

EXPLORING THE FAUNAL DISTRIBUTION PATTERN IN LATE NEOLITHIC
ULUCAK HÖYÜK, IZMIR, TURKEY
AN INVESTIGATION ON THE ECONOMIC ORGANIZATION OF
DOMESTIC AND NON-DOMESTIC UNITS

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ABSTRACT

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It has been suggested that a new social and economic unit that may be called as "the autonomous household" emerged during the later stages of Neolithization in the Near East. Although a stage wise development of households has been continuously observed in Central Anatolia and the North Levant, the same process has been difficult to observe in West Anatolia. Excavations at Ulucak Höyük in İzmir has provided one of the earliest and most continuous sequences of the Neolithic Process in West Anatolia. Through a study of the zooarchaeological remains among four units (2 residential houses, one workshop and an open area) at Phase IV (6000-5700 BC), this thesis aims to test the viability of the above stated hypothesis for the later phases of the Neolithic in West Anatolia.

Evidence are drawn from the study of the (hand-collected) macrofaunal remains and supplemented with information deriving from artifacts and architectural details. Only the bones from the immediate floor surfaces and below the collapse of the roofs were considered

The resulting picture revealed that, the subsistence economy of these units was mainly based on domesticates (sheep, goat, cattle, and pig). The hunted game (wild goat, fallow deer, roe deer, hare, tortoise, birds, and mollusks) also played a noticeable role both in the diet and technological activities.

Also, a different pattern of acquisition, production, and consumption has been attested within each architectural unit, particularly for hunted animals. The uneven distribution of other artefacts also indicates that each architectural unit specialized in different economic activities.

Keywords: Ulucak, Late Neolithic, Zooarchaeology, private economy.

ÖZ

GEÇ NEOLİTİK DÖNEMDE FAUNAL DAĞILIM ŞEMASI ARAŞTIRMASI
ULUCAK HÖYÜK, İZMİR, TÜRKİYE
YEREL VE YEREL OLMAYAN EKONOMİK ORGANİZASYON
ÜZERİNE BİR ARAŞTIRMA

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Yeni bir sosyal ve ekonomik birim olarak “otonom hane” kavramının Yakın Doğu’da Neolitikleşmenin son aşamalarında ortaya çıktığı ifade edilmektedir. Orta Anadolu ve Kuzey Levant’ta hanelerin aşama bazlı gelişimi sürekli gözlemlenmesine rağmen, bu sürecin aynısını Batı Anadolu’da gözlemlemek daha zordur. İzmir Ulucak Höyük’te yapılan kazılar Batı Anadolu’daki Neolitik dönemin en erken ve sürekli devam eden sürecini gözlemlemeyi sağlamıştır. Bu Zoolojik çalışmada, dört birim arasındaki kalıntıların (iki hane, bir atölye ve açık bir alan) IV. Tabaka’da (6000-5700 M.Ö) bulunduğu ve yukarıda bahsedilen hipotezde Batı Anadolu’daki Neolitik çağının geç dönemlerinde geçerliliğinin ölçmesi amaçlanmaktadır.

Bu çalışmada kullanılan kanıtlar, makrofaunal kalıntılar (elle-toplanmış) ve bu kalıntılardan elde edilen veriler ile ortaya konmuştur. Sadece tabanda duran ve çöken çatı altında kalan kemikler değerlendirilmiştir.

Eldeki sonuçlar bu kemiklerin beslenme ekonomisinin temelini evcil hayvanlar (koyun, keçi, sığır, ve domuz) olduğunu göstermektedir. Avlanan türler (yaban keçisi, yaban geyiği, tavşan, kaplumbağa, kuşlar, yumuşakçalar) hem beslenme alışkanlıklarında hem de teknolojik faaliyetlerde önemli ölçüde rol oynamaktadır. Ayrıca avlanan hayvanların üretim ve tüketime yönelik değişik türleri, her mimari birimde ayrı ayrı doğrulanmıştır. Diğer kalıntıların düzensiz dağılımı, her mimari ünitenin farklı ekonomik faaliyetlerde uzmanlaştığını göstermektedir.

Anahtar Kelimeler: Ulucak, Geç Neolitik, zooarkeoloji, otonom hane.

To my sisters,

Parvaneh

&

Nasim

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CHAPTER 1

INTRODUCTION

1.1. THE RESEARCH QUESTION AND APPROACH OF THE THESIS

The domestication of plants and animals has been suggested as a turning point in the human's history in terms of economic, biological and cultural aspects. (Arbuckle et al. 2014). The emergence of domesticates along with sedentism in this period have resulted in calling it as the Neolithic revolution (Childe 1936).

The magnitude of this issue has led to extensive studies on this topic from different perspectives including geographic, economic, social, biologic, and linguistic. This is while the more studies carried out on the topic, the high degree of complexity and diversity in different aspects of this big picture becomes apparent.

During the initial phases of the Neolithic way of life, and the formation of the so called "Neolithic package" (a group of material culture during the Neolithic period which were generally observed together) (Çilingiroğlu 2005) in the core regions (the SE of Turkey, northern Syria, Northern Iraq, and NW Iran), starting from the Pre-Pottery Neolithic (PPN), we encounter with many new certain phenomena. These are sedentary life style, subsistence economy mainly based on domesticates (founder crops and animals) with some minor exploitation of wild animals, occurrence of clay objects with either practical, prestigious or both functions, continuity and regularity of daily activities which were directed by taboos, and the communal mode of organizing the social and economic activities (Marciniak 2015).

Advancing to the later phases of the Neolithic and far from the core regions this certainty and clarity in socioeconomic organization gives way to a more diversified practices. Profound differences in the geography and environment of these regions along with several pushing and pulling factors seem to have led to the maturity and evolution of the previous life style. This diversity is a proof of the multifaceted nature of human culture. New economic, social, and geographic factors worked as the causes and the effects for new trends in human life style.

A series of changes in the subsistence economy and environment, increase of social interactions, human migration and probably so many other factors which are unknown for us

resulted in new forms of cultural preferences among the Late Neolithic inhabitants of Anatolia. These new forms can be mentioned as new patterns of organizing subsistence economy with higher independency than before (Marciniak 2008), advent of portable objects (stamp seals, tools, potteries, etc.) (Atakuman 2013), territory management, and increase of migration and colonization of new regions (Horejs et al. 2015).

We need to bear in mind that these new changes can hardly be the main triggers instead they actually work as media reflecting some other concepts (Çilingiroğlu 2005). Preserving the similarities along with a desire for differentiating your personhood and community (Atakuman 2013) are the reflection of a confidence among the Late Neolithic inhabitants which do not see the previous communal ties necessary for their survival anymore. At the same time, increasing the interaction and movement among the closely and far located populations inspires them to pay attention to concepts such as their roots and history but this time through another media.

What may have pulled them accepting the risk of independency might have been a higher reliance to agriculture and animal husbandry (mixed farming), and the exploitation of secondary products of animals. The pushing factors can be an increase in the population and depletion of the natural resources which both required people make the maximum use of their environment (Hodder 2013).

The mentioned arguments are the results of researches carried out in the well-studied Neolithic sites of Central Anatolia (Hodder 2013, Marciniak 2015). Ulucak höyük as a well-preserved Neolithic site with continuous habitation from the Early Neolithic (7th mill BC) to the Late Neolithic (6th mill BC) offers a good opportunity for investigating the nature of Late Neolithic culture in Western Anatolia (Fig. 1). The main aim of this study is to investigate the nature of the socio-economic structure of the settlement during the early 6th Millennium BC. In the next steps we try to understand the possibility that households similar to ones mentioned for Central Anatolia have also been formed in Western Anatolia and act as independent units though a case study in Ulucak during the Late Neolithic. The central question is whether or not the mentality of the Late Neolithic in Western Anatolia follows what happened in the other regions!

In this research, four units belonging to the IVb and IVc levels in Ulucak dated to 5710-5040 cal. BC and 6005-5740 cal. BC respectively (Çevik, pers.com.) have been studied through a zooarchaeological perspective and in comparison to the rest of archaeological remains. The main aim of the research was set as investigating the similarities, differences, and the level of independency of each unit, or put in other words the socio-economic structure of each building based on their subsistence economy and the type of activities that were performed there.



Figure 1. The location of Ulucak in the Aegean Anatolia (map from Çilingiroğlu 2009)

Simply what was expected is that in this level if households have been parts of a communal organization, and this is taken to mean the Ulucak village's society, the resources and the exploitation of them will be the same across the different units. Similarly, daily activities will be regular and homogenous. This is probably an extreme model of similarity and it is indeed treated as such, that is, it is not expected to find such an idealized homogeneity.

On the other hand, if we can attest the rise of the individual household in Ulucak, it is expected that the different units examined, even though may exploit the same resources (since these are related both to what is available in the environment, as well as the main trend of the economy) they will also show flexibility and individual adaptations according to the needs or the abilities of each household.

Investigating the faunal remains recovered from Ulucak IV and in relation to the architectural units as well as the other cultural remains can hopefully lead in better understanding of the nature of economic and social aspects of the inhabitants of these units in this period. The obtained results will be examined regarding the nature of economic and social independency of each architectural unit. Eventually, the study result can help making the diversified picture of Neolithic way of life, particularly the later stage of this period, in Anatolia clearer.

It is worth mentioning that the time span after the 6th Millennium BC when the data for this study belong to, corresponds to the Early Chalcolithic period in Anatolian archaeological terminologies (Table 1). However, due to the lack of any cultural break from the earlier occupational phases to the Level IV, as well as no evidence regarding a painted pottery horizon, which is the characteristic of the Chalcolithic period in Anatolia, this level has been labeled as the Late Neolithic period (Çevik & Abay 2016).

Table 1. The suggested chronology for the Central Anatolian settlements (Düring, 2011:128).

Early Bronze Age	3000-2000 BC
Late Chalcolithic	4000-3000 BC
Middle Chalcolithic	5500-4000 BC
Early Chalcolithic	6000-5500 BC
Late Ceramic Neolithic	6500-6000 BC
Early Ceramic Neolithic	7000-6500 BC
Aceramic Neolithic	8500-7000 BC

I need to declare here that one may ask that making any comparison between the Late Neolithic events in Central Anatolia with the 6th millennium cultures of Western Anatolia can be misleading, as they cover different time spans and located in different environments. However, what I am aiming to do in this research is making a comparison between the Late Neolithic mentalities of these regions along with the environmental influences on them. The maturity of Neolithic way of life in Central Anatolian cultures has been used as a sample to investigate the case of Ulucak with this knowledge that they do not necessarily match.

1.2. Organisation of the thesis

In order to achieve these goals, in the next chapter a general description about the nature of Neolithic ways of life in Anatolia from various suggested perspectives will be given. The main characteristics of the Late Neolithic period specifically in Western Anatolia will be introduced as well.

In the third chapter a discussion of zooarchaeology and the main applied methodologies in this research, as well as the value of making comparison between faunal remains study results with architectural and material culture will be explained.

In the fourth chapter, having introduced the case study along with the general description of the studied units, and their architectural and cultural remains, the primary result of zooarchaeological research in the units studied will be given.

Eventually, in the final chapter, the main body of our research discussion will be presented. The evaluation of study result at first will be discussed in the site level and in the frame work of a comparison between the units studied. In the next level, by comparing the nature of Late Neolithic way of life in Ulucak, with some other compatible Neolithic sites in Anatolia hopefully we can propose a status for Ulucak among the rest of Neolithic settlements in Anatolia as well as getting closer to the possible answers for our proposed questions.

CHAPTER 2

LITERATURE REVIEW

2.1. Neolithic in Anatolia

This chapter aims firstly at introducing the Neolithic period and its characteristics. This general account serves as the background information on cultural and economic developments which at a later stage brought forward traits that triggered the research question of this thesis. Then, the central subject of the thesis, the household concept is dealt with. The discussion moves to describing the archaeological research and environment in Western Anatolia which is the region where Ulucak höyük, is located. Finally, the excavation of Ulucak höyük and the units studied are presented.

The emergence of domesticates in the human's life, either as a part of their subsistence economy or only cohabitation as well as sedentism have been suggested as a turning point in the human's history in terms of economic, biological and cultural aspects (Arbuckle et al. 2014) in a way that it has been called as the Neolithic revolution (Childe 1936).

Domestication, as one of the major events of this period, can be defined as biological and anatomical changes in animals. Recent studies have documented that on every continent there is abundant evidence for the domestication of different plants and animals (Zeder 2014). Unanimously the Fertile Crescent region which comprises the SE of Turkey, northern Syria, Northern Iraq, and NW Iran has been proposed as the natural habitats of the main domesticates (Sheep, goat, cattle, and pig) as well as the main center for the domestication of these species (Arbuckle et al. 2014).

The domestication related changes have happened through a long-term process and a nonlinear relationship between human and animals in which both have their own benefits. This process is characterised by human intervention over the diet, breeding, and movement of animals aiming to provide themselves a more secure resource of food and power. Animals one the other hand benefitted from being taken care and having a more secure and less stressed reproduction. Human control and its consequences are responsible for changes in animal's wild phenotype changing them to domestic phenotypes (Zeder 2014).

Starting from the 10th millennium BC, the clear steps through animal domestication can be observed in the mentioned core regions. The presence of domesticated animals and human management over animals has been traced in Cyprus during the 9th millennium BC, mid to late 9th millennium BC in Central Anatolia, Southern Levant and in Zagros during the 8th millennium BC, followed by the Lake District and Aegean during the 7th millennium BC, mid to late 7th millennium BC in the Fikirtepe culture in Northwestern Anatolia, and in Eastern Europe in the late 7th millennium BC (Arbuckle et al. 2014).

The “Neolithic “itself is a long and complex process with many elements. It is actually divided into two distinct “periods”, the Early and the Late Neolithic. In the following pages, further information regarding the main characteristics of this era as well as its phases will be given.

It has long been thought that they were actually the Natufian elites during the Late Epipalaeolithic period that experienced the Neolithic way of life for the first time and later on as a result of colonization and diffusion, domestication and sedentism spread through the periphery areas (Henry 1989; Bar-Yosef and Meadow 1995; Cauvin 1997; Bar-Yosef and Belfer-Cohen 2002; Hole 2004). This hypothesis was later replaced by the “Golden Triangle” area theory, according to which the central parts of the Fertile Crescent consisting of the northern Syria and Southeastern Anatolia were the centers of Neolithisation (Kozłowski and Aurenche 2005). However, the recent researches revealed that the initial domestication may have happened in a larger area than what has been believed, including Taurus and Zagros foothills and perhaps Cyprus which has led to the best-suited model of “Polycentric” so far (Özdoğan 1995). It argues for Neolithic as a dispersed phenomenon that unfolds over a vast area of the Near East and developed along path-dependent trajectories in each region (Düring, 2011: 48, 49).

That Neolithic cultures in Anatolia were very fragmented showing different characters and developments based on their geographic location, cultural preferences, and their “Neolithic packages”. Till 1960’s it was argued that Anatolia was devoid of any Neolithic habitation. Lloyd (1956:53-54) even mentioned in his book “*Early Anatolia*” that in Anatolia there isn’t any sign of Neolithic culture. However, around 20 years later the results of archaeological projects in Anatolia including the “*Joint Prehistoric Research Project in Southeast Anatolia*” and “*Lower Euphrates Project*” which were operated in Çayönü completely changed the picture (Çilingiroğlu 2009). Therefore, perceiving Neolithic in the Near East as fragmented as a mosaic (Tringham 2000) and having a regional approach is beneficial for studying the

subject. As a consequence, people divide Anatolia according to regions including, southeast Anatolia, Central Anatolia, the Lake District, Western Anatolia, and Northwest Anatolia.

Due to the location of Ulucak höyük in Western Anatolia, the main discussion in this chapter will be focusing on understanding the main characteristics of the Neolithic period in this area, the Neolithisation process of this region as well as its transitions through different phases of Neolithic.

2.2. Neolithic in Western Anatolia

The Western Anatolia has a mild Mediterranean climate and it is located in the Mediterranean woodland climax (Zohary 1973). The presence of several rivers namely, Bakır Çay, Gediz Çay, Küçük and Büyük Menderes has led to the creation of small but fertile plains in the region which are favorable for farming. Moreover, the E-W oriented chains of mountains act as a barrier for access to the plains. These all have resulted in a noticeable variety of ecosystems and therefore variety and abundance of natural resources such as various marine (fish and mollusks) and terrestrial fauna and flora, and wood for the inhabitants. Such an environment should have been attractive for early settlers. Unfortunately, the exaggerated interest among archaeologists of the region for the proto-historic and Classic studies has resulted in a lack of sufficient research in the western periphery of the Anatolia in a way that for a long period of time the Aegean Anatolia was viewed as region devoid of early settlements (Lichter 2005). In recent times an increasing number of researches revealed a previously unnoticed missing similarity between the pottery of Thessaly and Northwestern Anatolia and more parallels between Western Anatolian pottery manufacture and typology and the Thessalian ones. These observations call for the necessity of more studies in this region where a possible link between the Aegean and the inner parts of the Anatolia may be found (ibid 2005).

One of the main reasons that makes the Western Anatolian Neolithic settlements of great importance is its strategic location as a frontier between the Neolithic core regions in the Fertile Crescent and Europe. The presence of several islands with Neolithic settlement evidence can be another sign of the importance of this region (ibid 2005). This has resulted in proposing that Western Anatolian settlements played a pivotal role in the Neolithisation of southeast Europe (Özdoğan 1983).

Questioning the relation between the Anatolian Plateau and Southeast Europe has resulted to vast surveys in Northwest and Western Anatolia by David French in the early 1960's which led to discovering several Neolithic settlements including Ulucak (Çilingiroğlu 2009). It was only during 1995 when the first excavations and explorations about the Neolithic settlements in this region begun. However, during the last two decades, the increasing number of excavations in Western Anatolia such as Ilıpınar, Aşağı pınar, Ulucak, Gülpınar, Yeşilova, Ege Gübre, Çukuriçi Höyük, Araplar, Çine-Tepecik and Heybeli dedecik have provided considerable information and a better picture of Neolithic cultures and sequences there (Düring, 2011:174).

Due to constant alluvial actions in the river valleys and continuous changes in the sea level, tracking the evidence for Epipalaeolithic/Mesolithic groups as well as early Neolithic settlements have been very difficult and most probably many of them still remain to be discovered (Lichter 2013). However, through a recent pedestrian survey as a part of a project for identifying the earliest traces of hominin presence in the Aegean Anatolia has resulted in discovering a Hand-axe and some cores and flakes in Kömürburun region which can be dated to Lower Palaeolithic age as well as few chipped stones in the Balıkköy Bay close to modern Izmir which probably belong to Mesolithic cultures (Çilingiroğlu et al. 2016)

Typologically these remains have been introduced as comparable tools with Aegean Mesolithic assemblages from Franchthi, Kerame 1 on Ikaria, Maroulas on Kythnos, and Stelida on Naxos and completely unrelated to the lithic assemblages from Eastern Mediterranean Epipalaeolithic and Pre-Pottery Neolithic (ibid 2016).

Based on excavations, the best evidence for the Neolithic settlement out of the Central Anatolia were retrieved from Ulucak and dated in the first half of the seventh millennium B.C (earliest level VI with a dating of c. 6700 B.C) with good evidences for wheat and barley cultivation, and fully fledged animal husbandry of all the domestic animals including sheep, goat, cattle and pig (three-quarter of the all fauna) (Çakırlar 2012, Çevik & Abay 2016).

Through the recent excavation projects in the Aegean Anatolia, a group of settlements which all have horizons dated to the 7th millennium BC have been identified, including Ulucak Höyük, Ege Gübre, Yeşilova and Çukuriçi. The recent excavation revealed the Neolithic period as their earliest occupational levels of these settlement with two main phases; Early (6700-6500 BC) and Late (6500-5900 BC). However, so far Ulucak level VI as the Pre-Pottery Neolithic phase (ibid 2016), along with Çukuriçi XIII as a Pottery Neolithic phase (Horejs 2016) and Yeşilova III.8 (Derin 2012) are the earliest occupational phases. All these

settlements have Late Neolithic phases as well including Ulucak level IV (Çevik & Abay 2016), Çukuriçi level X and VIII (Horejs 2016), and Yeşilova III.7-6, 3-5 (Derin 2012).

In a regional perspective, similarities along with dissimilarities can be observed among these Neolithic settlements. The aspects which are in common among these settlements can be mentioned as follow:

All these settlements have horizons starting from the 7th millennium BC. No evidence regarding earlier cultural phases, such as Mesolithic, have been identified from this region. However, a Hand-axe and some cores and flakes in K m rburun region which can be dated to Lower Palaeolithic age as well as few chipped stones in the Balıkklovay Bay close to modern Izmir which probably belong to Mesolithic cultures have recently been discovered (Çilingirođlu et al. 2016).

The recovered ceramics from these Neolithic settlements also reveal a “Regional Style” (Çilingirođlu 2012) with all having comparable shapes, classes, fabrics, and production technologies. Çilingirođlu has categorized them to two main groups including Red Slipped Burnished (RSB) wares, and Cream Slipped Burnished (CSB) wares (ibid 2012). The dominant ceramic forms in all these settlements are S-profile shaped jars and vertical tubular lugs. However, big storage jars and anthropomorphic vessels, as the characteristics of the Late Neolithic phases of Ulucak has never been encountered in the rest of Neolithic settlements in Izmir region (Çevik & Abay 2016).

Similar portable objects have also been recovered from these Neolithic settlements. These common objects can be categorized as polished stone axes, bone spatulae, bone tools, beads, and sling missiles. All the mentioned objects share similar raw material and production technologies. Obsidian of Melian origin is also the dominant resource for the stone tools in all these settlements. It is worth mentioning that the number of recovered portable objects in Çukuriçi in comparison to Ulucak is negligible (Horejs 2016).

However, a detailed look at the architecture of these Neolithic settlements reveal a different construction technology and resources in these settlements (Horejs 2016, Çevik & Abay 2016, Sađlamtimur 2012). While wattle and daube techniques with wooden posts were the main technique in building in Ulucak (Çevik & Abay 2016) buildings with stone foundations were dominant in Çukuriçi (Horejs 2016). Presence of rectangular as well as circular buildings in Ege G bre (Sađlamtimur 2012) are another indicative for the influence different traditions and cultural preferences (Horejs 2016). This also can be traced in the variable spatial organization within and around the buildings among these contemporary Late Neolithic

settlements particularly in terms of houses and cooking activities. While in Çukuriçi during the Late Neolithic phases (ibid 2016) hearths are scattered inside and outside houses, as well as courtyards and open areas, in Ulucak level IV the cooking activity related cultural remains such as ovens and grinding stones were only located inside the houses, as well as courtyards and roofs (Çevik 2015). The same case is observed in Yeşilova (Derin 2012).

The same phenomena have been tracked by Souvatzi (2008) in Neolithic cultures in Greece. Along with the high level of cultural similarities in Neolithic settlements of the region, house structures and therefore household seems to vary to a high degree. She interpreted this variety as an issue originated from having different social preferences and identities.

However, it is worth noting that the presence of lime plastered floors and walls, stone paving, practicing some daily activities in the courtyards, the building continuity (in Ulucak and Çukuriçi) (Horejs 2016, Çevik & Abay 2016), as well as evidence for a great conflagration (Brami 2014) are the other common characteristics among these Neolithic settlements.

According to faunal remain studies, the presence of domesticates since the earlier phases of Neolithic in Western Anatolia has been attested here (Çakırlar 2012) contrary to the lack of domestic cattle and pig in Central Anatolia till 6400 BC and 4500 BC respectively and domestic cattle in Northwestern Anatolia till 6500 BC (Arbuckle et al. 2014). This finding puts forward the question of how this domestic economy including all the “barnyard complex” animals developed at Western Anatolia.

The so-called “barnyard complex” consists of domestic sheep, goat, cattle and pig and has been shaped during several millennia, within an extensive area. In most sites, this “complex” came together during the Pottery (late) Neolithic and in some cases during the Chalcolithic period. The variety in faunal composition and managing systems seems to be the result of the different environmental conditions and cultural requirements and preferences. These all are indications that parallel domestication trajectories were in play contrary to the previously proposed hypothesis regarding the expansion models of the domesticates from the core regions to the other regions (ibid 2014).

The broad picture suggests a westward expansion of domestic animals from the Fertile Crescent region to the western Turkey via southern regions (following routes either by land or by sea) by the seventh millennium BC but by different trajectories and in different combinations instead of a “standard package”. The earliest “full package”, that is including all four domesticates (sheep, goat, pig, cattle) in western Anatolia is present in Ulucak VI and Çukuriçi, and later at Bademağacı and Yumuktepe in the south and southwestern Anatolia.

The late presence of domestic cattle (and never pig) in Central Anatolian Neolithic subsistence economy supports this hypothesis (ibid 2014).

In terms of the subsistence economy similarities and differences are observed among these Neolithic sites in Western Anatolia. In all the settlements domesticates, particularly Caprines followed by domestic cattle and pig, are the main taxa (Galik & Horejs. 2011, Çakırlar 2012). However, in case of Çukuriçi, probably as a result of its proximity to the coast, the exploitation of marine resources such as fish and marine mollusks had a key role in their subsistence economy. The noticeable number of dog remains from the two site of Çukuriçi and Ulucak are questionable as well (Galik & Horejs. 2011).

Among the hunted mammals, in Çukuriçi level VIII, hare, fox, aurochs, wild boar, fallow deer, and red deer has been identified (ibid 2011). The minute number of fallow deer antlers (around 3%) contrary to high number of its skeletal elements (around 30%) is in contrast with the high number of antlers in Ulucak level IV and low presence of fallow deer bones.

The above mentioned findings reveal the complexity and multifaceted nature of the Neolithic way of life in Anatolia and the fragmentation of the Neolithic cultures in Anatolia from the earliest levels to the latest. Meanwhile the less-investigated area of the Western Anatolia as a possible pathway of Neolithic way of life to southeast Europe deserves more attention and focused research. Therefore, this issue requires us having a more detailed and site level study as a way to grasp more about the nature of economic and social structure during this period in this region. Hopefully this can be a step towards a better understanding of the nature of Neolithic way of life in this region. Moreover, it will allow to investigate whether or not this fragmentation in different aspects of Neolithic cultures continues in Late Neolithic as well.

2.3. Household concept and Neolithic households in Anatolia

Earlier phases of the Neolithic in Anatolia (9th and 8th millennium BC) as a time period when the so-called “Neolithic package” is believed to have taken shape have always been the focus of attention among archaeologists (Whitehouse 1986, Thissen 2002, Çilingiroğlu 2005). Much research has been carried out on the subject and many models explaining the transition from Hunter-gather societies to the Neolithic way of life in Anatolia have been proposed (Ammerman & Cavalli-Sforza 1971, Özdoğan 1999, Düring 2013, Arbuckle et al. 2014, Horejs 2015.). This overrepresentation has overshadowed the later Neolithic phases (particularly 7th millennium B.C) and prevented any broad investigation about it. It resulted

in nominating this millennium as a period of time with little changes (Bogaard 2004). Nevertheless, recent studies have revealed that the opposite is true (Düring, 2011:123).

According to recent investigations on the Neolithic of Anatolia, there are evidence for profound structured changes in terms of climate, society, demography, architecture, and subsistence economy of the inhabitation of the central Anatolia during the 7th millennium BC. The effects of these transitions are debated: They could have been even more important than the initial events during the Early Neolithic period in a way that some scholars apply the term “second Neolithic revolution” for this transition which eventually resulted in the expansion of sedentary farming societies (ibid 2011:123).

It is believed that “houses” are key units for Late Neolithic societies and the place where the majority of everyday activities were performed and a high number of archaeological cultural remains recovered (Hodder 2013). Houses were a place for practicing and at the same time regulating communal activities particularly ritual and subsistence activities. These units were also regulated by these activities as well. Therefore, any change in one of them could consequently have a significant impact on the other one (Kadowaki 2012).

These units have experienced noticeable transitions during the Neolithic period (ibid 2012). This diachronic trend can be mentioned as a transition from a communal mode of decision making, exploitation, production and consumption of resources toward a more independent household. This new form of society is reluctant to share the resources or activities (Byrd 2000).

The main arguments regarding the transition from the Early Neolithic to the Late Neolithic are based on household studies. Therefore, firstly it is required to start with an introduction about household and household archaeology studies.

One of the consequences of the advent of processual approaches in archaeology in 1960's was household archaeology (LaMotta & Schiffer 1999). The main aim of this approach was studying the archaeological remains recovered from the house floors in order to obtain a clearer understanding about the social and economic structure as well as the demography of the ancient settlements.

The household has to be determined according to contextual studies as well as studying and locating the household unit within its wider social setting (Düring 2007). Numerous studies have been carried out examining a variety of evidence recovered from excavations at “house” level. That is instead of analysing the data in their entity by archaeological layers (all data recovered from any given layer studied together), the analyses were done by “units” in each

layer. In this type of work, the materials to be studied were only the ones found within or in relation to individual buildings which could be considered as representing a “house”. The aim is to reconstruct the social and/or economic activities of these houses and by comparing the different “houses” to establish similarities or differences in the behavior of different “households” (ibid 2007).

Regarding the definition of household, there are various suggestions and from different perspectives (cosmology, identity and memory) for it. While some give importance to the combination of “shared residence” and the “pooling of the economic resources” some others argue that these two do not necessarily overlap (ibid 2007). In Atakuman (2014:19) the “house” is defined as:

“In anthropological terms, houses are perceived as social institutions through which societies define membership groups which are not necessarily homologous with families as we understand the concept today.”

Accordingly, in an archaeological sense, a “household” can be defined as a unit where individuals, with some mutual goals of cooperation, co-residence, or based on hereditary and nonhereditary relations gather together. This unit works as a media to express the division between its residents and the others (ibid 2014).

Households can take on many forms including the lineage, the neighborhood and local community (Düring 2007) and they were the fundamental units of villages both in Mesoamerica and the Near East. It is considered that, although with different timing, both these passed through the same stages (Flannery 2002) which will be described as follow:

In the first stage, individuals lived in a series of small circular-to-oval structures, accompanied by communal or “shared” storage features. In this stage, huts don’t seem big enough for an entire family. The location of storage units out in the open supports the co-residence and shared culture amongst the community. This type of living together corresponds to the archaeological observations of the Early Neolithic.

In the second stage, nuclear families occupied substantial rectangular houses with private storage rooms. Through the time rectangular houses became big enough and with space divisions and sufficient private storage to house and provide for an entire family. Flannery (2002) also argues for a third stage in community developments in some parts of the ancient world which are termed “economic specialization”.

Here we can accept the three-phase system house transformation in the Middle East suggested by Hodder (2013).

1. During the Earlier Neolithic, houses were the main means of providing and preserving communal and social ties. Houses with high ritual themes and burials were performing this task.
2. Through the time the earlier units gave way to houses bigger in size and more independent in different modes of social and economic life.
3. During the Late Neolithic Houses with a high level of independency but small in size in order to be able to join other sites or mobile dispersed systems become dominant. Specialized production and a degree of hierarchy (Hodder 2013), the enhanced private ownership of resources and diversified subsistence activities within each architectural unit are the other transitions among the Neolithic settlements in the Near East (Kadowaki 2012).

However, one of the best suggested model for these transitional models has been that of *société à maison* (house societies) developed by Levi-Strauss (1982). This model argues for a stage of household and social development which typifies the time for transiting from kin- to class-based societies. Hierarchies, economic and social differentiation for achieving power and prestige are the characteristics of this stage.

The earliest example of this transitional phenomenon is present in Levantine and Mesopotamian cultures (Kuijt et al. 2011). Communal buildings, as a place where the ritual activities were practiced, were replaced by portable items as a new media at the end of PPNB.

Several hypotheses have been introduced as the main contributing factors for these transitions. A subsistence economy mainly based on domesticates has been suggested by Kuijt (2011) as the main factor giving the confidence to people to establish an independent household and refer themselves to this independent lifestyle as a self-identification.

Flannery (2002) argues for higher production and surplus as the advantages and incentives of “privatization” and the main reasons behind the mentioned transition from communal to the private system. Kadowaki (2012) has summarized them to climatic changes, environment deteriorations, and high reliance of farming, population growth, and decline of communal rituals.

Kuijt (2000) suggest the ‘*social crowding*’ as the main contributing factor for a series of social changes during the Late Neolithic. The induced stress of this population growth resulted in the advent of two-story, divided buildings with a high level of privacy in space and storage. He describes this transition as an inability of houses, rituals, and social leaders to manage every aspect of the society and therefore advent of powerful houses in terms of politics,

economy, and social aspects. This also resulted in a decrease in the presence of communal rituals and increase portable objects.

In terms of household transitions, Wright (2000) emphasizes on the location of cooking activities for the transitions from a communal life to more independent household in Levantine Neolithic settlement. She believes that practicing cooking and storage facilities in open social areas such as near the house entrances during the Natufian period is in contrast to the presence of these activities inside the houses during the PPNB period.

Also in contrast to the higher privatization of the household, the presence of a probable public space such as streets and well in the Late Neolithic settlements of Levantine cultures have been mentioned several times (Garfinkel et al. 2006, Garfinkel & Miller 2002). These areas have been interpreted as a social unit and areas for social groupings in intermediate scales (Kadowaki 2012)

Whatever the main reasons behind these transitions are, we encounter with new forms of household during this period. All these factors have influenced the nature of Neolithic houses in terms of their sizes, the type and mode of technical and subsistence economy related activities which were performed there, as well as the relationship among these units. All the mentioned shifts seem to be oriented towards a more independent and solitary way of life, private and domestic way of production, consumption and in general a more independent and self-sufficient household contrary to the previous communal and collective system.

The main criteria for an independent competitive economy has been suggested by scholars such as Byrd (2000), Wright (2014) and Düring and Marciniak (2006). The presence of evidence for variability at material cultures and features in size and number within a building, different architectural forms and their organization, and economic, symbolic activities (or combination of both) can be related to a more independent and competitive household. This differentiation can be based on considering differences between age, sex, blood relations, and the level of expertise of a building in one or several activities in the society.

