
Equid Prey Acquisition and Archaic *Homo* Adaptability at the Early Late Pleistocene Site of Xujiayao, China

JINGSHU LI^a, HENRY T. BUNN^b, SHUANGQUAN ZHANG^a AND XING GAO^{a*}

^a Key Laboratory of Vertebrate Evolution and Human Origins, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, 142 Xizhimenwai street, Beijing 100044, China

^b University of Wisconsin-Madison, Department of Anthropology, 1180 Observatory Drive, Madison, WI53706, United States

*Correspondence to: Xing Gao, 142 Xizhimenwai Street, Beijing, China, 100044
Tel. (8610) 88369258; Fax: (8610) 68337001; email: gaoxing@ivpp.ac.cn

Abstract: Besides active hunting by hominins, there are two methods of scavenging that can provide primary access to intact ungulate carcasses: first-access scavenging from non-predator-related accidents and early-access aggressive scavenging from carnivore kills. Patterns in mortality profiles of prey animals at archaeological sites provide evidence of prey acquisition strategies, which is an important factor in reconstructing hominin adaptability. The Xujiayao site is an early Late Pleistocene site in the Nihewan Basin, China. Its faunal assemblage is dominated by *Equus przewalskii* and *Equus hemionus*. Evidence from previous taphonomic analysis has implied that Archaic *Homo* was the dominant taphonomic agent in the accumulation of the animal remains. This research applies mortality profile analysis to determine a follow-up question: how were the equid carcasses acquired? The results of this study indicate that Archaic *Homo* at Xujiayao probably used both active hunting and scavenging to acquire equids in the early period (lower cultural layer), but mainly used active hunting in the later period (upper cultural layer) due to the fact that the climate changed to much colder conditions in the later period. This research provides new information on the subsistence adaptations of Archaic *Homo* in northern latitudinal climates of China in the early Late Pleistocene.

Keywords: Paleolithic; Xujiayao site; Equid; Mortality profile analysis; Taphonomy; Zooarchaeology

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Introduction

During the early Late Pleistocene of northeast Asia, the last glacial period created a new suite of challenges for Archaic *Homo sapiens*. One adaptive strategy for surviving successfully in the severe cold climate in more northerly latitudes involves securing a regular source of animal fat and protein (McBrearty & Brooks, 2000). How did archaic hominins who lived in the early Late Pleistocene in the western Nihewan Basin, north China, acquire animal resources? What were the subsistence adaptations to the cold climate? Solving these questions will advance research on the adaptations of Archaic *Homo sapiens*.

Bunn & Gurtov (2014) considered three broad ways to get early access to animal resources. Besides active hunting by hominins, there is first-access scavenging from non-predator-related accidents, as well as early-access, aggressive scavenging from carnivore kills. Mortality profile analysis can distinguish among the three broad methods of carcass acquisition outlined above, because the methods can be viewed as testable hypotheses, each of which is linked to specific mortality predictions. If prey were acquired by first-access scavenging of animals that died from causes other than predation, such as disease, malnutrition, or accidents like a flood which might confer survival advantage to some individuals, they should yield an attritional mortality pattern with abundant, vulnerable young juveniles and old adults. Scavenging from felid kills should not be significantly different from what felids are known to kill. However, mortality profiles by active hominin hunting are more challenging to predict. Ambush hunting, if selective and efficient, should yield an abundance of the nutritionally most attractive prime adults; non-selective ambush hunting should yield a living-structure mortality profile (Bunn & Gurtov, 2014).

Xujiayao site (40°06'028"N; 113°58'414"E; c. 970m above sea level; Figure 1) is an ideal site to determine hominin meat-acquisition strategies because it is an early Late Pleistocene (Chen *et al.*, 1982) open-air site with abundant artifacts, *Homo* and animal remains, as well as the first identified horse-kill site in the Pleistocene of China (Jia & Wei, 1976; Jia *et al.*, 1979; Norton & Gao, 2008). Moreover, the deposit consists of two cultural layers formed under different climatic conditions. The climate of the lower layer was warm and humid, and the upper layer was cold and dry (Li & Ma, 2014; Mu *et al.*, 2015). In this study, statistical methods and triangular graphs are used to compare various mortality profiles from different

contexts in order to test the above hypotheses and to determine the equid acquisition strategies in different cultural layers of the Xujiayao site. Finally, Seasonal phenomena, age classes, hunting techniques, and topographic situation are all considered in reconstructing events in an ecological context at Xujiayao.

Materials and methods

Xujiayao was discovered in 1974, and the site has since been excavated on more than five occasions. It consists of two localities-- Locality 74113 and Locality 74093 (Figure 2). Most of the specimens were uncovered from Locality 74093, which is situated in lacustrine deposits and at a depth of 8—12 meters below the present-day surface and forms the foundation of this study (Jia & Wei, 1976; Jia *et al.*, 1979). According to the erosional surface and the difference between the clay layers, the cultural material can be divided into two layers: the upper layer and the lower layer (Figure 2). In the north of Locality 74093, the upper layer consists of black silt clay, whose thickness is 3.15 meters; the lower layer consists of light red-brown silt clay, whose thickness is 2.36 meters(Wei & Wu, 2012). According to the study of grain size, magnetic susceptibility, stable carbon, oxygen isotopes, and total organic carbon, the climate of the lower layer was warm and humid, while the upper layer was stably cold and dry (Li & Ma, 2014).

The results of research on the teeth, mandibular ramus, and neurocranium of hominins from Xujiayao indicate that the taxonomic status of Xujiayao Archaic *Homo* is unclear with regard to other contemporary populations such as *H. sapiens* and *H. neanderthalensis*, and it probably represents a primitive hominin lineage (Wu *et al.*, 2013; Xing *et al.*, 2015). A great many spheroids have also been excavated from Xujiayao, but their function has not been identified (Li, 1994; Yi *et al.*, 2012).

