MORTALITY PROFILE ANALYSIS OF THE UNGULATE FAUNA FROM ÖKÜZİNİ: A PRELIMINARY RECONSTRUCTION OF SITE USE, SEASONALITY, AND MOBILITY PATTERNS

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INTRODUCTION

Current excavations of the Epipaleolithic deposits in Öküzini Cave have yielded a rich sample of animal bone (Yalçınkaya *et al.* 1995). From the recently excavated materials only a limited subsample of the archaeofaunal assemblage – that of the Main Profile, or Profile A area – has been thoroughly analyzed (Atici 1996; Gautier and Lopez-Bayon this volume; Yalçınkaya *et al.* 1995). Nonetheless, the high density of faunal remains in the Main Profile excavation units allows us to establish the most plausible reconstruction currently available of change in the use of Öküzini Cave as a mobile campsite over the course of the Epipaleolithic.

The ungulate dominated faunal assemblage from Öküzini is anthropogenic, comprised mainly of wild sheep (*Ovis orientalis*) and goat (*Capra aegagrus*) (Yalçinkaya *et al.* 1995; Atici 1996). It also includes significant quantities of fallow deer (*Dama dama*) (op. cit.). These probably combined to comprise the most abundant ungulate taxa within the catchment region around the cave. The common occurrence of wild sheep, goat, and deer in the Öküzini sample indicates that Epipaleolithic foragers typically hunted in the ecozones which still dominate the 10 kilometer radius of Öküzini and Karain: open grassland with shrubs and gallery forests; broken, rocky hill and mountainside with scrub vegetation; and high elevation pine forests. Other ungulate species identified, the remains of which are present in very small quantities, include roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), wild pig (*Sus scrofa*), and aurochs (*Bos primigenius*) (Atici 1996; Gautier *et al.*, this volume); the paucity of these animals in the Öküzini archaeofauna suggests that within the site catchment area, denser or more mature forest was rare, at least on the lower slopes of the Katran Dagi Mountains and the broad, rich plain in front of the cave. Small mammals and birds are present in the Öküzini assemblage but have not yet been extensively analyzed (Yalçınkaya *et al.* 1995).

The archaeological layers from within Öküzini Cave display traces typical of mobile Epipaleolithic hunter-gatherers. Previous excavations have not revealed architecture or storage pits, but the abundant hearth features and food refuse indicate that throughout Late Glacial times, the site was often reused, whether as a seasonal base camp, a short term residential camp or an overnight specialized activity station. Careful scrutiny of the ungulate bones recovered from the new Öküzini excavations can reveal more specific information about how Late Pleistocene foragers used the cave between circa 16,000 and 10,000 BP (uncalibrated radiocarbon years; cf. Hedges *et al.*, this volume; Yalçınkaya *et al.* 1995).

This chapter presents the age-at-death profiles derived from tooth eruption and wear patterns among the dominant ungulate prey taxa in the Öküzini archaeofaunal assemblage. These data are preliminary. As indicated above, they are based only on analysis of tooth specimens from the Main Profile units (I5d, J5c, J5d, K5c, K5d, L5c, and L5d) of the recent cave excavation.

From the outset, we stress our results may not bear strictly on Epipaleolithic patterns of seasonal mobility. Tooth eruption and wear data can also provide information about other cultural and social features, including the technology or organization of hunting, as well as incipient wild herd management practices. Seasonality information derived from juvenile ungulate teeth is typically accurate and precise for the portion of the year that includes the modal birth season and the few months that follow. Thus, the seasonality results must be evaluated in light of other available sources of archaeological information. We seek to understand the overall contribution of residential mobility, logistical mobility, technology, and the social organization of hunting and culling practices in shaping the seasonality and mortality profiles obtained from our tooth eruption and wear analyses. We discuss some of these aspects in this chapter. We also attempt to make the statistical bases of our conclusions transparent, so that the reader can evaluate the weight of our interpretations concerning shifts in the way that Epipaleolithic hunter-gatherers used Öküzini Cave.

THE FAUNAL SAMPLE AND ITS ARCHAEOLOGICAL CONTEXT

The Main Profile, or Profile A, consists of a 0.5 m by 3.5 m strip which served to clean and deepen the principal stratigraphic section exposed by prior excavators, including the initial, long-term work of Kökten (see Yalçınkaya *et al.* 1995). This strip was excavated from the post - Chalcolithic cave surface to a depth of over 3 m. The deepest exposed stratigraphic bed, Horizon XII, dates to the early Epipaleolithic, around 16,000 BP (Hedges *et al.*, this volume). Digging ceased at this level, which is near the depth of the present water table. The rich faunal assemblage was retrieved by wet-sieving the sediment from each 50 cm x 50 cm subsquare and 10 cm thick arbitrary level. We include in this study the ungulate mandibular tooth remains from Horizons II – XII. We have excluded the material from Horizon I and above. The Geological Horizon (GH) I sediments were deposited by very fast moving water, which mixed terminal Epipaleolithic with early Holocene cultural material (Goldberg and Bar-Yosef, this volume; Yalçınkaya *et al.* 1995).