The *société à maison* (Levi-Strauss 1982) model has attracted the attention of detailed studies of the household for understanding the nature of Neolithic societies as an intersection between the architectural units, their material cultures, and the inhabitants of these units. Several studies have been done through different perspective including isotopic and aDNA studies, architectural and household forms, building materials, to detailed artefact studies from relevant to the archaeological houses.

One of the best examples following the Lévi Strauss (2007) models for studying the house has been done by Pavlu et al. (1986) in the Neolithic site of Bylany, Bohemia, Czech Republic. According to their study, the presence of different cooking activities, different pot forms, as well as analysis of fats preserved in the pots are indicative for different economic practices, therefore different social identities for the inhabitants of these houses.

There are also relevant studies regarding the level and type of craft production activities within the households among Levantine Neolithic settlements (Quintero 1998, Wright & Garrard 2002). These studies argue for a domestic mode of chipped- stone blades and flakes in PPNB 'Ain Ghazal' (Quintero 1998:229-232), naviform blades in 'Ayn Abu Nukhayla (Henry et al. 2011) and stone beads in the Late Neolithic sites in Jilat-Azraq basin (Wright and Garrard 2002). Practicing these activities at the level of household and sometimes parallel to workshops has been interpreted as a reflection for an autonomous household in these Neolithic societies (Kadowaki 2012).

However, limited studies have tried to perform a household study from a zooarchaeological perspective. One example is an investigation of the case of domestic household in Israel, Hazor (2nd millennium BC) from a zooarchaeological perspective (Marom & Zuckerman 2011). The logic behind this approach was the correlation between the daily activities performed within each household (cooking, craft production, and consumption) and the historical and social processes in which any development or decline in the last ones can influence the households.

2.4. The Late Neolithic household in Anatolia

Closer to our case study, the household forms of Early Neolithic settlements in Central Anatolia, are best investigated and described in research carried out at Çatalhöyük (7100-5950 cal BC). These studies reveal that in general, during the Early Neolithic phases of this site, the community-based identity was of a great importance and the rest of the social life aspects were working for the favor of the community ties. The whole activities in the society were undertaken in groups and directed by taboos. These activities were consisting of constructions, procurements of the raw material and food, preparation, and consumption which requires a communal effort and also shared among the whole society members (Marciniak et al. 2015). Moreover, the biodistance studies on these burials suggest minor biological affinity among the burials beneath a single house (Pilloud & Larsen 2011).

However, these people were sharing the same food resources which implies that there was cooperation and sharing system among the residence of each house although they were not necessarily biologically related.

Regarding the subsistence economy supplying, all the activities seems to have been done by groups of people and were consisting of consumption of wild and managed Caprines as an ordinary food while the cattle meat was mainly consumed as a ceremonial food. (Russel & Martin 2005). For the task of constructions, wood resources from the high-quality oak and juniper trees surrounding Konya plain were provided as well as clay from Pleistocene sediments, back swamp clay and marl (Asouti 2013).

A diachronic study of the household mechanism in this Neolithic settlement from the early to the late phases of Neolithic period (7100-5950 cal BC) has revealed an end for these structures sometimes after the middle of the 7th-millennium cal. BC and a shift from a communal mode of life to a more independent household (Marciniak 2008). The first tangible sign is the demise for the cell-like structures with rich interior decorations. Later phases of Neolithic in Central Anatolia in Çatalhöyük are known with more dispersed, smaller and less permanent houses. Interior decorations and bucrania are not present anymore. Intramural burials were replaced by special burial architecture. However, these changes can be indicative of some other sorts of changes in the social structures, subsistence practices (ibid 2015) or the climate and the environment of the region (Biehl 2012).

This transitional phases can be observed by a comparison between the main three Neolithic settlements in this area. The main difference between Aceramic Aşıklı Höyük (Esin & Harmankaya 1999) and Çatalhöyük (Hodder 2005) in terms of household is that although the neighborhood clusters are present in both settlements, in the first one there is no archaeological evidence indicating a discrete household residence. Based on Steadman (2000) observations on Canhasan III buildings in this Neolithic settlement are very alike. According to the archaeological remains there, it seems that limited activities were performed within each architectural unit. This is while in Çatalhöyük (Hodder 2005) some standardized set of features namely hearth and storage are in association with a level of domestic activities along with burials and rituals (Düring 2007).

Hodder (2013) relates this transition during the 7th millennium BC to the domestication of cattle, more intensive exploitation of sheep and goat as well as cereal production. He believes that for early agricultural or hunter-gatherer-fishers social dependencies were of a great importance. However, through the time intensive exploitation of domesticated herds and

plants gave way to a more independent household. Therefore, we can observe advent of tombs, cemeteries, and field system instead of the house to establish a history and society ties.

He (Hodder 2014) also believes on a period of pressure and stress on the egalitarian society of Çatalhöyük by increasing the size and density of the society, the impractical communal work, different subsistence economy, as well as conflicting labor schedules. The response to this new situation was introducing a more independent household as well as more mobility which led to expansion of the Neolithic way of life after 6500 BC. In the case of Çatalhöyük, ownership of cattle and sheep and practicing a mixed system of herding and cultivating by individual household was the solution to bypass this tension.

Regarding the subsistence practices major changes in extracted wood species as well as herding management is observable (Asouti 2013). Through the end of the Neolithic period, the main wood species belongs to oak which grows near the settlement than juniperus which was the dominant wood resource during the earlier phases of Neolithic. Juniperus grows in surrounding upland which requires a communal undertaking to be extracted. It is worth mentioning that for such a shift Marciniak (Marciniak et al. 2015) argues as environment change as only a contributing factor and not the main reason behind this change in operation.

Moreover, the oxygen isotope data suggests two shifts in Caprine management as well, including a shift to the early birth season in March ‘which is the time for more available and rich grass period as well as herding Caprines in lower elevations which is much closer to the settlements (Henton 2013). The emergence of the early signs of a mixed farming (arable-pastoral integration) with the introduction of the use of fodder is indicative of a confident household which is ready to deal with higher but more independent labor at the expense of having an individual farmstead (Marciniak et al. 2015). The zooarchaeological studies in LN Çatalhöyük (late 7th Millennium BC) remains suggest a subsistence economy based on domestic sheep and goat exploitation as well as limited hunting and gathering wild species (Russell & Martin 2005).

Similar developments have been demonstrated for other regions in Anatolia. For example, regarding the status of portable objects in a study of Southeast Anatolia, Atakuman (2013) believes in a complex manipulation of social orders, using portable objects for construction of personhood instead of the previously used mediums (communal buildings). She argues for the crucial role of portable items such as pendants and seals as well as contexts in which activities such as food preparation and consumption were performing there at constructing social division and identity. Adaption of ceramics and producing them in complicated forms

during the 7th and 6th millennium BC is an indication for this social transition. Increasing cultural and economic exchange among different communities, could necessitates this new form of individualism (ibid 2013).

Extensive studies in the western part of Anatolia, particularly the excavation results in Ulucak and Çukuriçi Höyük also represent a series of transitions from the Early Neolithic levels of settlements to the later one.

Çevik (forthcoming) argues for the demise of the collective memory (building continuity, intra-mural burial, etc.) which was present in Early Neolithic architectural units (Level VI) at the end of the Early Neolithic at around 6200 BC in Ulucak and the advent of new ways of constructing the identity through portable objects giving the emphasis to a more independent household.

Based on the excavation results in Çukuriçi Höyük, Horejs (2016) argues for the presence of comparable portable objects including, figurines, bone spatulae, bone tools, beads, sling missiles, and stone axes which share the same raw material sources as one of the main characteristics of this period and the new media for introducing the society and personhood in the region. Horejs believes in a 'regional style' similar to what Çilingiroğlu suggested for the similar assemblage of potteries (RSB and CSB) in the same region (Çilingiroğlu et al. 2012).

However, investigating the household activities with the application of interdisciplinary studies such as zooarchaeology can be another approach. This can be a way to understand the domestic (cooking related activities and production) and non-domestic (such as craft production) behavioral pattern of the inhabitants of a unit and eventually the possibility of having a transition from a communal mode of life to a more private household.

The only example in Anatolia is again the work in Çatalhöyük (Twiss et al. 2009). In this study which utilizes the possibilities offered by spatial analyses and GIS, the spatial distribution of flora and faunal remains within the Neolithic houses in Çatalhöyük has been performed. NISP (Number of Identified Specimens), WIS (Weight of Identified Specimens), as well as their spatial pattern were the main analysis methods. The obtained data has revealed a different pattern of food and raw material storage between the studied units. The different use of space, and a tendency toward having a private storage has been attested to these units based on the interior organization of the houses, as well as their different entrance. Also no differentiation between the consumable material (plants and animals, or wild or domesticated) has been encountered as well. These data have enabled them to investigate the use of space,

storage, the status of domestic vs. wild species, and particularly the case of economic privacy and for the residence of buildings.

Moreover, all the above suggested scenarios for these transitions is based on individual observations and mainly focusing on architecture, burial practices, aDNA studies or ceramic based studies (Marciniak 2015, Pearson et al. 2015, Pavlů et al. 1986). Unfortunately, except for limited studies in Çatalhöyük (Twiss et al. 2009) no similar studies have been performed in Anatolia for investigating the case of different economic activities from a zooarchaeological perspective among different architectural units in a settlement.

Therefore, in this research the study of these units from a zooarchaeological perspectives has a great importance in our understanding the domestic organization, use of space, and social identity of the inhabitants of these units during the Late Neolithic period. In this thesis we have firstly studied and applied standard zooarchaeological methods (species proportions and skeletal representation) to all the animal bones recovered from the area and layers concerned in this study as a whole and then we separated the bones under study to “units” in order to examine similarities/dissimilarities amongst the units. However, what matters, is to be aware that there is no single model or methodology that will reveal the nature of Neolithic house and household. Based on the region of the study, house forms, material cultures, cultural preferences, as well as the preservation level, different techniques need to be applied. The key is the understanding of how these units were engaged with these diverse economic, social and environmental agencies, how they were elaborated and changed through the time, and eventually changed and developed the identity of its residents and vice versa.

2.5. Case study: Ulucak Höyük

The main concentration of the research question and projects on the better-preserved Roman and Greek sites in the western periphery of Anatolia has resulted to our poor knowledge about the earlier periods of this region. Issues such as the spread of Neolithic way of life outside of the core regions to the periphery areas, particularly the Neolitisation of Southeast Europe have brought up the necessity of further researches in this region as a missing link in these discussions. Increasing current projects on the prehistory of western Anatolia during the last decades such as IRERP project in Izmir, Miletus (Niemeier 2007), Metropolis-Bademgediği Tepe (Meriç 2007), Ulucak (Çilingiroğlu et al. 2004), and some more recent projects such as Çukuriçi Höyük, Dedecik-Heybelitepe, Ege Gübre, and Yeşilova have provided valuable

information in this regard and made the general picture of the prehistory (Particularly the Neolithic cultures of 7th and 6th mill BC) of the middle west of Anatolia clearer.

Various scholars such as Lloyd and Mellaart (1962), and French (1965) have mentioned Ulucak, till 1995 when the site was eventually excavated by Altan Çilingiroğlu and Izmir Archaeological Museum till 2009. Currently the excavation is performing under the direction of Özlem Çevik (University of Thrace).

What make Ulucak a pivotal site in the region and a key site for further studies are its strategic location in the Aegean Anatolia (Figure 2) which has been suggested as one of the core regions for the expansion of the Neolithic agro-pastoralism to the south East Europe as well as comprising one of the earliest Neolithic phases known in the Aegean Anatolia (early 7th Millennium BC).

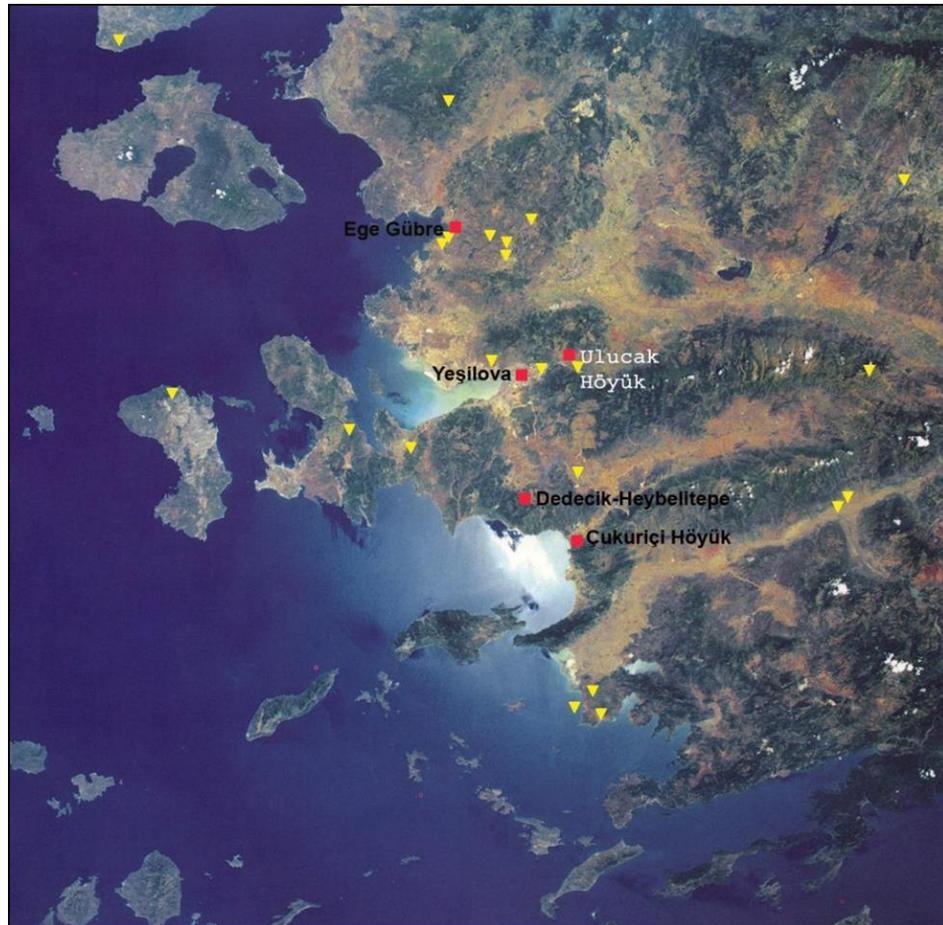


Figure 2. The location of Ulucak Höyük and in relation to the other Neolithic sites in the region

2.5.1. The geography and ecology of the region

Ulucak Höyük is a multi-layered mound which lies in Kemalpaşa plain, 9 Km in the east of Izmir, western extremity of Anatolia. So far it comprises uninterrupted cultural sequences from the Early Neolithic to the Late Roman/Early Byzantine period (Table 2). Figure 3 also demonstrates the excavation areas on the mound. Also a cemetery situated 200 m east of the mound also comprises Early and Middle Bronze Age burial but is devoid of any Neolithic burials. The plain is surrounded by the Nif and Spil mountains and irrigated by the Nif stream which didn't have a noticeable change in its course since the time the mound was inhabited.

Table 2. The chronology of the Ulucak mound (Çevik & Abay 2016).

Level	Period	C14
Level 0	Late Roman/Early Byzantine	
Level I (a-d)	Middle Bronze age	
Level II	Early Bronze age	
Level III (a-b)	Early Chalcolithic	5600-5400
Cultural Break		
Level IV (a-K)	Late Neolithic	6000-5800/5700
Level V (a-f)	Early Neolithic	6500-6000
Level VI	Initial Neolithic	7040-6600/6500

Belkahve pass is the main connection road between the plain and the Aegean coast. At the moment the mound covers an area about 4.5 ha, stands 6 m high above the plain, and c. 221 m above the sea levels. Due to high level of alluvial activities of the Nif river, as well as agricultural and construction activities by the factories around the site, the mound has been eroded and destroyed to some levels (Çilingiroğlu et al. 2012)

The occurrence of several river valleys in Central-West Anatolia such as the Nif stream close to Ulucak has made communication between the inner regions to the coastal areas possible (Çilingiroğlu 2009).

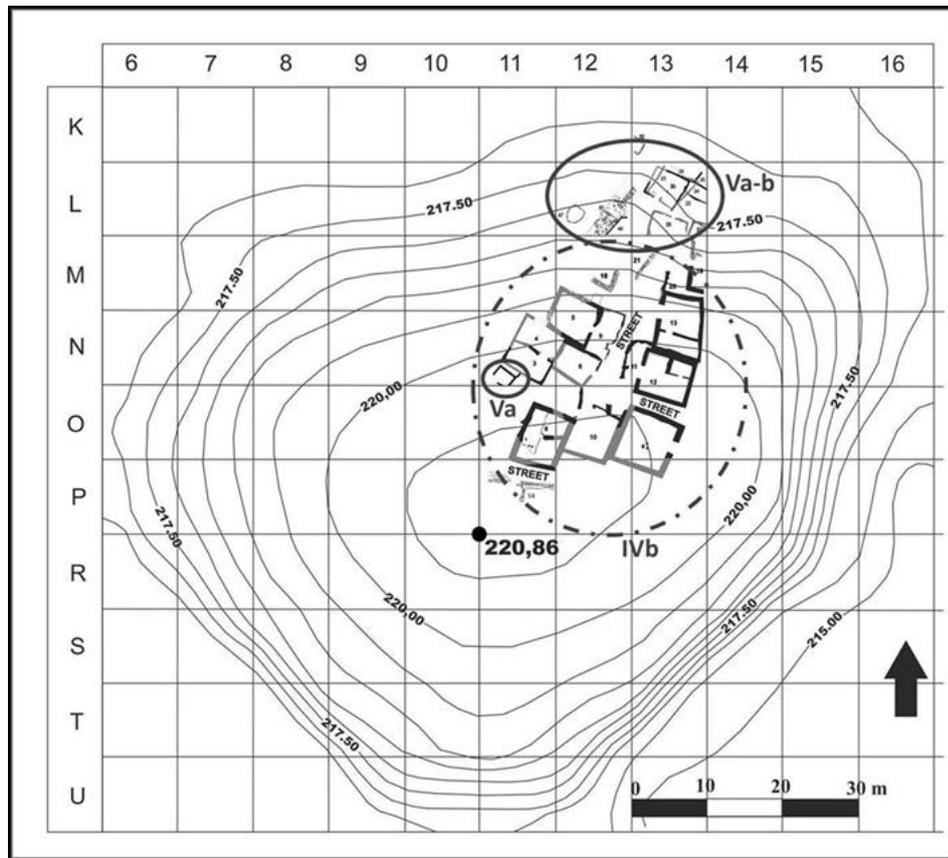


Figure 3. The excavation areas on the mound.

The Region has a Mediterranean climate, with a mild but rainy winter and spring and extremely dry winter. The average precipitation is around 950 mm. It has been revealed that during the time period which corresponds with Ulucak IV- VI there was a lake in the area. (ibid 2009)

Neolithic period in Ulucak has been divided in to three main occupational levels including level VI (6800-6600/6500 cal BC), V (6500-6000 cal BC) and Level IV (6000-5700 cal BC). Neolithic culture in Ulucak follows by Chalcolithic period after a short break about less than a century.

The main Neolithic characteristics present in early Neolithic Ulucak has been identified as a result of interaction between the local hunter-gatherers and the newcomers from the east. However, the type of this interaction hasn't been totally understood. So far, the leapfrog colonization model has been introduced as a possible scenario for the adaptation of the Neolithic culture in the Aegean Anatolia. This model argues for the interaction between a small group of immigrants and the native mobile foragers of the new land. Material culture

from Ulucak so far suggests an inner-west origin for the newcomers with the knowledge of herding, farming, and floor plastering (Çilingiroğlu & Çakırlar 2013).

It should also be noted that according to the conventional chronology of Anatolia, 6000 BC (Level IV) can be a good candidate for nominating as the Early Chalcolithic (Schoop 2005). However, the material culture in all mentioned Neolithic settlements in the Central Aegean settlements suggest a continuation of the Neolithic period during this time span (Horejs 2016). Therefore, the Late Neolithic of the Anatolia seems to be started approximately around 6500 BC which its remains can be observed in Ulucak V-IV (Çevik, forthcoming), Çukuriçi Höyük X-VIII (6500-5900/5800 BC) (Horejs 2016), and Yeşilova III.7–6.3–5 (Derin 2012). Through the recent studies Düring has suggested the period between 5500 to 3000 BC as the Chalcolithic period in Western Anatolia (Düring 2011). Also the presence of definite Chalcolithic culture in the Level III of Ulucak on the one hand, and the gradual development of material culture from the Level V to the Level IV and no sign of abrupt change between these two in Ulucak on the other hand has made labeling this level as Late Neolithic more logical (Çilingiroğlu 2009).

3.5.2. Level VI (Initial Neolithic)

This level as the initial level of occupation in Ulucak (dated to 6800-6600/6500 BC) with comprising the earliest archaeological remains from the Neolithic Period in the region has made this settlement of a great importance in the region (Figure 4). It has been introduced as

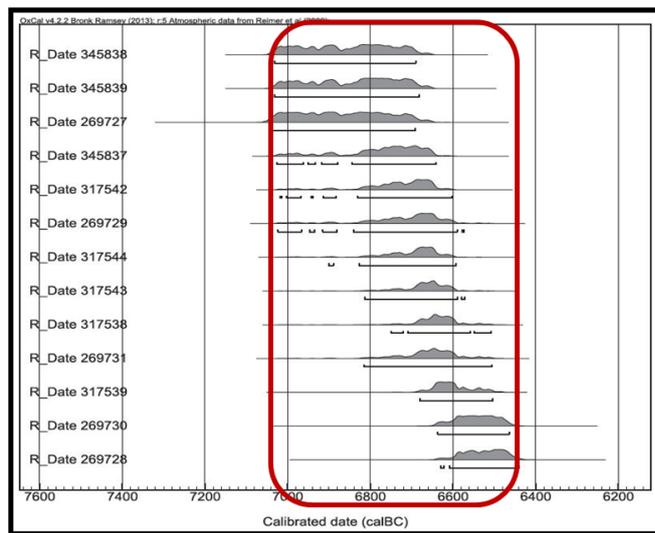


Figure 4. C14 dating of the Level VI (Çevik & Abay 2016).

a key site for better understanding the spread of the Neolithic culture into the Western Peripheries (Çilingiroğlu et al. 2012).

Due to limited presence of the “Neolithic Package” items in the cultural remains of this level, this horizon has been labeled as the initial Neolithic by the excavator (Çevik & Abay 2016). This phase is characterized by two buildings (42 and 43), with rectangular plans, mud-slab walls, and structures adjacent to each other (Figure 5). What make these two contemporary buildings special are the presence of rebuilding phenomena, and floors made of lime plasters and decorated with red and cream paintings (Figure 6). The presence of the red plaster floors as well as central postholes of these two buildings have made them comparable to Building T at Aşıklı Hoyük. However, this type of floor is also associated with Levantine and Central Anatolian PPN as well (Çilingiroğlu 2011).

These houses are made side by side and suggest rebuilding evidence for 3 times. Buildings are 14 m² and 25 m² in size respectively.

One grinding stone, a mandible of a Caprine, and one hearth filled with animal bones, particularly of cattle, in Building 42, and one saddle quern, one cattle scapula, and a bone implement are the only archaeological remains in these two units. This has been interpreted as deliberately cleaning attempts or abandonment rituals (Çevik & Abay 2016).



Figure 5. The location of buildings 42 and 43 (Çevik & Abay 2016).



Figure 6. Building continuation and painted wall plasters in the building 42 (VI) (Çevik & Abay 2016).

The location of the saddle querns in these two buildings is alike. A courtyard with thirteen hearth and ovens with scattered faunal and floral remains is located in the southern part of these two buildings. The continuity factor is present in this courtyard as well by traces of several renewals of fire installations. Two neonatal burials are recovered near these hearths which one of them comprise a grinding stone as well. The other evidence for human skeletons from this level belongs to parts of neonatal skeletons one in the filling of building 43 and the other one in the deposit in front of the entrance of building 42. Accumulation of bones, ashes, and hearth in front of the buildings (Figure 7) have been suggested as a possible communal activity area (Çevik & Abay 2016).

Except for three very small ceramic sherds, there is no evidence for pottery production. The high number of worked and used bones in the shape of splinters, points, awls, and ad-hoc tools are noticeable at this level (ibid 2016).

Lack of evidence for daily activities, along with the presence of continuous utilization of the hearth and ovens accumulated with high numbers of animal bones (mainly cattle), and ashes in this level have been interpreted as a possible communal type of living and activities (ibid 2016).



Figure 7. Accumulation of animal bones and ashes in the building 42 (Çevik & Abay 2016).

Presence of domesticated as well as sedentary life style in this initial level of occupation can be an indication for the initial Neolithisation of this region before the 8200 cal. BP event (ibid 2016).

2.5.3. Level V (Early Neolithic)

This level covers a time span between 6500-6000 BC (Figure 8). It is characterized by the first clear traces of potsherds, and portable objects including figurines, clay seals (Pintaderas), spindle wholes, loom weights, pendants, potteries, and obsidian (mainly with Melos origins and some from Nenezidağ and Göllüdağ). This horizon is representative of the Early Neolithic period in the settlement. The earlier phases of this level provide us with one open space paved with pebbles and some hearths, while the latest phase (Va-b) which are dated to 6200-6000 BC revealed one roomed buildings, rectangular in plan, with walls constructed by wattle-and-

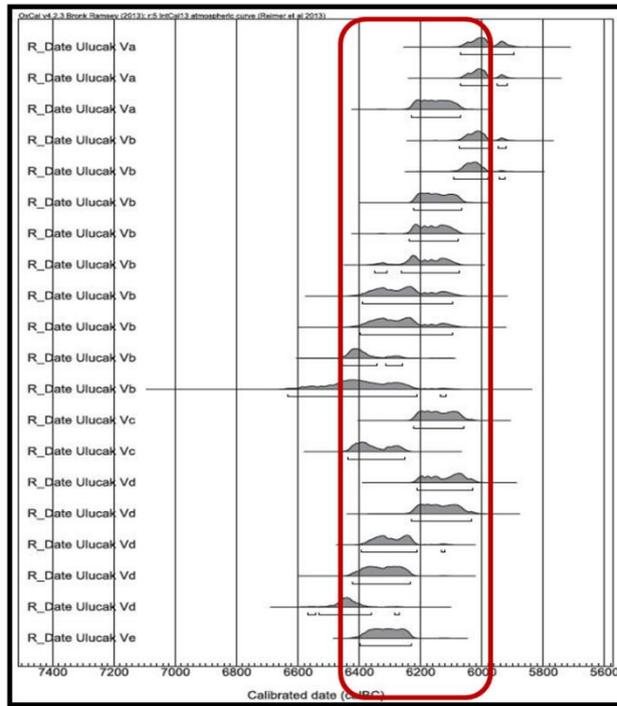


Figure 8. C14 dating results from Level V (Çevik & Abay 2016.).

daub or mud-slabs (Pise technique) and without stone foundations but sometimes with traces of wooden beams for supporting the walls. The interior corners of the buildings have rounded forms (Derin 2005). Each building has its own oven and storage. Evidence for the hearth, oven, storage, clay boxes within each building has been assumed as economically independent households (Çevik forthcoming).

Houses in this level are build adjacent to each other and held clay bins as storage facilities in circular or rectangular forms. Impressed pottery appears in this level too (Çilingiroğlu 2011).

The main characteristic of this level is the occurrence of post-wall buildings in which their evidence is survived in the shape of wide post holes. Superimposed architectural levels can be observed in this level as well.

Both inner and outer surfaces of the buildings have been plastered. In this level also buildings have a rectangular to square plan while the corners have a rounded shape (Figure 9).

The presence of the mentioned portable objects along with a demise for the previous communal memory (building continuity) has been proposed as a cultural break and advent of new ways of constructing the identity during 6200 BC (Çevik & Abay 2016).



Figure 9. Buildings in Level V (Çevik & Abay 2016).

2.5.4. Level IV (Late Neolithic)

While in the chronological sense the time span after the 6000 BC in Anatolia has been attested as Early Chalcolithic, continuation of the Neolithic material culture in this level led to nominating this level to the Late Neolithic period with ten sub-phases. It has been dated to 6000- 5700 BC (Figure 10). Along with previously present portable objects (human and animal figurines, clay seals, sling missiles, spindle whorls, polished axes, offering tables, and bone tools), we encounter with storage jars as well as anthropomorphic vessels in this level which seem to have replaced the previous storage bins and clay boxes (Çilingiroğlu et al. 2012). Level IVb as the most excavated (900 m²) and better-preserved sub-phase is characterized by rectangular buildings with defined corners and constructed by sun-dried

mud-bricks blocks walls on stone foundations and flat roofs with a narrow street in between and in most cases a courtyard in front of the buildings. There is evidence that walls and floors were frequently plastered. Wall painting was not present except for two buildings. Postholes next to the grill stones in the middle of the buildings are indicative of wooden pillars as a supportive for the flat roofs (Derin 2005). Recovering one grinding instrument on the collapsed roof also can be an indication of a flat roof which were used as an activity area. As this phase was ended by fire, contexts and their artefacts are very high preserved which makes the buildings suitable for contextual studies.

The Presence of grill stones, hearths, and ovens in these courtyards can be an indicative for using these spaces as a working area (Derin 2005). Anthropomorphic figurines inside a bowl together with some worked and unworked cherts in the building 12 are one of the most important finds of this phase.

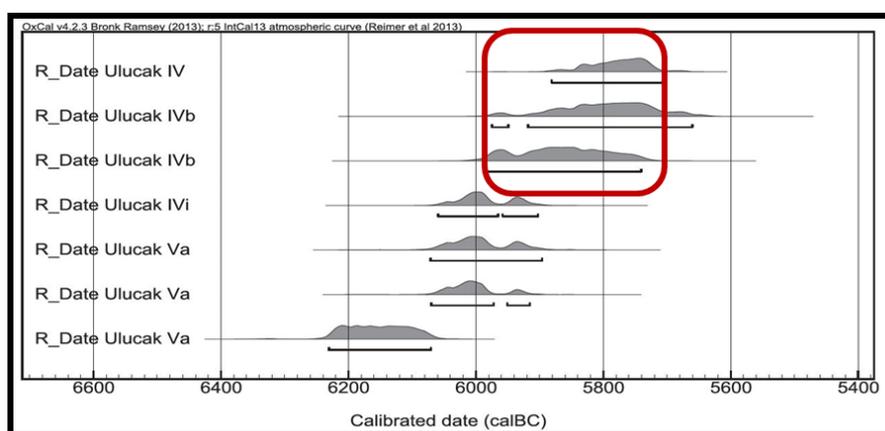


Figure 10. C14 dating of Level IV (Çevik & Abay 2016).

Houses in comparison to the previous phases are bigger in size and comprise internal divisions as well as courtyards which are surrounded by pisé walls (Figure 11). Food producing and storage facilities have fixed positions within the interior space of the buildings i.e. grinding stones near the oven, and ovens (flat-topped) and entrance in the same line. These have been interpreted as low degree of integrated household activities with the other households during this level. Definite presence of clayed mud platforms within all the buildings of this level as a place for the comfort of its residence has been interpreted as the other sign of household activities there (ibid 2005).

Derin also argues for some architectural similarities between Ulucak IV and Bademağacı (rectangular building, same location for the entrances and ovens), but different in the other aspects. These differences are more noticeable with the other contemporary settlements in

Lake District and Marmara Region. These has been interpreted as a distinguished, and regional development of architecture in these regions during the Neolithic period (ibid 2005).

Three anthropomorphic figurines (2 females, 1 male) have been found in this level (Buildings 6 and 13). They were all located within clay bowls along with flint flaks and obsidian blades inside the houses. Due to the presence of other remains including clay lumps, and grinding stones, it seems that manufacturing and food producing activities were operated within the houses.

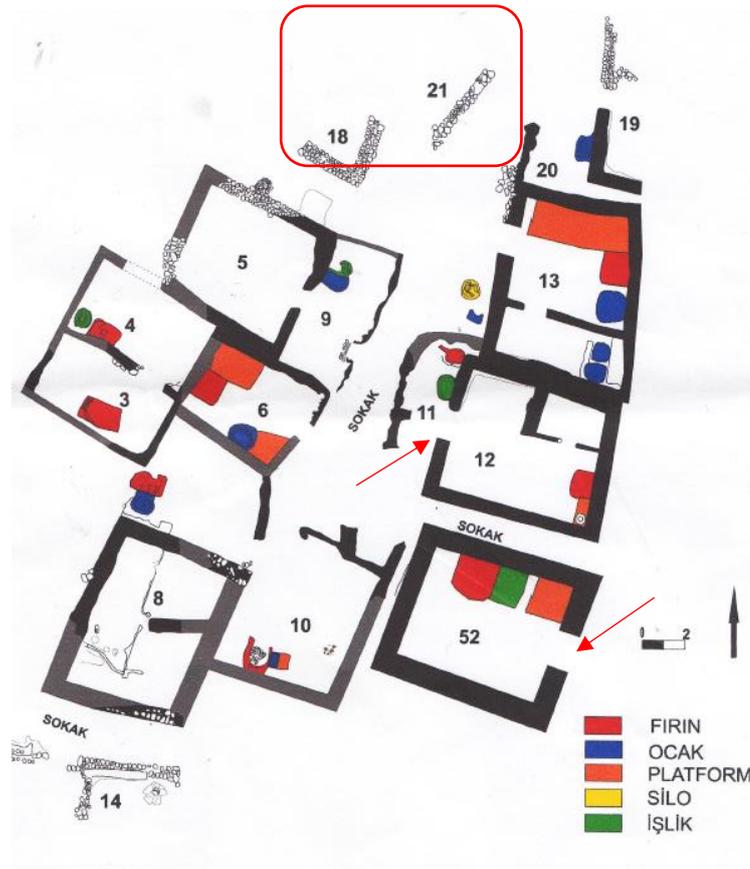


Figure 11. The map of units 52 and 12 and their entrances. (The rectangle shows the approximate location of the workshop area).

On the southern wall of the building 13, traces of red painting on the plasters are evident too which has been interpreted as some degree of elaboration given to the houses. The all mentioned elements within the residential buildings has interpreted by Abay (2003) as an importance of houses as a place where all religious and non-religious and daily activities are performed there.

