Middle age horses from the western borders of Khazar Khaganate (saltovo-mayaki culture of eastern Ukraine)

Abstract

The article describes the early Middle Age horse skeletal remains yielded by the Saltovo-Mayaki archaeological sites from Eastern Ukraine. According to the obtained results, the Saltovo-Mayaki domestic breed represents an improved riding horse with the medium height at the withers, thin and semi-thin metacarpals, elongated phalanges, moderately short muzzle, relatively large cheek teeth and long protocones in upper cheek teeth. A large number of juveniles and few seniles in the studied sample suggest that Saltovo-Mayaki Culture bearers practised hippophagy. This conclusion is supported by the recorded cutting tool marks on horse bones.

Keywords: early middle age, saltovo-mayaki culture, horse, morphology, hippophagy

Introduction

The Medieval polyethnic bearers of the Saltovo-Mayaki Culture from the Seversky Donets area (Kharkiv and Lugansk Provinces, Ukraine) were closely associated with the Khazar Khaganate and left a large number of archaeological monuments in the Pontic steppe region and adjacent steppe-forest area roughly between the Don and the Dnieper Rivers. The 10th century is regarded as the upper chronological border of the Saltovo-Mayaki Culture (or Saltov Culture), while the archaeological sites from the Seversky Donets area included in the present study are dated back to 9th century.1−3 Various variants of the Saltovo-Mayaki Culture represent specific stages of social-economic transition from nomadism to semi-sedentary agropastoralism.4 Horses remained an important domestic animal in the Saltovo-Mayaki Culture and represented a direct link between the nomadic past and the socio-economic relationships within the groups of Saltovo-Mayaki Culture bearers.5,6 The horse in the Saltovo-Mayaki Culture was not only an important source of food, draft force and transport mean, but also was considered sacred and sacrificial animal.5,9 Nonetheless, Khazar horses are still very little known despite the rich archaeozoological material yielded by the Saltovo-Mayaki sites, while the published characteristics of the Khazar horse breeds are incomplete and contradictory. Matolcsy7 reported the horses from the Mayaki Site as animals with the low (134.2cm) and medium (134.0-141.8cm) height at the withers. Pletnetova’s8 analysis of Saltovo-Mayaki horse images suggest the presence of two distinct horse breeds: a long-limbed breed with small heads and a robust short-limbed breed with relatively short limbs. Our research team of the Kharkiv National Pedagogic University under the direction of Prof. Vladimir Koloda.10−11 The part of archaeozoological horse remains (including the horse skull, phalanges, and long limb bones) are stored in the Institute of Zoology (Chisinau, Moldova).

The measurements of cranial and postcranial material are taken according to Vitt.15 The classification of horse limb robustness is adapted from Brauner.19 All measurements are given in millimeters, with exception of heights at the withers, which is indicated in centimeters. The age structure of horse remains is based on the record of an individual ontogenetic stage of dentition development: individuals with milk teeth are reported as “juveniles”; individuals with deeply worn teeth are reported as “seniles”, while the individuals with fully developed functioning dentition are reported as “adults”.

The following samples are included in the comparative analysis.

A. The presumed ancient domestic horse from Botai (the third millennium BC, Northern Kazakhstan) described by

Abbreviations: L, length; DLM, lateromedial diameter or measurement; DAP anteroposterior diameter or measurement; ANT, anterior; POST, posterior; DIAPH, diaphysis

Keywords: early middle age, saltovo-mayaki culture, horse, morphology, hippophagy

Introduction

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The present study aim is a detailed morphological, taphonomic, and demographic analysis of horse remains from the Saltovo-Mayaki archaeological sites of Eastern Ukraine and the comparative characteristic of the Saltovo-Mayaki horse breed and the use of horse by the Saltovo-Mayaki Culture bearers. The archaeozoological assemblages from the Saltovo-Mayaki sites in most cases are dominated by cattle (from 48.2% of the total number of individuals of domestic animals in the Mohnach Site to 17.6% in the Mayaki Site); small cattle (48.8-18.5%) and domestic pig (33.9-6.8%) remain an important source of meat.10−11 The structure of the Saltovo-Mayaki domestic animal assemblage suggests a rather strong dependence of water sources (cattle) and a rather sedentary farming (important presence of pig remains). Nonetheless, the horse remains are still quite numerous on Saltovo-Mayaki sites and vary from 12% of the total number of domestic animal individuals in Mayaki to 32.5% at Karhauhovo.8

