ARCHAEOZOOLOGY OF THE HOLOCENE IN ANATOLIA
An overview

by Dr. H. Buitenhuis

Archaeozoology, zooarchaeology, faunal analysis, bio-archaeology are all different approaches to the same type of study based on faunal remains: it is the study of animal exploitation by mankind. By now it has become an integral part of archaeological research. It is however not a new development in this region in the last decennia. Already in the 1930's during the Blegen excavations of Troy, faunamaterial was collected and studied by a specialist, Gejvall from Lund, Sweden. It resulted in two small articles (Gejvall, 1937,1938) and an unpublished report (pers. comm. Uerpmann). This early example of archaeozoological research in Anatolia was however not followed by others. The second World War of course also intervened. It is in the late 1950's and early 1960's that the bio-archaeology of Anatolia got its major impetus through the advent of research of early prehistoric settlements with the express purpose to find the beginnings of agriculture. These researches as undertaken by for instance Braidwood, Cambel and Mellaart, with the cooperation of biologists like Helbaek, Perkins, Daly and others, focussed the attention on material, which up to this time was quite often neglected, unless it was of a spectacular nature such as complete large bones, complete skeletons, horncores, antlers or worked bone. This type of material has quite often been described in archaeological reports since the 19th century, but are not of importance in economic and ecological reconstructions. The vast majority of the faunal remains were discarded. Even these early 1960's zoological studies were hampered by the type of recovery procedures used, and by the preconceptions of the researchers; not only of the excavators but also of the zoologists. The limitations of these early studies are quite clearly demonstrated by the publications on the faunal remains from Hacilar and Çatal Höyük in Central Anatolia (table 1.). The faunal remains from Hacilar published by Westley (1970), number 171 with an indication that more material was found. From Çatal Höyük no fragment numbers are given by Perkins (1969), but number of specimens. In total 701 specimen are counted but this type of number is uncomparable with bone counts of other sites as his method is not backed by fragment numbers. This particular method is also very much skewed in favour of larger animals. The implication that cattle domestication and breeding was the major form of animal exploitation in Çatal must also be considered in the light of the impressive plastic and graphic presentations of cattle in the site (Mellaart, 1967, 1975). I await therefore with great interest the results of the new excavations at Çatal Höyük. As any field researcher will acknowledge, the above mentioned numbers do not reflect in any way the normal amount recoverable from a major site. The conclusion drawn from these reports, that Central Anatolia was a large centre of cattle domestication and breeding, and that sheep and goat may have been domesticated much later in this area, have been long accepted as completely valid. Not withstanding the nowadays recognised questionable status of these early reports, they did however draw attention to the potential value of faunal analysis, which since that time has become to be more and more integrated in archaeological research.

The advent of the building of major dams in the Euphrates, beginning in the 1960's with the Keban dam, and followed in the 1980's with several dams in the Lower Euphrates (Özdogan, 1977), and the projected dams in the Tigris (Dicle) has stimulated the archaeological research in these areas enormously. Archaeozoological research was acknowleged as an integral part of prehistoric research but the cooperation and closeness of the

work within the project areas led to the acceptance of archaeozoology also for later periods. Especially Boessneck and Von den Driesch, both from the University of Münich in Germany, led this development.
The idea is now somewhat established that the field of archaeozoology has been firmly established and that the picture of faunal exploitation in the different periods and areas is becoming clear. It is true that our knowledge has considerably increased, but if we look at the factual basis of our knowledge, the amount of material which has been studied in detail is remarkably little. The number of sites studied archaeozoologically in any given period or area is remarkably small (fig. 1)(table 2).
This somewhat negative introduction is necessary to explain the continued need for faunal research and the problems it encounters. As the figure and table 1 shows, large areas and long periods are completely unknown in terms of archaeozoology.