Increasing the number of spindle whorls and loom weights, as well as a demise of building continuity phenomenon, and intramural burials can be the other main features of this phase of

Neolithic. For the first time, we also encounter with the presence of building with special functions in this phase.

As the main focus of this study is on the faunal remains retrieved from this phase, more detailed information will be given here regarding the nature of these buildings.

The entrances of all the buildings in this level opens toward an open area which can be interpreted as a communal area.

It has been mentioned by the excavators that with a high possibility the settlement through this level experienced its maximum point in terms of population and size. However, after a short period of time the site was burnt completely and abandoned.

2.5.4.1. Building 52

This building is located in the southern part of the trench O13 (Figure 12). This building shares its northern wall with the open area. It has been dated by the excavator to the level IVb. In comparison to the other studied areas, the interior architecture of this buildings seem different. It doesn't consist of any interior division between the areas. Also it has thicker walls in comparison to the building 12. The entrance of this building opens to the east and not the west (similar to the all other areas in this phase. This also doesn't have any evidence for the presence of an open area. The mains findings from this area can be listed as 2 large grinding



Figure 12. Building 52 (IVb).

sets, figurines, spindle-whorl, Hand axes, polishing stones, sling missiles, and high number of worked bones.

2.5.4.2. Building 12

This building is located in the trench O13 and share the same wall with the open unit (street) from the south (Figure 13). The dimensions of building 52 are close to the other two building locating on its north.



Figure 13. Building 12 (IVb).

There is a kiln in this area 4cm thick. The other cultural remains from this unit can be mentioned as sling missile, Ezgi tasi and grinding stone, animal figurines, beads and necklace, pestle, axes, worked stone, mortar, stone chisel, loom weight, spindle whorl, and one animal horn. In the eastern part of the area close to the kiln, there are accumulation of the small cultural finds while the western part id almost empty. Therefore, a division of areas for practicing different activities can be assumed.

Daily life activities particularly weaving evidence has been identified in this house (Çilingiroğlu 2011). An interesting concentration of loom weights together with one stamp in this building could be a good indication for interpreting this area where textile related activities such as weavings and stamping them were performed (Çilingiroğlu 2009).

Presence of portioning walls which divides the inner part of the building is noticeable too. As a result of presence of mudbrick pieces, a second floor for this area can be supposed.

2.5.4.3. Open area (the street)

The open area is located between the buildings 42 and 52 (Figure 14). A noticeable number of cultural remains have been recovered from this unit including figurines, ezgi tasi, hand axe, pestle, bone tools, awl, sling missile, complete ceramic vessels and marine mollusks. The definite function of this area hasn't been attested yet, while its architectural features, and the high fragmented remains recovered from there can be indications for a kind of public place or 'street'.



Figure 14. The open area (street) (IVb).

2.5.4.4. The Workshop

This area comprises at least five adjacent and interconnected buildings (55, 56, 60, 61, and 62) in the Level IVc (Figure 15) (Çevik forthcoming). However, it requires mentioning that

the function of this 5 units through the similar material remains and architectural units have been identified by the excavator as interconnected units where connected activities (producing pottery and grinding seeds) were performed. Therefore, the faunal remains recovered from these units have been studied together. For the further studies, a unit based study of the faunal remains from these buildings will be performed.



Figure 15. The workshop (buildings 55, 56, 60, 61, and 62) (IVc).

2.5.4.5. Building 55

Building 55 is 16 m² big in size and is characterized by the presence of working area arrangements (elevated stone-paved and mud-plastered platforms) (Figure 16). The main in situ remains in this

building consist of 2 ovens, and 15 grinding stones (only 6 of them in situ) on grinding installations which were set against the western and the southern walls of the building. High amount of red pigments (more than a dozens of clay loaves), six polishing stones, two clay vessels filled by the red pigment. A bone tool in the shape of a point has been uncovered inside of one of these vessels. Clay loaves and lumps of the red pigments ready for utilization are found frequently in the building (Çevik & Abay 2016).

The red pigment has been identified as hematite originated from a region 5 km far from the site. The presence of an unfinished vessel produced by the coiling technique as well as a several peculiar circular flat plates which has been functioned as a base for producing potteries in this technique supports the function of the buildings as pottery workshops (ibid 2016).



Figure 16. Building 55 (IVc).

High concentration of bone tools including spatulas and point, several polishing stones, and grinding stones (Figure 17) are the other characteristics of these buildings which support the possible function of the building as a pottery production area (ibid 2016).

Red-slipped ware potteries, standing for almost 90 percent of the whole ceramics of this level, similar to the other sites in the region, can be another indicator of the special function of these buildings (ibid 2016).

It is worth noting that the whole related structures as well as the remains are heavily burned.



Figure 17. Archaeological remains from building 55. a. grinding stones, b. bone tools, c. vessels with hematite samples inside, d. unfinished vessels made by coiling techniques, e. hematite lumps.

2.5.4.6. Building 56

This building is located in the south of the building 55 (Figure 18). This building covers an area about 3.36 x 3.30 m. The eastern wall of this building has a circular shape with 80x70 dimensions and is plastered. One hole has been observed within the mentioned wall which has been functioned as storage by the excavator.

While excavating the building, the surface has been covered by collapsed roof remains which have been made by mudbrick blocks. Similar to the rest of the buildings in this area, building 56 also has been exposed to fire. Probably this has resulted in the collapsing the roof and therefore a high preservation of the cultural remains within this building.

3 hematite lump and, 3 complete and vessels in situ have been found in this building. One of the small vessel has been found on the immediate surface of the 2nd floor. However, no entrance has been identified for this area.



Figure 18. Building 56 (IVc).

2.5.4.7. Building 60

This building is located on the western part of the building 55 (Figure 19). Due to the presence of an entrance, the building 55 and 60 seem to be interrelated. There is evidence of some destruction from the Roman period which has been resulted to the destruction of the northern wall of this area.



Figure 19. Building 60 (IVc).

Parallel to the southern wall of this building, a platform made of cobblestone has been observed which covers an area about 1.2 x 2.3.

A grinding stone with 25X17 cm dimensions are of the other archaeological remains within this area. Also, a storage with 1 m in depth is also present in this area where a number of the material culture of this building were recovered from.

In the middle of the building, 3 post holes for supporting the roof are also present.

There are similarities between the archaeological remains recovered from the building 60 and 55. But due to their limited presence, the exact function of the building 60 cannot be identified. However, the presence of stone platform, grinding stone, pestle, clay lumps, and lime a similar function with building 55 has been identified as building where specialized activities including pottery production, and grinding seeds.

2.5.4.8. Building 61

This building is located between the buildings 60 and 62 and on the west of building 56 (Figure 20). It has a west-east orientation with 5 m length and 2 m wide. This pattern has given this area a corridor like architecture.



Figure 20. Building 61 (IVc).

It is worth mentioning that through the excavation it has become evident that the kiln recovered from the building 56 actually was located in building 61. On western part of this kiln, the second kiln by 100x80x75 cm dimensions have been identified.

Several blocks of mudbricks also have been encountered while excavating. High possibly it was the collapse of the roof. In the eastern wall of this area, there are evidence for two post holes and one pith which an accumulation of stone tools has been found. Two other similar to this pit have been found in the western of the building 61 and one behind the kiln.

A grinding area located in the west of this building is the other in situ artefact recovered.

There is a plastered channel with two in situ hand ax inside and also one pith as well as one miniature small *in situ* vessel.

In the center of the area and in front of the kiln, there is an ash pith which was filled by ash and no other artefacts has been recovered. One burned femur of squirrel is the only faunal remain has been recovered from it. In front of this ash pith, and on the wall an area similar to a storage has been found. It has a circular shape and has a foundation made of stone and is plastered. This has made the area divided to two main areas (east-west).

In the eastern section, 8 vessels and two grinding stones, and resources of lead and limonite have been encountered.

One of the vessels (labelled as vessel 3), which seems to be a storage vessel hasn't been backed. It seems to be left uncompleted! A stone which seems to be its cap has been put on this vessel.

2.5.4.9. Building 62

It is located in the south of building 61 and west of building 56 and shares the same walls with these buildings (Figure 21).

While excavating, noticeable amount of burned plasters have been found which seems to the remains of the collapsed roof. Several waste of bones and vessels have been found along with these collapse which were extremely burned as well.

In the northwest of this area, there is a platform made of stone. One grinding area in the western part of the building, two grinding stones, four storage vessels, 3 unworked deer antler,

clay lumps and an accumulation of stones on the immediate surface of the floor are the main cultural remains from this building.



Figure 21. Building 62 (IVc).

Some collapsed pieces of a kiln have been encountered in the area which seems there has been a kiln which were completely destroyed. Also due to the presence of some foundation made of stone, it can be supposed that there were some attempts for dividing area to different sections.

On the corner of the northeastern part of the area an accumulation of pig bones was recovered which are completely burned to black (Plate 3, fig k).

2.6. The end of the buildings

Similar to the Levels Vf, Vb, and Va, Levels IVb and IVc were destructed by a big fire. Widespread evidence for house burning in the Neolithic settlements all over Anatolia, Southeast Europe and Balkans have been studies extensively so far. This extensive phenomenon has been identified as one of the signs of cultural interactions between the

occupants of these regions or in some extents explaining the similarity in the concept of house among them.

There are argues for the nature of these phenomenon, if it was a deliberate action with meanings behind, or an accidental events and as a result of lack of knowledge for managing the fire within the buildings.

Maxim Brami (2014) argues for the symbolic concept of this activity which is dominant during the pottery Neolithic between c. 6500-5500 BC. In his on his study about 59 sites during the Neolithic and Early Chalcolithic the occurrence of systematic fire destructions from Central Anatolia to the west (including western Anatolia, Thrace, and Greece) particularly in settlements such as Çatalhöyük, Bademağacı, Höyücek, Hacılar, Kuruçay, and Ulucak somewhere around the second half of the 7th and the first half of the 6th millennium BC has been explained as a deliberate and “close”-related activities. The extent of this phenomenon within the region in a specific period of time has been interpreted by hm as a sign of strong interaction between the inhabitants of these regions. This interaction was something beyond a trading system of material culture. He believes that actually exchanging these practices led to the expansion of Neolithic packages beyond their core regions (ibid 2014).

The presence of material culture (ceramics, tools, and figurines) within some houses and the lack of any human skeletons can be supporting evidence for these explanation (ibid 2014).

There are some argues for this phenomenon as being the result of a conflict. However, Stevanovic (1997) correctly mentioned that in this situation as almost all the Neolithic settlements in the region have experienced this destruction, if the fire was as result of coercive attack, so who were the people responsible for these attacks?

She believes that considering these series of destructed houses by fire as a lucky accident cannot be the case. As this activity results in the preservation of the houses and no attempt for restoration of the houses after the destruction have been observed, she argues for a deliberate and symbolic action (ibid 1997).

Moreover, according to her experimental house-burning studies, she believes that igniting the houses which cay is the main construction material is very difficult if not impossible. Presence of wood beams as a flammable material can help starting a fire, while the presence of clay as well as limited number of beams cannot let the fire to burn for a long time. Also the fire resulting from these beams can make a low energy fire. All the mentioned reasons along with the evidence supporting the knowledge of pyrotechnology among the Neolithic farmers as

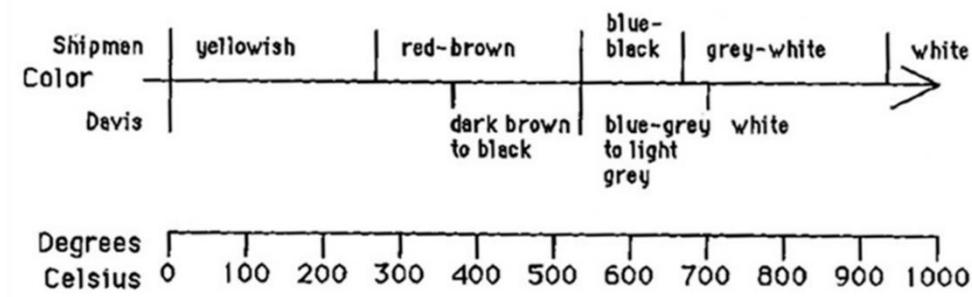
well as having completely burned horizons of fire destruction has enabled her to argue for the deliberate utilization of fuel for this activity and at the same time doing nothing to stop the fire. It is also mentioned in their study that the most difficult part of their experiment was their continuous attempt to sustain the fire (ibid 1997). Cobble paving under the fire installation for controlling the heat was observed many times in Ulucak Level IV (Çilingiroğlu 2009).

Also Mays mentions that a fire doesn't reach to its maximum temperature in less than two hours (Mays 1998). Therefore, in cases such as Ulucak where the houses even the remains within the houses are extremely burned, in a way that the majority of the ceramics from the workshop are completely deformed, we can suppose a fire which sustained for more than two hours.

Although the other factors including the season of fire, the direction of wind, and the environment of the settlement play crucial roles in inflammation and the duration of the fire, evidence in Ulucak also doesn't support an accidental fire in the settlement.

The studies at Ilıpınar VI, have estimated a temperature exceeding 1000 °C (Classz-Cooockson 2010). According the criteria suggested by Lyman (1994) based on the color of the burned bones recovered from the houses in Ulucak Level IV, the same temperature can be suggested for the fire in Ulucak as the bones which were subject to the heat have mainly in gray, blue, and white color (Figure 22).

It is worth nothing that not only Ulucak, but also the other Neolithic settlements in the entire Izmir region were abandoned for a long period of time around 5700 cal BC. Several explanations have been proposed for this simultaneous event including the 6200 cal BC climate change. However, evidence for the abandonments seem to have happened at least 300-500 years earlier than this climatic events. So far, the best explanation seems to be a possible conflict because of depletion of natural resources in the Nif plain as a result of increasing the population in the region and extensive exploitation of the resources in the region. This may have led to a competition between the inhabitants of the region which resulted in leaving the region for another land. The intensive fire in the level IVb and IVc could be a sign of this tension (Çilingiroğlu 2011).



Animal bone subjected to heating- colour graph (Lyman 1994).



Ulucak specimens

Figure 22. Estimating fire temperature based on burning color spectrum of Ulucak specimens (after Lyman 1994).

The Neolithic levels ended up with a conflagration around 5800/5700 BC, a culture with different cultural remains including dark faced burnished ware potteries and flimsy architecture which has been characterized as the Early Chalcolithic period (Level III) (Çevik & Abay 2016).

2.7. Subsistence economy of the settlement: Previous Zooarchaeological studies of the settlement

The cultivated plants are mainly einkorn wheat (*Triticum monococcum*), emmer wheat (*Triticum turgidum* ssp. *dicocon*), barley (*Hordeum* sp.), durum wheat (*Triticum aestivum/durum*) and free-threshing wheat as well as sheep, goat, cattle and pig are the main herd animals (Çakırlar 2012).

Except for a limited number of faunal remains (307) from the Levels IV, Va, and Vb which were studied by Trantalidou (2005), extensive zooarchaeological studies have been done by Canan Çakırlar on the Neolithic faunal remains of this settlement. These studied remains were

recovered through the operations from 2009 to 2012. The main concentration of this study was investigating the beginning and evolution of animal husbandry practices in the region as well as the role of Central-West Anatolian cultures particularly Ulucak Höyük in the expansion of animal husbandry technologies into the Southeast Europe.

Accordingly, the main attention has been focused on investigating the domestication status of main herd animals as well as the status of secondary products during Neolithic phases of the Höyük.

In general, the zooarchaeological study in Ulucak Höyük has revealed valuable information in both site and regional scales.

It has shed light on the main subsistence economy of the region since the beginning of the settlement (7th mill BC) to the younger phases of the Neolithic in which the domesticated Caprines as well as cattle and pig were the main components and through the time with some fluctuations and giving some more importance to the wild hunted species such as fallow deer and Hare in food package during the younger phases. The main herding techniques started from the meat production accompanied with milk exploitation (from Caprines and probably cattle) in the later phases.

In the bigger arch, archaeofaunal studies in Ulucak along with the other researches in Aegean Turkey (Yeşilova, Ege Gübre, Çukuriçi, and Dedecik Heybelitepe) can make the picture of food-producing communities in this region clear. However, limited zooarchaeological studies and publications from the majority of these settlements are of the main problems which can be faced to while doing this research.

Based on the publications from Ulucak (Çakırlar 2012 a, b), and Çukuriçi Höyük (Horejs et al. 2015) the present picture stresses on the status of domesticates in the Central- West Anatolia, outside their natural habitat as well as expanding the Neolithic way of life west of the core regions. This is while it demonstrates how diverse and complicated are the Anatolian Neolithic cultures than what has been considered before. In the light of this study, the Ulucak Höyük has been proposed by Çakırlar (2012a, b) as a probable passage of domesticated form of Caprines to the western Aegean (Knossos) at the beginning of the seventh mill BC. Moreover, it has attested the noticeable role of domesticated cattle and pig during the Late Aceramic Neolithic cultures, and the necessity of parallel zooarchaeological and palaeogenetic studies in the other settlements in the Central- west Anatolia, the Lake District, and western Aegean as well as

In order to fulfill these aims, NISP and WIS as the quantification systems as well as the mortality profile and sex ratio for interpreting procurement strategies have been used. The main aspects of producing mortality profile were observing fusion and ossification states of limb bones as well as tooth eruption and wear pattern. Non-metric observations on ruminant acetabular, horn core morphology, canine teeth in pig, and sexual dimorphism were the investigated factors for sex determination of the individuals.

In total 21,852 (112 kg) hand-collected vertebrate remains were studied for this research from the all three phases of the Neolithic (IV, V, and IV). However due to the presence of a building with a massive stone foundation with unknown function in the Level Vd, it has been decided to study faunal remains of these phases under four different clusters including Level VI, Level V Late (Va-c), Level V Early (vd-f) and Level IV.

The results of this study by Çakırlar (2015, 2012a, b) can be summarized as follows:

A limited number of complete skeletal elements in the assemblage are indicative of high level of fragmentation as well as low level of preservation. These all have made a noticeable portion of the assemblage (57%) to be recorded as unidentifiable. However quantified analyses (Z-test, and Chi-square test) have showed low differences in taphonomic biases in the assemblage which has made diachronic studies possible.

The main taphonomical processes which were responsible for the fragmentation of the specimens were identified as burning which heavily disturbed remains of Level IV, food processing activities (marrow and grease extraction), and tool making which were frequently seen in the Levels VI, V Early and IV as well as carnivore gnawing which was an important factor at bone fragmentation in the Level IV.

Investigating the factors such as percentages of the complete skeletal elements as well as specimens mean weight are indicative of high level of fragmentation of the faunal remains. This has been approved through the negative correlation between the mean weight of fragments and the proportion of unidentified vertebrates. For instance, during the Level V late medium sized mammals reach to their highest mean weight (5.7g) while it has the lowest traces of breakage induced by marrow and grease extraction (0.10%) in comparison to the other phases.

Since the beginning of the settlement (beginning of the seventh mill BC.), the main subsistence economy was based on all four initial herd animals (sheep, goat, cattle, and pig). Cervidae family (fallow deer, red deer, roe deer), European hare, tortoises, birds, fish, and mollusks were the other components of the subsistence economy of the settlement throughout

the whole Neolithic period. Leopard, red fox, beech marten, European badger, rodents, reptiles, gilt-headed sea bream consist the other identified taxa in the assemblage.

Regarding the domestication status of the main herds in Ulucak, it seems that since the beginning of the settlement in Ulucak domesticated sheep and goat were present in the settlement and were exploited as the main source of meat followed by domestic cattle and pig.

Cattle has always been an important source of food in all Levels of Ulucak and comprising at least 15% of the whole food remains during the Neolithic phases particularly during the Level IV. Concerning domestication status of the main ungulates in the settlement, LSI method after Meadow (1999) has been applied. The LSI of the cattle demonstrates that except for a limited number of larger specimens in the Levels VI and V Early, the majority of the Ulucak cattle were smaller than the standard female aurochs. It is an indicative of the exploitation of the smaller and morphologically domestic cattle from the beginning of the settlement along with a limited number of aurochs.

Data on reconstructing kill-off pattern and long bone fusion of cattle reveals a changing trend in herding strategy of the cattle from optimizing beef production from the beginning of the settlement up until the second half of the seventh mill BC, to probably some new aims. Lack of noticeable pathologies on cattle bones makes using cattle for the traction less possible. In order to identify this new herding system aims, reconstructing culling pattern of Cattle based on their mandibles is the best method. However, due to a limited number of preserved cattle mandible, Caprine kill-off pattern has been used for this study.

The culling rates of Caprine from Neolithic Ulucak was representative of a major change in Caprine exploitation particularly at the younger level of Neolithic Ulucak through keeping animals until the end of their productive and reproductive age most probably for exploitation of their milk, as well as the other secondary products such as fleece. This new trend accompanies meat exploitation increase through small and large hunted games such as hare and deer. Several possible reasons have been proposed for the increasing the number of hunted species during the Later phases of Neolithic.

Also, the presence of large storage facilities and wheat in a different and more concentrated distribution during the Level IV has been interpreted as some major changes in the society which require more concentrated, optimized exploitation of the resources and more intensified economic activities.

The natural behavior of the wild animals particularly deer and hare as a danger for the crop fields can make people targeting these animals. These can lead to increasing the number of these animal's skeleton within the archaeological contexts.

Changes in the environment (particularly the global climatic changes of 6200 BC) or the deforestation as a result of anthropogenic activities have also been suggested as possible reasons for increasing the deer populations and pushing them to the settlements zones.

Sheep and goat always comprised the highest species among the domesticated food animals in all the four phases. The ratio of sheep to goat is 3:1 in almost whole phases of the Neolithic as an indication of the more pronounced role of sheep than goat in the subsistence economy of Neolithic Ulucak. In the Level V, there is a slight decrease in Caprine importance which is as a result of increasing pig proportion.

The Logarithmic size indices of the Ulucak sheep reveal the dominance of smaller individuals than the standard wild female sheep which is comparable with Central Anatolian and Lake District sheep but smaller than the PPN sheep in Central Anatolia. This can be an indication for the absence of *Ovis orientalis* in the region and arrival of sheep in the Central-west Anatolia in its domesticated form through the expansion of Neolithic way of life. It is the same case for the goat while the number of individuals bigger than the standard goat is higher and is comparable to Aşikli Höyük, Şuberde, and Direkli goat mean values. For the both goat and sheep, LSI is an indicator of herding system which was based on keeping more number of females to the adult age.

Pig also has always been an important part of the subsistence economy of Ulucak during the whole Neolithic period particularly during the Level V late. The logarithmic size indices of pig remains are indicative of the presence of mainly domesticated pig which is smaller than the standard female wild boar along with some larger probably hunted wild individuals, particularly during the Level IV. Molar teeth measurements, as the best indicator for the domestication status of pigs, supports this result too. Both methods for creating kill-off pattern of pig present the same pattern; domination of juvenile culling and letting a little number of individuals to reach to the older ages.

DNA data has suggested a southwestern lineage origin for the main herds as well as western Anatolian origin haplotype for the pigs of Ulucak which can be as a result of interbreeding of local wild boars and domesticated pigs with the southwestern Asian origin (Ottoni et al.2013). This Neolithic package is only present in the contemporary (7th

millennium BC) sites of Bademagaci (De Cupere et al. 2008) in the Lake District and Knossos on Crete (Isaakidou 2008).

Among the hunted species, Cervidae particularly the fallow deer has the highest number among the other particularly in Level V late and later. The same case works for the European hare which has been proposed as an evidence for increasing hunting during the later phase of the Neolithic Ulucak either as a supplementary source of food or protecting the crop fields from getting harmed by the animals. Possible impacts of 6.2 ka climatic change or the anthropogenic deforestation could be the other explanation for increasing the number of fallow deer and hare.

Except for the Level IV, there are a limited number of dog bones as well as specimens with carnivore activity traces. However, through the later phases, there are numerous examples of partial complete skeletons of dogs. However, none of them carry traces for indicating human consumption possibility.

The presence of marine fishes such as gilt-head bream (*Sparus aurata*) and sea bream (Sparidae) as well as several examples of marine mollusks and Melian obsidian has been revealed the possible connection between the Neolithic Ulucak and maritime regions.

The secondary products technology particularly dairy products, particularly from cattle, were the other question which was trying to be explored through archaeofaunal studies in Ulucak. The main aspects which has been used to the detectability of Ulucak people for dairy products were the mortality profile of the domesticates (after Payne 1973) and diachronic changes in the contribution of cattle to the subsistence economy of the settlement with reference to Evershed et al. (2008).

Aquatic mollusks studies by Canan Çakırlar (2015) Also revealed some other aspects of the Neolithic subsistence economy of the Western Anatolia and the status of wild resources exploitation particularly marine mollusks for the Neolithic and Chalcolithic settlements.

It seems that the exploited mollusks had functions other than a source of food in both Ulucak and Barcın Höyük particularly for producing ornaments and another aspect of the inter-regional relationship and exchange between the settlements in this region.

The marine mollusks were transported from the coastal regions to the inland settlements as both consumptions and ornament production and this trend continues till the Late Chalcolithic.

In level VI Ulucak similar to the Level IV in Barcın as well as Çatalhöyük, there are perforated mother-of-pearl shells. This is while contrary to a vast number of waste of shell production or unfinished shell ornaments in Ulucak level IV, no similar evidence retrieved from Barcın so far. The same case works for the presence of Dentalium and Spondylus beads in Barcın contrary to Ulucak (Çakırlar 2015).

During the second half of the 7th millennium BC, transportation of marine shells to the inland sites increases with ornament production functions. From Ulucak Level IV as well as Ege Gübre, there is evidence for “Pintaderas” made of *Bolinus brandaris* shells which had the same function as stamp seals.

The initial utilization of shell marine in both early Neolithic settlements of eastern Aegean (Ulucak VI and Barcın VIe) was non-dietary and mainly for ornament production. These were including worked fragments of mother-of-pearl, *Nassarius*, *Columbella*, *Conus*, and *Mondonta* shells in the shape of rings. This is while in the later phase of the Neolithic, it is assumed that some rare marine shell species such as *Cerastoderma* and *Macra* were brought to the site for the consumption. This trend continues till the Late Chalcolithic as well (ibid 2015).

In Ulucak Level V and IV, *Cerastoderma*, *Arca*, and *Macra* shells are the most widespread taxa mainly found within middens. Çakırlar (2015) believes *Macra* and *Cerastoderma* shells were brought to the settlement while they were still alive and tend to have more dietary than the other functions.

The marine remains from the Çukuriçi VIII and Ulucak V and IV represents a reverse trend. It has been interpreted either as a pre-selection of shells before the transportation by the gatherer, as a different desire and preference of the receivers, or a kind of competition between the two groups (ibid 2015).

Increasing the accumulation of *Pinna* shells and bivalves in Ulucak Level V and IV, is an indication for transportation of marine shells, mainly in the empty shape, to this settlement for the purposes such as ornament production (ibid 2015).

The mentioned studies, have given us the broad diachronic picture of the subsistence economy of Ulucak during the whole Neolithic phases, including their main taxonomic components, the kill-off pattern of the Caprine and cattle, their possible domestication status, the role of hunted games in their diet, as well as the possible interaction among the Neolithic settlements in the Aegean through trading the marine resources.

CHAPTER 3

METHODOLOGY

3.1. What is zooarchaeology?

Environmental archaeology has four main sub-disciplines including archaeobotany, zooarchaeology, bioarchaeology, and geoarchaeology (Wilkinson & Stevens 2003). Zooarchaeology (also known as archaeozoology) refers to the study of fossilized faunal remains from archaeological contexts which are associated with human habitations. These remains are consisting of hard parts of animal skeletons including bone, tooth, shell, and in some cases hair and wool. Accumulation of these remains in archaeological contexts is as result of animal exploitations by humans as a source of food, transportation, decoration, or only co-existing (Davis 1987:19).

In the majority of excavations before 1960, animal remains were not even collected during the excavations. It was only during the 1970s with the advent of processualist approaches animal bones as a valuable source of information have become questioned (Ruscillo 2014). publications of faunal remain study results from Jarmo Shanidar and Zavi chemi in Iraqi Kurdistan, as well as Tepe Ali Kosh and tepe Sabz in Dehloran plain has enlightened the necessity and the value of zooarchaeological studies.

3.2. The main aims of Zooarchaeology

The main aim of this discipline is understanding the Human- environment interactions particularly human- animal relationship and the consequences of these interactions for both human and animals and as well as the environment (Reitz & Wing 2008:1). Zooarchaeology deals with questions such as animals pre/domestication status and origins, fauna and climate of regions, subsistence economy of archaeological settlements, their level of animal husbandry technologies (such as secondary products), storage, tool making, status of animals in ritual activities and taboos (social zooarchaeology), trading systems and marketing, human

social organization or to sum up the human past behavior. Concerning the main questions in zooarchaeology more details will be explained here.

3.2.1. Primary products exploitation

Human's subsistence economy is a product of their interaction with their environment and is highly dependent on the biological, cultural, and ecological factors (ibid 2008:252). In this sense zooarchaeology can basically be defined as "the study of the garbage of the ancient people's meal" (Davis 1987:19). Therefore, one of the primary aims of zooarchaeology is identifying the diet of ancient people as well as their cultural, biological and ecological aspect through studying the animal bones or better to say their organic garbage.

3.2.2. Secondary products

Secondary products refer to all resources that can be extracted from domestic animals during their life as opposed to after death, including milk, blood, dung, fiber, and labor/traction (Orton 2013). Therefore, one of the other main aims of zooarchaeology is investigating the ancient human's level of technology for exploitation of secondary products. The initiation and the scale of secondary products exploitation can reveal valuable information regarding the development of human economic system through the time.

Recent studies by Vigne and Helmer (2007) have revealed the evidence for the value of lifetime products from the ninth and eighth millennium BC settlement such as cattle traction and fiber for the PPNB sites in Syria as well as mixed meat and dairy production for early Neolithic sites such as Cafer Hoyuk, Tell el-Aswad, Tell Halula etc. (Peters et al. 2014).

3.2.3. Domestication

The initial management and domestication of main herd animal and plant species have always been a focus of attention among archaeologists and zooarchaeologists. Domestication can be defined as a sustained and mutualistic relationship between human and animals in which both of them can have their own benefits. In the process of domestication, human has control over

the reproduction, movement, protection, and nutrition of domesticates in order to get a secure source of food and energy as well as animals which can reproduce safely (Zeder 2014).

Tracking the locations, triggers, processes and the consequences of initial domestication has been one of the primary aims of zooarchaeology.

3.2.4. Reconstruction of past environment

Faunal remain studies can reveal valuable information for reconstructing past environment. The presence or lack of presence of specific species of animals and plants are the keys to this study as the dietary and climatic preferences of animals and plants have always been the same (Davis 1987:61). Accordingly, zooarchaeology is able to answer questions regarding the past environment of a region and its possible changes through the time by studying the faunal remains.

3.2.5. Human social organization

Having passed with the more straightforward questions such as the diet of the inhabitants of a settlement, zooarchaeology can reveal some other aspects of human culture including the social aspects of human life. Social ties, inequality, (gender) identity, ethnicity, specialization, household status, everyday activities of people, their use of space, feasting and sharing, and similar questions can be answered also through faunal remain studies.

Considering aspects such as the present type in each unit, kill-off patterns of them, their body part representations, butchery and cooking traces on bones, evidence for secondary products, consumption and discarding patterns, technological activities with them and etc. Within their own contexts are keys for answering questions regarding the social aspects of past human life (Russell 2012).

3.2.6. Materials and their contexts

Accumulation of animal bones in archaeological contexts is as a result of human-animal interactions for the purposes such as providing nutrition, tool and ornaments making, medical

purposes, providing hair, wool, and hide, transportation, as a building material or providing fertilizer, and symbolic or ritual associations (Reitz et al. 2008:6-7).

While studying the faunal remains it is very necessary to consider the nature of each context along with the other archaeological remains recovered from it. This variability can reveal a lot about the nature or function of each context and the possible kind of activities could be carried out there.

While studying a faunal assemblage, considering the site formation process as well as excavation procedures is of a great importance. They can reveal valuable information regarding the taphonomic history of the assemblage which has a great influence on the final synthesis of the research (ibid 2008:8).

3.3. Methodologies and recording systems

In this level, every single specimen is recorded in a Microsoft Access database. There is several information which is required to be recorded in the database anytime present. This information is the contexts and their dating, excavation and study date, element represented, specimen count, the present zone/s of per element, taxonomic identification, side, weight, ageing, sexing, taphonomic observation, measurement. This information is primary data and needs to be processed in the later levels.

3.3.1. Identification

Having dug, cleaned and sorted to the area and context level, next step will be the identification of the finds. In this step, each specimen is identified to the level of element and species of the animal. This identification requires basic biological and ecological knowledge including animal anatomy and taxonomy. There are two tools for this level of identification; animals reference collections in laboratories, and atlases of comparative osteology.

3.3.2 Anatomic attribution

In this step, faunal remains are identified to the level of anatomy (Figure 23). This can be done through the presence of diagnostic landmarks such as articular surface, and muscular attachments. The remaining specimens in which these landmarks are not present are recorded under the unidentified category. (The list of skeleton elements will be attached). In this level, we still need to divide unidentified specimens to either flat (such as vertebrates, scapula, pelvis, etc) or long bones (femur, tibia, metapodial, etc.)