Samples from the Xujiayao site

The faunal assemblage recovered from Xujiayao includes 21 taxa and is dominated by equid remains (including *Equus przewalskii* and *Equus hemionus*) (Jia *et al.*, 1979). Taphonomic analyses show that Xujiayao hominins had primary access to high utility long bones, which confirmed the behavioral correlation between the equids and the hominins (Norton & Gao, 2008). A rough calculation by previous researchers of the more than 4,300 equid cheek teeth uncovered at the site suggested that the teeth represent at least 213 individuals, and most of them are old adult equids (Wei, 1982; Wei, 2004). After a reclassification according to anatomical position, we conclude that the MNI (the minimum number of individual animals) of equids is 234; the NISP (the number of identified specimens per taxon) of equids is 4775 (Table 1). In this study, all *Equus przewalskii* and *Equus hemionus* teeth were integrated into one equid group because their morphology and ecological niche are similar (Feh *et al.*, 2001). Equid left lower teeth, being most abundant, were used in the reconstruction of the mortality profiles. Equid canines can be used to reflect sex, which in female equids are much smaller or even unerupted compared to male equids (Getty, 1975). However, according to our observation, there are only 31 individuals represented by canines, and one third of them are from the upper layer. It is a small, 15% sample, relative to 234 individuals based on cheek teeth, from which it is hard to get the exact ratio of the whole population of different cultural layers. That's why we will not include them in the study.

Comparative Sample from a European Archaeological site

The Bau de l'Aubesier is one of the richest European sites dominated by equids (Fernandez *et al.*, 2006; Fernandez & Legendre, 2003). The age of the lower layers (Level G to N) is between the Middle Pleistocene (OIS 6-7) and the Eemian interglacial (OIS 5e). Similar to Archaic *Homo* at Xujiayao, Neanderthals at BDA were also faced with the challenge of cold climate. The age-at-death data have been compared with a series of data from different contexts via a combined analysis of frequency, survival, and mortality. The results highlight the impact of Neanderthals on the adult age classes of horses, revealing that the hunting happened frequently in warm seasons (during summer months until the beginning of autumn) (Fernandez *et al.*, 2006; Fernandez & Legendre, 2003). This is similar to the majority of Middle Paleolithic sites, particularly—French Mousterian sites, where horse dominate the faunal spectrum with a high frequency of adult individuals, and the mortality profile has also been interpreted as the result of a massive butchery of equids at this site. The mortality

profiles indicate that hunting strategies of successive human populations at the various levels of occupation cannot be explained by scavenging of carcasses as a significant method of acquisition (Fernandez *et al.*, 2006; Fernandez & Legendre, 2003).

Samples from a Modern Context in Africa

Published data on the living structure of zebra populations and on the mortality profiles of carnivore-killed zebra from long-term, field-based research in the Serengeti and Ngorongoro ecosystem provide a key comparative sample for this analysis. Data on the zebra population from a randomly-shot sample of zebra and on zebra mortality from disease or malnutrition are from the Serengeti (Schaller, 1972), and carnivore data including lion and hyena predation on zebras are from both the Serengeti and Ngorongoro areas (Kruuk, 1972; Schaller, 1972).

Hadza Foragers and their Prey at Lake Eyasi, northern Tanzania

The Hadza of Tanzania are one of the very few societies anywhere in the world in which people still live by hunting and gathering. Zebras are their favorite prey animal. The comparative samples of zebras killed by Hadza are from two sources. One source includes 20 hunted and scavenged individuals from Hadza kill sites and Hadza base camps observed and collected over a several year period (1988, 1990-91, 1993)(Bunn *et al.*, 1988; Bunn, 1993; O'Brien, 1994). The other source includes 23 hunted and scavenged zebras from Hadza base camps collected by Bunn and colleagues over a more recent, several year periods (2008-2012).

Analytical age and mortality classes for ungulates

Due to their social and neurological immaturity, juvenile prey animals are more vulnerable to predators, disease and harsh environmental conditions, while old adults generally have a higher probability of mortality because of their poor body condition and nutrient storage compared to prime adults. Stiner (1990) proposed a three-age system to facilitate comparative analyses of multiple samples and to define the age boundaries between the three, classes, juveniles, prime adults, and old adults. Defining the three age classes (juveniles, prime adults, old adults) of equids is the first crucial step. Stiner's system follows longstanding practice in zooarchaeology in defining the boundary between juveniles and prime adults according to the replacement of all deciduous teeth by permanent teeth (the eruption of second premolars in equids, before 4 years old); she uses approximately 60-65% of potential lifespan (which zooarchaeologists and wildlife biologists have correlated roughly with permanent tooth wear)

as the boundary between prime adults and old adults. The potential lifespan of wild equids is approximately 25 years (Berger, 1986), so the age boundary separating prime adults from old adults is 15-17 years old.

Various techniques have been used to estimate the age of death of equids. Considering that a significant correlation exists in equids between the height of the crown and the age of the individual, the crown height technique is widely used to estimate the age of various hypsodont herbivores (Klein & Cruz-Uribe, 1983; Levine, 1979; Levine, 1982), and we chose it in this analysis as one measurement. We have used Levine's data to study Xujiayao because her data were from domestic horses which constitutes a truly justified methodological basis for comparing the population structures of different wild Equidae (Fernandez & Legendre, 2003). Spinage's (1972) data which are suitable for Hadza zebras have also been used. Levine's (Levine, 1979; Levine, 1982) data of the eruption sequence have been used to calculate the age at death.

For a statistical study of different mortality profiles, we first use χ^2 analysis to test for any significant difference between mortality profiles. Then, we use Fisher's Exact test to compare prime adults and old adults (this avoids the potential taphonomic bias inherent in comparing fragile juvenile remains, which can be significantly affected by carnivores and by other destructive taphonomic processes; Bunn and Gurtov, 2014). Statistical tests including χ^2 analysis and Fisher's Exact test were run in SPSS Statistics 23, with results considered significant if $P \leq 0.05$. Triangular graphs were used to examine the mortality patterns. It was run in a modified triangular-graph program that creates contour lines representing 95% confidence intervals based on sample size (Weaver *et al.*, 2011).

