotopes:

Strontium is particularly well suited for tracking human and animal mobility for two reasons: first, it shares the same charge (valence equaling +2), and has a similar ionic radius to calcium (Sr=1.32 Å versus Ca=1.18 Å) and therefore can substitute for calcium in skeletal bio-apatite without fractionation. In other words, strontium can serve as an alternative to calcium in skeletal development and therefore can serve an important biological role for vertebrates, especially when calcium is scarce in an organism's diet. Second, the ratio of strontium isotopes (specifically that of ^{87}Sr to ^{86}Sr) varies in accordance with geologic zones. This is because ^{87}Sr is the product of the radioactive decay of rubidium (Rb) and thus precipitated incrementally, whereas ^{86}Sr occurs naturally on its own, which, in general, means older geologic formations will have higher ratios of ^{87}Sr to ^{86}Sr. Concentrations will also vary based on the original ratio of Rb:Sr within a given geologic formation.

The distinct geological differences across the islands of Crete and Cyprus that manifest themselves through significant changes in elevation, make these attractive locations for applying isotopic analyses that are dependent on geologic variance (see, for example, Booij *et al*. 1995; Papanikolaou and Vassilakis 2010 and fig. 2 & 3). Major differences in the age of geologic formations, from the Paleozoic (c. 541-252.2 mya) through the Pleistocene (c. 2.6-0.011 mya), implies substantial difference in Sr values across the islands. However, without a database of known Sr signatures at specific locations, Sr analyses would only be capable of identifying outliers within a given sample population, thus detecting individuals who have migrated throughout their lives, but unable to determine from where they had migrated (see below). Therefore, to accurately track mobility using strontium analyses of archaeological samples, a baseline of strontium signatures across the study region is required.

Moreover, the ratio of strontium incorporated into human and animal skeletal tissue is relative to the *biologically-available* strontium, as compared to the *geologically-expected* strontium ratios in the bedrock of a given location. Bentley notes that because "$^{87}Sr/^{86}Sr$ ratios weather at different rates, a geological map of $^{87}Sr/^{86}Sr$ variations in bedrocks is not always sufficient to predict the $^{87}Sr/^{86}Sr$ entering the environmental Sr cycle"(2006: 142). This is due to a number of additional factors that contribute to the $^{87}Sr/^{86}Sr$ ratio including bedrock weathering, atmospheric and ocean inputs, and movement of strontium by watercourses. Price and Gestsdóttir (2006:135) found that biologically available strontium ratios in Iceland varied considerably from strontium signals in the underlying bedrock. Therefore, in order to accurately model human and animal migrations using strontium signals, it is

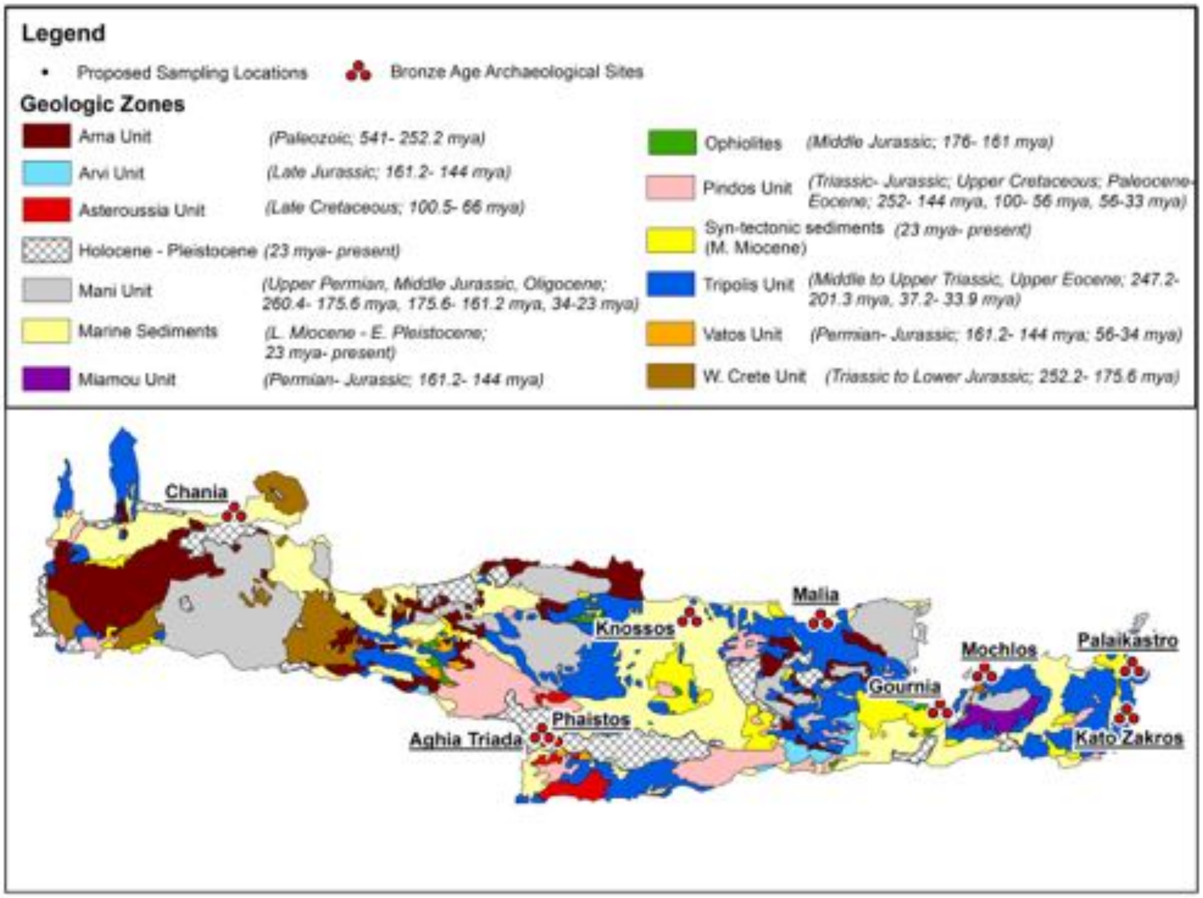

Figure 8.1: Geologic map of Crete

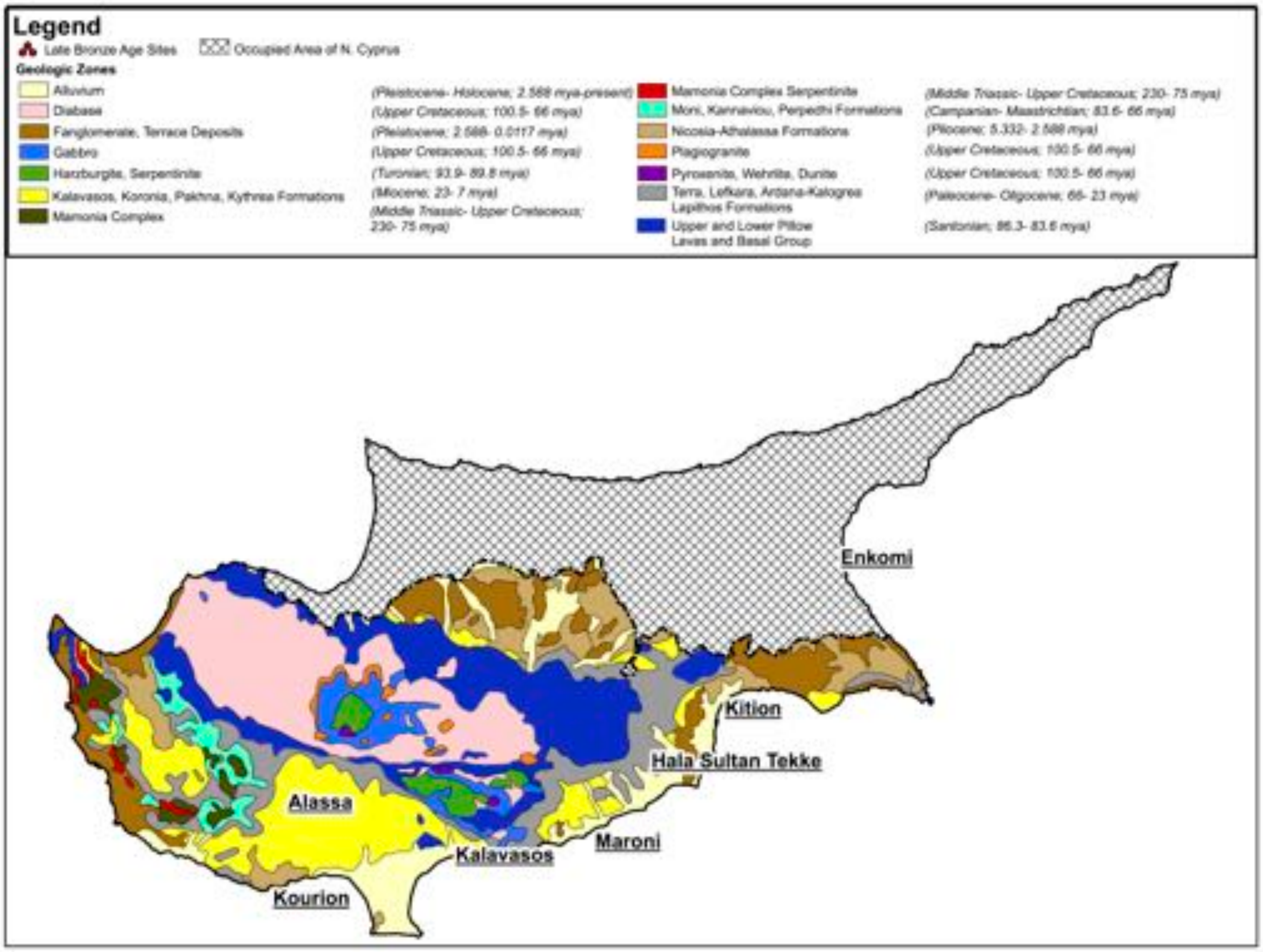

Figure 8.2: Geologic map of Cyprus

advantageous to map the *biologically-available* strontium in a given region rather than modeling it based on equations and known geology.

Biologically-available strontium can be best mapped using plant and small animal remains. Sillen *et al*. (1998) and Poszwa *et al*. (2004) show that plants consistently predict the average, local, *biologically-available* ^{87}Sr:^{86}Sr ratio. Small herbivorous animals average regional strontium signals, and therefore provide a useful way of tracking the strontium signal (Blum *et al*. 2000). With these findings in mind, the methodology proposed here follows that of Evans *et al*. (2010), who have created a strontium baseline for Great Britain. This study used a combination of snail-shell and archaeological samples across the study region, from strategically selected locations of known interest based on geologic or environmental disparities to develop a comprehensive database for comparison.

Similar studies are lacking on Crete and Cyprus. While Nafplioti (2011) has had some success utilizing snails and archaeological remains to develop an initial body of Sr values (n=23 samples) for Crete, more data is necessary in order to create a satisfactory database (approaching, for example, Evans *et al*. 2010, whose data include n=306 samples in creating a Sr baseline for Great Britain, or Hodell *et al*. 2004 whose data include n=216 samples in building a Sr baseline for the Yucatan peninsula). The Sr work on Cyprus has been restricted to geologic studies, thus identifying *geologically-available,* but not *biologically-available* Sr, and has also been of limited geographic scope (e.g. Booij *et al*. 1995; Staudigel *et al*. 1986).

Strontium analyses have been effectively used in archaeological research to both track the mobility of wild and domestic ungulate populations, and also to investigate land use practices.[199] A few studies are worth noting as they align with the goals of the analysis performed here in different geographic regions and time periods. Viner et al. (2012) analyzed the strontium ratio from thirteen cattle (*Bos taurus*) molars, representing thirteen different animals from the Late Neolithic site of Durrington Walls, Wiltshire, UK near Stonehenge. Cattle were prominent domesticated livestock in Britain in the Neolithic, and the demographics of faunal assemblages suggest an emphasis on dairy production from the Early Neolithic onwards (Legge 1981; Legge 2005). At Durrington Walls, pigs are the only livestock species more prevalent than cattle, however the management and mobility of the cattle disposed of (perhaps consumed at?) Durrington Walls was unknown. Given the apparent importance of cattle, Viner et al. sought to use Sr analyses to detect the grazing locations of cattle and to determine whether herds were grazed locally or at a distance from the settlement. While two of the thirteen teeth tested showed Strontium signals consistent with the local chalk-lands that surround Durrington Walls, the remaining eleven specimens produced signals that could not have come from the region around the site. Viner et al. divide these non-local specimens into three subgroups based on the strontium ratios they produced. The first group of 8 samples had strontium signatures consistent with geology at least 30 km from Durrington Walls, the second group of 2 samples could only have come from geology 90-100+

[199] A number of studies have used Strontium analyses of enamel from human remains as well to detect human mobility. Some recent examples include: Müldner et al. (2009) whose Sr analyses showed that medieval bishops and clergy at Whithorn Cathedral in Dumfries and Galloway, Scotland were not local, Eckardt et al. (2009) showed that Roman burials from Roman Winchester contained the remains of individuals from the Hungarian basin, and Gregoricka (2013) who used Sr analysis of human remains to detect potential mobility and regionalism in south-eastern Arabia during the Umm-Nar

km away, while the final subgroup containing two samples provided very radiogenic Sr signals consistent with pockets of geology in Cumbria, Scotland, and the nearby Malvern Hills. In this case, Sr values helped to identify a very wide-ranging and seemingly complex cattle economy, while also providing initial evidence to begin parsing the relationship between south-central England and the rest of the island during the Late Neolithic.

Minniti et al. (2014) used strontium ratios to detect the grazing locations and mobility of cattle consumed in Hampshire, England during the Iron Age and the Roman period. The study analyzed 95 cattle teeth—one of the largest collections of samples analyzed from an archaeological site in Great Britain—from Owlsebury; 11 from the Middle Iron Age (4^{th}-2^{nd} century BCE), 22 from the Late Iron Age (1^{st} century BCE- 1^{st} century CE), 45 from the Early Roman period (mid 1^{st} century CE- end of 1^{st} century CE) and 17 from the Middle Roman period (2^{nd} century CE). The Sr values suggested that Iron Age cattle had been raised on the chalk-lands that surround Owslebury (and which make up a substantial portion of the geology of south-central Great Britain). This is intriguing, especially given the apparent existence of a long-distance Late Neolithic cattle economy at nearby Durrington Walls as indicated by the work of Viner et al. (2012), and may suggest a more localized Iron Age economy. Alternatively, Early Roman, and especially Middle Roman samples indicated isotopic signals from geologic formations that were at least 70 km away, and resembling the Late Neolithic cattle economy at Durrington Walls. Minniti et al. suggest that these signals are suggestive of the import of cattle from central and northern England,

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period (2700-2000 BCE). However, because livestock are the principal focus of the analysis in this

Wales, Scotland, or even the European continent during the Roman occupation of the island (2014: 309).

Strontium analyses of caprine remains from Çatalhöyük are a final example of the power of strontium sourcing to detect land use patterns. In this case, strontium is instrumental in addressing the interaction between herding and agriculture. At Çatalhöyük, the nature of land use around the settlement has been of considerable debate, especially the use of the alluvial flood plain that surrounds the archaeological tell. The analysis of the faunal remains from the settlement in the 1990s made clear that caprines (primarily sheep) were of considerable importance to the diet there (Russell and Martin, 2005). More recent oxygen isotope analyses on sheep teeth from the faunal assemblage indicated that ~90% of the animals in the sample were herded in the lowlands and were not grazed in a transhumant fashion that would have used highland pastures in the Taurus Mountains (Henton et al. 2010). With this earlier isotope analysis framing the herding practices, Bogaard et al. (2014) sequentially analyzed seven sheep molars in a method very similar to the one employed in this project in order to determine the grazing location of the livestock throughout the first year of the animal's life. Results indicated that six of the seven animals were pastured in the alluvial plain around the settlement. While a pilot study with a small dataset, Bogaard et al.'s results illustrate the power of strontium analysis to aid in detecting land-use practices, while also providing preliminary evidence that at Çatalhöyük, "a range of habitats on the plain was exploited for diverse land-use practices, including cultivation, foraging and herding" (2014: 875).

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study, I only discuss livestock studies in detail here.

The potential for strontium analyses of faunal remains to help reconstruct herding strategies and broader land-use practices is becoming more and more established as studies like the above are performed and published. One key aspect of these studies (and in fact, a limiting factor that determines where Sr analyses can be deployed and how effective they might be) is the existence of baseline data that can be used to identify the *biologically-available* strontium in a given location (see e.g Hodell *et al*. 2004; Evans *et al*. 2009; Hedman *et al*. 2009; Nafplioti 2011). As noted above, this is a critical component of strontium analysis as it provides the data that makes it possible to link strontium signals in faunal remains with specific locations. While strontium values can be estimated based on the age of known geologic formations, a variety of additional factors impact biological strontium ratios as well, including variations in the weathering of given rock formations, different isotopic contributions based on available water and food sources, and the mixing of these signals. Therefore, the construction of a *biologically-available* strontium baseline, using land-snail samples as the primary data source to supply localized strontium values, is a critical component of this project that helps to makes it possible to pin-point the potential grazing locations of specific archaeological caprine specimens.

8.1.4 Oxygen Isotopes:

Useful isotopic analyses are not restricted to strontium, but also include carbon and oxygen, which can aid in evaluating seasonal mobility, breeding practices and livestock diet. The efficacy of complementary isotope approaches is indicated by Buzon and Bowen, whose use of carbon, oxygen and strontium in conjunction allowed them to comment on human migration in New Kingdom Egyptian and Nubia populations (2010; see also Buzon *et al*. 2007). Similar studies illustrate the benefit of multi-isotope methods to address mobility and seasonality in caribou (Britton *et al*. 2009), cattle (Evans *et al*. 2007) and caprines (Kirsanow *et al*. 2008).

Oxygen isotopic analysis makes it possible to comment on the birth seasonality and elevation changes during the life of the animal in question. The oxygen atom occurs in nature as three isotopes in different abundances, ^{16}O (99.757%), ^{17}O (0.038%), and ^{18}O (0.205%), with ^{16}O as the light isotope and ^{17}O and ^{18}O as the heavier isotopes, though the presence of ^{17}O is negligible (Rossman and Taylor, 1998).[200] Because oxygen atoms are a primary component in the H_2O water molecule, natural water cycle processes such as evaporation and condensation can filter the oxygen isotopes present at given elevations and during particular times of the year (Dansgaard 1964). Molecules that contain the lighter ^{16}O isotope evaporate more readily than molecules with the heavier ^{18}O isotope; conversely, molecules with the heavier ^{18}O isotope condense more readily than those with the lighter ^{16}O isotope. Lower elevations with hotter climates tend to experience greater evaporation, therefore water available at these locations has a higher average percentage of water molecules with heavier ^{18}O, leading to higher $\delta^{18}O$ values. At higher elevations, cooler temperatures lead to a more even distribution of oxygen isotope ratios, and lower $\delta^{18}O$ values. Ratios of ^{18}O:^{16}O are also linked to seasonal climate: during hot summer months—and especially in regional climates where summers are dry—when the water

[200] Due to it's very small relative abundance (only 0.038% of the natural occurring oxygen isotopes) ^{17}O is not a critical component in the oxygen isotopic ratio, and the traditional ratio used in oxygen analyses is ^{16}O:^{18}O.

cycle is characterized by greater evaporation ^{16}O evaporates more readily, so that groundwater and water in plants contains a higher ratio of ^{18}O to ^{16}O. In cooler winter months, however, oxygen isotope ratios remain relatively stable as evaporation and condensation even out. The deviation of this ratio of ^{18}O:^{16}O from the VSMOW (Vienna Standard Mean Ocean Water) standard provides a comparable value across all samples, referred to as a $\delta^{18}O$ value. $\delta^{18}O$ values correlate with temperate and elevation according to the following formulas:

> 1° C increase in temperature = 0.6‰ increase in $\delta^{18}O$
> (Rozanski et al. 1992)
>
> 100 m rise in elevation = 0.3‰ decrease in $\delta^{18}O$
> (Poage and Chamberlain 2001).

Oxygen incorporated into tooth enamel and skeletal tissue comes from body water, such that "enamel oxygen isotope composition is controlled primarily by the composition of ingested water, and, to a lesser extent, the composition of macronutrients in food" (Sponheimer and Lee-Thorp, 1999: 723). Body water that results from ingested water and plants, therefore, tracks water derived from the atmosphere through processes of precipitation or condensation (referred to as meteoric water in Geologic parlance; Longinelli 1984; Luz et al. 1984). As noted above, tooth enamel in sheep and goats is precipitated in sequential layers, and these layers draw the isotopes used in the production of the enamel from body water such that progressive enamel samples from caprines contain isotopes that are reflective of the environment the animal was living in when the portion of the tooth was formed. Fricke et al. (1998) show that the qualitative changes in $\delta^{18}O$ reflect actual climatological changes in the environment in which specimens lived while the enamel in their teeth was being laid down. It is difficult to sample enamel from teeth that correspond to the exact layers laid down during the production of the tooth, therefore dampening/averaging of the isotope signal often occurs. This means that while the $\delta^{18}O$ values can reflect qualitative patterning in the oxygen isotopes of the local environment during tooth production, they are not exact proxies (Balasse, 2002). Thus, $\delta^{18}O$ values from enamel cannot be used to directly correlate to temperature or altitude values using the formulas above, even though they can be used to indicate changes in temperature and elevation experienced by the animal during the growth of the tooth.

In Mediterranean environments, water available for ingestion, as well as the water incorporated into herbivore food sources are directly linked to rainfall due to the seasonal nature of precipitation and the lack of large water reservoirs such as deep lakes or year-round ice packs. This constant water-turnover means that $\delta^{18}O$ values are consistent with seasonal precipitation. In these relatively arid environments, herbivores receive most of their water intake either from seasonal streams or via the plants they consume (Silanikove 1989). Because $\delta^{18}O$ values vary with seasonal climates and also with altitude, oxygen isotope ratios in sheep and goat tooth enamel can therefore be used to detect seasonality of birth as well as elevation changes that would be indicative of seasonal pasturage in the highlands.

Two studies serve as examples for the use of $\delta^{18}O$ to investigate birth seasonality and elevation changes in herding strategies. Balasse et al. (2002) illustrated the potential for $\delta^{18}O$ to investigate seasonality of birth using sequentially-sampled enamel layers at Late Stone Age (c. 1300-190 BP) midden sites at Kasteelberg in

South Africa. This study analyzed eleven teeth, which in turn represented eight animal specimens (the study analyzed three second molars and three third molars from the same sample mandible). Plotting the $\delta^{18}O$ values against the distance of each sequential sample from the neck of the tooth (i.e. the portion of the tooth closest to the jaw, and the most recent enamel layer) produced sinusoidal data curves. These are consistent with a seasonal change in the oxygen isotopes environmentally available for uptake and use in biological processes. These sinusoidal curves indicate a patterned fluctuation in the ratio of ^{18}O:^{16}O in the local environment: a greater disparity between the isotopes during drier, hotter months (and therefore a lower $\delta^{18}O$ value), and a more even ratio (and therefore a $\delta^{18}O$ closer to zero) during the wetter winter months. Moreover, Balasse et al. identified two distinct groups in the $\delta^{18}O$ sinusoidal curves, differentiated by whether the plotted data begins with an upward or downward curve. These different curves indicate two distinct seasons of birth: one in the late fall, and a second in the late spring (both of which are consistent with more recent traditional breeding seasons). It is worth noting here that data that produces a complete sine curve represents relatively little regional movement during the period of tooth growth, while data curves that produce only an upward or downward swing potentially indicate gradual exposure to climatological changes that would occur if a transhumant grazing strategy was employed.

While Balasse et al. sought to use $\delta^{18}O$ as a seasonal indicator, Henton et al. (2010) used the analysis of oxygen isotopes in caprine teeth as proxy data for elevation changes in the pastureland around Çatalhöyük in central Anatolia. Henton et al. analyzed 9 teeth in the same sequential fashion as Balasse et al. and used similar sinusoidal patterning in the oxygen isotopes to detect seasons of birth. However, because their focus was on elevation changes and an investigation into potential transhumance, Henton et al. were also focused on the range between the highest and lowest $\delta^{18}O$ values. Animals herded in the same location year-round would experience greater variation between summer and winter temperatures (and therefore a greater variation in $\delta^{18}O$ values) than if they were herded in a transhumant fashion. This is because movement into the highlands during the summer and into the lowlands during the winter would ensure exposure to a more consistent relative temperature (and therefore a more consistent relative $\delta^{18}O$ value) throughout the year. In other words, a greater range between minimum and maximum $\delta^{18}O$ values across a single tooth indicates seasonal temperature fluctuations that are consistent with the herding of animals in the same climatic zone year round. Alternatively, a dampened $\delta^{18}O$ range would indicate movement across climatic zones as the movement between the winter lowlands and summer highlands negates seasonal variations in temperature and ensures relative climatic consistency (and therefore relative consistency of $\delta^{18}O$ values and a smaller range between minimum and maximum values).

To summarize: oxygen isotope values are determined by evaporation and condensation, and are directly correlated to fluctuations in temperature regimes. Because these isotopes are incorporated into sheep teeth, sequential enamel samples can provide data to track seasonality (indicated by a sinusoidal patterning of $\delta^{18}O$ values from a single tooth) and elevation changes (indicated by a dampened range of $\delta^{18}O$ values, and $\delta^{18}O$ values that trend upward or downward but do not return to initial levels as a sinusoidal pattern does). Both of these issues (seasonality and elevation change/transhumance) would have been important considerations for Late Bronze Age shepherds on Crete and Cyprus, where elevation changes could be significant if the highlands were used as pastureland, and where the season of birth would be important to ensure that newborn lambs could survive (or, alternatively, season of birth may give an indication of when lambs when meat sources were most readily available).

8.2 *Strontium Baseline Data:*

As noted above, because of complexities in rock weathering, soil development, strontium uptake by flora, and the contribution of strontium values in water as well as diet, *biologically-available* strontium signals present the best opportunity to track livestock movement throughout tooth growth. In order to do this, strontium ratio values for given locations across a region must be detected. *Biologically-available* strontium can be best mapped using plant and small animal remains. Sillen *et al.* (1998) and Poszwa *et al.* (2004) show that plants consistently predict the average, local, *biologically-available* ^{87}Sr:^{86}Sr ratio and small herbivorous animals such as snails average regional strontium signals, and therefore provide a useful way of tracking the strontium signal (Blum *et al.* 2000). This dissertation project employed the carbonate in land snail shell samples to attempt to produce a baseline of regional strontium values. These values are not exact—but, as studies such as Evans et al. 2010 have illustrated, they can provide a map of broad trends in the strontium values across a study area in order to help interpret strontium values from archaeological samples.

What follows is a case study for the application of strontium and oxygen isotopic analyses on sheep teeth from Late Bronze Age contexts on Cyprus. While these analyses should be equally applicable to archaeological samples from Crete, permitting issues prevented the export of archaeological samples for analysis. Some snails were collected to produce a strontium baseline for Crete, however the quality of the data for these samples was not sufficient to produce an extensive strontium baseline, and since archaeological samples from Crete are not analyzed here, these samples were not particularly applicable to the larger goal of illustrating how shepherding practices can be detected via isotopic analysis. For this reason, I treat the analysis of faunal remains that follows as a case study of how this method can be more widely deployed throughout the eastern Mediterranean to further model shepherding practices and land management in the past.

8.2.1 An Initial Cypriot Biologically-Available Strontium Baseline

Cyprus—and, for that matter, Crete—have substantial geologic variation (see fig. 8.1 and 8.2), a fact that should, theoretically, make both islands ripe for detailed strontium baselines. While strontium data from caprine teeth alone would make it possible to comment on the movement of sheep during specific periods of their lives, some strontium baseline data is required to pinpoint approximate locations for that movement. Therefore, the initial stage of this dissertation project involved an attempt at producing a strontium baseline for south-central and south-eastern Cyprus. These regions are where the archaeological sites from which the caprine teeth samples originated. A series of studies (e.g. Bentley 2006; Evans *et al*. 2009, 2010; Nafplioti

2011) have indicated that the remains of small herbivores present the best opportunity to produce strontium baseline data, and land snails are a prime candidate based on the fact that they incorporate strontium into the carbonate of their shells in a similar fashion as mammals incorporate strontium into their skeletal tissue.

Following this methodology, landsnails from forty-five locations across south-central and south-eastern Cyprus were collected during the spring of 2013. This attempt at producing a strontium baseline ran into two major setbacks, however. The first was the fact that landsnails were non-existent on the igneous geologic formations of the Cypriot Troödos. The reasons for this are not entirely clear, however the igneous formations clearly do not support an ecological niche that is attractive to landsnail populations. Because of this, strontium baseline values for the Troödos massif were not generated by this study. In addition, due to limitations in funding, and the fact that a substantial portion of the funding for this project needed to be reserved to support the analysis of archaeological samples, of the forty-five locations from which snail samples were taken, it was only possible to analyze and produce strontium values for fourteen. On the one hand, this leaves considerable room for additional studies to develop a strontium baseline for the island, especially considering that the robust strontium baselines for other geologic locations across the world are made up of well over 100 samples (e.g. Hodell *et al*. 2004 and Evans *et al*. 2010). Expanding the network of strontium values to the furthest eastern portions of the island and to the furthest western portions of the island would further extend this network of strontium values and provide a higher resolution dataset for interpreting strontium values from animal remains at various archaeological sites.

Despite these setbacks, the fourteen strontium values provided by the landsnail shells collected throughout the central and eastern portion of Cyprus provide a useful foundation for comparison with the archaeological samples that are discussed below. Baseline samples appear to generally correspond to known geological regions on Cyprus (see fig. 8.3), however more data is certainly required in order to provide a comprehensive mapping of strontium values on Cyprus. Alluvial deposits that are closer to the coast of Cyprus, and with ages between 23 mya to the present, appear to generally have values that are lower than those of the much older (~100 – 80 mya, see fig 8.2), igneous Troödos Massif. This is to be expected, as older geologies have higher ratios. Two outliers in the data do suggest that the biologically-available strontium in the snail shells analyzed is the result of more than just local geology (as expected): the 0.7088 value near Kalavasos-*Ayios Dhimitrios* and the 0.7088 value near Maroni. While contamination is a possible, given the similarity of the two values, it is equally possible that these values are the result of igneous enriched water that travelled down the Kalavasos and Maroni valleys from the Troödos highlands and was incorporated into the snail.

The value of this strontium analysis for this project is in their comparison with strontium values from archaeological samples. It is worth, therefore, noting the likely strontium signals in the vicinity of the archaeological sites under consideration here, since similar values from caprine samples will indicate a localized herding strategy, whereas drastically different values will suggest a broader, more regional

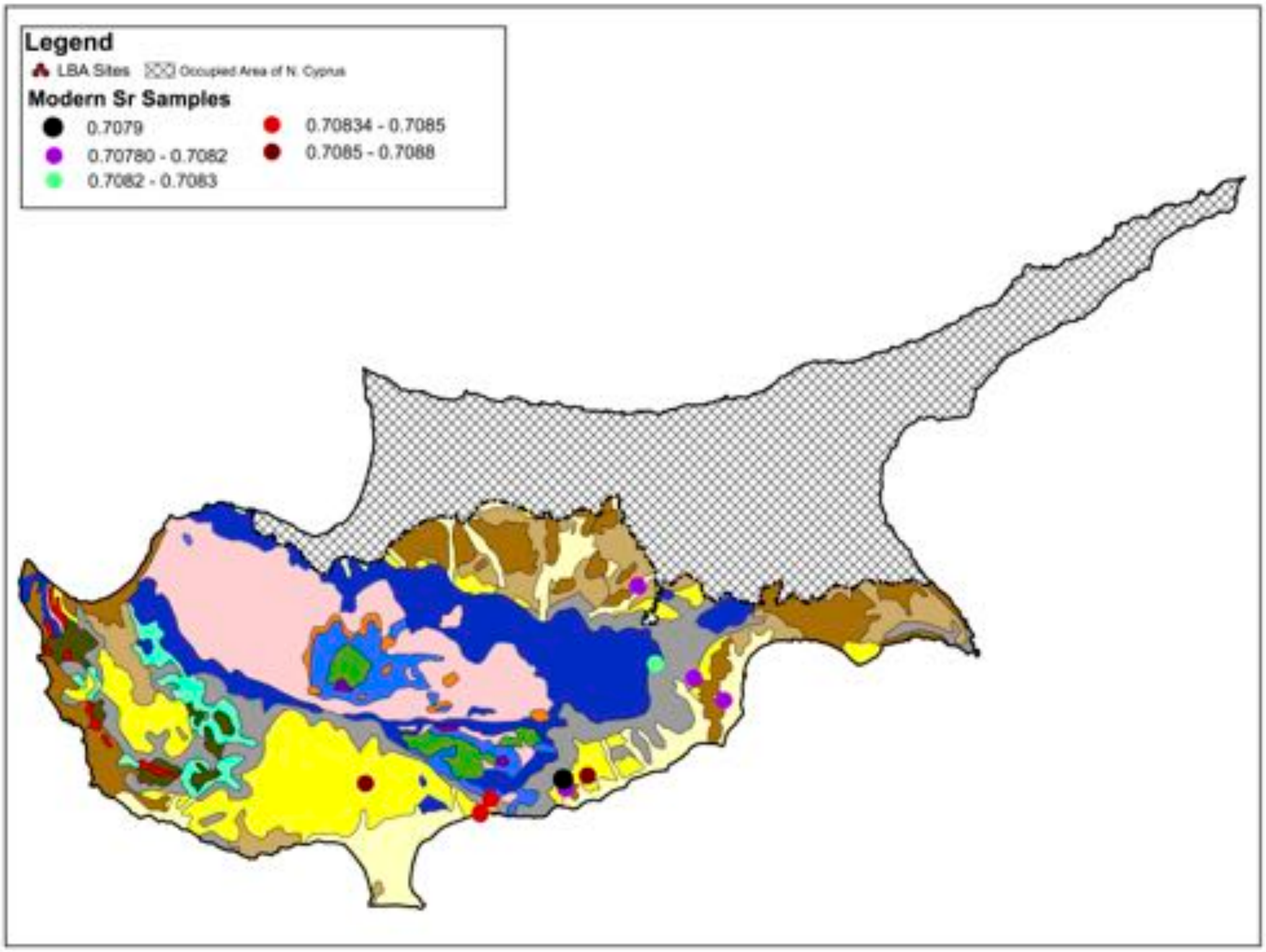


Figure 8.3: Map of baseline samples overlaid on Cypriot geology

(or perhaps, even island-wide) herding strategy.