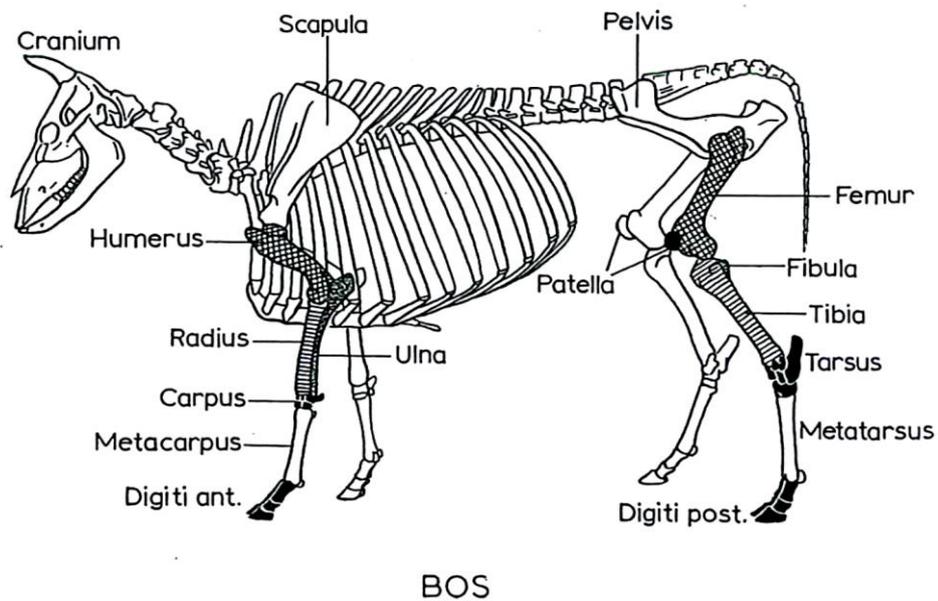


Figure 23. Anatomic identification of specimens (Schmid 1972).

3.3.3. Taxonomic attribution

This step is assigning the identifiable faunal remains to a taxonomic category. Every specimen needs to be identified to some level. However, majority of the faunal remains are often defined as unidentified as they cannot be assessed to the level of anatomy, species, genus, family, order, or size class.

In this research we have used the size system in which according to the size and the cortical thickness of unidentified specimens we assign them to four categories including sheep size, pig size, deer size, and cattle size. Both anatomic and taxonomic identification has been done

by making a comparison with the modern reference collections. This comparison is possible as except for some small changes in size, wild animal in archaeological remains resemble their present-day descendants. In the absence of reference collection, atlases are the best tools for the identification. They provide a detailed drawing of different species which makes identification of faunal remains possible. The main bone atlases used in this study are (Pales & Garcia 1981; Boessneck 1964; Clutton Brock et al. 1990; Zeder & Lapham 2010; Payne 1973; Vigne & Helmer 2007).

All of these steps are subject to bias as the identification is only based on the morphological resemblance of bones to the reference collection (Reitz et al. 2008: 164). Therefore, in the next steps, it is important to be careful while interpreting the primary database.

Hence we can say almost all of the specimens in an archaeological assemblage are identifiable but at different levels (some to the level of taxonomy but some other to the level of family or size).

3.3.4 Quantification

There are several methods for specimen counting in zooarchaeology such as NISP (Number of Identified Specimens), NR (Number of Remains), MNI (Minimum Number of Individuals), WIS (Weight of Identifies Specimens) which is used to estimate relative frequencies of taxa in an assemblage. Relative frequencies of taxa in an assemblage can reveal information such as past environmental situation of a region, taphonomic processes, recovery and sampling biases, as well as favorable species of animals used by different cultures, age and sex ratio of animals, trading systems and much more questions which all can be explored with a diachronic and synchronic point of view (Reitz et al. 2008:202).

All of these counting systems are subject to bias. Therefore, based on the preservation of the faunal remains along with the research question different counting systems can be used. One of the main methods for quantification of the faunal remains is NISP. NISP means “The Number of Identified Specimens”.

Davis (1987:35) has introduced at least three of these bias sources including unequal recovery of fragments during the excavation, unequal number of diagnostic bones in different species, and the differential fragmentation of bones.

There are some suggested solutions for these biases. For instance, before doing the calculation, body-part representation needs to be checked particularly in the excavation where the faunal remains were recovered by hand collecting and without sieving. Hand collecting faunal remains during excavation has a great negative influence on the recovery of smaller bones particularly unfused epiphyses of young individuals. This biased collecting method favors the recovery of easily recognizable elements particularly large mammals, long bones, and mandibles. In the case of any discrepancies such as the absence of smaller species element, it has been suggested to calculate the species frequencies based on easily visible elements such as mandible (Davis 1987:36).

Regarding the different element number in different species (for example a horse has only one metapodial while a pig has four of them) there should be some arithmetic manipulations in order to make final species spectrum more standardized. Davis (1987) suggests solutions such as doubling the equid phalange counts and excluding the pig lateral metapodials.

Eventually concerning the fragmentation bias John Watson (1979) suggested “diagnostic zone” calculation. As each zone is small and unlikely to be fragmented, counting the diagnostic zones makes counting the same bone more than one time impossible (Davis 1987:36)

3.3.5 NISP and diagnostic zones

One of the main specimen counting systems which are used in the majority of studies is NISP which is used to estimate the relative frequency of taxa in an assemblage. NISP as well as the other counting systems have its own criticizes. There are claims for application of NISP as it is unable to bypass problems such as taphonomic processes and it counts every single identified specimen as if they all have had an equal opportunity to survive and recovered in an assemblage. This is while the presence of a different number of elements in different specimens, different bone size, thickness and resistance, and much more human and non-human taphonomical processes have great influences on archaeological bone assemblages. One of the main suggested solutions for remedying these biases is dividing NISP either by the number of elements per taxon or by the number of identifiable elements per taxon (Reitz et al. 2008:204). In this research NISP has been used as one of the main quantifying systems Moreover, skeletal frequency method (frequency of different parts of the skeleton of different species) within each context and building and in comparison to the other building will be

applied. These approaches together will help to eliminate the level of bias in this research. Skeletal frequencies make determining the elements which could have been more valuable or practical for the inhabitants possible as well (Ibid P: 215).

3.3.6. WIS

There is a direct relation between the mammal's skeleton weight and their meat weight (Davis 1987: 36). Therefore, WIS can be used for estimating the amount of protein which could be obtained from a herd population as well as quantifying the degree of fragmentation for different taxa, spatial and temporal distribution of specimens, and relative size of specimens in an assemblage. However as there are so many taphonomical factors such as burning and fragmentation influencing the weight of faunal remains, they cannot be the direct representation of the mentioned aspects. Nevertheless, none of these issues should avoid us from quantifying the specimen weights. Even, the ration of the NISP of each taxon to their total weight can work as a great tool to estimate the level of fragmentation in each unit and in comparison to the other buildings.

3.3.7. Taphonomic observation

The term Taphonomy means “the study of the transition of animal remains from biosphere into lithosphere” as defined for the first time by the paleontologist I.A. Efremov in 1940. This term has found its way to archaeology when the understanding of early hominid evolution became more popular among archaeologists. Questions regarding the formation process of archaeological remains and distinctions between naturally modified bones from the ones which were modified by human agents have triggered the taphonomical studies among archaeologists. Nevertheless, in zooarchaeology, we can define taphonomy as “the study of the postmortem transformation of living organisms (in this case Animals), into a geological mode of occurrence. The study includes the processes that transform animal bones before, during, and after burial (Lyman 2010).

However, incomplete and biased archaeological records, as well as equifinality have made reconstruction of archaeological formation processes a demanding if not impossible job.

The term 'equifinality' for the first time was proposed by Ludwig Von Bertalanffy as "same final state from different initial state" in an open system (Lyman 2004). This term has been applied and expanded by many archaeologists and zooarchaeologists. According to this concept, different taphonomic causes can be responsible for a specific characteristic of an assemblage. Therefore, while studying the faunal remains and the formation processes which resulted in their accumulation, all the possible taphonomic causes need to be considered (ibid 2004).

Each archaeofaunal assemblage before arriving at the laboratories to study pass a lot of processes. Some of these factors can be controlled by archaeologist to decrease the level of bias while some other cannot.

This process starts with the human choice for hunting or slaughtering specific species of animals with the specific age and sex. This animal is butchered by particular techniques. All the mentioned choices can differ from one culture to another. Depending on the human choice, all or some skeleton parts of the animal have been transferred to the site. Since then the both human and non-human agents have great influences on the formation process of the faunal remains. These factors are butchery, cooking, disposal, secondary use (for making tool, glue, fuel etc.) and the other processes after the disposal such as getting stepped by human or animals, weathered, modified by animals living in the site (carnivores or rodents), and through the time lost by soil erosion or sub-surface decay. Therefore, having passed all these steps, the archaeological remains are not including all the remains of all the animals used by people living at the site.

The majority of these processes cannot be completely controlled or identified by zooarchaeologist. However, the choice of the excavation area, recovery methods (through hand collecting, wet, or dry sieving), analytical procedures and publication are procedures which can be controlled by the excavator and zooarchaeologists to control the level of bias (Davis 1987: 22).

Less uniform contexts in terms of preservation, color, and burning level with a high possibility have passed different taphonomic history in comparison to the more uniform context.

In general modifying factors can be categorized as below:

3.3.7.1. Human modifications

The majority of archaeofaunal assemblages are the garbage of ancient people. A set of activities such as butchering (cut mark, percussion mark, chop mark), roasting, fragmenting to get the bone marrow, tool making, discarding, and unintentional trampling are possible modifications by ancient people (Lyman 1994). Documenting these traces can provide valuable information regarding the past human behavior and site-formation processes in an assemblage.

Some of these events can be identified through the traces they leave on bones. The sharp and straight edges of a broken bone through a deliberate percussion, simple and irregular breakage through trampling, roasting through changing bone color from brown to black (in case of very high temperature to gray, white and light blue), marrow extraction by spiral breakage, and tool making through straight breakage on the medial shaft of long bones (for the waste parts of tool making) and polished, smooth edges of the worked bone and shiny surface.

The type and location of cut marks and chop marks can be an indicator of animal uses, as well as information such as the identity of the butcher and the consumers, presence of meat marketing (specialization) or household exploitation, feasting and much more relevant information (Reitz et al. 2008:242).

According to the studies by Baby (1954) and Binford (1972) about the incineration of bones, there are some criteria for the distinguishing dry, in-flesh, and green-bone burnings.

There are numerous factors such as the length of the burning, the type of flamed material, and the proximity of the bone to the heat can heavily influence the level of burning and therefore the color of bone. However, in general there some suggested criteria which makes distinguishing dry from green bone burnings.

The occurrence of warpage, deep diagonal fractures, or deep checking, cracks in the length of the calcined bones, as well as having a uniform color can be representative of bones which were subject to fire when they were green or fleshed. Presence of organic material such as skin, meat, or fat on the bone fails a uniform color on the bone (Baby 1954, Binford 1972).

3.3.7.2. Non-human modification

Non-human modifications can be divided into two different categories; animal induced modifications (carnivore, and rodents) and geological factors.

3.3.7.3. Animal induced modifications

Carnivores particularly the ones living close to human settlements such as dogs and boars (omnivore) break and chew long bones and swallow the smaller fragments (smaller than 2.5 cm). All these leave heavy traces on bone. Dog claw marks as well as biting and chewing can easily be identified on the bone surface.

Smaller specimens after getting swallowed either vomited or passed out. Carnivores' stomach juice heavily attacks the bones resulting in either complete disappearing to deforming the fragment. Digested bone is easily recognizable through its shrunk form and shiny surface.

Mice and the other rodents either living close to human settlements or the ones found their way to the archaeological deposits can also heavily attack bones. Chewed bones can easily be recognized through the bone surface with continuous parallel teeth marks.

Animal dead bodies can later enter to the archaeological assemblage as well. These intrusive specimens need to be excluded from the original assemblage while doing the analytical assessment.

3.3.7.4. Geological factors

The environment of bone has a great influence on its preservation. There are several characteristics of soil which can deteriorate bones preservation.

One of these factors is the pH scale of the soil. Soils with a high level of acidity can degrade bone. Plant roots are the sources for soil acidity which can result in etching the bone. High temperature can increase the bone deterioration as well. Pressure on the bone is the other factor which triggers bone loss and can make bones to lose its original shape.

In the case of Ulucak as a multi-layered settlement (From Neolithic to early Byzantine), pressure plays a great influence on the poor preservation level of faunal remains.

3.3.7.5. Bone density

Another factor which is responsible for unequal representation of the skeletal elements in the archaeological assemblage is their different resistance (Ioannidou 2000). She has worked on the correlation between the breakage pattern of different species and their bone density. The result reveals there is a positive correlation between the bone density of different species and their occurrence in archaeological contexts. i.e. the bones with higher density have higher resistance to taphonomical process, and therefore, higher chance of preservation in archaeological contexts. It has also revealed the pattern of element survival for many species are similar which means the same elements from different taxa have comparable bone density, hence more comparable chance for their preservation in archaeological faunal assemblages.

3.4. Provenance of the materials, approach and methods of the thesis.

Ulucak Höyük is a multi-layered settlement that was occupied from the Neolithic to the Early Byzantine Period (6800 Cal. BC- 330 AD) in the Aegean Anatolia (figure 1). Three Neolithic phases have been identified in this settlement which are labeled as VI, V, and IV from the earliest to the latest. At Level IV (6000-5700 Cal. BC), the excellent state of preservation of the archaeological remains has enabled us to analyse in details the character of Late Neolithic buildings. In this study four, seemingly residential buildings and non-domestic areas are included. More detailed, the area consists of two residential units (buildings 12 and 52-Level IVb), an open area (labeled as street by the excavator) (level IVb) and a group of 5 non-domestic, interrelated spaces (buildings 55, 56, 60, 61, and 62- Level IVc). The Level IVb has been dated to 5040- 5710 cal BC and the Level IVc to 6005-5740 cal BC (Çevik, pers.com.). In this level, a high number of various animal remains of domestic and non-domestic species were collected, including domestic sheep, wild and domestic goat, domestic cattle, pigs, fallow deer, red deer, Canidae, hare, testudo, and marine molluscs.

The main approach in this study in the first level is analysing the subsistence economy of the settlement during the Late Neolithic period based on the faunal remains of both domestic and wild animals recovered from the above mentioned contexts. Next, in order to understand the nature of economic strategies of the different units at Level IV, the distribution of faunal remains was analyzed in relation to the architectural features mentioned above. This is to investigate if the idea of *société à maison* (Strauss 1982), the individual house as a key concept

(Hodder 2013) stands for this period at Ulucak. Methodologically this approach is the same as the research of Twiss et al. (2009) in the sense that individual units are examined separately.

The differences in the distribution of the faunal remains amongst the different units was then evaluated in relation to the distribution of other artifacts, such as loom weights, spindle-whorls, figurines, ovens, grinding stones, bone tools, lumps of hematite, polishing stones, and storage jars, found within these contexts. This close observation can reveal more details of people's daily lives particularly their pattern of acquisition, production, reproduction, consumption, and disposal strategies.

Eventually, the revealed data has been examined vis-à-vis the suggested hypothesis regarding the advent of autonomous household and changes in social organization during the Late Neolithic in the Central Anatolia which is in contrast to the previous communal mode of life during the Early Neolithic. By evaluating the occurrence pattern of faunal remains along with the other features and artefacts within and between the houses we may be able to investigate the case of a "private economy", that is whether households undertook decisions and actions independently of community ties or whether they shared resources or perhaps a mixture of both.

In total, 3271 hand-collected vertebrate remains have been studied for this research. The assemblage is recovered from the trenches O13 (buildings 12, 52, and the open area) which were excavated during the 2013 and 2014 seasons and belong to Level IVb. Also the faunal remains from the workshop area are from the trenches M13 and M12 which were excavated during 2015 and 2016 operations respectively. Chronologically, this level has been labeled as IVc.

In order to secure that we study materials representing the exact time of occupation and use of the units, only the bones from the immediate floor surfaces and the bones recovered below the collapse of the roofs (fallen shortly after abandoning the house) were considered. In the case of the open area, only faunal remains from beneath the fallen wall debris of the building 48 have been studied. For constructing the analysis, the macrofaunal remains recovered by hand collection during the excavation have been used. As no wet or dry sieved remains are available at the moment, they will be included in the study in the future.

Both NISP (Number of Identified Specimens) and WIS (Weight of Identified Specimens) have been used in this study as the main quantification methods. The application of both NISP and WIS together can help overcoming possible quantification bias caused by fragmentation in the assemblage.

For the taxonomic identification of the specimens the criteria mentioned in the zooarchaeological atlases such as Pales & Garcia 1981; Boessneck 1964; Clutton Brock et al. 1990; Zeder & Lapham 2010; Payne 1973; and Vigne & Helmer 2007 have been used.

The high level of fragmentation, as result of various human and non-human induced agents have made 46% of the all assemblage unidentifiable. Therefore, the physical characteristics and the cortical thickness of each specimen have been used to categorize them to size levels including sheep size, pig size, deer size, and cattle size.

Reconstruction of mortality profile through producing fusion data of limb bones as well as tooth wear pattern are some of the ways for investigating the procurement strategies of a settlement. However, the high level of fragmentation in the assemblage did not allow performing any reconstruction of mortality profile, as well as biometry and investigation of the domestication status of species through LSI.

Having applied the above mentioned standard zooarchaeological methods, all the faunal remains recovered from the four units have been put together to investigate the main subsistence economy of these. This is done partly for presenting these new materials but also it is done in order to compare with the previous study of Çakırlar (2012a) and establish whether or not the bone assemblage from these units represent the same economy or are in any way exceptional.

The next step, is investigating the similarities and dissimilarities between the units studied based on their subsistence economy, exploitation, production, deposition, and the rest of daily activities performed within each unit. Here we are looking for evidence which can clarify ownership of resources among each unit, possibly different subsistence economy and practicing different economic activities which can be indicative for the development of independent households.

In order to understand the mentioned characteristics for the socio-economic structure of Ulucak during the early 6th Millennium BC, some factors have been investigated which are listed as follow:

1. The similarities and differences of taphonomic processes (breakage pattern, burning, and butchery marks) of the faunal remains recovered from each unit: This first step will be to examine the taphonomic biases that may have acted upon the bone assemblages so as to make sure that the different units are comparable. Observing the taphonomic factors including fragmentation level (the length of log bones), burning (their burning level based on their color (after Lyman 1994)), and butchery marks (number and type of butchery

marks including cut mark and chop mark) of bone assemblages within each unit can help us to investigate the taphonomic processes, level of comparability, as well as the level of contamination in each unit.

2. The status of domesticated and hunted game in each unit (based on both NISP and WIS): This next step is investigating the faunal composition in each unit in order to define “the household. Investigation of the value of each species based on their NISP and WIS in each unit is a way to understand the status of each taxon, the exploitation resource, the main subsistence economy, and the type of production activity which were performed within each unit and in comparison to the rest of the units. NISP will show us the value of each taxon in each architectural unit by its minimum number of presence. Skeletal elements will show us the value of different animal skeletal elements.

The premises are that if all the units show the same trends amongst them and with the “whole” undifferentiated bone assemblage then we can argue for no differentiation of units but rather similarity and uniform economic behavior. If in contrast, we locate differences then we can argue for households adopting independent economic strategies.” Moreover, an evaluation of the economy at Level IV based on the new findings from the units discussed in this thesis will be presented. These will be then compared to the previous work carried out by Canan Çakırlar (2012) at Ulucak and any other information we have in the region. This will enable us to understand the main exploited resources in Ulucak during the Late Neolithic period either as a source of food or technological activities. It is important to examine the materials in this way to clarify if the materials studied represent a similar picture with previous results or if they are “exceptional”. If the last is the case, we will have to consider what the reasons for this might be and evaluate if we can safely use the materials for investigating the household. If our materials are proven exceptional, obviously this should be taken into account. Here also the methods of NISP and WIS will be used.

3. The architectural information (the entrance location, interior arrangement, presence of courtyard) and the rest of cultural remains (their types and numbers) as complementary information have been considered as well: In addition to the animal bone evidence which are the main source of information for this thesis, knowledge gathered by other analyses will be considered as well. The distribution pattern of the rest of artifacts recovered within these units will be discussed to help understanding the nature of economic activities within each unit.

Relations between the long bone breakage pattern of the most widespread taxa in the settlement (Caprine and cattle) the number of bone tools and cooking related remains such as grinding stones found within each unit will also be investigated. This can help understanding the nature of activities which were operated within each unit (bone tool production, cooking, pottery making, textile production, etc.) and fine tune our understanding of the economic targets of each unit.

In this manner, we will examine whether or not we have evidence at Ulucak supporting the suggested hypothesis regarding the advent of autonomous household and changes in social organization during the Late Neolithic in the Central Anatolia which is in contrast to the previous communal mode of life during the Early Neolithic. Accordingly, in this study by evaluating the occurrence pattern of faunal remains along with the other features and artefacts within and between the architectural units we may be able to investigate the case of a “private economy”, that is whether households undertook decisions and actions independently of community ties or whether they shared resources or perhaps a mixture of both.

CHAPTER 4

ANALYSIS AND RESULTS

In this chapter the result of faunal remain studies from the four architectural units will be given.

In the first step, in order to understand the main subsistence economy of the inhabitants of the studied units as a whole during the Late Neolithic, firstly the general taphonomic study results of the assemblage will be given in this chapter. The general taphonomic evaluation is done in order to examine whether or not the various bone assemblages recovered from the four different units are comparable or not. The next step will be presenting the faunal remains study results for understanding the subsistence economy of each individual unit.

In the next step, we will try to investigate the existence of autonomous household during the Late Neolithic in Ulucak from a zooarchaeological perspective. The proposed answer to this question will be based on making comparison between the faunal remains from every architectural unit. Hence, this comparison will be applied firstly according to the main present taxa (their NISP and WIS) recovered from each architectural unit. This can reveal any similarity or differences between the abundance as measured by NISP and weight (and therefore the value) of different taxa in each building.

Before any attempt to study the data, investigating the taphonomic processes which the assemblage from each unit have passed seems necessary. It helps clarifying the comparability of faunal remains from each unit. Therefore, the in the first step, a comparison will be performed according to the similarities and dissimilarities between the taphonomic observation of the faunal remains from each architectural unit. The considered taphonomic factors are 1. skeletal representations, 2. Breakage pattern (length of Caprine and cattle long bones), 3. Tool production, 4. Faunal remains burning level, and 5. Number of specimens with carnivore gnawing and butchery marks.

Eventually, this information will be complemented by the rest of artefactual data from each unit.

4.1. General description of the assemblage

In total, 3271 faunal remains have been studied from the levels IVb and IVc. The bones originated from level IVb come from buildings 12, 52 and the open area (named street by Çevik, pers.com.) and level IVc workshop which includes 5 units (buildings 55, 56, 60, 61, and 62). Because the assemblage was very fragmented, only 54% of it could be identified and the rest of the assemblage (46%) has been divided in size categories: sheep size, pig size, deer size, cattle size, and unidentified.

4.1.1. Taphonomic observations

Examining the taphonomic biases that may have acted upon the bone assemblages can be a way to make sure that whether or not the faunal remains from the different units are comparable. Here the result of taphonomic observations of the faunal assemblage will be given.

4.1.2. Burning

One of the main limitations and difficulties for studying this assemblage is the high level of calcination of the remains. Almost 95% of the all assemblage from these four units are heavily burned. This taphonomic process has resulted in difficulties at observing the cut mark traces on the specimens, taking osteometric measurements, as well as sharp decrease on the actual weight of the assemblage.

There is a clear burning color spectrum in the assemblage starting from brown (lower degree, or high distance from the heat resource), to dark brown, black, gray, white, and blue (higher degree, or least distance from the fire). Studies by Lyman (1994) suggests 1000 ° C as a sufficient temperature which can turn the bone color to white.

Warping, deep diagonal fractures, deep checking, cracks in the length of the calcined bones, and uniform burning color have been suggested by Baby (1954) and Binford (1972) as the possible criterion for identifying the bones which were subject to fire while they were still fresh and green.

Observing the mentioned criteria on some of the specimens and lack of them on some other particularly on the worked bones is an indication of a mix of green and dry burning in the

assemblage studied for this thesis. Moreover, in the case of birds and canid specimens, presence of partial skeletons of hind limbs (astragalus, calcaneum, metatarsals, and phalanges) on their anatomic order is an indicative for in-flesh burning (plate 1, figs a-d). It is hard to quantify the exact proportions of bones burnt while green and the ones burnt when dry and evaluate the importance of such a differentiation because all the units studied were set to fire at the end of their life.

Since burning is almost uniform in all the bones from all the units we consider it not pose any particular taphonomic bias prohibiting the comparison between the assemblages of the different units.

4.1.3. Fragmentation

The level of fragmentation of the assemblage is extremely high in a way that 46% of the assemblage didn't carry any species related diagnostic characteristics and have been categorized only to general "animal size" level.

The ratio of the Caprine specimen occurrence (1259), as the dominant taxa in the assemblage, to their total weight (3159 g) indicates their high level of fragmentation. This means an average of 2.5 g for each specimen which is quite low even with the knowledge that different elements of a skeleton have different density and weight. The breakage pattern (length) of this taxa bones in different units supports this argument. The breakage pattern of Caprine long bones and their numbers (NISP) reveal a similar taphonomic pattern for this taxa in all studied units. Caprine long bones in all the buildings show a peak at 3-4 cm with a sharp decrease afterward, and they reached a maximum of 12 cm in the length (Figure 24). This noticeable similarity is an indication for the comparability of the bone remains of this species in all units studied.

However, the case of the cattle seems different. The average weight of each cattle specimen in the assemblage is around 16 grams (n: 127=1993g). Having looked at the breakage length of the cattle specimens in different units, it seems that the high mean weight of the specimens is an artifact of different breakage patterns in each unit. The majority of cattle specimens are very fragmented and more than half of them have a length smaller than 5 cm (Figure 25). The same pattern works for the building 52 but with a peak of breakage at 6cm. The irregular unsteady breakage pattern with many peaks at different lengths in the open area can be explained this being a place where waste from different activities therefore bones of different

lengths were disposed of and perhaps exposed to different taphonomic biases such as trampling.

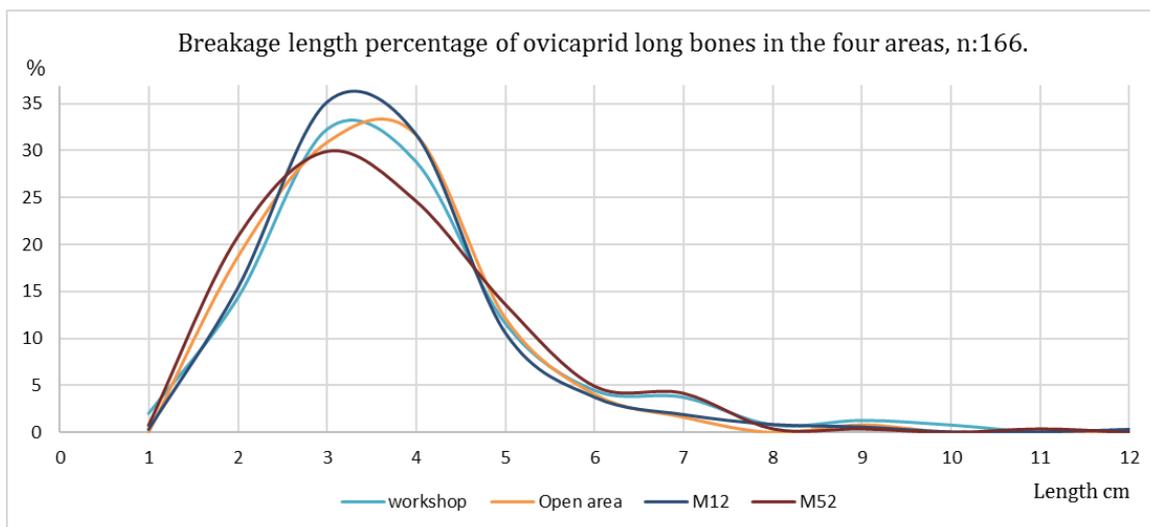


Figure 24. The breakage pattern of Caprine long bones in the four areas.

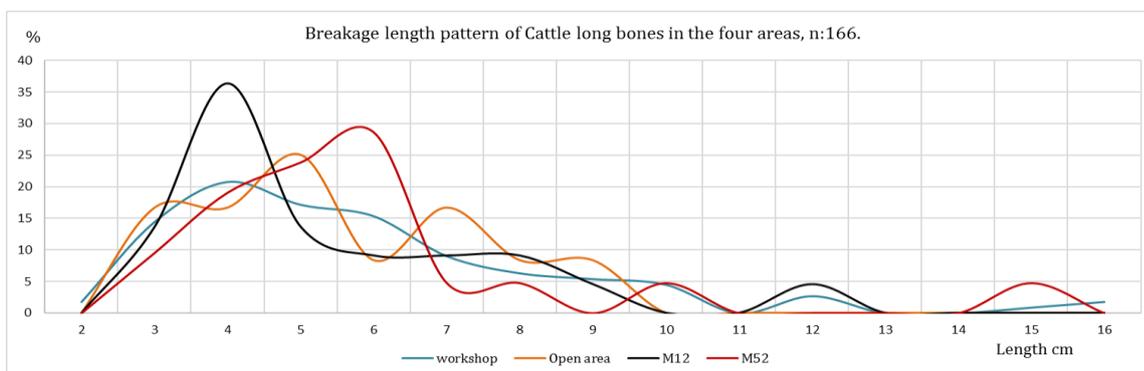


Figure 25. The breakage pattern of cattle long bones in the four areas.

However, the mild breakage pattern with many long pieces found at the workshop specimens reveal a different taphonomic process for this taxa. The main reason for this different pattern should be related to bone working activities in this area. The high cortical thickness of cattle bones, as well as their long and straight shape makes them a suitable source for tool production. The abundance of fresh, straight, and longitudinal breakage of long bones in this area are the other clue for the bone working activities in this unit.

Anyhow, this different pattern in the breakage pattern of cattle specimens do not necessarily make them incomparable. This pattern alongside the tools making activity evidence within

each unit can be meaningful as an indication of different cultural activities rather than taphonomic bias prohibiting comparisons.

The mean weight of Cervidae and pig specimens with the average of 6 g for Cervidae and 8g for pig seems interesting as well. The high number of almost complete antlers, as well as unsuitability of pig remains for tool production, and limited number of cut marks (n:4) on this taxon can be an explanation for their lower level of fragmentation.

4.1.4. Carnivore gnawing

Contrary to the high number of Canidae remains, limited number (n:11) of specimens with carnivore gnawing traces have been observed. Except for the one Caprine calcaneum from the open area, and one cattle scapula from the unit 52, the rest of the specimens with carnivore damages come from the workshop area. The low incidence of carnivore gnawing shows that this is not an important taphonomic factor for this study.

4.1.5. Butchery marks

As mentioned before, as a result of the high level of calcination, observing the butchery marks on the assemblage in most cases was impossible. In total, 50 specimens with butchery marks have been identified in all the units. The table 3 explains the types of cut marks and the tools used.

The presence of cut marks on almost all kind of skeletal elements in this assemblage, can also be an indication for doing the butchery within the site and exploitation of all elements.

In general, the butchery marks are present in all units. Most of the traces are observed on the specimens from the unit 52. But in comparison to their NISP in units 52 and 12 around 2% of their assemblage comprise the butchery marks. This number is around 1% for the workshop and open area. This can be an indication for more intensive food producing activities in the units 12 and 52 in comparison to the other units. The higher occurrence of knife cut traces are found on Caprines. Cattle bones, and to a lesser degree pig bones also show traces of butchery marks. While chop mark is the dominant trace on cattle, knife cut mark is the most common trace on pig bones.

Butchery marks on Cervidae are only present on bones from unit 12. This evidence can support the possibility of two different uses, a functional parallel to dietary use of this taxa in this unit.

Overall, no important differences between the species and between the units have been observed on the butchery marks, therefore this is not considered to be a process that could have introduced biases in comparing the assemblages.

Table 3. The type and number of species with butchery marks in each area.

Unit	species	NISP	Type of butchery traces	
			Knife cut	Chop mark
B12	Cattle	2		2
	Pig	2	2	
	Cervidae	2	2	
	Sheep size	4	2	2
	cattle size	2	2	
Total		12	8	4
B52	Ovicaprid	12	10	2
	Pig	1	1	
	Hare	1	1	
	Sheep size	5	4	1
Total		19	16	3
Open area	Ovicaprid	1	1	
	Sheep size	1		1
Total		2	1	1
Workshop	Ovicaprid	7	3	4
	Cattle	3		3
	Pig	1	1	
	Sheep size	4	2	2
	Cattle size	2	1	1
Total		17	7	10
Grand total		50	32	18

4.1.6. Tool production activities

Bone tool production, as an integral part of Neolithic animal bone utilization, has a pronounced presence in the Ulucak assemblage as well. Abundance of bone tools within a spectrum of forms ranging from finished items, to broken ones, as well as wastes of tool

production can inform us about tool production as an activity in Ulucak Level IV (Plate 2, figs e-h). The recovered bone tools in Ulucak have variety both in their typology and the choice of raw material, from very complex and planned objects, to opportunistic use of raw bone for completing a task and from Caprine and cattle long bones to Cervidae antlers. The occurrence of bone tools in all the studied units reveals a similar type of activities which were operated within all units (residential and non-residential). However, their concentration (figure 26) in the workshop (n:75) and Building 52 (n:24) contrary to their limited number in the other units (Building 12 with 11 examples and the open area with only 4) can be an indication for the different degree of concentration and type of activities. Caprine long bones are the main resource for the tool production in all units. Cattle long bones also compose 30% of the worked bones in the workshop. Also tools from Cervidae are highly represented in the workshop and in one example in the building 52.

Therefore, tool production activities may be considered as a factor posing a bias in the comparison of the assemblages between the units as well as the proportions of different species. This bias though is clearly cultural hence helpful for drawing conclusions as to household activities. Hence, it has to be taken into consideration when evaluating the species utilization in the different units.

