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Sayı Hakemi: Prof. Dr. Turan EFE

Mimarlar, Arkeologlar, Sanat Tarihçiler ve Restoratörler Ortak Platformu Yayınıdır

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ÖNSÖZ

KÜLLÜOBA KAZILARI VE BATI ANADOLU TUNÇ ÇAĞLARI ÜZERİNE YAPILAN ARAŞTIRMALAR

"Eskişehir bölgesinde gerçek anlamda ilk bilimsel Tarihöncesi Dönem araştırmalarını başlatan merhum Prof. Dr. Manfred Osman Korfmann'ın Anısına…"

Seyitgazi (Eskişehir) yakınlarında yer alan Küllüoba'da kazılar, başkanlığımda 1996 yılından bu yana kesintisiz sürdürülmektedir. Yüzey araştırmalarımız sırasında yüzeyinden topladığımız malzemenin ışığında, bu höyükte kazıların başlatılmasının nedenlerini dört ana başlık altında toplayabiliriz:

1.Demircihüyük stratigrafisinde temsil edilmeyen İlk Tunç Çağı'na Geçiş Evresi ve İTÇ III dönemlerinin araştırılması ve böylece Eskişehir bölgesinin güvenilir bir İTÇ kronolojisinin saptanması.

2. Bugüne kadar prehistorik dönemler açısından elle tutulur bir araştırma yapılmamış olan ve ayrı bir çanak çömlek grubunun yayılım alanını oluşturan Yukarı Sakarya Ovaları'nın İlk Tunç Çağı'ndaki kültürel gelişiminin ortaya konulması.

3. İTÇ III döneminde Troas ve Suriye-Kilikya bölgeleri arasındaki ilişkilerin iç batı Anadolu ve dolayısıyla Eskişehir ovaları üzerinden gerçekleştiğine dair yeni kanıtlar elde etmek.

4. Geç İTÇ III veya diğer bir deyişle, Orta Tunç Çağı'na Geçiş Dönemi'nin Eskişehir bölgesinde araştırılması.

Küllüoba Kazıları ile ilişkili olarak bugüne kadar yayınlanan makaleler –ki bunların bazıları oldukça kapsamlıdır- bu hedeflere ulaşmada daha şimdiden önemli adımlar atıldığını açıkça ortaya koyar. Hemen hemen başından itibaren bu kazılarda görev alan Murat Türkteki, Deniz Sarı ve Erkan Fidan; danışmanlığımda, konuları doğrudan veya kısmen Küllüoba kazıları ile ilişkili olan doktora tezlerini 2011 yılında tamamlamışlardır.

Erkan Fidan Küllüoba mimarisini ve bu mimarinin İlk Tunç Çağı'nda batı Anadolu ve Ege Dünyası içindeki yerini incelemiştir. Murat Türkteki ise Küllüoba kazıları ışığında, çark yapımı çanak çömleğin batı ve orta Anadolu'da ortaya çıkışı ve yayılımını incelemiştir. Deniz Sarı da İlk

ve Orta Tunç Çağları'nda Batı ve Orta Anadolu'nun kültürel ve siyasal gelişimini hazırlamıştır. Höyüğün Orta Tunç Çağı'na Geçiş Dönemi üzerinde Fatma Şahin tarafından yapılan doktora çalışması ise halen devam etmektedir.

Bu arada, tamamlanmış olan doktora tezlerinin yayınlanmasına karar verilmiş ve bu doğrultuda söz konusu tezler kısaltılarak daha kompakt bir hale getirilmiştir. Okuyucuya kolaylık sağlayacağı noktasından hareketle de bu makalelerin bir arada yayınlanmasının daha uygun olacağı düşünülmüştür. Diğer taraftan, Küllüoba'nın faunası üzerine araştırmalar yapan Can Y. Gündem de bu yayına makalesi ile katkıda bulunmuştur. Daha sonra da çevrimiçi (online) yayın için MASROP (Mimarlar, Arkeologlar, Sanat Tarihçiler ve Restoratörler Ortak Platformu) ile anlaşmaya varılmıştır. Bu vesileyle, burada makaleleri yayınlanan yazarlara ve yayını gerçekleştiren MASROP yetkililerine ve özellikle Daniş Baykan'a en içten teşekkürlerimi sunarım.

Bu yayın kapsamında, Küllüoba mimarisi ve bazı buluntu grupları daha ayrıntılı bir şekilde incelenmiş ve komşu ve uzak bölgelerle de karşılaştırmalar yapılmıştır. Bu şekilde yukarıda sıralanan hedeflere ulaşma yolunda daha somut veriler elde edilmiştir. İlk ve Orta Tunç Çağları'nda Orta ve Batı Anadolu'da söz konusu olan Kültür bölgeleri ve çanak çömlek grupları da yeni araştırmaların ışığında yeniden değerlendirilmiş ve bunların sınırları daha ayrıntılı olarak saptanabilmiştir.

Bu yayının, Eskişehir bölgesinde ve batı Anadolu genelinde Tunç Çağları ile ilgili gelecekte yapılacak araştırmalara ışık tutması dileğiyle…

Prof. Dr. Turan Efe
Bilecik, Mayıs 2012

PREFACE

THE KÜLLÜOBA EXCAVATIONS AND STUDIES ON THE WESTERN ANATOLIAN BRONZE AGES

"To the memory of late prof. Dr. Manfred Osman Korfmann who initiated, in the real sense, the first scientific prehistoric researches in the Eskişehir region…"

The excavations at Küllüoba located near Seyitgazi (Eskişehir) have been carrying out under the my auspices every single year since 1996. In the light of the material collected from its surface, we can sum up the reasons of why initiating excavations at this mound under four headings:

1.Investigation of the "Period Transitional into the EBA" and EBA III period which are lacking in the Demircihüyük sequence and thus, establishment of a more reliable EBA chronology of the Eskişehir region.

2.Establishment of the EBA sequence of Upper Sakarya Plains in which no tangible investigation has so far been carried out.

3. Providing new clues on which the relations between the Troad and Syro-Cilicia regions in the EB III period were established over inland western Anatolia, in other words via Eskişehir plains.

4.Investigation of the late EB III (Transitinoal Period into the MBA) in the Eskişehir region.

The articles so far published on the Küllüoba excavations -some of which are quite comprehensive- clearly demonstrate that important steps have already been taken towards reaching these goals. Murat Türkteki, Deniz Sarı and Erkan Fidan who took part almost from the beginning on in these excavations finished their dissertations related completely or partially to the Küllüoba excavations in 2011.

Erkan Fidan studied the architecture of Küllüoba and its place in the EBA of western Anatolia and the Aegean World. Murat Türkteki's thesis, on the other hand, deals with the early use and distribution of wheel-made pottery in west- and central Anatolia in light of the Küllüoba excavations. Deniz Sarı prepared cultural and political development of central and western Anatolia during the Early and Middle Bronze Ages.

The dissertation on the "Transitional Period into the MBA" of the mound, however, is still under preparation by Fatma Şahin.

Meanwhile, the completed dissertations have been shortened into a more compact form for publication. As a matter of convinience to the reader we decided to publish these articles together. On the other hand, Can Y. Gündem who is working on the fauna of Küllüoba contributed with his article as well. Finally, we came to an agrement with MASROP (Common Platform of Architects, Archaeologists, Art Historians and Restorers) for the online publication of it. On this occasion, I extend my sincere thanks to the authors for their contributions and the authorities of MASROP, especially Daniş Baykan, for publishing.

In this publication, a more detailed study of the Küllüoba architecture and other material groups is presented and correlations are also made with the neighbouring regions and far distant areas. Thus, more concrete data have been provided in terms of reaching the goals listed above. Cultural regions and pottery groups which prevailed in Central -and West Anatolia during the Early and Middle Bronze Ages are re-evaluated in the light of current research and their borders have been more precisely determined.

I hope this publication will shed more light on the future investigations to be carried out in the Eskişehir region, as well as in entire western Anatolia...

Prof. Dr. Turan Efe

Bilecik, May 2012

İçindekiler

The Subsistence Economy in Inland Northwestern Anatolia

During the Chalcolithic and Early Bronze Age

Can Yümni Gündem*

Abstract

Sheep were the most kept animals in Inland Northwestern Anatolia during the Chalcolithic Period and the Early Bronze Age. The most consumed meat was Mutton in the Chalcolithic Period and beef in the Early Bronze Age. The aging from cattle remains from Küllüoba shows that they were not only kept for meat but for their power. The size of the sheep became larger, but the size of the cattle became smaller over time in the settlements. The locations of the settlements were the main reason in the difference of the games. Hunting was clearly much more important in the earlier periods; however it changes in the later periods in Inland Northwestern Anatolia. Most of the hunted animals were wild horse, fallow deer and wild sheep. These animals indicate an open land with not very high grass and woods as well as forests.

An earlier study by the Author on Troy shows that shows that size increase in sheep is not necessary to differentiate hair and wool sheep in the Early Bronze Age, but instead, other archaeological evidences provide indication of wool production and use. As it was previously known, wool sheep might have been already introduced to Inland Northwestern Anatolia in the Early Bronze Age and not in the Middle Bronze Age.

Özet

Kalkolitik Çağ'dan İlk Tunç Çağı'nın sonuna kadar koyunlar, İç Kuzeybatı Anadolu en çok beslenen evcil hayvanlardır. Koyun eti, Kalkolitik Çağ'da en çok tüketilen etken, İlkTunç Çağı'nda en çok tüketilen sığır eti olmuştur. Küllüoba'da bulunun sığır kalıntıları, sığırların yalnızca etleri için değil aynı zamanda iş hayvanları olarak da beslenildiğini göstermiştir. Yerleşimlerde zaman içinde koyunların boyutları büyümüş ama sığırların boyutları küçülmüştür. Av hayvanlarının farklılığının nedeni yerleşim yerlerinin bulundukları farklı coğrafi ortamlardır. Erken dönemlerde avcılık yaşamda önemli bir yer tutarken, bu zaman içinde değişmiş ve ileri dönemlerde eski değerini kaybetmiştir. Avlanan hayvanların çoğunluğunu yabani at, geyik ve yabani koyun oluşturur. Bu tür yabani hayvanların bulunması, bölgenin çok yüksek olmayan otlarla kaplı açık arazi ve ormanlık alanlardan oluştuğunu göstermektedir.

Yazar'ın Troya'da yaptığı önceki çalışmaların, İlk Tunç Cağı'nda koyun boyutlarındaki değişimin kıl ve yün koyunu arasındaki farkı ortaya koymadığını, ama aslında diğer arkeolojik buluntuların önemli olduğunu göstermiştir Önceden bilindiği gibi yün koyunu Orta Tunç Çağı'ndan önce İlk Tunç Cağı'nda İç Kuzeybatı Anadolu'da beslenmiş olabilir.

Introduction

This article summarizes the patterns of the animal breeding and hunting in Inland Northwestern Anatolia from c. 4300 BC to 2000 BC, from Copper Age (CA) until the end of the Early Bronze Age (EBA). Three sites from the region were compared to build the basis of this study. These are Orman Fidanlığı (CA), Demircihüyük (for this article only the EBA period used) and Küllüoba (transition period to the EBA and EBA).

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Animal remains from Orman Fidanlığı were identified by M. and H.P. Uerpmann and published by H.P. Uerpmann (2003), whereas the animal remains from Demircihüyük were identified by von den Driesch and Boessneck and published by Rauh (1981) in her dissertation. Animal remains from Küllüoba were mainly[1] identified by the Author in different years on location as well as in the Istanbul University. Part of the recorded data from the Küllüoba material, excavated by T.Efe since 1996 to present, was analyzed in the author's master thesis[2]. Animal remains from Küllüoba[3]will be the main focus of this study since these results[4] have not been published elsewhere (Map. 1).

Methods

The animal remains were evaluated using the KNOCOD-System, which was developed by H.-P. Uerpmann(1978). This system records the properties of individual specimen, including taxonomic and anatomical identification, fragmentation, cut-marks, burning and other modifications, as well as information on the age of the respective animal at the time of its death. To consider the individual size of each fragment and estimate the contribution of meat, the weight of each find is also recorded. In addition, better-preserved animal remains are measured according to von der Driesch(1976) to observe size developments of the animals, which can potentially yield information about breeding patterns as well as changes of body size that can also result from environmental shifts. In some cases, logarithmic size indices (s. b.) were calculated in order to compare particular species between sites or periods (Meadow 1987). Dental development and fusion of the epiphyses are used to determine slaughtering-ages. The goal of ag edetermination is to understand the animal economy and breeding patterns of domesticates which were practiced by the people (Uerpmann 1971:5).

Logarithmic Size Indices (LSI) were used to compare the sheep size from different periods of the settlement, as well as with the other settlements. Normally, only the same bone element may be compared size-wise, e.g.a radius with a radius or a femur with a femur. The LSI allow the comparison of different skeletal elements, e.g. a radius with a femur. Thus, the number of

[1] H.P. Uerpmann was on location in the year of 1996/97 and M. Uerpmann in 1997.
[2]This master thesis is not published, but some of the data were published in the author's dissertation, Gündem 2010.
[3]For other archaeological data of the site, refer to other chapters in this volume are published in this volume by other colleagues, therefore this article does not contain such information.
[4]Updated and modified for this study.

comparable bones increases remarkably. A complete skeleton of a standard animal is needed for the calculation of LSI, and therefore the standard is usually measured on modern animal skeletons. The LSI arecalculated according to the following formula:

$$LSIx = \log x - \log m$$

Where x is the measurement of the archaeological bone and m is the corresponding measurement of the standard individual.

The results are represented as box and wiskers diagrams. The vertical center line indicates the maximum and minimum values, the filled box indicates the standard deviation, and the internal horizontal line represents the average value. The external small box shows the quartiles and the outside horizontal line the median (Gündem 2010).

Animal bone remains from Küllüoba

Animal bone material from every trench and level[5] in Küllüoba was collected and stored. Some of this material[6] was evaluated to document the development of the animal based economy in Küllüoba, especially among the vertically levels [down to up]. The lists of taxa from each level have been represented separately, except from EBA II and III. They were listed together, since the amount of identified animal bone material from EBA III is limited (Tab. 1 to 3).

Approximately 8,600 bone remains (c. 81 kg)[7] were analyzed to achieve the aims described above (s. a.). Most of the identified animal remains derive from mammals and the amount of the non-mammals is small. Some of the bone fragments could not assigned to certain species, and thus, they are listed under the unidentified category and they account for roughly a quarter of the bone remains (c. 9,5 kg).

Within the Transition Period (TP), c. 29% of the bone remains could not be classified to certain species and additional c. 28% in the EBA I and c. 26% in the EBA II/III were unidentifiable to species. The weight of the unidentified material averages c. 11% in all the periods. These

[5] Transition period from late CA to EBA, EBA I, EBA II and III.
[6] Only mammal remains were evaluated and other remains like bird, shell, etc… were recorded "non-mammals". Not many remains fall under this category.
[7] Approximately 8,000 bone remains (c. 74 kg) were evaluated for the recent author's master thesis. The whole recently studied material is c. 9,800 bone remains, but this assemblage with mixed material from TP until EBA III are not included here.

unidentified bones were classified under respective animal sizes. Remains of medium and large sized mammals comprise the majority of the assemblage. Table 4 represents main three groups of unidentified bone remains and possible animals that fall within the size category in the Küllüoba material.