In order to maximize the sample size of our stratigraphic units for the investigation of change over time, we have decided to follow the major shifts in the basic depositional regime in the cave, the intensity of human occupation, and the schemes of chipped stone technology and style. These three criteria suggest subdividing the Epipaleolithic deposits into an early component, consisting of Geological Horizons (GH) XII – VII; an intermediate layer, including GH VI-V; and a later component, comprised of GH IV - II. We acknowledge that by lumping the faunal material from GH XII-VII, we lose potential information about dynamic shifts in the use of Okuzini cave over several millennia following the Last Glacial Maximum. However, the currently available sample of ungulate dental remains from the lower horizons is so small, that we believe it is necessary to combine these stratigraphic units. In this way, we hope to offer a preliminary baseline for comparing the later phases of occupation with the earlier ones. We further emphasize that a prolonged hiatus in human use of the cave occurred during the deposition of the lower portion of GH VI. Consequently, the bulk of cultural material coming from our intermediate component actually belongs to the beginning of the intensive reoccupation of Öküzini after approximately 12,500 BP (uncalibrated 14C years).

These three groups of geological horizons exhibit distinct features of lithic technology and typology. A clear change in the dominant reduction strategy of bladelet cores occurs between GH VII and IV, with GH VI-V exhibiting some “transitional” features (Kartal, Léotard, and Kösem, this volume; Yalçınkaya *et al.* 1995). Associated with this development is an increasing frequency of geometric microliths from GH VII to the IV-II ensemble. We may have good *a priori* reason to suspect that mobility patterns altered in concert with a change in the strategies for raw material acquisition and tool blank production, as well as the preferences for particular microlith types. This may also have been linked to climatic change indicated with the increase in colluvial sediment deposition in GH VI-V times (Goldberg and Bar-Yosef, this volume; Yalçınkaya *et al.* 1995).

Our sample for seasonality analysis consists of 194 mandible fragments or isolated mandibular teeth. The NISP values for this ungulate dental sample are presented in table 2a. The taxa included in our analysis fallow deer (*Dama dama)* as well as wild sheep (*Ovis orientalis*) and goat (*Capra aegagrus*). We have excluded wild pig (*Sus scrofa*) and red deer (*Cervus elaphus*) from the seasonality analysis because these species combined are represented by combined 3 mandibular tooth specimens for the entire Main Profile. Preliminary analyses of the postcranial sample from the Main Profile reveal similarly low abundance for these animals (Atici 1996; Gautier *et al.* this volume). No other ungulate taxon has been identified in the Main Profile tooth sample.

METHODS OF DATA RECORDING FOR MORTALITY PROFILE ANALYSIS

By analyzing the eruption and wear patterns of ungulate teeth from the Main Profile, we seek to estimate the age at death of the animal represented. Before the state of wear was recorded, each dP_4, P_4, and lower molar tooth, whether in articulation in the mandible or isolated, was cleaned, labeled, identified to taxon and sided. This yielded counts of the minimum number of individuals (MNI) based on the total number of identifiable specimens (NISP) of mandibular cheek teeth for Main Profile GH XII-II at Öküzini. In most cases it is impossible to distinguish between the teeth of sheep and goat (Payne 1985), so our taxonomic assignment was frequently limited to “*Ovis/Capra*.” Sheep and goat were identified to the specific level (*Ovis orientalis* vs. *Capra aegagrus*) following the criteria defined by Payne (1985), who describes morphological distinctions present in dP_3, dP_4, M_1, and M_3 specimens which are either unworn or only just into wear. In practice, the crown morphology of the deciduous teeth discriminates most clearly between *Ovis* and *Capra,* and we restrict our specific identifications to these identifiable elements. It is important to complement the *Ovis* and *Capra* identifications based on teeth with those from other cranial and postcranial elements, because the non-dental diagnostic elements allow specific identification among older juveniles and adults (cf. Boessneck 1970; Hole *et al.* 1969; Payne 1969; Perkins 1964; Redding 1981). Our ratio of sheep to goat is necessarily that of the young juvenile portion of the sample, and therefore, our analysis of teeth only offers one limited perspective on the subsistence role of sheep versus goat as prey in the coastal Anatolian Epipaleolithic. Concerning the cervids, some of the juvenile teeth in our sample may fall into the upper size range for roe deer (*Capreolus capreolus*), but we have not identified any adult specimens of this species among the tooth sample. It is possible that roe deer newborns were occasionally hunted, trapped or even collected [Guy Bar-Oz, personal communication] by the occupants of Öküzini. We consider it more likely that the entire cervid sample can be assigned to *Dama dama*. Both species of deer would have mainly inhabited the upland forest, exhibiting similar agile escape behavior, dispersed small group sizes, and a mid-to-late spring birth season (today, late April through mid-May in the mountains around Öküzini). The significantly smaller body size of roe deer would have been the principal distinction concerning the mobile foragers who utilized Öküzini. The taxonomic assignments were made through comparison with published drawings and descriptions (Hillson 1986; Payne 1985) and comparative material collected by the first author or housed at the Museum of Zoology at Tel Aviv University.

