Social Dynamics in Bronze Age Europe: A Zooarchaeological Perspective

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ABSTRACT

The European Bronze Age (3000-700 BC) was a period of increased social differentiation. These changes were manifested in every aspect of life, including foodways; high-status individuals typically had much greater access to high-quality foods. This study analyzes faunal remains from two Maros culture sites: Pecica "Şanţul Mare" and Kiszombor-Új-Élet. These settlements were located in modern-day Romania and Hungary, respectively, and differed significantly. Pecica was much more prominent in terms of size, population, and regional influence. The goal of this study was to determine the desirability of the meats consumed at the two sites based on meat utility, age, and taxon. This study compared the consumption patterns at both sites and found little variability, despite their other differences. The lack of distinction shows that there was no status-related food inequality at the time of Pecica's founding, although this changes in later periods. These results contribute to archaeologists' understanding of economics and regional variation in a time of increasing complexity.

INTRODUCTION

The Bronze Age is known as a period during which tremendous change occurred in Europe, resulting in a significant level of social complexity and stratification across the continent. This phenomenon is illustrated by sites in the Carpathian Basin, including Pecica "Şanţul Mare," Romania, and Kiszombor-Új-Élet, Hungary. The Maros group occupied these sites for centuries (~2700-1500 BC), engaging in activities such as metallurgy, agriculture, and craft production. Pecica was a center of production, trade, politics, and ritual and was therefore the most important settlement in the region (Nicodemus et al. 2015; O'Shea et al. 2019). In contrast, Kiszombor was a small farming village with little to no influence. As such, one would expect that the residents of these two sites occupied two very different social strata.

The Maros culture group originated in the Great Hungarian Plain, seen in Figure 1, through the amalgamation of several Late Copper Age groups. Their earliest manifestation was during the Early Bronze Age and was marked in the archaeological record by a new type of pottery as well as distinct funerary practices (O'Shea 2011). The Early Phase was the longest, beginning in 2800 BC, but the Middle Phase saw the group's greatest geographic extent. Following the Middle Phase, which corresponded with the beginning of the Middle Bronze Age (c. 2000 cal BC), the Maros aggregated into fewer but larger settlements. The Late Phase began in the second half of the Middle Bronze Age, around 1850 BC. Trade, metal production, and horse rearing intensified greatly during this period. The Late Phase lasted until 1600-1500 BC, when the Maros cultural sequence abruptly ended (O'Shea et al. 2019).

Figure 1. Carpathian Basin with modern political borders and study area circled.

The newfound social differences of the Bronze Age were manifested in every aspect of Maros life. It is common for archaeologists to use materials such as grave goods to ascertain an individual's status, but inequality can be seen in many other parts of the archaeological record, including foodways. The pattern in which nutritious and desirable food is distributed can illustrate status and power within a society. This study focused on element utility as one proxy for unequal access to high-quality food based on social status. This measure is based on the fact that some portions of an animal's body provide more nutrition (e.g. protein and fat) than others (Reitz and Wing 2008). For example, an animal's femur, or upper leg bone, will yield much more meat than its phalanges, or hooves. This concept was first applied to archaeology by Lewis Binford in the 1978 book *Nunamiut Ethnoarchaeology*. He created utility profiles for artiodactyls which assigned discrete utility values to each element. Since then, many more indices have been developed for various species and research purposes. It is worth noting that utility indices are relative and are not used to calculate the actual caloric or nutritional content of an element.

Taxon and age were also considered as factors of desirability. Elites commonly had access to animals that were more difficult to raise or more dangerous. For instance, cattle require more resources to raise and maintain and are thus an impractical source of food for those who cannot afford it. Similarly, younger animals tend to be more tender and flavorful, making them more desirable for consumption; however, elites would typically be the only ones with enough resources to kill young animals without using them for other resources first (Crabtree 1990). Both of these practices are visible archaeologically and will contribute additional perspectives on food inequality.

This study applied the question of food accessibility to the Maros group based on faunal data from Pecica and Kiszombor. If the inhabitants of the sites were socially equal within the Maros culture, both faunal assemblages will display similar meat consumption patterns. However, it was previously established that Pecica had more regional influence and larger population of elite residents than Kiszombor, so it was expected that the distribution of desirable meats will greatly differ. Although much is known about Pecica's economy at its height (Nicodemus 2014), there is much less research regarding its earliest Bronze Age phases. Those phases include the brief time when both sites were occupied simultaneously, as illustrated in Figure 2, and are the period on which this study focuses. The result is a detailed look into the animal economies of two Maros settlements that were vastly different at their heights but had more in common than previously thought.