Research methods and material

The archaeozoological material comes mostly from the Saltovo-Mayaki archaeological sites situated in the valley of Seversky Donets River on the territory of Kharkiv Province, with exception of Faschevka site situated on the territory of Lugansk Province, Ukraine (Figure 1). The archaeological excavations were carried out by the research team of the Kharkiv National Pedagogic University under the direction of Prof. Vladimir Koloda.10−11 The part of archaeozoological horse remains (including the horse skull, phalanges, and long limb bones) are stored in the Institute of Zoology (Chisinau, Moldova).

The measurements of cranial and postcranial material are taken according to Gromova14−15 and Kuzmina.16 The body mass estimation is based on craniodental variables according to the methodology proposed by Janis.17 The height at the withers is estimated according to Vitt.15 The classification of horse limb robustness is adapted from Brauner.19 All measurements are given in millimeters, with exception of heights at the withers, which is indicated in centimeters. The age structure of horse remains is based on the record of an individual ontogenetic stage of dentition development: individuals with milk teeth are reported as “juveniles”; individuals with deeply worn teeth are reported as “seniles”, while the individuals with fully developed functioning dentition are reported as “adults”.

The following samples are included in the comparative analysis.

A. The presumed ancient domestic horse from Botai (the third millennium BC, Northern Kazakhstan) described by
Middle age horses from the western borders of Khazar Khaganate (saltovo-mayaki culture of eastern Ukraine)

A. The mean values (as in the case of other samples) of measurements provided by Kuzmina\textsuperscript{16} are used in this paper. It is necessary to indicate that Levine\textsuperscript{20} believes that the majority of horses from Botai were killed in the hunt;

B. The “ritual” skull of domestic horse from Dereivka described in details by Bibikova\textsuperscript{21}. The originally assumed Chalcolithic age for this specimen was subsequently discarded by the radiocarbon dates that revealed a much younger age for this specimen;\textsuperscript{20}

C. The complete skeleton of one of the horse individual that was considered as one of the last true wild tarpons. This specimen is known as “Shatilov’s tarpan” since the individual in question was donated to the Academy of Sciences of Sankt-Petersburg in 1862 by Russian naturalist Iosif Shatilov. The complete skeleton of this individual with collection number 521 is stored today in the Zoological Institute in Sankt-Petersburg. Kuzmina\textsuperscript{16} regards this specimen as a paralectotype of Equus gmelini Antonius, 1912. Geptner\textsuperscript{22} and Gromova\textsuperscript{15} admit that “Shatilov’s tarpan” contained a certain admixture of domestic horse blood. The statistical analysis of cranial measurements carried out by Spasskaya & Pavlinov\textsuperscript{23} demonstrated that the “Shatilov’s tarpan” is conspecific with the domestic horse Equus ferus caballus L. Since the skeleton of the “Shatilov’s tarpan” is studied in greatest details,\textsuperscript{14−16,23,24} it represents a certain interest for the comparative study;

D. The subfossil remains of wild tarpan Equus ferus ferus Boddaert, 1785 (= Equus gmelini Antonius, 1912) from Holocene of Eastern Europe;\textsuperscript{16}

E. Equus ferus uralensis Kuzmina, 1975 (= Equus caballus uralensis Kuzmina, 1975) from Late Pleistocene and Early Holocene of the Urals and North Caspian Area, Russia.\textsuperscript{16}

F. Equus przewalskii Polyakov, 1881 is represented by a large sample (22 skulls and 11 skeletons) stored in the osteological collections of Russia and Ukraine.\textsuperscript{16} Some of the measurements (length of nasal bones and the distance between the anterior edge of orbit and the prosthion point) are adapted from Gromova\textsuperscript{14} and are based on a smaller sample (n=3).

**Figure 1** The Saltovo-Mayaki archaeological sites studied and discussed in the present study: (1) Mayaki. (2) Volchanski. (3) Upper Saltov. (4) Piatnitskoe 1. (5) Mohnach. (6) Korobovyi Hutora. (7) Roganina. (8) Faschevka.