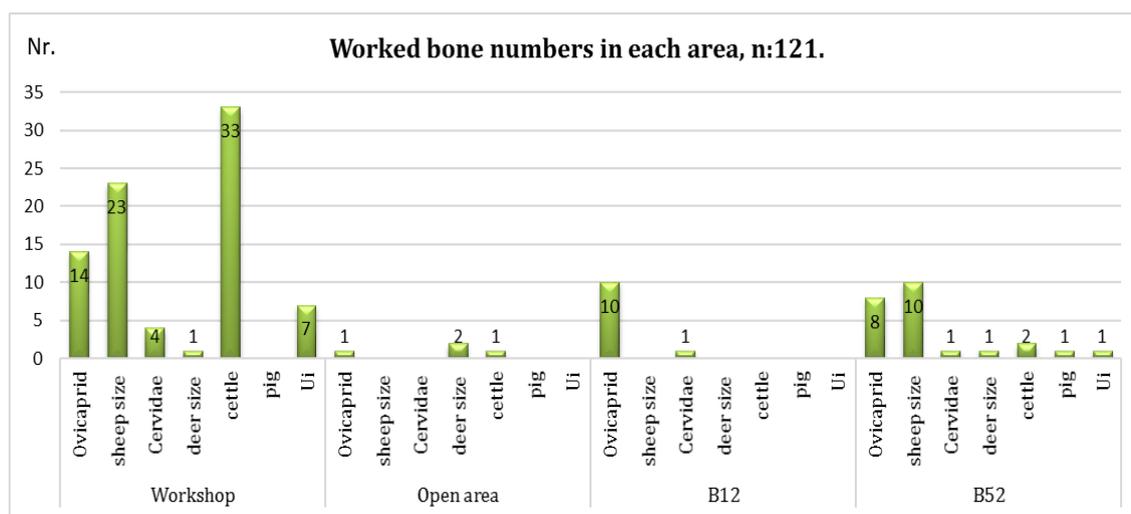


Figure 26. The numbers and sources of worked bones from each unit studied.

4.2. Animal economy of the studied units as a whole during the Late Neolithic Period

The subsistence economy of the studied units for this research was mainly based on domesticates (Caprine, cattle, and pig). Caprines, as the most common exploited taxa, represents 71% of the identified specimens by NISP (Table 4). After Caprines and decreasing sharply in proportions, cattle, and pig follow with 7%, and 6% of the identified specimens respectively and stand as the second, and third most important domestic taxa in the assemblage (plate 3, figs i-k).

Table 4. Taxonomic composition of the all areas studies (IVb and IVc).

Taxa	NR	Weight (g)	NR%	Weight%
<i>Bos taurus</i> (domestic cattle)	127	1993.3	7.2	26.4
<i>Ovis aries</i> (domestic sheep)	47	234.4	2.7	3.1
<i>Capra hircous</i> (domestic goat)	60	404	3.4	5.3
<i>Capra aegagrus</i> (wild goat)	4	585.6	0.2	7.8
Caprini (sheep/goat)	1152	2521.1	65.2	33.4
<i>Dama dama</i> (fallow deer)	45	336.3	2.5	4.5
<i>Cepreolus capreolus</i> (roe deer)	3	48.8	0.2	0.6
Cervidae (unknown deer)	89	429.4	5.0	5.7
<i>Sus scrofa</i> (domestic pig)	111	859.9	6.3	11.4
Canidae (dog/red fox)	77	99.7	4.4	1.3
<i>Lepus europaeus</i> (hare)	19	21.6	1.1	0.3
Rodentia	4	1	0.2	0.0
Aves (unknown bird)	15	2	0.8	0.0
Anura (frog)	1	0.3	0.1	0.0
<i>Testudo graeca</i> (tortoise)	7	12.2	0.4	0.2
mollusc	7	4.1	0.4	0.1
Total Identified taxa	1768	7553.7	54.1	66.3
cattle size	176	1359.9	11.7	35.5
sheep size	1231	2049	81.9	53.4
deer size	14	101.8	0.9	2.7
pig size	38	173.9	2.5	4.5
Unidentified	44	149.3	2.9	3.9
Total Unidentified	1503	3833.8	45.9	33.7
Grand Total	3271	11387.5	100.0	100.0

However, because of the high level of fragmentation and calcination of the majority of the assemblage, the status of Caprine in the assemblage may have been exaggerated to some extent. In comparison to cattle and pig, Caprine bones have lower resistance to destruction by pressure and heat (Brain 1967) which results in higher fragmentation hence higher number of Caprine fragments are found. To counterbalance this, the weight of bones is taken into account and by this method Caprines compose 50% of the whole assemblage followed by cattle and pig with 27% and 11%.

Few identified bones of Cervidaefamily including *Dama dama*, *Capreolus capreolus*, and some unidentified cervidaes were recovered which compose 8% of the identified specimens. However, a high number of antlers (no: 111) either fragmented or almost complete were found as well (Plate 4, figs l-o). On some of these antlers there are traces of polishing. These materials are clearly used for shaping tools or objects. The rest of the Cervidaebones count only to 26 specimens. Accordingly, while Cervidaefamily compose almost 8% of the identified species of the assemblage, their role at the subsistence economy of the settlement seems a more complicated issue and less easy to evaluate.

Collecting the shed antlers from the nature can be a reason for the high presence of them in the settlement while in total the rest of their skeletal elements are found in negligible numbers.

In contrast, Caprine, cattle and pig skeletal element show that all the elements of the skeleton are present in the units. This suggests that the culling and consumption of Caprines, cattle, and pig were operated within the settlement, and it is a regular act while it is not the case with cervidae. When we exclude antlers from the bone assemblage, the proportion of Cervidaeis only 26 specimens. This can be an indicative for a limited role of Cervidaefamily in the diet of the settlement and collected shed antlers from the nature as a reason for their abundance in our assemblage.

The people in Ulucak exploited also some other animals including hare (*Lepus europaeus*), unidentified birds, and tortoise (*Testudo graeca*). It is worth mentioning that regarding the importance of tortoise during the Neolithic period, consumption of the land tortoise as a source of supplementary food should also be considered. Seven marine mollusks were also recovered. Except for the hare which comprises 1% of the NISP, the rest of the mentioned taxa have a minor role in the subsistence economy of the settlement each of them having less than 1% of the identified specimens (plate 4, figs p-t).

Although no sieved faunal remains are included in this study, few number of possibly intrusive rodentia could be collected. Additionally, 1 squirrel femur (*Sciuridae*, *Sciurus vulgaris* or *Sciurus anomalus*), and 1 frog humerus from safe contexts were recovered.

High number of Canidae (dog/red fox) bones (n: 77) are observed in the assemblage. The notorious problem of separating dog from red fox has resulted in calling them as Canidae in this study (Plate 1, figs a-d).

The presence of several goat horns in the assemblage has enabled us to identify both the wild as well as the domestic goats. The horn cores presented in (Plate 6-fig w) show clearly the presence of both wild and domestic species during this level with the domestic form dominating. The verification of the domestication status of the rest of the species in the assemblage was not possible because of the high level of fragmentation and calcination which did not allow for sufficient measurements to be taken. However, based on previous studies by Çakırlar (2012a), the domestic status of the majority of animals in this settlement has been attested.

Two possibly intrusive human bones (one fibula from the open area and one mandible articulation from the unit 62 of the workshop) both burned, are very interesting as well. There are some arguments for the intentional inclusion of these partial human bones within a building during the Neolithic period as a part of abandonment activity (Russell 2012:72). The contexts where these bones are recovered from have been identified as safe contexts by the excavator (Çevik, per. com), however based on the taphonomic observation by the author, the specimens in the both assemblages are burned but in different colors and degrees. This can be induced through a different taphonomic history of the remains. Therefore, lack of enough evidence along with the different taphonomic observation of these specimens don't allow for further evaluation of these specimens.

4.3. Comparison of the four units on faunal and artefactual data.

In this part, in order to investigate the similarities and dissimilarities between the studied architectural units, the faunal and artefactual study results will be presented. In the first attempt, the main faunal remains recovered from each unit will be given. In the next step, the taphonomic observation of the faunal remains from each unit (Skeletal representation, the breakage patterns, bone tool production, burning levels of fauna, and butchery marks) supplemented by artefactual data will be presented.

4.3.1. Workshop

Species proportions

A big number of the faunal remains (n: 1456) are recovered from this area. While the function of these units has been identified as a working area, the accumulation of this number of bones seems interesting (Table 5) as they can be indicative of domestic activities (food production – consumption) rather than specialized working area. Except for the Caprine and hare, at least 40% of all the identified specimens of each taxon originate to this area (Figure 27).

Similar to the general trend in all of the 4 units studied, the dominant taxa in the workshop is Caprine which compose around 61% of the whole identified assemblage, this time followed by Cervidaewith 13% of NISP. Cattle and Pig consist 9% and 6% of the identified specimens.

High concentration (7% of NISP) of the Canidae (dog/red fox) in this area is interesting. Two *in situ* Canidae paws were recovered from this area. Similar to the rest of the artefacts and faunal remains in this area, these Canidae are heavily burned. There are several possible scenarios for the presence of these Canidae bones in these context. Dog as one of the earliest domesticated animals has frequently been found in the archaeological contexts. Also in the case of red fox, utilization of the skin and fur is also possible.

In this area, faunal remains from some other taxa have been recovered as well. Wild hare and unknown birds each with 1% of NISP and frog, tortoise and marine molluscs each with less than 1% are the other taxa recovered from this unit.

Table 5. Taxonomic composition of the workshop area (IVc).

Taxa	NR	Weight (g)	NR%	Weight%
<i>Bos taurus</i>	74	1329.8	9.1	35.0
<i>Ovis aries</i>	21	123.2	2.6	3.2
<i>Capra hircous</i>	28	231.6	3.4	6.1
<i>Capra aegagrus</i>	0	0	0.0	0.0
Caprini	449	1014.8	55.0	26.7
<i>Dama dama</i>	33	240.9	4.0	6.3
<i>Cepreolus capreolus</i>	2	39.2	0.2	1.0
Cervidae	81	295.5	9.9	7.8
<i>Sus scrofa</i>	45	455.5	5.5	12.0
Canidae	57	52.3	7.0	1.4
<i>Lepus europaeus</i>	7	8	0.9	0.2
Rodentia	2	0.8	0.2	0.0
Aves (unknown bird)	11	1	1.3	0.0
Anura (frog)	1	0.3	0.1	0.0
<i>Testudo graeca</i>	2	4.2	0.2	0.1
mollusc	3	0.6	0.4	0.0
Total Identified taxa	816	3797.7	56.0	67.1
cattle size	121	965.4	18.9	51.8
sheep size	460	692.3	71.9	37.1
deer size	8	63.2	1.3	3.4
pig size	18	87.5	2.8	4.7
Unidentified	33	55.7	5.2	3.0
Total Unidentified	640	1864.1	44.0	32.9
Grand Total	1456	5661.8	100.0	100.0

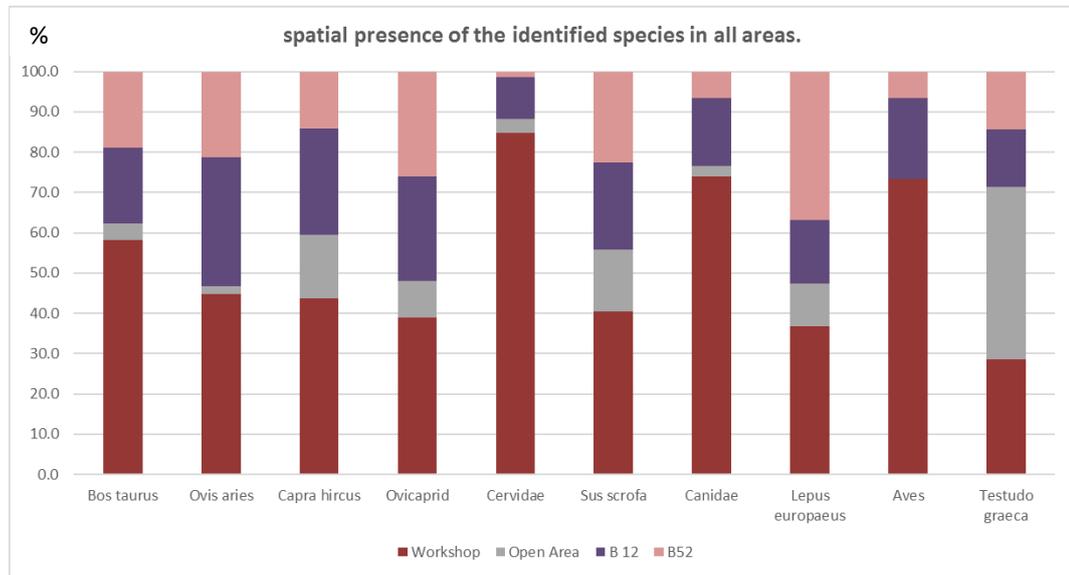


Figure 27. The ratio of identified taxa in all the units studied

Skeletal representation

The skeletal representation of the Caprines, cattle, and pig corresponds to the expected frequencies of anatomical elements in a complete skeleton i.e. all the skeletal elements of these taxa are present and none of them are over- and underrepresentation (Figures. 28, 29, 30) while for the Cervidae more than 90% of the identified specimens are antler fragments (Figure 31). The rest of the Cervidae finds consist of long bones which mainly are in the form of worked bones.

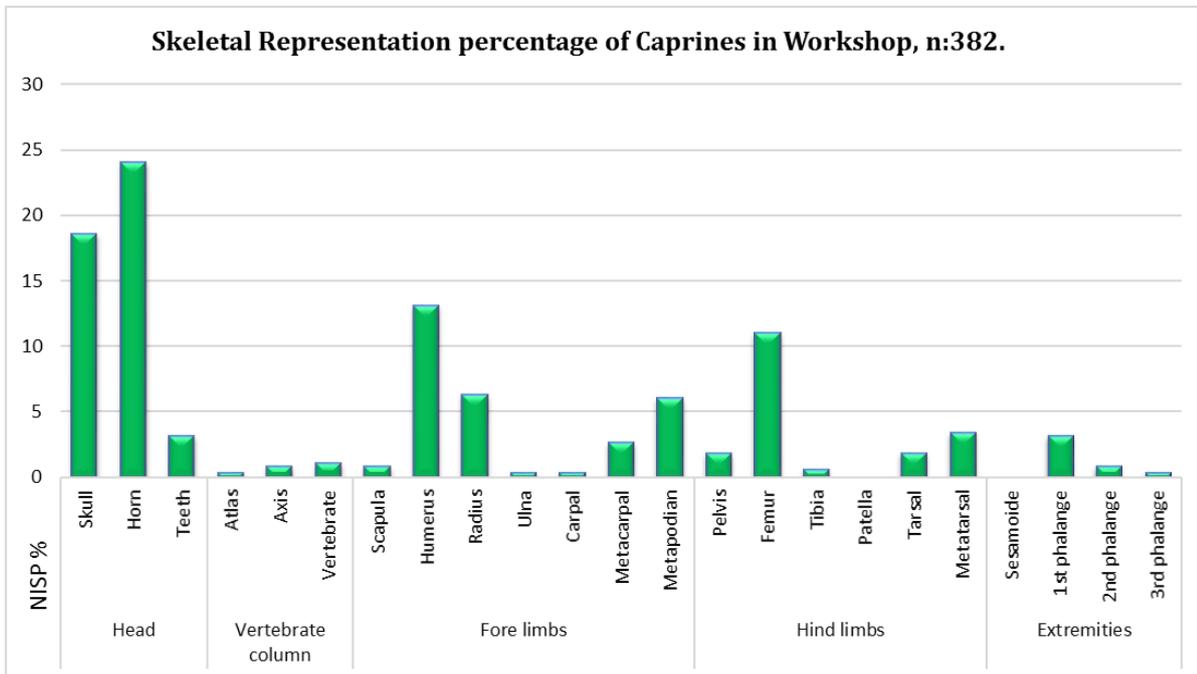


Figure 28. The skeletal representation percentage of Caprines in Workshop area.

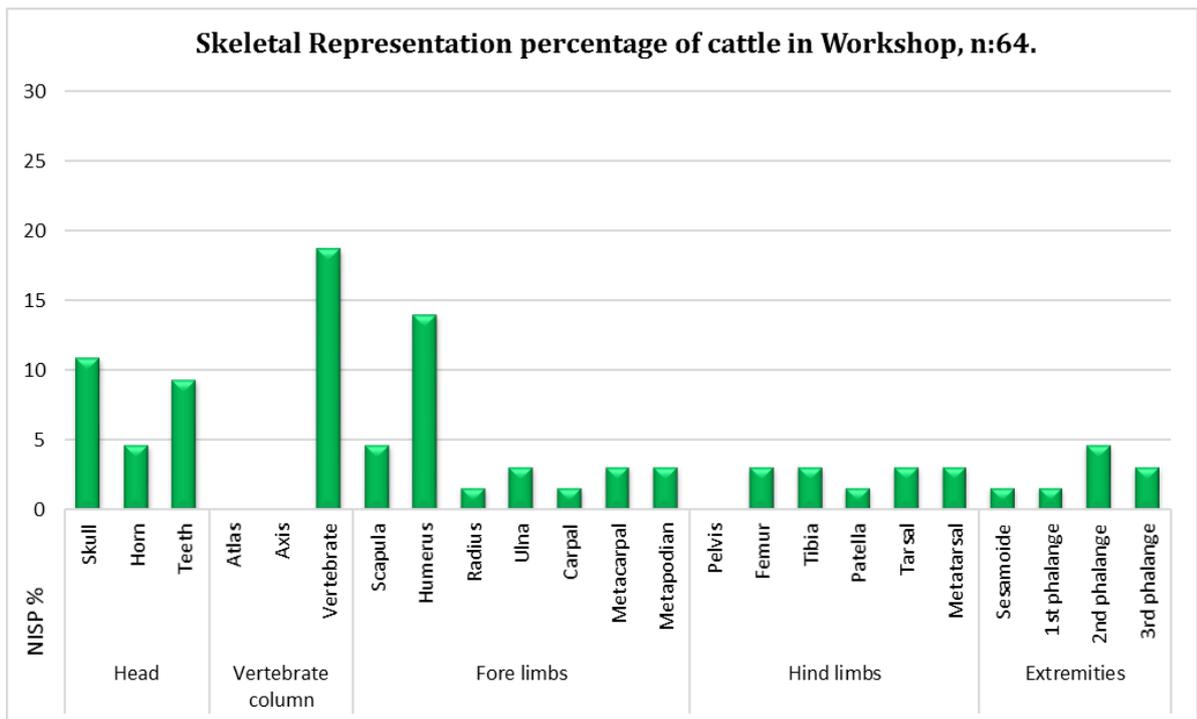


Figure 29. The skeletal representation percentage of cattle in Workshop area.

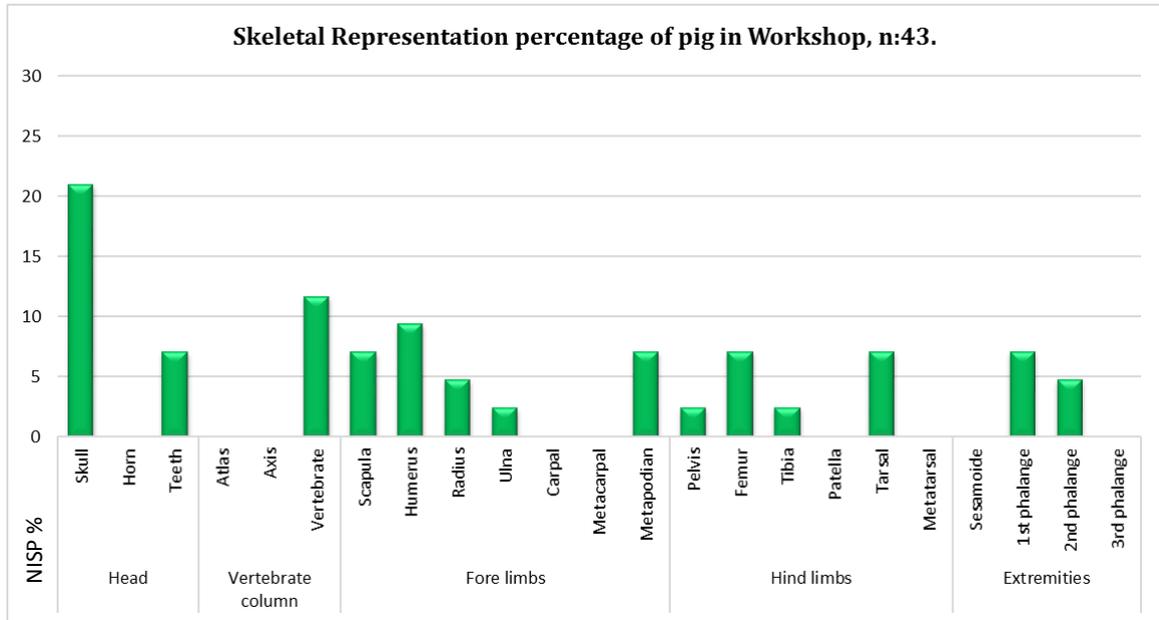


Figure 30. The skeletal representation percentage of pig in Workshop area.

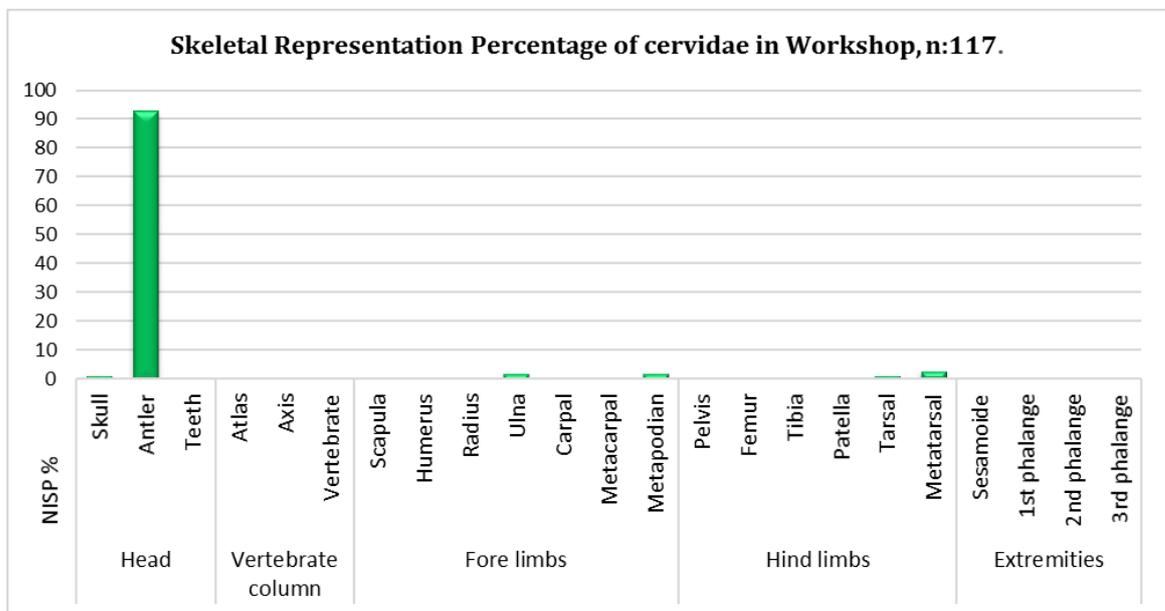


Figure 31. The skeletal representation percentage of Cervidae in Workshop area.

Breakage pattern

In order to investigate the level of fragmentation of different specimens in each area, the length of the Caprine and cattle long bones have been measured. The degree of fragmentation

of the cattle long bone at the workshop shows them to be less fragmented (from 2-16 cm) in comparison to the rest of the areas (figure 25). The presence of bone working waste as well as high concentration of finished items supports the idea that this could indicate the utilization of cattle bones both in the operation of bone tool making and utilizing them for food in this place at the same time.

However, the breakage pattern of the Caprines shows a similar trend to the other areas (figure 24). It is worth mentioning that tools made of cattle bones are only found in high numbers in the workshop area, whilst tools made of Caprine resources are widespread in all areas in this level. This could be an indication for either the same taphonomic process for the Caprine specimens, or the same pattern of bone tool production from Caprine taxa in both residential and non-residential areas.

Tool production

In total, 82 worked bones and opportunistic bone tools have been recovered from this area. Contrary to the limited presence of pig and cattle specimens in this area (only 64 specimens) more than 30% of the worked bones in the area are made of cattle bones (figure 227). Sheep size (n:23) followed by Caprine (n:14) bones are the next more common source of worked bones in this area.

Burning level

Temperature can pose changes on the surface color of the bones. The changes in the color starts from the light brown (low degree of temperature) to blue (the highest temperature). All the studied specimens from the workshop are completely burned. This indicates their presence in the unit before the fire. This is the same case with the human bone (jaw fragment, Plate 7, figs x) from this area. This specimen has been found within context with specimens which are all burned but to different degrees. This variety can be a result of different taphonomical process. Therefore, possibly we can consider them to be intrusive in the assemblage.

Butchery marks

Due to the high level of burning and fragmentation, accurate observation of butchery marks was impossible. In total 17 specimens with butchery marks have been recovered from this area (Table. 3) which 7 of them have been identified as knife marks and the rest as chop

marks. This number comprises about 1% of the all faunal remains from this area. Both types of the traces (cut mark and chop mark) have been present on all the domesticates including Caprines, cattle, pigs, sheep size and cattle size specimens.

Artefactual data

High number grinding stones (n:15), ovens (n:2), grinding installation, clay loaves and lumps of red pigment, several number of unfinished vessels produced by coiling technique, several stone and bone tools and so many other artefacts have made this rich area a suitable unit for calling as a working area. The presence of a working area arrangement (elevated stone-paved and mud-plastered platforms) is another characteristic of these interrelated units (Çevik 2015). However, diversity of the artefacts (figure 32) as well as the preset taxa and the normal skeletal representation of the majority of taxa can be an indication for several types of operations in this area.

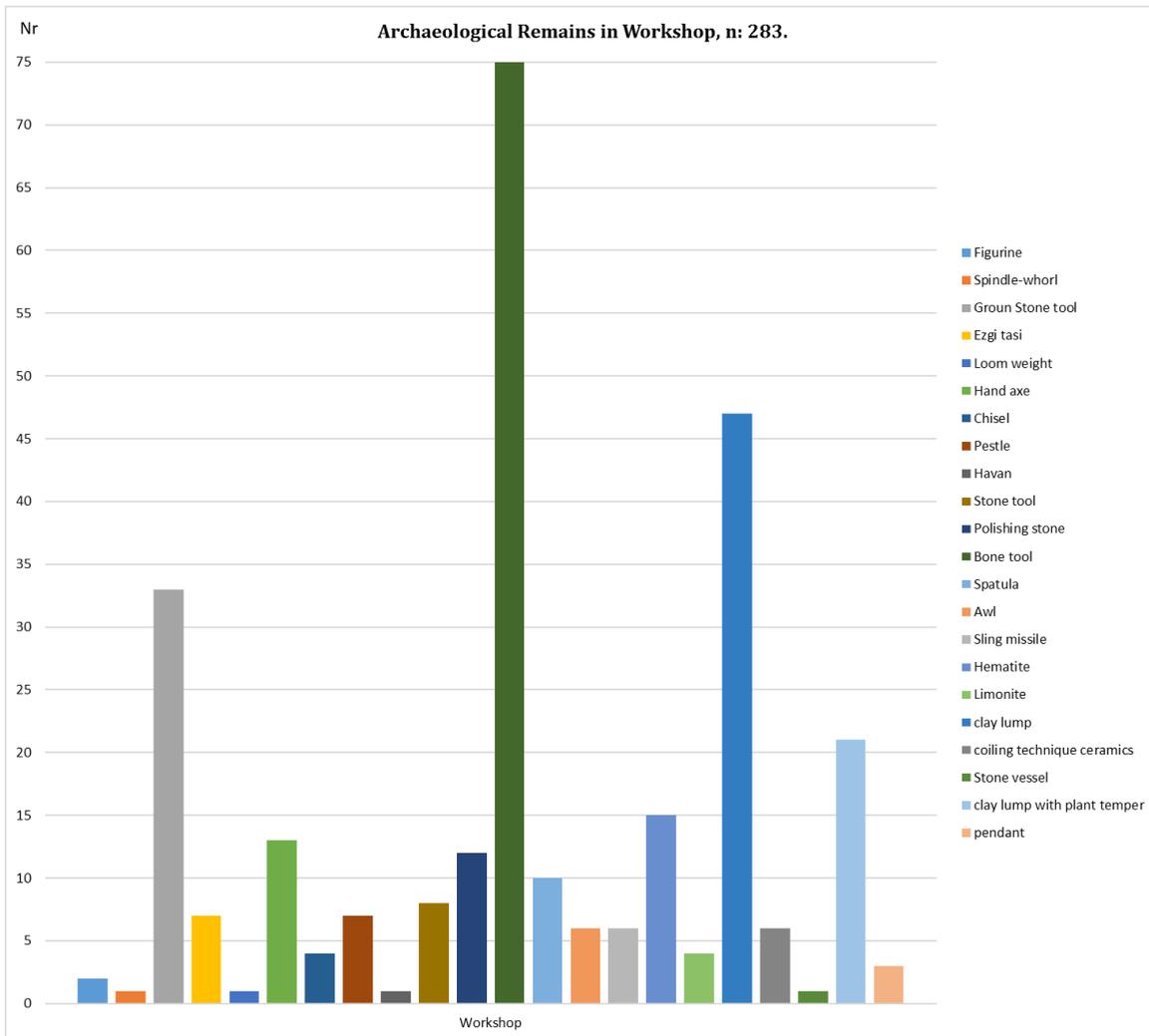


Figure 32. Archaeological finds from the workshop area.

4.3.2. Building 52

Species proportions

In total 832 specimens (1954.8 g) have been recovered from this area. Caprine stands as the most dominant species in this unit comprising 82% of the identified specimens (table 6). Cattle and pig are present in the assemblage with the same proportion of 6%. Also there are evidence for the occurrence of the other taxa including Lepus (2%), Canidae (1%), birds (1%), and testudo (1%) as well. So it can be suggested that the main subsistence economy of this unit was based on domesticates, with the hunted species playing limited role in their diet.

Table 6. Taxonomic composition of the building 52 (IVb).

Taxa	NR	Weight (g)	NR%	Weight%
<i>Bos taurus</i>	24	320.9	6.2	25.0
<i>Ovis aries</i>	10	39.9	2.6	3.1
<i>Capra hircous</i>	9	51.5	2.3	4.0
<i>Capra aegagrus</i>	0	0	0.0	0.0
Caprini	301	622.3	77.4	48.5
<i>Dama dama</i>	1	12.9	0.3	1.0
<i>Cepreolus capreolus</i>	0	0	0.0	0.0
Cervidae	1	70	0.3	5.5
<i>Sus scrofa</i>	25	122.3	6.4	9.5
Canidae	5	30.3	1.3	2.4
<i>Lepus europaeus</i>	7	9.9	1.8	0.8
Rodentia	2	0.2	0.5	0.0
Aves (unknown bird)	1	0.4	0.3	0.0
Anura (frog)	0	0	0.0	0.0
<i>Testudo graeca</i>	1	0.7	0.3	0.1
mollusc	2	2.1	0.5	0.2
Total Identified taxa	389	1283.4	46.8	65.7
cattle size	18	95.3	4.1	14.2
sheep size	413	533.8	93.2	79.5
deer size	3	22	0.7	3.3
pig size	8	19.7	1.8	2.9
Unidentified	1	0.6	0.2	0.1
Total Unidentified	443	671.4	53.2	34.3
Grand Total	832	1954.8	100.0	100.0

Skeletal representation

The skeletal representation of Caprines and cattle seems normal, i.e. the majority of the elements are present (figures 33, 34), while the low and sporadic representation of pig remains (figure 35) is evidence for a typical butchery waste (low meat bearing parts such as mandibles, metapodia in comparison to high meat bearing elements). Cervidae family is present in the unit with only one worked antler and one tarsal bone (figure 36). This limited presence can be an indication for the limited role of this family in the subsistence economy of its inhabitants.

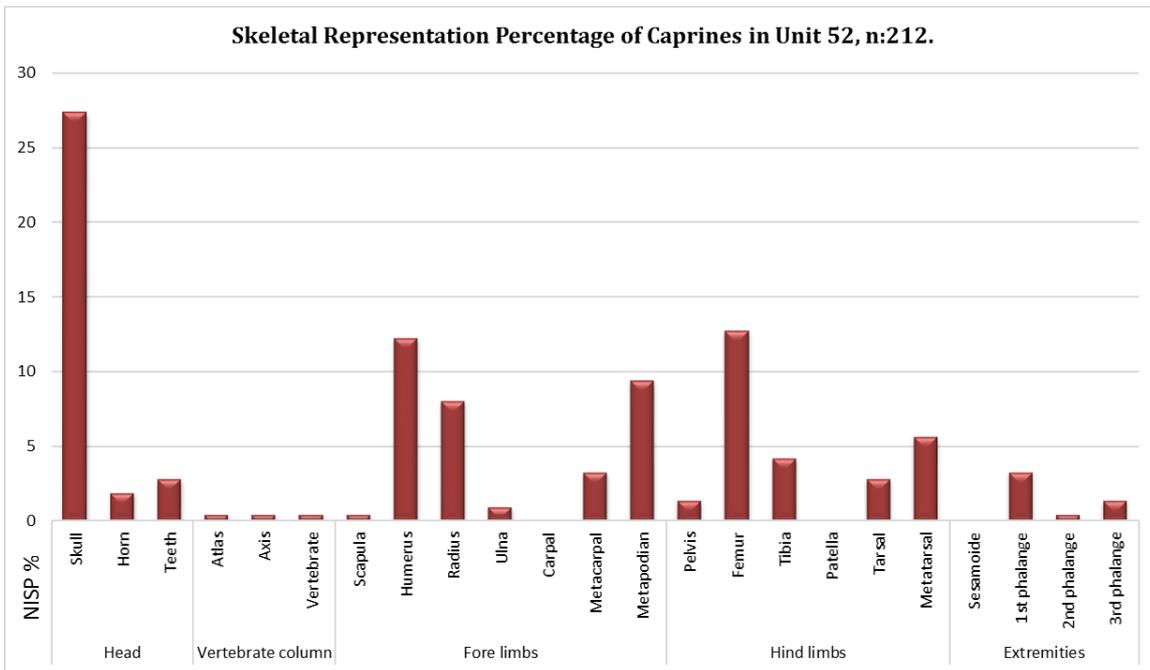


Figure 33. The skeletal representation percentage of Caprine in unit 52 area.

