

# **Archaeological supplement B to Damgaard et al. 2018: discussion of the archaeology of Central Asian and East Asian Neolithic to Bronze Age hunter-gatherers and early pastoralists, including consideration of horse domestication.**

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## **ABSTRACT**

The archaeological evidence relating to selected key cultures from Central and East Asia from the Neolithic to the Bronze Age is summarized. These cultures include the Eneolithic (Copper Age) Botai culture of northern Kazakhstan, the Bronze Age Okunevo culture from the Minusinsk Basin in Russia and Neolithic to Bronze Age cultures of the Baikal Region in East Siberia. Special consideration is given to the debate surrounding horse domestication within the Botai Culture, and the key lines of evidence are summarized.

## **1. Horse Domestication and the Botai Culture** (Alan K. Outram)

### *1.1 Horse Domestication in the Central Asian Steppe:*

The domestication of the horse is widely recognized as being of immense importance to the development of human societies, revolutionizing transport, trade, and modes of warfare (Anthony 2007; Olsen 2006; Outram et al. 2009). Recently, however, a number of large-scale analyses of human ancient DNA suggest that the development of mobile pastoral societies in the Eurasian steppe, particularly the Yamnaya culture of the Pontic Steppe, was responsible for a major period

of human migration into Europe around 5,000 years ago that may well be related to the arrival of Indo-European languages and culture in Europe (Allentoft et al. 2015; Haak et al. 2015). The development of these societies has been linked to horse riding, mixed herding, the use of wheeled transportation, and bronze metallurgy (Anthony and Ringe 2015). As such, understanding the earliest development of horse husbandry and pastoral economic systems in the steppes of Eurasia must be regarded as one of the big questions in prehistoric archaeology. Following the arrival of agriculture, this development arguably marks the beginnings of the next major phase of Anthropocene impacts on the environment, with vastly increased mobility representing the incipient phases of globalization, since Central Asia is a continental crossroads containing crucial East-West trade routes, potentially highly significant in initial “Trans-Eurasian Exchange” (Jones et al. 2011; Sherratt 2006).

With the exception of the dog, the reindeer, and South American camelids, it seems that animal domestications were generally undertaken by farmers (Outram 2014). The domestication of cattle, sheep, goats, and pigs in the Near East appears to have happened after a significant period during which the economy relied upon cereal agriculture alongside the hunting of wild gazelle, while in most other centers of domestication animals were, at best, domesticated at the same time as plants were (Outram 2014). Dog domestication is the earliest animal domestication, being clearly undertaken by people of the Palaeolithic (Sablin and Khlopachev 2002; Savolainen et al. 2002; Wayne et al. 2006). It is anomalous because, while dogs could be eaten at times, the relationship was much more likely to be related to mutual benefit with regard to hunting (Outram 2014). This is the classic example of Zeder 2012’s “commensal pathway” to domestication. The early phases of reindeer domestication are poorly understood, but this must clearly have followed Zeder 2012’s “prey pathway” to domestication. Unusually, it is an example of a hunter-gatherer population changing its long-standing hunting relationship to one of herding, rather than domestication, by an expanding farming population that was putting pressure on wild animal resources. Zeder (2012, p176) has suggested that horses might represent an example of the “direct pathway” to domestication, where domestication is a “intention-driven, directed process.” It is essential to understand the origins of the Botai people in order to establish the likely domestication route. Directed domestication implies a prior understanding of the concept, so it would be more likely to be true if the Botai had origins among people with familiarity of herding and stock raising. Yet, if it were a local adaption by hunter-gatherers familiar with horse hunting for millennia, then

this would be a unique example of a very late hunter-gatherer “prey pathway” domestication—but one that had the potential of massive effects upon human societies once horses were harnessed as well as eaten. A further key question must relate to the nature of the relationship between Botai, their domestic horses, and peoples such as the Yamnaya.

