

COMMENT ON “THE EARLIEST HORSE HARNESSING AND MILKING”¹

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The study of animal domestication is one of the most complicated issues, and a solution to it lies through the application of a wide range of methods from different disciplines. Such an approach was used by a team of scholars who published an article on the study of the remains of horses from the Botai settlement in Kazakhstan. The authors state that the features analysed indicate the presence of domestic horses at the Botai settlement in the second half of the 4th millennium B.C.E. The conclusion was based on the proportions of metacarpal bones discovered there in 2005-2006 (fig. 1).

However, there is another set of data on the dimensions and proportions of metacarpal bones excavated at the Botai. It was received during the excavations of the settlement in the seasons of 1980-1992, and made available in several publications (Ахинжанов, Макарова, Нурумов 1992; Косинцев 2002, 48-50; Кузьмина 1997).

The series of proportions of the metacarpal bones provided in these publications correspond to each other but differ from new, 2005-2005 series. It should be stressed that these parameters coincide with the proportions of bones from other contemporary sites located in Kazakhstan, such as, for example, the Kozhai settlement and the Kumkeshu settlement. A separate comparison of dimensions and proportions of horse bones was made between those found at Botai and Sintashta sites (Косинцев 2002, 48-50). The Sintashta population of 2000 BCE already had domestic horses and had harnessed horses to chariots. The comparison of bones shows that horses from Botai and Kozhai featured larger and more mas-

sive metacarpal and metatarsal bones than horses from Sintashta. The comparison of the proportions of the bones of domestic horses from Mongolia, the Sintashta settlement, and the Kent settlement with bones from the Kozhai settlement, the Kunkeshu settlement, and the Kuznetsk site of the Late Pleistocene reveals an important difference (fig. 1). As indicated by the parameters, horse bones found during the Botai excavations of 1980-1992 belong to wild horses (tab. 1, 2). In our opinion, the inconsistency between the data for 1980-1992 and 2005-2006 excavations at the same Botai settlement should be explained by technical error made during the analysis of the latter, and there is no evidence that horses at the Botai were harnessed.

In their article “The Earliest Horse Harnessing and Milking” the authors discuss different types of biting. According to their conclusions, some Botai horses were harnessed with bits. In their opinion, the proof is one excavated premolar P₂s: this premolar has traces typical of biting damage; traces resembling biting damage were also found on five diastemas. The authors assume that such traces are left due to the effect of bits. However, the enamel of mammals is very hard. In order for an instrument to leave traces it should be hard like the enamel to which it is applied. A macroscopic method is based on the results of the diastema and P₂s study of modern horses; iron bits are used for harnessing these horses (Brown, Anthony 1998, 331). Thus, well-marked biting damage is seen on the diastema and P₂s of many modern harnessed horses. Diastemas and P₂s belonging to the Iron Age, where metal bits were used, were taken to support this method of comparison (Bendrey 2007).

However, this methodology will not work if bits were made of other materials, softer than metal, such as leather or hair. Until now, only one small copper sheet was found on the Botai settlement.

¹ Published by Alan K. Outram, Natalie A. Stear, Robin Bendrey, Sandra Olsen, Alexei Kasparov, Victor Zaibert, Nick Thorpe and Richard P. Evershed in *Science* 323, 6 March, 2009, 1332-1335.

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There is also no evidence of metal-working at the settlement, and metal bits for horses were not in use at that time. The first cheek-pieces appeared at the beginning of the 2nd millennium BCE, and bone or antler mouthpieces had been used for their making. Before this period, bridles were made of leather or hair. Thereby, if there had been a domestic horse at the Botai, the bits for it would have been made of organic materials. Organic material cannot leave well-marked traces on teeth or bones. We studied 41 lower jaws with teeth of horses from kurgans of the Late Bronze Age, including some found in burials with chariots and cheek-pieces. We also studied 27 diastemas and 36 P₂s from the Late Bronze Age settlements. None of the bones or teeth had traces resembling biting damage (Bendrey 2007). For the first time such traces appear on the lower jaws (N=32) of

the adult horses from burials of the Early Iron Age in the Altai region, when metal bits were already in use. But these traces can rarely be seen: approximately on 9% of diastemas and on 3% of P₂s. The number of similar traces is much higher at the Botai settlement: 33% of diastemas and 7% of P₂s. Since metal bits were not introduced at that time, the noted high frequency of traces cannot be explained by their use. Hereby, the presence of the described features on the diastema and P₂s from Botai should have another explanation. It is possible that these are the results of an abnormal bite or some mechanical damage. The examples of it provide the materials from the Eneolithic/the Bronze Age sites: animal fangs and teeth featuring traces of mechanical damage. These teeth were used for necklaces, and the Botai tooth could have been used for this purpose as well.