Before going into details of faunal study, I must remind you of one important aspect of archaeozoological studies: Most other remains, such as ceramics, metal or architectural remains, are the remains of the actual product. Even botanical remains such as seeds, are the leftovers of the wished-for product. Animal remains, consisting mainly of bones, teeth, horncore, antler and shell, are however the debitage of a process, which yielded a different product: meat, milk, wool, carrying and drafting power. Therefore, apart from exceptions such as worked bone and ivory, bones themselves do not show us any direct evidence of the activity from which they came, and are heavily influenced by natral variation. Individual bone remains are therefore seldom of much value in themselves, and archaeozoology depend heavily on statistical interpretation of large amounts being valid samples and reflecting the actual process. Physical and chemical analysis of bones are therefore at this stage less useful research tools.

I would like to address a few of the questions archaeozoology is studying: As already said the impetus on bio-archaeological research in this region, came mainly through the interests of prehistorians in the development of agriculture. The questions they asked were:

1. Where were the first animals domesticated
2. Which animals were first domesticated
3. What caused domestication
4. What changes occurred in the animals through domstication 5. What was the effect of domestication on the human society and vice-versa.

For the European arena from which these questions arose, there are four major domestic animals of primary economic importance: sheep, goat, cattle and pig. As no wild sheep or goat occurred in Europe in the post-Glacial palaeontological record, it was natural to turn to the Middle East for the nearest sources of early domestication of these animals. Since the 1950's research was undertaken to establish the earliest forms of domestication. A number of simple techniques were used (simple in the meaning of not necessarily using complex machinery):
1. Fauna-listing
2. Study of changes in sex and age-ratio of the killed animals 3. Anatomical changes of animals both in form and size
4. Study of changes in the taphonomic remains

Fauna-listing consists of the counting of material as to absolute and/or relative occurrence of each

species in the faunal complex. This is not the place to go into the discussion on the problems and implications of the different methods of interpretating bone counts, bone weights, minimum number of individuals, corrected counts etc. However, differences in the quantitative occurrence of species as compared to an expected occurrence according to their natural abundance must be examined. No faunal complex from a human settlement reflexes accurately the complete natural faunacomplex. But sometimes changes may reflect a human choice in the exploitation pattern of larger consequence. A clear example of this is the dramatic change within the fauna-listings in the Southern Levant from the Natufian to the PrePottery Neolithic (PPN)(Ducos and Helmer, 1981). In the earlier period gazelles are by far the most hunted game. Caprines occur rarely and particularly sheep are very rare. With the advance of the PPN the ovicaprines become the most-killed animals, while anatomical changes prove their domestic status. Their prior scarcity and Ducos's study of similar material from the Damascene corridor (Ducos, 1993) (fig. 2), suggest clearly an at least partwise introduction of domestic sheep (and maybe goat) from more northern areas into the Levant. The Anatolian area may have been the source of this material. Of course, the natural distribution of wild sheep and goat also points to a similar origin (Uerpmann, 1982)

Material from this period in Anatolia is scarce and comes from the excavations of Cayönü (Çambel and Braidwood, 1980; Braidwood and Braidwood, 1982) , Çafer (Helmer, 1985), Gritille (Stein, 1990), Hayaz Höyük (Buitenhuis, 1985, 1988) and Asikli Höyük (Esin et. al., 199[illegible]; Buitenhuis, in prep.) in East and Southeast Anatolia. A preliminary study of the Cayönü material by Barbara Lawrence (1980,1982) dating from the beginning of the 8th millennium B.C. till the middle of the 7th millennium B.C. showed the occurrence of domestic sheep and goat. Taking into account the stratigraphic contexts of the material the division in an 'earlier' and 'uppermost' chronological category showed an equal type of change in the relative abundance of the different species as in the Southern Levant (table 3). The difference is here that in the 'earlier phase' the majority of the material was from Sus (pigs) and that ovicaprines, cervids and cattle were also quite important. In the 'uppermost' category domestic sheep and goat were encountered in the ovicaprine material and the change in relative abundance shows the same direction as in the Levant: large amounts of domestic ovicaprines and much smaller amounts of non-domestics, as no indication for the domestication of cattle and pig were encountered. We also see the increased importance of sheep as typical for the earliest domestication. The Cayönü material as presented does indicate a relative quick change from a purely hunting-gathering society to an agricultural society. The time-length of this process must be calculated a in few centuries at most. Future research analysing all material in even more detailed chronostratigraphic contexts will hopefully provide us with more information.