- Strontium baseline values for the alluvium along the south-central coast of the island near Hala Sultan Tekke are between 0.7081-0.7082. A similar value (0.7082) comes from a sample taken from an alluvial valley along the north-eastern edge of the Troödos, suggesting that the alluvial run-off from the Troödos maintains a strontium ratio of ~0.7082. Sheep herded around Hala Sultan Tekke (HST), therefore are likely to have strontium values that are close to 0.7082, and if sheep were brought into the highlands in that vicinity, enriched strontium values closer to 0.7083 or 0.7084 might suggest this.
- Baseline data from around Maroni is more complex: like HST alluvial regions around Maroni appear to have relatively low strontium values between 0.7079-0.7081 (leaving aside the 0.7088 value which is likely from water enriched via soil erosion and runoff from the Troödos to the north). Thus, again, lower strontium value from caprine remains close to 0.7081 or below, would indicate localized herding around Maroni and near the coast. Higher values would again be indicative of herding in the highlands, as higher strontium values from igneous Troödos geology were incorporated into sheep and goat skeletal tissue.
- At Kalavasos values are even more variable, likely the result of a similar erosive effect to that around Maroni, with water flowing through the Troödos foothills becoming enriched and affecting strontium values downstream at Kalavasos. Values around KAD are 0.7085-0.7088, meaning any strontium

values from samples at KAD that fall within this range cannot be ruled out as localized herding.

- Strontium values from the Troödos foothills around the Late Bronze Age settlement at Alassa again indicate that strontium values likely increase further into the highlands. A 0.7087 value helps to indicate that values that hover around 0.7087-0.7088 might be indicative of pasturing animals in these higher elevations in the south-central portion of the island.
- Due to the fact that Enkomi is located in the occupied northern portion of Cyprus, collecting snails for baseline analysis in the vicinity of that settlement was not possible. Therefore, strontium values for that region can only be guessed at. That being said, as noted above (pg. 231), Enkomi is located in alluvial bottomlands with geologies that are similar in age and composition to those in south-central Cyprus around Hala Sultan Tekke and Maroni. We should expect, therefore, that strontium values in the area around Enkomi would likewise be between 0.7081-0.7082.

8.3 Oxygen Baseline Data for Cyprus:

Since 1960, the International Atomic Energy Agency (IAEA) and the World Meteorological Organization (WMO) have collected precipitation from around the world to produce data for the isotopic composition of localized rainwater. This database is referred to as the Global Network of Isotopes in Precipitation (GNIP), and a limited dataset, collected between 1964 and 1972, is available for Cyprus (see table 8.1).

Collection Site	Beginning of Collection Period	End of Collection Period	δO^{18}
Prodhromos	3/1/64	3/31/64	-6.04
	1/1/65	1/31/65	-8.11
	12/1/65	12/31/65	-7.03
	1/1/66	1/31/66	-6.87
	3/1/66	3/31/66	-7.1
	10/1/66	10/31/66	-5.69
	12/1/66	12/31/66	-6.16
Halefka	11/1/71	11/30/71	-4.24
	12/1/71	12/31/71	-6.68
	2/1/72	2/29/72	-7.1
	3/1/72	3/31/72	-7.1
	4/1/72	4/30/72	-7.3
	5/1/72	5/31/72	-5.2
	6/1/72	6/30/72	-5.3
	7/1/72	7/31/72	-8.1
Nicosia	3/1/64	3/31/64	-2.52
	12/1/64	12/31/64	-9.46
	1/1/65	1/31/65	-8
	12/1/65	12/31/65	-5.15
	12/1/66	12/31/66	-4.21
	12/1/67	12/31/67	-4.6
	1/1/68	1/31/68	-5.85
	1/1/72	1/31/72	-6.1
	2/1/72	2/29/72	-4.2
	5/1/72	5/31/72	-4.6
	7/1/72	7/31/72	-3.5

Table 8.1: GNIP data for collection points in Cyprus (1964-1972)

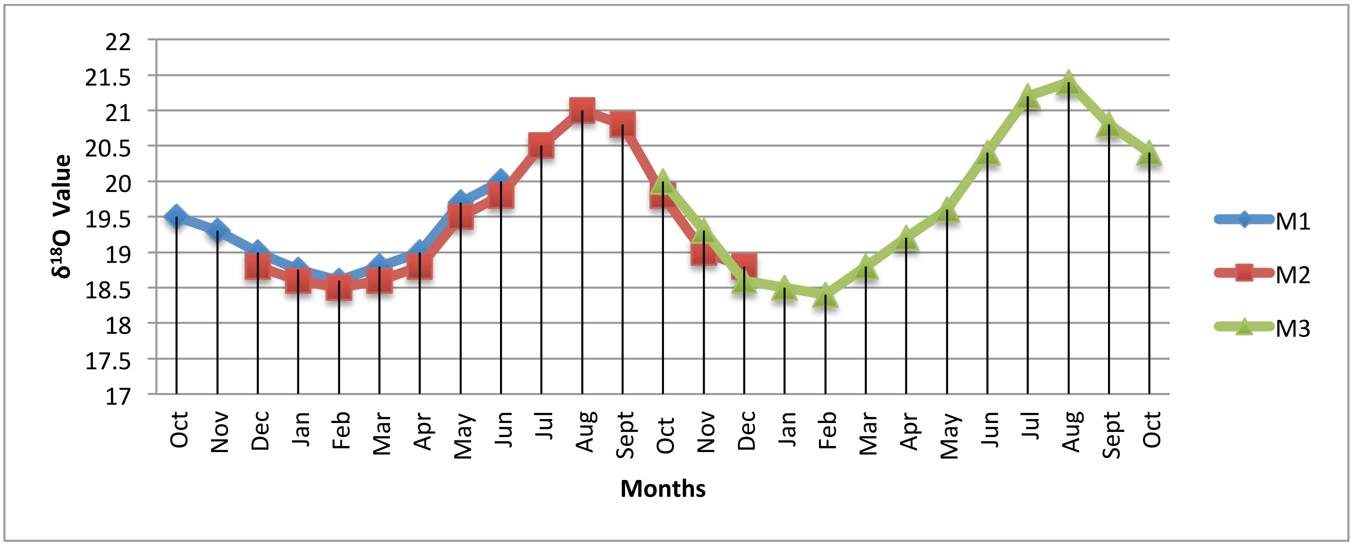
Precipitation samples were taken from three locations: Prodhromos in the central Troödos, Halefka along the north-western edge of the Troödos and in Nicosia, however the datasets were collected at irregular intervals, and—especially in the case of the Prodhromos data—are skewed towards the winter months. This makes it difficult to produce a consistent measure of oxygen isotopes in precipitation for various locations across the island, however these data indicate a correlation between elevation change and $\delta^{18}O$ values.

Jacovides, also under the auspices of the IAEA, collected groundwater samples from three locations in the Troödos Massif between 1976 and 1978, and found a strong correlation between $\delta^{18}O$ values and elevation (1979). This study found that groundwater at elevations of 1000 masl produced average $\delta^{18}O$ values of -5.20‰, while samples taken at 1500 masl or greater produced average $\delta^{18}O$ values of –7.50‰. While the exact $\delta^{18}O$ value for ingested water can not be determined, these values indicate that $\delta^{18}O$ values on Cyprus will vary with elevation changes. A later study by Boronina et al. (2005) analyzed hydrogen and oxygen isotopes in precipitation and groundwater in the Kouris basin in south-eastern Cyprus and also noted considerable variations in isotopic values between precipitation events. They also noted, however, a general monthly trend that matches the expected sinusoidal oxygen isotope curve, with the lowest $\delta^{18}O$ values corresponding to winter months, and higher values occurring in warmer, summer months. This study found that $\delta^{18}O$ values did vary with elevation on Cyprus, as much as -0.27‰ per 100m of elevation increase.

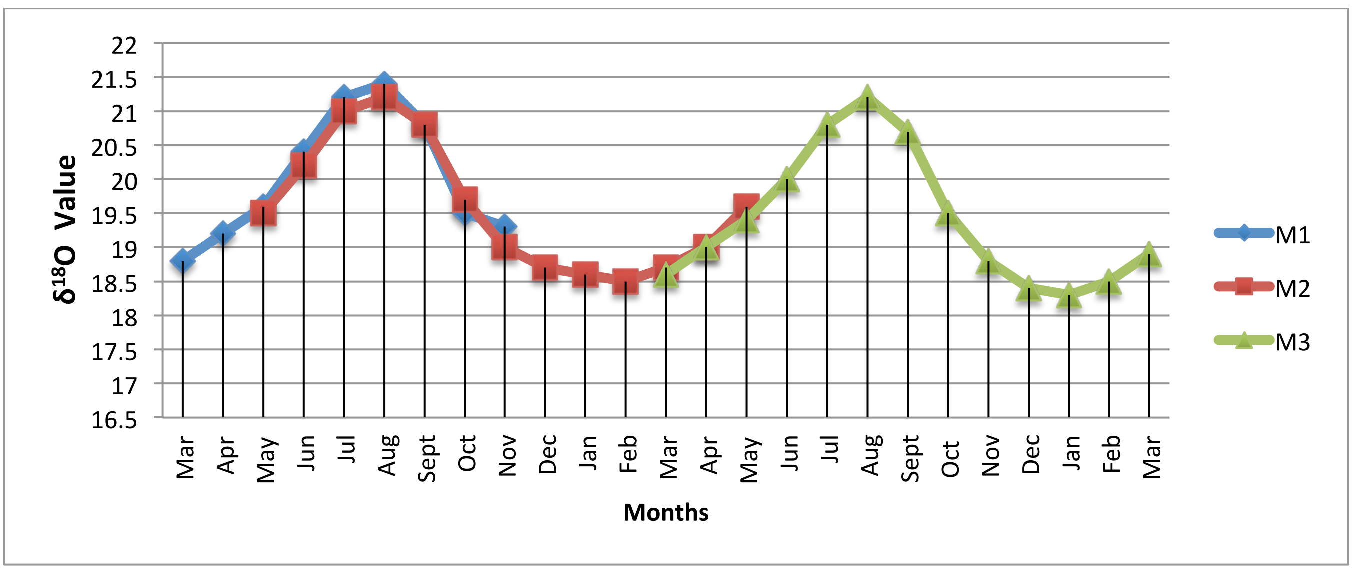
GNIP data can thus be useful in illustrating the potential trends in highland versus lowland oxygen isotope values and the variation between altitudes. GNIP data cannot, however, be directly compared with enamel $\delta^{18}O$ values. This is because the $\delta^{18}O$ value from the carbonate and phosphate in sheep enamel varies according to the $\delta^{18}O$ body water, which is, itself, contributed to by ingested water, consumed plants, and atmospheric oxygen, and therefore involves more than simply input from precipitation. Thus, $\delta^{18}O$ values from sheep enamel will produce values that can not themselves be directly compared with the GNIP $\delta^{18}O$ values, however, general oxygen isotope trends, including a decrease in $\delta^{18}O$ with 100 m of elevation, and lower $\delta^{18}O$ values in the winter, and higher $\delta^{18}O$ values in the summer, makes interpreting the isotopic analysis of the archaeological samples possible (see figure 8.5).

8.4 *Isotopic Analysis of Archaeological Samples:*

The following section analyzes the strontium and oxygen isotopes values from three Late Bronze Age archaeological sites on Cyprus. Each sample set is first considered in its archaeological context, as best as possible with regards to the available excavation records, followed by an in-depth discussion of each tooth specimen, and a comparison of the strontium values and trends, with the oxygen values and trends. A brief discussion serves to summarize how each subset helps to further frame our understanding of shepherding and livestock management practices (and, therefore, the agency of shepherds) for the animals that were consumed at each settlement. The sheep teeth sampled here are second (M2) and third molars (M3).[201] Recall that the enamel layers in second molars begin to be laid down just after the animals birth (in the first or second month) and the tooth is completed by a year after



(A)



(B)

Figure 8.4: Idealized, hypothetical $\delta^{18}O$ curve expected from first, second and third molars (M1, M2 and M3) for caprine fall birth (A) and spring birth (B)

201 The type of each tooth is identified in figs. 8.7, 8.9 and 8.11.

birth, while third molars begin to be formed at approximately one year and are complete at approximately two years (Hillson 2005: 230-232; Balasse et al. 2012: 358-359, see figure 8.4). Therefore the samples from each tooth represent approximately one year of herding practices. In some cases, $\delta^{18}O$ charts have more data points than Sr charts; this is due to the fact that considerably less sample is required to produce a reliable signal for oxygen analysis, and the missing Sr points correspond to samples that had too little strontium to produce a reliable reading.

8.4.1 **Kalavasos-*Ayios Dhimitrios***

Ten caprine teeth (labeled here as KAD1 through KAD10) were sampled from Kalavasos-*Ayios Dhimitrios* from a variety of Late Bronze Age contexts: T11 3.3, P52a, A.173, O51C, Q1B, and OIA (see fig 8.7). T11, P52a, A.173 and O51C deserve a detailed description, while Q1B and OIA are simply LBA fill contexts. T11 refers to Tomb 11, an elite tomb underneath a street that leads to the monumental structure, Building X. The tomb dates to the LCII (mid-14th to 13th century BCE) and the sampled tooth comes from the floor of the tomb, probably a funerary offering or the remnants of a funerary feast. P52a, A.173 and O51C likely represent more traditional, "every-day" refuse; P52a is a LBA discard pit in which "a substantial number of the caprine bones bear knife marks," (Croft, n.d.), A. 173 is the fill to a Late Bronze Age well, while O51C is a refuse layer above a pebble courtyard to the east of the Late Bronze Age structure 261. KAD1 comes from T11; KAD2 and KAD3 comes from P52a; KAD4, KAD5, KAD6 and KAD9 come from A.173; KAD7 is from

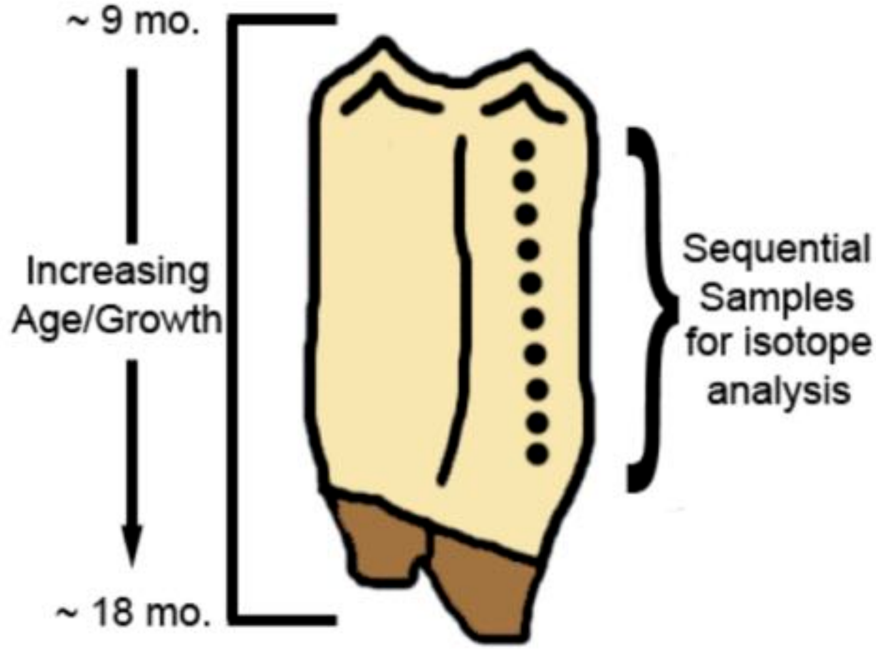


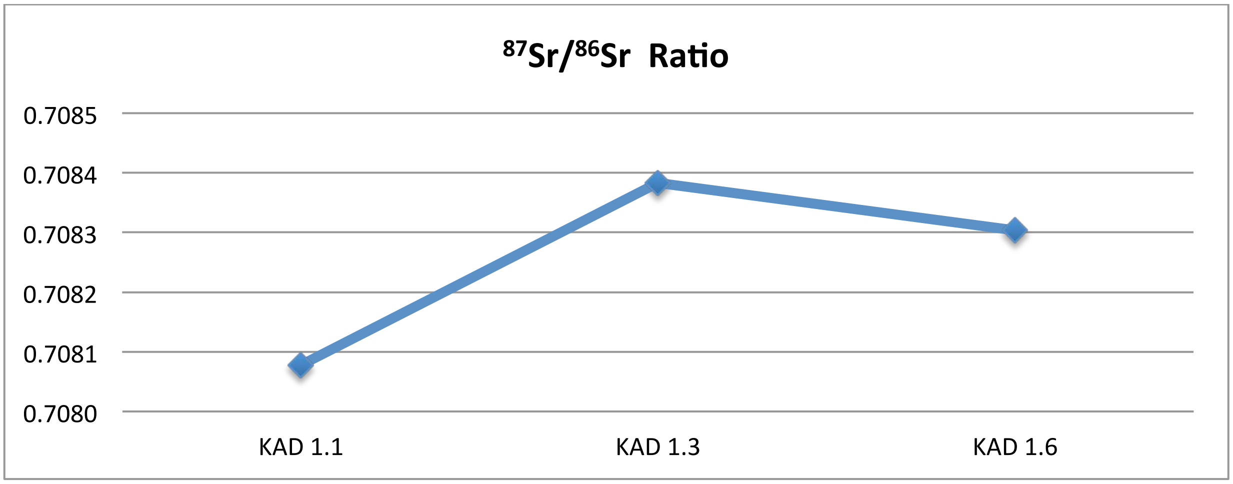
Figure 8.5: Diagram of caprine second molar (lingual view) and locations for sequential enamel sampling

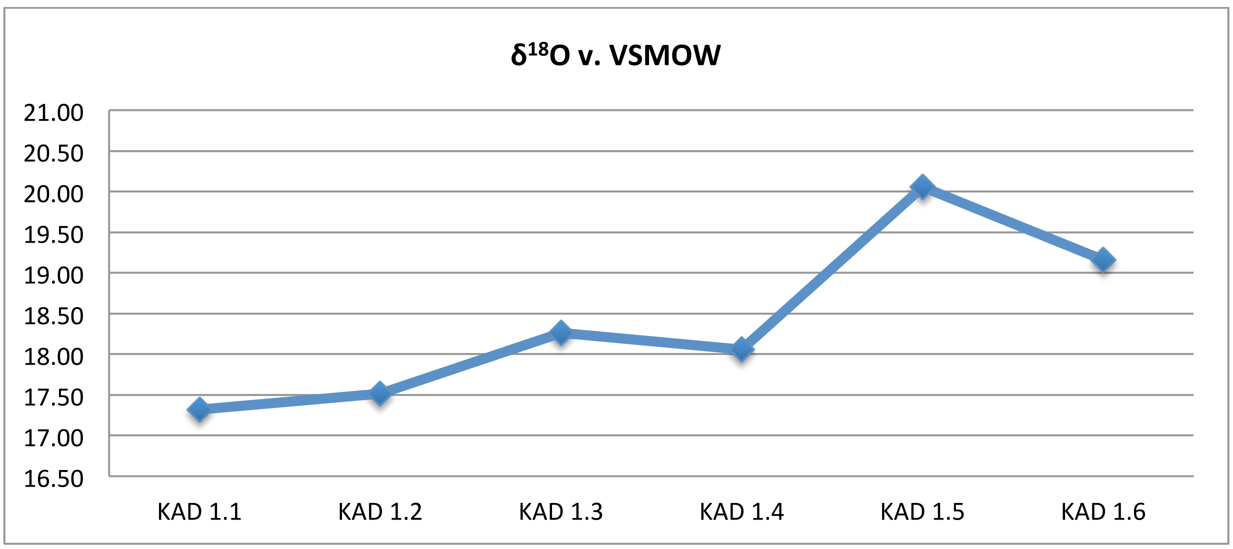
Samples	Tooth Type	Context	87Sr/86Sr	$\delta^{18}O$	Estimated δ18O Ingested H2O
KAD 1.1	Mandibular (Lower) M3	T11 3.3, Unit 2	0.7080775	17.32	-6.68
KAD 1.2				17.51	-6.55
KAD 1.3			0.7083835	18.26	-6.05
KAD 1.4				18.06	-6.19
KAD 1.5				20.06	-4.83
KAD 1.6			0.708304	19.16	-5.44
KAD 2.1	Mandibular (lower) M2	P52a, Unit 3.6	0.7084963	18.62	-5.80
KAD 2.2				18.38	-5.97
KAD 2.3				18.60	-5.82
KAD 2.4				19.77	-5.03
KAD 2.5				21.41	-3.92
KAD 3.1	Mandibular (lower) M3	P52a 3.6		19.85	-4.97
KAD 3.2			0.7084231	18.83	-5.66
KAD 3.3			0.708203	20.06	-4.83
KAD 3.4				19.64	-5.11
KAD 3.5				20.22	-4.72
KAD 4.1	Mandibular (lower) M2	A.173, Unit 3.6	0.7085156	18.41	-5.95
KAD 4.2			0.7084452	17.98	-6.23
KAD 4.3			0.7082527	18.06	-6.19

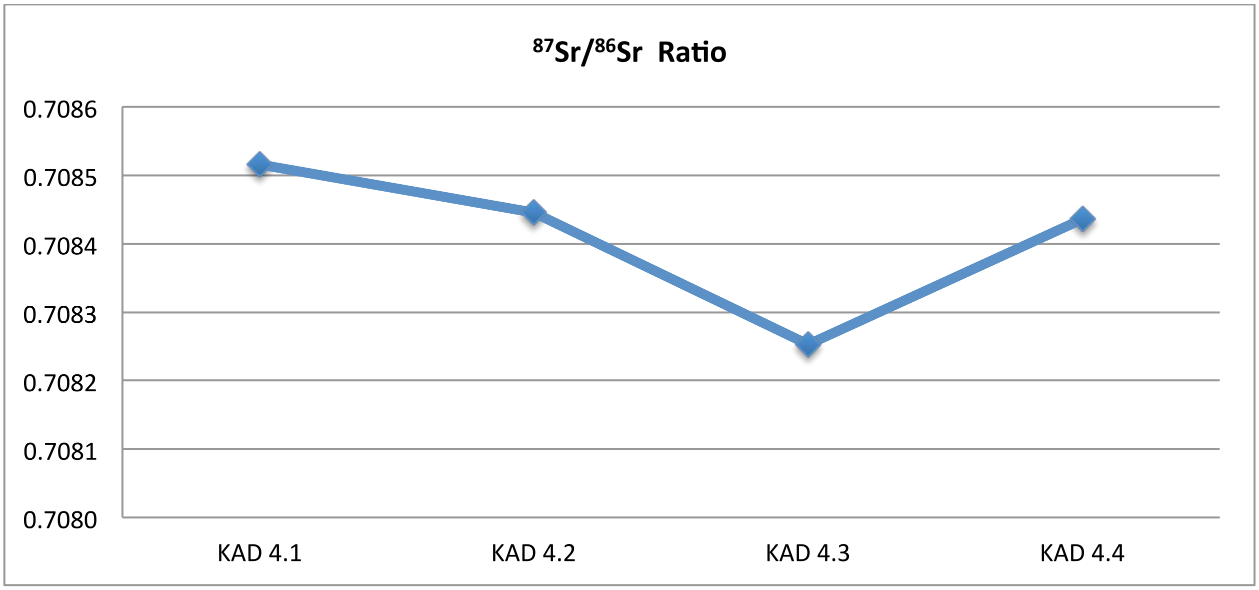
KAD 4.4			0.7084363	17.56	-6.52
KAD 5.1	Mandibular (lower) M3	A.173, Unit 3.6	0.7084626	17.23	-6.74
KAD 5.2			0.7573748	17.37	-6.65
KAD 5.3				16.64	-7.14
KAD 6.1	Mandibular (lower) M3	A.173,Unit 3.10	0.7085598	17.53	-6.54
KAD 6.2			0.7085701	17.12	-6.82
KAD 6.3			0.7085655	16.74	-7.07
KAD 6.4			0.7085731	17.88	-6.30
KAD 7.1	Mandibular (lower) M3	O51C, Unit 4.1	0.708373	19.93	-4.92
KAD 7.2			0.7083487	20.31	-4.66
KAD 7.3			0.7081935	19.99	-4.88
KAD 7.4			0.7089994	19.52	-5.20
KAD 7.5			0.7086156	18.92	-5.60
KAD 8.1	Maxillary (upper) M2	Q1B, Unit 18.6	0.7086433	19.13	-5.46
KAD 8.2			0.7086551	19.12	-5.47
KAD 8.3			0.7086141	19.37	-5.30
KAD 8.4			0.7085737	18.42	-5.94
KAD 8.5			0.708561	19.99	-4.88
KAD 8.6			0.7085479	18.19	-6.09
KAD				17.71	-6.42

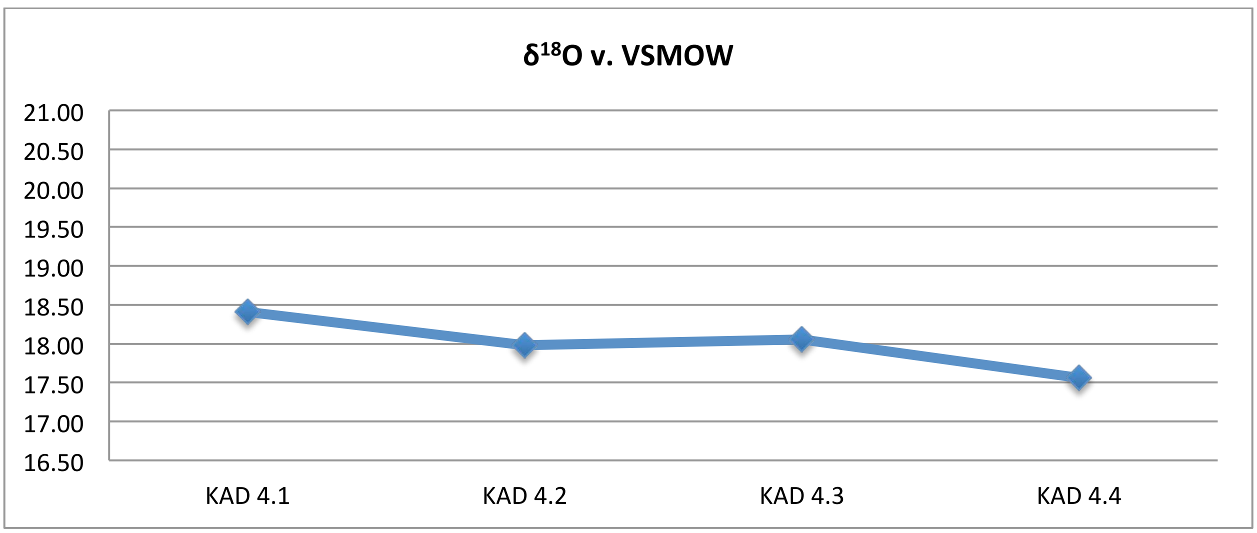
8.7					
KAD 9.1	Maxillary (upper) M2	A.173, Unit 3.5	0.7084651	19.53	-5.19
KAD 9.2			0.7084862	16.73	-7.08
KAD 9.3			0.7084886	18.98	-5.56
KAD 9.4				18.29	-6.02
KAD 10.1	Maxillary (upper) M3	OIA, Unit 7.1		20.89	-4.27
KAD 10.2			0.7082966	18.71	-5.74
KAD 10.3			0.7066228	18.83	-5.66
KAD 10.4				19.85	-4.97
KAD 10.5				20.29	-4.68
KAD 10.6				18.40	-5.95

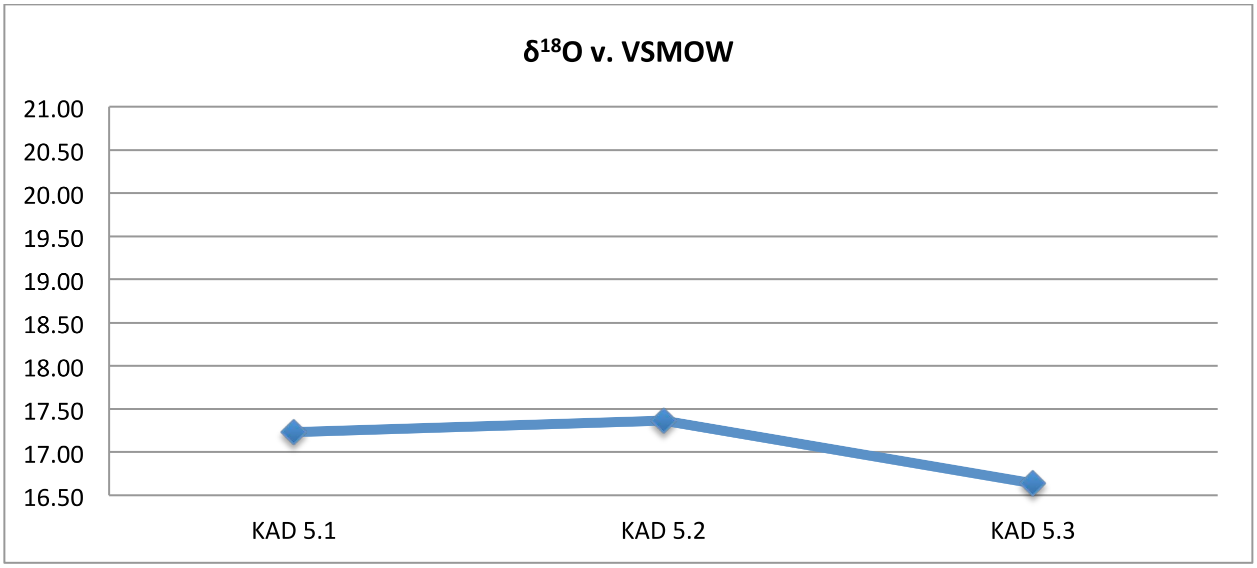
Table 8.2: Kalavasos- Ayios Dhimitrios samples with archaeological context, Sr, $\delta^{18}O$ and estimated $\delta^{18}O$ values of ingested water values.