There are two major ecological zones within northern and central Kazakhstan. In the north there is the “forest steppe,” made up of a patchwork of grassland with stands of birch and pine trees, while in the central region there is a relatively treeless, semi-arid steppe. The area was a steppe in prehistory also, though there was variation over time in relation to tree cover, with pine generally increasing in extent from the 4th millennium BCE through to the Iron Age (Kremenetski et al. 1997). Significant cereal agriculture appears not to have been practiced in the region until the Soviet period. The Neolithic of northern and central Kazakhstan (so-called because it possessed ceramics) appears to have had an economy based upon hunting, gathering, and fishing, and its stone tool tradition consisted mainly of blade technology. With a few exceptions, settlements are rather ephemeral, and many comprise little more than scatters of material with no solid evidence for farming activities. Around 3500 BCE, northern Kazakhstan sees a new phenomenon with the Botai culture manifesting major changes in economic focus, settlement structure, and material culture (Zaibert 2009). Pottery use becomes more widespread, and lithic technologies change to bifaces and ground stone tools. The Botai Culture develops sizeable settlements that can have more than 100 semi-subterranean pit houses. Whether these were seasonally used or sedentary sites is not currently known. The most significant change, however, is a sudden and extreme focus on the exploitation of horses. Horse bones represent the vast majority of faunal assemblages at all Botai sites, and at Botai itself they reach the level of 99% of the faunal assemblage (Olsen 2006). The steppes of Central Asia had a substantial population of wild horses that were also available to earlier prehistoric groups in the region as a prey animal. With Botai, however, one sees a sudden focus on that animal, in conjunction with the arrival of substantial villages and significant changes in material culture. Since Botai was discovered in the early 1980s, there has been considerable discussion over whether the horses were hunted or herded and whether they were biologically domestic or still wild. Some have argued that there was no clear size change in the animals (Benecke and von den Driesch 2003) and that there was not a clearly managed herd structure for meat production (Levine 2004). However, size change need not be an immediate consequence of all domestication events, and herd structures would not be optimized for meat if horses were also

being exploited for secondary products such as milk, riding, or traction (Anthony and Brown 2011; Outram 2014). Others have argued that the nature of the settlements and the low frequency of hunting material culture suggested control of the horse population and that multiple uses of horses for food and riding resulted in the broad herd structures seen (Olsen 2006). There is also established evidence for riding in the form of pathological bit-wear traces on the lower second premolars (Brown and Anthony 1998) in a form now known as type 1 bit wear manifested in as a beveled facet on the tooth (Anthony and Brown 2011).

Following further recent investigations (Outram et al. 2009) it is now clear that at least some of the Botai horses were herded and domestic. This new study confirmed evidence of bit-wear and harnessing pathologies using different but complementary techniques (Outram et al. 2009), known as type 2 (parallel band of wear down the front of the 2nd mandibular premolar) and type 3 bit wear (pathology of diastema) (Anthony and Brown 2011). Furthermore, Botai pottery contained two types of equine lipid residues identified as adipose fat and mare's milk fat (Outram et al. 2009), providing a clear indication of animal husbandry and secondary products use. Genetic research had also suggested that the date and general region of Botai fit with evidence for an increase in the frequency of coat colors in horses that are normally very rare in the wild and thus likely the result of domestic management (Ludwig et al. 2009). Indeed recent study of ancient genomes from the Botai horses themselves has also identified the significant presence of the leopard-spotting complex. This coat color is associated with human husbandry and selection in early domestic horses, and such control could have been exerted at Botai through the use of corrals that have now been archaeologically evidenced at more than one Botai culture site. Importantly, however, this study also concludes that Botai horses are not the principal source of modern domestic horse stock (Gaunitz et al. 2018). While earlier events of horse domestication remain possible and at least one other center of domestication is likely, Botai currently still represents the earliest unambiguous evidence for the herding and riding of domestic horses (Anthony and Brown 2011).

As such, it seems likely that early pastoralism in the region may have started with the horse but without arable agriculture, and it encompassed secondary as well as primary products. The Botai culture ends at the start of the 3rd millennium BCE. The following Early Bronze Age (c. 3,000-2,200 BCE) in that region shows the arrival of mixed pastoralism, with the addition of domestic cattle, sheep, and goats (Frachetti 2008). At this same time, the Yamnaya culture of the

Pontic-Caspian steppe sees rapid territorial expansion up the Danube, making use of cattle, horses, and wheeled vehicles (Anthony 2007). The timing of this development, following evidence of horse domestication in the adjacent Central Asia Steppe, is unlikely to be coincidental, but the relationship between Botai and Yamnaya is in need of further investigation.

### *1.2 Botai Culture Origins:*

A very significant question about the Botai culture is whether it was a local development from preceding Neolithic hunter-gatherer cultures, the result of inward migration, or a combination of local culture with outside influences. The immediately preceding Neolithic cultures in northern Kazakhstan were the Atbasar and Makhandzhar cultures (Kislenko and Tatarintseva 1999). Atbasar centers around the river Ishim, while Makhandzhar around the river Tobol. While possessing ceramics, hence their Neolithic label, their economy was based upon hunting and gathering in the forest steppe, and probably also fishing. Neolithic lithic technology focused strongly on blade production whereas the later Eneolithic cultures such as Botai made considerable use of bifacially-flaked stone technology (Kislenko and Tatarintseva 1999). While the ceramic tradition of the Botai is not radically different from the preceding Neolithic, the change in lithic technology is significant.