The occlusial wear pattern of each relevant tooth was drawn according to the conventions established by Payne (1973). These standards involve simple representations of the enamel crests, enamel infundibula, and exposed dentine on the occlusial surface of the tooth.

Payne (op. cit.) defined these conventions for the distal-most four lower teeth of sheep and goat, but they work equally well for the dP_4 and the molars of cervids. It is only the permanent cervid P_4 that exhibits too much complexity in its cusp morphology and sequence of wear to be easily recorded using the Payne drawing conventions. Consequently, we seriated the adult cervid sample according to the pertinent M_3 Payne stage, while the juvenile cervids could be aged according to that of the dP_4. It would be ideal to age the adults by the tooth that replaces the dP_4. Still, the eruption time of the M_3 is quite close to that of the P_4 in most ungulate species, and thus, it is accurate – if not tightly precise – to employ the dP_4 and M_3 to produce mortality profiles for the *Dama dama* samples from Öküzini. Despite the decrease in precision in discriminating between the juvenile and prime adult cervids, we will still be able to identify significant changes in the proportions of the major age categories, from the early to the later portions of the Epipaleolithic at Öküzini.

The conventional Payne stages for sheep and goat yield a complete sequence of age/wear categories for the dP_4 and the P_4 of these wild specimens in the Öküzini assemblage. Here, the distribution of wear stages in the ovicaprine M_3 sample provides an independent check on the adult wear/age distribution based on the P_4 eruption and wear data. Utilizing the more detailed data published in Deniz and Payne (1982), we have seriated the sheep and goat sample by grouping sets of sequential Payne stages into broader tooth wear phases. This decreases the precision of our determination of the grade of occlusial wear. However, it appears to increase the population-level correlation between wear and actual age (table 1). We note that in collapsing the number of Payne stages into our broader wear phases, we largely obviate the need to discriminate between levels of eruption for isolated *unworn* teeth whose crowns have completely formed and whose roots are well into formation (cf. Grant 1982). We can essentially treat isolated and articulated unworn teeth alike, because eruption occurs quickly, even relative to the briefest juvenile wear phase we have established (table 1). Our wear/age phases can then be presented as a detailed frequency distribution for the *Ovis/Capra* samples for each stratigraphic phase.

No such detailed comparative data exist for fallow or roe deer. Consequently, we can only seriate the cervid dP_4's by their individual Payne stages. Twelve wear stages are defined (Payne 1973), but it is simply unknown how much variability exists within or between cervid populations in the correlation between a given attrition stage and actual age. Given our relatively small sample of cervid specimens from Öküzini, we may miss a true seasonal mode; in our analysis, it might be diluted across 3 or 4 wear stages. However, if we do find a sharp, statistically significant mode in the distribution of wear stages, it will represent a conservative indication of a true mode in the underlying age distribution. Such a restricted range of ages within the juvenile sample could only occur through tight seasonality of hunting activity.