In general, if the data contour falls to the right-of-center portion in the triangular graph, it represents a catastrophic mortality profile. If the data contour falls to the left-of-center portion, it represents an attritional mortality profile. Non-overlapping contours indicate that data samples probably did not originate from the same source, with 95% probability. Following precedent, the lower left corner represents juvenile-dominated assemblages, the lower right corner represents prime-dominated assemblages, and the top corner represents old-dominated assemblages (Stiner, 1990; Stiner, 1994).

Results

Table 2 presents the prey-mortality data used in our analysis. Most equid teeth from Xujiayao are isolated. Because of the high occlusal surface similarity of lower premolars 3-4 and lower molars 1-2 (Eisenmann, 1986; Eisenmann *et al.*, 1988), it is difficult to distinguish them. Therefore, we chose deciduous and permanent premolar 2 as well as molar 3, which are much more reliably identified, as our study materials. According to the equid tooth-eruption sequence and wear stages (Levine, 1979; Levine, 1982), upper p2 usually replaces dp2 at the age of 2 to 2.5 years old, so we assigned 12 dp2s to the 0-2 years old group; the height of crown is about 60mm or higher. We assigned 25 slightly worn teeth with crown height less than 60mm to the 2-4 year age group. Then, at the age of 15 years old, p2 crown height is less than 12mm, or m3 is less than 26mm. So we assigned 1 p2 to the old group, and 191 p2s to the prime group. But some p2s are lost entirely in old age, so we also calculated the number of m3s. We assigned 6 m3s to the old age group. In the upper layer of Xujiayao, there are 23 juveniles (0-4y), 149 prime adults (4-15y) and 3 old adults (above 15y). In the lower layer, there are 14 juveniles, 42 prime adults and 3 old adults. A significant difference exists in the distribution of different age group individuals between the upper and lower layers ($\chi^2=6.135$, $df=2$, $P<0.05$).

Table 3 presents the results of Fisher's Exact test which reduces the analysis to a comparison of prime adults to old adults in order to avoid any taphonomic bias. However, it shows no significant difference between the upper and lower layer ($P=0.134>0.05$).

Figure 3 shows the overlap in triangular graph between the 95% confidence interval for the lower layer and living Serengeti zebras. This is consistent with the χ^2 analysis ($\chi^2=3.953$, $df=2$, $P=0.14>0.05$), as well as with the Fisher's Exact Test result ($P=0.08>0.05$). However, the lower layer data presents a mortality pattern intermediate between living structure and prime-dominant structure while the living Serengeti zebras display a prime-dominant pattern. The upper layer data set also represents a prime-dominant pattern, and according to Fisher's exact test at the confidence level of 95%, it has no significant difference compared with living Serengeti zebras. However, the χ^2 analysis shows a significant difference between them ($\chi^2=11.36$, $df=2$, $P=0.003<0.05$).

Figure 4 plots the mortality profiles of carnivore (including lions and hyenas) kills from the Serengeti and Ngorongoro areas. The carnivore data sets are almost not overlapping with either layer of Xujiayao. The χ^2 analysis also reveals that the carnivore samples are significantly different from both the upper layer (compared with lion: $\chi^2=52.207$, $df=2$, $P<0.001$; compared with hyena: $\chi^2=35.393$, $df=2$, $P<0.001$) and the lower layer (compared with lion: $\chi^2=9.334$, $df=2$, $P=0.009$; compared with hyena: $\chi^2=8.244$, $df=2$, $P=0.016$). The Fisher's Exact test reveals that the lion prey is significantly different from both cultural layers of Xujiayao while the hyena prey is significantly different from the upper layer data but has no significant difference compared to the lower layer data.

Figure 5 displays the mortality profiles of the natural death (disease or malnutrition) sample of Serengeti zebras. The natural data show a living structure, overlapping with the lower layer data yet different from the upper layer data. The χ^2 analysis supports this result (compared with the lower layer data: $\chi^2=21.255$, $df=2$, $P<0.001$; compared to upper layer data: $\chi^2=2.732$, $df=2$, $P=0.255$). The Fisher's Exact test yields the same result. Evidently, the disease afflicting zebras in the Serengeti was non-selective regarding age, thereby producing a living-structure pattern.

Figure 6 plots the mortality profiles of anthropic contexts from Hadza hunting and the Bau de l'Aubesier site. The data from Hadza hunting represent a mortality pattern intermediate between prime dominant and living structure, which is similar to the Lower layer data but different from the Upper layer data. This is consistent with the χ^2 analysis. The data from Bau de l'Aubesier site represent a mortality pattern intermediate between living structure and attritional structure, which has areas in common with the Lower layer data but different from the Upper layer data. This is also consistent with the χ^2 analysis. However, the result of Fisher's Exact test shows that there is no significant difference between any of the culture layers with Hadza hunting data or the Bau de l'Aubesier site. We also noticed that the mortality profile from Bau de l'Aubesier site is similar to hyena prey's mortality distribution. The χ^2 analysis also shows no significant difference ($\chi^2=0.605$, $df=2$, $P=0.739$), nor does Fisher's Exact test ($P=0.64$).

Discussion and Conclusion

The equid mortality profile of the Xujiayao Lower layer is different from that of the Xujiayao Upper layer according to χ^2 analysis. The difference may exist in the percentage of young individuals because there is no significant difference between these two layers in the percentage of prime adults and old adults via Fisher's Exact test results. Generally, many taphonomic agents including diagenetic processes and carnivore scavenging may cause significant reduction and even disappearance of juvenile tooth specimens of some fossil species because deciduous teeth are more fragile (Binford & Bertram, 1977; Lyman, 1994; Munson, 2000; Munson & Marean, 2003).