Tab. 1: Species list for the Transition Period (TP) of Küllüoba

TAXONOMY	**NIS**	**NIS-%**	**WIS(g)**	**WIS-%**
unidentified, small to medium	5	2,5	1,6	0,2
unidentified, medium	82	41	135,2	18,5
unidentified, medium to large	13	6,5	38	5,2
unidentified, large	100	50	557,3	76,1
unidentified mammal remains total	**200**	**100**	**732,1**	**100**
Cattle BOS	111	22,38	2577,1	40,41
Sheep, OVIS	21	4,23	327,7	5,14
Goat, CAPRA	8	1,61	69,6	1,09
Sheep or Goat, CAPRA/OVIS	218	43,95	1123,2	17,61
Pig, SUS	78	15,73	912,6	14,31
Dog, CANIS	14	2,82	150,1	2,35
Domestic mammals total	**450**	**90,73**	**5160,3**	**80,92**
Wild or Domestic Cattle	5	1,01	364,2	5,71
Wild or Domestic Sheep	3	0,60	81	1,27
Wild or Domestic Sheep/Goat	6	1,21	71,6	1,12
Wild Boar or Pig	3	0,60	36,2	0,57
Wild or Domestic mammals total	**17**	**3,43**	**553**	**8,67**
Rodentiauniden., small	1	0,20	0,4	0,01
Hare, *Lepuscapensis/europaeus*	4	0,81	10	0,16
Fox, *Vulpesvulpes*	2	0,40	3	0,05
Equidaeuniden.	5	1,01	78	1,22
Equushydruntinu/hemionus	4	0,81	161	2,52
Wild Boar, *Susscrofa*	1	0,20	17	0,27
Fallow deer, *Damadama*	3	0,60	48,1	0,75
Red deer, *Cervus elaphus*	4	0,81	131	2,05
Cervidaeuniden.	1	0,20	157	2,46
Aurochs, *Bosprimigenius*	2	0,40	20	0,31
Wild Goat, *Capra aegagrus*	1	0,20	9,4	0,15
Wild Sheep, *Ovisorientalis*	1	0,20	29	0,45
Wild mammals total	**29**	**5,85**	**663,9**	**10,41**
identified mammal remains total	**496**	**100,00**	**6377,2**	**100,00**
identified mammal remains total	**496**	**71,26**	**6377,2**	**89,70**
unidentified mammal remains total	**200**	**28,74**	**732,1**	**10,30**
analyzed material TOTAL	**696**	**100,00**	**7109,3**	**100,00**

Tab. 2: Species list for the Early Bronze Age I (EBA I) of Küllüoba

TAXONOMY	**NIS**	**NIS-%**	**WIS(g)**	**WIS-%**
unidentified, medium	146	55,7	224,4	23,8
unidentified, medium to large	3	1,1	6	0,6
unidentified, large	112	42,7	708,8	75,5
Unidentified	1	0,4	0,1	0
unidentified mammal remains total	**262**	**100**	**939,1**	**100**
Cattle BOS	173	25,63	2833,7	42,36
Sheep, OVIS	34	5,04	261,4	3,91
Goat, CAPRA	12	1,78	135,3	2,02
Sheep or Goat, CAPRA/OVIS	358	53,04	1510,2	22,57
Pig, SUS	21	3,11	179,6	2,68
Dog, CANIS	5	0,74	32,4	0,48
Domestic mammals total	**603**	**89,33**	**4952,6**	**74,03**
Wild or Domestic Cattle	12	1,78	475	7,10
Cattle or Red deer	5	0,74	55,7	0,83
Wild or Domestic Sheep	13	1,93	135,2	2,02
Wild or Domestic Goat	2	0,30	65	0,97
Wild or Domestic Sheep/Goat	7	1,04	75,5	1,13
Wild Boar or Pig	2	0,30	32,1	0,48
Wild or Domestic mammals total	**41**	**6,07**	**838,5**	**12,53**
Hare,*Lepuscapensis/europaeus*	2	0,30	2,5	0,04
Wild Horse, *Equusferus*	1	0,15	106	1,58
Equidaeuniden.	2	0,30	15,4	0,23
Equushydruntinus/hemionus	4	0,59	292	4,36
Fallow deer, *Damadama*	6	0,89	54,9	0,82
Aurochs, *Bosprimigenius*	2	0,30	219	3,27
Wild sheep, *Ovisorientalis*	13	1,93	179,1	2,68
Caprinaeuniden.	1	0,15	30	0,45
Wild mammals total	**31**	**4,59**	**898,9**	**13,44**
identified mammal remains total	**675**	**100,00**	**6690**	**100,00**
identified mammal remains total	**675**	**72,04**	**6690**	**87,69**
unidentified mammal remains total	**262**	**27,96**	**939,1**	**12,31**
mammal remains total	**937**	**100,00**	**7629,1**	**100,00**
non-mammal remains	**5**	**100**	**10,2**	**100**
mammal remains total	**937**	**99,47**	**7629,1**	**99,87**
Non-mammal remains total	**5**	**0,53**	**10,2**	**0,13**
analyzed material TOTAL	**942**	**100**	**7639,3**	**100**

Tab. 3: Species list for the EBA II/III of Küllüoba

TAXONOMY	**NIS**	**NIS-%**	**WIS(g)**	**WIS-%**
unidentified, small	1	0,06	0,5	0,01
unidentified, small to medium	10	0,56	6,7	0,1
unidentified, medium	872	48,55	1579,2	23,91
unidentified, medium to large	11	0,61	86,2	1,3
unidentified, large	900	50,11	4932,7	74,68
Unidentified	2	0,11	0,2	0
unidentified mammal remains total	**1796**	**100**	**6605,5**	**100**
Cattle BOS	1441	27,87	29800,5	49,32
Sheep, OVIS	273	5,28	3302,2	5,47
Goat, CAPRA	66	1,28	957,9	1,59
Sheep or Goat, CAPRA/OVIS	2322	44,91	10811,7	17,89
Pig, SUS	680	13,15	9942,2	16,45
Dog, CANIS	135	2,61	1230,3	2,04
Domestic mammals total	**4917**	**95,11**	**56044,8**	**92,76**
Wild or Domestic Cattle	10	0,19	275	0,46
Cattle or Red deer	8	0,15	102,1	0,17
Wild or Domestic Sheep/Goat	49	0,95	650,7	1,08
Wild Boar or Pig	25	0,48	605,4	1,00
Wolf or Dog	4	0,08	22,8	0,04
Canidaeuniden.	2	0,04	4,3	0,01
Wild or Domestic mammals total	**98**	**1,90**	**1660,3**	**2,75**
Rodentiauniden., small	12	0,23	14,3	0,02
Hare, *Lepuscapensis/europaeus*	15	0,29	46,9	0,08
Wolf,*Canis lupus*	1	0,02	12	0,02
Fox, *Vulpesvulpes*	16	0,31	109,7	0,18
Hyaenahyaena	1	0,02	28	0,05
Carnivorauniden., mittel	1	0,02	8	0,01
Equidaeuniden.	5	0,10	163	0,27
Equushydruntinus/hemionus	2	0,04	54	0,09
Wild Boar, *Susscrofa*	8	0,15	247,5	0,41
Fallow deer, *Damadama*	38	0,74	517	0,86
Red deer, *Cervus elaphus*	10	0,19	224,2	0,37
Cervidaeuniden.	6	0,12	152,3	0,25
Aurochs,*Bosprimigenius*	10	0,19	581	0,96
Wild Goat, *Capra aegagrus*	5	0,10	69,9	0,12
Wild Sheep, *Ovisorientalis*	25	0,48	489,5	0,81
Wild mammals total	**155**	**3,00**	**2717,3**	**4,50**
identified mammal remains total	**5170**	**100,00**	**60422,4**	**100,00**
identified mammal remains total	**5170**	**74,22**	**60422,4**	**90,15**
unidentified mammal remains total	**1796**	**25,78**	**6605,5**	**9,85**
mammal remains total	**6966**	**100,00**	**67027,9**	**100,00**
Non-mammal remains	**21**	**100**	**106,2**	**100**
mammal remains total	**6966**	**99,7**	**67027,9**	**99,84**
Non- mammal remains total	**21**	**0,3**	**106,2**	**0,16**
Analyzed material TOTAL	**6987**	**100**	**67134,1**	**100**

Tab. 4: Three main groups of unidentified bone remains and animals that correspond to the size category in the Küllüobamaterial.

Size	potential species
unidentified, medium	sheep, goat, pig, dog, etc…
unidentified, medium to large	fallow deer, wild boar, wild sheep, etc…
unidentified, large	cattle, equid, red deer, aurochs, etc…

The number of unidentified bone fragments from medium and large mammals is almost equally abundant in each period (Fig. 1). However, this does not hold true for the weight. Large unidentified mammal fragments weigh c. 75% in each period and medium unidentified mammal fragments little over 20% on average (Fig. 2). Long bones from the large mammals were possibly broken more often to gain access to the bone marrow, which made them too fragmentary for identification. However, even the smaller fragments from the larger animals certainly weigh more than the small or medium sized animal bone fragments. Therefore, the contribution of large mammals to cover the meat demand of the people should have been little higher than what has been calculated here.

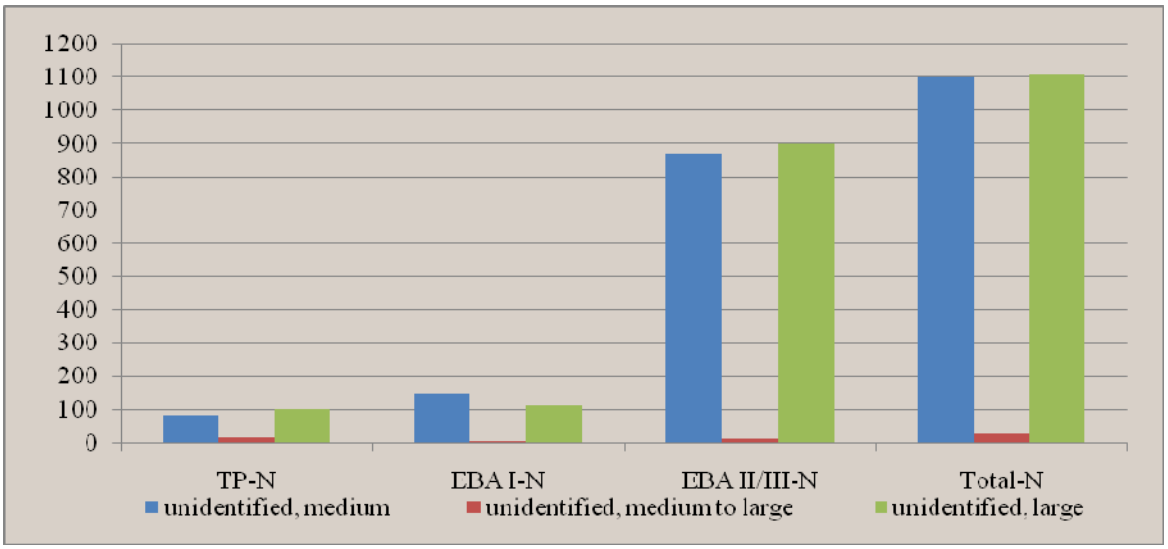

Fig.1: The number of unidentified bone fragments for each period and in total as NIS.

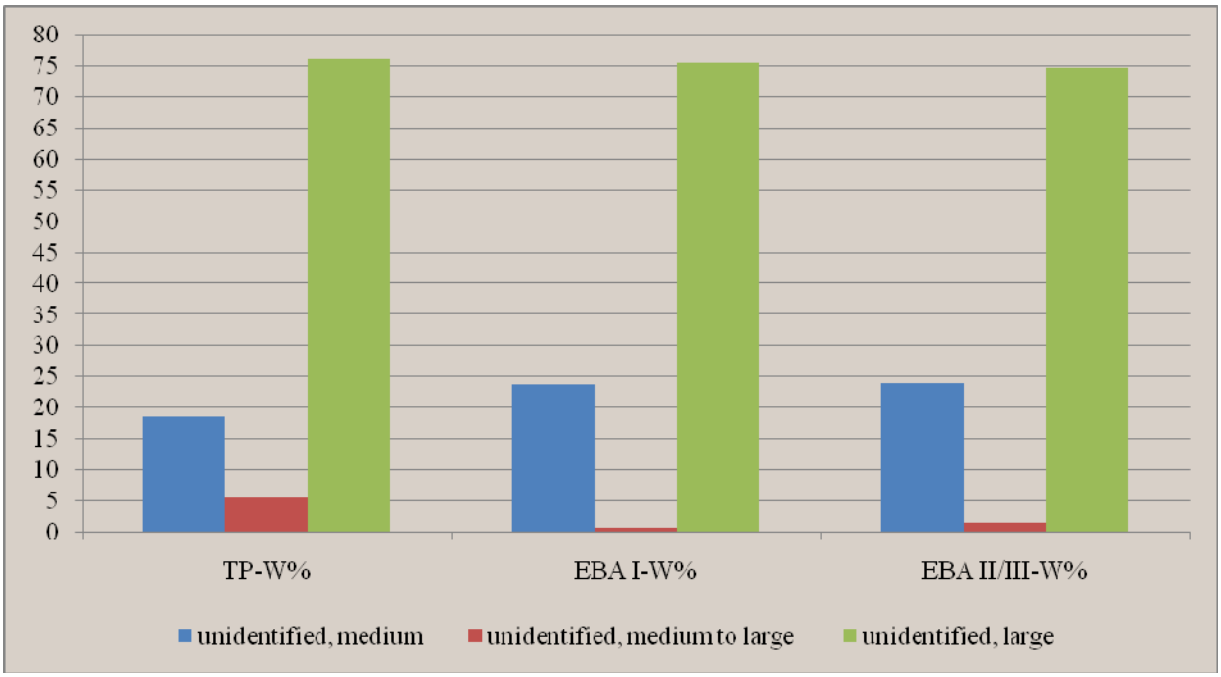

Fig. 2: The weight of unidentified bone fragments for each period as WIS%.

Majority of identified mammal remains came certainly from domestic animals. Approximately c. 91 NIS% (c. 81% of weight) of the identified mammal remains from Transition Period are from domestic animals and c. 89 NIS% (c. 75% of weight) in EBA I and c. 95 NIS% (c. 93% of weight) in EBA II/III. NIS of wild mammal remains are clearly low, but in some periods, their contribution in terms of weight is relatively high, c. 13% in EBA I but only c. 4% in EBA II/II. Rest of the remains could not be distinguished between domestic animals and their wild relatives[8].The domestic mammal remains clearly dominates in animal assemblage of Küllüoba. There is an evident increase of domestic animal remains after the EBA I not only in the NIS% but in the WIS% as well (Fig. 3 and Fig.4).

[8]This group comprises a small amount of the NIS in each period; however, in EBA I, this group makes up to the c. 13% of the weight. Majority of these bone remains are definitely part of the kitchen waste. This group will not be mentioned in this article as long as it is not necessary.

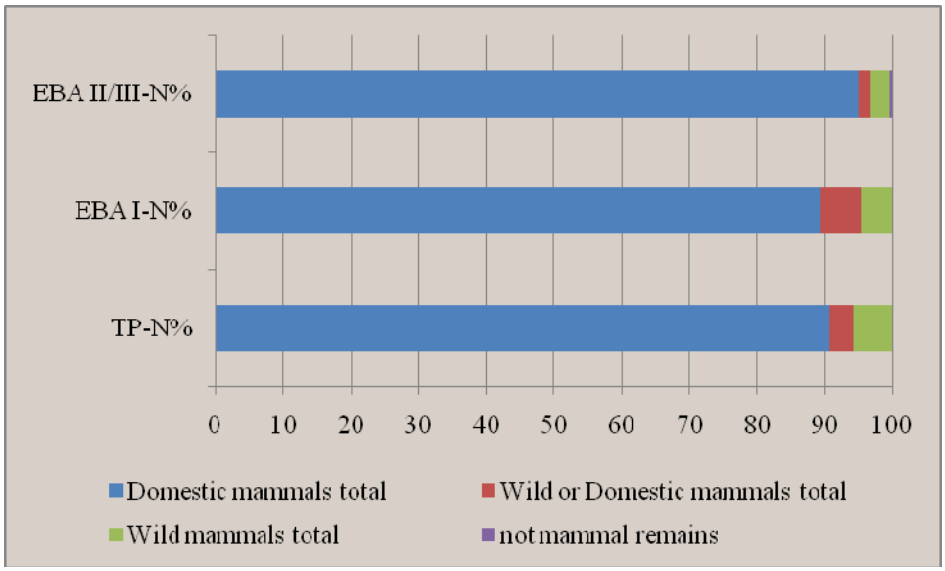

Fig. 3: The relative contribution of domestic, wild/domestic and wild mammals in bone assemblage (NIS) of identified mammal remains from each period.