**Figure 2** Skull proportions of wild and ancient domestic horses compared; for explanations see the Table 1.

The skull from Piatnitskoe-1 is well preserved and just damaged in the anteorbital area, therefore the distance between orbit and the prosthion point was unavailable for measuring. The skull belongs to a rather large young adult male. The size of the skull from Piatnitskoe-1 exceeds the mean values of the cranial series of coeval domestic horses from Rurik Hillfort (Northwestern Russia) (Tables 1 & Table 2) and rivals the largest skulls of the sample. The skull is characterized by a relatively short muzzle, which is significantly shorter than in the horse from Dereivka, and somewhat shorter than in the horses from Botai (Table 1) (Figure 2). The skull is relatively broader at the posterior edges of orbits: this measurement attains 43.6% of the basal length in the skull from Piatnitskoe and this value is quite close to that of the sample from Botai (44.2%).

The skull from Dereivka is somewhat narrower (43.0%), apparently, because of its relatively long muzzle. Wild horses involved in the comparison (“Shatilov’s tarpan”, Equus przewalskii, and Equus sp. from Liakhovsky Island) are characterized by the relatively narrower skulls (the frontal breadth to basal length ratio amounts to 42.9% in all three cases).
or a specific morphological character caused by domestication. The available data from literature give very little information of the relative length of nasal bones in horses. It is important to mention that the domestic horse skull from Dereivka is also characterized by relatively short nasal bones (44.0%), which are just slightly longer than those in the stallion from Piatnitskoe-1. The dental morphology of the stallion from Piatnitskoe is typical for the species Equus ferus, while the relatively long protocone in upper cheek teeth clearly distinguishes the specimen under study from wild tarpan (Piatnitskoe-1) (Table 3 & Table 4). Actually, the skull from Piatnitskoe is characterized by the relatively longest protocone in P3-M2 among the specimens and samples involved in the comparison (Figure 3). However, the protocone of M3 is relatively shorter and this character approaches the stallion from Piatnitskoe to the subfossil tarpan Equus ferus (Figure 3).

| Measurement                      | Piatnitskoe-1 | Dereivka (nr. 44-1192) | Botai | Rurik Hillfort* | E. ferus (ZIN-521) | E. ferus uralensis | E. ferus ssp. (Lyakhovsky Islands) | E. przewalskii* |
|----------------------------------|---------------|------------------------|-------|----------------|-------------------|-------------------|-----------------------------------|-----------------|
| Condylobasal length              | 513           | 493                    |       |                |                   |                   |                                   |                 |
| Basal length                     | 486           | 500                    | 490   | 479.4          | 468               | 517               | 501                               | 481.5           |
| Premolar-basal length            | 363           | 353.1                  | 351   | 378            |                   |                   |                                   |                 |
| Distance between opisthocranion and prosthion | 545      | 546                    | 520.4 | 520            |                   |                   |                                   |                 |
| Distance between prosthion and P2 | 123           | 152                    | 128.2 | 121            | 122               | 174               |                                   | 118             |
| Distance between prosthion and orbit | 335       | 308.9                  | 303   | 320            | 320               | 321               |                                   |                 |
| Upper cheek tooth row length (P2-M3) | 175         | 170                    | 180.8 | 164            | 171               | 175.5             | 174                               | 177.7           |
| Upper premolar series length (P2-P4) | 93           | 89.7                   |       |                |                   |                   |                                   |                 |
| Upper molar series length (M1-M3) | 80.4          | 77.3                   |       |                |                   |                   |                                   |                 |
| Length of diastema               | 90.2          | 108                    | 96.7  | 95.8           | 84                | 103               |                                   | 87.8            |
| Palatal length                   | 266           | 270                    | 267   | 255            | 266               | 262.7             |                                   |                 |
| Length of nasal bones            | 193           | 220                    | 239   |                |                   |                   |                                   |                 |
| Breadth of nasal bones           | 113.7         | 120                    |       | 108            |                   |                   |                                   |                 |
| Breadth of upper incisors        | 70.7          | 76                     | 73.3  | 67.3           | 67                | 72                |                                   | 70.2            |
| Maximum breadth of skull (behind orbits) | 212      | 215                    | 216.7 | 201.6          | 201               | 214               | 215                               | 206.6           |
| Length P2 – occipital condyles   | 388           |                        |       |                |                   |                   |                                   |                 |
| Height of occipit                | 100.1         | 88.5                   | 88    | 102            |                   |                   |                                   |                 |
| Breadth of occipit               | 121.6         |                        |       |                |                   |                   |                                   |                 |
| Breadth of condyles              | 87.1          | 78.3                   |       |                |                   |                   |                                   |                 |