Çafer, excavated by Cauvin and archaeozoologically studied by Helmer (1985), dates to the beginning of the 7th millenium B.C. The faunalist of the preliminary study (table 3) shows a variety of species in quantities as can be expected from a hunted, wild, faunacomplex. No indications of domestication, either in size, form changes, or age and sex ratio were found for any species.

The sites Gritille and Hayaz date to the second part of the 7th millennium B.C. The faunal material has been identified by G. Stein (1990) for Gritille and myself for Hayaz (Buitenhuis, 1985).
The aceramic neolithic occupation of Hayaz however was not a settlement but a flint workshop. Only a small area was occupied apparantly with the express purpose of collecting raw flint nodules and producing halfproducts. One does not expect a clear representative picture of a society's food production strategy in suc a situation.

Gritille was a normal settlement in the aceramic period.
Both in Hayaz and in Gritille the majority of material comes from ovicaprids, with much lesser amounts of cattle and pig (fig. 3). The domestic status of sheep and goat in both sites was established by size changes and sex and age-ratios. Hunting occurred mainly on cattle, pig, cervids, wild sheep and wild goat.

This overview of existing faunal studies of early neolithic material shows the basic lack of information yet available to really establish the how, why and where of the domestic process. Fortunately, since 1989 a team of the Istanbul University under the direction of Prof. Ufuk Esin is excavating Asikli Höyük lying on the western edge of the Taurus mountain range (Esin et al, 1993). The site dates from roughly 7200 - 6700 B.C. uncalibrated. The aceramic settlement produced an enormous quantity of faunal material. Some preliminary results can be presented to be included in the above sketched picture of the developments leading to and surrounding domestication.
The fauna-list (table 4) shows a marked abundance of caprines (87.5 %), while cattle (8.5 %), pig (2.2 %) and onager (0.9 %) are other species of some importance. This fauna-list compares very well with that of Cayönü in the 'uppermost' phase and with later Gritille and Hayaz. Within the ovicaprid material the ratio between sheep and goat is 5.9 : 1. The abundance of sheep over goat is maybe comparable to the later phases in the other sites (table 5). However, both for the fauna-listing and the Ovis/Capra ratio we must take into account the fact that the area around Asikli, with its rather flat undulating plane and mesa's, is much more favourable to wild sheep than wild goat. The distribution patterns of wild sheep and wild goat for this area is however not known.
The age pattern as based on mandibulae shows a marked preference for adult animals (2.5 - 4 years). The number of young animals was very small even if we take single teeth data into account. If we look at the postcranial remains of small ruminants we find a small number of remains of very young animals, aged less then six weeks, present in many samples. The vast majority of postcranial remains are however from adult individuals.
In size Ovis and Capra have not changed significantly compared to wild specimen and do not show the two-topped spread as does the Gritille material (fig. 4).
One factor can be taken into account that could not be explored as extensively in oter sites yet, as it will be Asikli. From the scatter of the different skeletal parts we can deduce that the animals were not killed on the site itself. The amount of remains of the cranium and lower legs (the metapodia and phalanges) is much to small compared to the number of remains of the other postcranial part. Remains of the ribcage and vertebrate collum are however very much present. The conclusion can be drawn that the animals were slaughtered somewhere else, but completely dressed carcasses were brought to the site to be further used. In itself this practise could suggest hunting as the primary source of meat, but then we would expect less vertebrae and ribs to be present.
The preliminary conclusions on the Asikli material are somewhat contradictory: The fauna-list and sheep/goat ratio suggest a domestic status for the ovicapridae. The age and size pattern show no changes to a hunting strategy and the skeletal dispersion pattern could be interpreted either way.