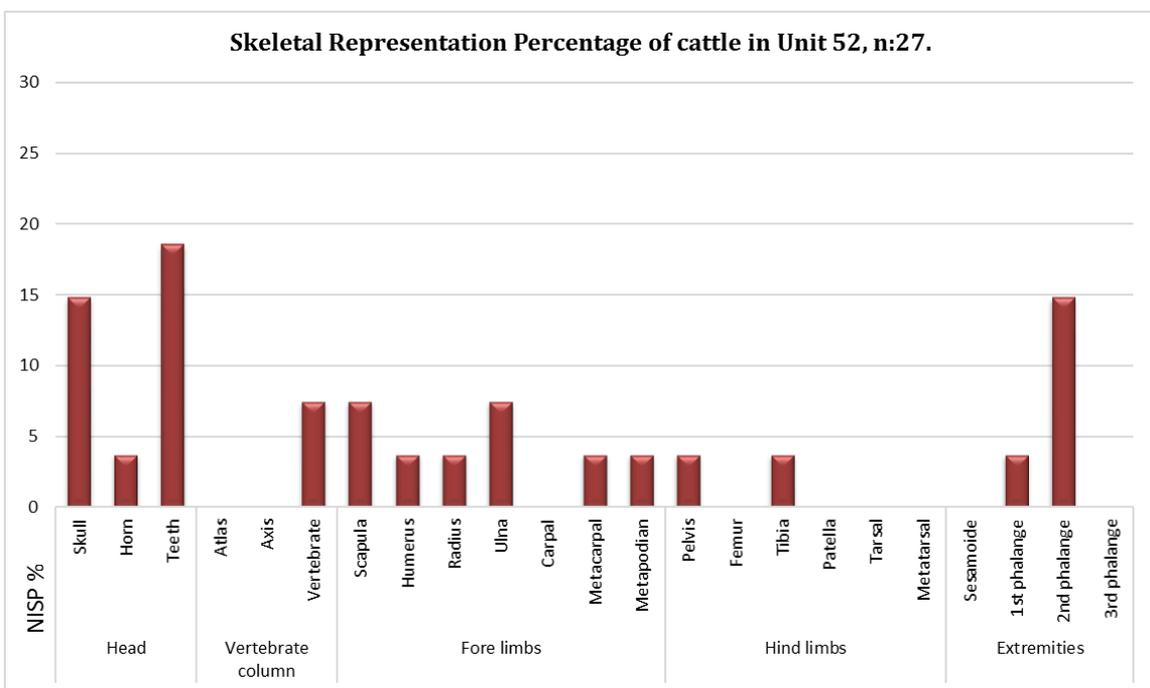


Figure 34. The skeletal representation percentage of cattle in unit 52.

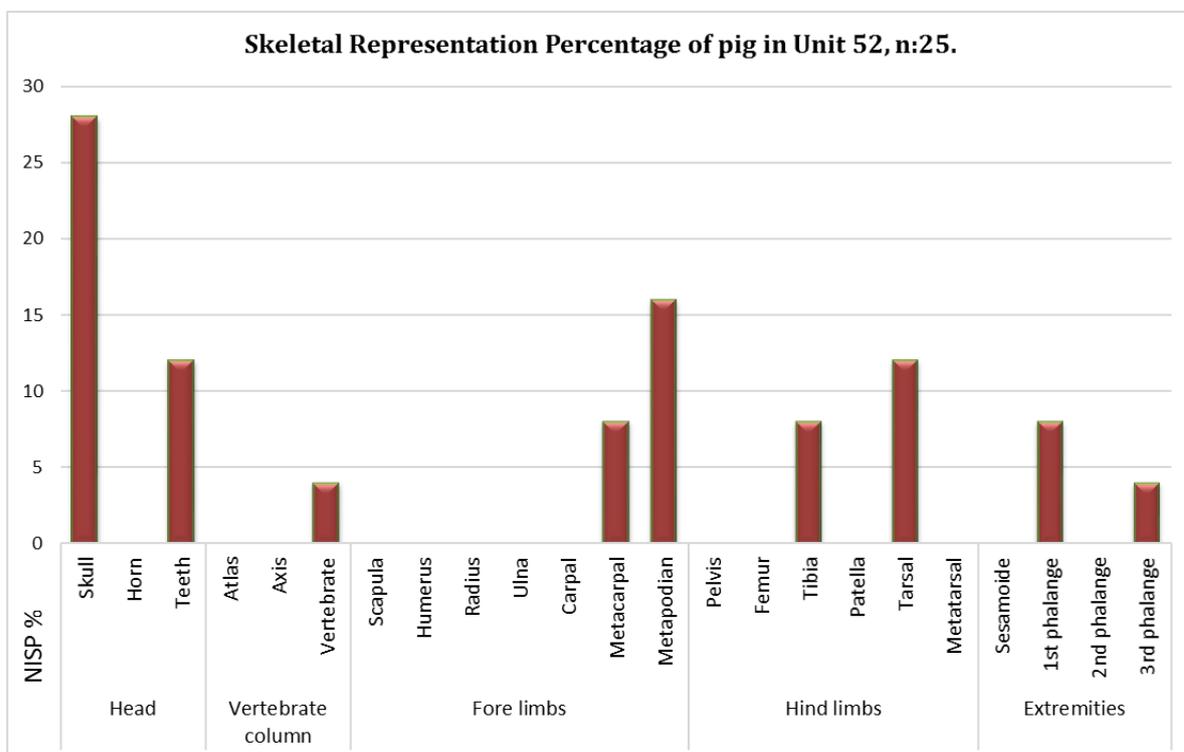


Figure 35. The skeletal representation percentage of pig in unit 52.

Breakage pattern

The breakage pattern of Caprine long bones, similar to the rest of the area, starts at about 1 cm with a pick at 3 cm and a fall afterward (figure 24). This trend continues to 12 cm. Also the ratio of the Caprine NISP (n: 320) to their weight (714 gr) in the assemblage reveals their high level of fragmentation.

Regarding the high level of fragmentation of the Caprine specimens in this area, it can be a result of high burning level, tool production, or food producing related activities (marrow extraction, etc.) or even a combination of all.

However, cattle long bone fragmentation shows a different pattern in comparison to the rest of areas (figure 25). It starts from 2 cm, picks at 6 cm and a decline afterwards. This trend continues to 16 cm.

The high weight of the Cervidae bones (83 gr) in this assemblage contrary to their limited number (n: 2) shows their lower level of fragmentation in comparison to the mean weight of each Cervidae specimen in the unit 12 (8 g). It is worth mentioning that one of these Cervidae specimens is a worked antler. The presence of a worked antler similar to the tools in

the workshop area can be an indication for different kinds of utilizations for Cervidae in this unit than a dietary source.

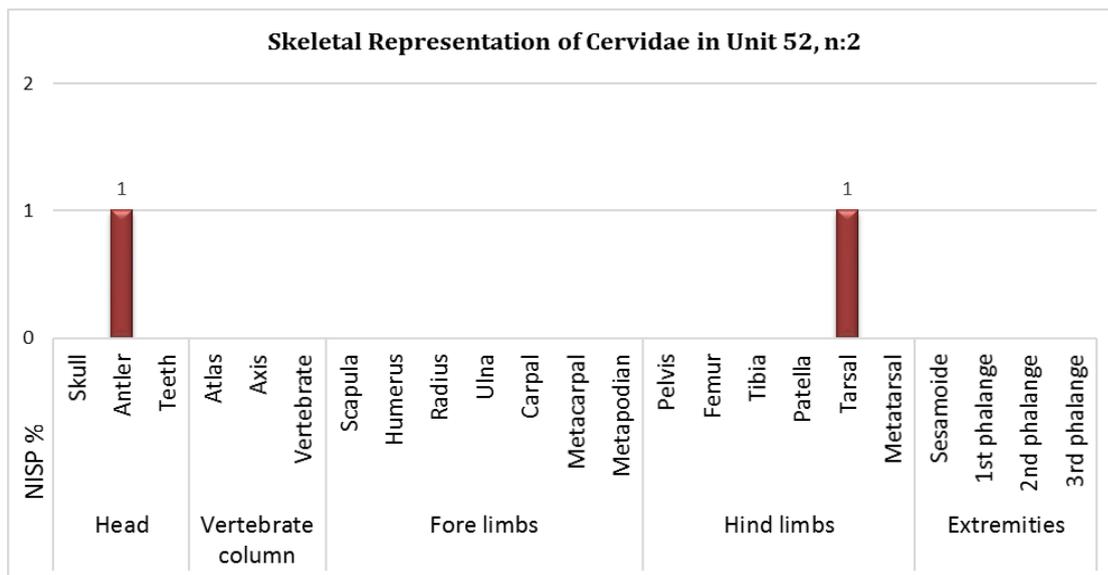


Figure 36. The skeletal representation percentage of Cervidae in unit 52.

Tool production

In total 24 worked bones and opportunistic bone tools have been recovered from this area (Figure 27). This high number of worked bones can be a reason behind of the high fragmentation of Caprine specimens as the main source of tool production.

The long bones of almost all identified taxa including Caprines, cattle, cervidae, as well as pig (the only one bone tool made of pig found in all the units examined here) were used for tool manufacture. Caprine long bones have been identified as the source of 18 of these tools. Cattle long bone fragmentation pattern also reveals an extended breakage pattern with a pick at 5-6 cm but also there are pieces as big as 15 cm. It is worth mentioning that cattle, after Caprines, are the main source of raw materials for tool production in this unit.

Burning level

Similar to the general trend in this assemblage a noticeable number (71% of the NISP) of the specimens are burned. The main color spectra are from brown to blue.

Butchery marks

In total 19 specimens with evidence for butchery marks have been identified from this area (Table 3). This comprises 2% of the all specimens from this area. Out of this number, 16 belong to knife marks and the rest identified as chop marks. These traces have been observed on Caprine, pig, sheep size and one hare specimens.

Artefactual data

Two figurines, two spindle whorls, seven ground stones, seven hand axes, three polishing stones, twenty-four bone tools, as well as four sling missiles are the main cultural remains which have been recovered from this area (Figure 37). All the mentioned artefacts are indicative for practicing some daily activities in this unit including textile production, tool production and cooking activities. However, the domination of bone tools in this area is noticeable as well.

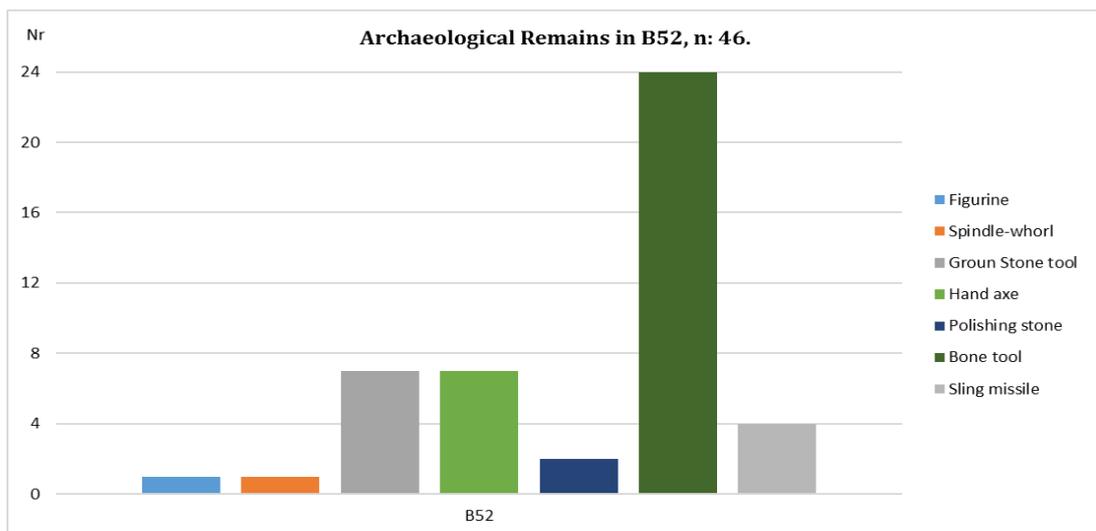


Figure 37. Archaeological finds from unit 52.

4.3.3. Building 12

Species proportions

In total, 713 specimens (22% of the all assemblage) have been recovered from this area. Caprine with 80% of the identified species are the dominant taxa in this unit (Table 7). Cattle and pig both with 6% of the identified species are the next main domesticated taxa in this unit. Therefore 91% of the whole identified specimens in this assemblage belongs to the domesticates.

Table 7. Taxonomic composition of the building 12 (IVb).

Taxa	NR	Weight (g)	NR%	Weight%
<i>Bos taurus</i>	24	313.3	5.8	15.7
<i>Ovis aries</i>	15	68.7	3.6	3.4
<i>Capra hircous</i>	14	80	3.4	4.0
<i>Capra aegagrus</i>	3	579.5	0.7	29.0
Caprini	297	671	71.9	33.6
<i>Dama dama</i>	8	57.2	1.9	2.9
<i>Cepreolus capreolus</i>	1	9.6	0.2	0.5
Cervidae	5	43	1.2	2.2
<i>Sus scrofa</i>	24	156.9	5.8	7.9
Canidae	13	13.2	3.1	0.7
<i>Lepus europaeus</i>	3	2.5	0.7	0.1
Rodentia	0	0	0.0	0.0
Aves (unknown bird)	3	0.6	0.7	0.0
Anura (frog)	0	0	0.0	0.0
<i>Testudo graeca</i>	1	0.7	0.2	0.0
mollusc	2	1.4	0.3	0.0
Total Identified taxa	413	1997.6	57.9	67.6
cattle size	23	200.8	7.7	21.0
sheep size	259	666.1	86.3	69.5
deer size	0	0	0.0	0.0
pig size	10	54	3.3	5.6
Unidentified	8	37.3	2.7	3.9
Total Unidentified	300	958.2	42.1	32.4
Grand Total	713	2955.8	100.0	101.0

Cervidae, have more pronounced presence in this unit composing 3% of the identified specimens. Fallow deer, is the main identified species in this family whilst the roe deer is the only one other Cervidaerepresented by one bone only.

Limited number of the other taxa including hare, birds, and tortoise are recovered from this unit as well each composing less than 1% of the identified specimens.

The number of Canidae (dog/red fox) in this assemblage is high (n:13). The reasons behind the presence of these taxa in these units seems ambiguous. The possible scenarios for their presence can be either their commensalism with human (as the earliest domesticated animal and their important role in husbandry and hunting activities), or their consumption by people as a part of their diet, and in case of red fox utilization of their skin and fur. Unfortunately, their poor preservation situation (all extremely burned), as well as the lack of cut mark traces have left us limited evidence for detailed explanation of the role of these taxa.

The noteworthy point from the faunal assemblage of this unit is three wild goat horns, almost complete and completely burned which were recovered from this area. The context which these horns were recovered has been identified as safe by the excavator. However, the function and the reason behind the presence of these complete horns in this unit and as the only example in the assemblage requires further studies.

Skeletal representation

Caprines also have a normal skeletal representation in this unit as the majority of the elements are present (Figure 38). However, the high presence of long bones including humerus, radius, metapodians, and femur in which all have a suitable form and characteristics for tool production, is noticeable as well.

Skeletal representation of cattle, contrary to the Caprines, in this unit is not the expected (figure 39). Most of the bones of the back legs are missing. There is a tendency for the long bones present in unit 12 to be missing in unit 52. If this pattern is not accidental, the high number of long bones which are suitable for tool production in the unit 52 can be related to the accumulation of bone tools in this unit.

Pig skeletal representation is also normal in this unit (figure 40). The skeletal representation of cervidaes (figure 41) in this unit with an accumulation of long bones contrary to the unit 52 is another interesting issue. The normal skeletal representation of cervidaes in unit 12 in comparison to the unit 52, can support our hypothesis regarding the role of this family in the subsistence economy of the residents of this unit as a dietary source. Presence of cut marks on some of the specimens of this unit also supports the argument.

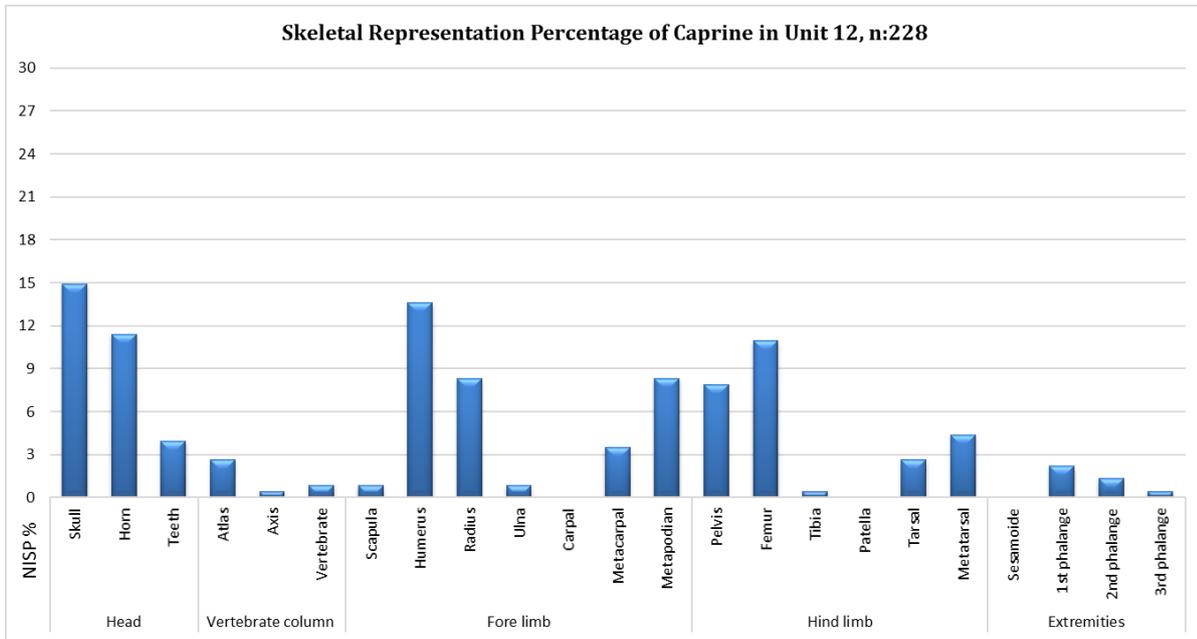


Figure 38. The skeletal representation percentage of Caprine in unit 12.

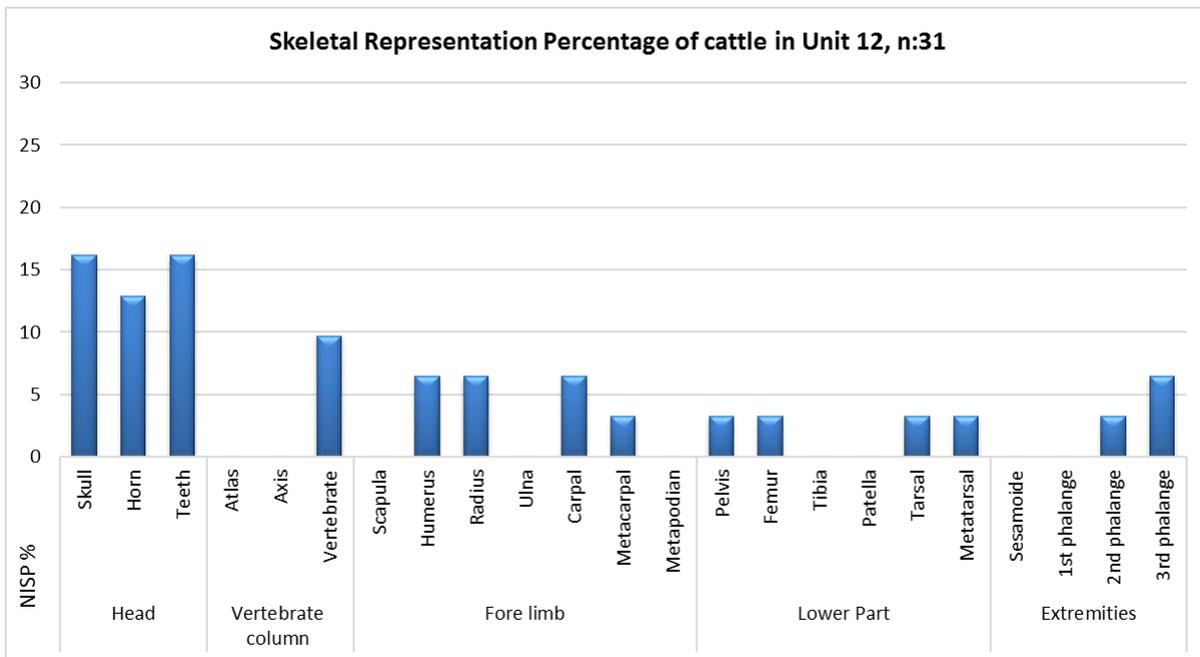


Figure 39. The skeletal representation percentage of cattle in unit 12.

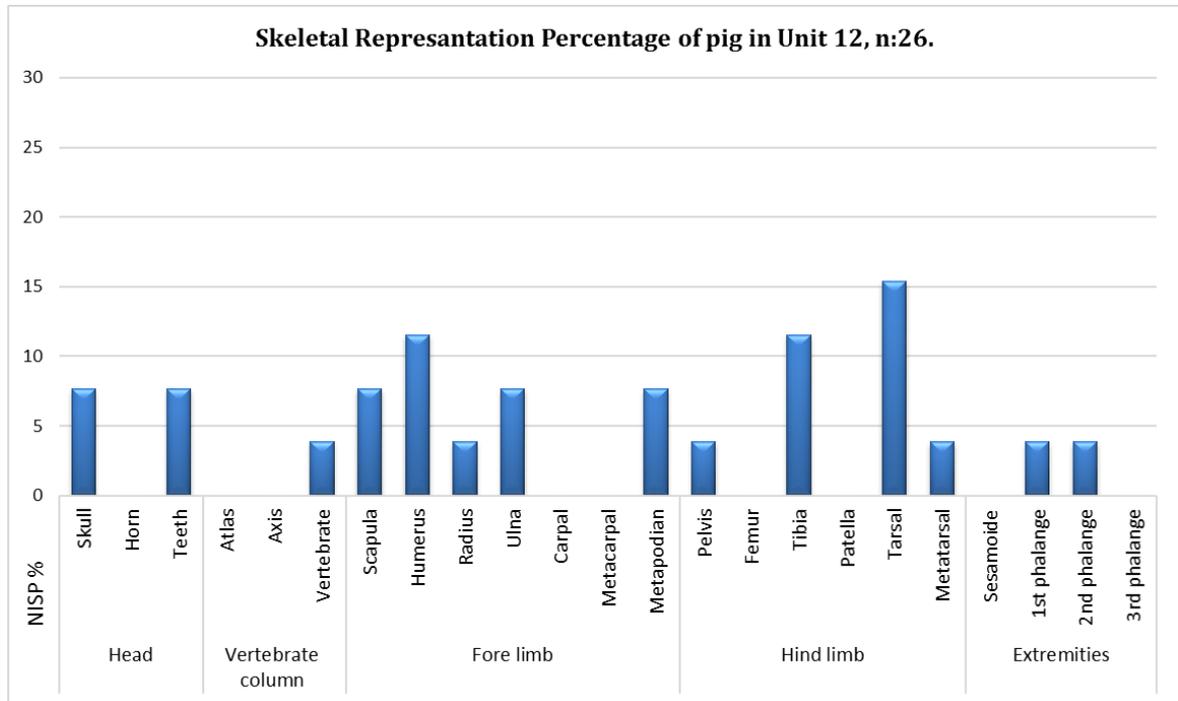


Figure 40. The skeletal representation percentage of pig in unit 12.

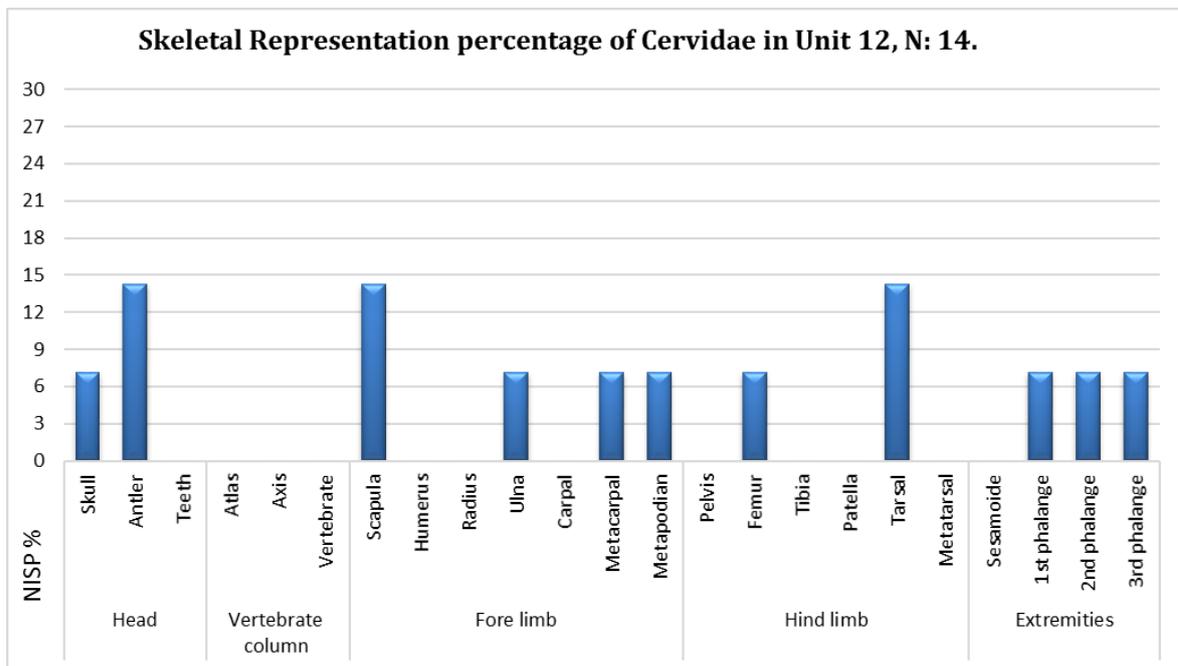


Figure 41. The skeletal representation percentage of Cervidae in unit 12.

Breakage pattern

Considering the weight of Caprines in comparison to their number (no:328= 820 g), it seems that the level of fragmentation in this unit is lower than in unit 52 with 2.5 g per fragment. However, the breakage pattern of Caprine long bones in this unit reveals a pick at 3-4 cm similar to the rest of units. Low number (n:11) of bone tools in this unit makes this pattern sensible (Figure 27). However, other taphonomical agents such as food production activities as an explanation for this pattern of fragmentation cannot be excluded.

However, the fragmentation pattern of cattle seems very different from the rest of units, with a sharp pick at 4 cm but also included are large pieces up to 16 cm (Figure 25). This can be an indication for more intensive exploitation pattern of this taxa in this unit in comparison to the rest of buildings.

Tool production

In total, 11 worked bones recovered from this area (figure 27). Caprines are the main resource for producing these tools. The only recovered worked Cervidae antler also is recovered from this area. No worked bone from the other species has been identified from this area.

Burning level

In total 681 specimens, which comprises about 96% of the assemblage from this unit, have been exposed to fire. Based on the different spectrum of the burning color as well as different fracture patterns, it is possible that the bones were dry, in-flesh as well as green when they were exposed to the fire.

Butchery marks

In total 12 specimens with knife and chop marks have been identified from this area which comprise for 2% of the assemblage from this unit (Table 3). Similar to the general trend in the all area, butchery marks are present on all the domesticates including cattle, pig, sheep size and cattle size. 4 specimens with traces of chopping also recovered from this area from which 2 are cattle specimens and the other two have been identified as sheep size. However, the one and only Cervidae specimen with butchery marks is also recovered from this area.

The presence of cut marks on Cervidaespecimens in this unit, along with their normal skeletal representation can support the role of this family in the subsistence economy of the residence of this unit as a dietary source.

Artefactual data

The other artefactual data recovered from this area can be categorized as 7 figurines, 1 spindle whorl, 31 ground stones, 12 loom weights, 9 hand axes, 5 polishing stones, 11 bone tolls, and 10 sling missiles (Figure 42). The concentration of ground stones and especially loom weights are noteworthy and can be indicators for practicing some production activities including grinding, textile production as well as bone tool production.

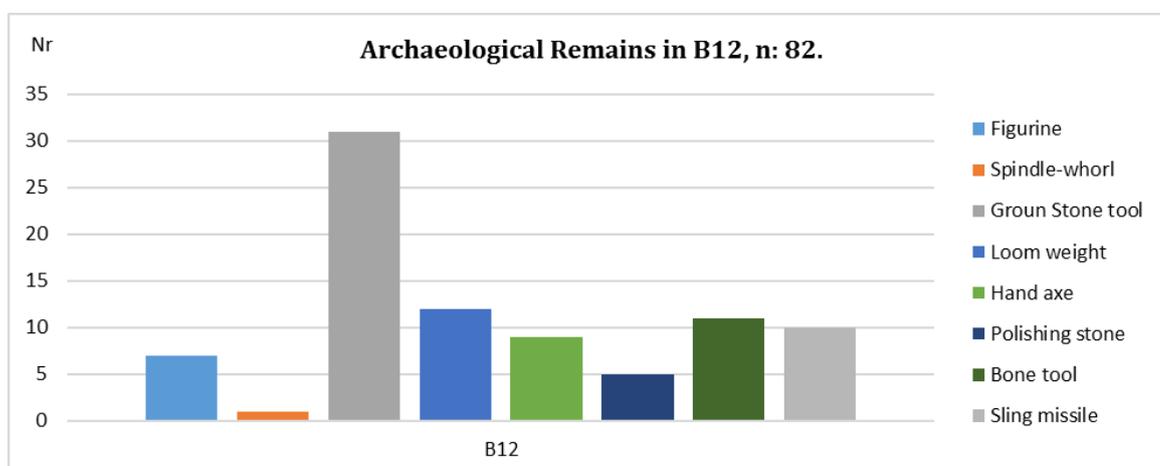


Figure 42. Archaeological finds from unit 12.

4.3.4. The open area

Species proportions

The open area (street) as the only unit without any roof has a higher possibility of contamination in comparison to the rest of units. However, limited number of faunal remains (n:270) have been recovered from this unit. Caprines with 77% of the all identified specimens, this time followed by pig (11%) are the main dominant taxa in this assemblage (Table 8).

Cattle and Cervidae each with 3% are the next main taxa. Limited number of Canidae and hare each with 1% are present. Except for a limited number of tortoise (2%), the other animals (such as birds, molluscs, and rodents) are not encountered.

Table 8. Taxonomic composition of the open area (IVb).

Taxa	NR	Weight (g)	NR%	Weight%
<i>Bos taurus</i>	5	29.3	3.3	6.2
<i>Ovis aries</i>	1	2.6	0.7	0.5
<i>Capra hircous</i>	9	40.7	6.0	8.6
<i>Capra aegagrus</i>	1	6.1	0.7	1.3
Caprini	105	213	70.0	44.9
<i>Dama dama</i>	3	25.3	2.0	5.3
<i>Cepreolus capreolus</i>	0	0	0.0	0.0
Cervidae	2	20.9	1.3	4.4
<i>Sus scrofa</i>	17	125.2	11.3	26.4
Canidae	2	3.9	1.3	0.8
<i>Lepus europaeus</i>	2	1.2	1.3	0.3
Rodentia	0	0	0.0	0.0
Aves (unknown bird)	0	0	0.0	0.0
Anura (frog)	0	0	0.0	0.0
<i>Testudo graeca</i>	3	6.6	2.0	1.4
mollusc	0	0	0.0	0.0
Total Identified taxa	150	474.8	55.6	58.3
cattle size	14	98.3	11.7	28.9
sheep size	99	156.8	82.5	46.1
deer size	3	16.6	2.5	4.9
pig size	2	12.7	1.7	3.7
Unidentified	2	55.7	1.7	16.4
Total Unidentified	120	340.1	44.4	41.7
Grand Total	270	814.9	100.0	101.0

Skeletal representation

Similar to the rest of units, the skeletal representation of the Caprines is normal and all the elements are present (Figure 43). However, skeletal representation of cattle and deer show a completely different pattern (Figures 44, 46). The skeletal representation of cattle and Cervidae contrary to pig seems irregular but interesting. While the pig has an almost normal skeletal representation (figure 45), cattle is only present with one bone tool made of tibia, as well as fragmented teeth, phalange, and tarsal bone (calcaneum). Fragments of limb bones

(n:4) are the main representatives of cervidaes in this unit. The suitable nature of cattle and Cervidae bones for tool production can make them a valuable source and hardly discarded. This also explains the high number of pig bones in the open area as the twisted shape of pig bones makes them unsuitable for tool production.

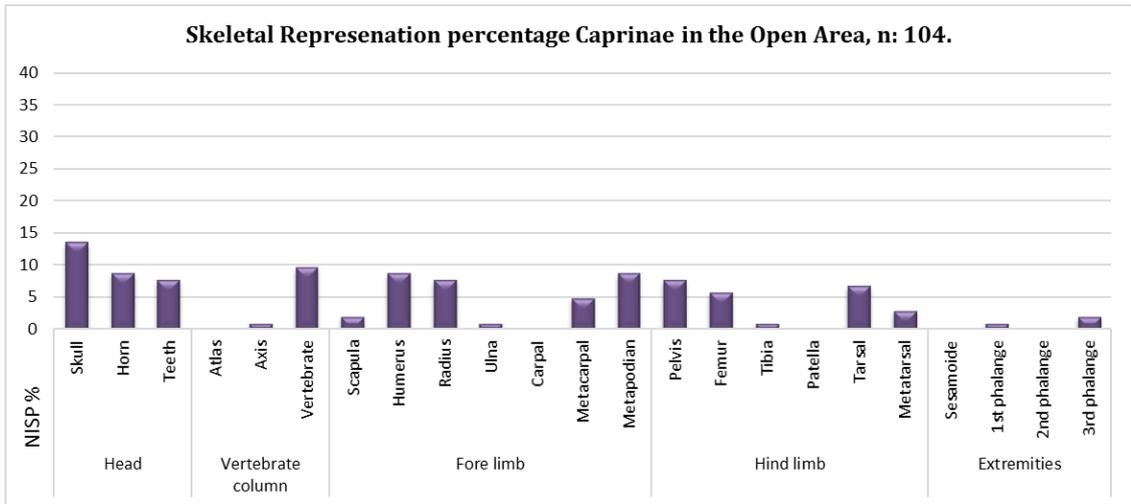


Figure 43. The skeletal representation percentage of Caprine in the open area.

