

Original Article

## INVESTIGATION OF ANIMAL BONE MATERIALS DISCOVERED IN NEOLITHIC SETTLEMENT NEAR THE DISTRICT HOSPITAL IN STARA ZAGORA

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### Summary

The bone material was studied and the species of origin were identified. The following methods of analysis were used: osteometric method, method for determining the minimum number of individuals, method for identifying the species of sheep and goat bones. A total number of 3237 bone fragments of wild and domestic animals were analyzed and identified. They belonged to at least of 1 994 individuals. In this investigation, the bones of wild mammals make up 317 or 9.79% of the total number of bones, and these of domestic animals 2 917 or 90.11%.

**Key words:** archaeosteology, paleontology

### Introduction

The Neolithic age on the Balkans includes the period from 6 200 to 4 900 BC. The earliest evidence of life in the Kazanlak valley is from the Neolithic period, as exemplified by the excavations of the Kazanlak village mound [1].

The second most common archeological finds (after pottery fragments) are bones, as well as weapons and tools made from them, as confirmed by the archeosteological studies of the Azmashka settlement mound near the town of Stara Zagora [2]. The needles, stilettos, chisels, and picks were primarily made from the ribs and tubular bones of smaller ruminants. Traces of processing were found on other bones in a number of other archeological sites [3, 4, 5, 6].

Judging by the osteological material, we can assess the species and age variety, since bones of domesticated and wild animals were found in nearly all prehistoric sites [1, 7, 8, 9, 10, 11]. Examining the bones revealed that the predominant animal remains were from cattle, pigs, smaller ruminants, and wild animals wild pigs, does, deer [3, 4, 5, 6].

The aim of this study was to perform a species differentiation of the discovered bone material. The research data can be compared with data from other geographic locations, related to the Neolithic period. This would allow us to determine the influence of the various climatic conditions on domesticated and wild animal phenotypes.

### Materials and Methods

#### Materials

The osteological material included 2 915 species-differentiated bones and bone fragments of mammals and birds (Table 1), discovered in the Neolithic dwelling in the area of District Hospital of Stara Zagora.

**Table 1.** Distribution of animal bone material by species

	Early Neolith		Early Halcolith		Late Halcolith		Early Bronze Age		Middle Bronze Age		Total
	number	%	number	%	number	%	number	%	number	%	
<b>Birds</b>			3								<b>3</b>
<b>Mammals</b>											
<b>Wild</b>	103	32.49	178	56.15	17	5.36			19	5.99	<b>317</b>
<b>Domestic</b>	1170	40.11	1199	41.1	160	5.49	32	1.1	356	12.2	<b>2917</b>
<b>Total</b>	<b>1273</b>	<b>39.33</b>	<b>1380</b>	<b>42.63</b>	<b>177</b>	<b>5.47</b>	<b>32</b>	<b>0.99</b>	<b>375</b>	<b>11.58</b>	<b>3237</b>

The animal bones belonged to a minimum number of individuals (MNI) of 1 994, 192 of which were wild species, and 1 802 - domesticated, as presented in Table 2.

**Table 2.** Distribution of mammalian minimum number of individuals (MNI) according to the historic age

	Early Neolith		Early Halcolith		Late Halcolith		Early Bronze Age		Middle Bronze Age		Total
	number	%	number	%	number	%	number	%	number	%	
<b>Wild</b>	62	3.11	105	5.27	11	0.56			14	0.7	<b>192</b>
<b>Domestic</b>	810	40.62	666	33.4	86	4.31	20	1	220	11.03	<b>1802</b>
<b>Total</b>	<b>872</b>	<b>21.87</b>	<b>771</b>	<b>19.33</b>	<b>97</b>	<b>2.44</b>	<b>20</b>	<b>1</b>	<b>234</b>	<b>5.87</b>	<b>1994</b>

The bigger part of the found bones was the remains from the food of prehistoric people who dwelled in those settlements. They are heavily fragmented, bearing numerous scars of being worked on with hard tools. Some of them had been thermally processed, their colour changing from dark brown to black. Whole preserved bones were also found, mostly the limbs of bigger or smaller mammals. Long tubular bones were primarily fragmented, which in our belief was the result of their processing for food. The percentage of unidentified bones varied in the range of 58% or an average of 6.5%, which indicated a good overall condition of the bone material.