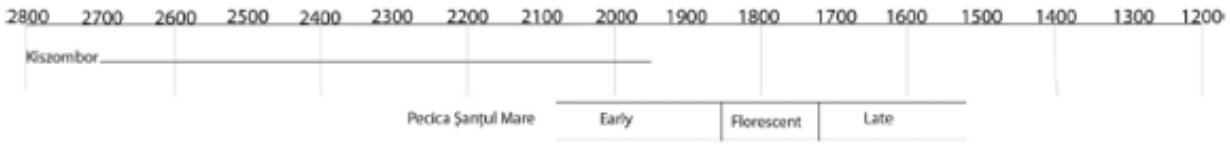

Figure 2. Dates of occupation (year BC) at Kiszombor and Pecica (modified from O'Shea et al. 2019, Figure 8)

METHODS

Faunal Analysis

Faunal remains from Layers F and G excavated at Pecica in 2015 were analyzed according to established zooarchaeological practices. The process involved assessing each specimen's overall size, robusticity, form, and other diagnostic features. The following primary data was recorded where possible: taxon, skeletal element, side, fusion status, completeness, post-deposition modifications, and measurements (von den Driesch 1976; Zeder and Pilaar 2010). A comparative collection of complete, modern specimens aided in the identification process. The data from layers F and G was added to the existing faunal database for Pecica. The data from Kiszombor was previously compiled by Dr. Amy Nicodemus following the same methods (Nicodemus 2010). The main secondary data needed for this study was number of identifiable specimens present (NISP); this measure was calculated for all data corresponding to Pecica Phases 5b-7. It was determined that the Kiszombor and Pecica samples had NISPs of 1343 and 8144, respectively.

Data Analysis

The frequencies of domesticated and wild mammals represented during Pecica Phases 5b-7 and Kiszombor Phase 2 were compared using chi-square statistical tests. In addition, identifiable mammal taxa were divided into medium and large size classes; these groups also included data from specimens that could be identified to size class but not a specific taxon. This is because in general, large animals provide more meat, are more dangerous, and are more costly to raise if domesticated, making them a more prestigious source of meat. Assessing the utility of the size classes separately allowed for an even more detailed look at the consumption patterns of valuable meats. Ovicaprids, roe deer, and pigs were categorized as medium mammals; cattle, aurochs, horses, wild boar, and red deer were considered large. The utility index presented in Binford 1978 was used to assign utility values to each identifiable element in the assemblage, and these values were placed into general categories of very high, high, medium, low, and very low following Nicodemus 2014, shown in Figure 3. The frequencies of utility categories within each size class were also compared with chi-square tests.

Utility Class	MGUI	Element	Utility Class	MGUI	Element
very high	100-80	rib	medium	30-20	radius
		costal cartilage			ulna
		sternebra			astragalus
		pelvis			calcaneus
		sacrum			naviculocuboid
		femur	low	20-10	cranium
		patella			atlas
high	55-30	mandible (with tongue)			axis
		hyoid			carpals
		cervical vertebra (no C1/2)			metacarpals
		thoracic vertebra			tarsals
		lumbar vertebra			metatarsals
		vertebra (gen)			caudal vertebra
		scapula	very low	<10	1 phalanx
		humerus			2 phalanx
		tibia			3 phalanx
		fibula			sesamoids
					horn core
					antler

Figure 3. Elements included in each utility category (Nicodemus 2014, Table 8.1).

The final category of calculations was ovicaprid age classes, which were determined according to two variables: epiphyseal fusion and dental wear. Skeletal elements were placed into groups based on the age (in months) at which their epiphyses completely fuse. The NISP was used to calculate the percentage of unfused elements in each age group. In order to determine dental age, a wear stage was assigned to each identifiable mandibular tooth following Grant 1982, and the corresponding age range (in months) was recorded. The MNI for each age range was calculated for every layer included in Pecica Phases 5b-7; those totals were then combined to represent the broader categories of juvenile, subadult, and adult for all Pecica phases. The frequencies of these groups were compared between Pecica and Kiszombor using a chi-square test. Those frequencies were also statistically compared against idealized age profiles that represent the culling practices associated with meat, dairy and wool production (Payne 1973).