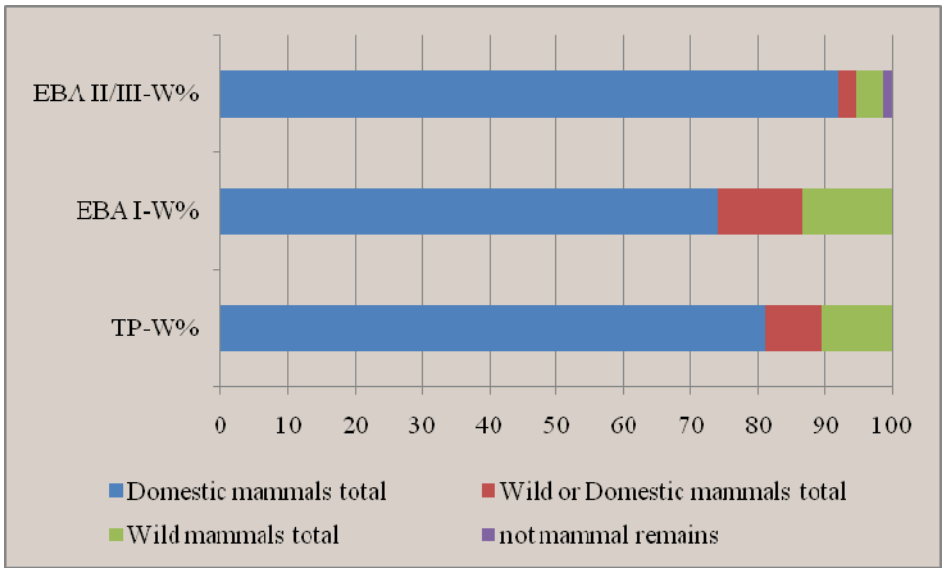

Fig. 4: The relative contribution of domestic, wild/domestic and wild mammals to the bone assemblage weight (WIS) among the identified mammal remains from each period.

The typical domestic mammal fauna for the Copper Age and the Early Bronze Age are identified in Küllüoba. Small ruminants are the most commonly identified group in the settlement from all

the periods, followed by cattle, pig and dog remains. Pig remains decrease drastically in the EBA I after the TP from c. 15% to c. 3% in NIS, but increase again clearly up to c. 13% in the EBA II/III among the identified mammal remains. Small ruminants increase while pig remains decrease during the EBA I. Small ruminants remains make up roughly half of the identified mammal remains in all periods and even c. 60% in the EBA I. Dog remains are seldom, but found in all periods (Fig. 5).

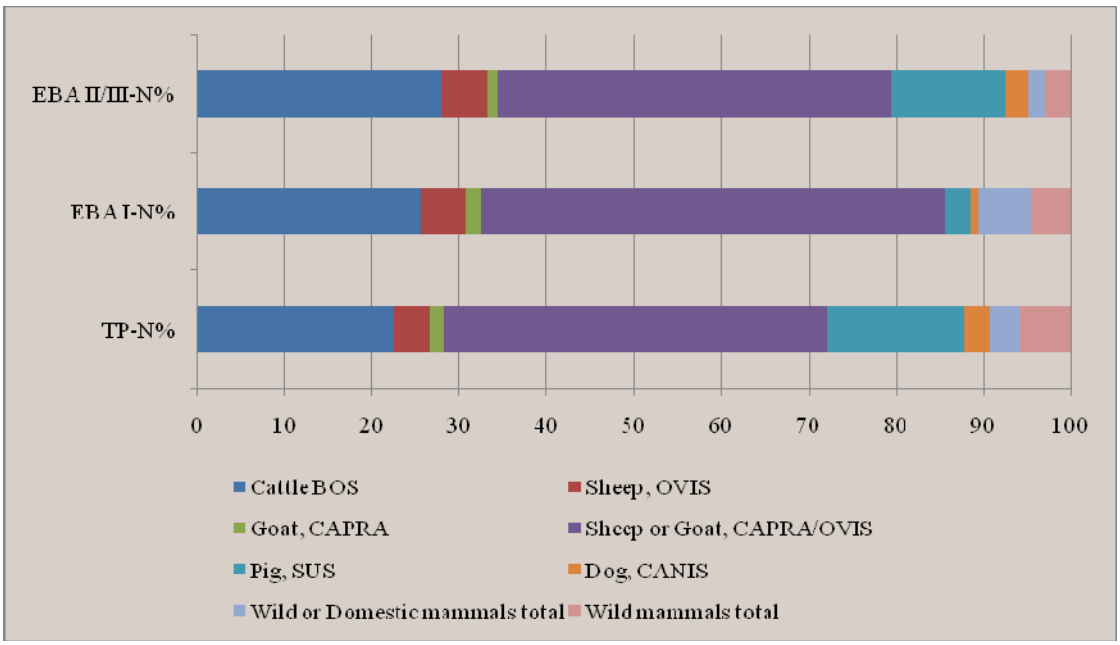

Fig. 5: Relative contribution of individual species to the number of bone finds (NIS) for all domestic animals for the each period among the identified mammal remains.

In contrast to the number of identified domestic animal remains, cattle remains clearly form the heaviest group in terms of WIS, followed by small ruminants (Fig. 6).

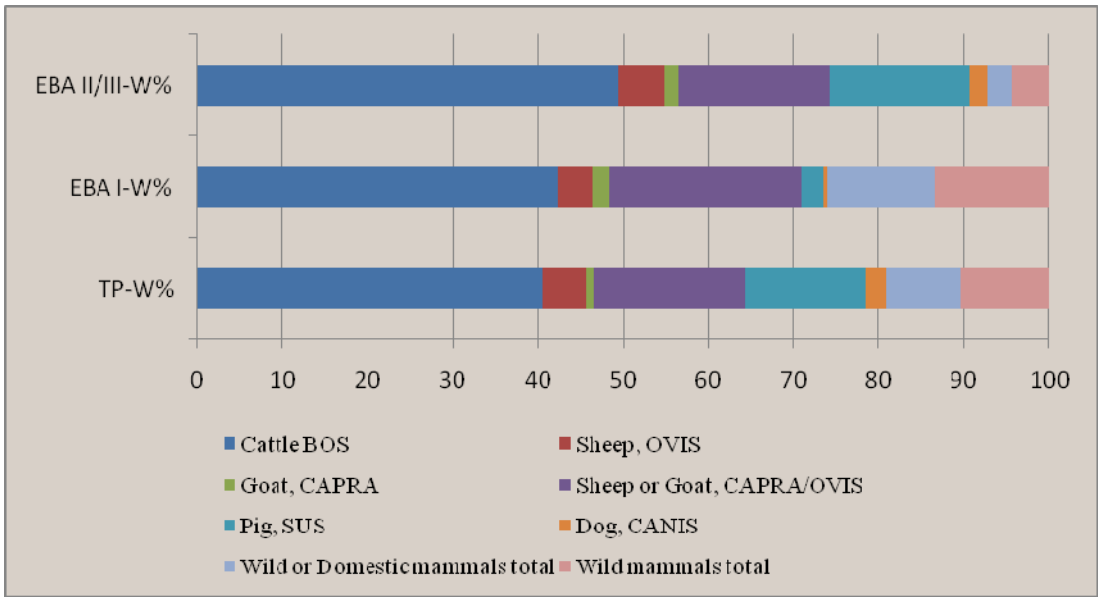

Fig. 6: Relative contribution of individual species to the weight of bone finds (WIS) for domestic animals for the each period among the identified mammal remains.

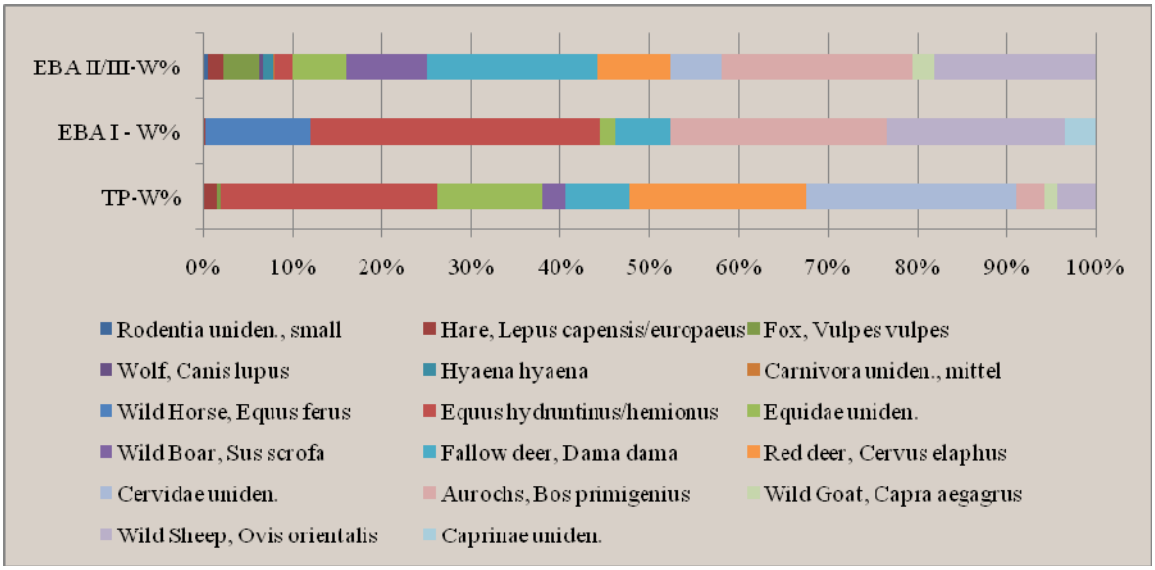

Fig. 7: Relative contribution of individual species to the number of bone finds (NIS) from wild animals for the each period among the identified wild mammal remains.

The identified wild fauna in Küllüoba are quite diverse. Many different wild mammal species are identified; however, most of them are in small numbers. Remains from wild sheep, fallow deer, fox and hare are frequently found in the animal bone assemblage. One wild horse remain is

identified from the EBA I period and *Equushydruntinus* /*hemoinus*remains are found in all periods as well as aurochs remains. Hyena and wolf remains are found in the EBA II/III period (Fig. 7).

Domestic animals

Sheep and Goat (OVIS and CAPRA)

Unidentified small domestic ruminant remains were recorded into the databank as OVIS/CAPRA because of the high degree of similarity between the bones of sheep and goat. It is sometimes quite hard to separate their bone remains and heavily fragmented bones of the small ruminants make it in many cases impossible to differentiate the two taxa. When diagnostic parts of the specimens are missing or badly damaged, it makes harder to identify them to species, and therefore they recorded as OVIS/CAPRA. Remains identified as OVIS/CAPRA cannot be treated as an animal species of its own. The ratio between sheep and goat bones can be used to better estimate the species composition of the faunal remains from Küllüoba and other sites.

Tab. 5: The ratio between sheep/goat and modified NIS and WIS of sheep and goat based on the ratio and NIS% and WIS% for all identified mammal remains. Modified NIS and WIS of sheep and goat include NIS and WIS of Ovis/Capra.

	TP – N	TP - N%	TP - W	TP-W%
c. ratio btw. Ovis/Capra	**2,6**		**4,6**	
Sheep	180	36,3	1250	19,6
Goat	67	13,5	271	4,2
	EBA I – N	EBA I - N%	EBA I - W	EBA I - W%
c. ratio btw. Ovis/Capra	**2,8**		**1,9**	
Sheep	298	44,2	1250	19
Goat	105	15,5	656	9,5
	EB II/III – N	EBA II/III - N%	EBA II/III - W	EBA II/III - W%
c. ratio btw. Ovis/Capra	**4,1**		**3,4**	
Sheep	2140	41,4	11650	19,2
Goat	521	10,1	3421	5,6

The ratio between sheep and goat based on identified bone remains is represented in the Table 5 and the re-calculated results among the identified mammal remains are represented in Fig. 8 and 9.

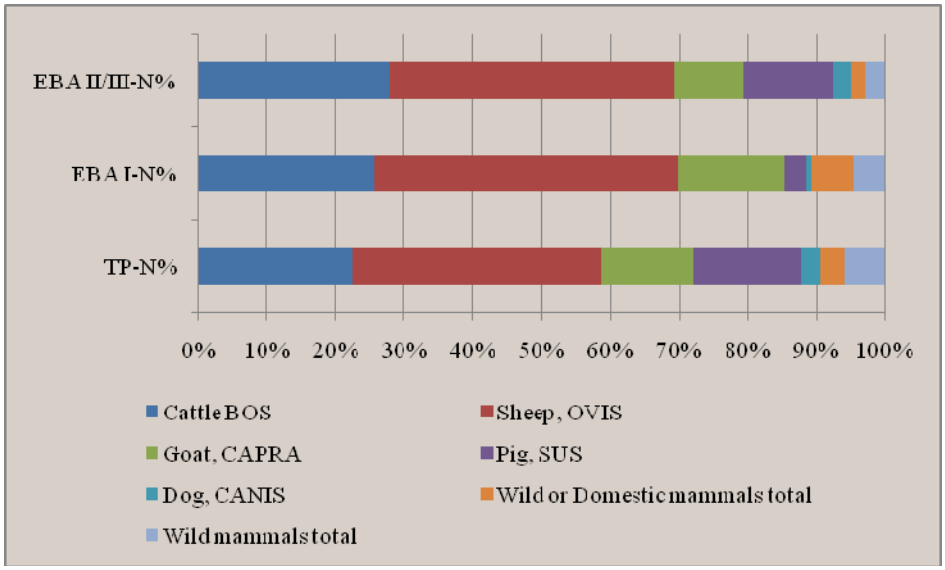

Fig. 8.1: Re-calculation of percentages among the identified mammal remains for each period after dividing the Ovis/Capra remains according to the ratio of sheep and goat.

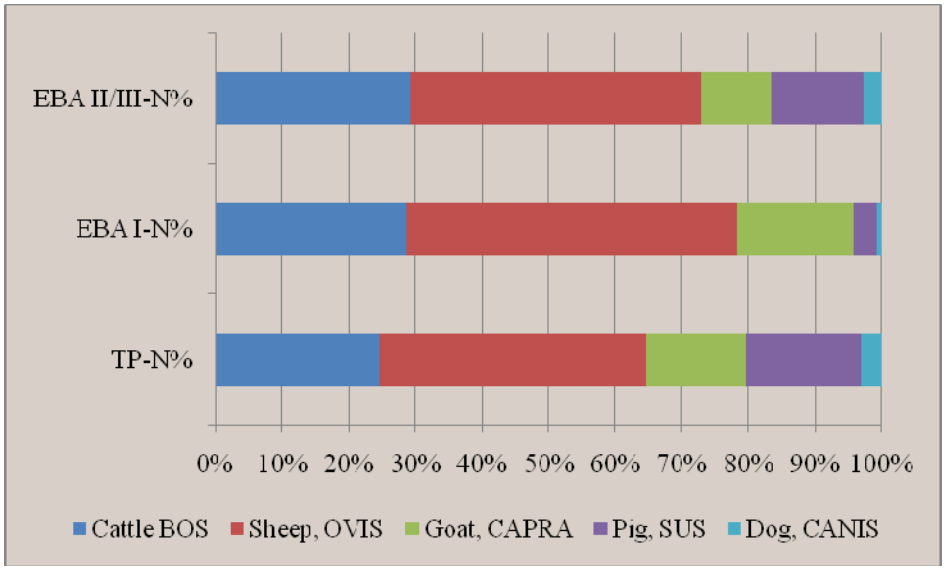

Fig. 8.2: Re-calculation of percentages among the identified DOMESTIC mammal remains for each period dividing the Ovis/Capra remains according to ratio of sheep and goat.