As for Xujiayao, we noticed that few equid teeth display evidence of having been subjected to fluvial processes, carnivore biasing, or diagenetic processes. The teeth surfaces also show only weak weathering attributes. Moreover, as for equids like zebras, even their foal teeth are fairly large and durable and are not easily-destroyed (Spinage, 1972). Even hyenas (the most powerful destroyer of animal bones) cannot significantly reduce the number of teeth of large ungulates like zebra (Bunn & Kroll, 1986). All indications show that the assemblage of zebra teeth is rarely affected by these taphonomic agents, so archaeological analysis based on equid mortality profiles should be both objective and realistic.

Regarding the potential biasing against transport of the head, it is maybe true that some people would favor transport of limb parts back to their camp, like what Hadza people did to the buffalo. However, even for the Hadza people, they treated zebra differently since zebra marrow in their mandible is abundant and delicious, as they said. We have also observed a lot of similar percussion damage to equid mandibles in the Xujiayao site assemblage. So we are not that worried about any potential bias of schlepp effect against the heads of equids.

Notably, the equid mortality profile of the upper layer is a significant mismatch to other likely sources including first-access scavenging from natural deaths (disease or malnutrition) and aggressive, power scavenging from carnivores. Although the distribution is similar to the living Serengeti zebras displayed in the triangular graph, which is a prime-dominant mortality pattern, they are not overlapping because the upper layer has more prime adults than the living zebra data set. χ^2 analysis also shows a significant difference between them. That is to

say, hominins didn't get the equids by some catastrophic death. Therefore, we conclude that hominins living in Xujiayao upper layer are likely to have acquired the equids mainly by active and selective hunting of prime adults.

Via χ^2 analysis and triangular graphing, equid mortality in the Xujiayao Lower layer is significantly different from the carnivore data set, although the Fisher's Exact test shows no significant difference from the hyena data set for prime and old adults. Moreover, considering that power scavenging from carnivore kills requires good luck and opportune timing because carnivores consume animal carcasses rapidly (Bunn, 2001; Bunn *et al.*, 1988) (especially hyenas, a group of which can finish eating a female zebra in 36 minutes (Kruuk, 1972)), we exclude the possibility of power scavenging in the Lower layer. But we cannot exclude the potential contribution from a combination of first-access scavenging of natural (disease or malnutrition) or catastrophic death as well as selective human hunting. Furthermore, the mortality profile is similar to Hadza's kills in a triangular graph. Since Hadza obtain carcasses by a combination of both active hunting and scavenging strategies (Bunn, 2001; Bunn *et al.*, 1988), we conclude that hominins at the Xujiayao Lower layer acquired the equids by multiple strategies like modern hunter-gatherers, and hominins at Xujiayao obtained proportionately more prime adults than Hadza.

From a comparative analysis of these varied mortality profiles, we see different strategies of equid acquisition between the upper and lower layers at Xujiayao. The first possible cause of the difference is that hominins changed their hunting strategies through time, as reflected in the different mortality patterns in the Lower and Upper layers, in order to adapt to various ecological settings, like different seasons, or changes of climate (Klein, 2009; Lyman, 1994). Research on Neanderthals has revealed that prey selection and prey exploitation may be subject to seasonal variation. And in stressful, dry or cold seasons, when prey may be concentrated near essential resources, a seasonally-restricted mass hunting event may yield resources at a high return rate. For instance, at the German reindeer-dominated site of Salzgitter-Lebenstedt, the largest group of animals –adult reindeer males–died around September. Neanderthals were highly specialized hunters of large mammals, especially from MIS 9 or 7 onwards and in steppe environments during the dry-temperate climates of the late Pleistocene (Gaudzinski-Windheuser & Kindler, 2012; Gaudzinski-Windheuser & Kindler, 2012). In Western and Central European Middle Paleolithic sites, faunas dominated by large herbivores attest to a selective long-term exploitation of individuals in particular age classes,

like the exploitation of large bovids centered on prime age individuals.

Through ethnographic study of the Hadza, carcasses will be obtained mainly by active, ambush hunting in the dry season compared to wet seasons, because waiting in ambush at water holes or along game trails leading to water holes yields high quality shots from close range (Bunn, 1993; Bunn, 2001; Bunn *et al.*, 1988). But the preliminary seasonal results from cementum analysis of equid cheek teeth from Xujiayao (Li Jingshu *et al.*, 2017) indicate that hominins used the site for both warm and cold seasons in both layers.

Therefore, we suggest that hominins at Xujiayao may have chosen a different equid acquisition strategy to adapt to the changing climate. From the faunal assemblage of Xujiayao (Jia *et al.*, 1979), the *E. przewalskii*, *Coelodonta*, *Megaloceros ordosianus*, *Cervus elaphus*, and *Bos primigenius* indicate a cool, temperate environment, while some other species like *Palaeoloxodon* and *Sus* indicate a warm and forest environment. Though we have no records for which species belong to which cultural layer, we at least know from the animal assemblage that the climate changed from being cold to warm. According to the pollen-based paleoclimate study of Xujiayao (Mu *et al.*, 2015; Yan *et al.*, 1979), we can see a distinct climate change from the early period to the later period. For the early period (Lower layer), the main vegetation types, such as *Artemisia* and *Chenopodiaceae*, reflect a warm and dry climate. For the later period (Upper layer), the vegetation type changed to *Pinus* and *Picea*, which are cold and humid-favoring plants. One of the most important adaptive traits to survive successfully in a cold climate would have been the ability to consistently procure sources of animal fat and protein (Gaudzinski-Windheuser & Kindler, 2012; McBrearty & Brooks, 2000). How did they manage to acquire an adequate supply of fat? One way is to target animals with the highest levels of body fat at the time of year when hunting took place—prime adults especially females in the cold seasons (Gaudzinski-Windheuser & Kindler, 2012). More productive active hunting in the Upper layer would be the probable way to obtain abundant animal carcasses. Furthermore, similar to the dry season, active hunting in a cold climate would be more productive because animals' trails are easier to track.