**Table 2** Mandibular measurements of ancient domestic and wild horses

| Measurement                      | Piatnitskoe-1 | Dereivka | Shatilov’s tarpan | E. ferus uralensis | E. ferus ssp. (Lyakhovsky Islands) | E. przewalskii* |
|----------------------------------|---------------|----------|-------------------|-------------------|-----------------------------------|-----------------|
| Mandibular length                | 410           | 434      | 418               | 430.0-448.0       | 422.2                             |                 |
| Length of lower cheek tooth row (P2-M3) | 171          | 176      | 177               | 180.5             |                                   |                 |
| Length of lower premolar series (P2-P4) | 82.3      | 88       |                   |                   |                                   |                 |
| Length of lower molar series (M1-M3) | 80.7          | 78       |                   |                   |                                   |                 |
| Length of diastema               | 76.1          | 93       | 79.5              | 100.0; 102.0      | 83.6                              |                 |
| Height of diastema in the middle | 42            |          |                   |                   |                                   |                 |
| Mandible height below P2         | 59.5          | 53       | 46                | 59                | 55.2                              |                 |
| Mandible height below M1         | 74.7          |          | 69                | 81                | 80.1                              |                 |
| Mandible height below M3         | 107.8         | 95       | 110               | 109.2             |                                   |                 |

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The estimated body mass of the stallion from Piatnitskoe-1 based on craniodental variables attains ca. 580 kg. The basal length of skull corresponds to 144-136 cm of the height at withers and belongs to the “medium height at withers” category according to the classification of Witt.\textsuperscript{18} Limb bones. Metapodials of the Saltov horses (Table 5 & Table 6) are comparatively gracile and approach in size and proportions modern E. przewalskii. Its metacarpals are much thinner than in the extinct horse E. f. uralensis and thinner and smaller than metacarpals of the horse from Botai (Figure 4). It is necessary to indicate that metacarpals of Saltov and Botai horses are quite distinct and their measurements do not overlap. The complete metacarpal from Piatnitskoe-1 is characterized by the narrowest diaphysis among the compared horse samples (its diaphysis breadth/total length of metacarpal ratio amounts to 13.9\%) and belongs to the so-called “thin legged horses” according to the definition given by Brauner.\textsuperscript{19} Another metacarpal from Upper Saltov with robustness index 14.4\% also belongs to this category of horses. Two complete metacarpals from Upper Saltov and Mohnach with robustness indexes 15.0\% and 15.5\% respectively fall within Brauner’s “semi-thin legged” type of horses (Figure 5). Therefore, the Saltov horses are characterized by remarkably thin limbs similar to those of modern E. przewalskii and are distinguished from the robust horses from Botai and the extinct horses from Eurasia (E. f. ferus, E. f. uralensis, E. f. lenensis, E. f. latipes).