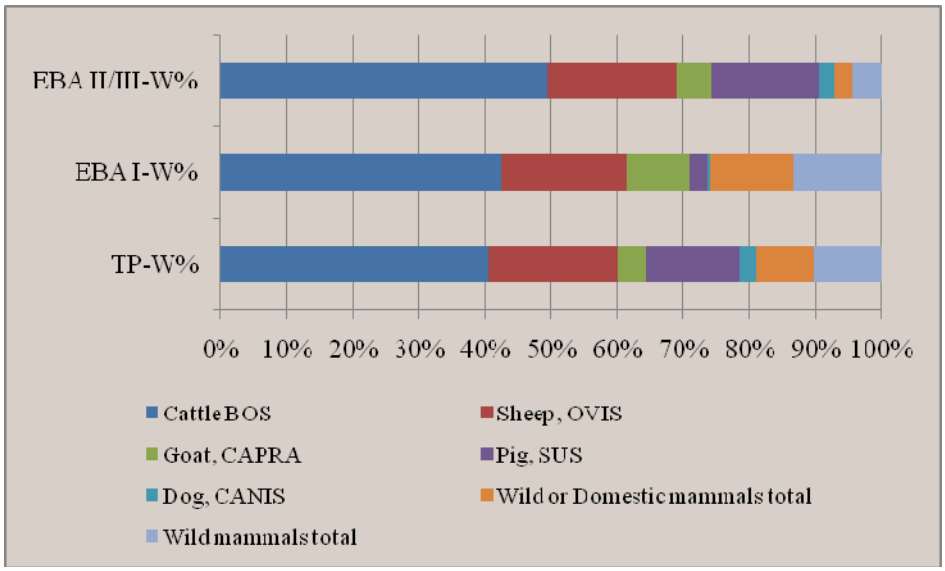

Fig. 9.1: Re-calculation of percentages among the identified mammal remains weight for each period after dividing the Ovis/Capra remains according to the ratio of sheep and goat.

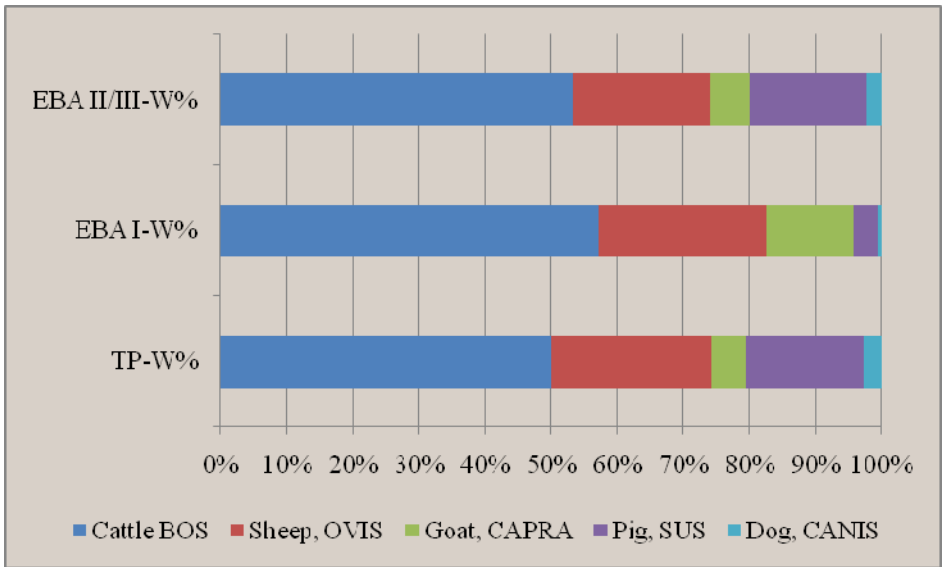

Fig. 9.2: Re-calculation of percentages among the identified DOMESTIC mammal remains weight for each period after dividing the Ovis/Capra remains according to the ratio of sheep and goat.

Sheep were the most kept domestic animal, and followed by cattle. During the EBA I period, sheep remains make up c. 50% and goat remains c. 18% of identified domestic mammal remains. Goat and pig were kept quite in similar numbers, although during the EBA I, the number of pigs decreased. This decrease in pig remains makes goat the third most kept animal in the settlement (Fig. 8.2). However, cattle remains are the most important animal in the weight category. Sheep bone remains weigh almost c. 1/4 of the identified domestic mammal remains in each period and has the second place after cattle. The increase of the goat remains in the weight category is clear with c. 15% in the EBA I period, but otherwise, goat remains weigh only the half of the weight in TP and EBA II/III compared the EBA I among identified domestic mammal remains (Fig. 9.2).

Kill-off pattern of Small ruminants

The dental data of small ruminants from Küllüoba - TP/EBA reveal that more than one-fifth of the flock was kept and slaughtered between the ages of 3 (c. 9%) and 18 (c. 13,5%) months. However, the core-group was kept and killed between 1 ½ and 3 ½ years of age (c. 55%). Little more than one-fifth of the animals fall between 3 ½ and 6 years old and only 2% of the animals reached an age older than six years. The epiphysis data also show that small ruminants were killed in large numbers in their first year of life, and altogether c. 30% survived up to the age of 3 ½. When both the dental and epiphysis data are considered, the pattern is not so different. Approximately, one-third of the animals reached an age older than 3 ½ years (Fig. 10)(Gündem 2010).

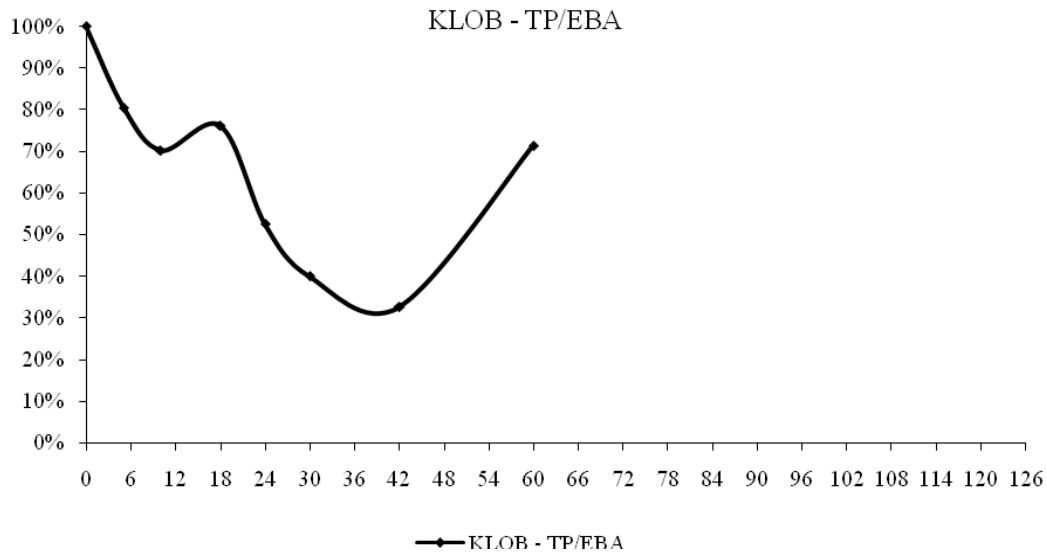

Fig. 10: The survival curve of the small ruminants in Küllüoba during the Transition Period and the Early Bronze Age according to the epiphysis fusion data.

The Size of Sheep and Goat

The size of the sheep change clearly after the Transition Period and they become larger, but the number of measured sheep bones from TP is limited. Therefore, this change in the size could be related to the sex of the animals. Sheep were on average smaller than the standard size, which is calculated from measurements of female wild sheep[9]. They become larger in the EBA and in some cases they are larger than the female wild sheep, which possibly point to the presence of big male domestic sheep (Fig. 11).

Goat remains from the EBA period show that they are clearly smaller than their ancestors or wild relatives. The standard animal which is used as a basis of comparison derives from the average

[9]The standard measurements for the calculation of theLSI for sheep were taken from a female wild sheep from Iran (Chicago Field Museum, specimen # FMC57951).

The standard measurements for goats are based on the average element dimensions of one female and one male wild goat from southern Turkey (Natural History Museum, London, specimen # BMNH653M and 653L2) (Uerpmann and Uerpmann 1994: Tables 12 & 14).

of a female and male wild goat. However, some of the remains show that there were some bigger male goats in the herds (Fig. 12).

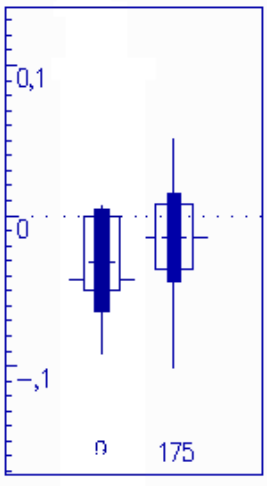

Fig. 11: The LSI-distribution of sheep remains from Küllüoba -TP (9) and Küllüoba-EBA.

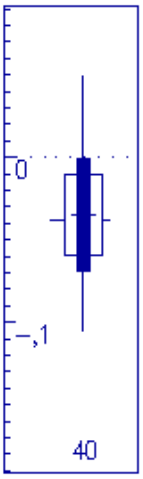

Fig. 12: The LSI-distribution of goat remains from Küllüoba-EBA.

Cattle

Number of identified cattle remains increase clearly in the settlement from the TP to EBA II/III. Cattle remains make up little under 1/4 of the identified domestic mammal remains during TP, whereby they increase to c. 28% in the EBA II/III (Fig. 8.1). This increase in the cattle remains is

also reflected in the weight category. Cattle remains from TP weigh the half of the identified domestic mammal remains, whereby it makes up c. 58% of the identified domestic mammal remains during the EBA II/III (Fig. 9.2).

Kill-off pattern of cattle

At Küllüoba, the slaughtering of cattle began at earlier ages. Cattle were slaughtered regularly beginning at the age of two and the dental remains indicate that some cattle became much older than nine years of age (Fig. 13) (Gündem2010).

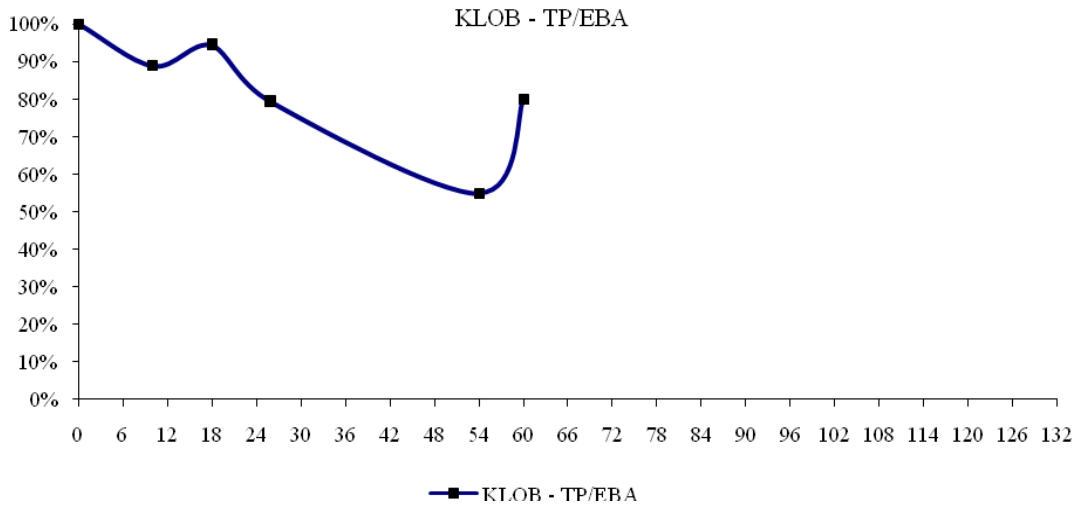

Fig. 12: The survival curve of the cattle in Küllüoba during the Transition Period and the Early Bronze Age according to the epiphysis fusion data.

The size of cattle

Measured cattle remains from the TP and EBA are almost the same size, while in the EBA II/III, the size variations are larger. The standard animal used for comparison derives from U.A.E. and has a shoulder height of c. 1,2 m[10]. The formation of the pelvis from this modern specimen exhibits the sexual characteristic of a female individual. The remains larger than the standard animal could be interpreted as male or as castrated cattle (Fig. 14).

[10]Because of a technical problem, the author cannot display the standard animal's measurements. The skeleton of the cattle (BOS30) is located in the comparative collection of Tubingen University. The lengths of the bones are not used for LSI calculations but the breadths, which is a better estimate for meat weight.

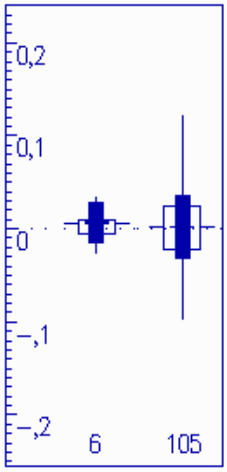

Fig. 14: The LSI-distribution of cattle remains from Küllüoba-TP and Küllüoba-EBA.

Pig

Pig remains show a large fluctuation between the periods. Pig remains make up c. 18% of the identified domestic mammal remains during TP and c. 15% during the EBA II/III. However, there is a large decrease in the remains during the EBA I period. The pig remains make up only c. 3% of the identified mammal remains (Fig. 8.2). Therefore, same pattern is apparent in the weight category. Pig remains make up c. 18% of the WIS during the TP and the EBA II/III, but only c. 3% in the EBA I (Fig. 9.2).

Kill-off pattern of pig

The slaughtering of pig began very early in Küllüoba. They were killed regularly between few months and three years of age. According to the dental and epiphysis data, few animals were aged between three and half and five years (Fig. 15) (GÜNDEM 2003, 2010).

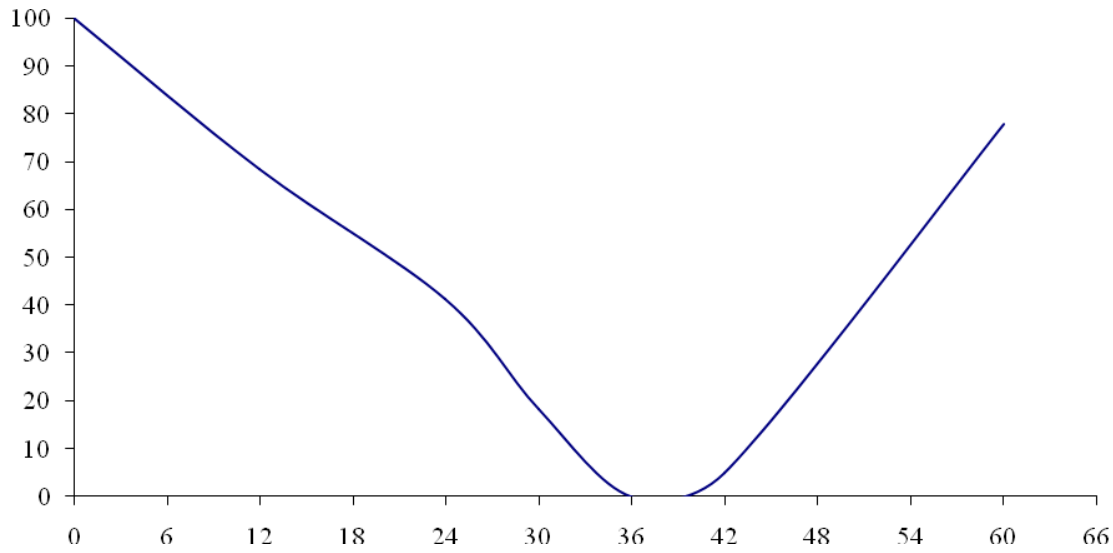

Fig. 15: The survival curve of pig in Küllüoba – TP/EBA.

The size of pig

The size of the pig remains shows that they were quite comparable in Küllüoba over different periods. However, there are a greater number of measured pig remains in the EBA, which caused a larger range in the size shown in the graph above. Kept pigs were smaller than a female wild boar[11], but the pig size becomes visibly larger in the EBA (Fig. 16).

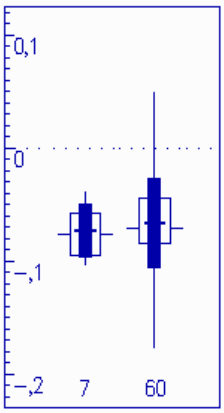

Fig. 16: The LSI-distribution of pig remains from Küllüoba –TP and Küllüoba-EBA.