Besides the explanation of adaptation to climate change, the other possibility is that the deposits may belong to two different hominin groups. However, the fragments of human fossils from Xujiayao have not been studied separately, and all of them belong to Archaic *Homo sapiens* (Jia *et al.*, 1979; Wu & Trinkaus, 2014; Xing *et al.*, 2015). Moreover, the

artifact assemblages and inferred hunting technology show no significant differences between the two layers (according to the excavator). Thus, current evidence provides no basis to reconstruct different hominin groups or taxa in the two layers at Xujiayao. A simpler reconstruction of evolving hunting activities at Xujiayao that is consistent with the new equid mortality data reported here is that climate change induced hominin hunters to adapt their hunting strategies to local conditions, and that they were successful in doing so even during cold seasons.

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Table 1. The total sample NISP of teeth from Xujiayao

		dp2	dp3-4	p2	p3-m2	m3	Total
Left Side	Upper	15	58	132	872	163	1240
	Lower	9	35	177	769	172	1162
Right Side	Upper	11	31	133	684	165	1024
	Lower	12	41	217	965	114	1348
NISP							4775

dp2= deciduous second premolar, p2=second premolar, m2=second molar, etc.

Table 2. Equine mortality data of Xujiayao site and other regions

Age (years)	0-2y	<2-4y	<4-15y	>15y	N or MNI ¹
Xujiayao site, China					
234					
Upper cultural layer					
<i>E. przewalskii</i>	4	12	119	3	138
<i>E. hemionus</i>	3	4	30	0	37
Lower cultural layer					
<i>E. przewalskii</i>	5	9	35	1	50
<i>E. hemionus</i>	0	0	7	2	9
Serengeti, Tanzania (Schaller, 1982)					
Sample shot	33	49	227	4	313
Disease/malnutrition death	11	7	31	6	55
Lion kill	24	30	88	32	174
Serengeti and Ngorongoro, Tanzania(Kruuk,1972)					
Hyena kill	11	11	20	4	46
Bau de l'Aubesier (Fernandez <i>et al.</i>, 2003)					
Hominin site	3	10	12	1	26
Lake Eyasi,Tanzania²					
Hadza kill	9	6	26	2	43

1. N means the number of individuals; MNI means minimum number of individuals.

2. The killed zebras by Hadza have been collected from 1988 to 2011 in Hadza's abandoned camps.

Table 3. Fisher's Exact test comparing prime and old adults from Xujiayao with other mortality profiles

	Bau de l'Aubesier (<i>p</i>)	Hadza (<i>p</i>)	Lower Layer (<i>p</i>)	Upper Layer (<i>p</i>)
Living Structure				
Sample Shot	0.55	0.68	0.08	1
Attritional Structure				
Disease or Malnutrition (Serengeti)	0.66	0.45	0.29	0.002
Carnivore Effect				
Lion (Serengeti)	0.18	0.02	0.004	<0.001
Hyena (Serengeti and Ngorongoro)	0.64	0.40	0.27	<0.001
Hominin Effect				
Bau de l'Aubesier site	1	1	1	0.28
Hadza	1	1	1	0.17

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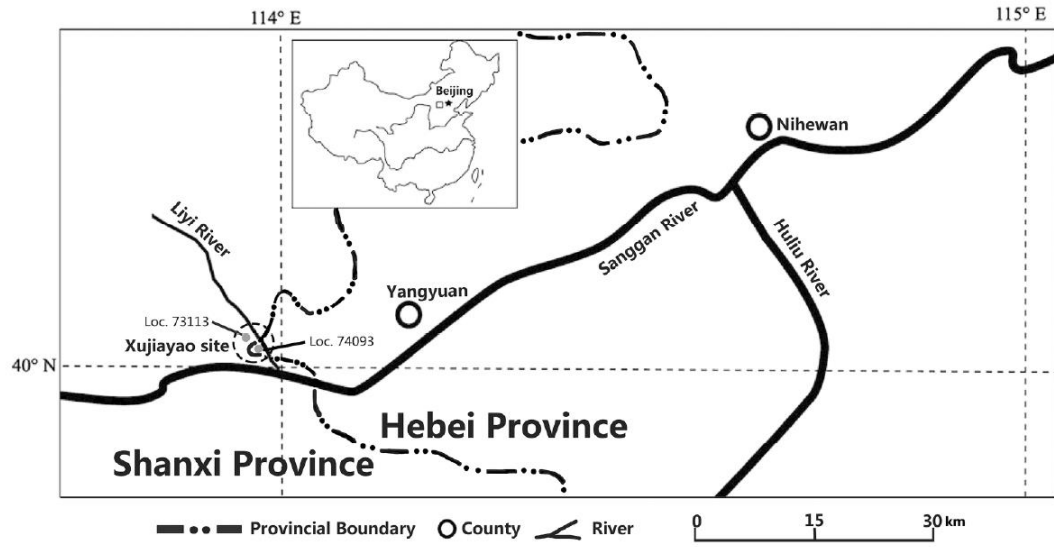


Figure 1. Location of Xujiayao site (modified after Jia *et al.*, 1979; Norton & Gao, 2008)