However, unlike E. przewalskii, the Saltov horse is characterized by larger and more robust first phalanx (Table 7, Table 8 & Figure 6). Nonetheless, the first phalanx of Saltov horses are still more gracile if compared to Botai horse and E. f. uralensis, and elongated if compared to E. f. ferus. The second anterior phalanx show the similar differences in size and proportions among the compared samples, but the overlaps of variation ranges are broader (Table 9, Table 10 & Figure 7). The estimation of height at withers based on available complete metapodials gave the following results (Table 5 & Table 6): three metatarsals and one metacarpal from Upper Saltov correspond to the “medium height at withers” category, while one metatarsal and one metacarpal from Upper Saltov correspond to the Witt’s category “below medium height at withers” (136-128 cm). Two metatarsals (one from Piatnitskoe-1 and another from Mohnach) also correspond to this smaller class of horse height at withers. Evidence of hippophagy. The traces of butchering on horse bones and the age profile of horse individuals found in the Saltov archaeological sites are reported here as evidence of hippophagy practice. It is important to indicate that 12 of 43 individuals recorded in the archaeological sites under study are juvenile, while only three individuals (a male individual from Mohnach and two individuals from Piatnitskoe-1 that yielded half of the recorded horse individuals) are classified as senile (Figure 8). This demographic structure of horse remains is quite different from the early Iron Age Uch-Bash material, where senile individuals attained ca. 45\% of the total individual number (18 individuals) and still different from the Iron Age Getic archaeozoological material from Moldova (Croitor, unpublished data) where juvenile individuals are quite rare (2 of 16 individuals).
isolated teeth and a fragment of long bone diaphysis) is recorded at Roganina site.

Figure 6 Measurements of first anterior phalanxes of ancient domestic and wild horses. For series samples, medium values and absolute ranges are shown.

Figure 7 Measurements of second anterior phalanxes of ancient domestic and wild horses. For series samples, medium values and absolute ranges are shown.

Table 3 Measurements of upper cheek teeth of the stallion mandible from Piatnitskoe-1

| Measurement | P2 | P3 | P4 | M1 | M2 | M3 |
|-------------|----|----|----|----|----|----|
| Length (sin) | 38.1 | 27.8 | 26.8 | 23.8 | 24.3 | 29.2 |
| Breadth (sin) | 23.5 | 26.7 | 27.6 | 27.1 | 25.7 | 24.1 |
| Protocone length (sin) | 9.7 | 13.6 | 14 | 13.3 | 14 | 14.1 |
| Length (dx) | 38.6 | 28.6 | 27 | 23.3 | 24 | 30.2 |
| Breadth (dx) | 23.4 | 26.8 | 26.8 | 26.8 | 25.4 | 23.9 |
| Protocone length (dx) | 10 | 13.7 | 13.9 | 13.2 | 13.7 | 13.8 |

Table 4 Measurements of lower cheek teeth of the stallion mandible from Piatnitskoe-1

| Measurement | P2 | P3 | P4 | M1 | M2 | M3 |
|-------------|----|----|----|----|----|----|
| Length | 33.4 | 26.5 | 14.6 | 25 | 24.5 | 32.1 |
| Breadth | 17 | 18.8 | 18.8 | 18.5 | 17.7 | 16.4 |

Table 5 Measurements of horse metacarpals from the Saltovo-Mayaki archaeological sites

| Site | L | LDMdiaph | DLMprox | DAPprox | DLMdist | Height at withers |
|------|---|----------|---------|---------|---------|------------------|
| Piatnitskoe-I | 216 | 30 | 46 | 45.9 | 136-128 |
| Upper Saltov | 211 | 31.6 | 44 | 32.1 | 44.2 | 136-128 |
| Upper Saltov | 225 | 32.3 | 53 | 48.7 | 144-136 |
| Upper Saltov | 48.4 | 31.8 | |
| Upper Saltov | 49.4 | 31.6 | |
| Upper Saltov | 50.6 | 32.2 | |
| Mohnach | 211 | 32.7 | 47.4 | 31.1 | 44.7 | 136-128 |

Table 6 Measurements of horse metatarsals from the Saltovo-Mayaki archaeological sites

| Site | L | DLMprox | DAPprox | DLMdist | DAPdist | Height at withers |
|------|---|---------|---------|---------|---------|------------------|
| Upper Saltov | 270 | 49.2 | 47.6 | 49 | 58 | 144-136 |
| Upper Saltov | 262 | 50.4 | 48.5 | 48.5 | 36.4 | 144-136 |
| Upper Saltov | 265 | 50.6 | 38.3 | 144-136 |
| Upper Saltov | 250 | 45.9 | 39.6 | 46.8 | 36.7 | 136-128 |
| Upper Saltov | 50.3 | 42.9 | |
### Table 7 Measurements of anterior first phalanxes of horses from the Saltovo-Mayaki archaeological sites