## Methods

We used the following methods for species differentiation of the osteological bone material:

Osteological differences between the genus *Ovis* and the genus *Capra* per Gromova [13].

Species differentiation of fragments from the distal end of sheep and goat tibia bones per Kratochvil [14].

Determination of the age of the domestic animals per Barone [15].

Method for determination of the minimum number of individuals per Beken [16].

Craniological and craniometric differences between the wild (*Felis silvestris* Schr.) and the domestic cat (*Felis lybica*) per Gerasimov et al. [17].

## Results and Discussion

### Comparative overview of the examined species

#### Birds

In the material obtained from the Neolithic dwellings, three bone fragments from a bird (period - early Halcolith), which belonged to two Greylag geese (*Anser anser* L.). were found out.

Greylag goose bones have been found in other prehistoric settlements as well - the Halcolith village at Ovcharovo [19] and Kazanlak [8]. These birds dwell primarily in and around swamps, lakes, rivers, and can also be encountered in the open fields during migration. There is no data about comparative studies between the prehistoric and current representatives of the species.

#### Wild mammals

We have found bone fragments from 9 wild mammalian species among the osteological material from the Neolithic dwellings near Stara Zagora. Not all species are represented in the different ages. Seven species were discovered in the cultural layers from the early Neolith, 8 in the early Halcolith layer, 4 in the late Halcolith layer, and 5 in the middle Bronze Age layer. No wild animal bones could be found in the layer of the early Bronze Age. The percentage distribution is presented in Table 3.

**Hare - *Lepus europeus* Pall.**

The osteological material from the settlement included 39 hare bones (Table 3). They belonged to minimum of 30 individuals, divided as followed: 10 from the early Neolith, 19 - early Halcolith, and 1 from the middle Bronze Age.

Wild hare bones have been found at other prehistoric sites in small numbers. At the Neolithic dwellings near Kazanlak, hare bones made up 0.35% of all bones and 1.24% of the minimum number of individuals [8]. At the Halcolith dwelling near Ovcharovo, wild hare bones accounted for 0.41% of all bones and 1.55 of individuals [18], while at the late Neolithic material from Yasatepe in Plovdiv hare bones represented only 0.10% of all bones and 0.50 of individuals. It is likely that the conditions in the prehistoric age were not beneficial to wild hares, and larger animals were more preferred as hunting objects [19].

Among the bone material there were mostly hip bones from the region of the acetabulum. Of hindlimbs, fragments from bones under the knee were predominant.

**Beaver - *Castor fiber* L.**

The beaver was represented by only one fragment - shoulder bone from the early Halcolith, belonging to one individual. There were no traces of tools on the fragment, so no conclusion could be made whether this species was an object of consumption. Vasilev [18] claims that beavers were used for food during the Halcolith, based on discovered traces of food preparation on the bones.

Beaver remains have been discovered in the Neolithic dwellings near Kazanlak - 0.65% of all bones [8], in Golyamo Delchevo - 0.28% and 1.67% of MNI [19], and early Bronze Age dwellings at Ezero - 0.05% of bones and 0.17% of MNI [20]. These percentages are lower at Ovcharovo, respectively - 0.007% and 0.07%.

**Fox - *Vulpes vulpes* L.**

There were 7 bone fragments from foxes, belonging to no less than 5 individuals, among the bone material from the Neolithic dwellings. No traces of cooking preparations could be found on them, which suggests that foxes were not the object of consumption for prehistoric people. Popov [21] claims that foxes were hunted for food, but that has not been confirmed by any known reference.

The scarce data from comparative studies of the discovered fox bones is focused primarily in the area

of the lower jaw, based on odontometric studies. The sizes of prehistoric foxes in Ovcharovo, as well as the ones found at other sites, are close to the maximum, compared to contemporary foxes. This led us to the conclusion that the prehistoric fox did not have significant differences in terms of size.

**Badger - *Meles meles* L.**

Only one badger bone was found. It is accepted that it belonged to 1 individual. It is a hip bone from the early Halcolith age. Badger bones have been found at other sites as well - Yasatepe, Golyamo Delchevo, Ovcharovo, and Kazanlak. These studies showed limited presence of badger bones - below 1%. Therefore, this species was not widely spread during the Neolith and Halcolith [18].