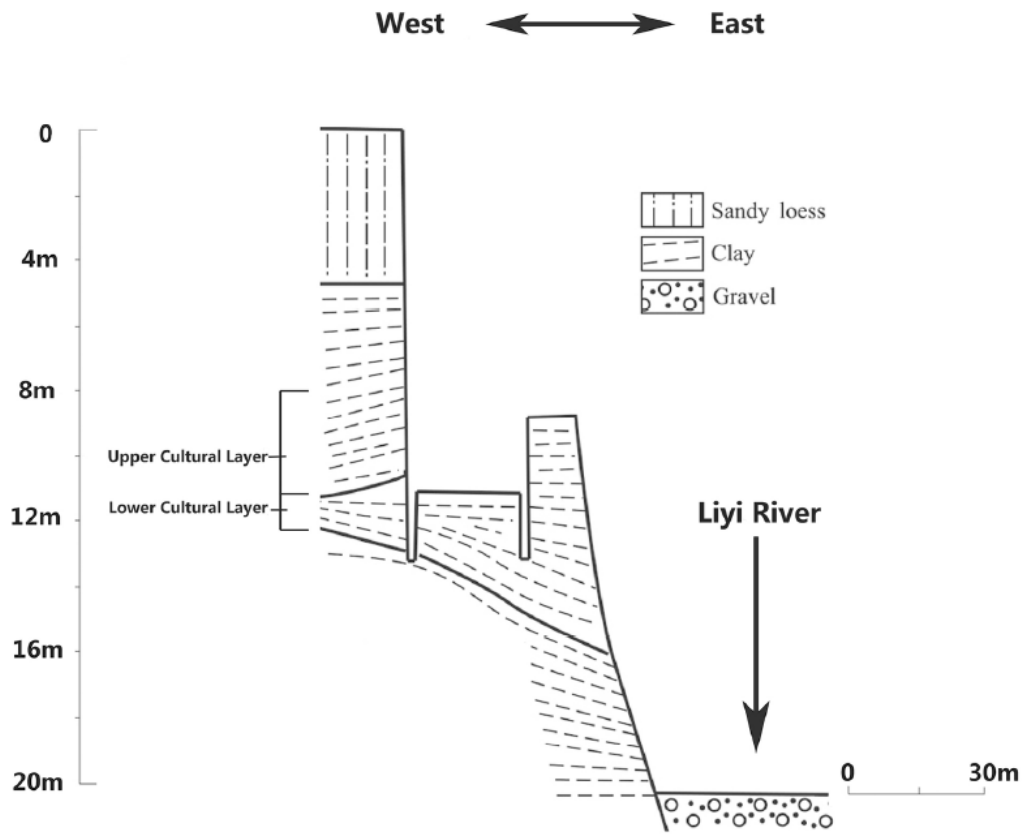


Figure 2. Stratigraphic section of Locality 74093 of the Xujiayao site (modified after Jia *et al.*, 1979; Norton & Gao, 2008)

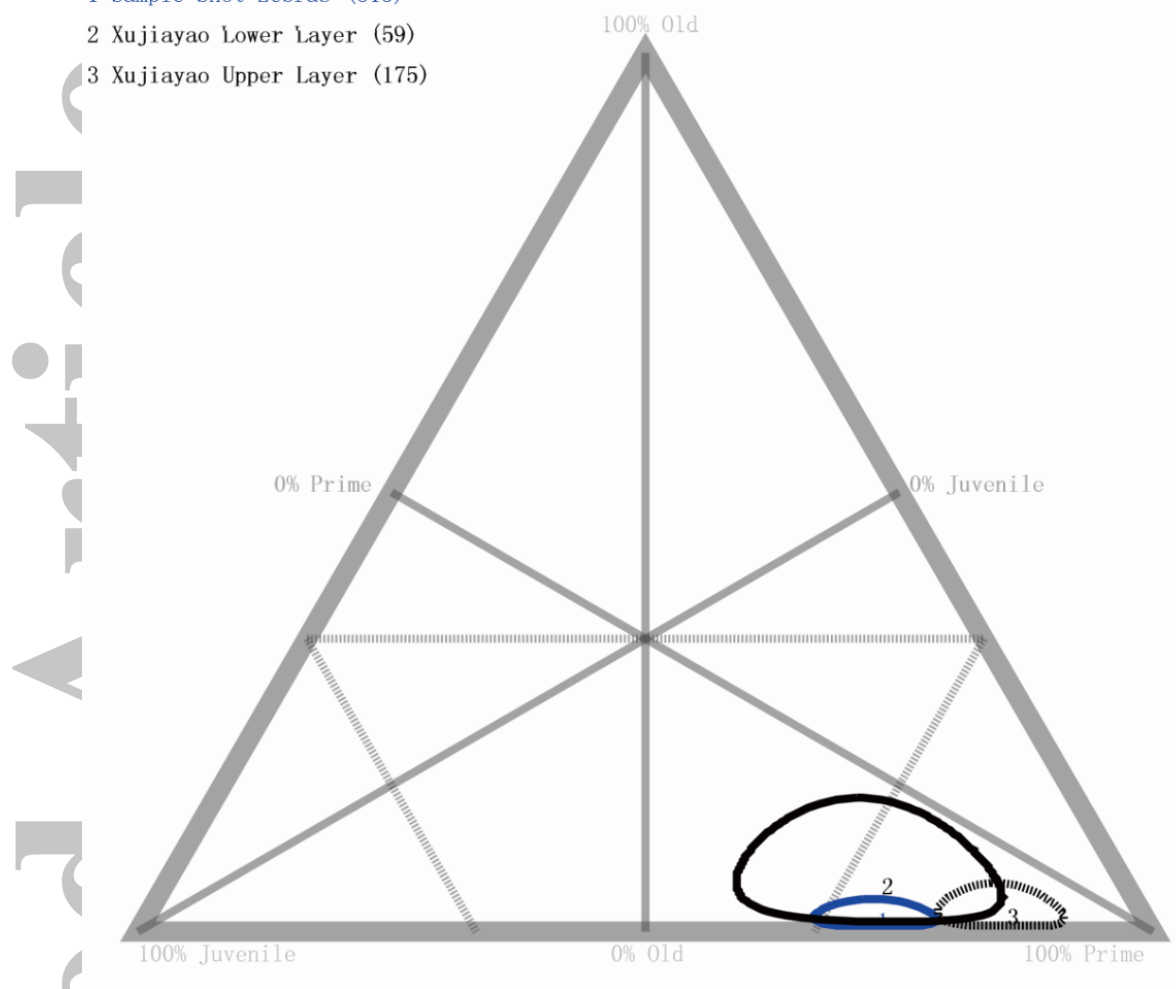


Figure 3. Equid mortality profiles from Xujiayao site (Upper layer and Lower layer) compared with living structure mortality profile of the Serengeti zebras