RESULTS

Taxon Abundance

At both sites, domesticated mammals appear much more frequently than wild. They comprise 39% of Kiszombor's NISP of 1343, while wild mammals only represent 2%. At Pecica, domesticated mammals represent 19% of the 8144 NISP, and wild mammals make up 1%. Ovicaprids (sheep and goats) are the most common domesticated species at both sites, making up 55% of domestic mammals at Kiszombor and 59% of those at Pecica. *Sus scrofa* (pigs) and *Bos taurus* (cattle) are the second and third most common taxa, illustrated in Table 1. At Pecica, pigs appear at a higher rate (28%) than cattle (13%); at Kiszombor, the proportions only differ by 3%. This difference may be due to the fact that Kiszombor is located in a dry grassland, while Pecica's environment is an ecotone between forest and grassland. *Equus caballus* (horse) appears in both assemblages, but at a very low rate. Statistically, the difference in domestic species abundance shown in Table 3 at the two sites is highly significant ($p<0.0001$, $\chi^2=39.63$, d.f.=3). While this result is statistically significant, the husbandry systems were functionally comparable.

Table 1. Domesticated mammal frequency at Pecica and Kiszombor

	Common Name	Taxon	NISP	%
Pecica	Sheep/Goat	Caprinae	919	59%
	Pig	*Sus scrofa*	429	28%
	Cattle	*Bos taurus*	197	13%
	Horse	*Equus caballus*	9	1%
	Total	———	1554	100%
Kiszombor	Sheep/Goat	Caprinae	266	55%
	Pig	*Sus scrofa*	105	22%
	Cattle	*Bos taurus*	93	19%
	Horse	*Equus caballus*	16	3%
	Total	———	480	100%

The frequencies of domesticated taxa can be applied to the question of social status by assigning value to each one. The relative value of a taxon is determined by several variables including cultural perception, meat quality, secondary products (e.g. milk, wool, and labor), and the cost of maintenance. Ovicaprids and pigs are considered less valuable, and cattle and horses are more valuable, especially the latter, due to their rarity at the time (Nicodemus 2014). After grouping the taxa into their respective categories, illustrated in Table 2, it is clear that low-value taxa are far more common. They represent 87% of the domesticated animals at Pecica and 77% at Kiszombor. In contrast, high-value taxa make up 13% of the Pecica sample and 23% of the Kiszombor. Statistically, the difference between the frequency of each value class at both sites is highly significant ($p=0.0001$, $\chi^2=25.03$, d.f.=1). However, in a practical sense, the difference is negligible; it is reasonable to say that the residents of neither Pecica nor Kiszombor were consuming high-value taxa at a high enough rate to indicate a difference in status.

Table 2. Frequency and value of domesticated taxa at Pecica and Kiszombor

	Value	Taxa	NISP	%
Pecica	Low	Caprinae and *Sus scrofa*	1348	87%
	High	*Equus caballus* and *Bos taurus*	206	13%
Kiszombor	Low	Caprinae and *Sus scrofa*	371	77%
	High	*Equus caballus* and *Bos taurus*	109	23%

The similarities in taxon abundance are also found in wild mammal frequencies. The most common wild species at both sites is *Cervus elaphus* (red deer), with a rate of 70% at Kiszombor and 75% at Pecica, as shown in Table 3. *Capreolus capreolus* (roe deer) is the second most common at both. Bos primigenius (aurochs) is only found at Kiszombor and accounts for 9% of the wild mammals in the assemblage. Both assemblages contain *Sus ferus* (wild boar), but the rate at Pecica (17%) is nearly double that of Kiszombor (9%), also likely due to the differences in habitat. These sample sizes are too small to perform a chi-square test, but it is evident that the percentages are very similar. All the taxa listed below, excluding *Capreolus capreolus*, are considered high-ranked. It is worth noting that the largest components of both overall assemblages were non-mammalian taxa such as birds, fish, and invertebrates. These species made up 80% of the overall Pecica assemblage and 60% of the Kiszombor assemblage. Because they are relatively low-ranked sources of food, they were excluded from further statistical analysis.