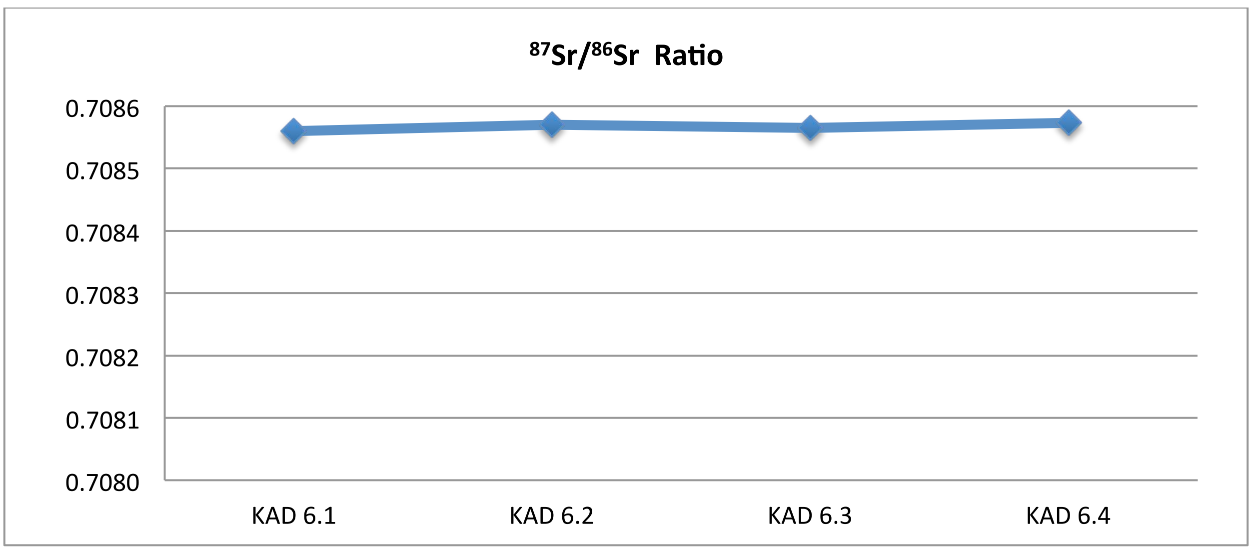

$^{87}Sr/^{86}Sr$ Ratio
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
KAD 1.1
KAD 1.3
KAD 1.6

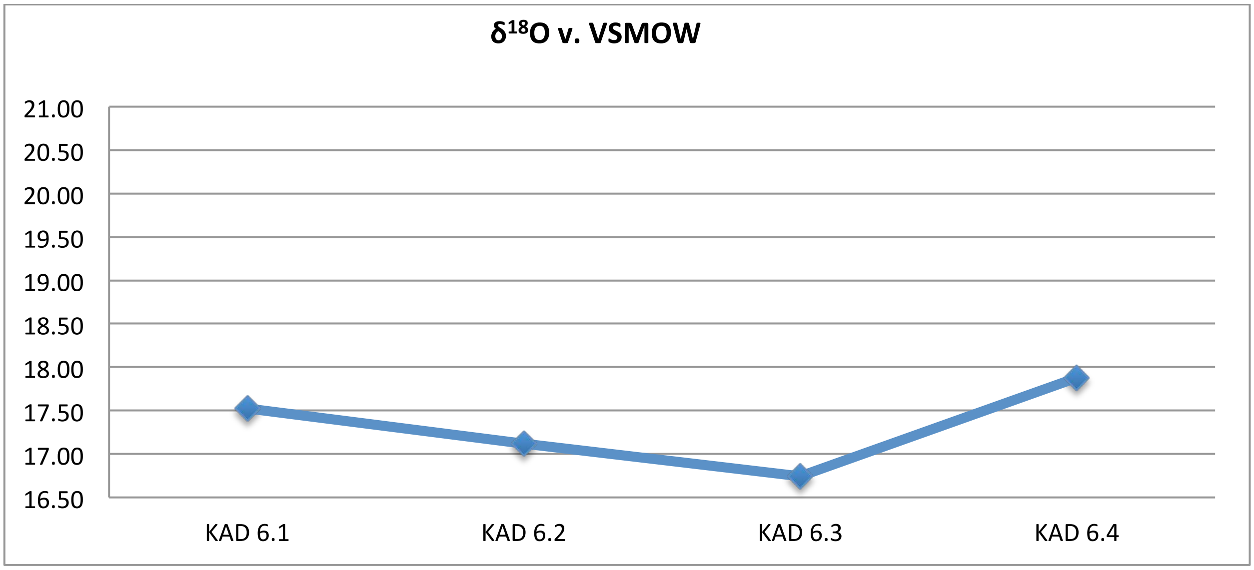

$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 1.1
KAD 1.2
KAD 1.3
KAD 1.4
KAD 1.5
KAD 1.6


$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
KAD 4.1
KAD 4.2
KAD 4.3
KAD 4.4

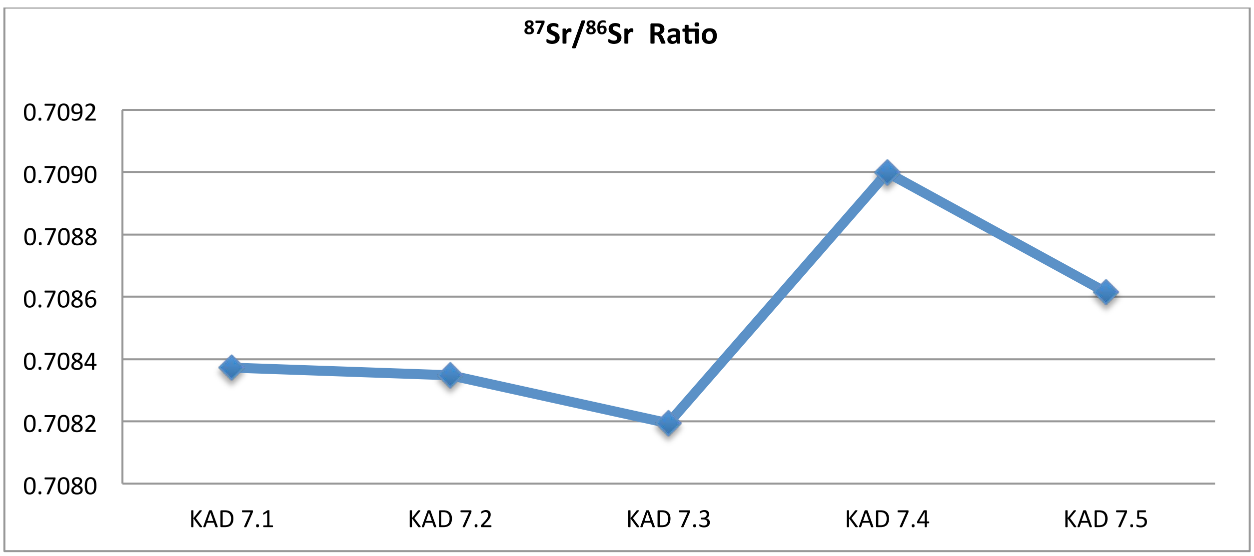

$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 4.1
KAD 4.2
KAD 4.3
KAD 4.4


δ18O v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 5.1
KAD 5.2
KAD 5.3

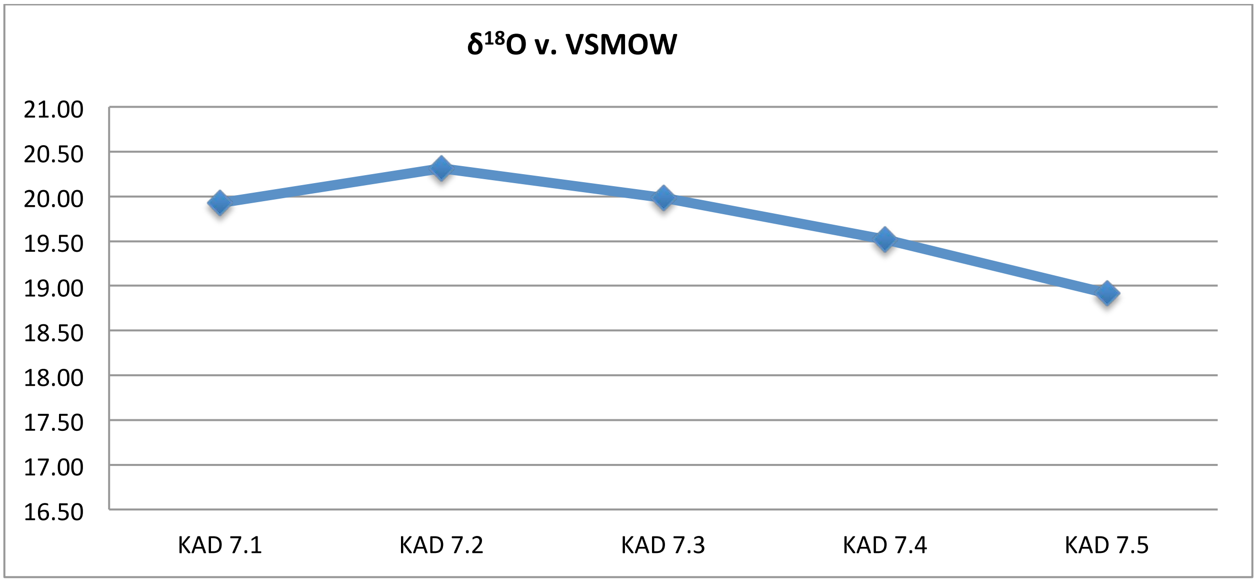

87Sr/86Sr Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
KAD 6.1
KAD 6.2
KAD 6.3
KAD 6.4

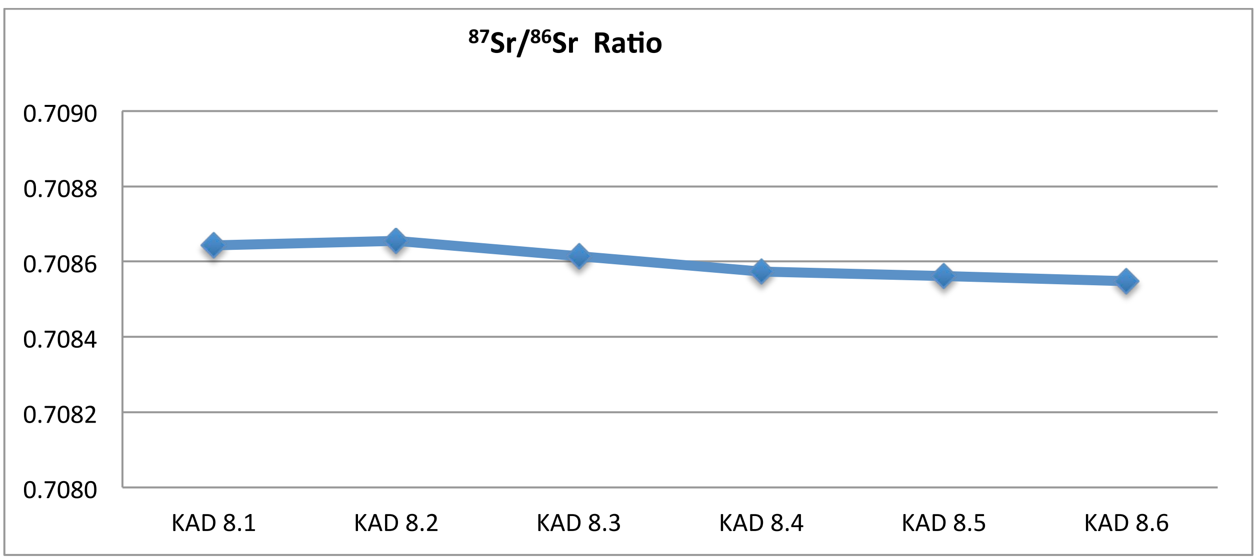


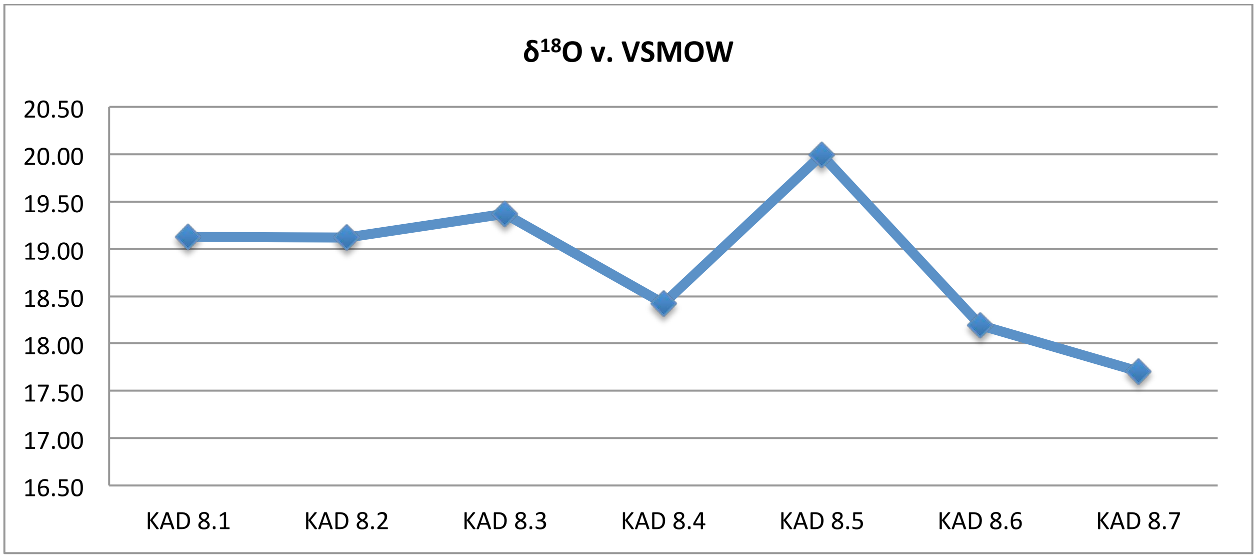
δ18O v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 6.1
KAD 6.2
KAD 6.3
KAD 6.4

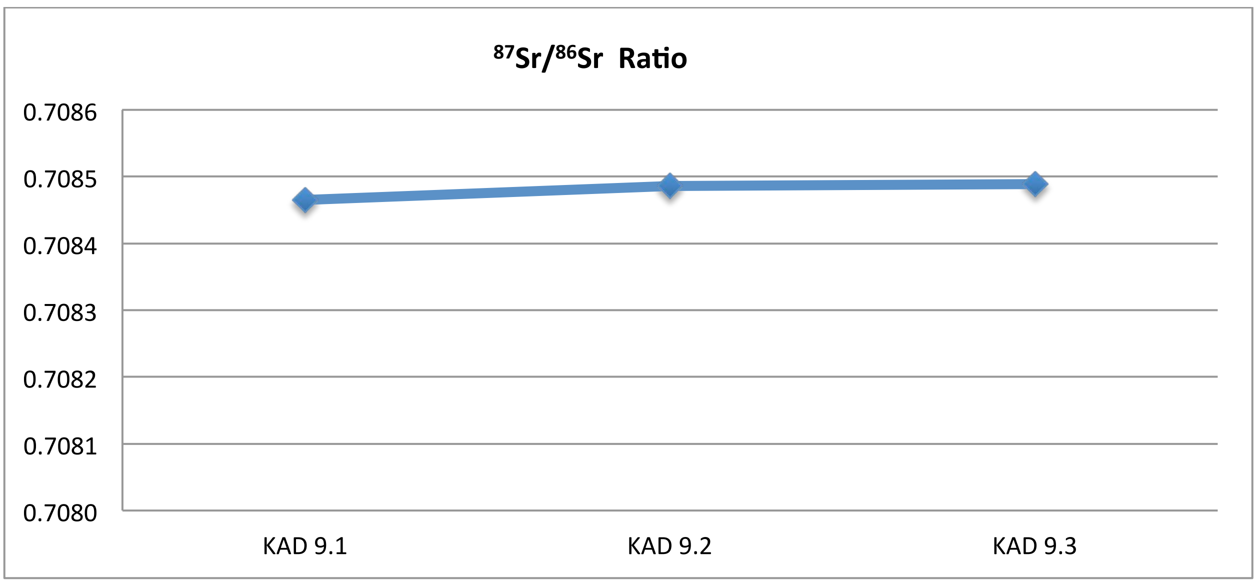


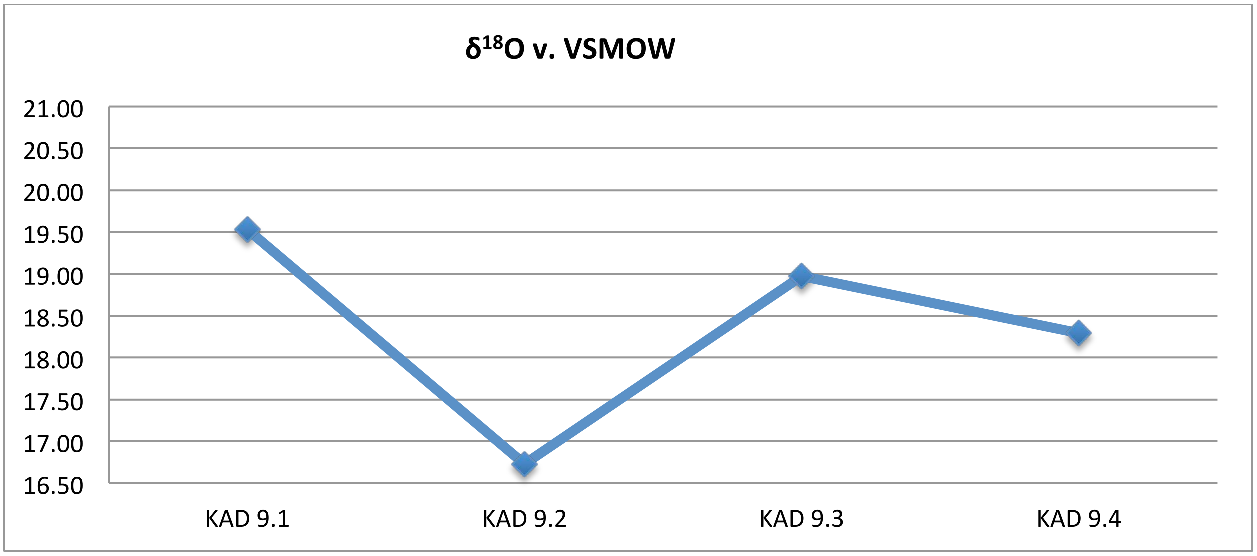
87Sr/86Sr Ratio
0.7092
0.7090
0.7088
0.7086
0.7084
0.7082
0.7080
KAD 7.1
KAD 7.2
KAD 7.3
KAD 7.4
KAD 7.5

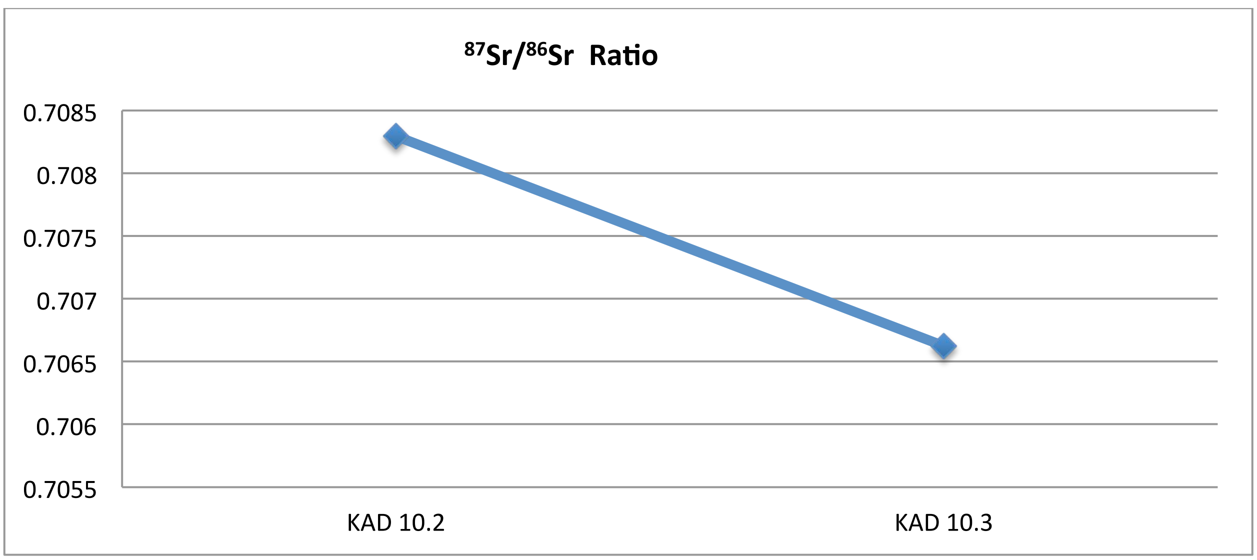

δ18O v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 7.1
KAD 7.2
KAD 7.3
KAD 7.4
KAD 7.5


87Sr/86Sr Ratio
0.7090
0.7088
0.7086
0.7084
0.7082
0.7080
KAD 8.1
KAD 8.2
KAD 8.3
KAD 8.4
KAD 8.5
KAD 8.6


δ18O v. VSMOW
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 8.1
KAD 8.2
KAD 8.3
KAD 8.4
KAD 8.5
KAD 8.6
KAD 8.7


87Sr/86Sr Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
KAD 9.1
KAD 9.2
KAD 9.3


δ18O v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
KAD 9.1
KAD 9.2
KAD 9.3
KAD 9.4


87Sr/86Sr Ratio
0.7085
0.708
0.7075
0.707
0.7065
0.706
0.7055
KAD 10.2
KAD 10.3

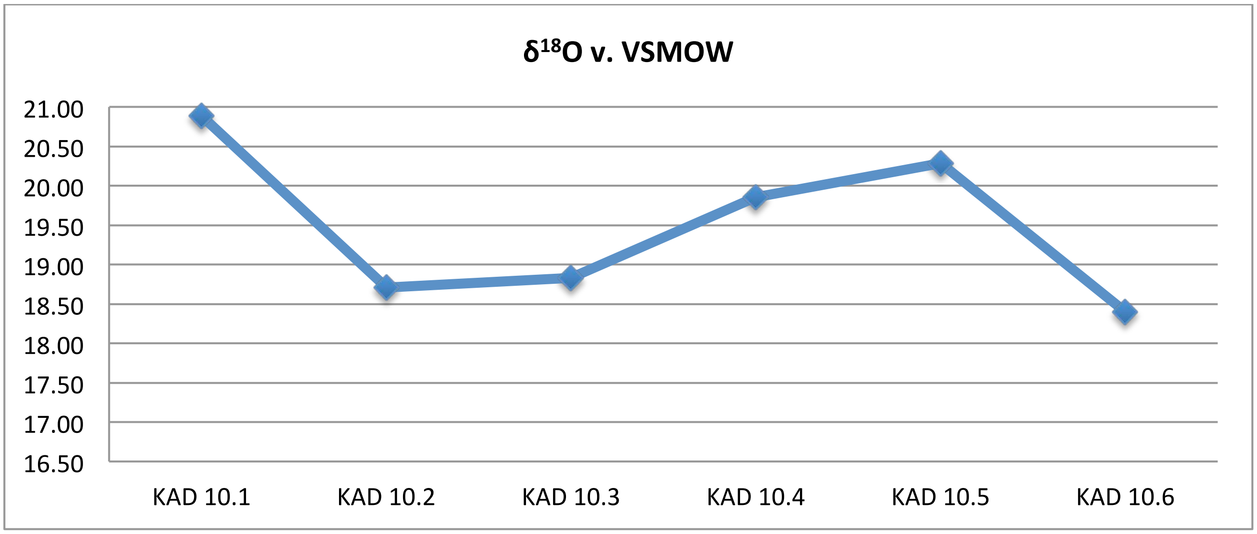


Figure 8.6: KAD strontium and oxygen isotope data curves, error bars show 2σ standard error for strontium values

O51C. KAD8 and KAD10 come from contexts Q1B and OIA respectively.

Strontium values from the KAD teeth indicate two distinct patterns that appear to correspond with herding strategies. The simplest trend in the Sr data is represented by those $^{87}Sr/^{86}Sr$ ratios that are consistent across the entirety of the tooth: samples KAD6, KAD8 and KAD9. These constant isotope values are indicative of a herding strategy that kept the animals in question in a local region throughout the entirety of the tooth growth (which corresponds to approximately the first year of life for KAD8 and KAD9 as these are M2, while KAD6 represents the second year of life as an M3). The values for these four teeth are also relatively consistent from one tooth to another. The four samples taken from KAD6 produce a rounded average $^{87}Sr/^{86}Sr$ ratio of 0.7086[202], while the six samples from KAD8 also produced a rounded average of 0.7086[203], and the three samples taken from KAD9 averaged out to 0.7085.[204] These 0.7085-0.7086 values would be consistent with a very localized herding strategy in which sheep were pastured in the direct vicinity of the settlement. Two strontium baseline measurements from around KAD indicated values of 0.7088 (0.708778) and 0.7085 (0.708468), so that any herding that incorporated strontium across both of these locations would create a strontium value average that resulted in strontium values between 0.7085 and 0.7088 in each tooth, consistent with the 0.7085-0.7086 values from KAD6, KAD8 and KAD9.

[202] Each $^{87}Sr/^{86}Sr$ reading can be taken out to the seventh decimal place, however only the first four decimal places are traditionally reported for $^{87}Sr/^{86}Sr$ values as the ensuing values become less reliable due to instrumental error. In this case, the average ratio for KAD6 read out to six decimals is 0.708567.

[203] Read out to six decimals, the ratio for KAD8 is 0.708599.

[204] Read out to six decimals, the ratio for KAD9 0.708480.

Trends in the $\delta^{18}O$ values for these four samples help to refine the strontium data. The $\delta^{18}O$ curves for each of these specimens begin with decreasing values, which would suggest that the teeth began growing at a period just before seasonal cooling (i.e. in the late summer/ early fall). Considering that these teeth either began growing just after birth (M2), or a year after birth (M3), these curves can provide evidence for seasonal birthing. KAD6 produces a curve where the first and last values are the highest values, and are close to one another (first value = 17.53, last value = 17.88), implying a summer birth. The high relative $\delta^{18}O$ values at the initial growth and completed growth of the tooth indicate a warm climate consistent with one of the warmest times of year (i.e. June/July in a Cypriot climate). The data for KAD8 and KAD9, however, indicate a later birth season in the early fall as the $\delta^{18}O$ values across both teeth oscillate through a full cooling season (the animal's first fall, into winter), a warming season (the spring into the summer), and then a second cooling season (as summer turns to fall at the end of the first year of life).

The variations in the $\delta^{18}O$ values also suggest changes in elevations during that first year of life for KAD8 and KAD9. This is based on the relatively significant range in $\delta^{18}O$ values for KAD8 and KAD9 over the course of the tooth growth. The range[205] of values for KAD8 and KAD9 equals 2.28 and 2.8 respectively, contrasting with a much smaller range of 1.14 for KAD6. The averaging of $\delta^{18}O$ values for KAD8 and KAD9—18.85 and 18.38 respectively—as opposed to KAD6—17.32—is also suggestive of exposure to a more variable climate for KAD8 and KAD9. This

[205] The highest $\delta^{18}O$ values minus the lowest $\delta^{18}O$ value.

implies that KAD8 and KAD9 were pastured in higher elevation environments, as they grew older. Because $\delta^{18}O$ values at the crown of the tooth of these samples were somewhat higher than $\delta^{18}O$ values towards the root of the tooth, and the growth period for the tooth is approximately one year, if the animal remained in a similar location with a consistent seasonal climate, we should expect to find values at the beginning and end of sampling which are roughly the same (which is the case for KAD6). $\delta^{18}O$ values that are lower towards the root of the tooth therefore suggest that animals were being herded in cooler regions (likely corresponding to higher elevations) at the end of their first year of life than they were when they were first born. The vulnerability of newborn lambs to colder temperatures would make it reasonable to keep these animals in more temperate, lower elevation environments during their first months of life. By the following year, however, when the animals were more robust, they could be grazed at higher elevations deeper into the fall season to free up land for other uses in the direct vicinity of KAD. The combination of Sr and $\delta^{18}O$ data, therefore, suggest that KAD6 remained in the direct vicinity of KAD during the period of tooth growth, while KAD8 and KAD9 remained relatively local, but appear to have been grazed at higher elevations during the period of tooth growth.

The remaining KAD samples that produced useful strontium data show considerably greater degrees of variation in the $^{87}Sr/^{86}Sr$ ratios, which are likely the function of herding practices that moved across areas that contributed different $^{87}Sr/^{86}Sr$ ratios into the animals diet. In other words, the trends present in the strontium data for KAD1, KAD4 and KAD7 are suggestive of at least a wider regional herding pattern, and perhaps the consumption at KAD of animals pastured in the neighboring Maroni river valley or further afield. At the very least, the fluctuations in strontium values in these three samples are indicative of animal movement, and contrast with the steady and consistent strontium values from KAD6, KAD8 and KAD9 (which appear to represent herding close to the settlement at KAD). KAD1, which is a lower M3 and therefore represents roughly the second year of life, has a distinct differentiation between the early tooth formation (a $^{87}Sr/^{86}Sr$ value of 0.7081) and later tooth formation ($^{87}Sr/^{86}Sr$ values that are between 0.7083 and 0.7084). The closest geographical location for strontium baseline value similar to 0.7081 is from the neighboring Maroni valley, however, strontium baseline samples from around Hala Sultan Tekke are also consistently around 0.7081. Baseline data collected to the east of the settlement at KAD produced a value of 0.7084, consistent with a movement into that region towards the end of M3 formation (around the end of the second year of life). However, baseline data for the Lefkara geologic formations that are just to the north of KAD and separate the settlement from the Troödos range, also produced $^{87}Sr/^{86}Sr$ values of 0.7083, and herding in higher parts of the Troödos is likely to have contributed to even greater $^{87}Sr/^{86}Sr$ values. Thus, the $^{87}Sr/^{86}Sr$ values from KAD1 represent one of two transitory herding patterns. The first would have been a coastal strategy, with movement along the coast from areas east of KAD (near Maroni or, perhaps even as far as Hala Sultan Tekke) to around KAD; the second would have been a foothill herding strategy, with coastal herding near Maroni or HST at the beginning of tooth growth, followed by pasturing in the foothills of the Troödos.

The $^{87}Sr/^{86}Sr$ values for KAD4 and KAD7 are indicative of a similar mobile herding strategy. For KAD4, a roughly sinusoidal curve is suggestive of a seasonal herding pattern that moved between two locations with distinct strontium values. The first location would have had higher strontium values (approximately 0.7085) while the second location would have had lower strontium values (closer to 0.7082). The initial Sr values for KAD begin close to 0.7085, gradually approach 0.7082 across the growth of the tooth, and then begin to rise again towards 0.7085, and could be suggestive of herding in the foothills of the Tröodos at the initial formation of the tooth, followed by a transition into the lowlands during the middle of the tooth growth, and finally a return to the foothills and regions of higher Sr ratios towards the end of the tooth growth. KAD7 produced a similar pattern. Initial values near the occlusal surface of of the tooth are between 0.7082 and 0.7084, indicative of localized herding around KAD. However, the final two values from KAD7 sampled towards the root of the tooth produced much higher $^{87}Sr/^{86}Sr$ values, suggestive of a movement into the highlands. The final value, KAD 7.5 is 0.7086, dips back towards values consistent with the lower foothills between the coastal settlements and the Troödos.

The $\delta^{18}O$ values for these three specimens show opposite trends: KAD1 indicates tooth growth during gradual warming, while KAD4 and KAD7 indicates tooth growth during gradual cooling. For KAD1, the $\delta^{18}O$ values provide a clue to determine whether the animal experienced coastal or Troödos foothill pasturing. Gradual movement into the foothills (and therefore into areas of higher elevation) would tend to produce $\delta^{18}O$ values that decreased rather than increased, while movement along the coast—especially during the spring and into summer—would produce $\delta^{18}O$ that increased. Thus, the increasing $\delta^{18}O$ values imply a coastal movement for KAD1 between from locations east of KAD towards the settlement itself. For KAD4 and KAD7, the gradual decreasing of $\delta^{18}O$ values is suggestive of a movement to higher elevations (into the highlands), and therefore consistent with the strontium values.

The final group of samples from KAD (KAD2, KAD3, KAD 5, KAD 10) are samples for which strontium values were largely unreliable, producing error values far outside acceptable ranges. This may have been due to a number of factors including sample contamination, a lack of sufficient strontium in the sample, or overheating, and therefore early vaporization of the sample by the TIMS, burning off the sample before reliable readings could be collected. KAD2, KAD3 and KAD10 did produce one strontium value each, and these values, which cluster around 0.7083-0.7084, are consistent with a localized herding pattern even though the fact that they are only one reading makes it impossible to provide any chronological scope for the movement of the animal during the growth of the tooth.

$\delta^{18}O$ values for these samples were, however, able to be collected. The $\delta^{18}O$ values for KAD3 and KAD10—both of which came from M3 and therefore represent the second year of the animal's life—are the easiest to interpret as they produced distinct sinusoidal $\delta^{18}O$ data patterns, consistent with seasonal temperature changes in one location across a year. These data, therefore, suggest that both KAD3 and KAD10 were each herded in consistent locations during their second year of life, likely near the coast. These sinusoidal patterns also imply that KAD3 and KAD10 were born in the early autumn, with values decreasing during the initial formation of the tooth. It is impossible based on these data to determine whether these animals were herded in the vicinity of KAD like KAD6, KAD8 and KAD9, or whether they were herded in a similar climate as at KAD, but not in the direct vicinity of the settlement as is likely the case for KAD1.

$\delta^{18}O$ values for KAD 2 and KAD5 produced opposing trends: KAD2—which is an M2 and therefore represents roughly the first year of the animal's life—shows a general pattern of climatic warming, while KAD5—which is a third molar and therefore represents roughly the second year of life—shows a general pattern of cooling. The pattern present in the KAD5 data is similar to the pattern for KAD7, and therefore likely indicates a movement into the highlands. The lower absolute values for $\delta^{18}O$ from KAD5 may either indicate a generally cooler year than that recorded in KAD7, or a start and end point that were at higher elevations. KAD2 likely represents a periodic herding strategy that brought sheep into progressively warmer climates through the course of a year, and so opposite that of KAD5 and KAD7, and this may, in fact, imply that some sheep were overwintered in cooler, highland climates, despite the general assumption that Mediterranean shepherds will tend to transport their flocks to the lowlands during the winter. It is worth recalling Halstead's example of traditional high-altitude mixed farming in the Pindhos Mountains of Greece (1991b). While not an ideal scenario for optimizing livestock production, this example illustrates the fact that higher altitude farming is a possible means of subsistence, and KAD2 may represent a sheep raised in this environment and brought to 'market'[206] to be consumed at the larger settlement.

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[206] I use this term loosely here to refer to the process of bringing the animal down from highland mixed farming for consumption, presumably in exchange for goods or perhaps as a tax of some sort. The

To sum up: the caprine teeth samples from Kalavasos-*Ayios Dhimitrios* can be organized into three groups based on their archaeological context: tomb/elite contexts (T11; sample KAD1), potential large-scale disposal/potential feasting contexts (P52a and A.173; samples KAD2, KAD3, KAD4, KAD5, KAD6 and KAD9), and everyday refuse contexts (O51C, OIA and Q1B; samples KAD7, KAD8 and KAD10). Strontium and oxygen values suggest three distinct shepherding patterns: a localized strategy in which animals were herded close to KAD (samples KAD4, KAD6, KAD8 and KAD9, and perhaps KAD3 and KAD10); a regional, coastal strategy in which animals were herded along the coast, but may have been pastured on land in the neighboring Maroni Valley, or perhaps further afield, such as near Hala Sultan Tekke (samples KAD1, and again, perhaps KAD3 and KAD10); and a regional herding strategy that employed the highlands (samples KAD5 and KAD7). KAD2 is something of an outlier but may indicate the overwintering of sheep and/or goats in temperate highlands, therefore the possibility of year-round occupation at higher elevations to the north of Kalavasos.

8.4.2 Hala Sultan Tekke

Eleven caprine teeth were samples from Hala Sultan Tekke (HST) from a variety of contexts across the site (samples labeled HST1 through HST11). Some samples have more secure context information that others, however all samples can be dated to the LCIIIA at the very end of the LBA, and therefore about a century younger

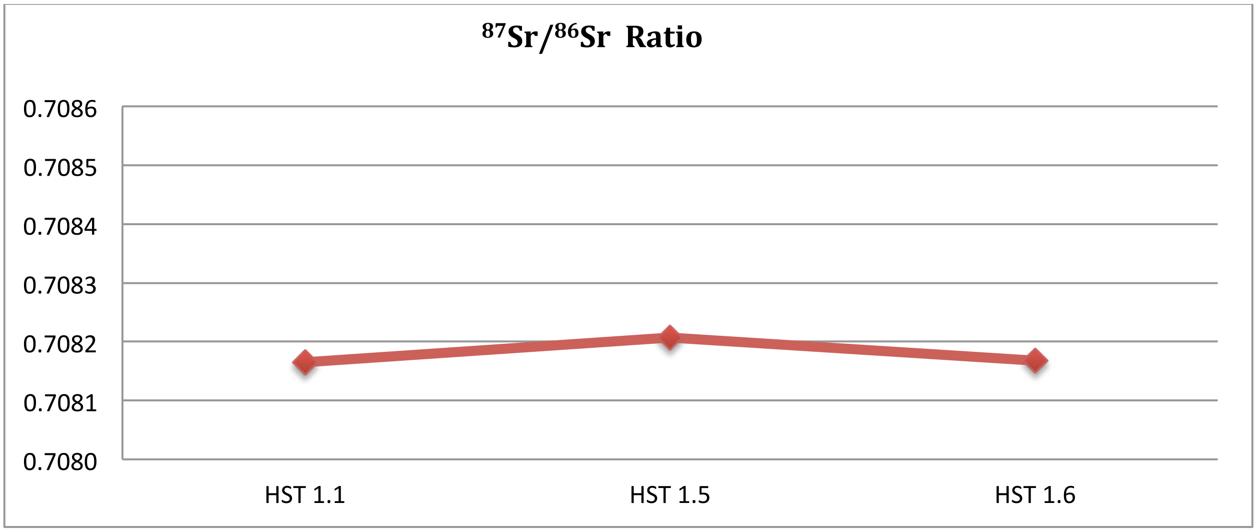
exact nature of this exchange—and whether it would resemble a 'market' in the modern sense of the word is, at least at present, impossible to determine.