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- 1 Lion Killed Zebras (174)
- 2 Hyena Killed Zebras (46)
- 3 Xujiayao Lower Layer (59)
- 4 Xujiayao Upper Layer (175)

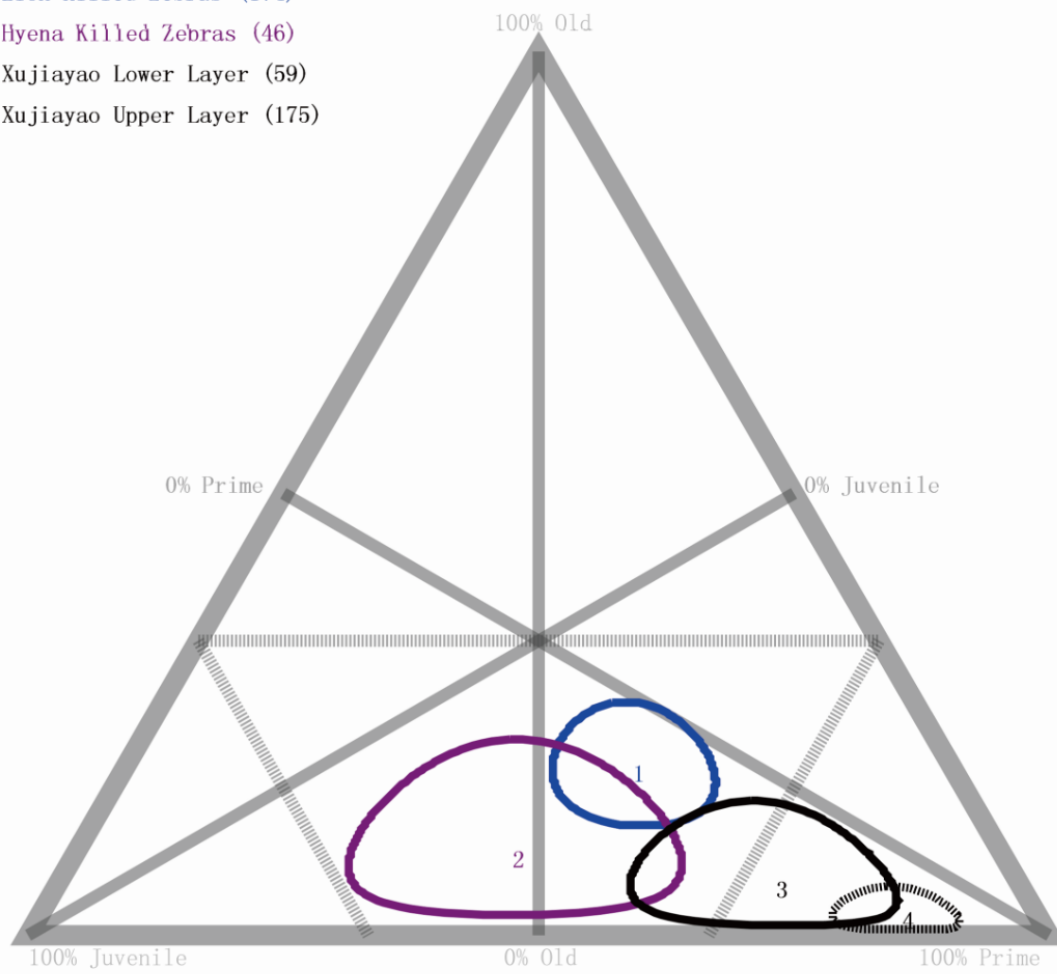


Figure 4. Equid mortality profiles from Xujiayao site (Upper layer and Lower layer) compared with those from hyena-killed and lion-killed equids