Table 3. Wild mammal frequency at Pecica and Kiszombor

	Common Name	Taxon	NISP	%
Pecica	Red Deer	*Cervus elaphus*	69	75%
	Roe Deer	*Capreolus capreolus*	10	8%
	Aurochs	*Bos primigenius*	0	0%
	Wild Boar	*Sus ferus*	2	17%
	Total	———	81	100%
Kiszombor	Red Deer	*Cervus elaphus*	16	70%
	Roe Deer	*Capreolus capreolus*	3	13%
	Aurochs	*Bos primigenius*	2	9%
	Wild Boar	*Sus ferus*	2	8%
	Total	———	24	100%

Body Part Representation

The similarities between the two assemblages are not limited to taxon abundance; they can also be seen clearly in the body part representation of both medium and large mammals, as demonstrated in Figure 4. At both Kiszombor and Pecica, there is a relatively low proportion of very high-utility elements from medium mammals (17% and 22%, respectively). However, high-utility elements comprise 36% of the Kiszombor assemblage and 34% of the Pecica. Medium-utility elements are slightly more common at Kiszombor (13%) than at Pecica (9%). The low category is the second largest at both sites, totaling 28% at Kiszombor and 32% at Pecica. Finally, very low-utility elements are relatively uncommon at both Kiszombor (5%) and Pecica (3%). This suggests that there was not enough social differentiation to lead a large portion of the sites' populations to consume extremely low-quality food. The differences in these proportions are statistically significant ($p=0.009$, $\chi^2=13.63$, d.f.=4), but not functionally.

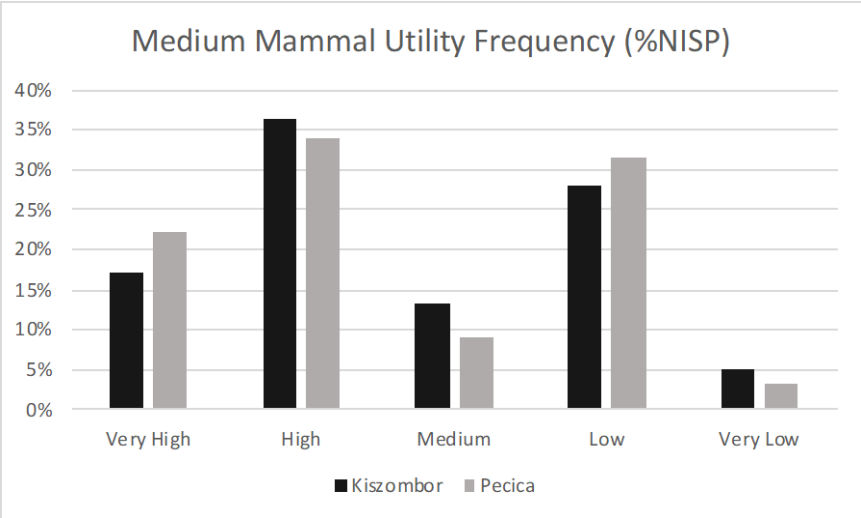

Figure 4. Medium mammal utility value frequency and Kiszombor and Pecica.

The pattern of large mammal utility values, shown in Figure 5, differs slightly from that of medium mammals. Once again, the very high-utility elements make up a comparatively small portion of the assemblages; at both sites, they represent 20%. The high-utility category is slightly larger, making up 28% of both assemblages. Medium-utility elements are less common, totaling 8% at Kiszombor and 11% at Pecica. In contrast to the medium mammals, low-utility is the highest proportion of large mammal elements, and the quantity at Kiszombor (33%) is greater than that of Pecica (27%). Very low-utility elements are more common in large mammals than medium due to marrow extraction processes. The proportions between Kiszombor (12%) and Pecica (14%) barely differ. Statistically, the variations in proportions of large mammal utility categories is highly insignificant ($p=0.32$, $\chi^2= 4.72$, d.f.=4).