Kislenko and Tatarintseva (1999) suggest that the Atbasar and Makhandzhar were involved in the development of the Botai culture but under influences coming from the eastern Caspian and southern Urals. This explanation allows for adaptation of local peoples influenced by external cultural ideas. Such an origin from local, hunter-gatherer Neolithic peoples is also favored by Botai's original and long-term investigator, Victor Zaibert (Zaibert 2009). On the other hand, scholars such as Anthony (Anthony and Brown 2011) suggest significant influence from migrating peoples from the Volga-Ural steppes in the genesis of the Botai culture in northern Kazakhstan and, later, the Afanasievo culture in the Altai. The former solution would suggest a local, hunter-gatherer genetic origin for the Botai, while the latter suggests genetic influx from more westerly pastoralist groups, perhaps resulting in admixture. The former lends itself to an original domestication event based upon the "prey pathway," while the latter suggests either "directed" domestication of a local species by people familiar with herding or introduction of domestic horses from outside.

### *1.3 The Botai Site:*

Excavations have been conducted at the Eneolithic settlement of Botai under the direction of Victor Zaibert since 1980. The site dates to the mid- to late 4th millennium BCE (Levine and Kislenko 2002; Outram et al. 2009) and is the type site for a wider culture that includes a number of similar settlements, the most important of which are Krasnyi Yar and Vasilkovka (Olsen et al. 2006). A key feature of all these sites is the extreme dominance of horses in their faunal assemblages, almost to the exclusion of other species (Olsen et al. 2006). Ever since these sites were discovered, therefore, Botai has been the focus of many discussions about early horse domestication, herding, and riding. Botai culture sites consist of a very significant number of houses arranged in long rows, as seen at Krasnyi Yar and Vasilkovka (Olsen et al. 2006), or both rows and circular clusters, as seen at Botai itself (Gaunitz et al. 2018). The houses are sub-circular pit houses dug about 1 m below the ground surface and between about 5-8 m across. Their floors are compressed, clay-rich soil, and there are usually fairly central hearth pits, plus occasional eccentric storage pits, but no clear evidence for the precise nature of roofing or roof support. The houses are generally ringed by pits that are rich in bone deposits that are heavily dominated by horses (Olsen et al. 2006; Zaibert 2009; Zaibert et al. 2007), but usually there is also a dog burial or cranium in at least one associated pit (Olsen 2000).

Human burials are very rare in the Botai culture (Olsen 2006), and only a very small number of features containing human remains have been found, and all of these are at the site of Botai itself. The most significant of these features was a large pit that contained the remains of 4 individuals (2 adult men, an adult woman, and a 10–11-year-old child) along with the partial remains of at least 14 horses, principally crania, that formed an arc around the edges of the pit (Olsen 2006; Zaibert 2009). In 2005, a partially disarticulated inhumation was also discovered that lacked significant accompanying deposits (Zaibert et al. 2007). In addition to these inhumations two disarticulated human crania have also been found—one had a clay mask applied to it before it was buried in a pit outside a house, and the other had been made into a bowl (Olsen 2006). Most recently, in 2016, a further almost complete individual was found in a shallow grave next to a house in an unusual posture without any identifiable funerary rite or grave goods. It is clear, from this evidence, that we currently lack a sound understanding of Botai culture funerary practices, and these few inhumations may not be “normative” in nature. Archaeological exploration has been

concentrated on the settlements themselves, and currently there are not obviously recognizable monuments or surface finds that might indicate the presence of accompanying cemeteries. What is clear is that horses were an important part of Botai culture ritual deposits, along with dogs, and that skulls, whether human or animal, held particular significance.

## **2. Okunevo** (Alexey Polyakov, Andrei Gromov, Vyacheslav Moiseyev)

The Bronze Age Okunevo culture is a unique phenomenon in the archeology of the southern and western Siberia, first of all due to its complex burial traditions and very rich art heritage that testify to the developed spiritual and religious views of the Okunevo people (Gass 2011). Although single kurgans and burials were excavated more than a hundred years ago (Savinov 2007; Vadetskaya 1986: 27, 28) the Okunevo culture was recognized and described as an independent cultural phenomenon only after excavations of Chernovaya 8 burial place by G.A. Makimenkov in 1962-1963 (Maksimov 1965, 1975, 1980). The culture was named after one of the earliest explored Okunevo burials in the Okunev ulus (Komarova 1947).

The Okunevo culture is represented mostly by burial grounds. Currently 62 Okunevo kurgans consisting of more than 500 burials and 60 single burials have been studied. Although several cases of the presence of Okunevo ceramics in cultural layers of multilayer settlements have been reported it is still not possible to connect traces of any buildings or hearths with this culture. Numeral engravings on rock “Pisanitsy” and stone stellas with complex drawings are the unique character of the Okunevo culture (Leont’ev et al. 2006).