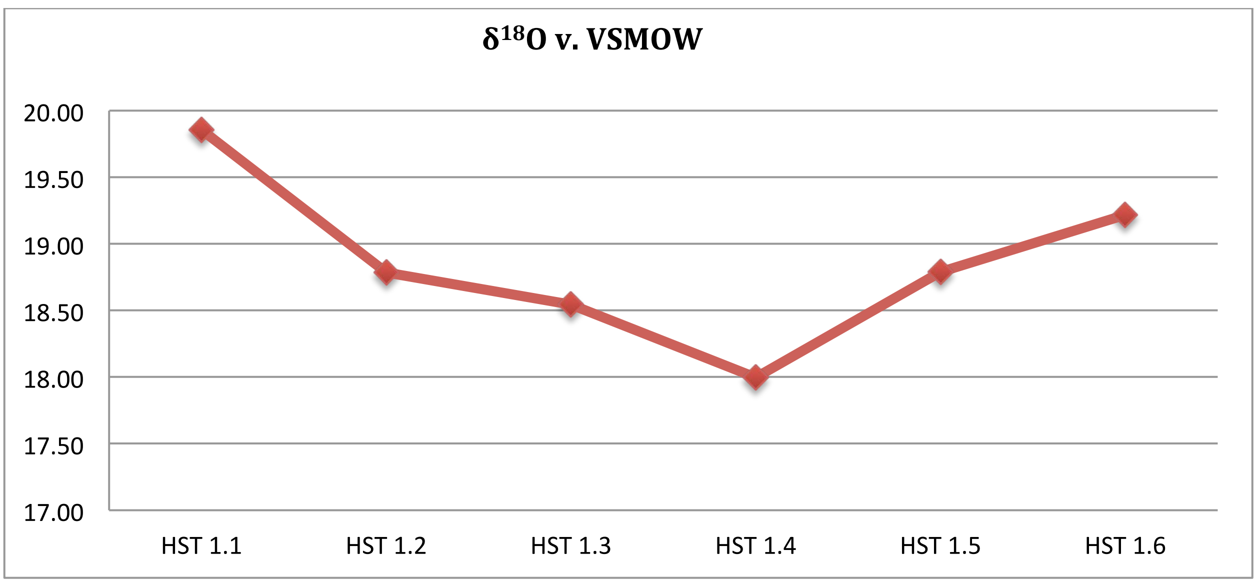
Samples	Tooth Type	Context	87Sr/86Sr	$\delta^{18}O$	Estimated δ18O Ingested H2O
HST 1.1	Maxillary (upper) M3	Area 8 F1103, L5G	0.708165	19.86	-4.97
HST 1.2				18.78	-5.69
HST 1.3				18.54	-5.86
HST 1.4				17.99	-6.23
HST 1.5			0.7082068	18.79	-5.69
HST 1.6			0.7081672	19.22	-5.40
HST 2.1	Mandibular (lower) M3	Area 23 F7012 Well 5-6m	0.708005	19.68	-5.09
HST 2.2			0.7083998	18.16	-6.11
HST 2.3			0.7083977	18.09	-6.16
HST 2.4			0.7084909	18.94	-5.59
HST 2.5			0.7084853	18.67	-5.77
HST 2.6				19.29	-5.35
HST 3.1	Mandibular (lower) M2	Area 8 F1843 Ashy area	0.7082876	20.49	-4.54
HST 3.2			0.708308	20.79	-4.34
HST 3.3				19.78	-5.02
HST 3.4			0.7082648	20.14	-4.78
HST 3.5			0.7082328	20.31	-4.66
HST 4.1	Mandibular (lower) M2	Area 8 F1021/2 Bones (5)	0.7083093	20.36	-4.63
HST 4.2				19.68	-5.09
HST 4.3				20.06	-4.83
HST 4.4			0.7082312	21.52	-3.85
HST 4.5			0.7081577	19.39	-5.29
HST 4.6				19.75	-5.04
HST 5.1	Maxillary (upper) M2	Area 8 F1631 layer 36 (ash layer) Κοκκαλα και Καρτες	0.7083177	19.91	-4.94

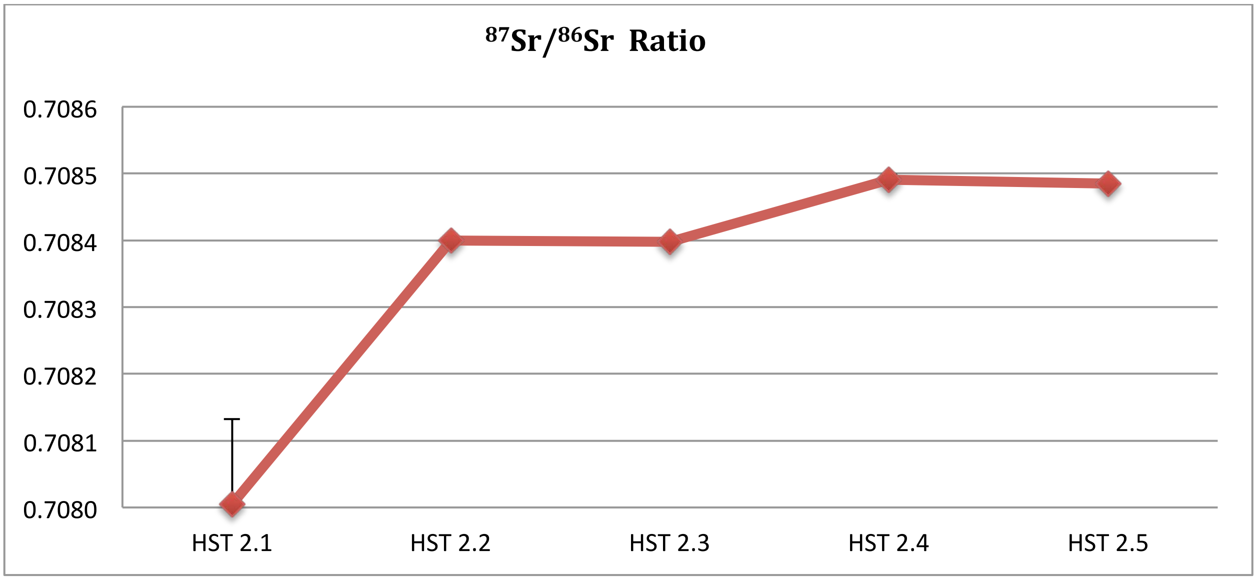
HST 5.2			0.708241	18.46	-5.91
HST 5.3			0.7084362	17.80	-6.36
HST 6.1	Maxillary (upper) M3	F1705 layer 3B Bones	0.7083936	18.03	-6.20
HST 6.2				17.84	-6.33
HST 6.3			0.7084148	18.23	-6.07
HST 6.4			0.7084106	18.79	-5.69
HST 6.5			0.7084047	18.24	-6.06
HST 6.6			0.7084254	19.68	-5.09
HST 7.1	Maxillary (upper) M3	Area 8 1.4g F1121 (47)	0.7081723	19.93	-4.92
HST 7.2			0.7048991	18.98	-5.56
HST 7.3				18.63	-5.80
HST 7.4			0.7082507	20.41	-4.59
HST 7.5			0.7083617	19.99	-4.88
HST 7.6			0.7083691	19.53	-5.19
HST 7.7			0.7082972	19.33	-5.33
HST 7.8			0.7083054	18.47	-5.91
HST 8.1	Maxillary (upper) M3	Area 8 South F1522B gravel (82)		19.58	-5.16
HST 8.2				19.02	-5.53
HST 8.3			0.7084798	19.17	-5.43
HST 8.4			0.7084864	18.35	-5.99
HST 8.5			0.7084724	18.17	-6.11
HST 8.6				19.06	-5.51
HST 8.7			0.7084525	19.71	-5.07
HST 9.1	Maxillary (upper) M3	Area 8 South L.3 F1542 (142) No.1	0.7083843	18.72	-5.74
HST 9.2			0.7084211	18.40	-5.95
HST 9.3				16.74	-7.07
HST 9.4			0.7084416	17.77	-6.38
HST 9.5			0.7083931	18.27	-6.04
HST 10.1	Maxillary (upper) M3	Area 8 South L.3 F1542 (142) No.2	0.7083199	18.94	-5.59

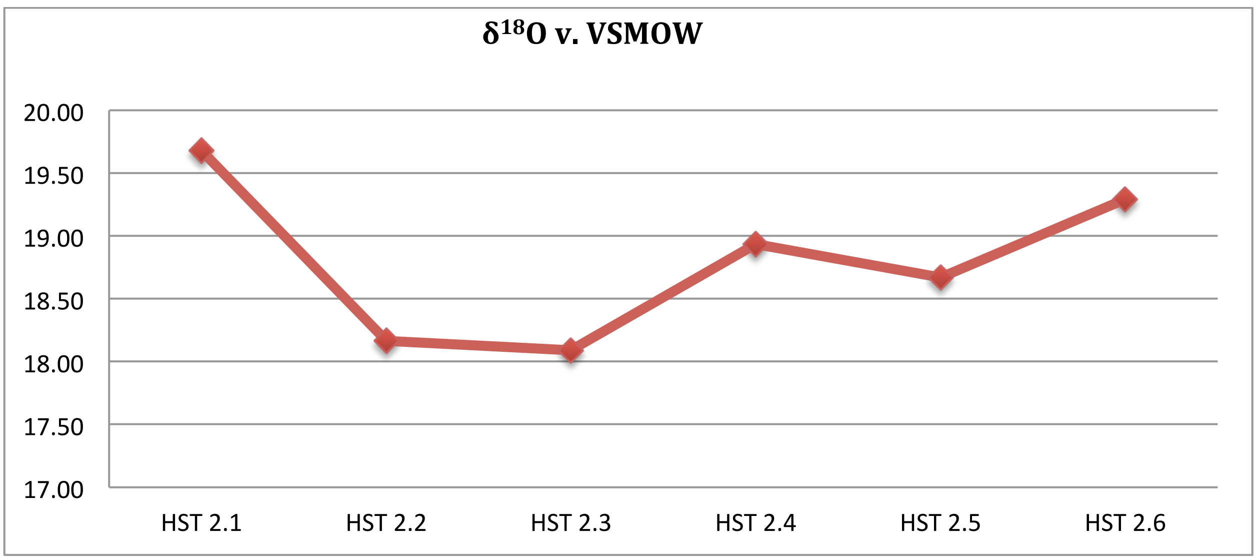
HST 10.2			0.7083051	19.00	-5.55
HST 10.3			0.7083885	19.61	-5.13
HST 10.4			0.7084234	20.29	-4.68
HST 10.5			0.7082545	22.70	-3.05
HST 10.6			0.7083995	20.71	-4.39
HST 10.7			0.7085669	21.47	-3.88
HST 11.1	Maxillary (upper) M2	Area 8 F1371 (big pithos)		20.59	-4.48
HST 11.2			0.7082699	19.56	-5.17
HST 11.3			0.7082855	18.10	-6.16
HST 11.4			0.7081694	17.81	-6.35
HST 11.5			0.7084014	18.49	-5.89
HST 11.6			0.7084823	18.71	-5.74

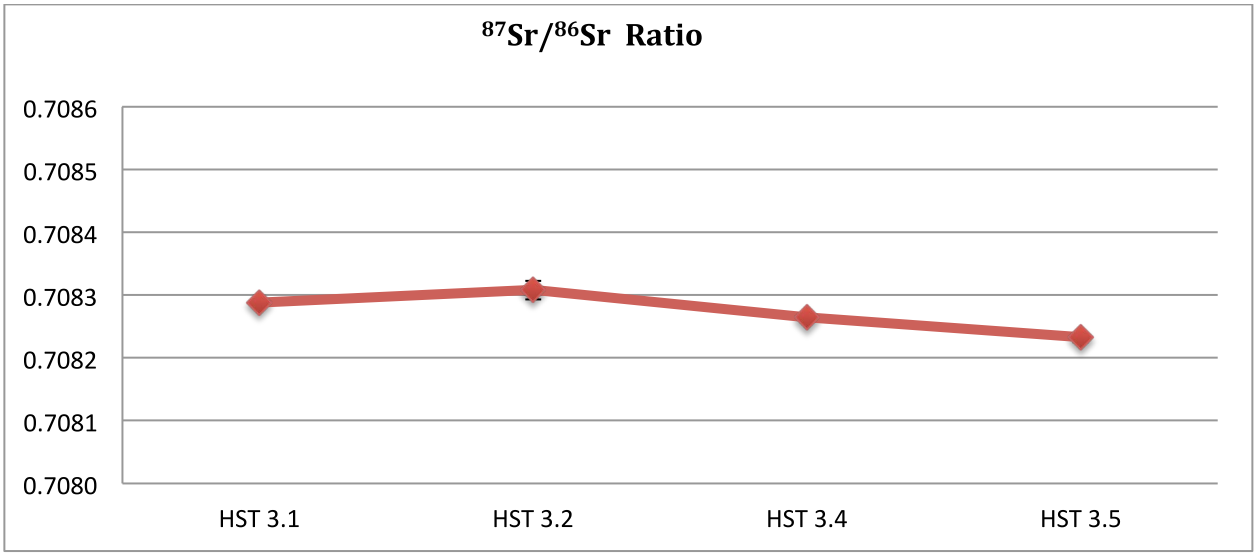
Table 8.3: Hala Sultan Tekke samples with archaeological context, Sr, $\delta^{18}O$ and estimated $\delta^{18}O$ values of ingested water values

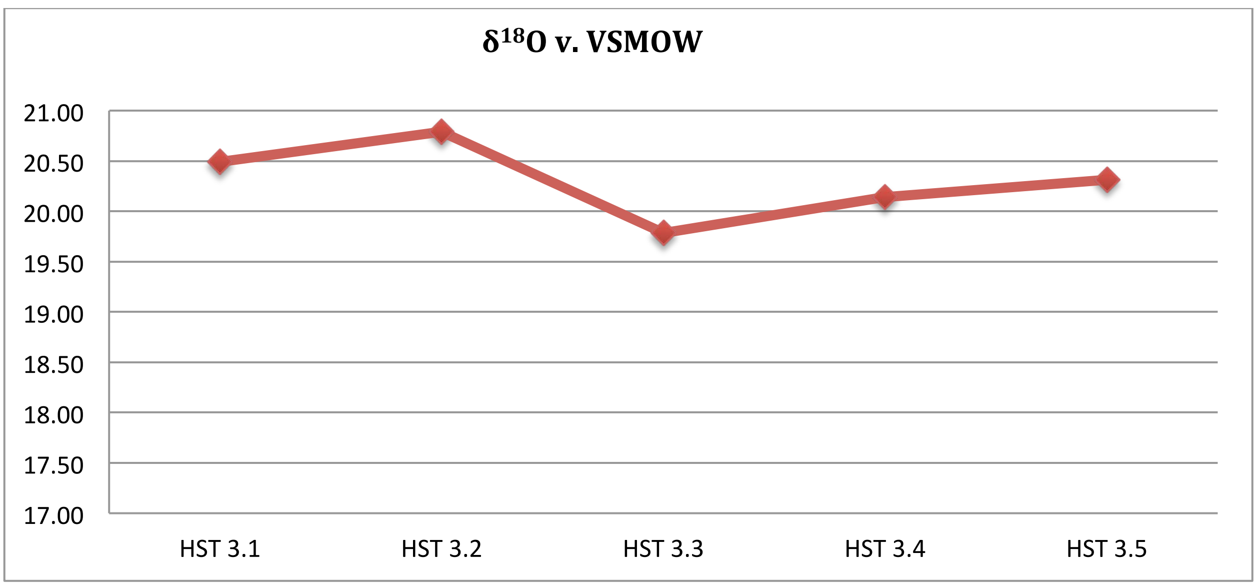

$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 1.1
HST 1.5
HST 1.6

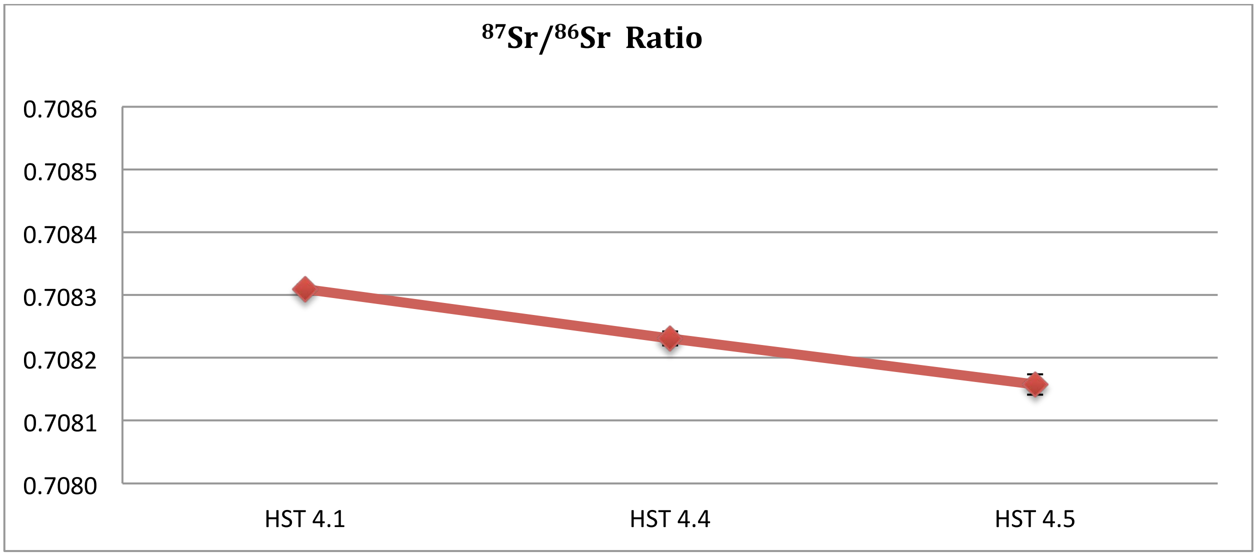

$\delta^{18}O$ v. VSMOW
20.00
19.50
19.00
18.50
18.00
17.50
17.00
HST 1.1
HST 1.2
HST 1.3
HST 1.4
HST 1.5
HST 1.6

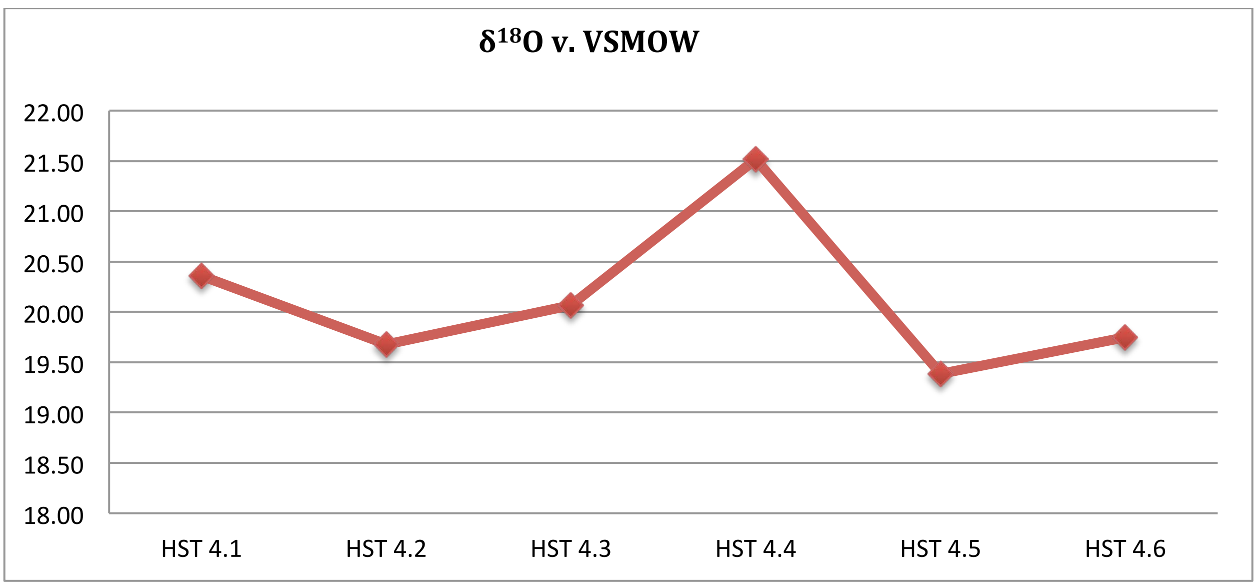

$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 2.1
HST 2.2
HST 2.3
HST 2.4
HST 2.5

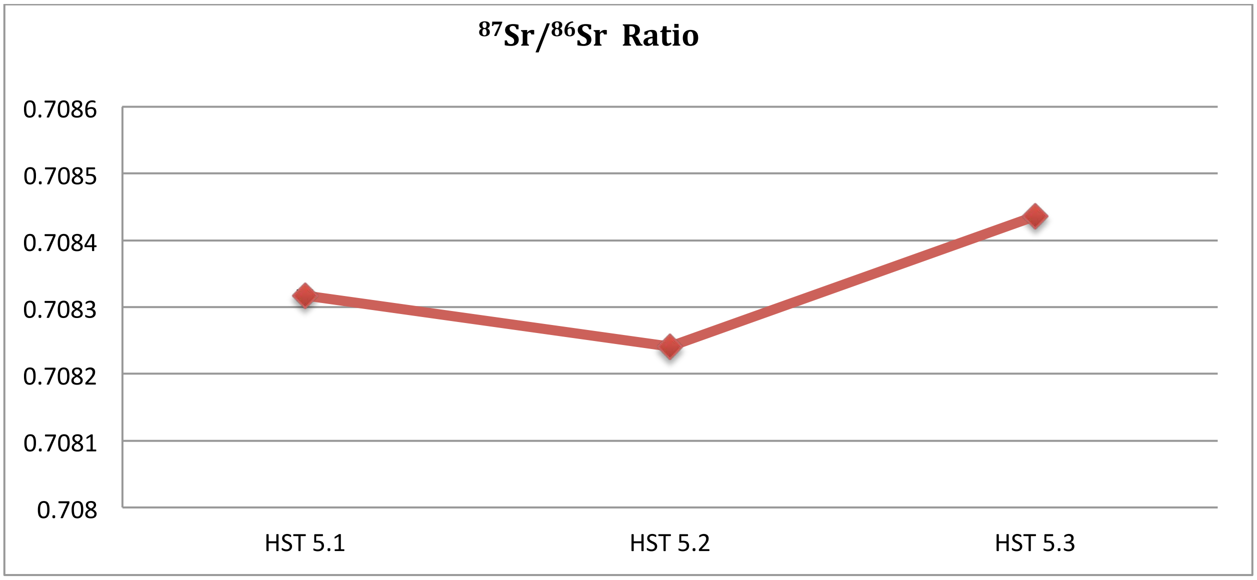

$\delta^{18}O$ v. VSMOW
20.00
19.50
19.00
18.50
18.00
17.50
17.00
HST 2.1
HST 2.2
HST 2.3
HST 2.4
HST 2.5
HST 2.6


$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 3.1
HST 3.2
HST 3.4
HST 3.5

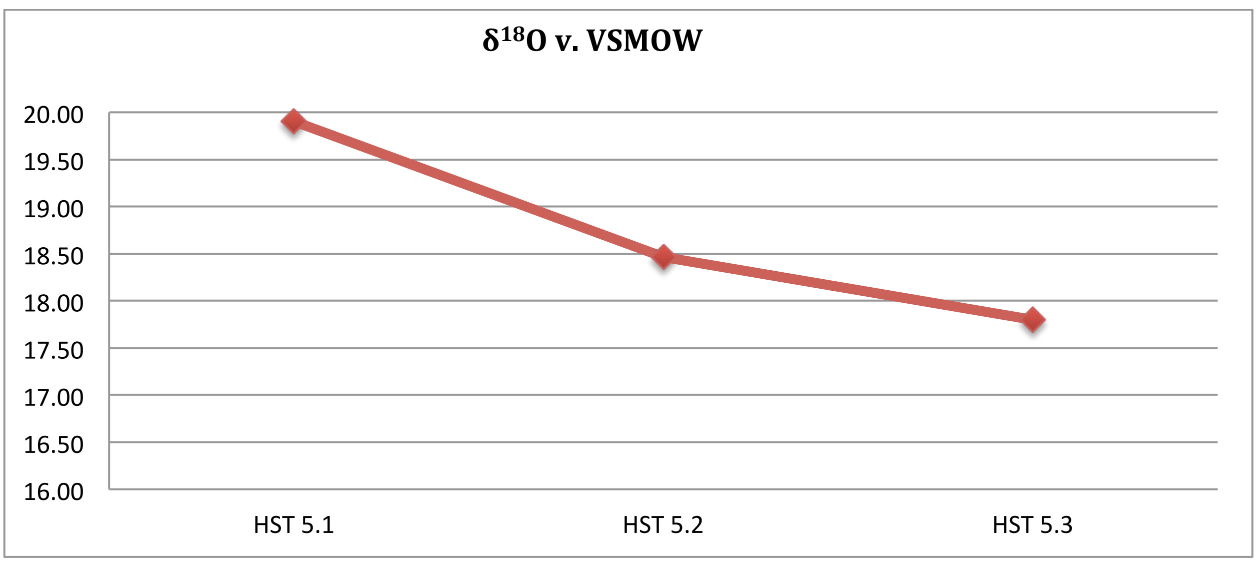

$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
HST 3.1
HST 3.2
HST 3.3
HST 3.4
HST 3.5


$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 4.1
HST 4.4
HST 4.5

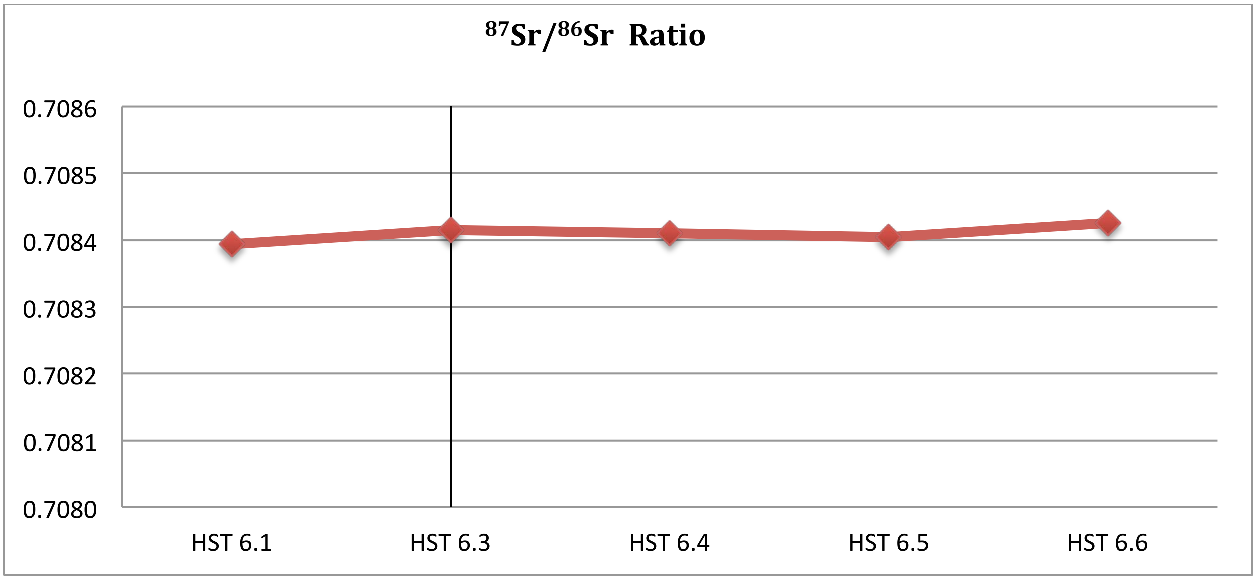

$\delta^{18}O$ v. VSMOW
22.00
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
HST 4.1
HST 4.2
HST 4.3
HST 4.4
HST 4.5
HST 4.6

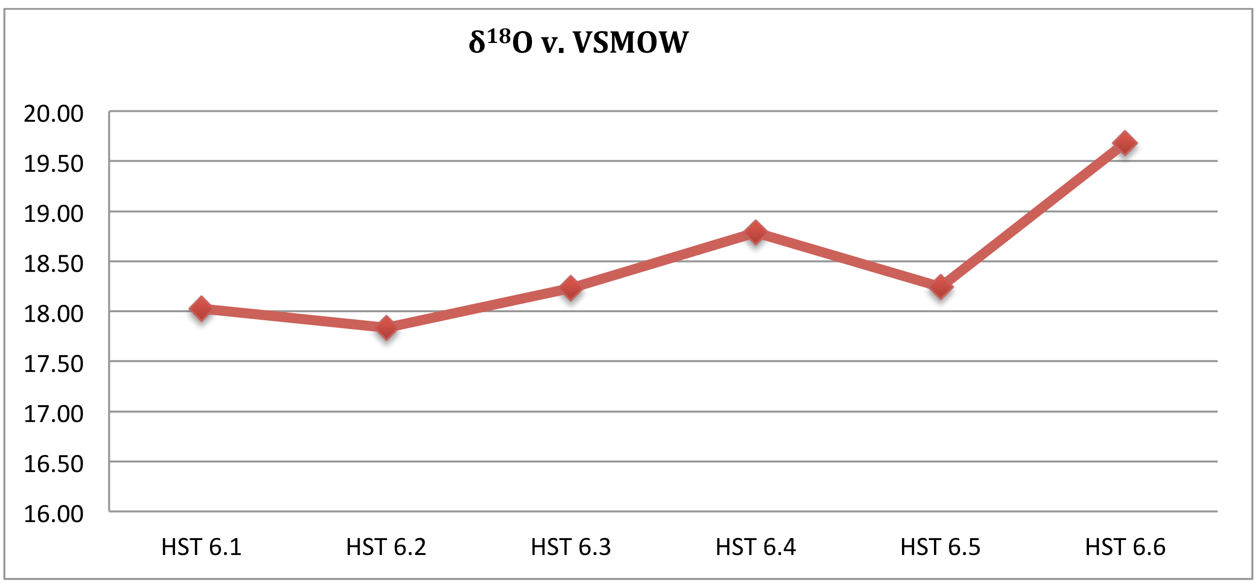


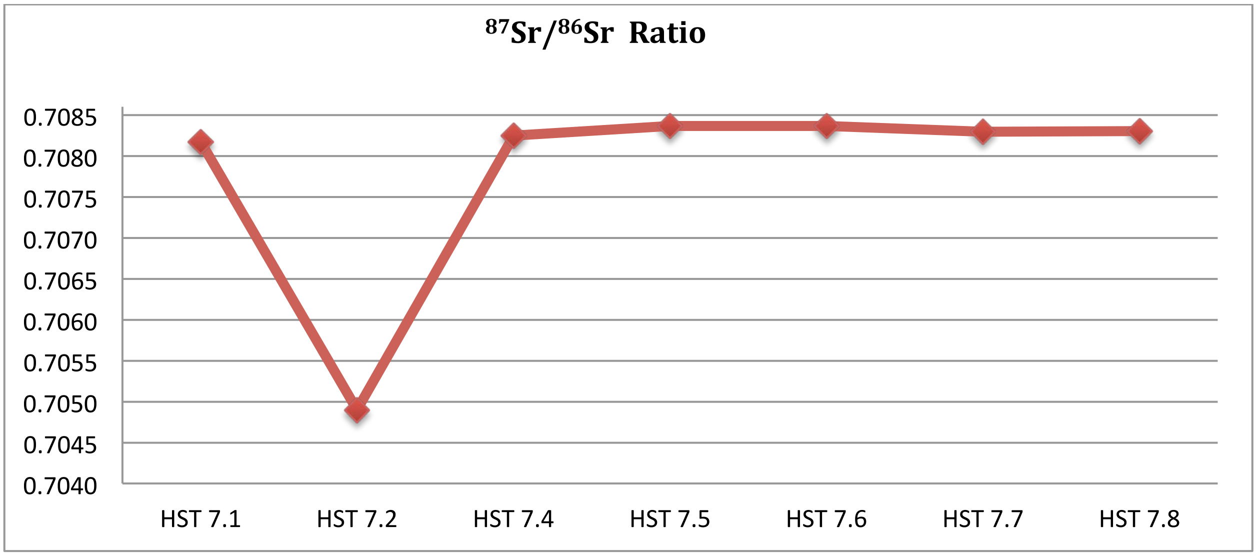
$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.708
HST 5.1
HST 5.2
HST 5.3

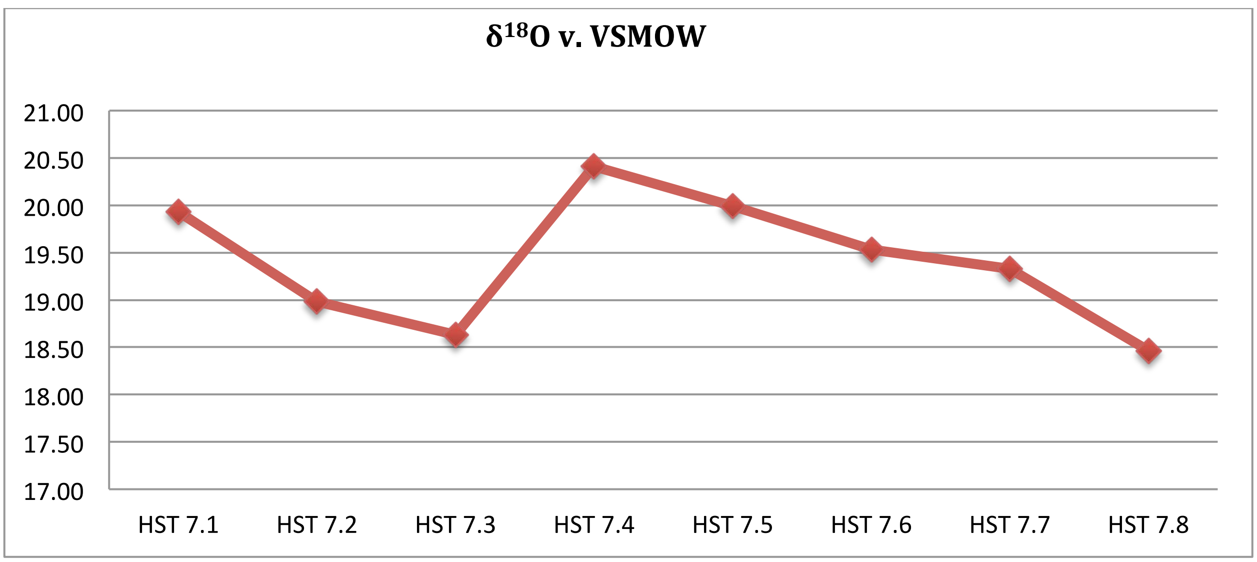


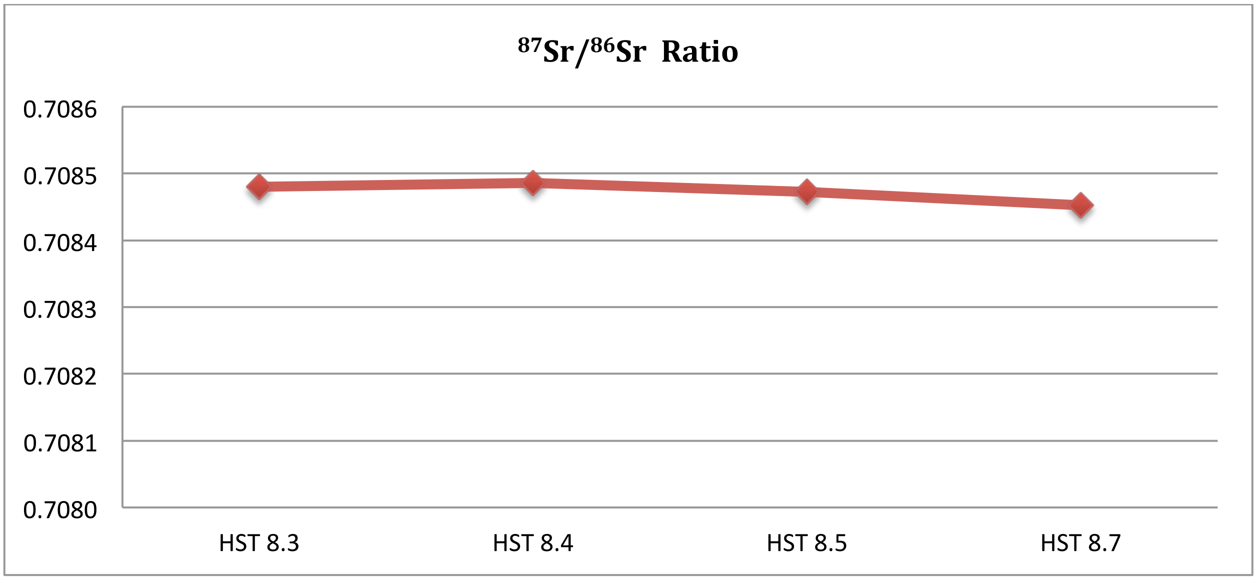
$\delta^{18}O$ v. VSMOW
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
16.00
HST 5.1
HST 5.2
HST 5.3