**Wild boar - *Sus scrofa* L.**

The wild boar was represented by 115 bones, divided as follows: 30 from the early Neolith, 76 from the early Halcolith, 6 from the late Halcolith, 3 from the middle Bronze Age, belonging to a MNI as follows - 17 from the early Neolith, 35 from the early Halcolith, 4 from the late Halcolith, and 2 from the middle Bronze Age. Considering the overall bone material, the wild boar was represented the most among the wild animals. Boar bones have been found in a number of prehistoric sites, such as Yasatepe (1.32% of all bones), Rakitovo (3.06%), Golyamo Delchevo (11.10%), Kazanlak (11.67%), and Ovcharovo (9.62%).

Ivanov et al. [19] and Kovachev [8] compared the osteometric data of prehistoric wild boars with data about other boars from the villages Golyamo Delchevo, the Emenska cave, Madara, and Ezero. They found out that the animals' sizes varied in nearly the same ranges, and had very similar mean values.

**Roe deer - *Capreolus capreolus* L.**

There were 78 deer bones - 44 from the early Neolith, 32 from the early Halcolith, 5 from the late Halcolith, and 2 from the middle Bronze Age. They originated from a total of 32 individuals - 1.61% of all animals and 18.29% of the group (Table 3). The number of roe deer bones was the second-highest (after the wild boar), and the number of individuals was the third-highest after the boar and the red deer. Like the wild boar, the roe deer was widely spread in the region during the Neolith and the Halcolith. Roe deer bones have been found at several sites, such as Golyamo Delchevo [19], Ezero [20], and Kazanlak [1], where similar osteometric studies have been performed. On this basis, Vasilev [18] determined that there were visible changes in the roe deer's size during the Halcolith, which he explained with the climatic changes of that age.

**Red deer - *Cervus elaphus* L.**

There were 56 found red deer bones, belonging to no less than 37 individuals, as follows: 5 from the early Neolith, 24 from the early Halcolith, 1 from the late Halcolith, and 7 from the middle Bronze Age. The amount of individual bone material places the red deer as the second-most common of the wild animals as an object of hunting (after the wild boar). The red deer

and the roe deer were widely spread in those ages, as proven by the fact that their bones have been found in nearly all prehistoric village mounds. In Kazanlak, red deer bones account for 18.49% of all bones and 12.4% of individuals. In Rakitovo, the percentages are 14.11% and 14.87%, in Yasatepe - 5.22% and 3.74%, respectively. In Ovcharovo the red deer is represented with the highest values - 25.09% of the bones and 14.87% of the individuals. Compared to the other sites we mentioned, at the village we studied the percentage of red deer individuals was higher than the number of roe deer.

The osteometric studies performed on red deer bones did not show any significant differences in the animals' size in any of the prehistoric mounds [18, 8].

#### **Aurochs - *Bos primigenius* Boj.**

In the material from the Neolithic dwellings in Stara Zagora, there were 5 bones fragment from aurochs, all of them belonging to the late Halcolith. They originated for at least 3 individuals, which makes up 0.15% of all individuals.

Aurochs bones have been found in many other prehistoric sites in Bulgaria. They are encountered most in the sites at Ezero - 4.33% for the Halcolith and 4.12% for the early Bronze Age, in Rakitovo - 4.39%, in Ovcharovo - 2.16%, and Kazanlak - 2.14% of all bones and 3.1% of individuals. The percentage of aurochs was the lowest in the current study. Bokonyi [22] studied the Neolithic aurochs in Hungary and found that it was widely spread and an object of hunting by the local population.

#### **Domestic mammals**

##### **Cattle - *Bos primigenius f. taurus* L.**

Cattle bones were the most common at the dwellings near Stara Zagora - 1293, which made up 43.54% of all bones or 49.41% in the domestic animals group. The osteological material originated from 865 individuals, which was 43.54% of their total number and 47.74% in the group. There were 321 individuals from the early Neolith, 356 from the early Halcolith, 541 from the late Halcolith, 8 from the early Bronze Age, and 126 from the middle Bronze Age. The large difference in the numbers from the Halcolith and the early Bronze Age drew our attention. This was probably because during that age there was a break in dwelling within the area, due to destruction by fire.