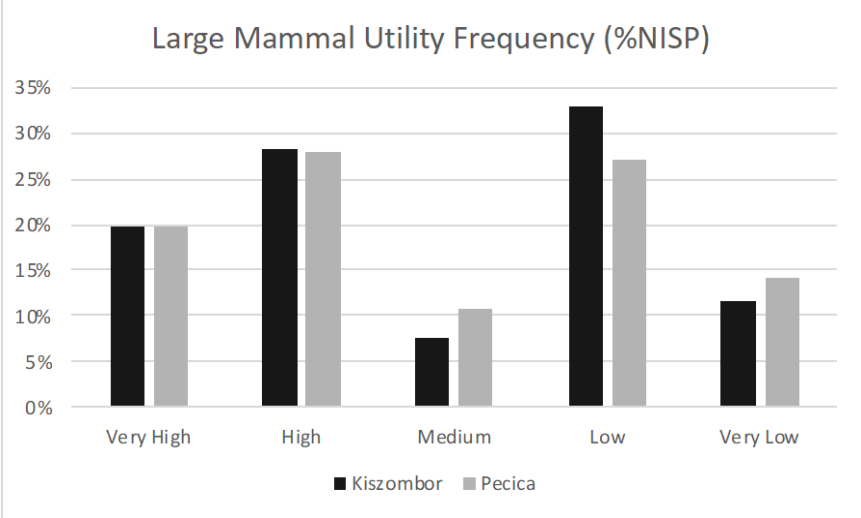

Figure 5. Large mammal utility value frequency at Kiszombor and Pecica.

Ovicaprid Age

The epiphyseal age patterns of ovicaprids are also relatively similar between the two sites. As shown in Figure 6, the Pecica sample follows the expected pattern for meat production, while the Kiszombor sample deviates. 100% of individuals are older than the fetal category at both sites. At Kiszombor, 100% of the sample is also older than the neonate stage, compared to 96% at Pecica. Pecica's proportions continue to decrease gradually, with 91% of individuals being older than 6-10 months, as opposed to a more drastic difference of 86% at Kiszombor. At both sites, there is a large decrease in the proportion of individuals older than 13-16 months, with 50% at Kiszombor and

64% at Pecica. There is another large drop at Kiszombor, showing that 36% of the sample is older than 18-28 months; at Pecica, this change is once again gradual (50%). Because of its small size, the Kiszombor sample begins to deviate from the expected pattern. The calculations show that 60% of individuals are older than 30-36 months and 33% are older than 36-42 months. In contrast, the Pecica sample maintains the pattern and shows that 0% of individuals are older than the last two age ranges. These samples were not compared statistically; this is because epiphyseal aging is less reliable than dental aging. In addition, the results for older animals do not agree due to the lack of late-fusing elements affected by density mediated attrition and carnivore gnawing.

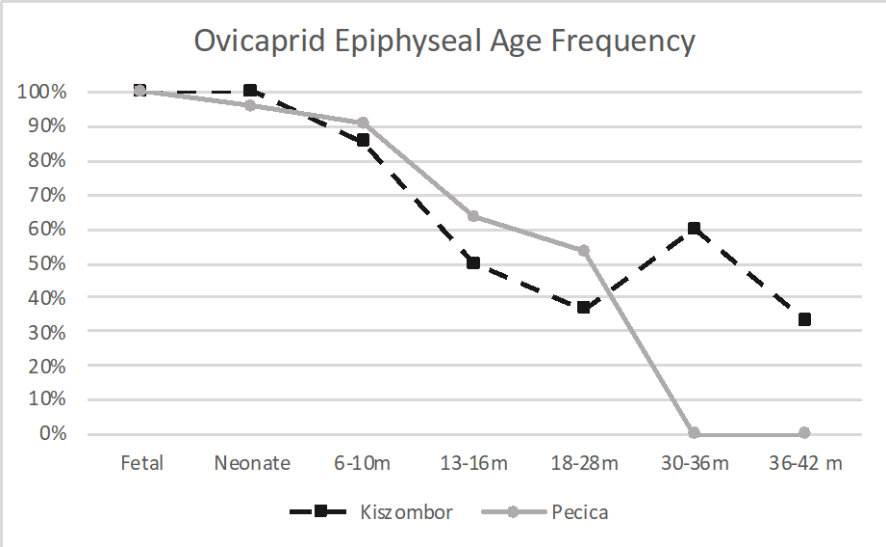

Figure 6. Epiphyseal age range survivorship of ovicaprids at Kiszombor and Pecica (% NISP).

The dental age patterns at the two sites are also similar, as demonstrated in Figure 7. Only teeth that could be identified as sheep and not general ovicaprid were included in the dental aging analysis, and frequency was based on the minimum number of individuals (MNI) as opposed to NISP. The juvenile category is the smallest at both sites, but the proportion at Kiszombor (20%) is almost double that of Pecica (11%). The subadult category is much more comparable, totaling 40% at Kiszombor and 42% at Pecica. The final age group, adult, represents 40% of the Kiszombor sample and 47% of the Pecica sample. Statistically, the differences in these proportions are very insignificant ($p=0.71$, $\chi^2=1$, d.f=2).