| Site         | L    | DLMprox | DAPprox | DLMdiaph | DLMdist | DAPdist |
|--------------|------|---------|---------|----------|---------|---------|
| Piatnitskoe-1| 75.3 | 52      | 31.1    | 36       | 45.5    | 26.2    |
| Piatnitskoe-1| 83.5 | 54.5    | 32.3    | 37.5     | 46.6    | 26.6    |
| Vodianoe     | 79.5 | 57      | 38      | 38.1     | 47.7    | 24      |
| Korobovy Hutora| 78.1 | 57.3    | 37.4    | 35.1     | 49.5    | 25.9    |
| Korobovy Hutora| 74.3 | 56.5    | 38.2    | 35.3     | 42.7    | 23.5    |
| Korobovy Hutora| 76.8 | 55.3    | 37.6    | 34.7     | 44.3    | 26.5    |
| Roganina     | 80.7 | 51.5    | 35.3    | 37.8     | 45.3    | 26.4    |
| Upper Saltov | 81   | 58.8    | 31.7    | 36.8     | 45.7    | 26.1    |
| Upper Saltov | 74.5 | 55.3    | 42      | 34       | 43.6    | 24.7    |
| Upper Saltov | 76   | 55.2    | 37.9    | 37.4     | 46.6    | 27      |
| Upper Saltov | 78.3 | 54.8    | 28.2    | 34.3     | 43.5    | 24.3    |
| Faschevka    | 80.2 | 53.8    | 33      | 36.7     | 48      | 29      |
| Faschevka    | 80.4 | 55.6    | 33.3    | 34.5     | 48      | 27      |
| Faschevka    | 84.4 | 59.7    | 34      | 38.5     | 47.7    | 27      |

### Table 8 Measurements of posterior first phalanxes of horses from the Saltov archaeological sites

| Site         | L    | DLMprox | DAPprox | DLMdiaph | DLMdist | DAPdist |
|--------------|------|---------|---------|----------|---------|---------|
| Korobovy Hutora| 73.6 | 55.8    | 37.2    | 35       | 44.2    | 23.6    |
| Korobovy Hutora| 73.5 | 55      | 33.8    | 41.6     | 23.8    |
| Korobovy Hutora| 71.5 | 52.3    | 38.8    | 33.5     | 42.3    | 25.2    |
| Korobovy Hutora| 72.6 | 49.5    | 33.5    | 31.5     | 39.7    | 23.5    |
| Korobovy Hutora| 74.2 | 48      | 34      | 32.9     | 41.4    | 22.7    |
| Upper Saltov | 73.5 | 49.2    | 28.6    | 34.8     | 40.3    | 23.3    |
| Upper Saltov | 71.3 | 53.5    | 38.4    | 35.3     | 41      | 24.7    |
| Upper Saltov | 71   | 52.5    | 29      | 34       | 40.2    | 23.2    |
| Upper Saltov | 72.6 | 49.8    | 27.5    | 31       | 40.1    | 22.9    |
| Upper Saltov | 72.3 | 51.3    | 30.2    | 30       | 39.4    | 24      |
| Faschevka    | 76   | 60.6    | 32.5    | 37.3     | 46.6    | 27.1    |
| Volchansk-2  | 75.3 | 55      | 29.6    | 33.3     | 40.4    | 24      |

### Table 9 Measurements of anterior second phalanxes of horses from the Saltov archaeological sites

| Site         | L    | DLMprox | DAPprox | DLMdiaph | DLMdist | DAPdist |
|--------------|------|---------|---------|----------|---------|---------|
| Vodianoe     | 43.4 | 51.7    | 32.3    | 41.5     | 46.9    | 28.5    |
| Korobovy Hutora| 40.2 | 51      | 44.3    | 46.5     | 24.5    |
| Upper Saltov | 32.5 | 55.1    | 32.7    | 47.6     | 50.5    | 26.6    |
| Upper Saltov | 35.5 | 49.8    | 29.2    | 43.5     | 48.7    | 26.1    |
| Upper Saltov | 36.1 | 52.6    | 31.7    | 46       |
| Mohnach      | 40.1 | 50.3    | 32.1    | 41.4     | 45.4    | 28      |
| Volchansk-2  | 42   | 58.9    | 37.5    | 47.4     | 52.4    | 32.6    |
| Volchansk-2  | 37   | 53.3    | 31.4    | 44.7     | 51.3    | 25.5    |