[11] The skeletal of female wild boar is located in the comparative collection of Tubingen University and labelled SUS22. The measurements are at the end of this article (Tab. 7). The lengths of the bones are not used for LSI calculations but the breadths, which is a better estimate for meat weight.

Dog

Dog remains are identified in all periods of Küllüoba. Their remains make up the smallest group of identified domestic mammal remains, c. 3% in the TP and the EBA II/III but only c. 1% in the EBA I among the identified domestic mammal remains (Fig. 8.2). The amount of the dog remains is little and their contribution to the weight category is also small (Fig. 9.2).

Kill-off pattern of dog

An age determination of the dog teeth was not performed since it is unclear whether the dogs were primarily used as food sources. Probably, they consumed kitchen wastes in the settlement, mostly animal bones. As dogs consume bones, the tooth surface becomes worn over time. The proportion of bone consumed cannot be accurately estimated. The number of gnawing marks on other animal bones indicates that dogs were frequently consuming bones. The age determination of the dogs was carried out based on the epiphysis data only. Approximately 40% of the dogs remains indicate that they did not reach the age of 1,5 years (Gündem 2003). Nine percent of the dog remains besides skull and dental remains exhibit either cut or burn traces (Gündem 2010).

The size of dog

Measured dog bones from Küllüoba TP and EBA periods were smaller when the measurements were compared with an Arabian Wolf[12]. However, they were quite larger bones, probably from male individuals.

Wild mammalian fauna remains in Küllüoba

Approximately, 200 mammal remains from all periods were identified as wild animals. The percent of the wild mammal remains in the assemblage decrease over time. If we assume that the half of the "wild or domestic" mammal remains belong to wild mammals, then there would be a clear increase of their percentage especially in the TP and the EBA I. Hunting was apparently practiced more often in the daily life of the people in the first two periods than in the last (Tab. 1 to 3).

[12]The Arabian Wolf is smaller than its relatives in Europe.

Hare, *Lepuscapensis/europaeus*

Over 20 remains were identified as hare. They all come from the brown hare(*Lepuscapensis*). Kumerloeve notes that, hares' distribution ranges across the land of Turkey from the coastal area to high altitudes if there is enough food and the nutrition conditions are met (Kumerloeve 1975).

Most of the identified bone remains are long bones. Probably, they were hunted in the vicinity of the settlement for their fur and meat. Cut marks on the bones show that rabbit meat was part of the diet of the inhabitants at Küllüoba. The proportion of the hare is about c. 9% among the identified wild mammals and bone weight is only c. 1% due its small size (Fig. 17) (Gündem 2003).

Fox, *Vulpesvulpes*

18bone remains were identified asred fox. According to Kumerloeve, the distribution of red fox ranged across entire Anatolia (Kumerloeve 1975). Two remains come from the TP and sixteen others from the EBA II/III. A slight-cut trace was found on a metatarsus. This might have been happened during the skinning of the animal for the fur. Atibia has a partially burning mark, which could indicate that the fox was not just for its fur, but perhaps also hunted and trapped for its meat.

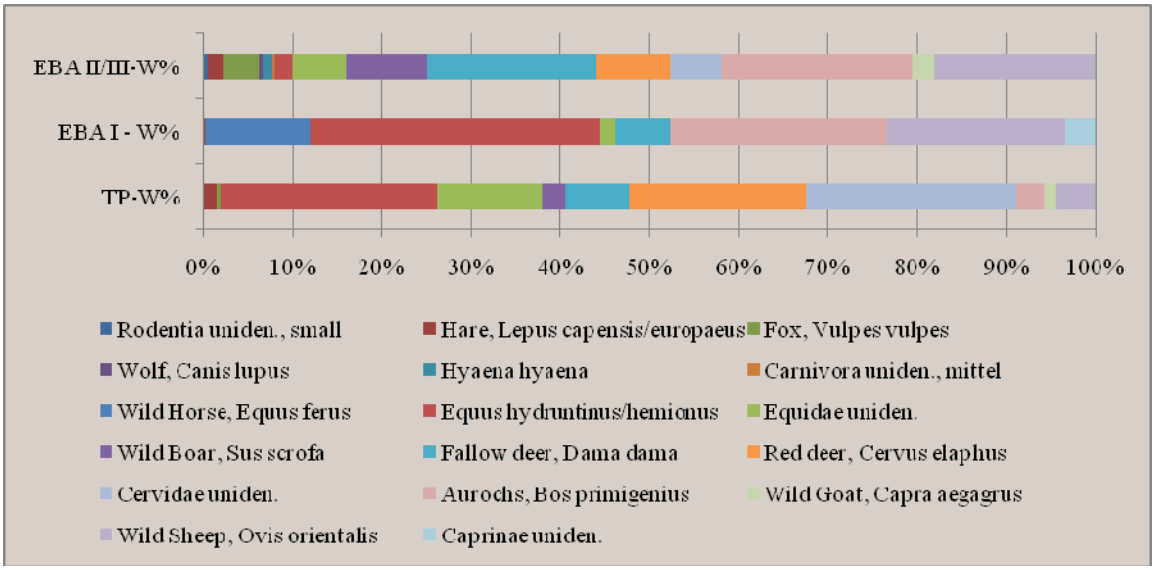

Fig. 17: Contribution of individual species to the number of bone weight (WIS) from wild animals for the each period only among the identified wild mammal remains.

Wolf, *Canis lupus* and Hyena, *Hyaenahyaena*

Each taxon is represented by single bone remains. The hyenas do not exist in Anatolia anymore (Kumerloeve 1975), whereby wolves still exist. They were probably local wild animals and brought to the settlement via dogs or hunting.

Wild Horse, *Equusferus* and *Equushemionus*

A wild horse (*E. ferus*) remain is identified from the EBA II/III period and it is a front first phalanx. The measurements are as follows[13] (based on von den Driesch 1976): Greatest length = 92,5mm / Proximal width = 58,2mm / Proximal depth = 39,5mm / Smallest width of Diaphyse = 40mm / Distal width = 50mm. These measurements are quite similar to the specimens from Demircihüyük(Rauh 1981). Some *Equidae* bones could not be identified to specific species. There may be other wild horse remains in the bone assemblage, but it will remain uncertain.

Other *Equidae* dental and long bones derive from *E. hemionus*. They were identified in all periods but in small numbers (Tab. 1 to 3). However, they make up one of the heaviest groups among the identified wild mammal remains in Küllüoba due to their large size, especially in the first two periods (Fig. 17).

Uerpmann and the Author first classified these bones as *E. hydruntinus* (European Wild-ass) after the certain distinct characteristics on molars from *E. hemionus*. Therefore, the accuracy ofthe classification of this *Equus* in Küllüoba remains unclear. For this reason, it would be better to classify these remains as *E. hydruntinus/hemionus* in Küllüoba, until more researches about this theme are published (Geigl and Grange 2012, Orlando 2009).

Cut and fire traces on the bones clearly indicate that they were hunted and consumed. Gnawing by carnivores was found on the bones as well.

Wild boar, *Susscrofa*

The wild boar is represented by at least nine bones in the identified mammal remains. No clear wild boar remains are recovered from the EBA I period, but two bone remains recorded as “wild

[13]Some measurements must be taken again like distal depth and depth of diaphyes.

or domestic" category. Most of the other remains were identified from the EBA II/III period (Tab. 1 to 3).

Wild boars are in many parts of Anatolia today due to its flexible adaptability. They like to inhabit the wood and wetland areas. They also are found on plains and mountainous terrain, if sufficient cover and food are available (Rauh 1981).

On the skeletal remains from Küllüoba, butchering traces were found, showing that the boars were eaten by people in the settlement.

Fallow Deer, *Damadama*

Fallow deer remains are one of the most abundant wild animals in the bone assemblages with c. 45 bones. Most of the finds derive from the EBA II/III period. They make up one of the heaviest assemblages among the wild mammal remains, but not among the identified mammal assemblage (Tab. 1 to 3).

Skull and antler remains were not recovered in the studied faunal material, which may indicate that the hunters only brought bones attached to the meat back to the settlement. Probably, unwanted pieces of the game were left on the hunted location. Some of the fallow deer bones show cut marks and burning traces.

Red Deer, *Cervus elaphus*

The red deer in Turkey is classified under the subspecies *Cervuselaphusmaral*. Untila few decades ago, they were found in the hilly and mountainous regions of Turkey. Because of the modern destruction of such habitats, they are becoming rare or almost disappeared from Anatolia. In earlier times, they were found in all forest areas of the peninsula. The red deer preferred colder regions compared to fallow deer, and probably preferred areas in the North Anatolian and the Central Anatolian forests (Kumerloeve 1975).

Altogether, 14 remains were determined as red deer. In contrast to the fallow deer, eight of these remains belong to antler pieces and only six of them come from long bones. Antler pieces are not attached to the skull, so they could have been collected from the nature or even imported as goods. One antler remains shows burning traces. No red deer remains were yet identified from

the studied material from the EBA I, but this may change when the new excavated material will be analyzed in the future (Tab. 1 to 3).

Aurochs, *Bosprimigenius*

Remains of wild cattle, *Bos primigenius*, could be found at many excavations in Turkey. Their bones were found in Syria and in the other countries of the Near East (Uerpmann1987). They preferred mixed forests with a temperate climate, but they were also found in steppe areas. According to Kumerloeve, they went already extinct in the middle of the first millennium AD (Kumerloeve 1975). However, Kussinger points out that wild cattle bones were identified from the medieval period of Lidar Höyük (Kussinger 1988).

Altogether, 14 bone remains were identified certainly as wild cattle, however. c. 25 remains were classified as "wild or domestic". They make up one of the heaviest groups among the wild mammal remains due to their size (Tab. 1 to 3). Their bone remains were identified from all the periods and they are mostly long bones.

Wild Sheep, *Ovisorientalis* and Wild Goat, *Capra aegagrus*

These two species do not exist anymore in Northwest Anatolia, but their remains were identified in Küllüoba. Today, wild sheep inhabit the mountains of south central and eastern Turkey. The distribution of the wild goat extends from the Taurus Mountains to various areas of the eastern highlands (seeUerpmann1987).

Wild sheep remains make up c. 1/5 of the identified wild mammal remains with 39bones specimens in each period. They are the second most abundant wild animal after fallow deer. Six remains were identified as wild goat and they were found in TP and the EBA II/III periods (Tab. 1 to 3).

Küllüoba's environment - mostly flat, open terrain with only few hills and no rocky area - could explain the presence of the wild sheep near the settlement. Wild goats, on the other hand, prefer more steep and rocky areas with bushes. The surroundings of Küllüoba are not suitable for the wild goat, because they are not adapted to flat terrain (cf. Uerpmann1987).

If the unclear "wild or domestic" sheep/goat remains (c. 80 fragments) would be add to the identified species, especially the wild sheep, then their importance increases clearly in the bone assemblage.

Wild sheep remains are represented mostly by long bones. Theage determination of the wild sheep derives from the epiphysis data only. The result shows that they were hunted between the age of 5th months and 30th months old and were brought to the settlement. Figure 18 represents a clear size difference between the domestic and wild sheep. The following figure represents the size range for the domestic and wild goat (Fig. 19).

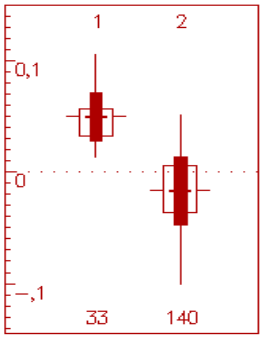

Fig. 18: The LSI-distribution of the wild and domestic sheep[14].

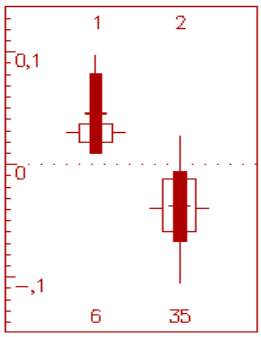

Fig. 19: The LSI-distribution of the wild and domestic goat[15].

[14]This graph was made in 2003.
[15]This graph was made in 2003.

Livestock management: meat consumption through the time in Küllüoba

Sheep was always the most kept animal in Küllüoba in each period. They make up between c. 40% and half of the domestic animals, especially during the EBA I as there is a decrease in the pig. Sheep would have been kept for its meat, milk, wool, but if the kill-off pattern is considered, then it is probable that they were kept mostly for their meat[16]. 1/3 of the animals were killed between few months of age to a year old. A second group (more than half of the herd) was slaughtered with 1 ½ years of age, as the fodder and the weight of the animal became optimal. The rest were raised until they were older than 3 ½ years of age and very small number of animals reached the age of six or older. The Author assumes that a certain portion of the killed small ruminants younger than 1 year old were goats (Tab. 6).

Tab. 6: The aim of small ruminant breeding for different age groups and the probable killing age, including the likely sex of slaughtered animals (Gündem 2010).

Killing Age	**Breeding Aims**	**Mainly Killed Gender**
<4 M	Milk production of mothers, hides, balance in flock, very little for meat	Male
~6 M	Hides, balance in flock, little for meat	Male
~12 M	Meat, hides, balance in flock	Male
1 1/2 -2 Y	Little wool/mohair production, meat, little help in enlarging the flock, hides, milk	Castrated
2-3 1/2 Y	Wool/Mohair, milk, help in enlarging the flock, meat, hides	Castrated
3 1/2-6 Y	Mainly wool/mohair production, help in enlarging the flock, milk, meat, hides	Female ?/Castrated
6-8 Y	Maximize the wool/mohair production, meat, hides, very little help in enlarging the flock	Female / Castrated
>8 Y	Leader animals	Female and Castrated

The average of sheep size increase very little over time, which could reflect an introduction of a new sheep race. In fact, it is quite challenging to interpret this pattern since the measured material from the TP was not large enough for an adequate sample size, which could cause misinterpretation.

[16]The number of the sheep was much greater than goat. Therefore, the results from small ruminants could be applied for sheep killing pattern as well.

Cattle make up on average little more than ¼ of the domestic animals and were the important animal after sheep. Beef was consumed clearly more than mutton or any other red meat. In the first two-layer, cattle account for c. 40% of the red meat consumption and almost half during the EBA II/III period, whereas mutton accounts for 1/5 of the red meat consumption in all the periods. Cattle were not only kept for their meat but also as labor animal. Villagers started to slaughter them regularly at the age of two, again as the fodder and the weight of the animal became optimal. However, the dental data show that some of them became older than nine years old. These must have been kept for work on fields or for transport.

Goats are the fourth abundant animal after pig among all the domestic animals. However, the number of pigs decreases drastically in the EBA I period. Goat reaches the 3rd in the list during EBA I period. Pork was consumed more than goat meat except in the EBA I. The aging data from pig show clearly that they were kept and slaughtered for meat.

Goats were kept probably for their meat and mohair. There is no chemical evidence to suggest that the people drank their rich protein content milk or any milk from sheep or cattle. However, young slaughtered animals during the nursing period could indicate the use of milk.

The decrease in the number of pig remains among the domestic animals could be explained by changes in the climate and environment or mostlikely due to a greater interest on the sheep and cattle herding.

Subsistence economy of the people in Küllüoba was based mainly on sheep and cattle breeding. Sheep breeding and herding were the most logical solution for this steppe like and flat environment, as well as for cattle. The farmers could obtain most benefit by investing a small amount of capital and energy, as they do today in the region. As the Author worked on location (a quite small village), there were at least two big sheep flocks (few hundreds of sheep). Sheep[17]raising was probably important for the villager mostly for the exploitation of sheep for meat. Cattle were the main meat provider and labor animal.

[17]Spindle weights were found yet in small numbers, since the inside of the houses have not been all excavated. Nevertheless, there is a clear increase of spindle weights in the EBA III, whereby the TP and the EBA I has yielded few spindle weights, since these periods were excavated in very small areas. No 'webbing complex' is yet excavated as well (Personal communication with E. Fidan). These evidences show that the sheep race still might have been hair-sheep in the earlier periods and in the second half of the EBA II or beginning of the EBA III, the wool-sheep introduced to Küllüoba. However, this is subject to change with more data from studies of spindle weights and botanical studies.