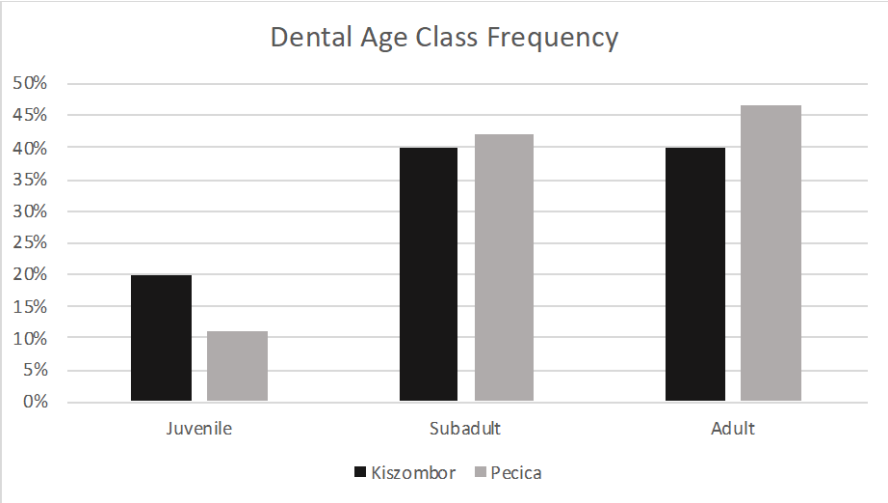

Figure 7. Sheep dental age class frequency at Pecica and Kiszombor (% MNI).

These results were then compared to idealized husbandry age profiles. As seen in Figure 8 below, the age data from both sites most closely resembles the expected age profile of a herd that is raised primarily for meat production. The Pecica sample is significantly different from the expected proportions for meat production ($p=0.04$, $\chi^2=6.38$, d.f.=2); however, its difference from the dairy ($p<0.0001$, $\chi^2=45.87$, d.f.=2) and wool ($p<0.0001$, $\chi^2=35.59$, d.f.=2) profiles is even more significant. The difference between the Kiszombor sample and the expected butchery age profile is statistically insignificant ($p=0.61$, $\chi^2=1$, d.f.=2). In contrast, it is significantly different from the dairy ($p=0.0001$, $\chi^2=18$, d.f.=2) and wool ($p=0.0006$, $\chi^2=15$, d.f.=2) profiles.

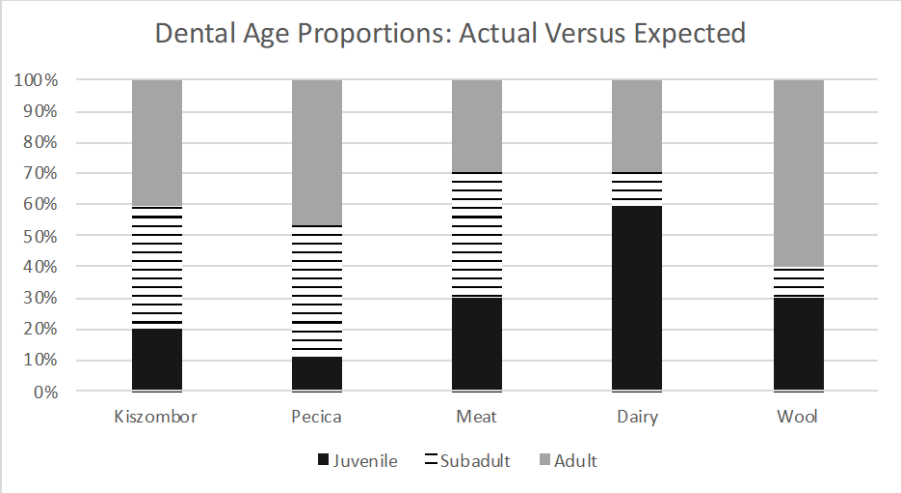

Figure 8. Proportions of dental age classes at Kiszombor and Pecica versus expected proportions (% MNI)