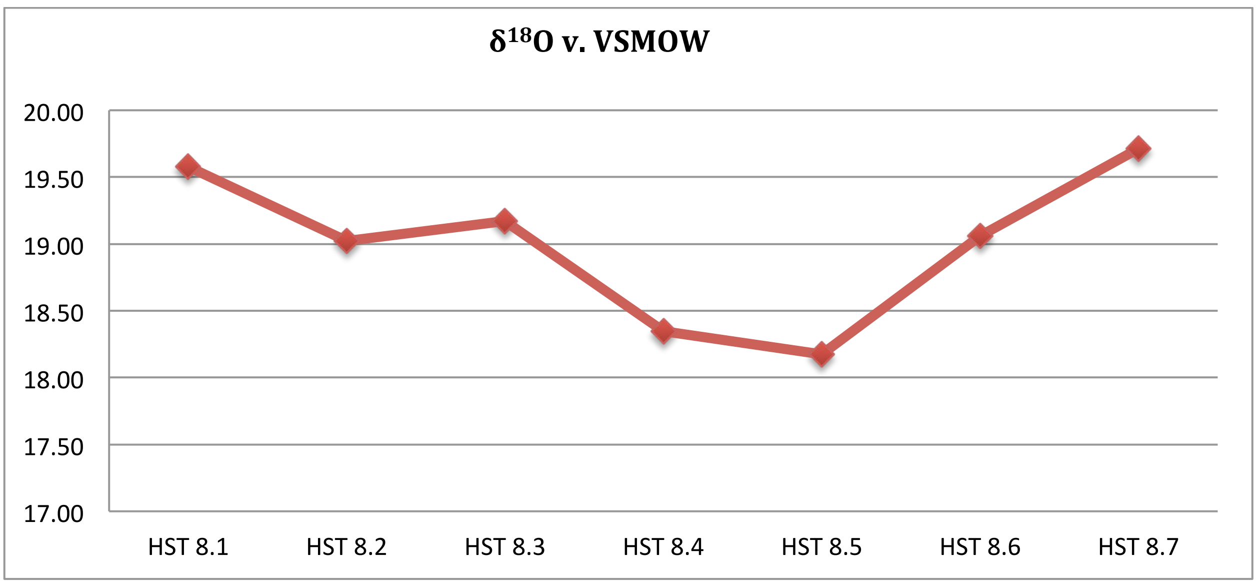

$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 6.1
HST 6.3
HST 6.4
HST 6.5
HST 6.6

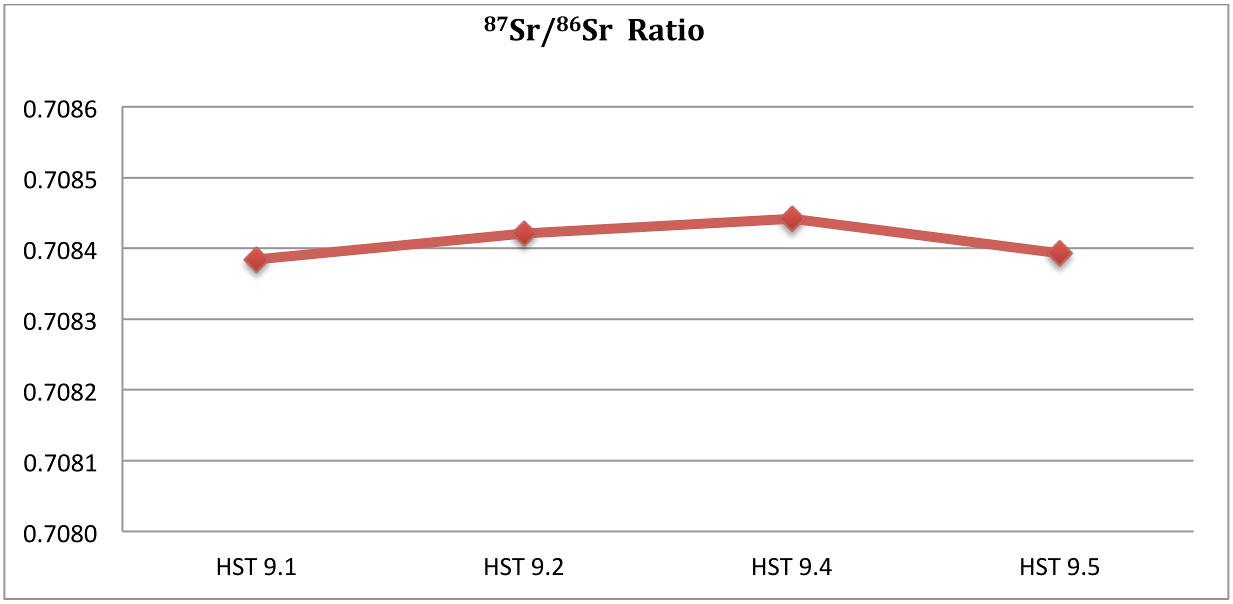

$\delta^{18}O$ v. VSMOW
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50
16.00
HST 6.1
HST 6.2
HST 6.3
HST 6.4
HST 6.5
HST 6.6


$^{87}Sr/^{86}Sr$ Ratio
0.7085
0.7080
0.7075
0.7070
0.7065
0.7060
0.7055
0.7050
0.7045
0.7040
HST 7.1
HST 7.2
HST 7.4
HST 7.5
HST 7.6
HST 7.7
HST 7.8

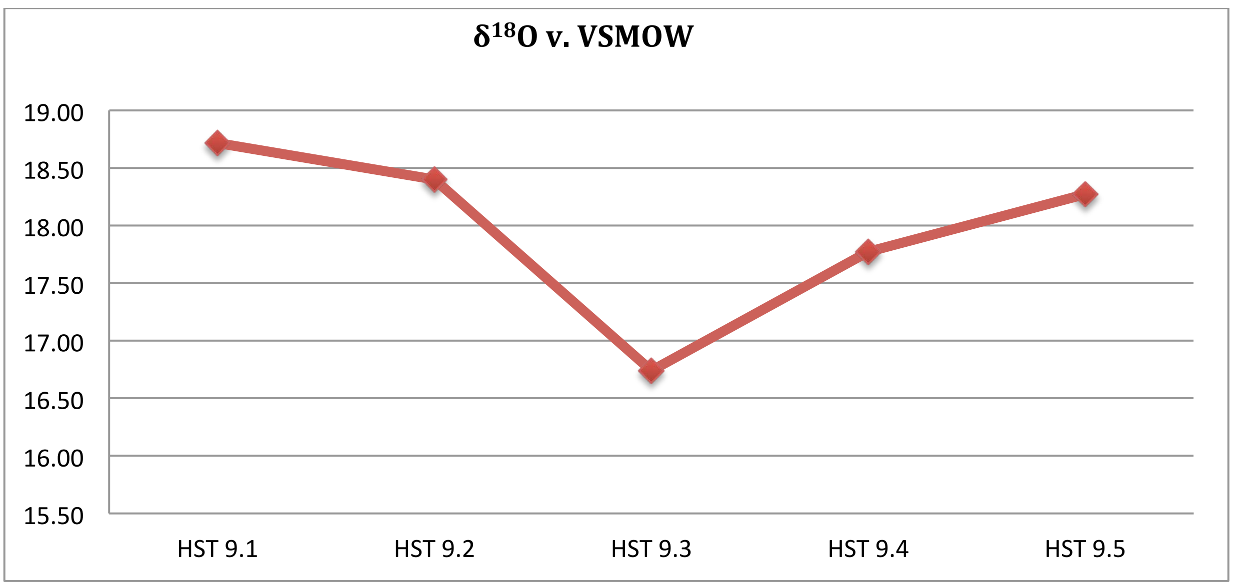

$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
HST 7.1
HST 7.2
HST 7.3
HST 7.4
HST 7.5
HST 7.6
HST 7.7
HST 7.8


87Sr/86Sr Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 8.3
HST 8.4
HST 8.5
HST 8.7

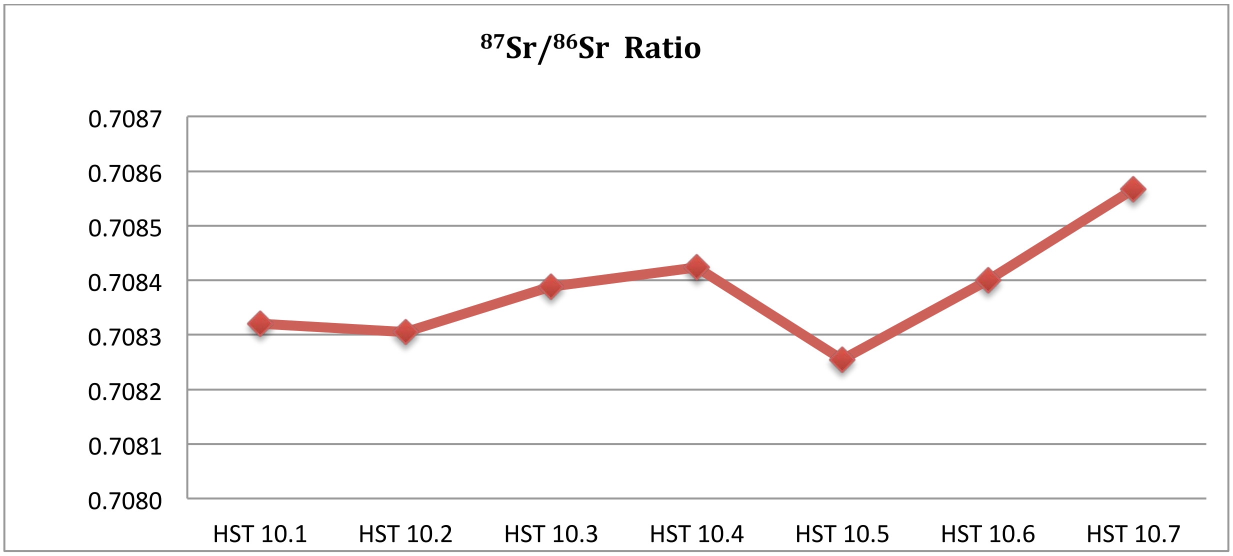

δ18O v. VSMOW
20.00
19.50
19.00
18.50
18.00
17.50
17.00
HST 8.1
HST 8.2
HST 8.3
HST 8.4
HST 8.5
HST 8.6
HST 8.7

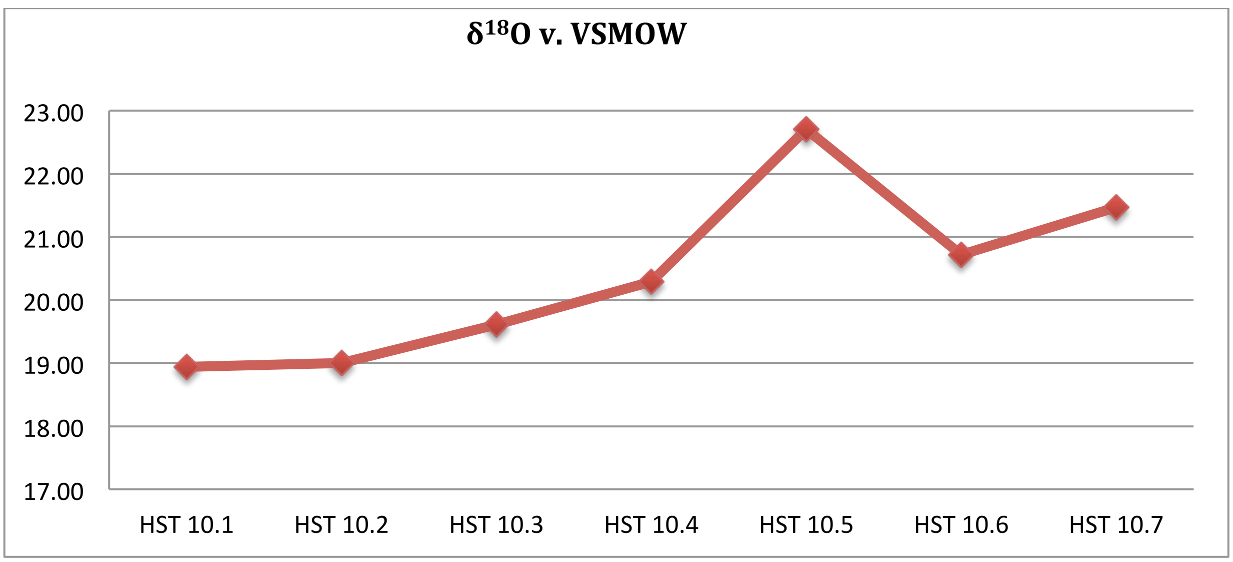


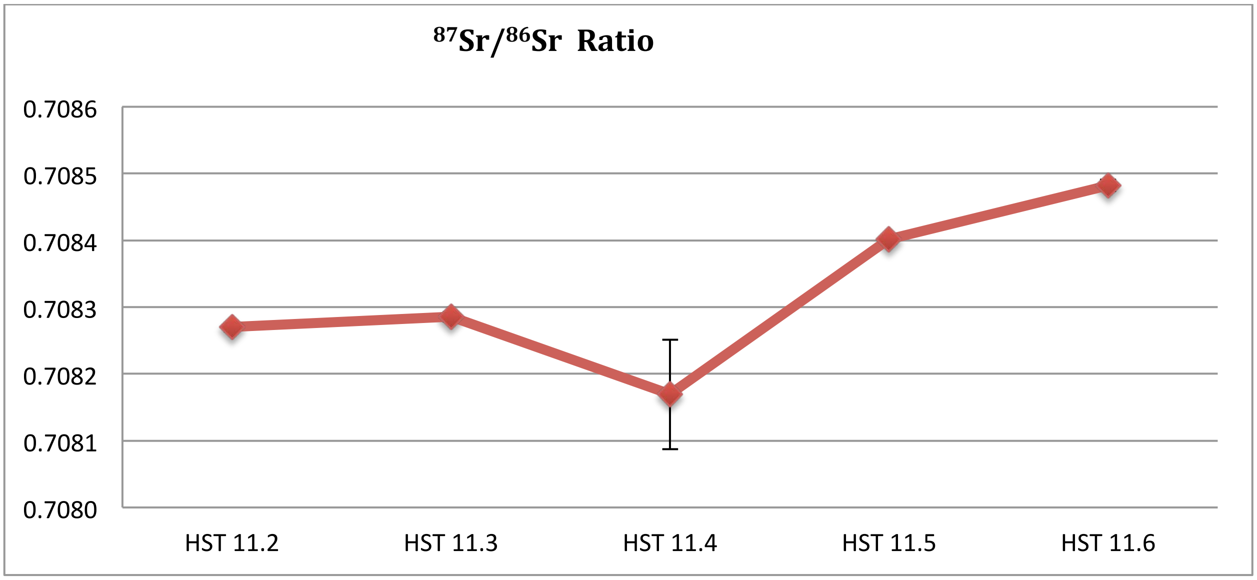
$^{87}Sr/^{86}Sr$ Ratio
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 9.1
HST 9.2
HST 9.4
HST 9.5



$\delta^{18}O$ v. VSMOW
19.00
18.50
18.00
17.50
17.00
16.50
16.00
15.50
HST 9.1
HST 9.2
HST 9.3
HST 9.4
HST 9.5


87Sr/86Sr Ratio
0.7087
0.7086
0.7085
0.7084
0.7083
0.7082
0.7081
0.7080
HST 10.1
HST 10.2
HST 10.3
HST 10.4
HST 10.5
HST 10.6
HST 10.7


δ18O v. VSMOW
23.00
22.00
21.00
20.00
19.00
18.00
17.00
HST 10.1
HST 10.2
HST 10.3
HST 10.4
HST 10.5
HST 10.6
HST 10.7



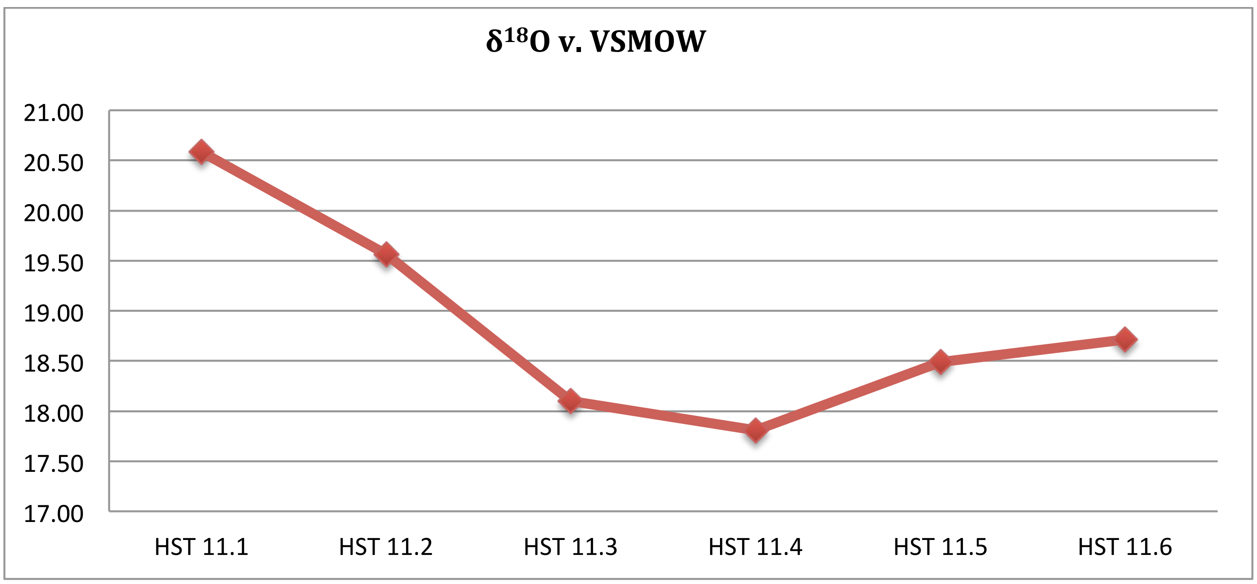


Figure 8.7: HST strontium and oxygen isotope data curves, error bars show 2σ standard error for strontium values

than the samples from KAD. The most secure contexts are samples HST1 and HST2. HST1 comes from what Hult identifies as a domestic kitchen context based on the presence of a number of bone fragments and coarse-ware/cooking vessels (1981). This room was part of a larger, presumably domestic structure built around a central courtyard in Area 8. The sample was collected from Layer 5, the prime occupation layer for Room 2. HST2 comes from one of a series of wells situated across the settlement at HST, with the fill for this well representing a general domestic refuse context. Åström notes that this is one of the latest wells at the site, with the earliest layers of the well dating to the LCII, and more recent layers containing LCIIIA1 and LCIIIA2 material. The stratigraphic layer that contained the teeth analyzed here (5-6m below surface) contained Base Ring II, White Slip II and Mycenaean IIIB ceramics, in addition to Canaanite ceramic fragments, likely dating this layer to LCIIIA2 (Åström 1998: 111-115).

HST4, HST5, HST6, HST7, HST8, HST9 and HST10 and HST11 are all LCIIIA deposits or fill layers from Area 8, a clearly domestic district of HST. These samples therefore likely represent everyday domestic refuse that was the result of discard animal remains after consumption. These can therefore be grouped in together with HST1, which is just a more securely located sample from domestic refuse. HST3 comes from an ashy layer in room 49 in Building D, an as of yet unpublished structure that was excavated at HST in the early-mid 1990s. Collectively, then, these samples represent caprine remains from almost entirely domestic contexts (in most cases, domestic refuse/trash contexts). Generally speaking, then, these samples likely represent everyday usage of caprines and do not represent specialized feasting, ritual or funerary deposits, for which samples are limited at HST.

Like some of the samples from KAD, a number of samples from HST have consistent $^{87}Sr/^{86}Sr$ values across the vertical axis of the tooth, including HST1, HST3, HST6, HST8, HST9. These samples make up more than half of the specimens analyzed from HST; HST3 is the only second molar of this group, while HST1, HST6, HST8 and HST9 are third molars. As in the case of KAD, these consistent strontium values reflect a localized herding strategy that would have kept flocks in a similar area over the approximately one year time period represented by the growth of each tooth. Intriguingly, these HST samples with consistent strontium values have various tooth averages, unlike at KAD, where the average $^{87}Sr/^{86}Sr$ values for similarly consistent teeth all clustered around 0.7085-0.7086. At HST, the teeth present four distinct averages: HST1 at 0.7082,[207] HST3 at 0.7083,[208] HST6 and HST9 at 0.7084[209] and HST8 at 0.7085.[210] Taking the strontium baseline data as a loose guide, these groupings would appear to show consistent, year-round shepherding strategies at varying locations in the Hala Sultan Tekke periphery. As the $^{87}Sr/^{86}Sr$ values increase, they likely represent grazeland progressively closer to the older (and therefore contributing higher $^{87}Sr/^{86}Sr$ ratios) Troödos geologic formations. Regardless, given

[207] As in the case of KAD4, KAD6, KAD8 and KAD above, read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST1 is 0.708179.

[208] Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST3 is 0.708273.

[209] Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for both HST6 and HST9 are 0.708410. The fact that these average values match so precisely makes it likely that HST6 and HST9 are animals that were herded in exactly the same pastureland, and perhaps even in the same field.

the consistency of $^{87}Sr/^{86}Sr$ baseline values of 0.7081-0.7082 from the alluvium around HST, the 0.7083-0.7085 values are distinct and a clear indicator of herding in regions towards the center of the island, and not along the coast near Hala Sultan Tekke.

Samples HST2, HST4 and HST5 have $^{87}Sr/^{86}Sr$ values that also suggest a relatively localized herding strategy, although these values are slightly more variable than HST1, HST3, HST6, HST8 and HST9. These data points suggest a small-scale mobile herding across limited distances that crossed into areas with underlying geologies that with different $^{87}Sr/^{86}Sr$ values. $^{87}Sr/^{86}Sr$ values for HST2 showed a general upward trend, beginning with a value of 0.7084 and progressing to a value 0.7085, though values averaged at 0.7084[211]. HST4 produced $^{87}Sr/^{86}Sr$ values trending downwards from 0.7083 to 0.7082, with these values averaging at 0.7082[212]. Between these two, HST5 created a curve with an initial downward slope from a first $^{87}Sr/^{86}Sr$ value of 0.7083 to 0.7082, but then an up-swing with the final value at 0.7084, and these values averaged 0.7083[213]. The data from HST2 and HST4 produced steady unidirectional trends implying a one directional movement from an area with one $^{87}Sr/^{86}Sr$ signal to an area with a different $^{87}Sr/^{86}Sr$ signal. The values for HST2 suggest that this animal may have been herding in similar areas as HST6 an HST9 (above), while the 0.7083 average value for HST4 raises the possibility that it was being herded in areas near HST3. The values for HST5, may imply a movement from one location with 0.7083-0.7084 $^{87}Sr/^{86}Sr$ values to an area with lower (0.7082)

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210 Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST8 is 0.708472.
211 Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST2 is 0.708443.
212 Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST4 is 0.708232.

$^{87}Sr/^{86}Sr$, and a return back to the initial grazeland over the course of the year in question.

The remaining samples, HST7, HST10 and HST11 produced complex $^{87}Sr/^{86}Sr$ data that appear to represent substantial mobility for each of the individual animals. The curve for HST7 is suggestive of movement from an area with $^{87}Sr/^{86}Sr$ values around 0.7082, shifting to an area with $^{87}Sr/^{86}Sr$ values close to 0.7084, and then shifting again to areas with 0.7083. This sort of fluctuation in $^{87}Sr/^{86}Sr$ signals would not be difficult to create in the area around HST, especially in the foothills of the Troödos to the north-west of the coastal settlement. Indeed, the Troödos foothills are a complex geological zone with many varying $^{87}Sr/^{86}Sr$ signals, and could therefore be responsible for the values present in HST7 without much distance travelled. What these data do suggest, however, is that the animal that was eventually consumed at HST likely came from a hinterland that stretched into the low foothills to the north and west and was not an animal that was herded on the local coastal plain surrounding the settlement. HST10 and HST11 have even more complex $^{87}Sr/^{86}Sr$ curves, with values that vary from below 0.7082 to values that hover around 0.7085. These are the largest range of values for any of the samples from HST and imply—at the very least—a movement from areas with lower $^{87}Sr/^{86}Sr$ values near the coast to areas of higher $^{87}Sr/^{86}Sr$ values, likely in the Troödos foothills.

The $\delta^{18}O$ values for HST1, HST2, HST5, HST8, HST9, HST11 present evidence for later summer births. The $\delta^{18}O$ data for all of these samples show similar

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[213] Read out to six decimals, the average $^{87}Sr/^{86}Sr$ ratio for HST5 is 0.708331.

general trends of initially decreasing $\delta^{18}O$ values for the first half of the sequence, and then gradually increasing $\delta^{18}O$ values. These samples match an annual temperature cycle beginning with the highest annual temperatures at the end of the summer, dropping into the fall and winter and then gradually rising again in the spring and into the summer. HST5 shows the beginning of this trend, but has only a limited number of data points (3). HST4 represents a sinusoidal $\delta^{18}O$ curve that implies a slightly later (early fall) birth season, with gradual cooling (decreasing $\delta^{18}O$ values) through the winter, then increasing $\delta^{18}O$ values through the spring and summer, followed by decreasing values again into the early fall. It is worth noting that the range of $\delta^{18}O$ values for these samples is consistently around 2.00-2.10, and suggests that the temperature changes responsible for these $\delta^{18}O$ values were seasonal changes. While there does appear to be a slight correlation between higher average strontium ratios (likely implying use of higher elevation pastures) and lower average $\delta^{18}O$ values (likely signally cooler general climates, and therefore consistent with higher elevation pasturage), the differences between lowland and highland $\delta^{18}O$ values do not appear to be particularly significant. This implies that while shepherds were probably employing higher elevation areas for pasturage, they were likely not venturing deep into the Troödos mountains where elevation would have a more significant impact on lowering general temperature.

The $\delta^{18}O$ values from HST6 and HST10 also share similar trends, with values generally increasing across each tooth. This pattern is indicative of a birth season in late winter, the season with lowest temperatures, such that temperatures (and $\delta^{18}O$

values) would consistently rise over the growth of the tooth. The $\delta^{18}O$ values show either a consistently low $\delta^{18}O$ value or a very short initial decrease for the first two data points, followed by a gradual increasing trend, implying a beginning of tooth growth (and by extrapolation, the animal's birth) towards the end of seasonal cooling. HST6 and HST10, however, appear to have experienced different climate regimes towards the end of their first year of life. $\delta^{18}O$ values for HST6 increase gradually, and appear to be relatively dampened; an effect we might expect to see if seasonal temperature changes were not drastic (as would be the case in higher elevation environments/the Troödos foothills). In other words, the $\delta^{18}O$ values for HST6 support an argument that this animal lived year-round in a relatively temperate environment. The $\delta^{18}O$ trend for HST10 is more complicated, matching the complex pattern from the $^{87}Sr/^{86}Sr$ from the same sample. The likelihood of a regional transhumance strategy that employed a progressive movement into the highlands evidenced in the $^{87}Sr/^{86}Sr$ can be supported by trends in the $\delta^{18}O$ values. An initial herding in the lowlands, with gradually rising temperatures would create the slowly increasing $\delta^{18}O$ values from the beginning of the tooth growth, until HST10.5, which indicates a significant increase in localized temperature during the late spring/early summer. At this point, the dramatic decrease in $\delta^{18}O$ values between HST10.5 and HST10.6 could have been caused by movement into the highlands that would have dampened the seasonal heat, therefore reducing $\delta^{18}O$ values as well.

HST7 produced a pattern of $\delta^{18}O$ values similar to HST10, likewise implying a considerable herding movement about halfway through the growth of the tooth, but in reverse: from highlands to lowlands. HST7 shows an initial decrease in $\delta^{18}O$ values that would be indicative of a mid-to-late summer birth where tooth formation occurs at a point in year with the highest annual temperatures. The decline in $\delta^{18}O$ values is indicative of a gradual seasonal cooling into the fall. The increase on $\delta^{18}O$ values represented by HST7.4, however, suggests a dramatic increase in temperature that would be possible if the animal was driven into lower elevations and the coastal plain near HST. Thus, HST7 appears to represent a mid-summer birth in the highlands, followed by a movement into the lowlands as temperatures in the highlands cooled with the seasons. HST3 produced a sinusoidal $\delta^{18}O$ curve that begins with increasing values, implying a late-spring birth season, followed by a seasonal cooling representing the fall and winter, and then a return to values similar to the initial data points. The curve itself is relatively flat, however, suggesting that the region in which HST3 was pastured was more temperate than other locations.

Summarizing the HST samples: the archaeological contexts for each are roughly similar as they come from deposits of likely domestic refuse, especially from Area 8. This suggests that the interpretations of the isotopic analyses above relate directly to the herding strategies used to raise sheep consumed in non-specialized situations. In other words, these sheep are as close to animals consumed in "everyday" situations as we are likely to get. Beyond this, the fact that these sheep appear to have been consumed in domestic contexts suggests that individuals and families at HST either raised their own sheep which they consumed, or were able to acquire sheep through some manner of exchange from individuals or groups who raised these livestock in the Hala Sultan Tekke hinterland (or, perhaps, further afield).

The isotopes provide evidence for a number of herding strategies, suggesting that the livestock consumed at HST were herded in a series of locations in and around south-central Cyprus. The $^{87}Sr/^{86}Sr$ values from the specimens make it possible to group HST1, HST2, HST3, HST4, HST5, HST6, HST8, and HST9 together as indicating consistent herding in a given location across the growth period of each of these teeth. However, the average values for these relatively consistent $^{87}Sr/^{86}Sr$ ratios can be grouped into at least four sets: HST1 and HST4 at 0.7082; HST3 and HST5 at 0.7083; HST2, HST6, HST7 and HST9 at 0.7084; and HST8 at 0.7085. These average strontium ratios, and the relative consistency of the ratios across the growth of the tooth are suggestive of animal herding at locations that are progressively greater distances from HST, with the higher $^{87}Sr/^{86}Sr$ values suggesting herding into the foothills of the Troödos, and the lower $^{87}Sr/^{86}Sr$ implying herding in areas nearer to the coast. At the very least, this is indicative of animal management practices that appear to have used a number of micro-environments in the HST hinterland.

In basic terms, this is suggestive of a number of herding locations for the animals being consumed at HST, and is the kind of pattern we would expect to find from a relatively decentralized livestock management scheme. The fact that animals appear to have remained in one location throughout an entire year is suggestive of small-scale herding that could be supported on local resources, and which would, therefore, not require transhumance to make other resources more readily available (nor would the size of a small-scale flock justify the labor expended in a transhumant mode of herding).

The $^{87}Sr/^{86}Sr$ values for HST7, HST10 and HST11 are indicative of some sort of regional transhumance. The Sr ratio curve for HST7 is what we would expect from an animal that was moving across various, relatively small, geologic zones skirting the edge of the Troödos foothills. This is reminiscent of a modern practice that occurs in the Maroni Valley, where 21st century shepherds drive their flocks down towards the coast to graze on fallow or harvested agricultural land for a day or two at a time. A similar pattern of shepherding in the LC could have produced the Sr curve for HST7. The data curves for HST10 and HST11 show a relatively steady change over the course of tooth growth, beginning in an area with Sr ratios around 0.7083, dipping for a short time into an area with lower strontium values to result in a data point around 0.7082, and then moving into a region with higher strontium values around 0.7085+. This would match a traditional transhumant pattern beginning in the foothills of the Troödos, moving into the lowlands/towards the coast during the winter, and then moving towards the highlands in the summer.

Most of the specimens (HST1, HST2, HST4, HST5, HST7, HST8, HST9, and HST11) produced $\delta^{18}O$ values that were indicative of a late summer birthing season, where $\delta^{18}O$ values initially decreased representing the seasonal cooling in the winter, before leveling off and increasing again as temperatures warmed in the spring. This is consistent with a late winter mating season as sheep gestation averages 147 days or approximately 5 months. If mating occurred in March, the birthing season would fall in July or August. Breeding the animals at the end of the winter period, especially in a

Mediterranean environment where the winter was a wet season with reliable precipitation and therefore more reliable grazing, would ensure that pregnant ewes were as strong and nutritionally sound as possible before the nutritional demands of pregnancy. A second, less prevalent birth season, is suggested by HST6 and HST10, whose $\delta^{18}O$ values begin low and gradually increase over the course of the tooth, implying a winter birthing season. This is likely to have occurred in the coastal lowlands where milder winter temperatures predominate.