It is interesting to set this situation off to the hypothesis proposed among others by Stein (1990) in his study comparing the
Gritille and Çafer remains. His hypothesis of risk avoidance and diversified subsistence suggest a change in the subsistence pattern caused by sedentism and plant domestication. Especially the last, which seems to have occurred somewhat earlier than the animals domestication in the above

mentioned sites, might have conflicted strongly with the traditional all-year hunting strategies, because of the necessity to nurture and protect crops. It also caused new seasonal risks especially in the late winter period when crops are gone and eaten. The hypothesis is therefore that because of this summer hunting, which can be done over a wide range and therefore bring in a much more varied prey, is abandonded, and winter-hunting, focussed on a 'least-effort' strategy, is adopted (fig. 5). This would entail a focussing on the most available game. Sheep was probably the most numerous wild game and would have descended into the valley, to become the most likely game in winter. This would then also explain the persistent occurrence of very young animals as necessary late winter hunting would take place in this area in the months february to april, during and just after the breeding season of sheep. Increasing management of wild herds to procure a yeararound supply of meat would have led to the emergence of domestication. Asikli quite probably has been a site in which this process is taking place, but where the domestication of animals did not yet expresses itself yet in the anatomical features of the material.

Short discussion of archaeozoology in protohistoric and historic periods

In the above presentation of the early neolithic developments in Anatolia the subsistence patterns are evolved for personal and group-survival. The direct purpose of animal exploitation was the procurement of meat, although skins, leather or fur may have been of secondary purpose. There are no indications of milking as a secondary activity and neither of the acquisition and/or use of wool.
These secondary activities developed through the millennia and found their first major expression in the pictorial record of the Bronze Age and later. Apparantly the emerging complex societies were instrumental in the succesful exploitation of these secondary products, such as milk and wool. From this period we see in the pictorial record a continuous development of new characteristics, such as full wool coats, milked sheep, goat and cattle, developing fattails, hornlessness or different horn shapes etc., which eventually developed into the modern-day traditional breeds. It is at this stage that intensified comparative analysis of macro-characters and stable-isotope and DNA-analysis may provide better possibilities to study this divergence in characters and subsequent emergence of breeds.

In these complex societies an important new element is the regional and long-distance trade. Two major factors are involved in this development: A hierarchical society to organise the production, distribution, and availibility of transport power. The appearance of domestic horses, donkeys, the unsuccesful attempt to domesticate onagers, the introduction of camels (dromedary) and the increased appearance of oxen clearly illustrate this trend in developing societies.

Although a number of sites from the Bronze Age and later have been archaeozoologically studied (fig. 1, map. 1), in particular Korucutepe (Boessneck and Von den Driesch, 1975), Tepecik, Gritille, Hayaz, Hassek (Stahl,1989), Lidar (Kussinger,1988) and Demircihöyük (Rauh,1981), no studies have been done or could be undertaken to relate the changed faunacomplex to the different aspects of these complex societies other than in general terms. In these sites not only the major domestic food animals (sheep, goat, cattle and pig) are found, or the transport animals (horse, donkey, camel or oxen), but quite often a long list of species of wild mammals and birds. For example, in the neolithic sites of Suberde 20 species are mentioned, but not specified. In neolithic Çafer 8 species, in Hayaz 11 mammal and 3 bird species, and in Hacilar 9 species were recognised. Of the other early sites no full species lists are available. On the other hand in the Late Chalcolithic

site of Hassek Höyük 25 mammal species and 16 bird species were recognised, while in the Bronze Age and later of Korucutepe respectively 26 and 19 species were found;in Demircihöyük 26 mammal species were found; and in Lidar 32 mammal and 19 bird species were found.
The exploitation of these species in a context of self-supporting local subsistence is uneconomical. Their occurrence in these complex societies, with its market economy, shows that other factors have been introduced that make this kind of exploitation feasible. The hierachical structure of complex societies and the increased occurrence of luxury items suggest a possible explanation. The study of faunamaterial from these later sites may therefore provide us with a clearer understanding of developing complex societies and the development of breeds for 'secondary' or 'multiple' purposes.