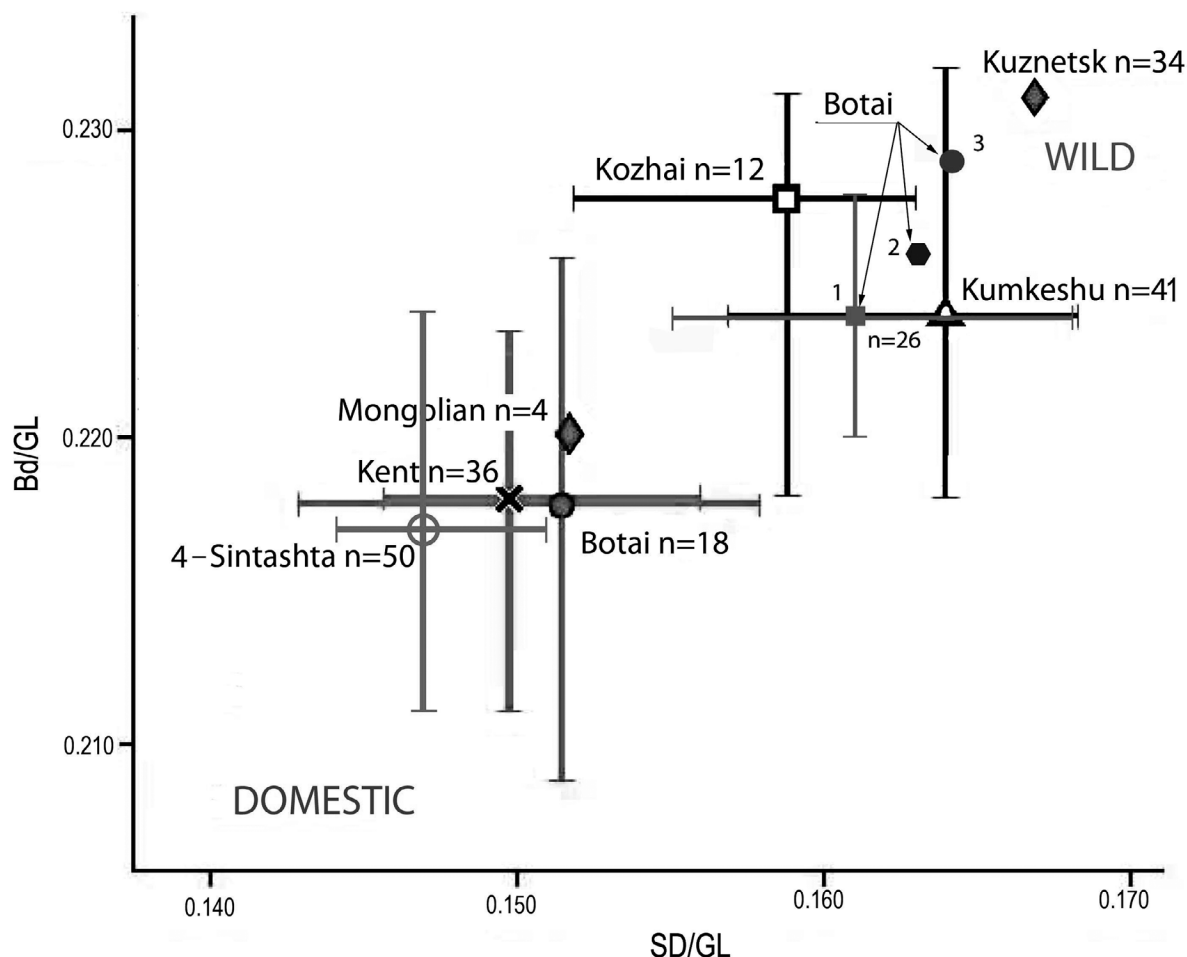


Fig. 1. Scatter plot for ratios of measurements Bd/GL and SD/GL on horse metacarpals from different ancient and modern populations. The Botai horses plot in association with other ancient and modern domestic populations. Botai: 0 - selection from 2005-2006 excavations; 1 - selection from 1990-1991 excavations (Kosintsev, non published); 2 - selection from 1987-1988 excavations (Кузьмина 1997, n=33); 3 - selection from 1980-1986 excavations (Ахинжанов, Макарова, Нурумов 1992, n=38); 4 - Sintashta (Косинцев 2002). Bars indicate \pm interquartile ranges (not available for the Botai excavations of 1980-1988, the Kuznetsk site, or Mongolian population).

Besides the bones, Outram and his colleagues studied fatty acids on cooking vessels, also found at Botai. As a point of reference, they took the contemporary data on the equine milk fat and equine adipose fat of horses for the territory of Kazakhstan. Analytical results of ratio $\delta D C_{18:0}$ to $\delta D C_{16:0}$ the authors received from the study of the remains on the sherds they interpret as proof for equine milk being kept in the vessels. The difference between the values of δD fatty acids level of modern data and the ancient level, which is higher, the authors explain, citing palynological studies, by climate iridisation. However, the referenced works do not contain such data (Kremenetski, Tarasov, Cherkinsky 1997, 132; Tarasov, Jolly, Kaplan 1997, 286-287). Therefore, reasons other than climatic ones should be sought to explain the differences in the δD level of archaeological fats.