Hunting and the Environment

Wild animals are found in small numbers, but rich in diversity with different species in the bone assemblage. Game animals make up an important group of the bone assemblage, if the half of the "wild or domestic" category could have been securely identified to either category, especially in the first two periods.

The number of identified wild animal as well as their contribution of meat decrease clearly in the EBA II/III period. Apparently, the farmers of Küllüoba managed to have a more stable animal breeding and agricultural economy. Therefore, they did not have to go for a hunt to depend on other resources for red meat. Other possibility is that the number of the game decreases in the region, because of the human impact or changes in climate. However, the species of hunted animals do not change much through time. It is highly possible that the number of game animals decrease in the vicinity of the settlement. This might have happened, since the villagers exploited trees, which are scarce in the region, for fire or construction material and this action might have caused game animals to leave the region.

Almost all of the identified wild animals prefer steppe like flat environment with sparse trees/small woods in a temperate to cold climate[18]. It seems that wild goat was the only animal that is not local, since they prefer a different habitat to survive. Wild goats inhabited the rocky and mountain regions, which are far from the settlement, and hunters may have spent some time to go and hunt them selectively. Other possibility would be through trade. It is possible that tradespeople hunted wild goats as they were passing through their living habitats.

Aurochs, *Equushydruntinus/hemionus* and wild sheep were important meat suppliers especially as the pork consumption decreased in the EBA I.

[18]Today, the same climate dominates in the region. However, cultured fields dominate the landscape. The whole great plain is used for the agriculture and it almost impossible to see many trees or woods as long as if they are not planted by the villagers.

Mammalian Remains from Inland Northwestern Anatolia Settlements

The three settlements, OrmanFidanlığı – Demircihüyük[19] and Küllüoba, are located on the west wing of the Upper Sakarya Plain. Settlements were established quite close to each other. If a line would be drawn from Northwest to Southeast, Demircihüyük would be located on the Northwest point, Southeast point Küllüoba and almost in the middle, Orman Fidanlığı. Distance between Demircihüyük and Küllüoba is c. 65 km (Map 1).

Map 1: The location of the settlements and important cities in Western Anatolia.

[19]Only the results from the EBA periods are used for this article.

OrmanFidanlığı is dated between 4300 and 3300 BC, Demircihüyük early EBA 3100-2700 BCand late EBA 2700-2400 BC (Rauh 1981), and Küllüoba the Transition Period 3300-3000 BC, the EBA I 3000-2700 BC and the EBA II/III 2700-2000 BC (Efe, personal communication). These dates give us the possibility to observe the development of the animal breeding and hunting strategy on this plain from 4300 until 2000 BC.

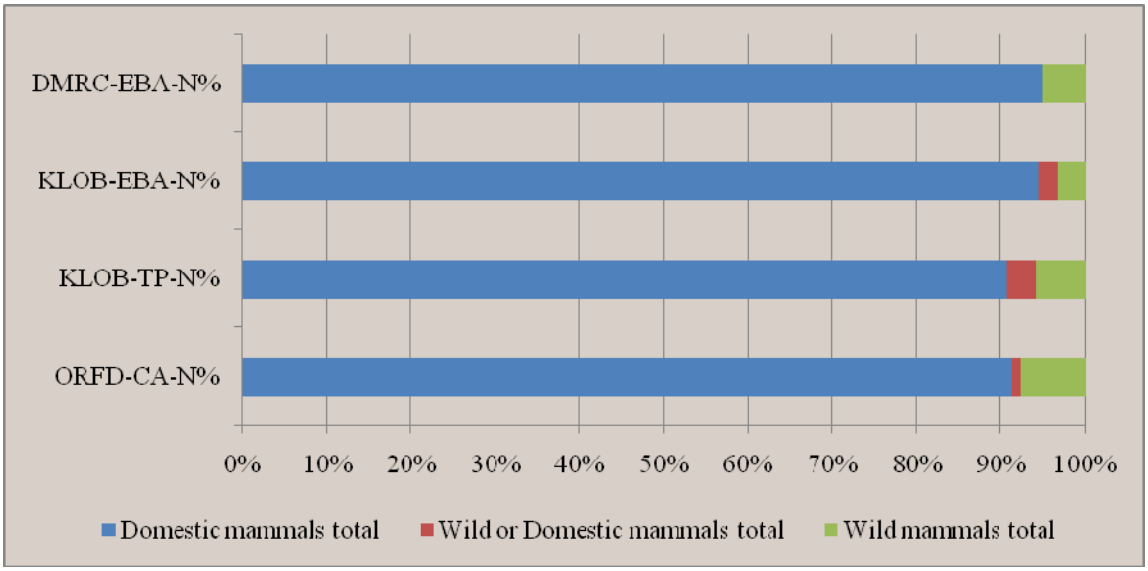

Fig. 20: The contribution of domestic, wild/domestic and wild mammals to the bone assemblage (NIS) among the identified mammal remains from each settlement (ORFD = Orman Fidanlığı – KLOB = Küllüoba and DMRC = Demircihüyük)

Most of the identified material derives from domestic mammal remains in all the settlements and the contribution of the wild mammal remains decrease over time. Most of the identified wild mammal remains were found in Orman Fidanlığı (Fig. 20), which impact the weight category. Approximately, 15% of the bone weight among the identified mammal remains from Orman Fidanlığı is wild game. This is the highest portion among the highland settlements, followed by Küllüoba-TP. In Demircihüyük and Küllüoba-EBA, they weigh almost the same amount. The domestic animals dominate the weight category, especially in the EBA period with c. 90% of the identified mammal remains deriving from domesticates. The proportion of domesticates is only c. 80% in Orman Fidanlığı and Küllüoba-TP (Fig. 21).

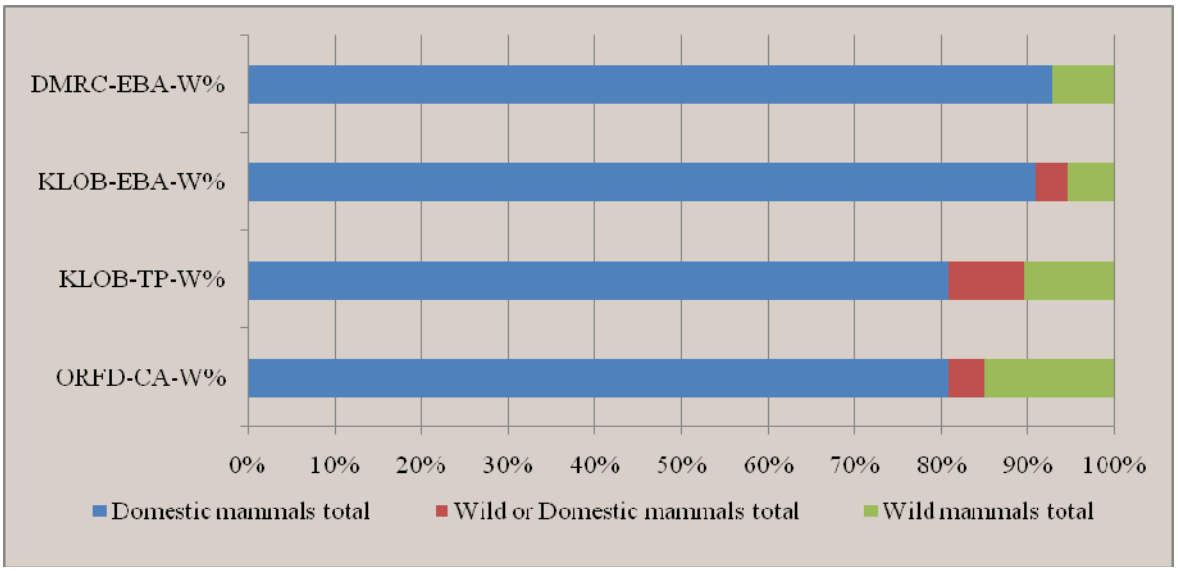

Fig. 21: The contribution of domestic, wild/domestic and wild mammals to the bone weight assemblage (WIS) among the identified mammal remains from each settlement.(ORFD = Orman Fidanlığı – KLOB = Küllüoba and DMRC = Demircihüyük)

Sheep remains from the earliest settlement Orman Fidanlığı is clearly dominant among the identified domestic mammal remains. Sheep remains decrease through time. There is a clear increase of pig remains after the Copper Age in the Transition Period, but their remains are less abundant in the EBA periods again. The important increase occurs with cattle, which remain almost constant by making up c. ¼ of the domestic animal remains from TP and later periods. In Demircihüyük, more small ruminant remains were identified than Küllüoba-EBA. Dog remains from Küllüoba are more abundant than the other settlements (Fig. 22).

There is a clear decrease in the weight of small ruminates and increase of cattle remains through time. Sheep remains make up the heaviest group in Orman Fidanlığı with c. 70% and drastically decrease over time in the other settlements, which could be observed for goat remains as well. The weight of pig remains increases clearly in the Küllüoba-TP after Orman Fidanlığı; however there is a slight decrease in the following period at Küllüoba and Demircihüyük as they make only c. 1/10 of the identified domestic mammal remains. Bone weight of cattle remains is almost same in all the settlements except in Orman Fidanlığı. In all other settlements, cattle remains make up about 50% of the identified domestic mammal remains (Fig. 23).

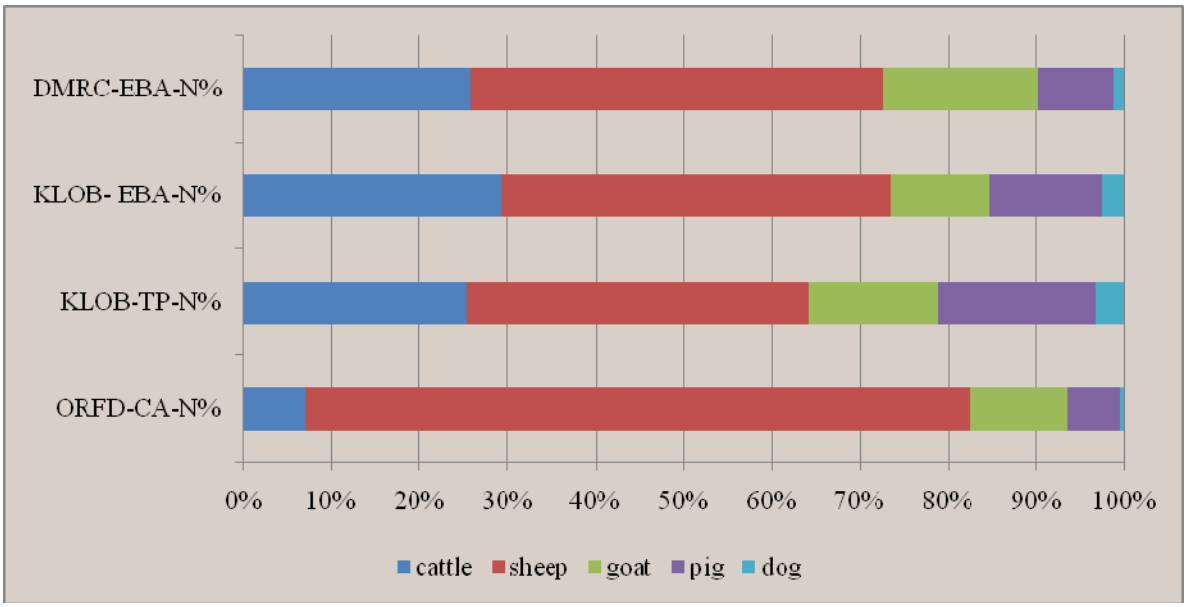

Fig. 22: Re-calculation of percentages among the identified DOMESTIC mammal remains (NIS) for each settlement after dividing the O/C-remains according to the ratio between identified sheep and goat.

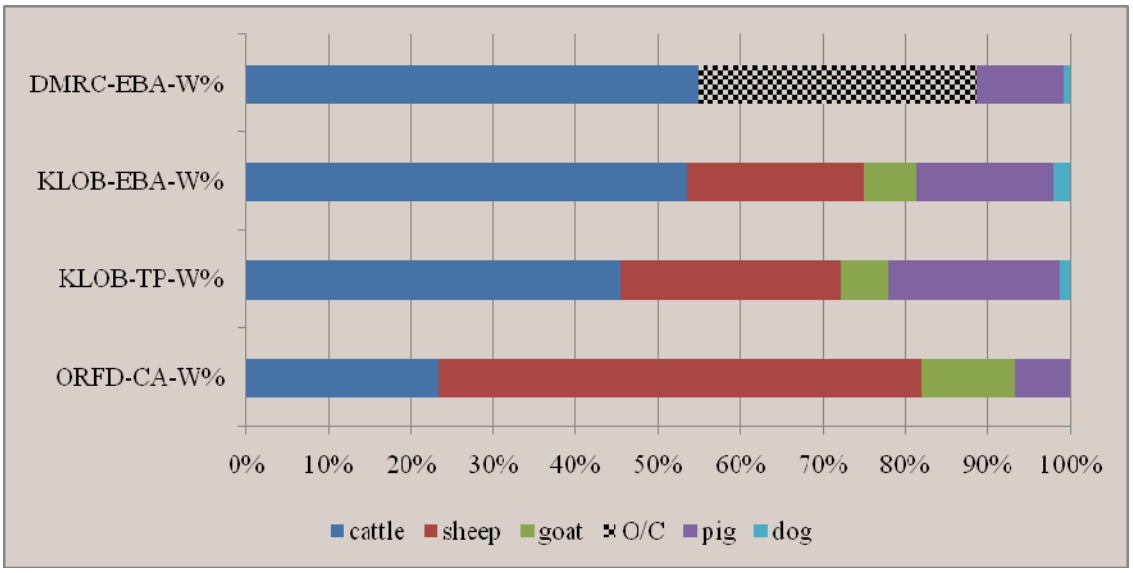

Fig. 23: Re-calculation of percentages among the identified DOMESTIC mammal remains weight for each settlement after dividing the Ovis/Capra remains according to the ratio between identified sheep and goat.

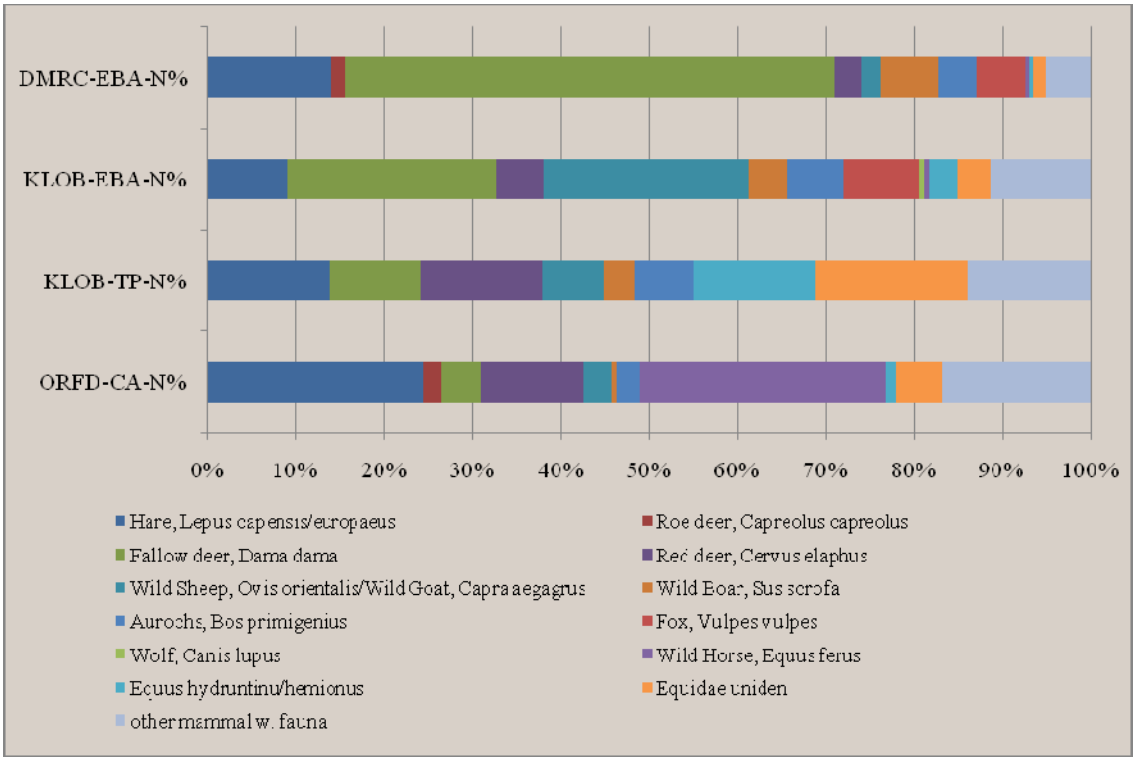

Fig. 24: Composition of wild taxa based on the number of bone finds (NIS) for each settlement.