There were large amounts of cattle bones at all prehistoric sites in the country, evidencing that the breeding of these animals was widely-spread. In Kazanlak, cattle bones accounted for 31.56% of all bones and 17.45% of individuals, in Rakitovo the percentages were, respectively, 44.45% and 32.34%, at Yasatepe - 67.03% and 54.27%, and in Ovcharovo - 34.5% of all bones [1, 7, 8, 18].

Obtained data put the village mound near Stara Zagora at one of the top positions in terms of the amount of cattle bones found there; evenly distributed regarding the skeleton, with mostly bones from the head, lower jaw, and limbs. Whole bones were rarely found. Most preserved were bones from the carpal and

tarsal joints, which can help us determine the animals' height up to the withers, their weight, and the amount of meat that could be obtained from them for food.

##### **Small ruminants**

Small ruminants, including sheep and goats, were second-most common among the domestic animals (after cattle) with 726 found bones and 502 individuals. Their origins were divided as follows: 270 from the early Neolith, 177 from the early Halcolith, 11 from the late Halcolith, 5 from the early Bronze Age, and 29 from the middle Bronze Age. In percentages - these were 25.26% of all individuals.

At other sites, there were varying percentages of sheep and goat bones: in Kazanlak - 15.85% of all bones and 21.3% of individuals, in Ezero for the early Bronze Age - 21.88% of all bones and 31.93% of individuals, in Golyamo Delchevo for the Halcolith age - 5.14% of all bones and 16.04% of individuals, and in Ovcharovo - 10.1% and 16.85% respectively.

At the examined site, bone material from small ruminants was heavily fragmented - out of 1 026 bones only 726 were differentiated as belonging to sheep or goats, which was 70.76% of all small ruminant bones, belonging to a total of 502 individuals, with the ratio of sheep:goats being 2.77:1.

Heavily fragmented and non-differentiated bones were not included in the measurements.

##### **Sheep - *Ovis amon f. aries* L.**

There were 499 sheep bones found and they are the third-most common (after cattle and pigs) with 17.03% of all bones and 19.07% in the group. The number of individuals was 369 or 18.57% of all, 20.36% in the group.

It should be noted that only one sheep horn and a few preserved skulls have been found. The results were similar in the studies of the bone material from Kazanlak [8]. Despite the availability of data about a domesticated "copper" sheep during the Halcolith [18], the breeding of hornless sheep could not be accepted for certain, even though they have been bred in Hungary and Yugoslavia [22].

After comparative osteological studies of the sheep from Kazanlak and other sites, Kovachev [1] established that a relatively large breed of sheep had been bred, compared to the sheep from the Halcolith, which matched metrically the sheep from the early Bronze Age from Ezero. [20]. A sheep close to the Neolithic one from Kazanlak was the early Neolith sheep in Rakitovo [8].

##### **Goat - *Capra aegagrus f. hircus***

At the site near the District Hospital 227 bones and fragments from goats were identified - 118 from the early Neolith, 97 from the early Halcolith, 2 from the late Halcolith, and 10 from the middle Bronze Age. They belonged to 133 individuals - 6.69% of the total number and 7.34% in the group. By the number of bones, the goat was the fourth-most common animal, representing 7.75% of all bones or 8.67% in the group (Table 3).

It should be noted that no goat bones from the early

Bronze Age have been found. Compared to sheep, there were more horn findings from goats, yet they were not enough for a full metric profile and comparison with goats from other sites to be performed.

The largest amount of bones and bone fragments belonged to the early Neolith (118) and early Halcolith (97), while the lowest - the late Halcolith (2) and the middle Bronze Age (10), distributed evenly during the initial two periods. There were no bones from the fingers and the tarsal joint.

**Pig - *Sus scrofa f. domestica* L.**

In the material from the prehistoric village, 540 bones and bone fragments from pigs could be found, divided as follows: early Neolith - 226, early Halcolith - 202, late Halcolith - 32, early Bronze Age - 10 and middle Bronze Age - 70. They belonged to a total of 405 individuals, which accounted for 18.43% of all bones, 20.38% of the individuals, and 22.35% of the domestic animals group. By the number of bones, pigs were the

third-most common animal after cattle and sheep, and by the number of individuals it was on the second place after cattle.