In above examples I have tried to describe the present-day stand of faunal research in Anatolia, in the past and present. The continuing prehistoric research and the recently evolving cooperation between archaeozoologists and classical archaeologists is a good example of the future prospects for archaeozoological research in Anatolia which is basically still at its very beginning.

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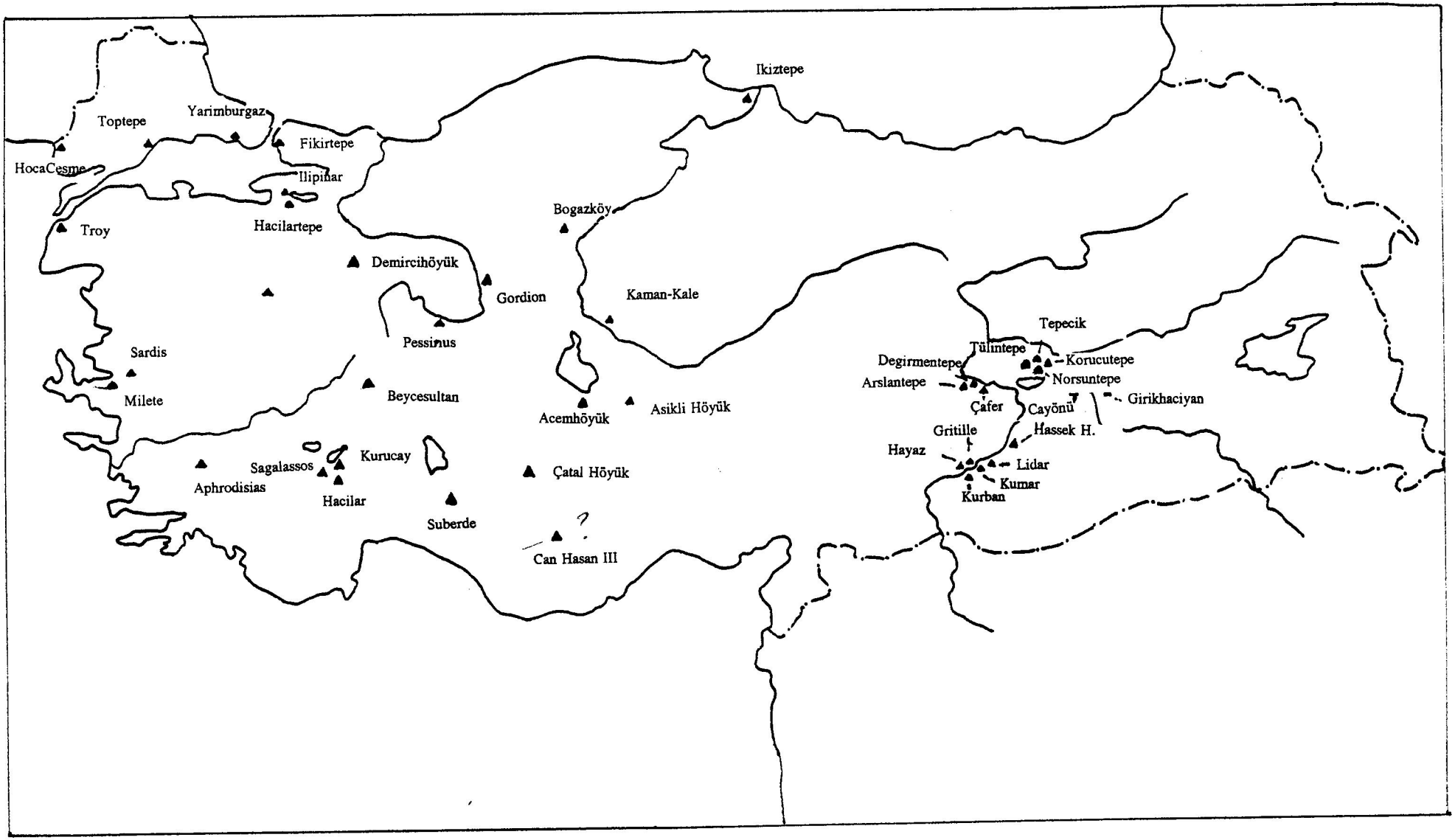
Ikiztepe
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Gordion
Kaman-Kale
Pessinus
Tepecik
Tülintepe
Korucutepe
Degirmentepe
Arslantepe
Norsuntepe
Sardis
Milete
Beycesultan
Çafer
Cayönü
Girikhaciyan
Acemhöyük
Asikli Höyük
Gritille
Hassek H.
Hayaz
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Aphrodisias
Hacilar