Hare was identified quite frequently in three settlements, especially in Orman Fidanlığı, where hare remains make up ¼ of the identified wild mammal remains. The biggest difference lies in the fallow deer remains between the settlements. They make in Demircihüyük c. 55% of the wild animal remains, little more than 1/5 in Küllüoba-EBA, c. 1/10 in Küllüoba-TP and only almost c. 5% in Orman Fidanlığı.

However, wild horse remains are the most abundant in Orman Fidanlığı. These remains amount to 1/5 of the wild animal remains and c. 2,5% in Demircihüyük. There is only one remain from Küllüoba, which is identified as wild horse and comes from the EBA period. *Equushydruntinus/hemionus* was identified from all settlements in small amounts, but most were found in the Küllüoba.

Roe deer remains were found in small amount in Orman Fidanlığı and Demircihüyük, but there is no evidence from Küllüoba. Red deer remains decrease over time. Most of them were identified from Orman Fidanlığı and Küllüoba-TP.

Wild sheep/goat were identified in small number from each settlement, however, they account for c. 1/5 of the wild animal remains in Küllüoba-EBA. Fox remains were found only in Küllüoba-EBA and Demircihüyük (Fig. 24).

Wolf and hyena remains were found in Küllüoba. Brown bear, wild cat and badger remains were identified in Demircihüyük. Marten remains were found in both Orman Fidanlığı and Demircihüyük. These kinds of wild fauna are quite rare in the entire assemblages.

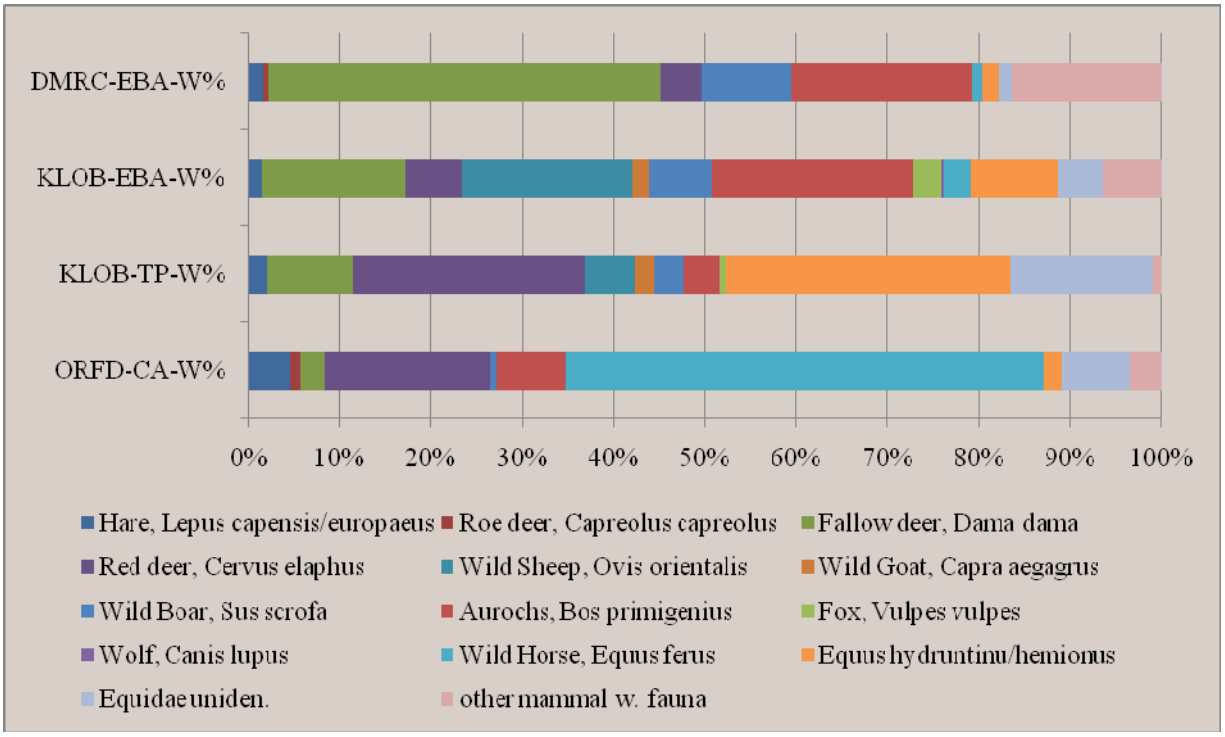

Fig. 25: Composition of wild taxa based on the weight of bone finds (WIS) for each settlement.

Hare remains are abundant in terms of the number of identified specimens, but their contribution to the weight category is small due to their fragile bones. The weight of fallow deer remains makes up for more 40% of the identified wild animal remains in Demircihüyük, which is more abundant than in the other settlement or periods. Red deer remains were not identified in high percentage, but they make up 1/5 of wild animal remains weight in Orman Fidanlığı due to their heavy bones and even c. 1/4 in Küllüoba-TP. The wild horse remains impact the weight category in Orman Fidanlığı and makes up approximately half of the identified mammal remains weight.

Equushydruntinus/hemionus remains from Küllüoba-TP make up c. 1/3 of the weight; however, they do not contribute to the assemblage in other settlements or periods. Aurochs remains make up c. 1/5 of the identified wild remains weight from Demircihüyük and Küllüoba-EBA. Wild sheep/goat remains in weight category play an import role in Küllüoba, especially in Küllüoba-EBA, accounting for c. 1/5 of the identified wild mammal remains weight (Fig. 25).

Size of the domestic animals in Inland Northwestern Anatolian Settlements

The small number of measured cattle remains from the Orman Fidanlığı-CA and the Küllüoba-TP show similarities with the compared standard animal[20]; however, cattle in Orman Fidanlığı-CA were slightly larger. Cattle size in Küllüoba-EBA shows similarity with the standard animal with differences based on sex. Cattle size in the early Demircihüyük-EBA period was bigger than the later Demircihüyük-EBA period. Cattle size became smaller thereafter. Cattle in Küllüoba-EBA were smaller than the contemporaneous settlement Demircihüyük-EBA (Fig. 26 and Fig. 27). The shoulder height of cattle was calculated as ca. 1.23 m according to an intact metacarpus in Küllüoba, whereas the shoulder height of cattle was between ca. 1.16 m and 1.27 m in Demircihüyük[21] (Rauh 1981, Gündem 2010).

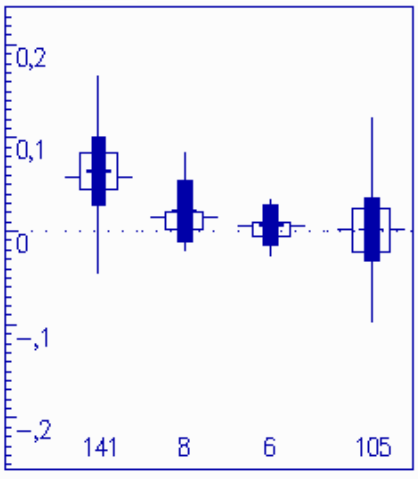

Fig. 26: The LSI-distribution of cattle remains from Fikirtepe[22] (Neolithic), Orman Fidanlığı-CA, Küllüoba -TP and Küllüoba-EBA.

[20]The shoulder height is calculated at ca. 1.20 m, similar to BO30.
[21] The shoulder height of cattle in Demircihüyük was also calculated from the metacarpus.
[22]Fikirtepe is a Neolithic site and located in Istanbul(Boessneck, J. and A. von den Driesch, 1979). The Author uses this site's cattle LSI-distribution, since other researchers used the same site's cattle LSI-distribution to compare with

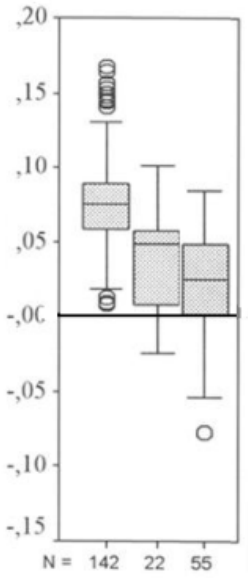

Fig. 27: The LSI-distribution of cattle remains from Fikirtepe (Neolithic), early Demircihüyük-EBA and late Demircihüyük-EBA (Von den Driesch and Pöllath2004:Fig. 4)(modified by the author).

The size of the sheep from Orman Fidanlığı-CA and Küllüoba-TP is smaller than the standard animal. Only few sheep in the both flocks are of a similar size as or slightly larger than the standard animal (Gündem 2010). The size of the sheep in Küllüoba-EBA shows a little increase in the size compared to the Küllüoba-TP. In Demircihüyük[23], sheep are generally smaller than those in the neighbouring settlements of Küllüoba and the size of sheep becomes slightly smaller after the earlier Demircihüyük-EBA, perhaps due the sex of the measured individuals[24]. Some of the sheep remains from Küllüoba-EBA show that individuals are clearly bigger than a female wild sheep (Fig. 28and 29). The shoulder height of the sheep in Küllüoba is calculated to

Demircihüyük (Cattle, female, Inv.-Nr. 25 from the Bayerische Staatssammlung fuer Anthropologie und Palaeoanatomie, Munich. Manhart 1998, Tab. 103) . The researchers used different standard animal for their LSI-evaluations. Fikirtepe result is used here to understand the size in relation of Demircihüyük to other sites.

[23] Same standard animals used in both cases, as well as for the goat.

[24]Same pattern among the sheep size exists between the EBA I and EBA II/III periods in Küllüoba. However, the number of the measured sheep bones is 15 from EBA I. The author thinks that the sample size is too small to make adequate interpretation. The number of the female measured sheep bones might have outweighed the male (Diagram DIIb-10., Gündem 2003).

between 50 cm and 57 cm (Gündem 2010) and in Demircihüyük, shoulder height of sheep is calculated to between c. 50 cm to 69 cm (Rauh 1981: Tab 19).

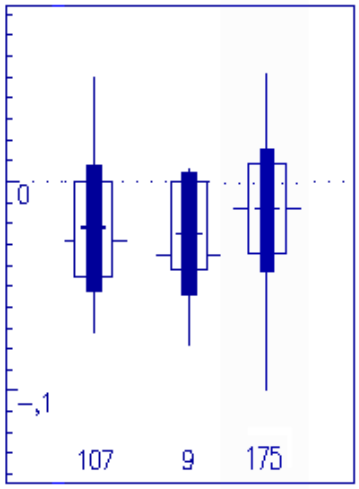

Fig. 28: The LSI-distribution of sheep remains from Orman Fidanlığı-CA, Küllüoba -TP and Küllüoba-EBA.

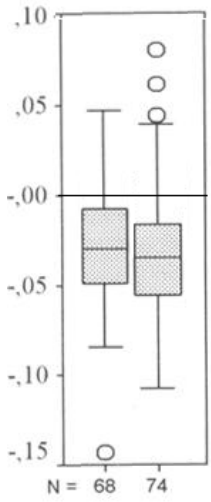

Fig. 29: The LSI-distribution of sheep remains from early Demircihüyük-EBA and late Demircihüyük-EBA (Von den Driesch and Pöllath 2004:Fig. 6)(modified by the author).

The earliest goat remains from the highlands, Orman Fidanlığı-CA, are clearly smaller than the standard animal (the average calculation from a female and male wild goat). A clear increase in the size of the goat could be observed in Küllüoba-EBA[25]. Goat are similar in size at

[25]The number of measured goat bones from the TP and the EBA I from Küllüobaaretoo small for adequate comparison (altogether only seven).

Demircihüyük-EBA and Küllüoba-EBA, however, their size variation becomes smaller in the late Demircihüyük-EBA, but mainly remains the same (Fig. 30 and 31)(Gündem 2010).

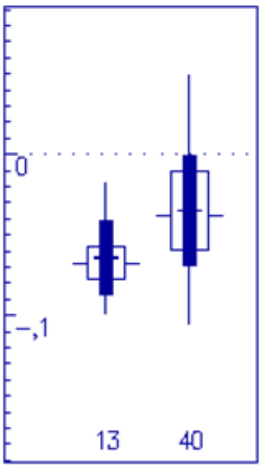

Fig. 30: The LSI-distribution of goat remains from Orman Fidanlığı-CA and Küllüoba-EBA.

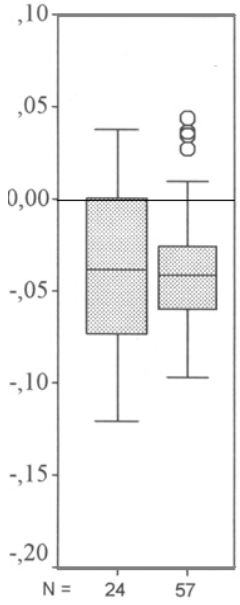

Fig. 31: The LSI-distribution of goat remains from early Demircihüyük-EBA and late Demircihüyük-EBA (Von den Driesch and Pöllath2004:Fig. 7)(modified by the author).

In Orman Fidanlığı-CA, small pigs were kept in the settlement. The transitional period from Küllüoba indicates that the pigs become even smaller. Some pig measurements from Küllüoba-EBA show that even smaller pigs were kept with some larger individuals in this period

(Gündem2010). Pig remain measurement from the neighboring settlement of Demircihüyük shows that the size of the pigs are almost the same as in Küllüoba (Gündem2003)(Fig. 32).

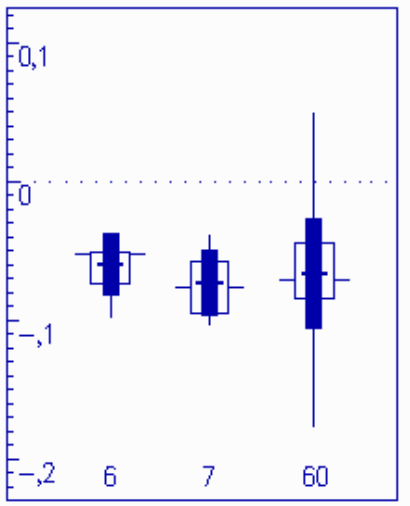

Fig. 32: The LSI-distribution of pig remains from Orman Fidanlığı-CA, Küllüoba -TP and Küllüoba-EBA.

Livestock Management and Meat consumption on Inland Northwestern Anatolia

Dominance of domestic animal remains shows clearly that the subsistence economy of the people on highland was based on their live assets. Sheep were the most kept animal in all periods and in all settlements. The number of the sheep in the settlements decreased after the Copper Age and there is a clear increase in the number of cattle in the settlements.

Uerpmann writes for the animal breeding and hunting in Orman Fidanlığı as follows: *"The faunal remains from Phase I-V of Orman Fidanlığı indicate subsistence based strongly on the herding of sheep* (hair-sheep)*, which were the meat producing animals. Cattle, which were kept in low numbers, nevertheless produced almost one fifth of the meat consumed at the site. Goats may already have been used for milking. Pigs were present but not important for subsistence. Hunting was practiced only as a minor supplement.*

After the hiatus separating Phase V from Phases VI/VII, the subsistence of the people living at Orman Fidanlığı had changed. Hunting particular of wild horses provided about half of the meat. The importance of sheep was greatly reduced and goats had become equally important.

Cattle contributed the same amount of as all the small ruminants together. There were the most important individual domestic species at this time…"(Uerpmann 2001, 194).