For the investigation of seasonality, we are primarily interested in the detailed wear/age profiles of juvenile animals, but the overall mortality pattern may offer relevant information concerning general patterns of site use. In this study, we largely follow the approach developed by Stiner (1990, 1994) in presenting the total mortality profile in a simplified form. She divides the life history of ungulate prey taxa into juvenile, prime, and old adult. These major stages of development and aging are often of direct interest to traditional subsistence hunters, who may maintain very specific criteria for selecting their prey, whether the focus is body size, group size, or ease of capture. Regardless of the selectivity of a past hunting tradition, these life-stage categories help the archaeologist to understand the predominant hunting and butchery patterns that prevailed (Stiner op. cit.). We suggest that subsistence hunters might be interested in an additional distinct age class among wild ungulate prey – that of older juveniles and very young adults. We expect the males of this age class to exhibit distinct aggregation behavior. In fact, sub-adult and young adult males forming bachelor groups may become relatively abundant during a certain portion of the year – probably during mid-summer through autumn, as younger juvenile mortality rates increase. The overall frequency of males of this age class in the Öküzini assemblage will depend not only on the season of occupation but also on the frequency of hunting forays, their size and organization, and the technology involved. Unfortunately, we cannot offer sex ratios for each age class in this paper, but future analysis of sexually dimorphic cranial and postcranial elements will help to clarify the significance of the abundance of older juveniles and young adults indicated by the teeth.

We define the four major age classes as follows. For *Ovis* and *Capra*, juveniles are indicated by our dP_4-P_4 wear phases 1-5; older juveniles and young adults by dP_4-P_4 phases 6-7 and M_3 phase 1; prime adults by dP_4-P_4 wear phases 8-9 and M_3 phases 2-4; and old adults by dP_4-P_4 phase 10 and M_3 phase 5 (see table 1). For *Dama dama*/*Capreolus capreolus*, juveniles are defined by the not-yet-shed dP_4; young adults by M_3 phase 1; prime adults by M_3 phases 2-4; and old adults by M_3 phase 5.

RESULTS

The results of all analyses outlined in the previous section are presented in tables 2-3 and in figure 1. These data summaries bear on our investigation of residential mobility and hunting activity during the Epipaleolithic occupation of Öküzini. The data include relative taxonomic representation of fallow deer, sheep, and goat; the overall mortality profiles for these taxa in the early and late phases; and the frequency distribution of tooth wear phases for each of the major ungulate taxa in each of the three main stratigraphic phases we have defined. The dental NISP and MNI counts for each of the main ungulate taxa are presented in table 2. The mortality profiles – subdivided by major life stages – are summarized in tables 3a (fallow deer) and 3b (ovicaprines). Unfortunately, *Ovis orientalis* and *Capra aegagrus* specimens must be combined into one sample, because the teeth identifiable to genus are restricted the dP_3 and dP_4. Detailed mortality profiles for the ovicaprines – based on the dP_4 and P_4 samples – are shown in figure 1. We do not present detailed results for the ovicaprine M_3 assemblage, because this tooth offers less precise estimates of age at death than does the P_4, even for young and prime adult. The M_3 wear phase profiles for the Öküzini ovicaprines are completely consistent with those derived from the P_4 data. We also do not present detailed mortality profiles derived from the Main profile sample of *Dama dama* dP_4's and M_3's. We have sparse comparative information concerning the precision and accuracy of the *Dama dama* M_3 as an estimator of age at death among adults; in addition, *all* 8 fallow deer dP_4's recovered from the entire Main Profile excavation exhibit light wear on the mesial cusps of the teeth, unambiguously revealing a set of neonate fawns (< 2 months of age at death).

DISCUSSION: A RECONSTRUCTION OF THE CHANGING USE OF ÖKÜZİNİ DURING THE EPIPALEOLITHIC

Although this discussion must be considered provisional – due the restricted sample on which it is based – we identify a most likely interpretation of the taxonomic abundance and mortality profile data presented in this paper. We argue for our reconstruction through supplemental data concerning the changing frequencies of ungulate body parts over the course of the Öküzini Epipaleolithic sequence.

The core of our paper is the mortality profiles generated from the Main Profile tooth sample (table 3 and figure 1). These distributions strongly suggest spring and early summer hunting activity throughout the Epipaleolithic occupation of Öküzini. The fallow deer and the ovicaprine data are consistent. As indicated above, the current modal fawning period of the fallow deer population in the Katran Mountains surrounding Öküzini occurs around the beginning of May. All of the juvenile tooth specimens preserved in the Main Profile assemblage are those of neonates. These include 2 specimens from GH XII-VII and 6 from GH IV-II. The detailed mortality profiles among the juvenile ovicaprines (figure 1) exhibit a strong mode at wear phases 2-4 throughout the Main Profile sequence.

What does this mode mean with respect to the seasonality of hunting activity? Following a range of studies of domestic sheep and goat from throughout the Mediterranean and Western Asia (summarized in Redding 1981) and a report on surviving goat populations in Central Asia (Schaller 1977), we would expect most lambs to be born during early spring (March through May) and most kids to be born between winter and early spring (January through March). However, observations of extant wild sheep and goats in Anatolia and other portions of Western Asia indicate a modal birth season of March through May (Altuna 1991; Gautier 1998; Helmer 1984). We take this late winter-spring period as the most likely birth season for Late Glacial ovicaprines in Anatolia.