Bones of domestic pigs have been found in other prehistoric sites: in Kazanlak - 8.28% of the bones and 10.69% of the individuals [8], in Ovcharovo (early Halcolith) the pig was on the second place according to number of bones and on the first place according to number of individuals [18], in Rakitovo - 7.79% of the bones and 11.11% of individuals respectively, in Ezero (early Bronze Age) - 19.37 % and 25.32% [20]. Thus, the Neolithic dwelling near Stara Zagora took one of the leading positions with its number of domestic pig bones, indicating that pigs had already been domesticated in this region, and confirming the theory of Bekeni [23] that the domestication of pigs began on the Balkan Peninsula in the period of the early Neolith.

During the Halcolith, pigs had a leading role in animal breeding, and had equal height and weight indicators in Ovcharovo [18]. Therefore, the author

**Table 3.** Distribution of bone and minimum number of individuals by animal species for the settlement as a whole

Animal species	bones			individuals		
	number	%	% of group	number	%	% of group
<b>Wild</b>						
Wild pigs	115	3.93	36.74	58	2.93	33.14
Red deers	78	2.66	24.92	32	1.61	18.29
Roe deers	56	1.91	17.89	37	1.86	21.14
Foxes	7	0.24	2.24	6	0.3	3.43
Jackals	3	0.1	0.96	2	0.1	1.14
Badgers	1	0.03	0.32	1	0.05	0.57
Martens	7	0.24	2.24	4	0.2	2.29
Beavers	1	0.03	0.32	1	0.05	0.57
Hares	39	1.33	12.46	30	1.51	17.15
Horses	1	0.03	0.32	1	0.05	0.57
Aurochs	5	0.17	1.59	3	0.15	1.71
<b>Total wild</b>	<b>313</b>	<b>10.67</b>	<b>100</b>	<b>175</b>	<b>8.81</b>	<b>100</b>
<b>Domestic</b>						
Cattle	1293	44.13	49.41	865	43.54	47.74
Sheep	499	17.03	19.07	369	18.57	20.36
Goats	227	7.75	8.67	133	6.69	7.34
Pigs	540	18.43	20.63	405	20.38	22.35
Dogs	58	1.99	2.22	40	2.01	2.21
<b>Total domestic</b>	<b>2617</b>	<b>89.33</b>	<b>100</b>	<b>1812</b>	<b>91.19</b>	<b>100</b>
<b>Total animals</b>	<b>2930</b>	<b>100</b>		<b>1987</b>	<b>100</b>	

accepted that the domestication of pigs occurred far before the Halcolith.

In Kazanlak, Kovachev [1] determined through osteometric studies the height at the withers of the Neolithic pig and defined it as a mammal with a size similar to that of a wild boar, rather than the size of the Halcolith pig. The author determined the height at the withers to be, in average, 84.3 cm, compared to the height of the wild boar - 99.4 cm.

#### **Dog - *Canis lupus f. familiaris* L.**

There were 58 dog bones in the examined material, which made up 1.99% of all bones and 2.22% of the group, divided as follows: early Neolith - 31, early Halcolith - 26 and middle Bronze Age - 1. They belonged to 40 individuals or 2.01% of all individuals and 2.21% of the group (Table 3). It is interesting to note that dog bones have not been found for the ages of late Halcolith and early Bronze Age.

Dog bones have been found at other similar sites, such as in Golyamo Delchevo, where they accounted for 1.76% of all bones and 5.67% of all individuals [19]. In Kazanlak, dog bones represented 1.55% of all bones and 3.53% of individuals [1], and in Ovcharovo, respectively, 2.56% and 5% [18]. With the exception of the fact that we could find no dog bones from the late Halcolith period, there were no percentage differences regarding the presence of dogs, compared to other known prehistoric settlement mounds throughout the country.

The lack of preserved skulls prevented us from performing full craniometrical studies and comparative analysis.

## **Conclusions**

The significant amounts of bone material indicated well-developed agricultural and animal breeding activities, typical for a settled way of life. In the Neolithic dwelling near the District Hospital in Stara Zagora, there were mostly bones of domesticated animals, especially large ruminants, followed by small ruminants and pigs similarly to other examined settlement mounds. Bones of wild animals included remains of boars, roe deers, hares and red deers, which provided evidence that hunting was an important aspect of the local people's way of life.

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