8.4.3 Enkomi

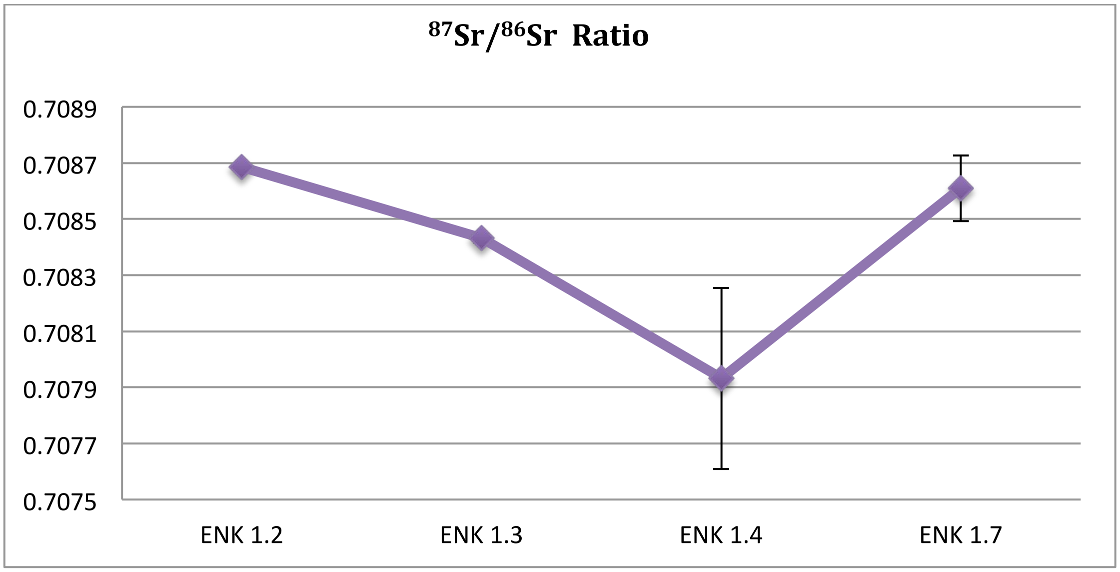
Unfortunately, due to the modern geopolitical situation on Cyprus, and the fact that an unrecognized Turkish-supported government occupies the northern portion of the island, it was impossible to collect and analyze baseline strontium samples from around the settlement at Enkomi. Therefore, expected strontium values for geologic regions around the archaeological site are best-guesses, based on known strontium values of specific geologies and the known geology surrounding Enkomi. Enkomi is situated at the edge of an extensive alluvial plain that makes up a large part of the *Mesaoria*, stretching west towards modern day Nicosia/Lefkosia. Alluvial deposits in south-central Cyprus produced $^{87}Sr/^{86}Sr$ values 0.7082 and 0.7083. The other predominant geologic formations in the vicinity of Enkomi are Nicosia-Athalassa Formations and Fanglomerate terrace deposits, both of which are fairly young conglomerate formations, dating to the Pliocene (5.332-2.588 mya) and Pleistocene (2.588-0.0117 mya) respectively, for which we might expect strontium ratios that are proximate to the 0.7082-0.7083 of the alluvial region around Enkomi.

Samples	Tooth Type	Context/ Excavation Label	87Sr/86Sr	$\delta^{18}O$	Estimated δ18O Ingested H2O
ENK 1.1	Maxillary (upper) M2	Enkomi 510		19.27	-5.36
ENK 1.2			0.7086852	18.35	-5.99
ENK 1.3			0.7084313	18.48	-5.90
ENK 1.4			0.7079314	19.11	-5.47
ENK 1.5				19.01	-5.54
ENK 1.6				18.89	-5.62
ENK 1.7			0.7086095	19.28	-5.36
ENK 2.1	Maxillary (upper) M2	Enkomi 575	0.7087968	18.50	-5.89
ENK 2.2				18.40	-5.96
ENK 2.3			0.7087966	17.72	-6.41
ENK 2.4			0.7087639	18.92	-5.60
ENK 2.5			0.7087495	19.22	-5.40
ENK 2.6			0.708791	19.81	-5.00
ENK 2.7			0.7087714	20.09	-4.81
ENK 2.8			0.7087742	19.00	-5.54
ENK 3.1	Maxillary (upper) M2	Enkomi 576	0.7087972	19.26	-5.37
ENK 3.2			0.7086603	19.27	-5.37
ENK 3.3			0.7086306	19.30	-5.35
ENK 3.4			0.7087266	20.09	-4.81
ENK 3.5				19.64	-5.11
ENK 3.6			0.7086193	18.64	-5.79
ENK 3.7			0.7086799	18.81	-5.68
ENK 4.1	Maxillary (upper) M1	Enkomi 578		19.53	-5.19
ENK 4.2				19.72	-5.06
ENK 4.3				19.88	-4.95
ENK 4.4			0.7087084	19.90	-4.94
ENK 4.5			0.7087984	19.34	-5.32
ENK 4.6			0.7087031	20.54	-4.51
ENK 5.1	Maxillary (upper) M3	Enkomi 551	0.7086834	20.73	-4.38
ENK 5.2				21.28	-4.00

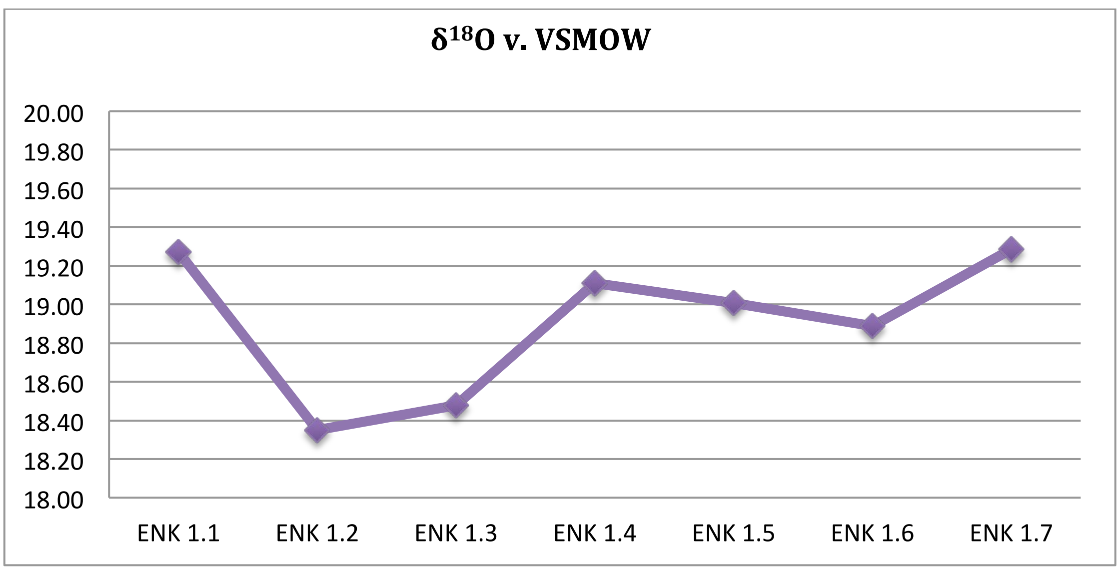
ENK 5.3				18.36	-5.98
ENK 5.4			0.7086927	18.77	-5.70
ENK 5.5			0.7087997	20.02	-4.86
ENK 5.6			0.7086958	20.05	-4.84
ENK 6.1	Maxillary (upper) M2	Enkomi 560		19.02	-5.53
ENK 6.2				19.20	-5.41
ENK 6.3				19.45	-5.24
ENK 6.4				20.96	-4.22
ENK 6.5			0.7087559	19.73	-5.05
ENK 6.6				21.25	-4.03
ENK 6.7			0.7087371	20.15	-4.77
ENK 7.1	Mandibular (lower) M2	Enkomi 563		18.59	-5.82
ENK 7.2			0.7087648	21.07	-4.15
ENK 7.3			0.7087995	18.04	-6.20
ENK 7.4			0.7085051	18.59	-5.82
ENK 7.5			0.7084826	18.78	-5.70
ENK 7.6			0.7087594	19.62	-5.13
ENK 8.1	Maxillary (upper) M2	Enkomi 580	0.7088267	19.93	-4.92
ENK 8.2			0.7087606	18.45	-5.92
ENK 8.3			0.7087464	19.03	-5.52
ENK 8.4			0.7087151	19.66	-5.10
ENK 8.5			0.7086975	19.23	-5.39
ENK 8.6			0.7084659	18.69	-5.75
ENK 8.7			0.7086179	19.21	-5.41
ENK 9.1	Mandibular (lower) M2	Enkomi 649	0.7087674	19.06	-5.50
ENK 9.2			0.7087711	18.97	-5.57
ENK 9.3			0.7084093	19.44	-5.25
ENK 9.4			0.7087174	19.18	-5.43
ENK 9.5			0.7087722	19.29	-5.35
ENK 9.6			0.70872	19.74	-5.05
ENK 9.7			0.7086589	20.28	-4.68
ENK	Mandibular	Enkomi 800	0.7085962	19.44	-5.25

10.1	(lower) M3			
ENK 10.2		0.7085679	19.82	-4.99
ENK 10.3		0.7084652	20.40	-4.60
ENK 10.4		0.7085755	19.49	-5.21
ENK 10.5		0.7085288	19.53	-5.19
ENK 10.6			18.09	-6.16
ENK 10.7			18.68	-5.76
ENK 10.8			18.95	-5.58

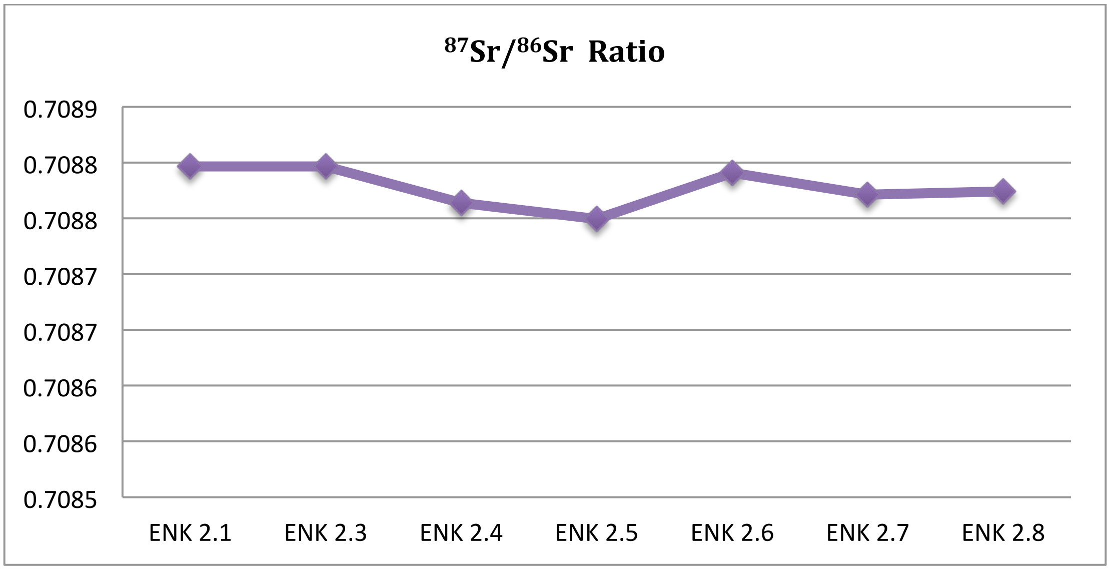
Table 8.4: Enkomi samples with archaeological context, Sr, $\delta^{18}O$ and estimated $\delta^{18}O$ values of ingested water values.

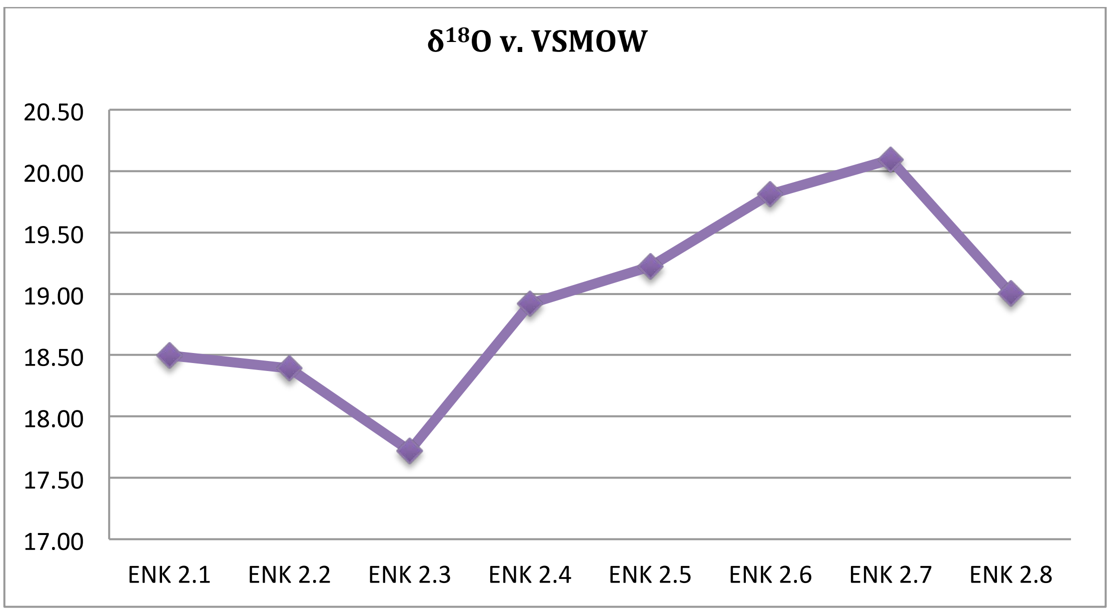


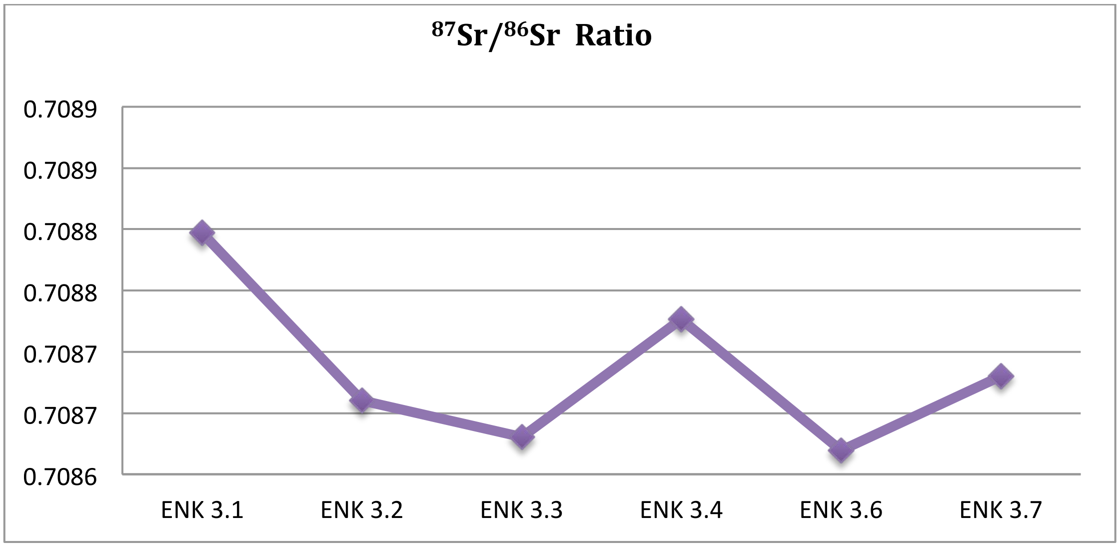
$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7087
0.7085
0.7083
0.7081
0.7079
0.7077
0.7075
ENK 1.2
ENK 1.3
ENK 1.4
ENK 1.7



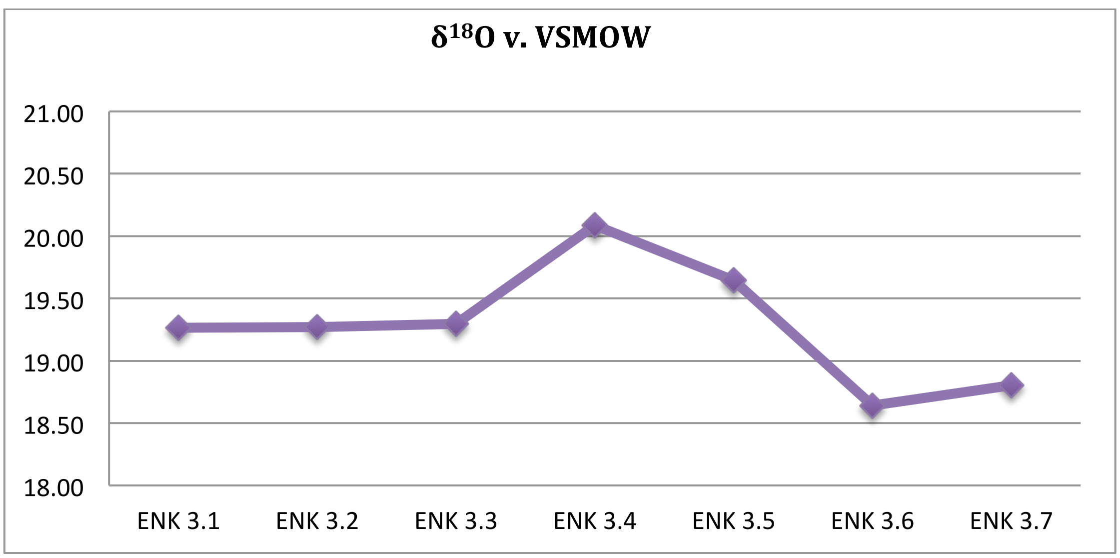
$\delta^{18}O$ v. VSMOW
20.00
19.80
19.60
19.40
19.20
19.00
18.80
18.60
18.40
18.20
18.00
ENK 1.1
ENK 1.2
ENK 1.3
ENK 1.4
ENK 1.5
ENK 1.6
ENK 1.7


$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7088
0.7088
0.7087
0.7087
0.7086
0.7086
0.7085
ENK 2.1
ENK 2.3
ENK 2.4
ENK 2.5
ENK 2.6
ENK 2.7
ENK 2.8

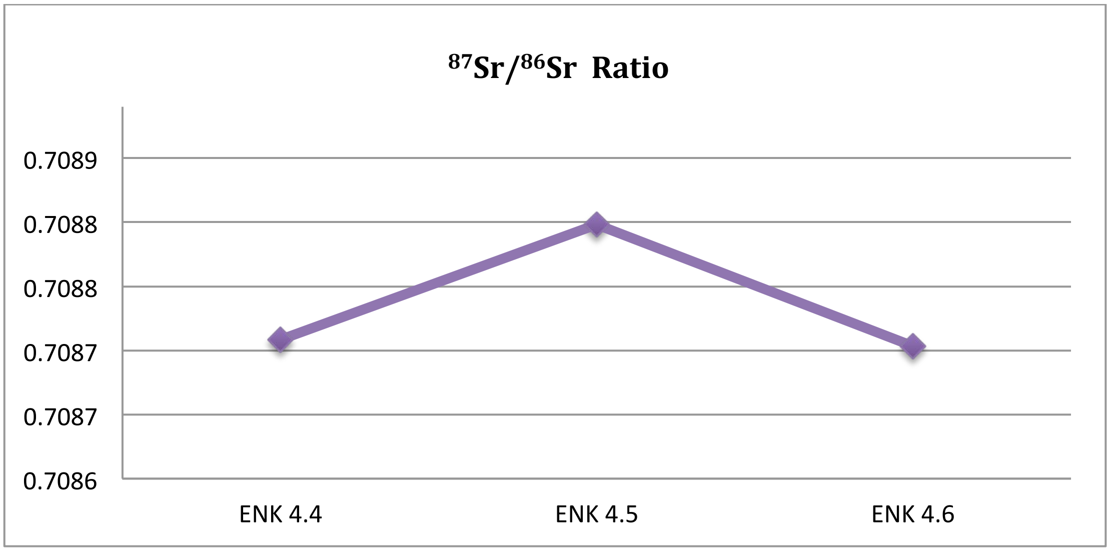

$\delta^{18}O$ v. VSMOW
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
ENK 2.1
ENK 2.2
ENK 2.3
ENK 2.4
ENK 2.5
ENK 2.6
ENK 2.7
ENK 2.8



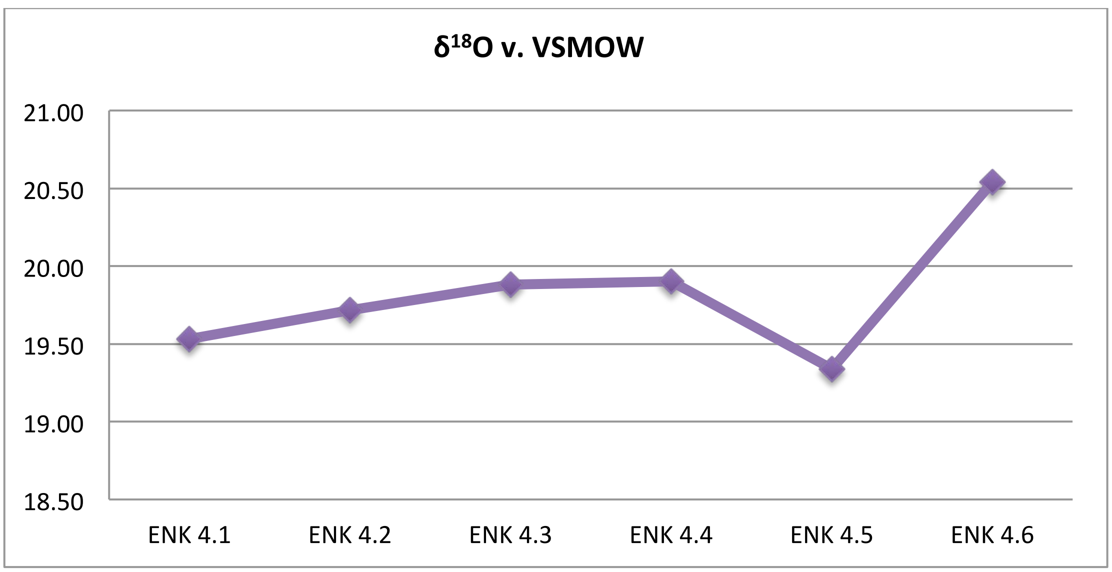
$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7089
0.7088
0.7088
0.7087
0.7087
0.7086
ENK 3.1
ENK 3.2
ENK 3.3
ENK 3.4
ENK 3.6
ENK 3.7



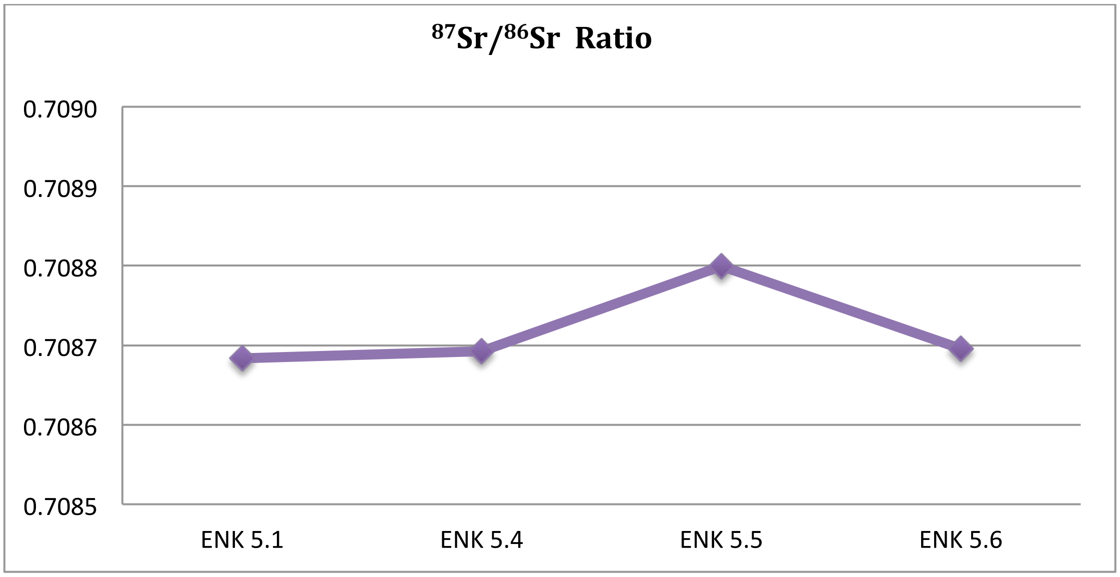
$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
ENK 3.1
ENK 3.2
ENK 3.3
ENK 3.4
ENK 3.5
ENK 3.6
ENK 3.7



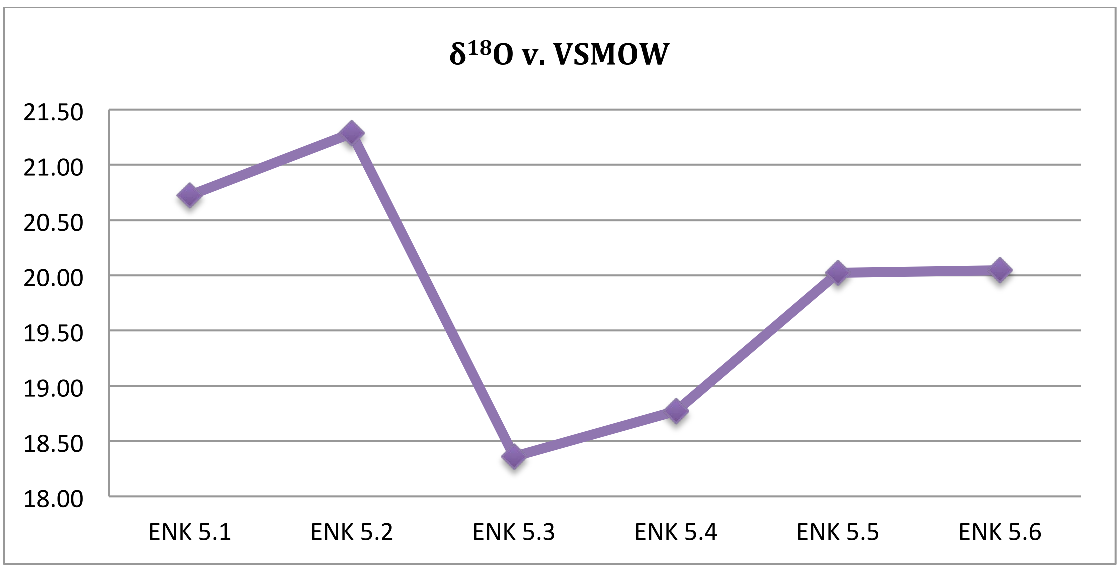
$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7088
0.7088
0.7087
0.7087
0.7086
ENK 4.4
ENK 4.5
ENK 4.6



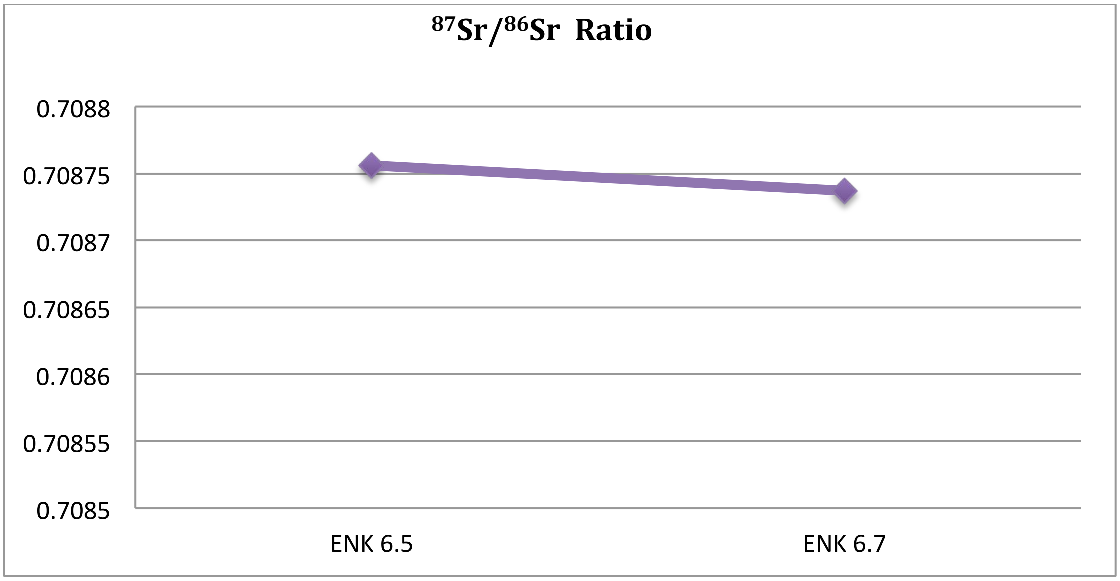
$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
ENK 4.1
ENK 4.2
ENK 4.3
ENK 4.4
ENK 4.5
ENK 4.6

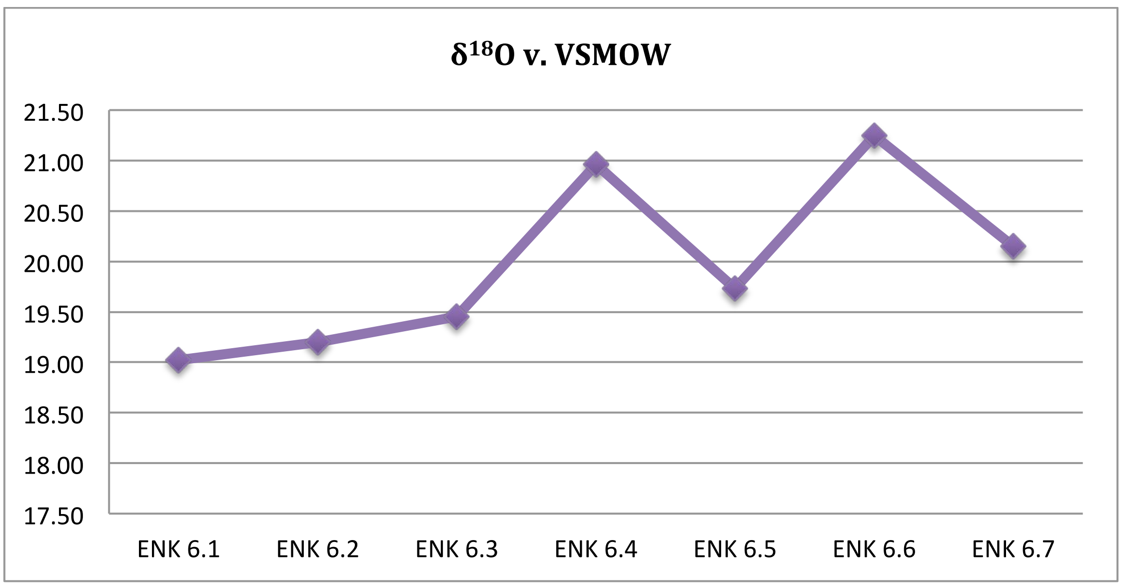


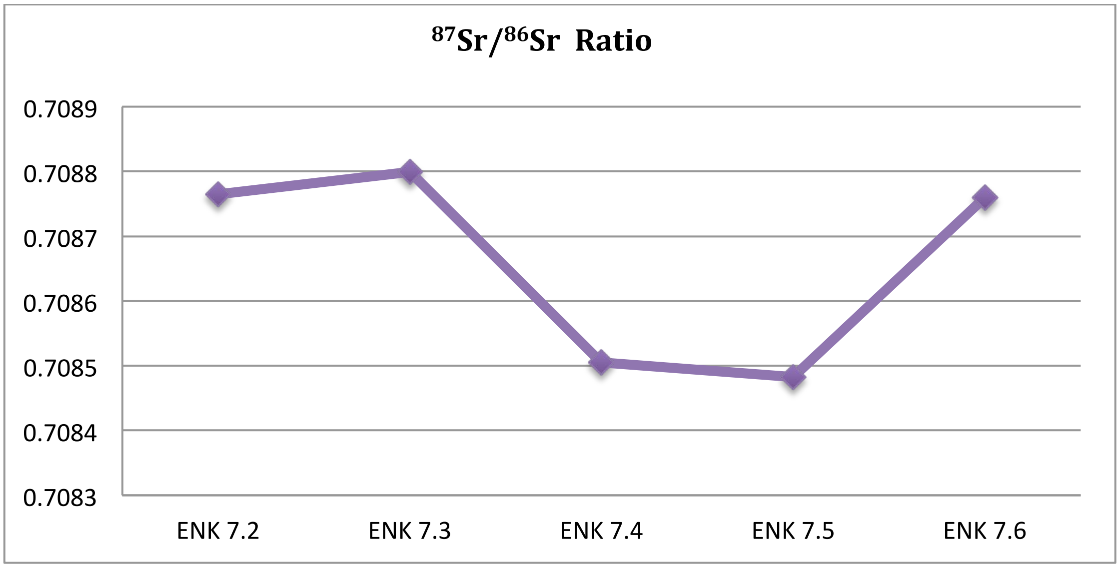
$^{87}Sr/^{86}Sr$ Ratio
0.7090
0.7089
0.7088
0.7087
0.7086
0.7085
ENK 5.1
ENK 5.4
ENK 5.5
ENK 5.6

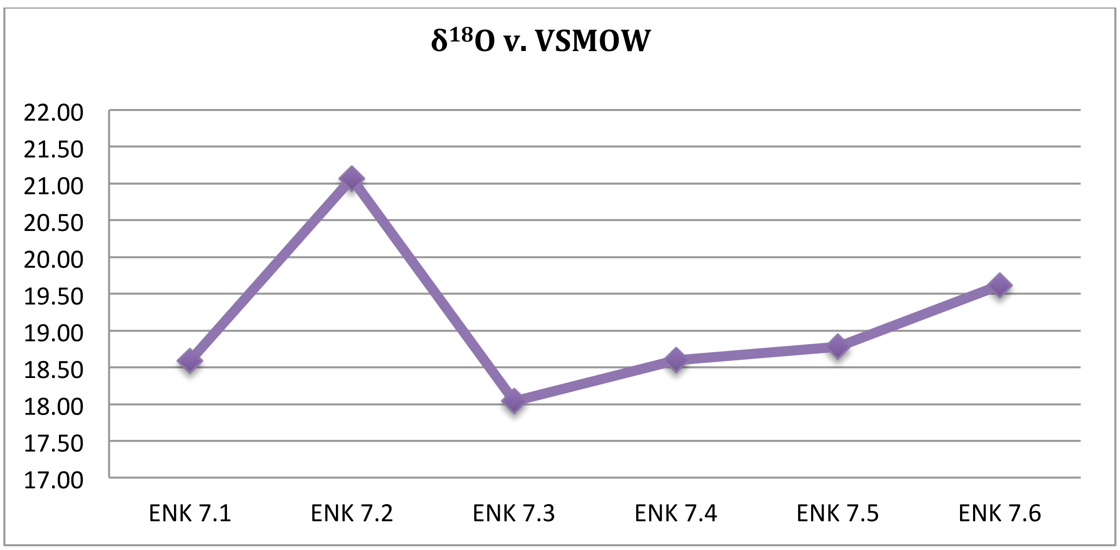


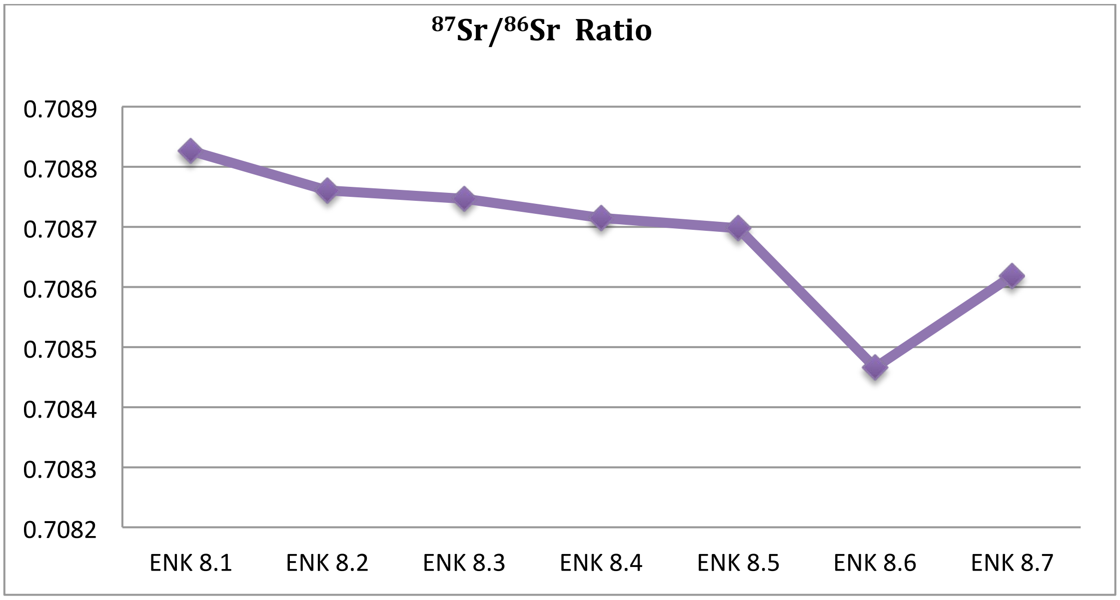
$\delta^{18}O$ v. VSMOW
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
ENK 5.1
ENK 5.2
ENK 5.3
ENK 5.4
ENK 5.5
ENK 5.6