We also expect the preponderance of lambs and kids exhibiting wear phases 2-4 (see table 1) to have died between 1 and 8 months of age. This prediction is conservatively wide. The median age of a large sample of "wear-phase-4" angora goats assessed by Deniz and Payne (1982) falls at 4.5 months. Thus, assuming similar rates of crown attrition for young juvenile wild sheep and goat, some of the teeth showing wear phases 2-4 could have been taken either in later winter or in autumn; yet, late spring through summer brackets the most typical season of death for ovicaprine juveniles in the Öküzini Epipaleolithic sample. The few neonate (phase 1) or yearling (phase 5) ovicaprine teeth could either represent spring-summer kills with unusual wear patterns or they could actually indicate occasional hunting activity during late winter or springtime. While Öküzini could have been sporadically used as a mobile campsite in other seasons, we have found strong evidence that throughout the Epipaleolithic sequence, young sheep and goat were hunted and then butchered and consumed during late spring and summer at Öküzini Cave. Hunting of juvenile fallow deer also took place during late spring or early summer, although we have no neonate *Dama dama* tooth remains from GH VI-V (ca. 12,500 b.p.) (table 3a).

The Main Profile tooth data, then, provide direct evidence for late spring to early autumn hunting of juvenile ovicaprines and fallow deer. It is difficult to establish that the seasonality of the juvenile ungulate assemblage reflects the full range of seasonality of occupation of the site. Still, the extreme rarity of ovicaprine dP_4's exhibiting phase 1 wear suggests that Epipaleolithic foragers did not utilize Öküzini during and right after the peak birth season. Newborn kids and lambs would have been relatively abundant and easy to take during late winter and spring.

The fact that only slightly older and larger juveniles at wear phase 2 were commonly hunted during all periods suggests that the occupants of Öküzini did not selectively decide to target or transport their prey based on body size. Moreover, neonate fallow deer mandibles with incompletely formed deciduous teeth have survived intact in the Main Profile deposits. It is therefore unlikely that newborn lambs and kids were commonly hunted but their skeletal remains subsequently destroyed after archaeological deposition.

Returning to the topic of seasonality, it is more challenging to rule out autumn-winter occupation at Öküzini. Because of the modal late-winter to spring birth season for wild ovicaprines in Anatolia, the age category of 8-month-old to yearling (wear phase 5) would proably represent uncommonly encountered prey during the late spring-autumn period of occupation at Öküzini (roughly June through October). However, mortality in the first year of life can be as high as 60% in some domesticated goat populations, and it is typically about 30% in domesticated sheep and 45% in domesticated goat breeds (Redding 1981:115). Natural mortality might adequately account the low frequency of wear phase 5 teeth in the Main Profile assemblage; even if they occupied the cave during late autumn and winter, Epipaleolithic hunters might not have had much opportunity to take ovicaprines of this 8-month-to-yearling age class. Considering the Main Profile assemblage in its entirety, we cannot currently rule out late autumn and winter episodes of residential and foraging activity at Öküzini Cave.

Each of the three stratigraphic components does show subtle differences in the details of the ovicaprine mortality distribution (figure 1 and table 3a). They show tantalizing shifts in their fallow deer age-at-death distributions, although the cervid sample size is particularly small. We can further identify significant temporal trends in taxonomic abundance, as well as well as butchery and carcass part transport practices. These different patterns of change through time provide multiple lines of evidence suggesting a particular history of shifting site use. To begin with, the data from GH XII-VII – representing the period 16,000-13,000 BP (uncalibrated 14C years) – suggest that Öküzini primarily served as a short-term residential camp site. For both the ovicaprine sample and the limited fallow deer assemblage from GH XII-VII, the mortality profile is dominated by older sub-adults and prime adults (table 3b). This indicates that the mobile Epipaleolithic foragers occupying Öküzini during this time period preferred to target the largest available animals. They did occasionally target juveniles, but they preferentially hunted prime adults (which occur at a greater than random frequency; cf. Klein and Cruz-Uribe 1984; Stiner 1990). The adult:fawn ratio in GH XII-VII is similar for fallow deer, although this might be a coincidence of small sample size. In light of our hypothesis that Öküzini was typically used as a short term camp site during this early period of the Epipaleolithic, the low abundance of *Dama dama* tooth specimens relative to the ovicaprine count (table 2) is consistent with our provisional expectation that ovicaprines were the most abundant ungulates in the immediate vicinity of the site. Finally, the relatively high ratio of head to limb fragments for all ungulates in the GH XII-VII assemblage (reported in Atici [1996] and illustrated in figure 2) fits with the hypothesis that foragers did not regularly transport food resources obtained more than a few kilometers from the site; there is no significant suggestion of relatively biased transport of meat-and-marrow-rich limb parts (see figure 2). Thus, we argue that the best preliminary reconstruction of the typical occupation of Öküzini Cave during the early portion of the Epipaleolithic is one in which the length of stay was limited to a few weeks during spring or summer.