### Table 10 Measurements of posterior second phalanxes of horses from the Saltov archaeological sites

| Site         | L    | DLMprox | DAPprox | DLMdiaph | DLMdist | DAPdist |
|--------------|------|---------|---------|----------|---------|---------|
| Korobovy Hutora| 37.2 | 50.7    | 32.7    | 41       | 46.2    | 25.8    |
| Upper Saltov | 39.2 | 50.2    | 31      | 41.8     | 46.3    | 27      |
| Upper Saltov | 35.5 | 47.1    | 30.2    | 37.8     | 43.6    | 26.4    |
| Volchansk-2  | 38.3 | 53      | 34      | 45       | 49.2    | 26.9    |

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Discussion

The horse remains from the studied Saltov archaeological sites belong to a rather small-medium size horse breed with gracile thin or semi-thin limbs (according to the classification of Brauner). The cranial length of the stallion from Piatnitskoe-1 and the length of metapodials mostly correspond to the medium height at the withers (134-136 cm), which is optimal for horseback riding. Fewer metapodials correspond to the height at the withers below the average, ca. 128-134 cm. The relatively thin metacarpals approach medieval Saltov horses to the most thin-limbed domestic and wild modern horse forms. The elongated thin phalanx corresponds to the gracile proportions of metacarpals of Saltov horses. The obtained data support the conclusions of Matolcsy on medium/small stature of Saltov horses based on material from Mayatskoe settlement. The medium/small thin-limbed morphological type of Saltov horse is rather uniform and there is no evidence on the presence of two or more different horse breeds. The reported earlier a rather large height at the withers of the stallion from Piatnitskoe-1 is based on a misuse of cranial measurements (condylobasal length instead of the basal length of skull).

The relatively large cheek teeth suggest a closer relationship of Saltov horses to the ancient horse breed from Botai (Kazakhstan). The exceptionally long protocone of upper cheek teeth in the stallion from Piatnitskoe-1 may be regarded as an evidence of insignificant hybridization with European wild tarpans. Therefore, one can assume that the Saltov horse breed is not local and apparently was brought to the Severski Donets basin from the east. Obviously, the medium-sized and thin-limbed Saltov horses represent an improved riding horse breed. Nonetheless, the recorded cut marks on horse bones and the exceptionally high number of juveniles (28% of the total number of recorded individuals) and very low number of seniles (7%) suggest the hippophagy practised by the Saltov culture bearers. The specific character of horse remains age composition from Saltov monuments becomes clear when compared with the age profile of horse remains from the Crimean Iron Age site (Uch-Bash) where senile individuals attain almost 45% of the total number of individuals, or if compared with Getic archaeozoological material from Moldova, where remains of juvenile individuals are rare (Figure 8). The partially burn horse skeletal remains found in Molnach and Roganina suggest rather the horse implication in rites than hippophagy. The presence of horses in the arbitrary Saltov herd varies from 11.1% to 32.5% of the total number of domestic animals, marking a significant, but rather an unstable nomad cultural influence over the sedentary Saltov population.

Conclusion

The Early Medieval Saltov horses represent an improved riding breed with medium height at withers (134-136 cm), thin metapodials and elongated phalanges. The relatively large teeth and long protocone in upper cheek teeth rather suggest the oriental provenance of this breed and the larger morphological distance from the coeval domestic horses from northwestern Russia and local wild tarpans E. ferus ferus. The relatively short nasal bone represent a specific morphological character of the single complete male skull available for study. The short nasal bones approach the Saltov stallion to the ancient domestic horse from Dereivka and distinguish it from “Shatilov’s tarpans” and wild E. przewalskii. The significance of this character is not clear yet. The high proportion of juvenile individuals (28%) and few seniles (7%) in the archaeozoological material are interpreted here as an evidence of hippophagy. This conclusion is confirmed by the cut marks recorded on the horse skeletal remains. Few partially burn remains of horses may indicate the ritual importance of this animal.

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Conflict of interest

Author declares that there is no conflict of interest.

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