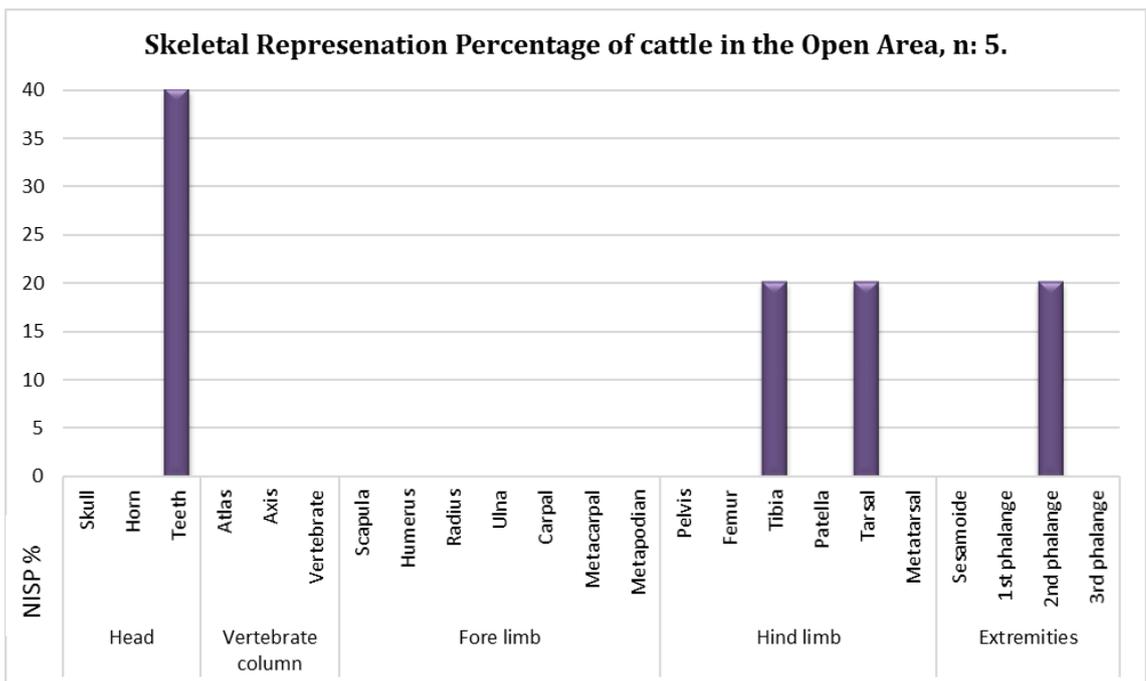


Figure 44. The skeletal representation percentage of cattle in the open area.

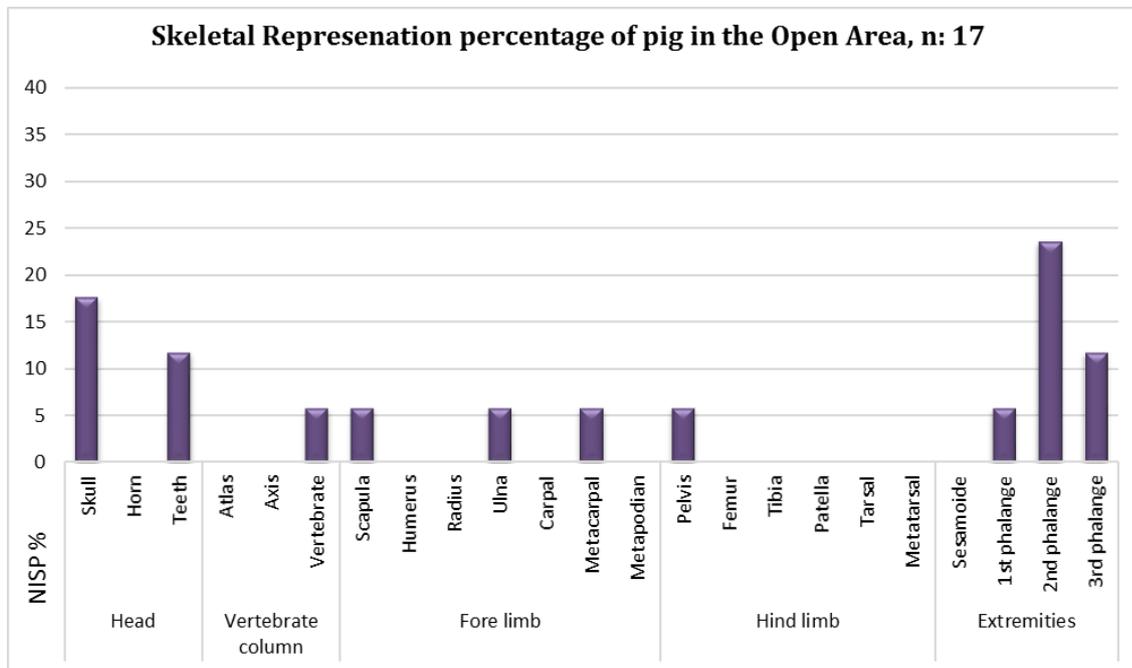


Figure 45. The skeletal representation percentage of pig in the open area.

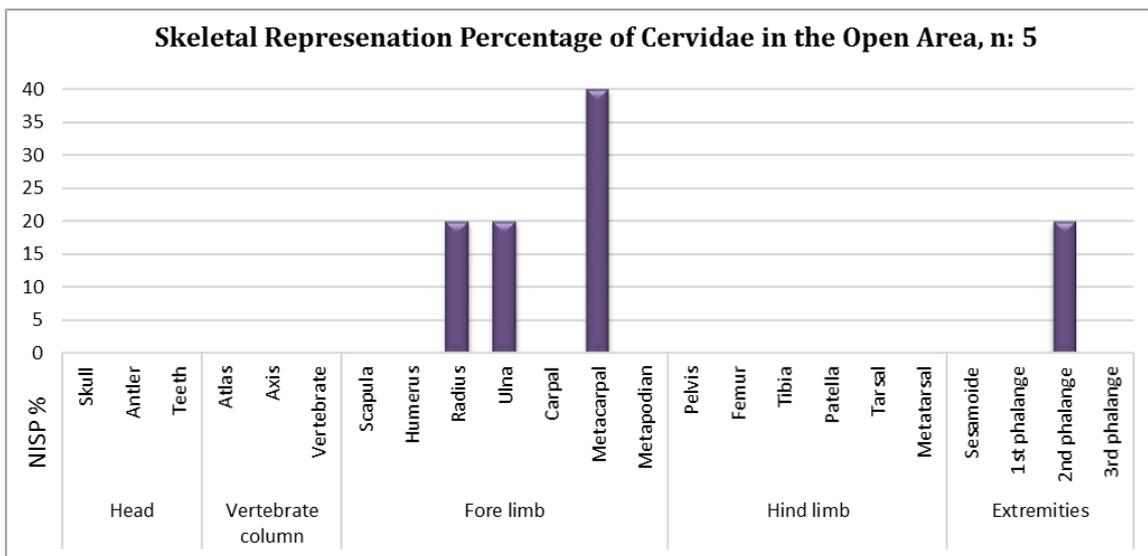


Figure 46. The skeletal representation percentage of Cervidae in the open area.

Breakage pattern

The breakage pattern of Caprines in this area is similar to the rest of units with a peak at 3-4 cm and a downturn afterward. While the Caprine breakage pattern (figure 24) in this unit follows the same pattern as the other units, irregular and unsteady breakage pattern with continuous ups and downs of cattle can be an indication for another taphonomic explanation for this unit (Figure 25). The longest cattle long bone in this area is 10 cm which is another indication for the higher level of fragmentation in the cattle bone assemblage of this area. However, since their number is low (n:5) and have an irregular breakage one explanation can be that they are the waste of the building either the leftover of food or tool making activity.

Tool production

Limited number (no: 4) of bone tools and waste of tool production have been recovered from this area (Figure 27). Caprines, cattle, and deer size bones were the resource for these tools.

Burning pattern

In total 264 specimens which is around 94% of the whole specimens recovered from this area have been composed to fire. The burning color spectrum in this area as well as different breakage pattern can be indicative for the burning of a mix of fresh and dry bones.

Butchery marks

Only two elements (around 1% of the whole NISP in the unit) have butchery evidence (Table 3). Both of these traces (one knife mark and the other chop mark) are evident on Caprine bones.

Artefactual data

The high concentration of the other artefacts (Figure 47) including 2 figurines, 3 hand axes, 1 pestles, 4 bone tools, 2 awls and 2 sling missiles seems interesting which can be an indication for a utilization of this unit as a dumping waste area.

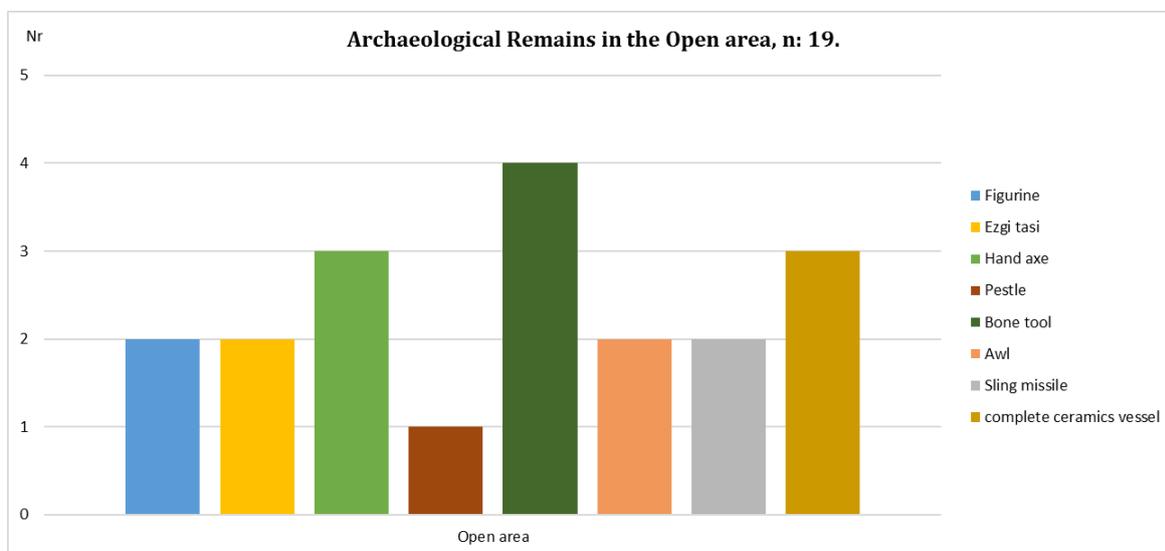


Figure 47. Archaeological finds from the open area.

4.4. Discussion

4.4.1. The general economy of Ulucak Level IV in comparison to previous studies and other Neolithic settlements

In general, a noticeable difference hasn't been observed between the study results from the level IV Ulucak by Çakırlar (2012 a, b) and this research. In total, she has studied 5701 specimens from the Level IV.

From the taphonomic point of view both studied assemblages were exposed to high level of fragmentation. However higher level of fragmentation can be attested for the faunal assemblages of this research. While the mean weight (in gr) of identified and unidentified medium sized mammals in her study was approximately 3.8 gr, whilst an average of 2 gr is found for this research assemblage. Better preservation of assemblage in her study, contrary to this research, has enabled her to examine questions such as kill-off pattern of Caprines and cattle, as well as producing LSI (Log Size Index).

Moreover, while 95% of this research material were exposed to fire, only 13.8 % of her assemblage were carrying traces of burning or calcination. This is a supportive evidence for the higher level of fragmentation of this research material. However, this difference can be an artifact of the different research questions which have influenced decision making when

choosing the assemblages for study. The main question in this study was investigating nature and subsistence economy separately for each of the buildings presented. Therefore, the faunal remains only from contexts representing the last time of “use” inside these areas have been studied. Instead Çakırlar had a diachronic and synchronic approach for investigating the general subsistence economy of the region through the time. In her work all contexts safely dated to the period into question were included.

Also a higher number of specimens with butchery marks in this research (1.5%) in comparison to the previous study with only 0.5% is noticeable too.

However, both studies have suggested the presence of four main domesticates (sheep, goat, cattle, and pig) as the main component of the subsistence economy of Ulucak during the later phases of Neolithic, followed by hunting species particularly fallow deer, and marine resources.

Çakırlar argues for the intensified exploitation of pig during the IV level contrary to the earlier phases of Neolithic. High number (8%) and weight (11% of WIS) of pig remains in this study agree with her argument.

Regarding the proportions of species at the herds of the settlement (Caprines, cattle, and pig) on the basis of NISP and WIS some comparisons are possible. In this assemblage, Caprines comprise 84% of the domestic animals followed by cattle and pig with each 8%. This pattern in the previous study suggests the presence of Caprines with almost 70%, followed by cattle and pig each with 15%. The equal role of cattle and pig in the subsistence economy of this level in both studies along with the dominance of Caprines is noticeable and a supporting evidence for the compatibility of both study results. Nevertheless, in this study Caprines hold the highest percentage by both, NISP (71%) and WIS (52%) while in Çakırlar’s work Caprines decrease by the WIS method (40%) and follow in the second place after cattle (50%). Accordingly, the lower presence of cattle remains along with their lower weight indicates a possibly different role of cattle remains in the units studied in this assemblage. It has already been shown that cattle bones have been used as tool making resource after consumption of the meat. Lower NISP scores of pig bone contrary to its weight scores can also be indicative of an opposite case to the cattle, that is a solely dietary role for pig hence its bones are little fragmented.

In the case of hunted species, in both assemblages hunted hare, Cervidae (fallow deer, and roe deer, the earlier one found more abundant), hare, and limited number of bird remains are

present. While red deer has been observed in Çakırlar's assemblage, no red deer were identified in this assemblage.

The other interesting point, is the presence of partial skeletons of canids (dog/fox) in both assemblages along with the scarcity of the specimens with dog chew marks.

The only other published zooarcheological study in this region is that of Çukuriçi (Galik et al. 2011). Comparison with these results also supports that the dominant economic strategy is the heavy exploitation of Caprines followed by cattle and pig.

The faunal remain studies in Çukuriçi from the level VIII which is the horizon of the Level IV Ulucak (Galik et al. 2011) reveals the domination of domestics with 70% of the identified specimens.

Hunted species comprise less than 10% of the assemblage. A high presence of bivalves (20%) and gastropods (almost 2%) is noticeable as well. However, regarding to the location of this settlement, as a coastal site, the exploitation of marine resources as a complementary strategy is expected.

Among the hunted mammals, in Çukuriçi level VIII, hare, fox, aurochs, wild boar, fallow deer, and red deer has been identified. The minute number of fallow deer antlers (around 3%) contrary to high number of its skeletal elements (around 30%) is in contrast with the high number of antlers in Ulucak level IV and low presence of fallow deer bones. Also while red deer comprises around 12% of hunted taxa in Çukuriçi level VIII, no red deer element has been identified in this research material.

Galik (2011) argues that there have been vegetation changes around the environment of some settlements such as Ilipinar, Ulucak, and Çukuriçi during the Late Neolithic. These resulted to a similar new trend among the late Neolithic inhabitants of these regions that is extensive exploitation of Caprines and fallow deer as taxa which prefer open land.

Interestingly, in this level of Çukuriçi, contrary to the earlier level, dog remains start occurring which is the same case with Ulucak Level IV.

Also four Neolithic sites in Marmara region in Istanbul including Fikirtepe, Pendik, Yenikapi, and Ilipinar have been studied by Canan Çakırlar (2013). According to the previous studies in these settlements, due to the accumulation of the marine mollusks and fish remains, a foraging subsistence economy for these settlements has been suggested. However, recent studies suggests another scenario for these regions. It is suggested that animal husbandry particularly domestic sheep, goat, and cattle were the main economic strategy for these

regions and foraging and exploitation of marine resources was mainly a supplementary strategy next to animal husbandry. Therefore, after domesticates (sheep, goat, and cattle), shellfish, hunted mammals, and fish were the main dietary component in these Neolithic settlements. Dairy products exploitation was also a part of their economic strategies.

Moreover, it has been showed that domestic pig was absent in these regions and in the younger phases of Neolithic there were either domesticated locally or introduced from the neighboring regions such as western Anatolia.

Arbuckle (2013) suggests some cultural avoidance reasons behind the absence of domestic pig in central Anatolian cultures, while due to the high presence of domestic pig in Later Neolithic phases of Ilıpınar, Çakırlar believes that the same case doesn't work for the Marmara region Neolithic settlements.

Therefore, a different characteristic of animal husbandry in this region in comparison with the other contemporaries in Central Anatolia, the Lake District, and Central Western Anatolia can be attested. i.e. in central Anatolian Neolithic settlement sheep and goat were the main subsistent component until the 6th millennium BC. This is while since the beginning of the Neolithic in the lake District, and the Aegean Anatolia particularly Ulucak, domestic sheep, goat, cattle, and pig were present.

Having a more detailed look at Ulucak faunal remains, some noticeable similarities can be observed with the mentioned Neolithic settlement in Marmara region. The presence of domestic sheep, goat, and cattle (excluding pig) as a main component of their diet, exploitation of dairy products, the supplementary but noticeable role of hunted species (either mollusks or wild mammals), and high exploitation of domestic pig during the later phases of Neolithic (Çakırlar 2012a) can be suggested.

However, lack of domestic pig in earlier phases of Neolithic in Marmara region contrary to Ulucak is one of the main differences.

Finally, we can argue for diversity in the subsistence economy and husbandry techniques among the Neolithic settlements along with some clear similarities. The diversity can be due to different cultural preferences, as well different geographic locations. However, attributing the mentioned similarities to a common cultural history requires further researches.

4.5. Comparison of the different units

The general trend in the faunal spectrum of the four units of Ulucak during the Late Neolithic period suggests exploitation of similar and common sources of animals. Even though this is so, when taking a more detailed look at each unit, there are some clear dissimilarities among the different buildings' assemblages (Table 9). However, these differences are not only on the species spectrum. In the case of the two residential units, the main differences are on the kind of utilization of species as well as skeletal representation, while in the case of the open area and the workshop the mentioned differences is related to the different percentages of the present taxa. The mentioned similarities and differences can be observed in the figure 48.

Caprines were the main and dominant taxa in all four units representing their main food resource and tool production raw material. Domination of tools made of Caprine long bones, their normal skeletal representation in all the areas, as well as the surprising similar breakage pattern of this taxa in all the units, supports this hypothesis. Therefore, it seems that parallel to the workshop as a place where tool production out of Caprine long bones took place, there was a domestic mode of production of the same tools within the residential units.

Cattle as the second most important taxon in the settlement reveals a completely different pattern. Contrary to the same NISP of cattle in the two residential units, the somewhat opposite pattern of the skeletal representation of this taxa in these two areas is noteworthy i.e. the elements which are present in one unit, are very limited or completely absent in the other unit. It may indicate that cattle bones were used as raw materials in unit 52. While butchery marks on cattle bones are present showing that this species was consumed at the same time it was the main source of tool production in the workshop (33 out of 75). Large bone fragments and mild breakage pattern of the cattle long bones in the workshop reveals a quite different pattern than the other units. Therefore, it can be assumed that while the cattle were present in all units, their number, and function were to some extent different. A more dietary status in the residential units and a more functional utility in the workshop can be considered for this species. Low presence of this taxa in the open area (3%) can support the importance of cattle bones as raw materials for the tool production. The cattle bones that were not broken during consumption were not thrown away in the open area or other rubbish areas but instead they may have been collected for tool manufacturing.

Pig is also always present in the assemblages from the all units while its presence is almost two times higher in the open area (11%) than the other units (5-6%). Being unsuitable for tool production because of their twisted shape, higher occurrence of pig bones in the open area

seems logical if we consider that there the rubbish is disposed. Different skeletal elements representation at the two residential units is noteworthy as well. The concentration of limb bones in the unit 12, is in contrast with their absence in the unit 52. This shows that unit 12 consumed regularly pig whilst for the unit 52 selected parts were only found.

Cervidae are also present in all units. However, in comparison to cattle, their distribution within the units is more unequal. In the workshop, antlers make the most of Cervidae findings clearly pointing out to the collection of them as raw materials for tool making. However, their almost normal skeletal representation in the building 12 along with the presence of butchery marks on some species proves the consumption for Cervidae in this unit. This is in contrast with the very limited occurrence of Cervidae in the building 52 with only one worked fallow deer antler, and one calcaneum. This low presence can indicate a different status for this taxa in unit 52 which is perhaps used again for tool manufacture (antlers) much more than a food resource.

Having looked at the other archaeological artefacts from these units, similarity among the studied units is undeniable. However, the accumulation of one or more items in each area (while they are completely absent or with a very limited number in the other area) can be an indication for a kind of similarity along with an attempt for a differentiation and specialization in an activity within each unit. Similarity of the main faunal resources, along with their completely different representation, number, and utilization can support the suggested hypothesis.

The workshop area is clearly dominated with items and raw materials related to production of certain artifacts such as ceramics and bone tools. Other everyday items are also found such as figurines (n:2), items of personal ornamentations such as beads (n:2), pendant (n:1) and food production related artifacts such as 2 ovens, and 15 grinding stones (only 6 of them in situ) one grinding installations. This is not strange if we think that everyday life and craft activities cannot be totally separated.

Units	Faunal composition		Taphonomic observation				Rest of cultural remains	
	Domesticates	Hunted game	Skeletal representation	Breakage pattern	Burning	Butchery marks		Tool production
Workshop	Caprine (61%) cattle (9%) pig (6%)	Cervidae (13%) Canidae (7%) Lepus & Aves (1%) frog, tortoise, mollusc (>1%)	Caprine: normal Cattle: normal pig: normal Cervidae: 90% antlers, worked long bones	caprine: similar pattern cattle: less fragmented (peak at 4)	100%	17 specimens (1%) 7 knife marks 10 chop marks only on domesticates	82 worked bone 33 cattle 37 Caprine/sheep size 5 Cervidae/deer size 7 UJ	Production tools (grinding stones, ovens, clay loaves, red pigment lumps, unfinished vessels, bone tools)
	B52	Caprine (82%) cattle (6%) pig (6%)	Cervidae (1%) Canidae (1%) Lepus (1%) Aves, frog & mollusc (<1%)	Caprine: normal Cattle: normal pig: low & sporadic (butchery waste) (negative trend with B12) Cervidae: limited (no:2)	caprine: similar pattern cattle: less fragmented (peak at 6)	71%	19 specimens (2%) 16 knife marks 3 chop marks on caprine, pig, hare	24 worked bone 18 Caprine/sheep size 2 cattle 2 cervidae/ deer size
B12	Caprine (80%) cattle (6%) pig (6%)	Cervidae (3%) Canidae (3%) Lepus & Aves (1%) tortoise & mollusc (<1%)	Caprine: normal (more long bones) cattle: back legs are missing pig: normal (negative trend with B52) Cervidae: normal	caprine: similar pattern cattle: highly fragmented (peak at 4)	96%	12 specimens (2%) 8 knife marks 4 chop marks domesticates & Cervidae	11 worked bone 10 Caprine 1 Cervidae	textile production, tool production, , cooking activities (spindle whorl, grond stone, loom weight, polishing stone, bone tools, sling missile)
Open area	Caprine (77%) pig (11%) cattle (3%)	Cervidae (3%) Canidae & Lepus (1%) tortoise (2%)	Caprine: normal cattle: limited posterior limbs pig: normal Cervidae: limited anterior limbs	caprine: similar pattern cattle: irregular & unsteady pattern	97%	2 specimens (1%) 1 knife mark 1 chop mark on Caprine/sheep size	4 worked bones 1 Caprine 1 cattle 2 deer size	dumping area (figurines, hand axe, pestle, bone tool , awls, sling missile)

Table 9. Comparison of units studied from zooarchaeological and archaeological aspects.

The open area shows a variety of everyday items in relative small numbers. The units 12 and 52 have a variety of everyday items without any one playing a very important role with three exceptions. In Unit 12 we have an abundance of ground stone tools and the unit 52 a very high number of bone tools. In Unit 12 also there is a large number of loom weights which are missing from Unit 52 and the open area whilst there is a small number of them in the workshop. These findings also point out to a picture of all activities happening within all areas but clearly there is an emphasis of certain activities in specific units.

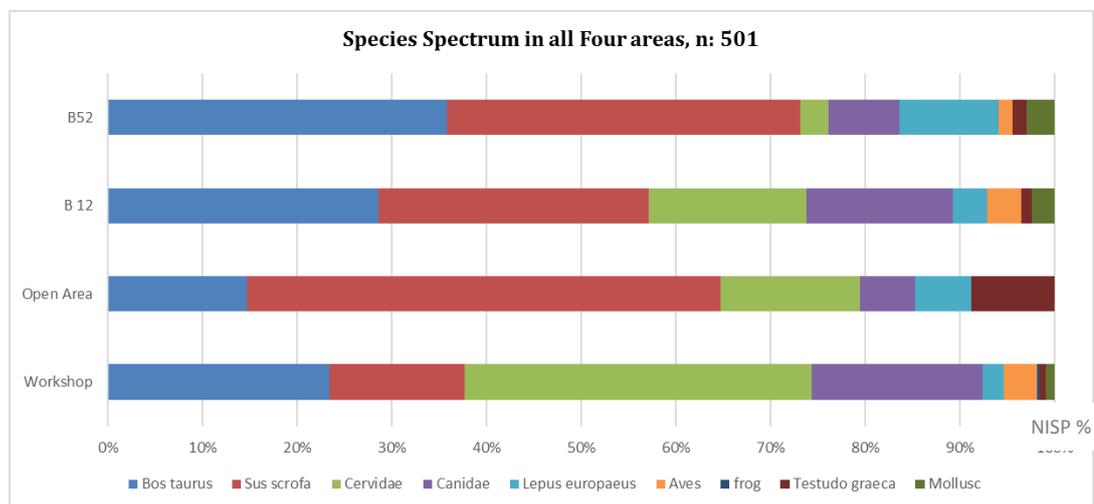


Figure 48. The species spectrum comparison between the units studied by means of NISP percentage (Caprines excluded).

Also having a look at the architectural pattern of the units 52 and 12, clear differences can be observed as well. While a clear interior arrangements and space differentiation can be observed in unit 12, no parallel evidence is present in unit 52. The unit 52 has an entrance opening to the east, without any evidence for an open yard. This is while the unit 12 has an entrance facing to the west and to an open yard with some evidence (oven and working area platform) for practicing production and daily activities in this area (Figure 11).

These are evidence of differentiated households where high number of daily activities were performed within and around each of them. The boundaries and privacy are clearly defined in these houses by walls. This is while at the same time some activities are getting specialized and are performed within a special space (workshop). The presence of a “workshop” even if not absolutely contemporary with the domestic buildings 12 and 52 indicate that during the Late Neolithic groups of people are taking the risk of “independent household” type of

economy to a step further: That is to the point of assuming such specialized economic strategies as it is to operate a “workshop”.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND FURTHER RESEARCH

5.1. Conclusions

In this thesis, I set up an aim to examine the subsistence economy and the taxonomic composition of four residential and non-residential units in Ulucak. The data used here came from Level IVb and IVc which corresponds to the Late Neolithic period in the region and are dated to the 6000-5700 cal BC.

The methods applied for studying the faunal remains are species proportions and taphonomic observations (skeletal representation, breakage pattern, burning, butchery marks, and tool production).

In this research some evidence of differentiation between the different studied units was indeed found. It mostly stemmed from the exploitation of wild animals, namely the deer artifact assemblages also showed some differentiation in the equipment contained within each unit therefore indicating households or group of people putting more emphasis to different activities or “occupations”.

Looking at the overall economy of the units, the trend observed is exploitation of domesticates (Caprine, cattle and pig) with hunted game (Cervidae, Lepus, Aves) playing important role which is similar to what previous zooarchaeological studies in Ulucak (Çakırlar 2012 a, b) suggest. High number of Canidae skeletal elements is this level is noticeable as well. While there is no evidence for the consumption of this taxa in the settlement, the possibility of Canidae exploitation as a part of diet cannot be excluded.

Turning to comparison between the different units, in order to test the possibility of having independent household in Ulucak level IV, some differences among the studied units were observed. When we consider species proportions, we observe that the faunal composition of the all units is based on completely similar resources particularly in the case of domesticates. Caprines, followed by cattle, and pig were the main taxa recovered from the all units. Cervid family (fallow deer, and roe deer), hare, bird, Canidae (dog/red fox), rodents, tortoise, and marine molluscs compose the rest of taxa in each unit.

Nevertheless, in the case of the workshop and the open area, there is an opposite trend” between the two concerning taxonomic composition. The dominant taxa in the workshop (cattle, Cervidae, and Canidae) have limited presence in the open area. And the same holds true for the high number of pig and hare in the open area, which played negligible role in the workshop. In the case of the residential units, high number of hunted species (Cervidae, canid, and bird) in the unit 12 is in contrast with their lower presence in the unit 52. The only hunted game with higher number in the unit 52 is hare comprising 10% of NISP.

Turning to skeletal representation, clear diversity between different units can be observed. No diversity has been observed in the Caprine specimens, while a clear negative trend between the skeletal elements of cattle, and to some levels pig and Cervidae in the unit 12 and 52 is present.

These findings support our expectation because truly clear differences between units are noticeable. The units 12 and 52 are clearly different from each other in terms of the skeletal representation of cattle, pig, and Cervidae, their breakage pattern, number of worked bones as well as the rest of artefacts. Also at least, in the case of Cervidae while a dietary role can be assumed for this animal in the unit 12, probably it was not a part of the subsistence economy of the unit 52.

Clear diversity between the architecture and the organization of these two units also support our results. While the unit 52 has an entrance to the west, the unit 12 opens up to its backyard which is surrounded by pise wall. The occurrence of a working area and oven in this yard can be an indication of practicing some daily activities in this area, while no yard is present in the unit 52.

In the final step, a comparison between the earlier Neolithic occupational levels in Ulucak with the studied units for this research can be useful as well. The dominant characteristics of Neolithic way of life in Ulucak was architectural units big in size, with no cultural remains indicating for practicing daily activities there. The presence of architectural continuity, as well as ritual and symbolic utilization of animal bones and lime plastered floors are the other characteristics of this level (Çevik & Abay 2016). The main subsistence economy of the settlement was based on domesticates with hunted game playing limited role (Çakırlar 2012 a). The concentration of thirteen hearths and ovens in this level also have been identified as communal hearths where the inhabitants of the settlement were eating there together for a long period of time. These characteristics during the 4th occupational level of the settlement (Late Neolithic) gave way to architectural units smaller in size comprise cultural remains

indicating daily activities and food production. Phenomenon such as building continuity, animal bone implements, of communal hearths and ovens are not present anymore. The exploitation of similar resources but in different percentages and elements, practicing vessel, tool and food production within each building, as well as presence of building specialized in an activity can be indications for having households more independent from the others. Increasing the exploitation of hunted species including pig, Cervidae, and hare contrary to the earlier phases of Neolithic period in the settlement is another interesting issue and change in the subsistence economy of the settlement. However, the end of all phases of the settlement are the same, completely burned either intentionally or because of natural events (such as earthquake).

5.2. Limitations and further research

Although the research has reached its aims, several limitations were faced while doing this research. First, due to the high level of fragmentation of the faunal remains a considerable number of specimens have been left unidentifiable. This also has made it difficult to use sufficiently the weight and measurement information. This has made a part of information such as the size of the animals as well as their real weight unattainable. The high degree of fragmentation may have also biased to some extent the evaluation of the exact role of each different species in the economy because some species suffered more fragmentation than others.

Second, burning is another agent resulting in even more fragmentation of the specimens. It has also made some of the butchery marks difficult to observe.

Third, one of the important problems for interpreting these results and advocating the case of the “independent household” for Ulucak is the limited number of units available with such detailed spatial information at present. Also we have assumed that each building is a “unit” which is expected to have been used by one “household”. More research on other such “units” will help demonstrate if this is the case or not. Unfortunately, similar data are not available from other sites in the region to provide a background against which the results of the current study could have been compared.

Fourth, as in the case of both units (12 and 52) some parts of buildings have been excavated by the previous team that worked at Ulucak. Unfortunately, these data couldn't be studied.

Different excavation and documentation methods have made retrieving the information impossible.

Finally, limited excavation in the earlier phases of Neolithic in Ulucak as well as lack of parallel studies in the whole region do not provide an opportunity for a diachronic and synchronic study of the household operations.

Therefore, for the further research, examination of more houses in the Level IV of Ulucak as well as earlier phases can be suggested.

In addition, the variety of activities observed in the units and our suggestion that the households may well have been operating in the independent mode suggested for the Late Neolithic, brings forward the idea that a spatial analysis of the faunal remains and the rest of remains within each building will be a very useful research for the future to examine how the allocation of space for various activities is done within the buildings and in comparison between them.