It appears that following the hiatus in the cultural sequence represented in the basal portion of GH VI, foragers resumed utilizing the cave as a short term camp. It is somewhat difficult to interpret distinct features of the mortality pattern and taxonomic abundance data for GH VI-V, because some of these characteristics may again be anomalies of small sample size. The most robust pattern is the increase in the frequency of juveniles hunted relative to sub-adults and prime adults (table 3b). If we take the distribution of ovicaprine life stage classes in GH XII-VII as our expected frequency, then the resulting G-test statistic yields only a probability $p = 0.08$ that the GH VI-V mortality pattern was sampled from the same distribution. While this statistical result does not fall below the standard significance level ($p \leq 0.5$), we contend that the apparent increase in hunting of juveniles may be part of a broader late Epipaleolithic trend associated with decreasing mobility (Davis 1983; Stiner *et al.* 1999; Stiner *et al.* 2000). We propose that the use of the cave during GH VI-V times was more frequent and perhaps more lengthy than in the earlier Epipaleolithic. However, the low percentage of fallow deer in the GH VI-V assemblage might indicate that foragers did not regularly use Öküzini as a seasonal *base camp*; we do not yet have any indication that they relied on ungulate prey more commonly found in the upland forest, several kilometers away (table 2a and 2 b). This suggestion is consistent with the relatively high ratio of head:limb fragments (fig. 2), which reflects frequent transport of whole carcasses back to the cave.

The phase of deposition of GH VI-V was relatively brief, and the immediately succeeding GH IV-II ensemble offers evidence that the trajectory of increasing sedentism continued into the later Epipaleolithic at Öküzini. The predominance of juvenile sheep and goat is even more striking than in GH VI-V (table 2), with an intriguing near-disappearance of older juveniles and young adults from the sample. There is a highly statistically significant increase in the frequency of fallow deer teeth in the GH IV-II sample, and nearly half of the *Dama* specimens are those of neonates. Finally, the ratio of cranial fragments to skull fragments drops markedly when compared to the lower stratigraphic components (figure 2; Atici 1996). These data combine to indicate a regular use of Öküzini as a summer base camp between 12,500 and 11,000 BP (uncalibrated 14C years). We might imagine the length of residence often extending for several months, as hunting parties would have had to be less discriminating in selecting ovicaprine prey based on body size. They would also have made longer distance forays to hunt fallow deer. Moreover, traveling a greater distance from the kill site, they would have more frequently only brought the nutritionally rich limb elements back to the cave, reducing the overall head:limb ratio in the archaeological record.

CONCLUSION

The mortality profile data presented in this chapter indicates that Öküzini was most often used as a spring and summer camp site by Epipaleolithic foragers. The seasonality pattern remained quite constant over time, but the nature of the typical visit changed over the millennia. Essentially, the length of stay gradually increased, probably from days or weeks to months, with the most extensive occupations suggested for geological horizons IV-II.

These results reveal the exciting potential of the Öküzini archaeofauna to expand our understanding of the Epipaleolithic human utilization of sheep and goat at the margins of the Fertile Crescent. We have not suggested that the increasing abundance of juvenile ovicaprines in the upper horizons of the Main Profile relates to incipient herd management practices (cf. Zeder and Hesse [2000] for a recent discussion of ovicaprine domestication in the Near East). Juveniles from wild populations may be hunted frequently as a consequence of reduced residential mobility among hunter-gatherers. Davis has documented a similar rise in the abundance of wild juvenile mountain gazelle over the course of the Epipaleolithic in the Southern Levant (1983). Our results place the emphasis on continuing the analysis of the Öküzini and Karain B samples. Detailed juvenile and adult sex ratios, juvenile mortality profiles, and more accurate taxonomic identifications can be recovered from post-cranial sheep-goat remains. These data will help us to evaluate the preliminary reconstruction of mobility, site use, and hunting activity presented in this chapter. If our hypotheses hold, such further analysis would also help to resolve how and why foragers Katran Dagi Mountain region became more sedentary through the Epipaleolithic. Ultimately, this will offer us a better understanding of the cultural, social, and economic changes occurring at the end of the Pleistocene in Western Asia as a whole.