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Suberde
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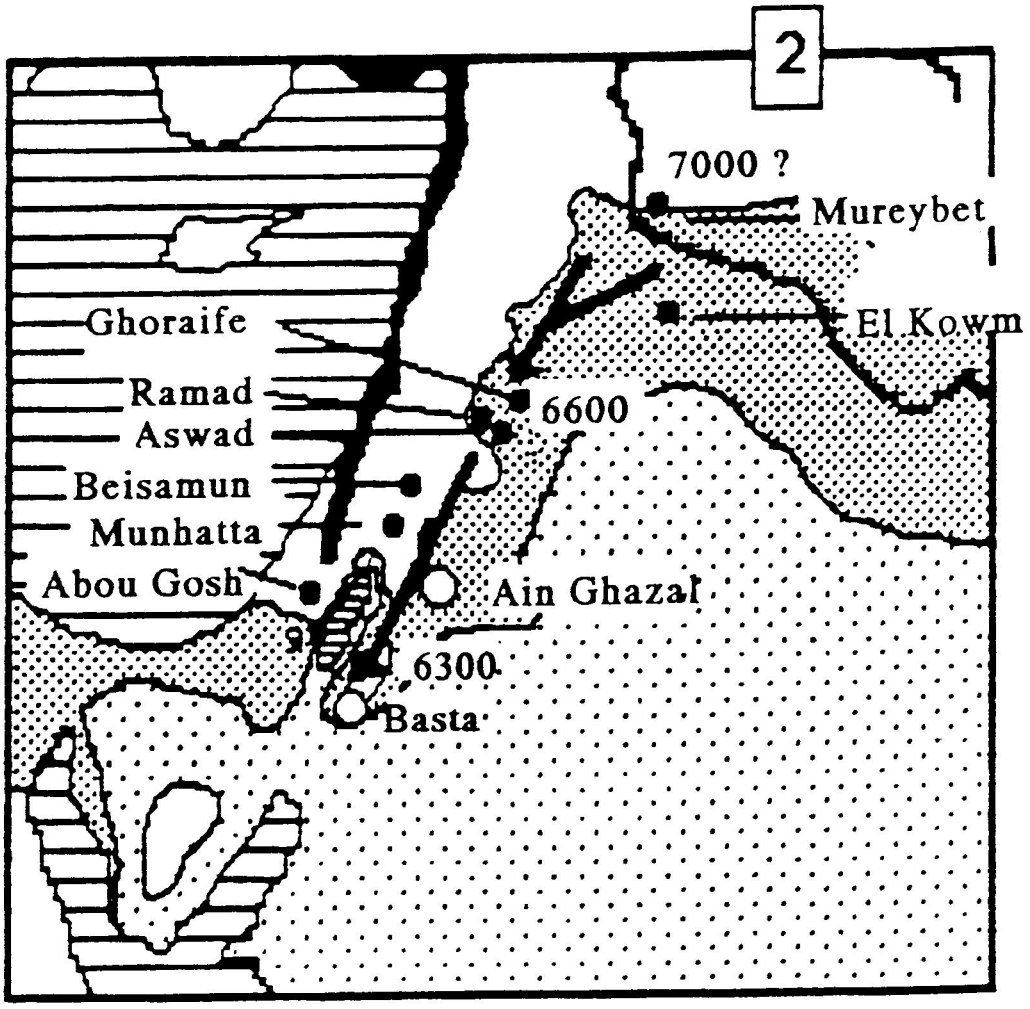
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Mureybet
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Ramad
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Beisamun
Munhatta
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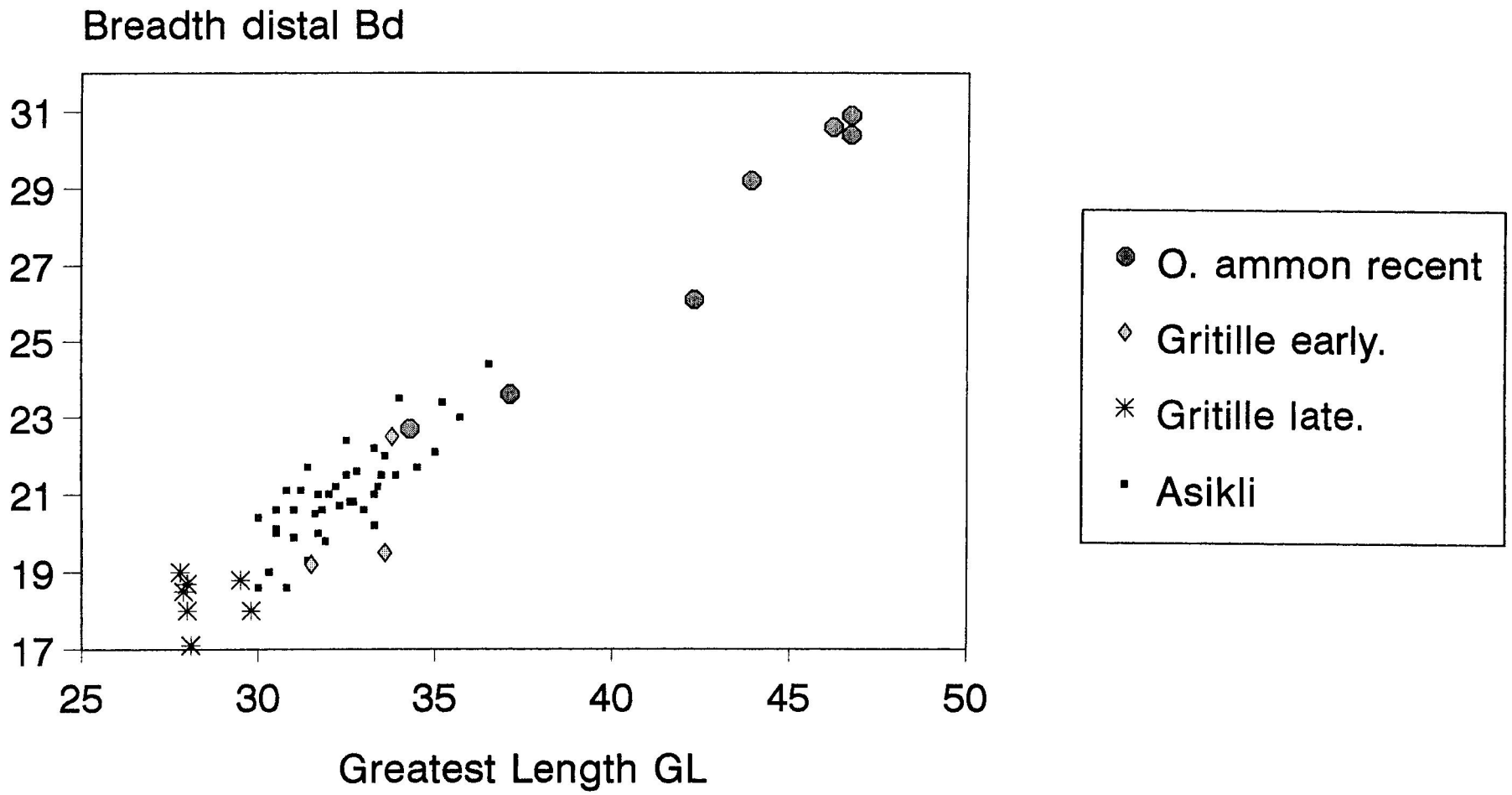
Basta