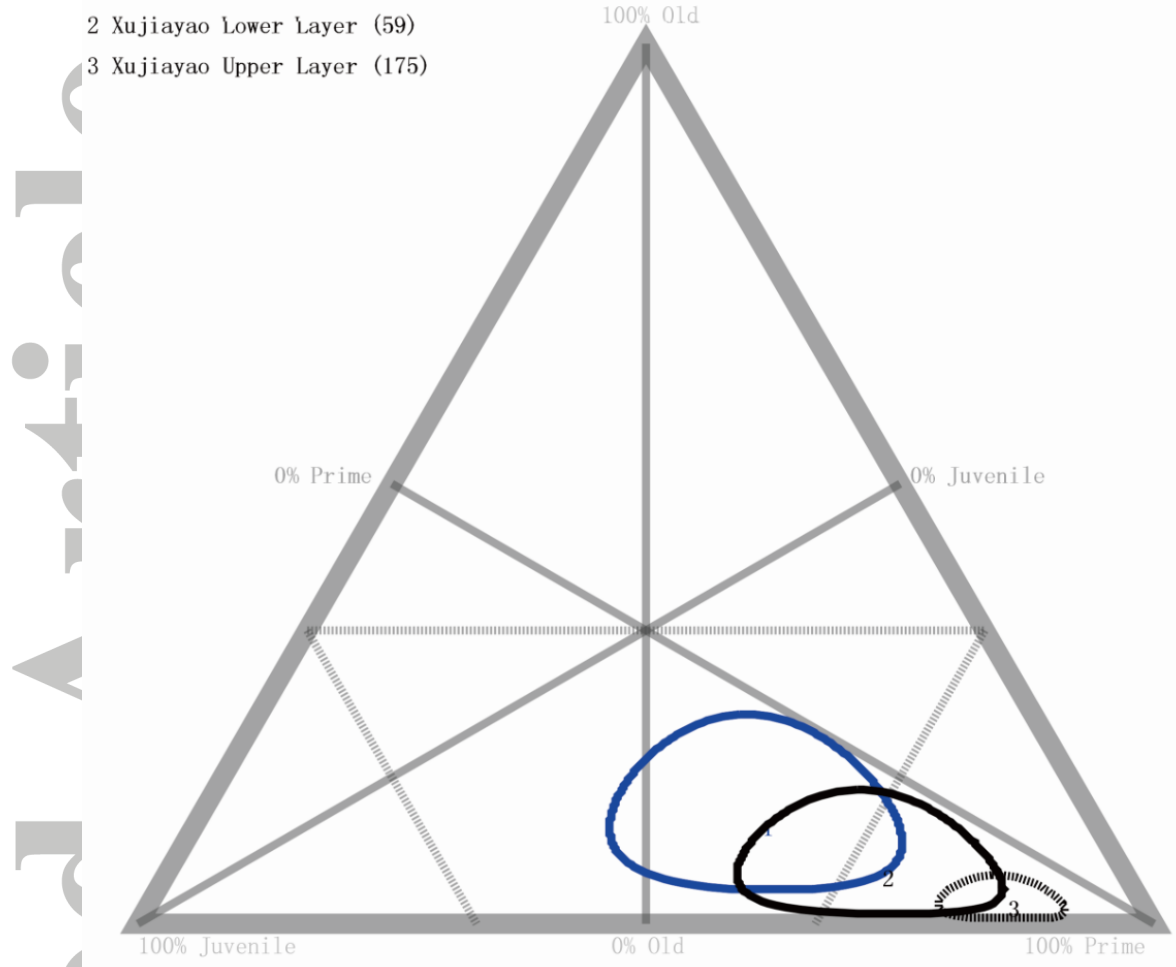


Figure 5. Equid mortality profiles from Xujiayao site (Upper layer and Lower layer) compared with those caused by disease or malnutrition

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- 1 Hadza killed zebras (43)
- 2 BDA (26)
- 3 Xujiayao Lower Layer (59)
- 4 Xujiayao Upper Layer (175)

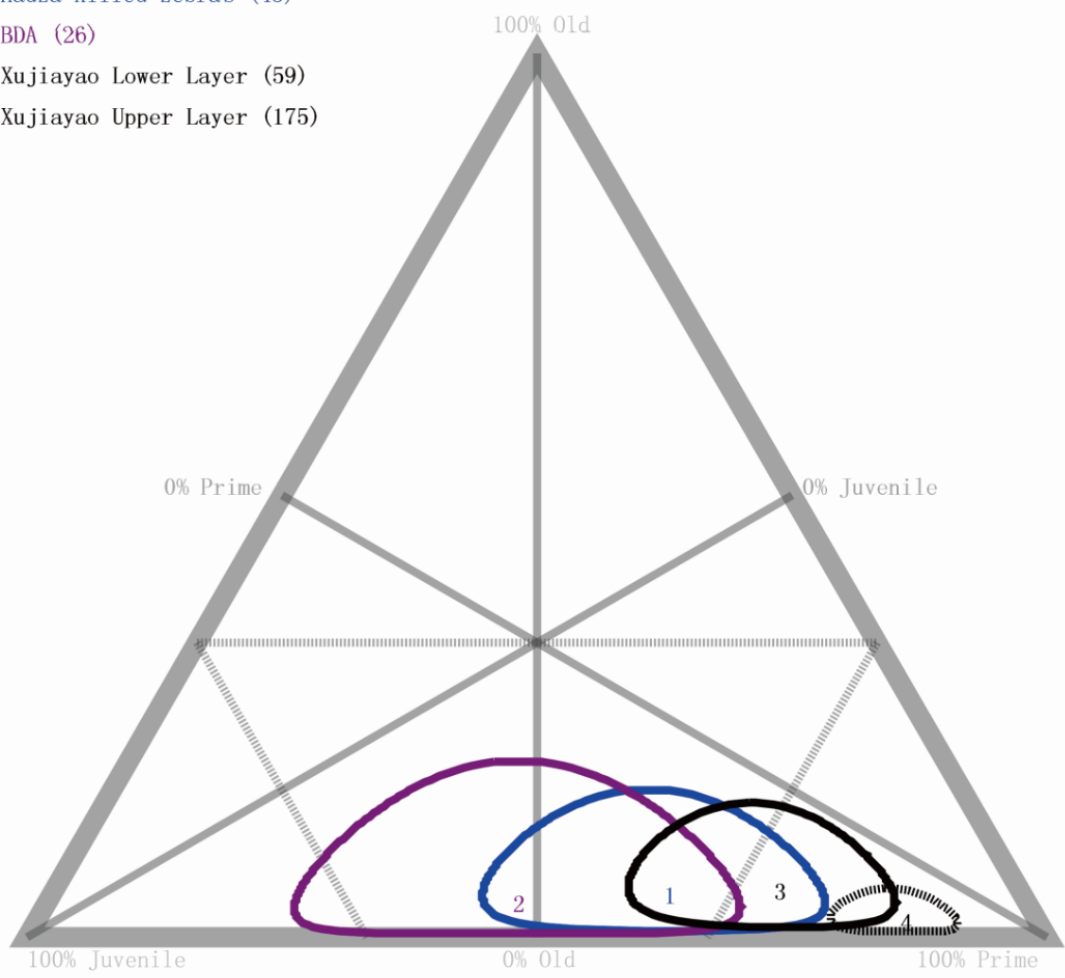


Figure 6. Triangular graph comparing the mortality profile of equids from Xujiayao site (Upper layer and Lower layer) with mortality profiles from modern and archaeological hunters' prey