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dP_4/P_4 Wear Phase	Payne Stage	Life Stage	Median Age (Months or Years)	Range (Months or Years)
1	dP_4 0-1	Juvenile	n.a.	Neonate
2	dP_4 2-4	Juvenile	n.a.	< 2 mo.
3	dP_4 5	Juvenile	2.5 mo.	1-5 mo.
4	dP_4 6-7	Juvenile	4.5 mo.	2 mo. to 1 yr. 3.5 mo.
5	dP_4 8	Juvenile	1 yr. 3 mo.	5 mo. to 1 yr. 9 mo.
6	dP_4 9-12/P_4 E	Older Juv.	1 yr. 4.5 mo.	9 mo. to 2 yr.
7	P_4 1-5	Young Adult	2 yr.	1 yr. 4 mo. to 2 yr. 2 mo.
8	P_4 6-7	Prime	2.5 yr.	2 yr. 2 mo. to 3 yr. 4 mo.
9	P_4 8	Prime	4 yr.	2 yr. 6 mo. to 4 yr. 6 mo.
10	P_4 9-10	Old	5 yr. 9 mo.	4 yr. to 8 yr.

a)

M_3 Wear Phase	Payne Stage	Life Stage	Median Age (Months or Years)	Range (Months or Years)
1	M_3 1-2	Young Adult	2 yr.	1 yr. 10 mo. to 2 yr. 10 mo.
2	M_3 3-4	Prime	3 yr.	2 yr. 2.5 mo. to 4 yr.
3	M_3 5-8	Prime	3 yr. 4.5 mo.	2 yr. 6 mo. to 6 yr.
4	M_3 9-10	Prime	4 yr. 6 mo.	3 yr. 6 mo. to 7 year
5	M_3 >10	Old	n.a.	>6 yr. 6 mo.

b)

Table 1. Occlusal wear phases defined for sheep and goat dP_4's, P_4's, and M_3's (based on data from Deniz and Paine 1982).

Strat. Unit	*Dama*	*Ovis/Capra*	*Ovis*	*Capra*	**TOTAL**
IV-II	18	26	3	3	**50**
VI-V	6	53	9	0	**68**
XII-VII	8	62	6	2	**78**

a)

Strat. Unit	*Dama*	*Ovis/Capra*	*Ovis*	*Capra*	**TOTAL**
IV-II	7	6	2	2	**17**
VI-V	4	17	5	0	**26**
XII-VII	3	18	3	2	**26**

b)

Table 2. (a) NISP and (b) MNI values for the main ungulate taxa in the early, intermediate, and late phases of theÖküzini Epipaleolithic. Data are based on all identifiable isolated teeth and mandible fragments with teeth from the Main Profile.

Stratigraphic Unit	**Juvenile**	**Old juvenile/ Young Adult**	**Prime Adult**	**Old Adult**
IV-II	6	0	7	0
VI-V	0	1	5	0
XII-VII	2	0	4	0

a)

Stratigraphic Unit	**Juvenile**	**Old Juvenile/ Young Adult**	**Prime Adult**	**Old Adult**
IV-II	9	1	6	1
VI-V	17	6	10	0
XII-VII	12	10	16	0

b)

Table 3. Overall age-at-death distributions for the Öküzini Main Profile ungulate fauna for the early, intermediate, and late Epipaleolithic phases: (a) *Dama dama* and (b) *Ovis* + *Capra* mortality profiles. The data are absolute numbers of tooth specimens falling into each life stage category. This is based on the Payne wear stage exhibited by identifiable dP$_4$’s and M$_3$’s in the case of (a) *Dama dama* and dP$_4$’s and P$_4$’s in the case of (b) *Ovis* + *Capra.*