LATE TAURUS PPNB MAIN TAXA

Fig. 3.

Ovis spec.

Astragalus



List of species and their abundance

HAÇILAR (number of fragments)

	Early Chalcolithic	Late Neolithic	Aceramic Neolithic
Canis spec.	1	2	2
Sus scrofa	.	2	.
Cervus elaphus	37	3	.
Dama dama	.	.	1
Capreolus capreolus	.	1	.
Ovis musimon	1	6	.
Capra aegagrus	.	1	.
small ruminant	8	32	11
Bos spec.	7	51+	4
Lepus europaeus	1	.	1

ÇATAL HÖYÜK (number of specimen)

Layer	VI	X-XII
Bos	255	267
Ovis	89	20
Cervus	8	19
Equus	13	30

	Northwest Anatolia	West/South Anatolia	Central Anatolia	East/South Anatolia
Byzantine period 0 A.D. - later		Pessinus	Kaman-Kale	Gritille Hayaz
Iron Age/ Classical period first mill. B.C.	Troy	Sardis Milete Aphrodisias Gordion Yazilikaya Sagalassos	Kaman-Kale	
Bronze Age 3000 - 1000 B.C.	Troy	Gordion Beycesultan DemirciH.	Bogazköy Ikiztepe Acemhöyük	Hayaz H. Gritille Lidar H. Kurban H. Korucutepe Tepecik Norsuntepe Tülintepe Arslantepe
Chalcolithic 4500 - 3000 B.C.	Hacilartepe Yarimburgaz Toptepe Ilipinar			Hassek H. Degirmentepe Hayaz H.
Late Neolithic 6000 - 4500 B.C.	Fikirtepe Ilipinar HoçaCesme	Hacilar Kurucay Can Hasan III	Çatal Höyük	Girikhaciyan Kumartepe
Early Neolithic 8000 - 6000 B.C.		Suberde	Asikli H.	Hayaz H Gritille Cafer Cayönü

Preliminary list of abundance of species in the different sites

CAYÖNÜ (percentage of fragments)

	'Earlier'	'Uppermost'
Bos	14.8	2.2
Cervus	17.0	1.3
Caprinae	23.4	81.3
Sus	44.7	15.2

ÇAFER (number and percentage of fragments)

	N	%
Bos	99	14.8
Cervus	12	1.8
Dama	3	.
Ovis/Capra	326	48.9
Capreolus	7	.
Sus	202	30.3
Canis	5	.

Preliminary fauna list

ASIKLI HÖYÜK (number and percentage of fragments)

	N	%	
Canis spec.	1	.	
Vulpes vulpes	8	.	
Equus hemionus	166	0.9	
Sus scrofa	371	2.2	
Cervidae	60	0.3	
Dama spec.	17	—	
Cervus elaphus	9	—	
Capreolus capreolus	13	—	
Bos primigenius	1464	8.5	
Capra aegagrus	506	2.9	}
Ovis orientalis	2870	16.8	} 87.5
small ruminants	11610	67.8	}
rodentia	1	.	
Lepus europeaus	10	.	

RATIO OVIS : CAPRA

	EARLY		LATE
CAYÖNÜ	0.54 : 1		2.16 : 1
ÇAFER		0.17 : 1	
ASIKLI		5.91 : 1	
GRITILLE		1.16 : 1	2.89 : 1
HAYAZ			1.04 : 1