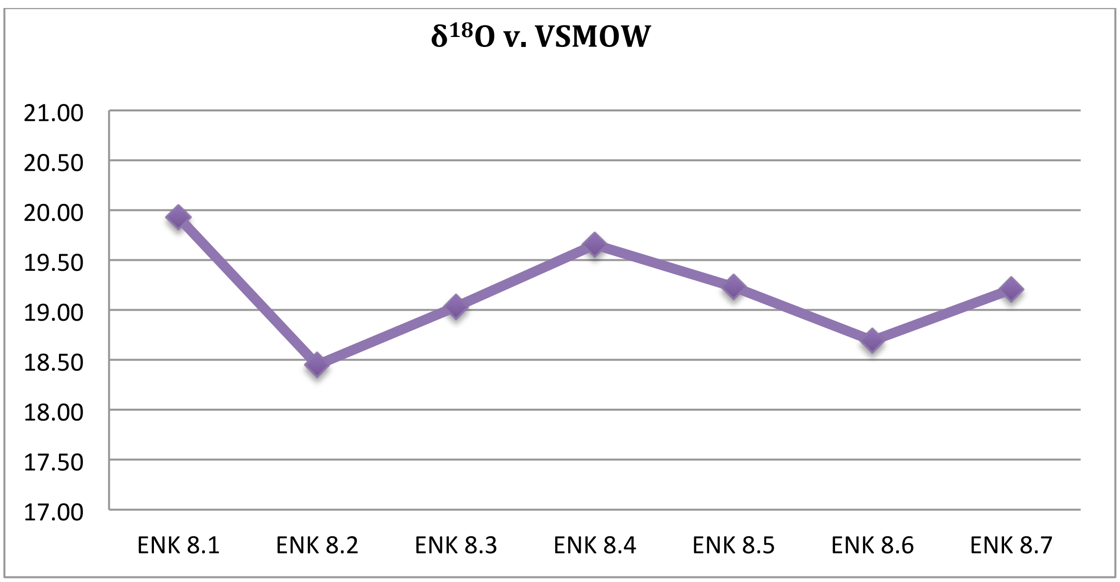

$^{87}Sr/^{86}Sr$ Ratio
0.7088
0.70875
0.7087
0.70865
0.7086
0.70855
0.7085
ENK 6.5
ENK 6.7

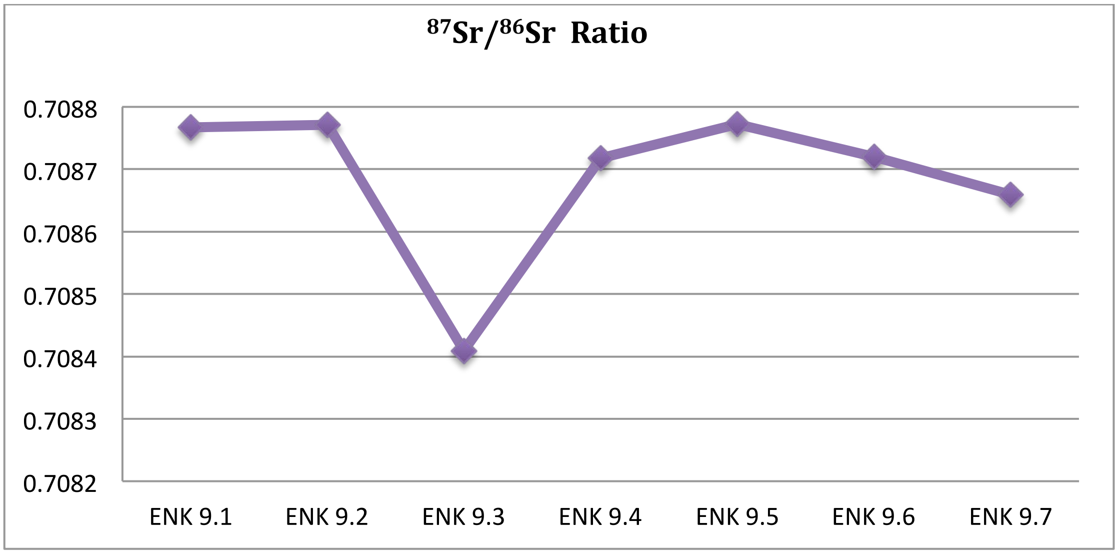

$\delta^{18}O$ v. VSMOW
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
ENK 6.1
ENK 6.2
ENK 6.3
ENK 6.4
ENK 6.5
ENK 6.6
ENK 6.7

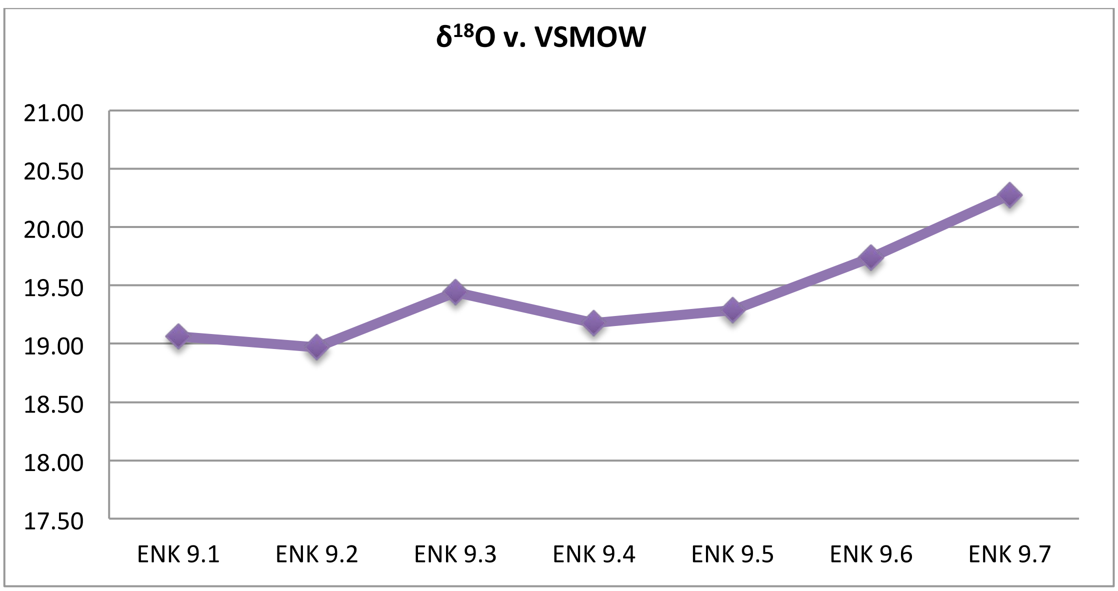

$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7088
0.7087
0.7086
0.7085
0.7084
0.7083
ENK 7.2
ENK 7.3
ENK 7.4
ENK 7.5
ENK 7.6

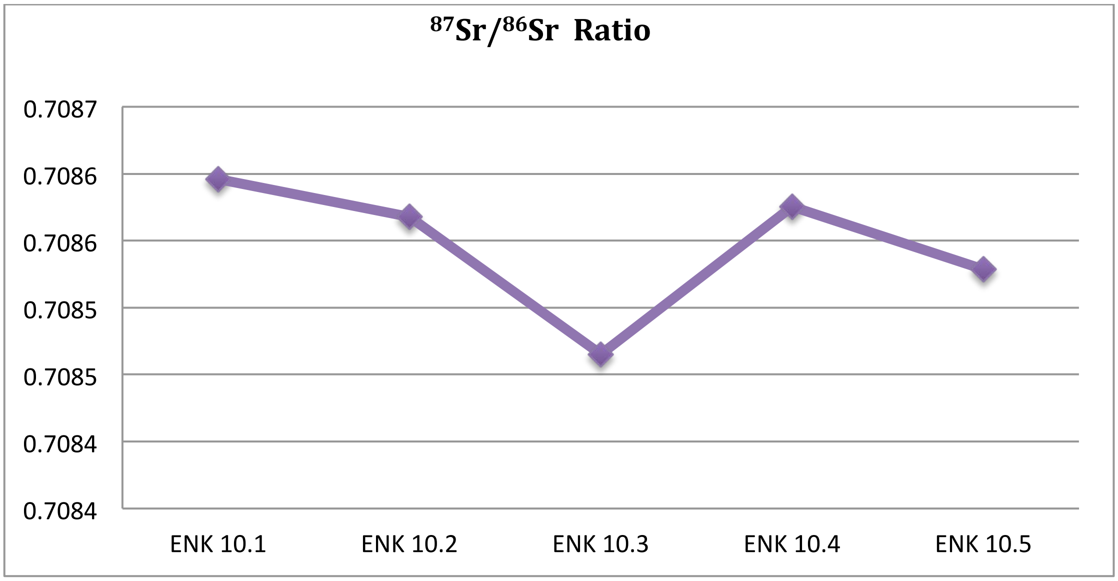

$\delta^{18}O$ v. VSMOW
22.00
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
ENK 7.1
ENK 7.2
ENK 7.3
ENK 7.4
ENK 7.5
ENK 7.6


$^{87}Sr/^{86}Sr$ Ratio
0.7089
0.7088
0.7087
0.7086
0.7085
0.7084
0.7083
0.7082
ENK 8.1
ENK 8.2
ENK 8.3
ENK 8.4
ENK 8.5
ENK 8.6
ENK 8.7


$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
ENK 8.1
ENK 8.2
ENK 8.3
ENK 8.4
ENK 8.5
ENK 8.6
ENK 8.7


$^{87}Sr/^{86}Sr$ Ratio
0.7088
0.7087
0.7086
0.7085
0.7084
0.7083
0.7082
ENK 9.1
ENK 9.2
ENK 9.3
ENK 9.4
ENK 9.5
ENK 9.6
ENK 9.7


$\delta^{18}O$ v. VSMOW
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
ENK 9.1
ENK 9.2
ENK 9.3
ENK 9.4
ENK 9.5
ENK 9.6
ENK 9.7



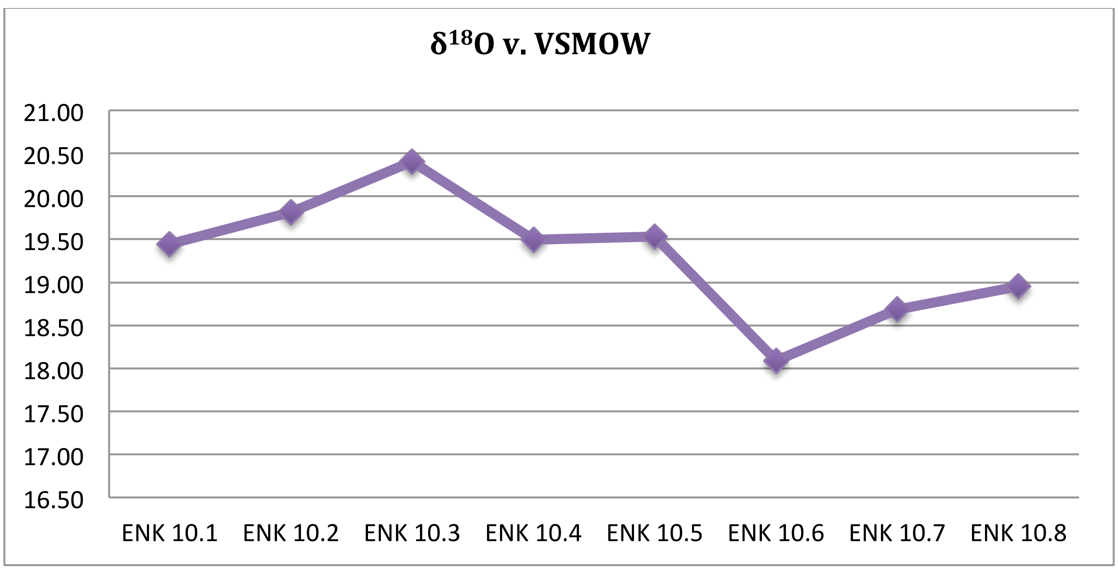


Figure 8.8: Enkomi strontium and oxygen isotope data curves, error bars show 2σ standard error for strontium values

Ten caprine molars were analyzed for strontium and oxygen isotopes (labeled ENK1 through ENK10). Contextual data for these samples is unfortunately not particularly specific, due –in part—to less interest in faunal remains during the mid-twentieth century excavation of the settlement. These samples do, however, come from the LCII-LCIII layers of Area 1, a winged domestic structure that was part of one of the urban insula that made up the Late Bronze Age urban center. One striking initial observation that can be made about the strontium ratio data for the Enkomi samples is that all samples tend to have $^{87}Sr/^{86}Sr$ values that are considerably higher than any of the samples from Kalavasos, Maroni or Hala Sultan Tekke. The average of all strontium ratio values for samples from Enkomi is 0.7087. There are two potential causes for this relatively high $^{87}Sr/^{86}Sr$ average: it may be caused by $^{87}Sr/^{86}Sr$ mixing in which seawater misting from the Mediterranean Sea—whose average strontium ratio is 0.7088-0.7089 (Flecker & Ellam 2006)—causes the enrichment of strontium values in plant species consumed by herbivores. These higher values might also represent significant contributions from a geologic region with $^{87}Sr/^{86}Sr$ values around 0.7088. Despite the fact that it was not possible to collect baseline samples from the area around Enkomi (see above), it is unlikely that either the alluvial bottomlands or the fanglomerate terraces would produce these relatively high values. This would mean that many (if not all) of the teeth sampled were from animals that were herded at a distance from the settlement.

The case for Mediterranean Sea mist contributions to strontium values is difficult to support for two primary reasons. First, strontium values from baseline samples as near to (or, in some cases, nearer to) the Mediterranean coastline in south-central Cyprus produced $^{87}Sr/^{86}Sr$ values between 0.7081-0.7084, considerably lower than the ~0.7088 values from around Enkomi. If distance from the coast was the key determinative factor for Mediterranean mist contributions to $^{87}Sr/^{86}Sr$ values, we should expect to find similarly enriched values around HST and KAD, and we do not. Moreover, wind patterns on Cyprus are predominantly westerly, which would make it difficult for Mediterranean mists to reach areas around Enkomi, which sits on the east coast of Cyprus and therefore west of the closest Mediterranean coast. It is, however, possible that strontium values along the immediate coast would experience enriched $^{87}Sr/^{86}Sr$ values from Mediterranean misting, though unlikely that all sheep represented here were herded at the edge of the sea.

A number of the teeth sampled from Enkomi produced consistent strontium values across the tooth, indicating that the animals in question were herded in the same location for the duration of the tooth growth. Samples ENK2, ENK3, ENK5, ENK6, ENK10 match this pattern of steady values. Note however, that ENK6 produced only two useful strontium data points, making any conclusions drawn about this animal based on the strontium data somewhat less reliable (see discussion of $\delta^{18}O$ values for these specimens as well). The strontium values of these six specimens vary: ENK2 producing $^{87}Sr/^{86}Sr$ values that average 0.7088, while ENK3, ENK5 and ENK6 produced average values of 0.7087, and ENK10 produced an average value of 0.7085. Baseline samples that produced similarly high values (~0.7088) came from the regions around Kalavasos, Maroni and Amathus, where igneous geologic formations permeated the surrounding alluvial and sandstone deposits (see above).[214] In the vicinity of Enkomi there are two potential locations where similar geologic formations could produce $^{87}Sr/^{86}Sr$ ratio values of 0.7087-0.7088: the foothills to the north-east of the Troödos, across the *Mesaoria* or the foothills of the northern Kyrenia mountain range. Baseline $^{87}Sr/^{86}Sr$ data for both regions is lacking so pinpointing the herding of these animals to one of these two locations is impossible on present data. However, these data do make the important point that a significant portion of the animals consumed at Enkomi were likely herded in the foothills of the mountains, at least 20 km distant (in the case of the Kyrenia range) and up to 50km distant (in the case of the Troödos foothills) from Enkomi.[215]

The remaining specimens—ENK4, ENK7, ENK8 and ENK9—produced $^{87}Sr/^{86}Sr$ values that were suggestive of mobile herding patterns. In each case, initial $^{87}Sr/^{86}Sr$ values for each tooth are between 0.7087-0.7088. Despite the fact that ENK4 only produced three reliable strontium values, the values produce a curve that—if extrapolated out before ENK4.4 and after ENK4.6—would be consistent with transhumant herding. The high strontium value for ENK4.5 would represent pasture at one end of the transhumant pattern of herding, while a pasture with a lower strontium value (perhaps a value of 0.7085 that would be consistent with the values for

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214 Note, again, that $^{87}Sr/^{86}Sr$ values approximating 0.7088 might also be the result of a Mediterranean misting signal, which would imply herding at a very close proximity to the Mediterranean coast. This is certainly possible, however, the fact that strontium baseline signals for the area around Hala Sultan Tekke produced strontium ratio values that were ~0.7081 implies that Mediterranean misting does not contribute considerably to coastal environs. Until strontium baseline samples can be collected from the region around Enkomi (currently impossible based on the occupation of northern Cyprus by an unrecognized, Turkish-backed government), this question must remain unresolved, however.

215 Note that ENK1 produced error values that made the $^{87}Sr/^{86}Sr$ readings unreliable, and therefore was not included in this discussion.

ENK7, ENK8 and ENK9?) would represent the pasture at the other end of the transhumant movement.

For ENK7, ENK8 and ENK9, strontium values towards the end of tooth growth of 0.7085 indicate a movement into a new geologic zone with lower $^{87}Sr/^{86}Sr$ values. This pattern is most prevalent for ENK7, whose early $^{87}Sr/^{86}Sr$ values of ~0.7088 suggest that the animal in question was herded in the same region as ENK2, ENK3, ENK5, ENK6, and ENK10 for a period of time. ENK7's $^{87}Sr/^{86}Sr$ values drop to *circa* 0.7085, before returning to 0.7088 at the end of the tooth growth. If the strontium baseline sample from Alassa in south-central Cyprus, is any indication, $^{87}Sr/^{86}Sr$ values of 0.7085-0.7086 are consistent with Pachkna chalky marls. Small outcrops of these formations are present between the foothills of both the Troödos and Kyrenia ranges and the plain of the *Mesaoria*. This might therefore suggest a herding strategy that involved a seasonal movement from the highlands, into the lowlands, before the seasonal climate cycle encouraged a movement to grazing the low-slopes of one of the mountain ranges. However, $\delta^{18}O$ values (see below) make it more likely that the herding pattern represented by ENK7 was one that skirted along a geologic boundary, causing the strontium values to vary even if elevation/temperature did not vary significantly. This would have been possible in the mountain foothills.

The $^{87}Sr/^{86}Sr$ values for ENK8 show an initial and steady decrease from 0.7088 to 0.7087, followed by a single $^{87}Sr/^{86}Sr$ value that dipped below 0.7085, and a final value that ticked back up to just below 0.7086. The gradual change at the beginning of the sample (rather than a punctuated change from, e.g. 0.7088 to 0.7085) is suggestive of a grazing strategy that caused animals to graze along the edge of two geologic zones, creating a mixing of $^{87}Sr/^{86}Sr$ values. As this herding incorporated more and more grazing in the geologic area with values below 0.7088, the $^{87}Sr/^{86}Sr$ ratio precipitated into the animal's tooth enamel gradually decreased as well. The final two $^{87}Sr/^{86}Sr$ values for ENK8 suggest a more dramatic movement into a region with lower strontium values. This would be consistent with herding in the foothills of either the Troödos or Kyrenia mountains, with the 0.7085/0.7086 values again representing a movement into the chalky marls at the base of these mountain formations. While ENK8 does not show the clear sinusoidal pattern indicative of a return to the same pastures during the initial growth of the tooth (as in the case of ENK7), the fact that the final value of ENK8 shows an increasing trend is suggestive of a move back towards initial pasture areas.

The strontium ratios for ENK9 show a similar pattern, with most values illustrating gradually decreasing $^{87}Sr/^{86}Sr$ ratios from just below 0.7088 to just below 0.7087, punctuated by one value of 0.7084. This pattern suggests a herding pattern similar to that of ENK8: herding along a geologic boundary that gradually incorporated lower concentrations of ^{87}Sr isotopes with one value indicating herding in a region with distinctively lower strontium ratios. The key difference between ENK8 and ENK9 is the timing of this lower strontium value, which suggests that ENK8 and ENK9 represent animals that were born during different seasons. This 0.7084 value (ENK9.3) in the ENK9 data would be suggestive of a movement across a geologic formation that was considerably different than the geologic regions that contributed strontium to either ENK9.2 or ENK9.4. This could represent a passage across any number of fanglomerate or Nicosia-Athlassa formation outcrops in the vicinity of Enkomi.

Of the first group of Enkomi samples discussed above that have consistent strontium ratio values, ENK2, ENK5 and ENK10 produced sinusoidal $\delta^{18}O$ curves that are the simplest to interpret. ENK2 shows an initial and gradual decreasing of $\delta^{18}O$ values, followed by a steady and prolonged increase of values, with a final value that again begins to decrease. This pattern is consistent with a seasonal temperature change with oxygen uptake recorded in the tooth beginning in the middle-to-late fall when temperatures (and $\delta^{18}O$ values) would be steadily decreasing. As this specimen is an M2 and would begin forming at or just after birth, this implies a lambing season in the late fall, and a mating season in late spring (May or early June). ENK5 and ENK10 illustrate a slightly different pattern of $\delta^{18}O$ data, with initial $\delta^{18}O$ values increasing, before dipping considerably, and then gradually increasing once again. This is a pattern consistent with initial tooth growth in the late summer (in August or early September) when temperatures would reach their annual peak, before dropping off in the winter and then rebounding in the spring. Because both ENK5 and ENK10 are third molars, these likely formed approximately one year after birth and therefore roughly reflect the season of the animal's birth, as well. These late summer births are consistent with the lambing season of a number of specimens from HST, and would correspond to a late winter/early spring (i.e. February or March) mating season.

The $\delta^{18}O$ curve for ENK3 is suggestive of a seasonal climate cycle but one with less variation than those experienced by ENK2, ENK5 and ENK 10. The range of the $\delta^{18}O$ values for ENK3 (range = 1.45) is tighter than the range for either ENK2 (range = 2.09) or ENK10 (range = 2.31). This suggests that ENK3 experienced less substantial temperature changes during the growth of the tooth. This kind of $\delta^{18}O$ curve might be indicative of a transhumant herding pattern that kept animals in cooler regions during the summer and warmer regions during the winter, however the steady strontium values for ENK3 indicate herding in a consistent location and therefore rule out transhumance. The relatively flat nature of the $\delta^{18}O$ data curve for ENK3, and the fact that the most significant change is caused by an increase in values suggest that the location in which this animal was shepherded experienced a warm season similar to that experienced by ENK2 and ENK10, but a cold season that was milder. This would imply a year round occupation at a lower elevation, where winters are milder, yet summers are equally warm, a situation that we would expect to find in the lowlands surrounding Enkomi, rather than in the foothills of either the Troödos or Kyrenia ranges. While the flat beginning and end of ENK3's $\delta^{18}O$ curve makes it difficult to determine whether this animal was born in the fall or spring, it is possible to backtrack from the highest $\delta^{18}O$ value at ENK3.4 which must correspond to the summer, to infer a spring season of birth.

The relatively flat $\delta^{18}O$ curve for ENK4, and the small range of values relative to other samples (range = 1.20) might be suggestive of a transhumant-herding pattern that would have kept animals within a relatively consistent climate over the course of the growth of the tooth. The trend in the ENK4 strontium data is likewise suggestive of transhumant movement, even if this specimen only produced three reliable strontium values that are suggestive of a larger transhumant trend. Because of the relatively flat nature of this curve, it is unfortunately not possible to assign a season of birth.

ENK6 produced a similarly difficult to interpret $\delta^{18}O$ curve. Initial values from the outset of tooth growth gradually increase, implying a gradual warming, and thus growth during a spring season. However, data points ENK6.4, ENK6.5 and EKN6.6 create substantial fluctuations in the data curve, with ENK6.4 increasing significantly (an increase of 1.51), then decreasing significantly (by 1.23) to ENK6.5, and then increasing significantly again (by 1.53) to ENK6.6, then decreasing significantly again (by 1.10) to reach the final value, ENK6.7. This kind of punctuated and substantial change in $\delta^{18}O$ values cannot be explained by climatological factors, and cannot be attributed to seasonal variations. Instead, this fluctuation in the data can only be interpreted as movements in and out of the highlands across the growth of the tooth.

It is therefore possible to interpret this signal as influenced by something other than a need for access to pasturage or more appropriate seasonal temperatures. Instead, this signal could reflect an attempt at avoiding man-made pressures. While largely circumstantial, it is tempting to interpret this sporadic movement—especially when this sporadic movement might have occurred along the north coast—as a response to the kind of military action that the Hittites undertook against the kingdom of Alashiya during the reign of Arnuwanda I or Suppiluliuma II at the end of the 13th century BCE (see Chapter 3, pg. 83-92). This kind of military invasion along the north coast of Cyprus would have encouraged Late Cypriot shepherds to retreating into the mountains—manifesting as a dip in the $\delta^{18}O$ values—before a return to milder climates.

Samples ENK7, ENK8 and ENK9 produced $\delta^{18}O$ values that were—like the strontium curves they produced— also difficult to interpret. The $\delta^{18}O$ data points for ENK7 may suggest a similar 'escape' strategy as ENK6. Five of the six $\delta^{18}O$ values produce something of a sinusoidal curve, with an initial gradual, downward trend, followed by an even more gradual upward trend. However, the second value (ENK7.2, $\delta^{18}O$=21.07) is significantly higher than any of the other values for the specimen. While it is possible that this is an instrument error and an outlier, there is no good reason to believe that this is the case. Thus, if this data point does represent a legitimate trend in the data, it is a considerable increase in environmental temperature that is unlikely to have been caused naturally. This would imply a substantial decrease in elevation, with movement from the highlands into the lowlands. Intriguingly, the strontium data does not illustrate a distinct change in strontium values that would match a drastic elevation change illustrated by the $\delta^{18}O$ value for ENK7.2. It is possible that the initial strontium values correspond to a geologic formation that encompasses a series of elevations, and the ENK7.1 $\delta^{18}O$ value is a value from the highest elevations in this region, while the ENK7.2 is a lower elevation location. A combination of seasonal cooling and a return to a higher elevation could account for the ENK7.3 values being slightly lower than the ENK7.1 value. ENK7.2

notwithstanding, the decrease from ENK7.1 to ENK7.3 implies a seasonal cooling consistent with a fall and winter climate, while the eventual increase in succeeding $\delta^{18}O$ values is suggestive of a steady seasonal warming that would be consistent with a spring season and summer season. Since ENK7 is an M2 and would being forming just after birth, the $\delta^{18}O$ data implies a mid-fall birthing season.

ENK8 has $\delta^{18}O$ values that create a quintessential sinusoidal curve, however these values cycle through this curve twice when a traditional seasonal temperature change should only cycle once over the time period represented by the growth of the tooth. This suggests that the animal in question experienced artificial temperature variations over the course of tooth growth; in other words, a herding strategy that would have caused the animal to experience warming, cooling, warming, cooling, warming. This $\delta^{18}O$ curve is also relatively flat, such that the range of values across the whole tooth (1.48) (see table 8.4). While ENK8 does appear to have experienced some variation in temperature, the herding strategy experienced by the animal appears to have dampened that signal.

The herding strategy that can best account for this evidence is one in which the strontium baseline signal was relatively consistent across a region of elevation change, similar to ENK7. A river valley might provide an environment where this was possible, where erosion of geologic formations at the highest elevation of the valley would drive strontium values in the lower portions of the valley to incorporate eroded minerals, therefore enriching strontium values at lower elevations, and keeping a relatively consistent strontium signature throughout elevation changes. Herding that incorporated a daily use of the valley's hill slopes, and employed varying elevations to limit exposure to seasonal temperature changes would best match both strontium and oxygen isotopic signals. The dampened signal and the fact that ENK8 appears to have experienced considerable mobility throughout its life makes it impossible to use these data to comment on a seasonality of birth.

Oxygen isotope values for ENK9 are also relatively flat, with a range of only 1.31, implying a dampening of the temperature signal similar to ENK8. The trend in the data, however, is quite different as it shows a gradual upward trend across all of the data. Together, the dampening of the signal and gradual upward trend are suggestive of a herding pattern similar to that experienced by HST6 where seasonal changes in temperature were not significant—or, if they were, mobility was used to mitigate them. A pattern of mobility with significant distance traveled is not supported by the strontium data, whose relatively flat curve implies a relatively consistent herding location within the same geologic region. Instead, it is likely that gradual mobility with elevation variations corresponding to seasonal temperature changes, but remaining in the same geologic region is responsible for the combination of strontium and oxygen curves for ENK9. In other words, ENK9 appears to have experienced a similar pattern of herding as ENK7 and ENK8. The gradual increasing of $\delta^{18}O$ values implies a steady and gradual warming experienced by the animal during the growth of the tooth. Given that this is an M2 and would have begun calcification just after birth, this $\delta^{18}O$ pattern is consistent with a seasonal birth in the spring.

When taken all together, the isotopic data for the ten specimens from Enkomi—like the data from Hala Sultan Tekke—indicates that there were multiple herding strategies at work. It is worth reiterating that the average strontium value for all Enkomi samples is considerably higher than the average strontium value for any other specimens at any of the other archaeological sites considered here. This implies that the animals consumed at Enkomi were likely herded in a region that did not overlap with the herding regions of the other settlements. Enkomi's relative proximity to the Kyrenia mountain range and the Karpas Peninsula, make these prime candidates for herding regions that would have produced strontium ratio values approaching 0.7088. However, the modern geopolitical situation on Cyprus makes it impossible to test this hypothesis at present.

Strontium and oxygen data for samples ENK2, ENK3, ENK5, ENK6 and ENK10 suggest that these animals were herded in locations that were consistent throughout the growth of the analyzed teeth. This would suggest a small-scale herding pattern that was likely part of a mixed farming-herding subsistence strategy. Year-round herding in one location would mean this location was at a relatively low elevation, as high elevation herding would like have been challenging during the more severe winter weather. The strontium values for these five samples indicate three distinct herding locations: a location with strontium values around 0.7088 (ENK2), a herding location with strontium vales around 0.7087 (ENK3, ENK5 and ENK6) and a location with strontium values around 0.7085 (ENK10). While it is not possible on current evidence to pinpoint these locations, the these three herding locations feature year-round herding suggests that small-scale herding was widespread in the region around Enkomi and made a substantial contribution to caprine consumption at the site.

The remaining specimens—samples ENK4, ENK7, ENK8 and ENK9—present evidence for a more complex herding strategy, as there are indications of mobility for each of these. ENK4 and ENK9 produced relatively flat oxygen curves that would be indicative of a transhumant herding strategy that ensured a largely consistent temperature throughout the growth of the tooth. The strontium values for ENK4, despite only contributing three reliable data points—are suggestive of a curve that would represent transhumant herding. For ENK9, the strontium trend is generally a gradual decreasing trend, punctuated by one value—ENK9.3—which collectively indicate a pattern of mobility across different geologic regions as would be expected with a transhumant pattern of herding.

ENK7 and ENK8 represent the most unique and intriguing of the Enkomi samples, largely because of the sporadic nature of the $\delta^{18}O$ values for these two samples. The see-saw pattern present in both of these $\delta^{18}O$ curves is not reproduced by any other specimen analyzed here in any part of the island. It is difficult to determine how a natural climatological pattern could produce the temperature swings that would create such a fluctuating $\delta^{18}O$ curve. Thus, elevation change seems to be the only likely way that temperature fluctuations could occur to produce these $\delta^{18}O$ curves. Given the considerable elevation difference between the lowlands of the north coast of Cyprus and the c. 1000m Kyrenia mountains, this region provides a good candidate for such stark and rapid elevation changes. Given the apparent turmoil of the 13th century BCE, and the known invasions by the Hittites and other Anatolian peoples during this period, it seems reasonable to suggest that this elevation change may be the result of shepherds driving their flocks into the highlands of the Kyrenia as a means of escaping Hittite marauders or simply the violence associated with these events.

Collectively, then, the caprine teeth at Enkomi provide a picture of Late Cypriot herding practices that is largely consistent with the shepherds at KAD and HST. Caprine animals consumed at Enkomi appear to have been herded in both relatively stationary, small-scale, mixed farming contexts, as well as more mobile herding strategies that employed the highlands and the lowlands throughout the seasonal cycle. However, samples ENK7 and ENK8 provide an intriguing—though admittedly speculative—example of the potential use of the Cypriot mountains as areas of refuge during periods of military violence. The use of mountainous environments as safe havens is a well-documented strategy of avoidance used by a variety of groups the world over, highlighted especially by James C. Scott in a region of Southeast Asia called Zomia (2009; see also Chapter 3). Krzysztof Nowicki has also noted the apparent importance of mountain refuge settlements on Crete at the end of the Bronze Age (Nowicki 1994, 2001). ENK7 and ENK8 raise the possibility that shepherds employed these mountains in a short-lived manner to escape conflict.