Küllüoba-TP provides additional information about the subsistence economy of the people on Inland Northwestern Anatolia between the Copper Age and the Early Bronze Age. Sheep herding also formed the basis of the subsistence of the people. However, this 'signal' was not as strong as the Phase I-V of Orman Fidanlığı. There is a clear increase of cattle after CA in the Küllüoba-TP in the settlement. Goats were kept in smaller numbers than pigs. Sheep were kept in large numbers, but cattle were the main meat-producing animals. Cattle, among other domestic animals, provided almost the half of the meat consumption. Mutton and pork follow the consumption of beef. Goat meat was consumed in small amount. Hunting was still important, but lost its significance for contributing to the red meat consumption from c. 15% in Orman Fidanlığı to 10% in Küllüoba-TP. The size of small ruminants and pig does not change and remains the same similar to their relatives from Orman Fidanlığı. However, the size of cattle decreases over time.

Küllüoba-EBA still shows continuity in the subsistence economy similar to the later period at TP in Küllüoba. Sheep were also kept in large numbers, however, the number of the cattle increases in abundance at Küllüoba-TP compared to Orman Fidanlığı. They make up 1/3 of the entire assemblage. There is a clear decrease in the number of herded goats and pigs.

Small ruminants from Küllüoba - TP/EBA were killed mainly in four ages. 1/10 of them were killed around the age of three months, which could indicate mainly the usage of milk from mothers. Almost 15% were killed around the age of 18 months, which could indicate use of their meat as the fodder and weight of the animal were optimal, since the animal cannot put on weight after a certain age even if they continue consume fodder. If the animal kept for maximal meat gain, 18 months would be the right time to slaughter the small ruminants. More than half of the small ruminants were kept and slaughtered between the ages of 1 ½ and 3 ½ years of age, which were probably exploited for their meat. The use of their wool is unclear but the female individuals surely increased in the flock. Little more than one-fifth of the animals were between 3 ½ and 6 years old. Probably they were kept for the same reasons the other groups of individuals that were culled earlier. Only few individuals became older than six years old and probably they were kept as lead animals of the flocks. Castration of the male individuals is

observed in Küllüoba but their percentage in the flocks remains unclear. Cattle were herded and slaughtered for their meat. The largest number of individuals was killed as their fodder and weight stood optimal roughly at the age of two and beyond. The elderly cattle were kept to ensure the herd and as labor animals. Goats were eaten in small amount. There is a decrease of pork consumption. The contribution of game animal meat decreased in the Early Bronze Age period in Küllüoba. In this period, they only cover c. 5% of the meat demand of the people.

The average of the sheep size increase at OrmanFidanlığı and Küllüoba-TP, however, there are still small sized individuals in the flocks. The size of the cattle remains the same, but cattle are still smaller than individuals from Orman Fidanlığı-CA. There is a clear increase in the size of goats after Orman Fidanlığı-CA and the size of pig shows generally the same pattern between two periods. There are bigger individuals in the Küllüoba-EBA than in Orman Fidanlığı and Küllüoba-TP, however, smaller individuals are present as well.

The faunal remains from Demircihüyük-EBA indicate that the subsistence was based mainly on domestic animals as well. Sheep were kept in bigger numbers than any other animals. The proportion of cattle in the settlement is similar; however, the sheep flock was bigger than Küllüoba-EBA. Goat herding was clearly important in Demircihüyük-EBA than Küllüoba-EBA. Pigs were kept in smaller number at Demircihüyük-EBA than Küllüoba-EBA.

Rauh writes about cattle breeding as follows: *"during all phases of settlement, cattle were the most important source of meat. While the keeping of cattle decreases during the second half of the Early Bronze Age, the keeping of small ruminants increases. Cattle were slaughtered quite young. Thus, half of the stock was slaughtered before they reached the age of 2 ½ years. As time passed, the size of cattle became smaller. This finding reflects a well-known pattern in the history of the domestication of cattle…."* (1981, 172-173). These results are similar to the pattern observed in Küllüoba-EBA. There is a size decrease as well from Küllüoba-EBA I to II/III. However, the Author cannot make a conclusive statement, since only five cattle bones were measured from Küllüoba-EBA I. Cattle from Demircihüyük were altogether larger than the ones from Küllüoba-EBA.

The small ruminants were an important asset of the people in Demircihüyük and Rauh describes the small ruminant management as follows: "*more than the half of the small ruminants wa*

sslaughtered before they reached the age of 2 years. This young average age indicates that sheep were used mostly for meat. The measurements obtained from bones of sheep show that a rather small breed was kept. The small size and relatively short lifetime suggest that these were hairy sheep than wool sheep. It appears that the wool sheep race was introduced rather late in the area around Demircihüyük. Thus, when their measurements are compared, some of the sheep, which come from the second half of the Early Bronze Age and the Middle Bronze Age are larger in size than bones from earlier periods. The reason for the increase in the size of sheep in the second half of the Early Bronze Age may well be due to the importation of a wool sheep breed, which would have supplied the settlement not only with meat but also with wool. At all times, more female goats were kept than male sheep and goats."(1981, 173). Small ruminants represent the largest group of animals recovered in both EBA settlements on the highland.

Sheep were slightly larger in Küllüoba than those in Demircihüyük. Rauh reports this size change of sheep during the late EBA period in her Figure 2a, where she compares the "Talus" measurements from the early EBA period with the late EBA period (s.a., 1981). The number of larger sized sheep increases in the late EBA period. However, the general size remains within the same range as in the early period, which could be explained by the increase of measured male individuals. The LSI-distribution figure for sheep size in Demircihüyük represented by von den Driesch and Pöllath publication indicates a different result as well (2004). Indeed, the size of the sheep becomes slightly smaller and the number of smaller sheep increases in the late EBA period as well (von den Driesch and Pöllath 2004:Fig. 6 and here Fig. 27). However, as the Author has shown, this size increase is important (see von den Driesch and Pöllath 2004), but not necessary to prove the existence of wool sheep in the settlements. Other archaeological finds could support the introduction of wool sheep to settlements in the West Anatolia. High numbers of spindle whirls, webbing complexes andthe absence of fiber gained plants remains could indicate wool sheep breeding similar to Troy. The introduction of wool sheep to Troy should have took place at the middle/end of Troy I (2920-2550 BC) (Kromer et al 2003) and beginning of Troy II (2550-2200 BC.) (see Gündem 2010 and also Balfanz 1995[26]).

[26]Balfanz inferred that the wool sheep existed in Troy only on the basis of spindles, loom weights and webbing complexes without reviewing archaeozoological and botanical data, which were not completed at that time (1995). However, the Author used all the above evidences and proved the existence of the wool sheep (Gündem 2010).

The decrease in the size of sheep around the end of EBA on the highland could be explained by climate changes. Staubwasser and Weiss write: "*this globally observed climate event occurred roughly between 4500 and 3500 calyr BP (Gasse, 2000; Weiss, 2000;Booth et al., 2005). This interval includes some chronological imprecision, usually ±100–200 yr. In the highest resolution records, the event begins at 4200 calyr BP and lasts about300 yr. In records from the eastern Mediterranean region and West Asia, a severe drought is observed almost everywhere. The 4.2 ka event apparently displaced the Mediterranean wester lies and possibly the Indian monsoon, thereby reducing the seasonal precipitation necessary for rain-fed cereal agriculture.*" (2006, 381). The arid climate could have impacted the sheep size. Probably, the lack of good pastures with high quality or the short period of green pastures caused sheep to consume low quality nutrition. Therefore, they became smaller. Generally, the size of goat is similar in both settlements.

Rauh writes about pig breeding in Demircihüyük: "*the relative importance of swine among the livestock increases during the Early Bronze Age and is highest during the Middle Bronze Age. Pork constituted 10% of the settlement's meat consumed… The majority of pigs were slaughtered by the age of 2 years. The bones of pigs come from rather small animals"*(1981, 173). Pig breeding system was quite similar in Demircihüyük and Küllüoba. However, pig breeding was generally more important in Küllüoba than in Demircihüyük. Pigs were kept in greater abundance than in Demircihüyük. Pork covered c. 15% of the meat demand at Küllüoba.

Game meat was consumed almost in similar quantity at both EBA settlements. The decrease in hunting is quite clear at the EBA settlements. The consumption of wild meat remains clearly under 10% in Demircihüyük and even less at Küllüoba with c. 5%.

Dogs are found in each period and settlements. Their meat consumed in large numbers in Küllüoba. The size of the dogs in Küllüoba was smaller than an Arabian Wolf. Rauh writes about the dogs in Demircihüyük that "*the dogs varied considerably in size. Besides small ones there were mostly medium sized dogs.*"(1981, 173-174).

Understanding the Environment on Inland Northwestern Anatolia from the Chalcolithic Period until the end of Early Bronze Age via identified wild mammal fauna

Uerpmann writes; "*Except for the cultivated poplar groves around the forestry school, which provides the name of Orman Fidanlığı, there are no forest in the close vicinity. This does not seem to have been the case in the past, because finds of red, fallow and roe deer indicate the former existence of woodlands. On the other hand, it is also obvious from the fauna that the area was not completely covered by higher vegetation. The bones of horses and hydruntines as well as of the great bastard are evidence for large areas of steppe. Remains of wild sheep also seem to be present. As these animals would have been inhabitants of the steeper slopes in the hilly and mountainous areas, they indicate that even the higher parts of the landscape were not completely covered along the rivers and alluvial plains. This is also supported by the presence of beaver bones at the sites. The other wild animals are inhabitants of wider range of biotopes and are not restricted to any special type of vegetation. However, the fairly long list of wild animals indicates a varied environment with higher vegetation in appropriate habitats*"(2003, 188). Uerpmann further explains changes in environment based on the wild horse remains found in the Phase VII in Orman Fidanlığı after a hiatus: "*The marked reliance on the wild horses at Kes Kaya and Phase VII of Orman Fidanlığı might indicate a reason for the changes*" (2003, 195). Apparently, the climate became cooler at the last Phases of Orman Fidanlığı. This change in climate provided a suitable habitat for wild horses to graze on the plain of Orman Fidanlığı.

The transition period from the Late Chalcolithic into the EBA in Küllüoba shows similar taxa like Orman Fidanlığı. However, certain identified equidremains are from *E. hydruntinus/hemionus*. Cervids remains indicate the existence of possible woodland in the vicinity of the settlement.

The amount of identified *Equidae* (wild horse and *E. hydruntinus/hemionus*) and cervid remains indicate that the environment did not change much in the Early Bronze Age periods of Küllüoba. Open and some wood-land existed around the settlement. Probably the trees became less dense, since they were used for construction and fire. It is possible that during the Early Bronze Age, especially later periods, people were traveling longer distance to find and hunt the game. The hilly areas were exploited quite often to hunt the wild sheep.

The rich fallow deer remains from Demircihüyük compared to Küllüoba and Orman Fidanlığı indicate an environment with forest, although the wild horse remains point to a more open land. Rauh writes about the location of Demircihüyük; " *... the area is characterized by natural oak forests and pines at lower altitudes, pointing to agradient zone that transitions into the Mediterranean climate"*[27] (1981, 69). Probably, the north and west of Demircihüyük was occupied, which are areas close to the site with forests, where the fallow deer were hunted in large numbers as they came out to graze in the open areas. Open plain with low grasses and bushes occupied the east and probably south of Demircihüyük, where people hunted wild horse and *E. hydruntinus/hemionus*.

Conclusions

Animal-based economy on Inland Northwestern Anatolia was mainly based on the domestic animals and little on the wild animals. Especially, people of the highlands became less dependent on the wild resources over time.

The economic importance of sheep herding can be observed in all periods and settlements. Farmers of the highland kept sheep in large number, since the environment was suitable for sheep herding.Uerpmann reported the earliest domestic sheep on the highland as hair-sheep (2001). The author shares the same idea for the Transition Period sheep, from the Late Chalcolithic into the Early Bronze Age in Küllüoba. The timing of introduction of the wool sheep to the highland remains unclear. Therefore, the question of possible introduction of wool sheep to Küllüoba in the second half of the Early Bronze Age remains open, since some evidences from botanical remains as well as the little excavated of interior houses, which could indicate increase in the number of spindle whirls and webbing complexes, are still unclear.

Mutton was consumed in large amounts during the early periods of Copper Age in Orman Fidanlığı. However, wild horse and cattle meat were clearly consumed more in the later periods of Orman Fidanlığı, which is explained by Uerpmann as changes in the climate after the hiatus. Cattle were still the main meat provider in the Early Bronze Age. Cattle were not only kept for their meat but for their use as working animals. Goat and pig were kept in certain number, but they were not as important as sheep or cattle for the farmers on the highland.

[27] *„...Dort markieren natürliche Eichenwälder und in tieferen Lagen Kieferbestände den Übergang zur Mediterranen Klimazone."* (Rauh 1981, 69).

The existence of oak and pine forest on the northwest of this highland made it possible for the people to hunt more fallow deer. Further in the east – southeast direction of this region, there was more open land.

The Early Bronze Age sheep material from Küllüoba should be further studied to understand the process of introduction of wool sheep to the great highland plain. Other important questions such as the direction and method of introducing wool sheep can be addressed by studying the faunal assemblages from Küllüoba in the future, namely, how and when did the people bring the wool sheep to west Anatolia.

Tab. 7: Bone Measurements from SUS22 used for LSI-calculations.

Scapula	**SLC**	**GLP**	**LG**	**BG**	**HS**			
SUS22/R	25,2	36,6	33,5	25,4	219,1			
SUS22/L	26,1	37,1	31,5	26	217			
Humerus	**Bd**	**BT**	**SD**	**Bp**	**Dp**	**GLC**	**GL**	
SUS22/R	42,2	30,7	17,4	52	65	183,7	208,5	
SUS22/L	42,9	30	17,5	52,4	64,8	183	208,6	
Radius	**Bp**	**SD**	**Bd**	**GL**			**BFp**	**BFd**
SUS22/R	28,5	18,8	33,7	156,7			27,7	30,9
SUS22/L	29	17	34	158,8			28,6	31,5
Ulna	**BPC**	**DPA**	**SDO**	**GL**				
SUS22/R	22,9	41,3	31,2	209,2				
SUS22/L	23,1	43,3	33,2	209,2				
Metacarpus III	**Bp**	**Dp**	**SD**	**Bd**	**Dd**	**GL**	**DD**	
SUS22/R	22,1	19,5	14,6	17,1	17,7	74,4	10,2	
SUS22/L	22	19,5	14	18	18	74,9	10,8	
Metacarpus IV	**Bp**	**Dp**	**SD**	**Bd**	**Dd**	**GL**	**DD**	
SUS22/R	15,7	16,7	12,7	16,6	17,6	75,7	11	
SUS22/L	16,2	16,5	12,6	16,2	17,5	75,3	12,8	
Pelvis	**LA**	**LAR**	**GL**					
SUS22/R	33,6	29,8	234,2					
SUS22/L	33,9	29,9	236					
Femur	**Bp**	**DC**	**DD**	**Bd**	**BTP**	**GLC**	**GL**	
SUS22/R	57,3	25,2	19,3	50	21,5	221	218,9	
SUS22/L	58	25,5	18,6	49	21,5	220,1	220,4	
Tibia	**Bp**	**SD**	**Bd**	**Dd**	**GL**			
SUS22/R	52,4	21,5	30,3	26,4	209			
SUS22/L	52	20,8	29,8	25,9	210			
Astragalus	**GLl**	**GLm**	**Dl**	**Dm**	**BC**			
SUS22/R	40,5	38,9	19,8	25,8	27,6			
SUS22/L	41,1	38,6	20,8	25,7	27,5			
Calcaneus	**GL**	**BB**	**GD**					
SUS22/R	82,5	24,9	31,5					
Metatarsus III	**Bp**	**Dp**	**SD**	**Bd**	**Dd**	**GL**	**DD**	
SUS22/R	17,5	22,4	13,5	16,1	17,9	84		
SUS22/L	17,5	22,3	13,4	15,9	18	83	10,9	
Metatarsus IV	**Bp**	**Dp**	**SD**	**Bd**	**Dd**	**GL**	**DD**	
SUS22/R	16	24,5	13,2	15,4	18,3	92,5	10,9	
SUS22/L	17,5	24,1	13,3	15,3	18,5	91,5	10,9	

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