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APPENDICES

A. PHOTO PLATES

Plate 1.



a. Canidae
Paw
burned



b. Canidae
Paw
burned

c. Canidae
Mandible
burned



d. Canidae
(from left to right):
Tibia
Calcaneum
Femur
burned

Plate 2.



e. worked bones
Sheep size long bones
Heated and burned



f. Worked antlers
Cervidae
burned



g. Worked bone
Metapodia
burned

h. Worked bone
Tibia
heated



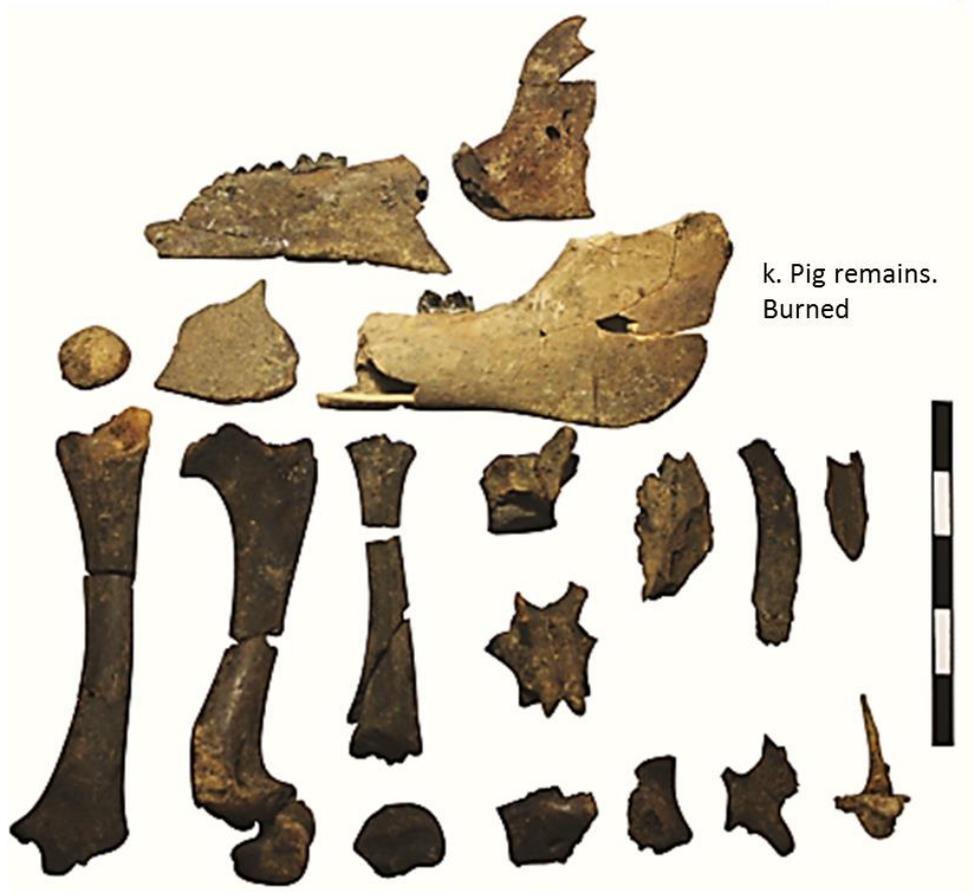
Plate 3.



i. Goat,
Humerus,
burned



j. Goat
Horn
Burned.



k. Pig remains.
Burned

Plate 4.



l. Fallow deer
1st and 3rd phalanges
burned



m. Fallow deer.
Calcaneum
Burned



n. Fallow deer
Antler
burned



o. Fallow deer
Antler
burned

Plate 5.



p. Hare
Humerus
burned



q. Hare
Femur
burned



r. Tortoise
Shell and Humerus
burned



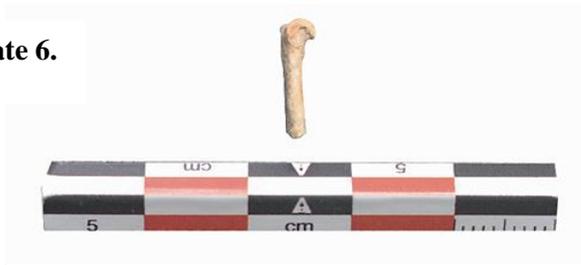
s. Aves
burned



t. Tortoise
Shell
heated



Plate 6.



u. Rodentia



w. Wild goat
Horn
burned



v. Squirrel
Femur
burned

Plate 7.



x. Human
Mandible
burned



y. Human
Fibula
heated



z. Molluscs
worked
burned

B. TURKISH SUMMARY/ TÜRKÇE ÖZET

Yeni bir sosyal ve ekonomik birim olarak “otonom hane” kavramının Yakın Doğu’da Neolitikleşmenin son aşamalarında ortaya çıktığı ifade edilmektedir. Orta Anadolu ve Kuzey Levant’ta hanelerin aşama bazlı gelişimi sürekli gözlemlenmesine rağmen, bu sürecin aynısını Batı Anadolu’da gözlemek daha zordur. İzmir Ulucak Höyük’te yapılan kazılar Batı Anadolu’daki Neolitik dönemin en erken ve sürekli devam eden sürecini gözlemlemeyi sağlamıştır. Bu Zooarkeolojik çalışmada, dört birim arasındaki kalıntıların (iki hane, bir atölye ve açık bir alan) IV. Tabaka’de (6000-5700 M.Ö) bulunduğu ve yukarıda bahsedilen hipotezde Batı Anadolu’daki Neolitik çağının geç dönemlerinde geçerliliğinin ölçmesi amaçlanmaktadır.

Bu çalışmada kullanılan kanıtlar, makrofaunal kalıntılar (elle-toplanmış) ve bu kalıntılardan elde edilen veriler ile ortaya konmuştur. Sadece tabanda duran ve çöken çatı altında kalan kemikler değerlendirilmiştir.

Trantalidou (2005) tarafından incelenen Düzey IV, Va ve Vb’den alınan sınırlı sayıda faunal kalıntı (307) haricinde Canan Çakırlar tarafından bu yerleşimin Neolitik faunal kalıntılarına ilişkin geniş hayvanatlılık araştırmaları yapılmıştır. Çalışılan kalıntılar 2009’dan 2012’ye kadar olan operasyonlarla toplanmıştır. Bu çalışmanın ana konsantrasyonu, bölgedeki hayvancılık uygulamalarının başlangıcı ve evrimi ile Orta-Batı Anadolu kültürlerinin, özellikle Ulucak Höyük’ün Hayvancılık teknolojilerini Güneydoğu Avrupa’ya dahil ettiler.

Buna göre ana ilgi Höyük’ün Neolitik evrelerinde ana hayvan sürülerinin evcilleştirilme durumunu ve ikincil ürünlerin durumunu araştırmaya odaklanmıştır.

Genel olarak, Ulucak Höyük’teki zooarkeolojik araştırması, hem saha hem de bölgesel ölçekte değerli bilgiler ortaya çıkarmıştır.

Yerleşimin başlangıcından (M.Ö. 7. binada) beri Neolitik Çağ’ın evrimleşmiş Kaplarının yanı sıra sığır ve domuzun ana bileşenler olduğu genç dönemlere ve bölgenin ana geçim ekonomisine ışık tutmuştur. Bazı dalgalanmalar ve genç safhalar sırasında gıdalardaki geyik ve tavşan gibi beslenen yabani avlanan türlere biraz daha önem veriliyor. Ana ıslatma teknikleri, sonraki aşamalarda süt üretimine (Caprines’den ve muhtemelen sığırlardan) gelen et üretiminden başlamıştır.

Daha büyük kederde, Ulucak’taki zooarkeolojik çalışmaları ve Ege’nin Türkiye’deki diğer araştırmaları (Yeşilova, Ege Gübre, Çukuriçi ve Dedecek Heybelitepe), bu bölgedeki gıda

üreten toplulukların resmini netleştirebilir. Bununla birlikte, bu yerleşimlerin çoğundan sınırlı zooarkeolojik çalışmaları ve yayınları, bu araştırmayı yaparken karşılaşılabilecek başlıca sorunlardan biridir.

Genel olarak , Çakırlar (2012 a,b) tarafından Ulucak'ın 4. seviyesinden yapılan çalışma sonucu ile bu araştırma arasında belirgin bir fark görülmemiştir. Toplamda 4. seviyeden 5701 numune incelenmiştir. Tafonomik bakış açısıyla incelenilen topluluklar , yüksek parçalanma düzeyine maruz kalmışlardır. Bununla birlikte , bu araştırmadaki faunal topluluklar için daha yüksek düzeydeki parçalanma kanıtlanabilir. Tanımlanmış ve tanımlanmamış orta boy memelilerin ortalama ağırlığı 3.8 gr iken bu araştırma gurubu için ortalama 2 gr bulunmuştur. Araştırmaların aksine topluluğun korunması , Caprine ve sığırların öldürülme şekillerinin yanı sıra , LSI (Log Size Index) gibi sorunların da incelenmesini sağladı. Dahası , bu araştırma malzemesinin %95'i ateşe maruz kalırken , topluluğunun sadece %13,8'i yanma veya kolsinasyon izleri taşıyor. Bu , araştırma materyallerinin parçalanma seviyesinin yüksek olması için destekleyici bir kanıttır. Bununla birlikte bu farklılık , çalışmak için toplulukları seçerken karar vermeyi etkileyen farklı araştırma sorularını her eseri alabilir. Bu çalışmadaki ana soru , sunulan binaların her biri için ayrı ayrı araştırma ve doğa ekonomisi idi. Dolayısıyla faunal , yalnızca bu alanlardaki "kullanım" ın son zamanını temsil eden bağlamdan kalmıştır. Bunun yerine Çakırlar , bölgenin genel geçim ekonomisini araştırmak için eş zamanlı bir yaklaşıma sahiptir. Çalışmalarında , söz konusu döneme güvenli bir şekilde tarihlenen tüm içerik eklenmiştir.

Ayrıca , bu araştırmada (1.5%) kutup işaretleri bulunan örneklerin kıyaslanmasında yalnızca 0.5%'lik değerli araştırmalara kıyasla daha çok göze çarpar.

Bununla birlikte , her iki çalışma Neolitik Dönem'in ilerleyen dönemlerinde Ulucak'ın geçim ekonomisinin ona bileşeni olan dört ana evcil hayvanın (koyun , keçi , sığır , domuz) varlığının ve ardından avcılık türlerinin kısmen de olsa geyik ve deniz kaynaklarının bulunduğunu göstermektedir.

Çakırlar, Neolitik dönemin aksine IV seviyesinde domuzun yoğun bir şekilde sömürüldüğünü savunuyor. Bu çalışmada domuzların yüksek sayı (% 8) ve ağırlığı (WIS'in% 11'i) argümanı ile aynı görüştedir.

Yerleşme sürülerindeki (kapris , sığır ve domuz) NISP ve WIS temellerindeki oranlarla ilgili bazı karşılaştırmalar mümkündür. Bu toplulukta Caprines , ev hayvanlarının %84'ünü oluştururken , %8'ini domuz ve sığır oluşturmaktadır. Bir önceki çalışmadaki bu model , neredeyse %70'lik Caprines'in varlığından , bunu %15 ile sığır ve domuzun izlediğini

göstermektedir. Sığır ve domuzun her iki çalışmada geçim ekonomisindeki eşit derecedeki rolü Caprines'in hakimiyetiyle dikkat çekicidir ve her iki çalışma sonuçlarının uyumluluğu için destekleyici bir kanıt vardır. Bununla birlikte , Çakırlar' da NISP (%71) ve WIS (%52) en yüksek orana sahip olan Kerkük'ler , WID yönetimine göre (%40) kefirler , 2. Sırada da sığırlarda (%50). Buna göre , düşük sığır varlığı , düşük ağırlıklar ile birlikte kaldığından , bu külçe bölgede incelenen ünitelerde sığır kalıntılarının muhtemelen farklı bir rol oynadığını gösterir. Sığır kemiklerinin et tüketiminden sonra kaynak ücreti olarak kullanıldığı şimdiden gösterildi. Ağırlık skorlarının aksine alt NISP domuz kemiği puanları , sığırın karşıt durumunun göstergesi olabilir ; taht domuz için sadece bir beslenme rolüdür ve dolayısıyla kemikleri küçük parçalanır. Avlanan türlerdeki her iki toplulukta tavşan , Cervidae (nadas , geyik erken bulunur) ve sınırlı miktarda kuş kalıntısı vardır. Çakırlar'daki toplulukta kırmızı geyik görülürken bu toplulukta tespit edilmemiştir.

Diğer ilginç nokta , köpek yeme işaretleri bulunan örneklerin kıtlığı ile birlikte her iki toplulukta kısmi köpek iskeletlerinin (köpek /tilki) varlığıdır.

Bu bölgede yayımlanmış diğer tek zooarkeolojik araştırması Çukuriçi'dir (Galik ve diğerleri 2011). Bu sonuçlarla kıyaslama, baskın ekonomik stratejinin, Kaprinin ağır sömürüye uğrayarak sığır ve domuz olduğunu izah etmektedir.

Çukuriçi'de IV. Seviye IV. Ulucak'ın ufku olan (Galik ve diğerleri 2011) VIII. Düzeydeki faunal kalıntı çalışmaları, tespit edilen örneklerin% 70'inde yurtiçi hâkimiyetini ortaya koymaktadır.

Avlanan türler, topluluğun% 10'dan azını oluşturmaktadır. Bivalveslerin (% 20) ve gastropodların (neredeyse% 2) yüksek varlığı da dikkati çekmektedir. Bununla birlikte, bu yerleşimin yeri ile ilgili olarak, kıyı alanı olarak, deniz kaynaklarının tamamlayıcı bir strateji olarak kullanılması öngörülmektedir.

Avlanan memeliler arasında Çukuriçi VIII. Seviye, tavşan, tilki, aurochs, yaban domuzu, nadasa geyik ve kırmızı geyik tespit edilmiştir. İskelet elemanlarının sayısının (yaklaşık% 30) aksine, nadasa geyik boynuz sayısı (yaklaşık% 3), Ulucak IV seviyesinde yüksek sayıdaki boynuz ve nadasa ait geyik kemikleri varlığının aksine. Ayrıca kırmızı çöl, Çukuriçi VIII. Düzeydeki avlanan taksonların% 12'sini oluştururken, bu araştırma materyalinde kırmızı geyik unsuru tespit edilmemiştir.

Galik (2011), Geç Neolitik Çağ sırasında Ilipinar, Ulucak ve Çukuriçi gibi bazı yerleşim birimlerinin çevresi boyunca vejetasyon değişiklikleri olduğunu savunuyor. Bunlar, bu

bölgelerin geç Neolitik sakinleri arasında, açık araziye tercih eden taksonlar ve nadasa ait geyiklerin geniş kullanımı olan benzer yeni bir eğilime neden oldu.

İlginçtir ki, Çukuriçi'nin bu seviyesinde, önceki seviyenin aksine, köpek kalıntıları Ulucak IV seviyesinde aynı durumla başlar.

Ayrıca İstanbul'un Marmara bölgesinde Fikirtepe, Pendik, Yenikapı ve İlipinar dahil olmak üzere dört Neolitik alan Canan Çakırlar (2013) tarafından incelenmiştir. Bu yerleşimlerdeki daha önceki çalışmalara göre, deniz yumuşakçularının ve balık kalıntılarının birikimi nedeniyle, bu yerleşimler için geçimlik bir geçim ekonomisi önerilmiştir. Bununla birlikte, tekrarlanan çalışmalar bu bölgeler için bir başka senaryo önermektedir. Özellikle yerli koyun, keçi ve sığırların hayvancılığın bu bölgelerin başlıca ekonomik stratejisi olduğu ve deniz kaynaklarının taranması ve kullanılması, hayvancılığın yanında ek bir strateji olarak öne sürülmüştür. Bu nedenle, evcil hayvanlardan sonra (koyun, keçi ve sığır) kabuklu deniz hayvanları, avlanan memeliler ve balıklar, bu Neolitik yerleşimlerde başlıca diyet bileşenydi. Süt ürünleri sömürüsü de ekonomik stratejilerinin bir parçasıydı.

Dahası, bu bölgelerde evcil domuz bulunmadığını ve Neolitik Çağ'ın genç evrelerinde yerel olarak evcilleştirildiğini veya batı Anadolu gibi komşu bölgelerden getirildiğini gösterdi.

Arbuckle (2013), İç Anadolu kültürlerinde yerli domuzun yokluğunun arkasında bazı kültürel kaçınma nedenlerini öne sürerken, İlipinar'ın Daha Geç Neolitik Döneminde yerli domuzun varlığı nedeniyle Çakırlar, aynı davanın Marmara Bölgesi için geçerli olmadığını düşünüyor. Neolitik yerleşimler.

Bu nedenle, bu bölgede hayvancılığın farklı bir özelliği olan Orta Anadolu, Göller Bölgesi ve Orta Batı Anadolu'daki diğer çağdaşlarla kıyaslanabilir. Yani Orta Anadolu Neolitik yerleşim yerinde koyun ve keçi, M.Ö. 6. binyılın başlarına kadar varolan temel bileşendir. Bu, Göller Bölgesi Neolitik Çağ'ın başlangıcından bu yana ve özellikle Ege Anadolu'da özellikle yerli koyun, keçi, sığır ve domuzlar Ulucak'ta bulunmaktaydı.

Ulucak faunal kalıntılarına daha detaylı bir bakışı olan Marmara bölgesinde bahsedilen Neolitik yerleşim ile gözle görülür benzerlikler gözlemlenebilir. Diyetlerinin temel bileşeni olan yerli koyun, keçi ve sığırların (süt hariç) süt ürünlerinin kullanımı, avlanan türlerin (yumuşakçalar veya yabani memeliler) tamamlayıcı rolü ve yerli domuzun yüksek derecede sömürülmesi süresince varlığı Neolitik dönemin sonraki evreleri (Çakırlar 2012a) önerilebilir.

Bununla birlikte, Marmara bölgesinde Neolitik Çağ'ın erken evrelerinde evcil domuz bulunmaması Ulucak'ın aksine başlıca farklılıklardandır.

Son olarak, Neolitik yerleşimler arasında geçim ekonomisi ve hayvancılık tekniklerindeki çeşitlilik ve bazı açık benzerlikler üzerinde tartışabiliriz. Çeşitlilik, farklı coğrafi bölgeler gibi farklı kültürel tercihlere bağlı olabilir. Bununla birlikte, bahsedilen benzerlikler ortak bir kültür tarihine atfetmek, daha fazla araştırmayı gerektirir.

Bu topluluğu incelemek için ana sınırlamalardan ve zorluklardan bir tanesi, kalıntıların kalsinasyonunun yüksek seviyede olmasıdır. Bu dört birimden gelen bütün topluluğun neredeyse% 95'i ağır yanmış durumda. Bu tafinik süreç, osteometrik ölçümlerin yanı sıra, topluluğun gerçek ağırlık üzerinde keskin azalma gösteren örneklerde kesik iz izlerini gözlemlenmede güçlüklerle sonuçlandı. Aynı zamanda, topluluğun parçalanma seviyesi son derece yüksek olup, topluluğun% 46'sında herhangi bir türle ilgili tanınabilir özellik taşımayan ve yalnızca "genel hayvan boyutu" düzeyinde kategorize edilmiştir.

Geçmiş Neolitik Dönem'de Ulucak'ın dört bölgesinin faunal yelpazesindeki genel eğilim , benzer ve ticarete neden olan hayvan kaynaklarının istismar edilmesini öneriyor. Buna rağmen , her birine daha ayrıntılı bir bakış atarken farklı bina toplulukları arasında açık farklar vardır. (Table 9). Bununla birlikte bu farklılıklar sadece spekturumunda değildir. İki konut ünitesinde ana farklılıklar , iskelet sistemi kadar türlerin kullanımı türündedir , açık olan ve atölye çalışması sözkonusu farklılıklar mevcut taksonun farklı yüzleriyle ilişkilidir. Belirtilen benzerlikler ve farklılıklar , şekil 48 de görülebilir.

Kapronlar , başlıca gıda kaynaklarını ve takım üretim hammaddesini temsil eden dört birimde başlıca ve baskın taksonlardır. Caprine'nin uzun kemiklerinden yapılmış aletlerin hakimiyeti , bütün bölgelerdeki normal iskelet temsilleri ve bu birimlerin serpteki benzeri kırılma biçimleri , bu hipotezi destekliyor. Bu nedenle , Caprine uzun kemiklerinden atölyeye takım üretimi yapılan paralel bir yer olarak , yerleşim birimlerinde aynı araçların üretildiği yerli bir modu varmış gibi görülür.

Yerleşimde ikinci önemli takson olan sığır, tamamen farklı bir durum ortaya koymaktadır. İki farklı birimdeki sığır NISP değerleri aynı olmasına rağmen, bu birimler içindeki iskelet elementlerinin temsilindeki zıtlık dikkat çekicidir. Diğer bir deyişle bir birimde bulunan elementler, diğer birimde çok sınırlı veya tam anlamıyla yoktur. Bu durum sığır kemiklerinin, Birim 52'de, hammadde olarak kullanıldığını gösterebilir. Sığır kemiklerindeki mevcut kasaplık izleri bu türün tüketildiğini gösterirken aynı zamanda işlik alanında alet yapımı için ana kaynak olduğunu da göstermektedir. Sığır kemiklerine ait büyük kemik parçaları ve hafif kırılma şekilleri, diğer birimlerden oldukça farklı bir durum sergilemektedir. Bu nedenle, tüm birimlerde sığır bulunmasına karşın, sayıları ve fonksiyonlarında bir miktar farklılık olduğu

kabul edilebilir. Bu tür için, konutlarda daha çok beslenme durumu ve işlik alanında ise daha çok işlevsel bir fayda sağladığı düşünülebilir. Bu taksonun açık alandaki düşük varlığı (%3), sığır kemiklerinin alet üretiminde hammadde olarak kullanılmasının önemini destekleyebilir. Tüketim sırasında kırılmayan sığır kemikleri açık alana veya diğer çöp alanlarına atılmayıp, bunun yerine alet imalatı için toplanmış olabilirler.

Domuzun varlığı ise daima tüm birimlere ait buluntu topluluklarında görülürken, açık alan (% 11) içindeki varlığı, diğer birimlerden (% 5-6) neredeyse iki kat daha fazladır. Domuz kemiklerinin bükülmüş şekilleri nedeniyle alet üretimi için uygun olmayışları ve açık alanda daha fazla oranda bulunmaları nedeniyle bu kemiklerin buralara çöp olarak atıldıklarını düşünmek mantıklı görünmektedir. Her iki konut biriminde de farklı iskelet elementlerinin dağılımı dikkate değerdir. Birim 12'deki ekstremite kemiklerinin yoğunluğu, Birim 52'de bulunmamaktadır. Bu durum dolayısıyla, Birim 12'nin düzenli olarak domuz tükettiği, 52 nolu birimde ise sadece domuzun seçilen kısımların bulunduğu tespit edilmiştir.

Geyik, her birimde görülmektedir. Bununla birlikte, sığıra kıyasla, birimlere içindeki dağılımları eşit değildir. İşlik alanlarındaki geyik boynuzları, bunların alet yapımı için hammadde olarak toplandıklarını açıkça göstermektedir. Bununla birlikte, Bina 12'deki normal iskelet elementleri kasaplık izleri ile birlikte bulunmaktadır.

Bazı türler bu birimde geyik tüketimini kanıtlamaktadır. Bu durum, 52 numaralı binada geyiğin sınırlı bir şekilde bulunması, sadece bir adet işlenmiş ala geyik boynuzu ile calcaneumunun bulunmasıyla zıtlık içeren bir durumdur. Bu düşük mevcudiyet, bu taksonun Birim 52'de muhtemelen bir besin kaynağından çok alet yapımı için (boynuzlar) kullanıldığı farklı bir durumu gösterebilir.

Bu birimlerdeki diğer arkeolojik buluntulara bakıldığında, incelenen birimler arasındaki benzerlik yadsınamaz. Bununla birlikte, her alanda bir veya daha fazla buluntunun birikmesi (diğer alanlarda tamamen yokken veya çok sınırlı sayıda bulunurken) bir çeşitliliğin göstergesi olabilir ya da her birimde bir faaliyet ile ilgili olarak, farklılaşma ve uzmanlaşma girişimi de olabilir. Ana faunal kaynakların benzerlikleri, bunların tamamen farklı dağılımları, sayıları ve kullanımları ile birlikte önerilen hipotezi destekleyebilir.

İşlik alanına, seramik ve kemik alet gibi bazı buluntuların üretimi ile ilgili öğeler ve hammaddeler açık biçimde hakimdir. Ayrıca figürinler (n: 2), boncuk (n: 2) ve pedant (n: 1) gibi kişisel süs eşyaları, gıda üretimiyle ilgili 2 adet fırın, 15 ezgi taşı (6 tanesi yerinde) ve bir ezgi taşı düzeneği gibi günlük kullanım amaçlı buluntular ele geçenler arasındadır. Günlük

yaşam ve zanaat faaliyetlerinin tamamen ayrılamayacağını düşünürsek bu durum garip değildir.

Açık alan, nispeten küçük sayıdaki günlük öğeyi içermektedir. Birim 12 ve 52’de, üç istisna dışında çok önemli bir rol oynamayan, çeşitli gündelik öğeler görülmektedir. Birim 12’de çok sayıda öğütme taşı ve Birim 52’de çok sayıda kemik alet bulunmaktadır. Birim 12’de ayrıca Birim 52’de ve açık alanda görülmeyen çok sayıda tezgah ağırlığı vardır. İşlik alanında ise az sayıda tezgah ağırlığı bulunmaktadır. Bu bulgular, tüm alanlarda gerçekleşen faaliyetlere dair bir resim ortaya koymaktadır. Açıkça belli birimlerdeki belirli faaliyetlere vurgu yapılmaktadır.

Ayrıca Birim 52 ve 12’nin mimari yapılarına bakıldığında da açık farklar gözlemlenebilir. Birim 12’de net bir iç mekan düzenlemesi ve alan ayrımı gözlemlenirken, Birim 52’de ise farklı bir durum bulunmaktadır. Birim 52’de, açık avluya ilişkin herhangi bir kanıt olmaksızın doğuya açılan bir giriş aralığı vardır. Bununla birlikte Birim 12, Batı’ya bakan bir girişi ile üretim ve günlük faaliyetlerin yürütüldüğüne dair bazı kanıtlara (fırın ve çalışma alanı platformu) sahip açık bir avluya sahiptir.

Tüm bu durum, içinde ve çevresinde her gün çok sayıda etkinlik gerçekleştirilen farklılaşmış hanelerin kanıtıdır. Sınırlar ve gizlilik, bu evlerde duvarlarla açıkça tanımlanmıştır. Aynı zamanda bazı faaliyetler, uzmanlaşmaya başlamış ve özel bir alan (işlik) içerisinde gerçekleştirilmektedir. Bir "işliğin" varlığı, 12 ve 52 numaralı domestik binalarla kesinlikle çağdaş olmasa da, Geç Neolitik Çağ insanların "bağımsız hane" tipi ekonominin risklerini alıp, durumu bir adım daha ileri götürdüklerini göstermektedir.

Bu çalışmada araştırılan üniteler arasında fark olduğuna kanaat kılınmıştır. Yaban hayvanlar, daha, detaylı olmak gerekirse, geyik kalıntılarında çıkan gözlemler, her ünite içinde kullanılan ekipmanların çevredeki yaşayanların farklı aktivitelerle uğraşmış ve farklı ‘yerleşkeler’ tabirini kullanmanın uygun olduğunu göstermektedir.

Eğer bu ünitelerin ekonomik belirtilerine bakıldığında, Ulucak’ta daha önce yapılmış olan zooarcheolojik çalışmalarda (Çakırlar 2012 a, b) belirtildiği gibi, evcilleştirilmiş hayvan türleri (keçi, büyükbaş ve domuz) ve avlanan türlerinden (geyik, tavşan ve kuş) faydalandığı görülmüştür. Çok sayıda olan köpekgillerin kemikleri de fark edilmiştir. Taksa kullanımlarının verisi bulunmasa da, besin ihtiyaçları için köpekgillerden faydalanılmış olunmuş olmasının ihtimali göz arda edilemez.

Farklı üniteler arasındaki farklara geri dönersek, Ulucak IV bölgede bağımsız hane olmuş olma ihtimaline bakıldığında, bazı farklılıklar gözlemlenmiştir. Bu ünitelerde türlerin

boyutları, faunal yapıları evcilleşmiş türler ile benzer örneklere raslanmıştır. Köpekgiller, büyükbaş, ve domuz bulunan taksalar en temel olanlarını oluşturmaktadır. Cervid ailesi (alageyik ve karaca), tavşan, kuş, köpekler, sürüngenler, kaplumbağa ve bu taksanın geri kalanını oluşturmaktalar.

Yine de atölye ve açık alanlara geldiğimizde, ikisinin taksonomisi arasında ters bir eğilim vardır. Baskın olan taksanın (büyükbaş, geyik ve köpekgiller) atölyede az izine rastlanılmıştır. Aynı gözlem bölgedeki çok sayıda olan açık havada rastlanan domuz ve tavşan içinde atölyedeki katkıları için söylenebilir. Yüksek sayıda olan avlanan türlerin (büyükbaş ve köpekgiller) hane üniteleri içinde 12. Ünite, 52. Ünite ile karşılaştırıldığında az bulunduğu gözlemlenmiştir. 52. hane de sadece tavşanın varlığı kıyaslandığında (NISP değerinin 10%'unu kapsamakta) fazla olduğu görülmüştür.

İskeletsel örneklerde ise, farklı üniteler arasında bariz farklara rastlanılmıştır. Fakat keçi türleri arasında bariz bir farka rastlanılmamıştır. Aynı zamanda, 12. ve 52 ünite de bulunan büyükbaş ile domuz ve köpekgillerin kemikleri arasında negatif bir eğilime rastlanılmıştır, bu gözlemler bizim beklentilerimizle örtüşmektedir.

Farklı üniteler arasında benzerlik bulunamaması bizim görüşlerimizi desteklemektedir. 12. Ve 52. Ünite iskeletsel yapıları, kırılma şekilleri ve diğer kanıtlara bakıldığında birbirlerinden bariz bir şekilde farklıdır. Ayrıca, 12. Ünite'deki köpekgillerin beslenme davranışlarına bakıldığında, 52. Ünite'dekilerin yetinme ekonomisinin bir parçası olduğu idda edilebilir.

Bu iki ünitenin arasındaki mimari ve örgütsel farklarda bizim sonuçlarımızı desteklemektedir. 52. Ünitenin batı girişi bulunmaktadır, ve 12. Ünite duvarı bulunan bir arka bahçeye açılmaktadır. Bu bahçede bulunan fırın ve atölye alanı bu alanda işlevsel aktiviteler yapıldığını göstermektedir ama 52. Ünite'de benzer bir iz bulunmamıştır.

Son aşamada, Ulucak'taki Neolitik yerleşkelerin seviyeleri arasında karşılaştırmalı bir çalışma verimli olabileceği düşünülmektedir. Ulucak'taki yaşamın baskın karakterleri hanelerin büyük mimari kalıntıları bulunsa da kültürel kalıntıların olmaması günlük faaliyetlerin yapıldığının göstergesidir. Bölgedeki mimari istikrar, sembol ve adetlerin kullanımı, hayvan kemikleri, ve kireçli zemin bu seviyenin belirtileridir (Çevik & Abay 2016). Yetinme ekonomisinin temelleri avlanan hayvanların sınırlı katkısı ile fakat öncelikle evcil hayvanları kapsamaktadır (Çakırlar 2012 a). Bu alandaki bulunan 13 fırın ve bacanın ise toplumsal yemek alanı olarak kullanıldığı düşünülmektedir. Bu özellikler ise geç neolitik çağın 4. Yerleşim seviyesindeki küçük mimari kalıntıları bu alanlardaki kültürel kalıntılar ve besin üretimine işaret etmektedir. Bina bütünlüğü, hayvan kemiği kalıntıları, ve toplu ocaklar

gibi olaylar günümüzde artık yer almamaktadır. Benzer kaynak tüketiminin farklı yüzdelerde alet ve hayvan üretimi için kullanılmıştır. Aynı şekilde, herhangi diğer aktivitelerde özelleşmiş haneler bu bölgedeki hanelerin birbirinden bağımsız olduğuna işaret etmektedir. Domuz, köpekgiller ve tavşan gibi avlanan türler Neolitik çağının önceki dönemlere göre faydalanılma oranı bir sorundur ve barınma ekonomisi için bir değişim işaretidir. Fakat, bütün yerleşme dönemlerinin bitimi aynıdır, kasti yakarak imha edilmiştir veya deprem gibi doğal afetlere uğramıştır.

Bu araştırma hedeflerine ulaşmış olsa da, çalışma esnasında birkaç engelle rastlanmıştır. İlk olarak, faunal kalıntıların yüksek derecede parçalanması yüzünden bir çok tür tanımlanamamıştır. Bu sebep ölçme ve tartma işlemlerini de aksatmıştır. Sonuç olarak hayvanların ağırlıkları gibi bilgilere ulaşılamamıştır. Daha önemlisi, yüksek dereceli kemik parçalanması her türün evrim sürecindeki rol dağılımı hakkında elde edilmiş istenen bilgiyi çarpıtmış olabilmektedir.

İkinci olarak, yakma parçalanma için kullanılan ikinci bir faktördür ve kalıntılar üzerindeki kesikleri gözlemlemeyi zorlaştırmıştır.

Üçüncü olarak, Ulucak'ta bağımsız ev hanesi kavramının araştırması ve savunması sadece elde bulunan kalıntılarla sınırlanmıştır. Aynı zamanda, her ünite her bir ev halkını barındırdığı varsayılmaktadır. Diğer ünitelerin bulunması bu rastlantıları doğrulamakta katkıda bulunacaktır. Fakat, bölgede bu çalışmaya karşılaştırma ve geçmişten bir örnek denilebilecek diğer yapılar bulunamamaktadır.

Dördüncü olarak, Ulucak'ta 12. Ve 52. Ünite olduğu bu binaların bir kısmı önceki kazılarda çıkmıştır. Ne yazık ki, bu kazıların verileri üzerine çalışılmamıştır ve kazılar esnasında farklı kazı ve belgeleme metotları kullanılmıştır.

Son olarak, Neolitik çağın erken evreleri hakkında sınırlı sayıda bulunan kazı olması, bölgede hane hakkında eş zamanlı ve beraber yürütülen çalışmaya bulunmamaktadır. Gelecekteki çalışmalarda Ulucak 4. Bölgenin çalışılması tavsiye edilmektedir.

Ayrıca, çalışılan hanelerde Neolitik dönem kapsamında bir çok farklı aktivitenin olmuş olabileceği, diğer binalardaki faunal kalıntıların alan analizi yapma konusunda faydalı olacağı konusunda ve bu hanelerin ne türlü aktiviteler için kullanıldığını anlamamız açısından faydalı olmuştur.

C. TEZ FOTOKOPİSİ İZİN FORMU

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Bölümü: Yerleşim Arkeolojisi

TEZİN ADI (İngilizce):

TEZİN TÜRÜ: Yüksek Lisans

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1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.
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