8.4 *What the isotopes say: Interpreting Late Cypriot Shepherding*

Oxygen and strontium isotopes in the caprine teeth from these three Late Cypriot archaeological sites present entirely new evidence from which to consider not only Late Cypriot shepherding, but also patterns of life, and distinct actions and strategies of non-elites in Late Cypriot society. The trends in the isotopes can be brought to bear on archaeological questions on at least three useful levels considered here: that of the individual shepherd/herder, that of the archaeological site and community, and that of the larger island.

On present evidence, it has been difficult to determine the nature of the Late Cypriot herding economy, especially from the perspective of the individuals who were responsible for herding the flocks. Even with the isotopic evidence, it still remains difficult to detect ownership (i.e. were the individuals overseeing the grazing of the flocks also the flock owners?) and control, as well as the size of particular flocks of sheep. Isotopic data does, however, begin to fill in questions about the mechanisms of herding and land usage, and provides hints about the nature of the larger sheep and goat production economy. Perhaps the most critical observation is that a number of herding strategies appear to have been employed across the island during the Late Cypriot period. At KAD, HST and Enkomi the isotopic data provide evidence for localized herding patterns consistent with smaller-scale shepherding and perhaps mixed farming, concurrent with larger scale herding that likely involved greater mobility, perhaps in the form of medium-range (20-40km) transhumance.

There is considerable variety in the herding strategies suggested by the isotopic data. At KAD, three strategies can be detected, each progressively more mobile and taking place progressively further from the settlement at Kalavasos. At Hala Sultan Tekke evidence for smaller-scale herding is considerably more prevalent than transhumant or mobile pastoralism. This smaller-scale production is suggested by a consistent pasturing location across the growth of the analyzed tooth, and isotope data that suggests a series of grazing locations which is indicative of a more de-centralized (or at least not tightly controlled) herding mechanism. This is suggestive of more individualistic and—perhaps—even entrepreneurial herding strategies that allow shepherds to make the most out of localized environments and to do so with an eye towards fulfilling some sort of private demand for animal products at Hala Sultan Tekke. Given the fact that HST appears to have been a trading port and something of a 'market town,' the predominance of apparently autonomous shepherds fits nicely with the *ethos* of market town. Importantly, the strontium values for these samples do no suggest that these animals were all herded in the same location, but instead some were probably kept in the lowlands near the settlement, while others appear to have been herded at higher altitudes in the Troödos foothills.

Three samples from HST (HST7, HST10 and HST11) do, however, present isotope evidence for movement and mobilization. The strontium data for HST7 matches what we might expect from a herding pattern that moves flocks from the Troödos foothills towards the coast and back again, using a river valley as a conduit. HST10 and HST11 produced strontium curves that would match a transhumant pastoralism that took advantage of elevation changes to mitigate seasonal climate changes.

At Enkomi, a similar shepherding pattern emerges: two major trends, which likely correspond to two major herding strategies, appearing in the isotopic data. The

Enkomi data was challenging to interpret, in part because of the lack of available strontium baseline data in the region, and also due to the complexity of the strontium curves produced by the samples. The most simple data trends were those of ENK2, ENK3, ENK5, ENK6 and ENK10, all of which produced mostly flat strontium curves, and are therefore suggestive of herding in a consistent location year-round, and—like at KAD and HST—indicative of a small-scale production. Intriguingly, the average values for many of these samples were in the vicinity of 0.7088, well above the expected values for the alluvial geology around the settlement. Based on data from south-central Cyprus, values of 0.7087-0.7088 are consistent with locations where igneous erosion met sandstone deposits, a geologic situation that would exist along the margins of the Kyrenia mountain range. This raises the distinct possibility that much of Enkomi's caprine consumption was being supplied by smaller scale farmsteads or farming communities in the mountain foothills to the north and west.

Samples ENK4, ENK7, ENK8 and ENK9 produced data that indicates a mobile herding strategy and which—like the strategies employed at KAD and HST—appears to have used changes in elevation to mitigate seasonal temperature changes. However, the most intriguing aspect of the Enkomi dataset is the relatively dramatic fluctuations in the $\delta^{18}O$ data for ENK7 and ENK8 that are consistent with relatively rapid elevation changes. When taken in concert with the known political strife of the period, especially the invasion of Cyprus along the north coast by the Hittites and Hittite allies, it is tempting to see these variations as examples of shepherds fleeing into the Kyrenia range with their flocks to avoid military forces.

In general, the isotopic data presented here show distinctive evidence for multiple herding strategies, employing different parts of the island in order to pursue particular production goals. Considering these data from a site-wide perspective allows the realization that at any of the three settlements considered here, at least two herding strategies were in use to supply the settlements with sheep and goat. The isotopic evidence points to two unique strategies: small-scale, stationary herding which would be consistent with a mixed-farming strategy, as well as a mobile—and in some cases transhumant—pasturing strategy, which would be more conducive to larger-scale, more specialized, shepherding.[216] Whether or not this large-scale herding strategy is partially or wholly driven by a centralized government (as in the Late Minoan case), or is a more decentralized system with smaller groups or individuals driving production (as in other Bronze Age cases from Anatolia and Mari; see e.g. Arbuckle 2012, Heimpel 2003, especially p. 29-34) is difficult to address from isotopic evidence alone. Nevertheless, the isotopic data provides evidence for a simple but important realization that multiple herding strategies—both larger scale, potentially transhumant and smaller-scale likely mixed farming—were being employed by Late Cypriot shepherds.

Considered from an island-wide level, the isotopic data present a unique perspective on the apparent insularity of these three settlements. The strontium data available from KAD, HST and Enkomi all suggest that, even in the case of longer-distance herding patterns, sheep and goat flocks were kept within 30-50 km of the

[216] Note that this does not necessarily indicate a large-scale, specialized herding, but instead would make this kind of herding possible, in a way that stationary herding would likely exhaust local resources

settlement in which they were consumed. Indeed, at Hala Sultan Tekke and KAD, this distance might be limited to 20km or less. While this is perhaps unsurprising given population estimates for similar Late Cypriot settlements of in the low thousands (e.g. Manning et al. 2014), these data do provide evidence to consider the economic and social draw of these settlements. In other words, these isotopic data suggest that KAD, HST and Enkomi all drove relatively regional production economies, but production economies that encouraged the engagement of shepherds (and perhaps farmers?) who lived 10, 20 or 30 km distant from the central regional settlements. The exact mechanisms for bringing animals (and other produce) to market are still unclear, however these data do begin to allow an engagement with questions about the productive hinterland of these sites. Moreover, the isotopic data present little evidence to suggest that sheep or goats were being herded in a specific region of the island and then distributed to various settlements. Instead, the data imply a regionalized, and in many cases small-scale, and apparently de-centralized herding strategy.

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more quickly at large scale.

CHAPTER 9

WEAVING TOGETHER LOOSE ENDS

9.1 *Re-Framing the Conversatio*n

On the north wall of the second floor living room in the West House at the Late Minoan site of Akrotiri a miniature fresco was painted above the windows. This fresco is fragmentary but is also one of the best-preserved examples of Minoan wall-painting yet unearthed. It is unique in that it features a microcosm of the world from a Minoan perspective—it illustrates their world, as they would recognize it. The northwest corner of the fresco depicts a number of stone buildings—perhaps a small coastal town not unlike the settlement at Akrotiri. Attacking ships appear below, apparently just off the coast, while warriors, complete with boars-tusk helmets, body-sized shields and long spears are marching onto the land. While the central focus of this portion of the fresco is the attack, in the upper registers we find two shepherds, one leading a herd of goats towards the center of the image, the other leading his flock of sheep away (fig. 9.1, 9.2). A grove of trees with a boundary may represent a sheepfold, while women are also depicted traveling to and from a spring appearing to gather water. The presence of livestock and their herders is conspicuous—an intriguing indication that shepherds and livestock were an important and easily recognizable aspect of the everyday Minoan world.

On its own, the miniature fresco is suggestive, but taken alongside other sources of evidence the importance of livestock in general—and caprines in particular—to the Late Bronze Age Mediterranean becomes irrefutable. At major

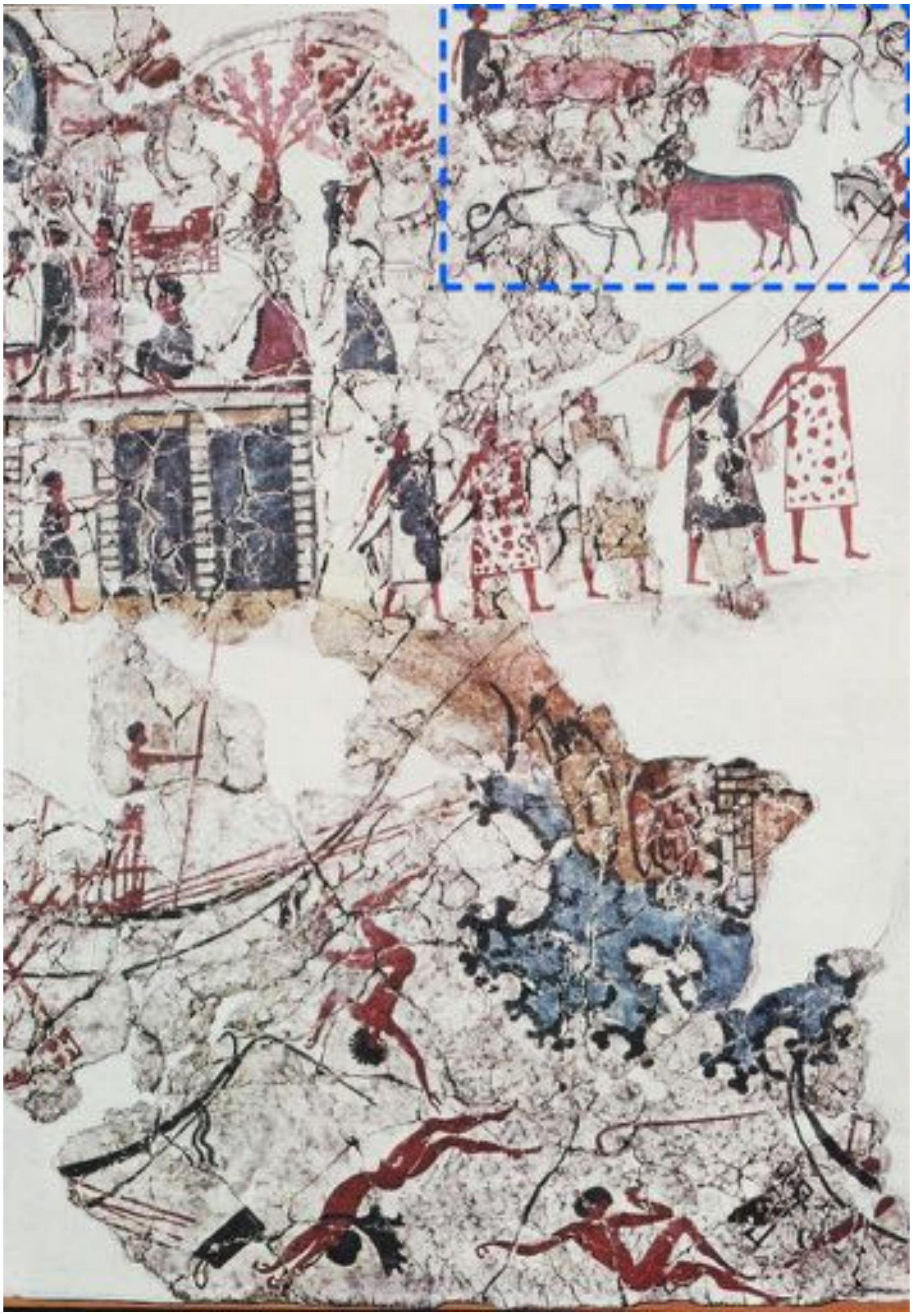

Figure 9.1: North-west corner of miniature fresco from West-House at Akrotiri (Artstor)

Figure 9.2: Close-up of shepherd and sheep flock and goat herd from miniature fresco in West-House at Akrotiri (Artstor)

Minoan and Late Cypriot settlements sheep and goat remains account for more than two-thirds of the large animal remains, almost without exception. Evidence from the Linear B archive underscores this, with more than 35% of the tablets from Knossos discussing sheep, wool or textile production (984 tablets discuss flocks of sheep, 221 discuss textiles and textile production and 84 refer to allocations of wool; Rougemont 2014: 341). Loom weights are especially prevalent at Minoan settlements, with a collective tally of over 1,400 weights of various types from sites including Knossos, Praisos, Palaikastro, Kommos, Petras, Akrotiri, Keos, Ayia Irini, Archanes and Malia (based on data from Burke 2010 and Barber 1993). The intricate, variegated textiles associated with Minoans (Barber 1993: 311-343) provide additional circumstantial evidence for the importance of woolen textiles in the dress and identity of Minoan people. Wool would have been the preferable material for these garments as it most readily holds the dyes necessary to make the colors required for these intricate designs (Militello 2014: 267).

Tablet archives at contemporary (or slightly earlier) Near Eastern settlements like Mari, Ebla and Ugarit indicate that wool and sheep were a source of wealth for private familial units as well as for royal courts (Michel 2014, Matoïan and Vita 2014). Legal and clerical texts from Late Bronze Age Ugarit, for instance, indicate that private families owned flocks of between seven and sixty sheep, while palatial flocks linked to ruling elites would have totaled more than 1,800 animals (Matoïan and Vita 2014: 315). At the Near Eastern kingdom of Mari during the early centuries of the 2nd millennium BCE wool was a critical material that was issued as a ration to palatial dependents, was used to produce clothing for the royal family and its retainers, and, when made into textiles, served as royal gifts to other parallel kings and royal households. The majority of this wool was produced by palatial flocks, but wool was also received via taxation and purchased from private individuals (Durand 2009, Michel 2014). Thus, in various burgeoning Late Bronze Age states of the region, shepherding and management of sheep, the trade of sheep, and the production and sale of wool were of critical concern to high-level elites and private citizens alike.

Homer's *Odyssey* provides some additional tantalizing evidence for the importance of livestock (and especially sheep and goats), to the powerbase of Late Bronze Age elites. In Book 17 as Odysseus finally returns to his estate on Ithaka disguised as a beggar, his swineherd, Eumaeus, not recognizing him, describes the wealth of the estate by listing the livestock (*Od.* 17.95-17.105): twelve herds of cattle, twelve flocks of sheep, twelve droves of pigs, and twenty-three herds of goats.[217] It is striking that Eumaeus chooses to list livestock as the primary measure of Odysseus' wealth as opposed to land owned and controlled or material riches. Moreover, the swineherd Eumaeus and a goatherd named Melanthius are key figures in the epic from the moment Odysseus returns home. Theses personal relationships between Odysseus and the men who tended his flocks might also be a suggestive metaphor for key linkages between Bronze Age elites and the individuals who looked after their livestock.

These numerous lines of evidence point to the critical nature of both livestock

[217] "His property is unspeakably great: no hero on the dark mainland or on Ithaca herself has so much, nor do twenty men together have such wealth. I will recount it to you: on the mainland both foreign and local shepherds pasture his twelve herd of cattle; as many flocks of sheep and droves of pigs, and as many wide herds of goats. Lastly, here, eleven herds of goats are tended, with faithful men watching over them" (*Od.* 17.95-17.105).

and the individuals responsible for their care to economies and power structures of the Late Bronze Age world. It is surprising, then, that shepherds are rarely analyzed as strategic actors on Crete or Cyprus. Rather than investigated as effectual individuals who must have made decisions and strategies to navigate the social, economic and environment challenges that they faced, they are instead considered peripheral, far outside principal settlements and therefore not worth detailed analysis. In Minoan scholarship this is arguably a result of a keen focus on 'palatial' centers at the detriment of smaller settlements and individuals outside the direct scope of the 'palatial' sites. In Late Cypriot scholarship an emphasis on the debate over island-wide political organization (the "heterarchy/hierarchy debate") and a strong focus on copper and copper production as the fundamental Late Cypriot economic pursuit have likewise distracted from considering lower-level economic actors that produced more quotidian materials and products, such as shepherds. This dissertation challenges these perspectives by identifying the numerous factors that would have influenced shepherding practices on both islands. By using isotopic analysis, it explores the potential for distinct, heterogeneous shepherding practices, ultimately identifying a number of diverse patterns of livestock movement and management on Late Bronze Age Cyprus.

9.2 *Results of Research*

The result of the 'centralizing' approach to Minoan and Late Cypriot scholarship has been an ingrained perspective that views Minoan and Late Cypriot shepherds as passive or, at most, re-active, in a world that revolved around centralized settlements and their social, political and economic drivers. Minoan and Late Cypriot pastoralists have been defined by their relationship to the major centers of the period, and are largely considered a homogenous group, characterized by their use of an animal production economy. The possibility that they were unique individuals and groups that managed their flocks in particular ways based on environmental, economic, social and political variables, and who engaged with people at the growing 'urban' centers on their own terms is something that has been largely overlooked.

Therefore, seeking to understand the management of livestock and shepherds in the hinterland requires problematizing and re-vamping our theoretical apparatus. The early chapters of this dissertation have sought to identify this 'centralizing' tendency in both Late Cypriot and Minoan scholarship—a tendency that is born out of a 'Hobbesian' understanding of social and political organization. This view presents a paradigm in which the power to effectively shape a society, an economic system or a political organization is inherently situated in a single individual or location. Investigations into the development of the earliest states on Crete and Cyprus have often conflated complexity with this centralization or consolidation of power within a particular settlement. This understanding of power and societal organization appears to underlie the emphasis on Minoan palaces and Late Cypriot 'urban' centers and has characterized related scholarly debates over political organization of both islands. As a result, non-centralized/non-urban/non-palatial groups have been, at best, rarely considered, and at worst, reduced to abstract, supposedly ineffectual and inconsequential people and groups.

This perspective is, fortunately, beginning to give way to a more flexible (and ultimately more realistic) understanding of the complexities of the political, economic and social processes of centralization during the Late Bronze Age on both islands. Knappett (1999), Schoep (2002, 2010), Driessen (2002, 2004), and Militello (2014) are at the vanguard of this movement for Minoan Crete, while Given (2004, particularly Chapter 3) and Crewe (2007) represent a similar perspective for Late Bronze Age Cyprus. These new approaches emphasize the heterogeneity of the Minoan and Late Cypriot centers in terms of different land use and production linked to localized environments, as well as factionalism, competition and negotiation amongst various social, political and economic groups. The central realization and foundational argument of these studies is that the developing social, political and economic complexities of Late Bronze Age Crete and Cyprus occurred in a heterogeneous, dynamic world with multiple actors relating to each other at multiple scales. The traditional approach to power that emerges from a Hobbesian parentage is therefore ill-equipped to account for this dynamism because its prime focus is to provide a blueprint for a stable society rather than to effectively recognize and analyze the multi-faceted, messy nature of human interaction and development. In other words, Hobbes' model is better suited as a plan for structuring the future, rather than as a paradigm for analyzing the past. As such, the theoretical position forwarded by this dissertation was aimed at effectively considering power as in-flux, multi-faceted and relational in order to both recognize, and begin to examine the power and strategies of non-centralized shepherding populations on Late Bronze Age Crete and Cyprus.

This approach found its roots in a Machiavellian understanding of power that was aimed at describing how individuals and societies have actually functioned, rather than projecting on to them how they should have functioned as a Hobbesian approach inadvertently does. The development of this theoretical paradigm and the ensuing discussion had three major goals: first, in Chapter 2, to argue for and illustrate the historical importance of non-elite and non-centralized individuals through a series of case studies. Second, to foreshadow and outline the rest of dissertation project by laying the theoretical groundwork. This argues for first coming to terms with the historical context of a given situation along social, political, economic and environment lines, and then to plug in evidence for specific individual actions. Third, in Chapter 3 and 4, to underscore the fact that we have not done an effective job of evaluating if (and how) non-centralized individuals like shepherds would have played a critical role in the development and maintenance of Late Bronze Age political economies on Crete and Cyprus.

The latter chapters of this dissertation (5, 6, 7, and 8) were aimed at exploring the many considerations of shepherding populations and their interactions with the rest of society on Crete and Cyprus during the Late Bronze Age. The primary goal of chapters 5, 6 and 7 was to evaluate the context in which LBA shepherds would have developed herding strategies—to, in other words, uncover the rules of Machiavelli's metaphorical game.[218] We saw that faunal datasets on Crete and Cyprus overwhelmingly illustrate an emphasis on caprines as the primary livestock. Sheep and goats that would have been relatively tolerant to less available water and more

[218] I am referring to Machiavelli's metaphor for power relations: "a game of strategy with specific—but constantly changing—rules; rules that are recursive, continually modeled and shaped by the actions of the players and the environment in which the game is being played" (see Chapter 2, pp. 20).

marginal land would have been attractive livestock to keep during this period of climatological drying in the Eastern Mediterranean. At the same time, loom weights and evidence for intricate textile production on both islands suggests that a demand for wool as a raw material would have contributed to the importance of especially sheep (and presumably their shepherds) in these LBA economies. More circumstantial evidence from the similar early states in the Near East also illustrates the critical importance of wool as a material in these Bronze Age economies. Sheep and goats would have made dairy production possible, and some limited evidence also suggests that this would have been made into cheese, likely in a process similar to rural cheese production in the highlands of Crete during the 20th century CE. Moreover, flocks of sheep and herds of goats would have played important social roles in LBA Crete and Cyprus, as illustrations of wealth and by providing the means for feasting which appears to have been an important way of developing and reinforcing social bonds.

The scale of caprine flocks and the impact that this would have had on both herding strategies and flock movement is a critical consideration. On Crete, the Linear B documents imply a sheep population of at least 100,000 animals, while on Cyprus, our best guess is between 25,000 and 50,000 animals. Livestock management, however, is likely to have occurred at different scales based on the individual size of various flocks. Contemporary Near Eastern examples, as well as Late Byzantine and Ottoman period records from Cyprus remind us that livestock production likely occurred at a household level of production with herds/flocks of 1-10 animals concurrent with an institutional level of production with herds/flocks of hundreds or thousands of animals.[219] These diverse scales of herd/flock size would have necessitated different amounts of resources and would also have driven varying levels of transhumance and animal movement. Transhumance was considered as a three-part typology of flock movement: 1) localized pastoralism with herding done within 3-6 km of a permanent settlement; 2) a mobile shepherding strategy with a limited transhumant range, less than a few days travel time, and often making use of different ecosystems that exist with substantial changes in elevation; 3) long-distance transhumance covering 75+ km. In short, the necessity for flock movement varies both with flock size and the distance required to reach superior resources. Moreover, evidence for varying distances of travel likely can be linked to varying scales of livestock production and, indeed, varying demands for the consumption of animals and animal products.

The topography and environment of Crete and Cyprus would encourage the use of the highlands as places for pasturing sheep, especially in drier, hotter winter months. Upland plateaus that dot the island of Crete would have (and still do) provide access to substantial pasturage as well as cooler temperatures and more available water and therefore would likely have been prime endpoints for transhumant routes from the lowlands. Pastoral production could also have made use of some of the lower mountainsides on the island (between 400 and 1000m), and would have made shepherding a particularly flexible occupation. On Cyprus, the highlands are split into two dissimilar mountain ranges: the forested Troödos and the craggy, but well-watered

[219] And, also, at any number of points along this continuum, if, for example privatized flocks were brought together and herded as a larger group as is common in a number of places today including the Caucasus, Crete and Cyprus.

Kyrenia. The trees of the Troödos would have made browse available for goats, and, at the same time, made farming challenging and unattractive. Indeed, the highland goat folds that peppered the Troödos during the Ottoman period alert us to the importance of the forests as resources for livestock management. The karstic nature of the Kyrenia range would have made springs readily available during the Bronze Age, likely making these areas attractive for herding sure-footed livestock during dry summer months.

Isotopic analysis of sheep teeth from Late Cypriot contexts at Kalavasos-*Ayios Dhimitrios* (KAD), Hala Sultan Tekke (HST) and Enkomi made it possible to evaluate the ways Late Cypriot shepherds actually managed their animals through distinct case studies. Strontium isotopes in the teeth provided data for considering movement across the Cypriot landscape, while oxygen isotopes provided a glimpse into the seasonality as well as potential elevation changes that the animals experienced during the growth period of the analyzed teeth. By and large these data illustrated complex and substantial variation in the experiences of the livestock suggesting considerable heterogeneity in the management strategies employed by Late Cypriot shepherds. The three settlements were located at different locations across the island, with KAD in the south-central portion, HST along the coast to the east, and Enkomi on the eastern shore. These distinct locations also mean varying distances from the Troödos and Kyrenia mountains, as well as different access to grazeland and water resources.

Briefly summarizing, animals consumed at KAD appear to have been shepherded based on three distinct methods: a localized strategy that kept animals in the lowlands within a few kilometers of the settlement, a regional coastal strategy that pastured animals along the southern coast, but further afield, perhaps 25-30km distant from the settlement, and a regional highland strategy that employed the foothills of the Troödos mountains to the north. If the ratio of these ten samples analyzed from KAD is representive of the larger herding population, localized shepherding was preferred. It accounts for about half of the samples analyzed. Regional coastal shepherding was represented by about a third of the sample, and highland regional shepherding accounted for the remaining 20%.

At HST the data presented a much more variable picture of shepherding practices. The strontium values for these specimens were suggestive of a number of herding schemes that would have made use of a variety of micro-environments in the region. The substantial variation of these samples implies a level of distinction in shepherding methods that is not present at either KAD or Enkomi, and implies a series of de-centralized strategies. Most of the animals do, however, appear to have been shepherded in the same location throughout the year based on the oxygen isotope data, which further suggests that these were smaller scale flocks that did not require substantial movement to meet resource needs. These data from HST therefore imply a livestock economy that was made up of a number of shepherds and flocks, rather than a few large institutionally-driven herds.

The picture provided by the isotope data for Enkomi is likewise variegated. Strontium values for the animals at Enkomi are markedly higher than the animals at either KAD or HST. This, in turn, suggests that these animals were herded in places with geology that was distinct from the southern coast, and did not overlap with the animals from KAD or HST. Likely candidates for this herding region are the Kyrenia mountain range and coastal plain along the northern coast or the isolated Karpas peninsula to the north-east. About half of the Enkomi samples provided strontium values that were consistent with year-round herding in one location, therefore implying a smaller-scale flock/herd size that would not have required transhumance. Alternatively, the remaining four samples produced data that suggested a more complex and mobile herding strategy that may imply larger groups of livestock and the necessity for transhumance. Finally, two samples from Enkomi (ENK7 and ENK8) produced oxygen values that represent rapid elevation changes that would have been possible in the Kyrenia range. In light of the fact during the Late Bronze Age the northern coast of Cyprus appears to have come under considerable military pressure and invasions from the Hittite empire and it's allies, it is tempting to see these elevation changes as a shepherding strategy that sought to avoid impending violence from the north.

Together the isotopic data provides considerable evidence for the heterogeneity of shepherding patterns and strategies across the island of Cyprus during the Late Bronze Age. Rather than marginal groups who were more-or-less homogenous in their approach to livestock production, the isotopic data suggest that numerous, and often complex and variable, herding strategies characterize the livestock consumed at some of the largest Late Cypriot settlements. This implies that shepherds were strategic users of the Late Bronze Age landscape and their decisions would have had considerable impact on the availability of animal products at sites like KAD, HST and Enkomi. These data therefore imply that rather than passive homogeneous groups, shepherds were critical, diverse, effectual and strategic actors in the Late Cypriot community.

9.3 *Future Directions*

Although the isotopic data presented in this dissertation provides a unique approach for analyzing shepherding and livestock management practices on Late Bronze Age Cyprus, it is certainly not exhaustive or complete. The larger goal of this project has been to encourage a perspective that considers shepherds impactful actors within a historical context. These isotopic data are not exhaustive in their ability to do this. There are three primary avenues for additional research that would contribute considerably to filling out the lives of animal herders on Cyprus and Crete.

The first, and perhaps most basic, is a more comprehensive zooarchaeological analysis of caprine remains and the production of a database of all known faunal remains from these three settlements (and indeed for the other Late Bronze Age settlements on Cyprus). While a small number of zooarchaeological datasets have been analyzed and published (e.g. Kouklia by Halstead 1977 and Marki-*Alonia,* Kissonerga and Kalavasos-*Ayios Dhimitrios* by Croft, 1996, forthcoming) the overwhelming majority of large, proto-urban Bronze Age settlements on Cyprus have not had their zooarchaeological remains analyzed and catalogued. These faunal data and the age-survivorship curves that they would provide would make it possible to comment on product specialization and animal consumption at different large Bronze Age settlements. Based on the preliminary evidence from this dissertation we might expect livestock usage to be quite variable, however survivorship curves will provide more solid data to determine this. Used in conjunction with isotopic analyses, these faunal studies would produce a more comprehensive picture of Late Cypriot animal use practices. This is will be a challenging task, however, in part because faunal remains have, traditionally, been deemed unimportant on Cyprus and often do not have useful contextual data. Moreover, faunal collection is often only done by hand and does not use sifting to ensure collection of the most animal remains as possible from each archaeological context. This means that large amounts of bone are lost, and the faunal datasets for each site can be skewed.

A second avenue for advancing the study of livestock management would be to collect more data points for a strontium baseline. While this project attempted to provide data that would aid in the analysis and interpretation of the strontium values from the archaeological remains, these data points are largely skewed towards south-central Cyprus, and are not entirely representative of (or, sufficient for) the island as a whole. Strontium analyses are still relatively expensive and this demands that archaeological studies limit the number of strontium analyses they can perform on faunal remains when they are also contributing to a strontium baseline. Future work that might produce a more comprehensive strontium baseline will provide archaeological analyses with an important tool for pinpointing the location of animals (and, by proxy, flocks/herds) at specific points of time.

A final opportunity for expanding on the isotopic analyses performed here would simply entail more strontium and oxygen analyses on additional specimens from archaeological sites on Cyprus and Crete. In addition to arguing for a novel theoretical approach to non-centralized individuals, and focusing on shepherds and herders, this project has aimed to bring isotopic analysis to bear on archaeological remains from Cyprus—a technique that is essentially new to archaeological pursuits on the island (*pace* Rich et al. 2012). Because of this, any additional data points from archaeological remains will help to shape models and to identify trends in herding practices, animal production and animal consumption. Beyond Late Minoan or Late Cypriot contexts, isotopic analyses of faunal remains from earlier or later archaeological settlements might also provide an opportunity for considering the locations in which Cypriot shepherds were keeping their sheep and the ways in which livestock were produced and managed in the Cypriot environment. Additional data should make it possible to identify trends in herding in particular regions, or the change of herding strategies at particular periods of time, linked with political, social and economic circumstances.

9.4 *Beyond Minoan and Late Cypriot Shepherds*

The research in this dissertation cautions us in at least two important ways that expand beyond Late Bronze Age Crete and Cyprus. First, the dissertation highlights what appears to be a bias towards the importance of centralized locations in archaeological thought. This is despite the fact that considerable evidence suggests that non-lowland, non-centralized individuals and groups often play a major role in shaping how lowland, centralized communities function. If, as Stein contends, this overemphasis on the importance of centralization is a "nagging problem" in archaeological thought, it is critical that we seek ways forward that recognize the impact of non-centralized individuals and groups in shaping the world at large. One useful way of doing so is to, as Machiavelli suggests, "place [ourselves] in a low position on the plain in order to consider the nature of the mountains and the high places and place [ourselves] high atop mountains in order to study the plains".[220]

But there is a larger and slightly more abstract lesson inherent in these pages concerning the importance of balance in archaeological research, and in studies of human behavior more broadly. A balance that recognizes the fact that human history is, at its heart, relational, made up of interactions between individuals or between groups. If the goal of archaeology is to provide—as accurately as possible—a holistic understanding of the ancient world through whatever methods are available to us, it is critical that we approach this in a way that recognizes the complementary processes that are inherent in human history: the bottom-up and the top-down, the hinterland-in as well as the center-out.

Thus, Machiavelli's argument for the importance of vantage point holds considerable promise as a way of understanding the relationship between centralized settlements and the people of their hinterland. But, we must also recognize that Machiavelli's metaphor will carry us only so far. For the social scientist, the anthropologist, the historian or the archaeologist the aim is not to understand the perspective of the prince or the commoner alone, but instead the complex interface between prince and commoner. In this sense we would do well to recognize that the tableau of the ancient world is as the miniature fresco at Akrotiri suggests: made up not only of the view afforded by the shepherd, nor solely the view afforded by the

[220] Recall the selection from the dedicatory preface to Macchiavelli's *The Prince* cited in Chapter 2 which reads, "…for, just as those who paint landscapes place themselves in a low position on the plain in order to consider the nature of the mountains and the high places and place themselves high atop mountains in order to study the plains, in like manner, to know well the nature of the people one must be a prince, and to know well the nature of princes one must be of the people."

towns folk, nor indeed the view afforded by the mauraderer. It is, instead, the balanced composition of these many varied perspectives painted into one dynamic scene.

APPENDIX

This appendix details the laboratory methodology used for the strontium and oxygen isotope analyses. Strontium samples were analyzed in the Department of Earth and Atmospheric Sciences at Cornell University, while oxygen samples were run in the Cornell University Stable Isotope Lab (COIL).

Strontium:

The surface of all samples (snail and caprine teeth) were initially abraded using a tungsten burr to remove any surface layer contamination, and then wiped with acetone. Snail samples were then pulverized, while sequential enamel samples were taken from each tooth, with approximately 0.5 mg of sample being used per analysis. Samples were rinsed six times with weak acetic acid, and decanted each time. After since acetic acid washes, samples were rinsed in de-ionized water. Samples were then dissolved in 1ml of 3N HNO_3. Strontium was separated using PFA Teflon columns with Eichrom Sr- spec resin, through which the 3N HNO_3 sample solution was eluded, capturing the strontium, followed by an H_2O elusion that released strontium. Samples were then loaded onto tantalum filaments using a tantalum fluoride method, and analyzed in a Fisons-VG Sector-54 multi-collector Thermal Ionization Mass Spectrometer (TIMS), equipped with 7 Faraday cups and a Daly ion counting system for low-level ion beams.

Oxygen:

0.3 mg of powdered enamel were used for oxygen analysis. Oxygen analysis was performed on a Thermo Delta-V isotope ratio mass spectrometer, interfaced to a Temperature Conversion Elemental Analyzer. To ensure accuracy and precision, an in-house standard was analyzed every 10 samples. Standard deviation for the internal standard benzoic acid for $\delta^{18}O$ was 0.54‰ and for internal C4 wood, standard deviation was 0.76‰. Isotope corrections were performed using a two-point normalization (linear regression) of all $\delta^{18}O$ data using two international standards (IAEA 601 and IAEA 602).

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