An analysis of two groups of δD values made of fatty acids on archaeological ceramic demonstrated the significant difference in regression coefficients. This fact allows us to conclude that these two groups characterize the diversity of fatty acids.

The differences between these two selections are greater than between fatty acids of equine milk fat and equine adipose fat. Thus, it is unlikely that the

group of values at the top of scatter plots illustrated in Fig. 2B can be interpreted as milk fat of an archaeological equine. This demonstrates the much higher values of δD level in archaeological fats.

Thereby, neither bone characteristics, nor traces on teeth or residue on sherds from the Botai settlement given by A. Outram and his colleagues in the reviewed article can be used as evidence for the existence of domestic horse in the territory of Kazakhstan during the Eneolithic/Bronze Age period.

The culture of the Botai was traditional, with deep roots in the local hunters' culture of the Late Stone Age. There are no other known domestic animals at the Botai settlement except dogs. All animal bones found at other settlements of this culture belong only to wild breeds. Thus, we suppose that the archaeological culture of Botai was left by humans who were hunting wild horses. Simultaneously, in the West, in the Eastern European steppes, the population of the Early Bronze Age possessed herds consisting of hoofed animals. It was only at the turn of the 3rd-2nd millennium BCE when the evolution of the Western model of cattle-breeding, and its spread to the East led to the appearance there of chariots pulled by horses known from the finds in the Ural tombs.

Table 1

Horse metacarpal bone indexes (Mc III) for Botai settlement, according to different authors

| Indexes | Outram et al. 2009 | Ахинжанов, Макарова, Нурумов 1992 (excavations of 1980 г.) | Ахинжанов, Макарова, Нурумов 1992 (excavations 1983 – 1986 гг.) | Кузьмина 1997 | Косинцев 2002 | Kosintsev, Plasteeva, Vasil'ev 2013 |
|---------|----------------------|--|---|---------------|---------------|-------------------------------------|
| | n = 18 | n = 38 | n = 431 | n = 33 | n = 33 | n = 24 |
| SD/GL | ca 15,1 ¹ | 16,4 | 16,1 | 16,3 | 16,3 | 15,9 |
| Bd/GL | ca 21,8 ¹ | 22,9 | 22,4 | 22,6 | - | 22,3 ² |

¹ - index values defined after: Outram et al. 2009, fig. 1

² - index values calculated by median Bd & GL values

Table 2

Horse metacarpal bone indexes (Mc III). The settlements synchronous to Botai settlement, according to different authors

| Indexes | Kozhai 1 | | | Kumkeshu | |
|---------|----------------------|-----------------|-------------------------------------|----------------------|-------------------------------------|
| | Outram et al. 2009 | Гайдученко 1998 | Kosintsev, Plasteeva, Vasil'ev 2013 | Outram et al. 2009 | Kosintsev, Plasteeva, Vasil'ev 2013 |
| | n = 12 | n = 22 | n = 6 | n = 41 | n = 16 |
| SD/GL | ca 15,9 ¹ | 16,3 | 16,1 | ca 16,4 ¹ | 16,6 |
| Bd/GL | ca 22,8 ¹ | - | 23,1 ² | ca 22,4 ¹ | 22,5 ² |

¹ - index values defined after: Outram et al. 2009, fig. 1

² - index values calculated by median Bd & GL values

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Comentarii la articolul “The Earliest Horse Harnessing and Milking” (Folosirea străveche a calului și mulsul)

Rezumat

Alan K. Outram, împreună cu colegii, consideră că în Kazahstanul de Nord, în așezarea Botai, a existat un centru de domesticire a cailor. Noi, însă, suntem de părerea că aici nu au existat cai domesticiți, iar locuitorii așezării Botai, în perioada eneoliticului târziu se îndeletniceau cu vânătoarea cailor sălbatici – a tarpanilor. Parametrii oaselor de cai de la Botai se deosebesc radical de parametrii cailor domesticiți din perioada următoare – epoca bronzului. Iar urmele de pe dinții și diastemele cailor de la Botai nu sunt urme de zăbale, deoarece astfel de piese apar în această regiune abia în prima epocă a fierului.

Комментарий к статье “The Earliest Horse Harnessing and Milking” (Древнейшее использование лошади и доение)

Резюме

Алан К. Оутром вместе с коллегами считают, что в Северном Казахстане, на поселении Ботай, был самостоятельный центр доместикации лошади. В противоположность этому, мы полагаем, что здесь не было домашних лошадей, а жители поселения Ботай в эпоху позднего энеолита охотились на диких лошадей – тарпанов. Параметры костей лошадей Ботая резко отличаются от параметров домашних лошадей следующей исторической эпохи – бронзового века. Следы на зубах и диастемах лошадей не являются следами от удил, т.к. такие удила здесь появились лишь в раннем железном веке.

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