DISCUSSION

All of the evidence in the previous section supports the conclusion that differences in social status were not manifested in meat consumption patterns. Although some differences between the assemblages, such as domesticated mammal taxa, are statistically significant, they are not functionally different; the discrepancies between the two samples were represented by percentage values that would not be noticible in a herd of actual animals. The residents of Pecica and Kiszombor were primarily consuming low-ranked domestic mammals–mostly ovicaprids. They raised sheep mainly for meat and did not prioritize secondary products. The relative lack of high-ranked domestic taxa at both sites indicates that those animals were not being used specifically for elite consumption practices like feasting; it was expected that they would be more common at Pecica because of its greater size and regional influence. Although wild mammals represented small parts of the assemblages, the largest portion of wild mammal taxa at both sites was represented by red deer, a highly valuable species. This, along with the frequencies of other wild taxa, shows a relatively similar pattern in hunting practices as well.

The body part representation of the two assemblages lends even more support to the conclusion that consumption patterns were the same between Pecica and Kiszombor. A contributor to the fact that high-utility elements were the most common for both medium and large mammals is likely that elements within that category, such as vertebrae, break easily while still being identifiable and will be over-represented in the NISP calculation. In addition, the high frequency of low-utility elements may be partly due to butchery practices. While these factors are worth considering, the overarching utility trends in the assemblages are practically the same. If the assemblages reflected the expected social differences between Pecica and Kiszombor, there would be a large difference in the frequencies of very high-utility elements.

Because the animal husbandry and consumption patterns at Pecica and Kiszombor were nearly identical, it can be concluded that any social differences that may have existed between the residents of the two sites did not affect foodways during this time period. This is not to say that there was no social inequality. In fact, Pecica's economy was focused on craft production and trade, even in its earliest phases (Nicodemus 2014). Therefore, it is likely that there was some level of differentiation between the sites in that were reflected in other aspects of their society and thus in other aspects of the archaeological record.

In addition, archaeologists have concluded that the animal economy at Pecica reflected elite consumption patterns in its later phases. There is evidence of unequal meat distribution and feasting in the Fluorescent Period. Horses, arguably the most valuable taxon, also became an important part of the economy later on (Nicodemus 2014). In contrast, only 1% of domesticated mammals from Pecica in this study were identified as horses. These patterns seem to indicate Pecica accumulated wealth in the Initial and Early Periods through craft production and trade but maintained a more generalized pastoral strategy. Over time, the socioeconomic differences that this wealth created were exacerbated, and eventually, subsistence patterns were altered to reflect those differences. Unfortunately, Kiszombor was no longer occupied after Pecica's Early Period, so it is impossible to compare the later consumption patterns of the two sites.

CONCLUSION

Pecica "Şanţul Mare" and Kiszombor Új-Élet have provided archaeologists with an abundance of information about the Bronze Age Maros culture of the Carpathian Basin. Their burial practices, craft production, and trade relationships have been well-documented; however, there was a lack of understanding regarding the animal economies at the two sites during Pecica's earliest Bronze Age occupation and Kiszombor's terminal period. This study was focused on determining the similarities and differences between faunal assemblages from the relatively brief period during which both sites were occupied simultaneously.

Originally, it was hypothesized that animal husbandry and consumption patterns would differ due to Pecica's greater regional influence and larger elite population. After multiple analyses, it was clear that the residents of Pecica and Kiszombor had a very similar approach to their animal economies during the final centuries of the Early Bronze Age. They raised the same species in similar frequencies, used similar culling strategies, and hunted the same game. Although this refutes the original expectation of this study, it shows exactly how varied economic systems could be within one culture and even one site. Despite the fact that it does not show significant social stratification, this conclusion highlights the complexity that is associated with the Bronze Age in a different way by showing that different parts of economic systems do not always develop at the same time.

Future studies could focus on other aspects of the sites' economic systems, such as ceramics or metallurgy, during the same period. This would provide more insight on inequality that may have existed between the two sites, especially since this study found no difference. In addition, it would be beneficial to compare the plant remains from this period to determine if overall subsistence practices were the same, or if this conclusion can only be applied to meat production. Other studies might compare in more detail the differences between the multiple layers from Pecica's Initial and Early Periods, which were grouped together for the sake of this comparison. Clearly, much remains to be learned about the beginnings of economic and social differentiation in the Bronze Age of the Carpathian Basin.

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