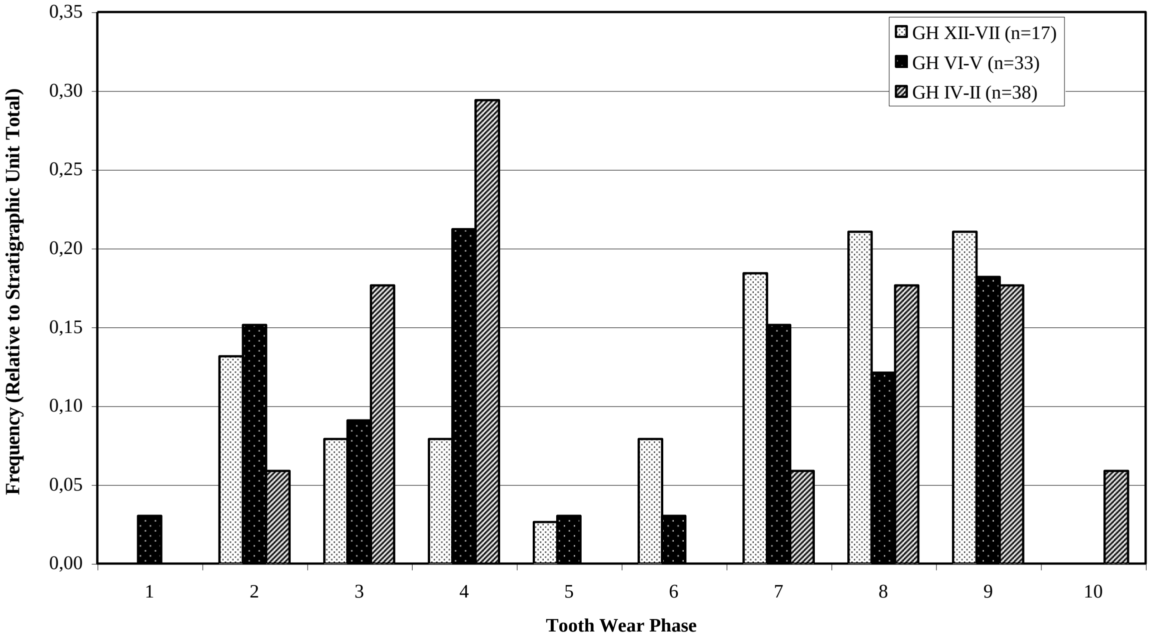

Figure 1. Detailed ovicaprine mortality profiles from the Main Profile sample. The mortality profiles are derived from tooth wear phases of identifiable dP4 and P4 samples from each of the three stratigraphic ensembles. The reader should note that we have much more detailed age-at-death information about the juvenile life stages than for the adult ones.

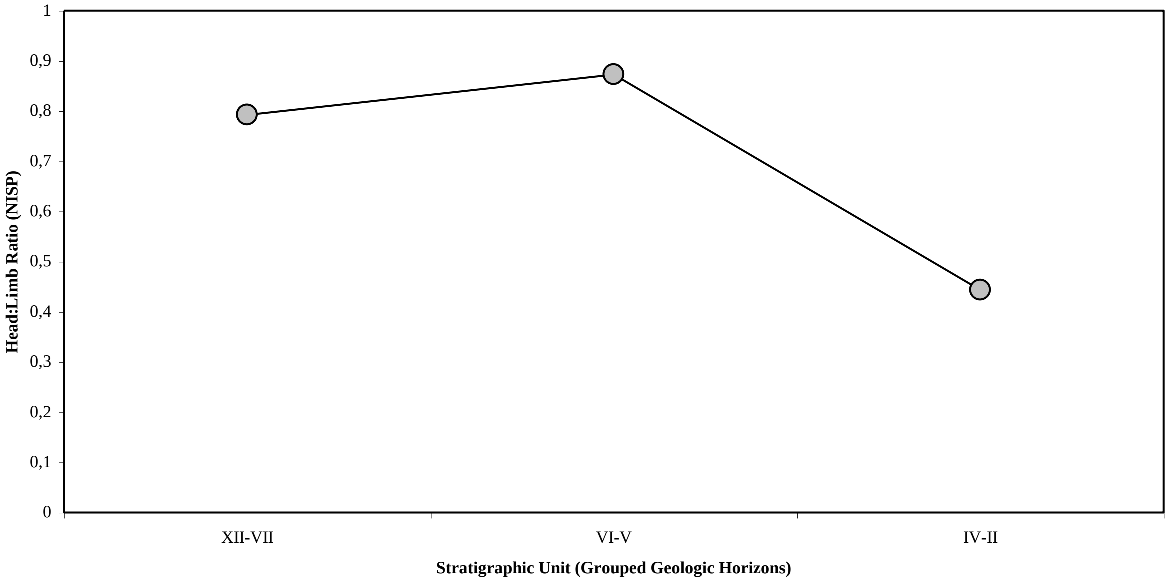

Figure 2. Ratio of head:limb parts in the three major stratigraphic subdivisions of the Main Profile Epipaleolithic units at Öküzini. Data based on the total number of identifiable specimens for *Ovis*, *Capra*, and *Dama*, as reported in Atiçi 1996. For GH XII-VII, NISP=1552; for GH VI-V, NISP=990; and for GH IV-II, NISP=1379.