All Okunevo sites have been found in the Minusinsk Basin which is located along the middle part of the Enisey River. This small territory of about 350 by 100 km is totally surrounded by the Eastern and Western Sayans mountains on one side and Kuznetsk Alatau on the other. Obviously such geographical isolation restricted population contacts of the Okunevo people with human groups in adjacent regions. Another geographical factor which added to the uniqueness of the Okunevo culture is rather complex landscape of the Minusinsk Basin which includes steppe, forest-steppe and taiga environments. This variation provided the opportunity to combine different models of economic activity the arrival of cattle breeding has been a principal source of discussion concerning origin of the Okunevo culture. Maksimov suggested that Okunevo culture was developed by the local Neolithic tribes of the Krasnoyarsk-Kansk forest-steppe who lived to the north of the Minusinsk Basin. After adopting cattle breeding and metal production from

Afanasievo people these groups superseded Afanasievo tribes in the Minusinsk Basin (Maksimov, 1975: 36, 37). The second theory that is supported at the present time by most researchers suggests that Okunevo culture resulted from the interaction of local Neolithic hunter-gatherers with Western cattle breeders. This opinion is supported by evident parallels between early Okunevo burials and those of the Catacomb culture (Lazarev 1995).

Based on results of excavations in the mid-1990s of a number of the Okunevo sites of the Uybat river basin, I. P. Lazarev suggested dividing Okunevo culture on early Uybat and late Chernovaya periods (Lazarev 1997). This was supported by most researchers. Later D. G. Savinov suggested additional final period of Okunevo culture called Razliv, which is represented by materials from three sites: Chernovaya XI, Razliv X, and Strelka (Savinov 2005). This suggestion remains disputable because of difficulties in differentiating of the artifacts and burial practices in the abovementioned sites from those of the Chernovaya period.

Radiocarbon AMS dating of 50 Okunevo samples are within 2600–1800 BCE (Polyakov 2017; Polyakov and Svyatko 2009; Svyatko et al. 2009). According to these studies the Uybat period is dated as 2600–2300 BCE, Chernovaya as 2200–1900 BCE, and Razliv later than 1800 BCE.

The Okunevo culture shares some elements of its material culture including pottery with a number of local cultures from adjacent areas such as the Samus', Elunino, Karacol, and Krotovo cultures of western Siberia and Altai, the Kanay type burials of eastern Kazakhstan, and the Okunevo-like culture of Tuva. This makes it possible to view all of them as belonging to “the ring of related Okunevo-like cultures” (Molodin 2006; Savinov 1997; Stambulnik and Chugunov 2006). Nevertheless, there is currently no sound evidence of the common origins of all these cultures. Neither that there are similarities in their material cultures resulting from contacts of these peoples nor that there are broad time-specific characteristics of the area can be excluded. Few sites excavated on the upper Enysey in Tuva share elements of their material culture with Okunevo burials, but in spite of their geographical closeness to the Minusinsk Basin, the excavators of the site do not include them in the Okunevo culture in a strict sense (Stambulnik and Chugunov 2006).

According to studies of cranial morphology the Okunevo people resulted from admixture of Western Bronze Age migrants and local Neolithic tribes. It was reported that in the early Okunevo burials individuals displayed rather contrasting cranial morphology. Interestingly females demonstrated more Asian traits than males (Gromov 1997). Many Okunevo skulls have occipital-



temporal deformation, which can result from cradle-boarding infants (Benevolenskaya and Gromov, 1997; Gromov 1998). The suggestion that Okunevo people and American Indians had common ancestors was based on the study of both cranial metric and nonmetric traits (Kozintsev et al. 1999) and was recently supported by genetic data (Allentoft et al. 2015).

### **3. Archaeological cultures of the Baikal region from the Late Mesolithic to the Bronze Age** (A. W. Weber, V. I. Bazaliiskii, O. I. Goriunova)

The middle Holocene hunter-gatherer archaeology of the Baikal region in East Siberia has attracted the attention of Western scholarship from roughly the middle of the 20th century (Chard 1958; Michael 1958; Okladnikov 1959; Tolstoy 1958). The main reason for this attention was the availability of high-quality materials from habitation sites (camps) and cemeteries, the latter typically with large numbers of well-preserved human skeletal materials—a rarity among prehistoric hunter-gatherers worldwide and especially in the boreal zone. For example, Weber and Bettinger (2010) report 184 documented cemeteries with a total of 1,026 graves and 1,182 burials (individuals). However, these numbers have since increased somewhat due to continued fieldwork. More information about Baikal hunter-gatherer cemeteries can be found in a few recent reviews in English (Bazaliiskii 2003, 2010; Weber 1994, 1995; Weber and Bazaliiskii 1996; Weber et al. 2002) and Russian (Bazaliiskii 2005; Goriunova 1997; Kharinskii and Sosnovskaia 2000; Turkin and Kharinskii 2004).

Beginning in the late 1990s, these materials have become the subject of research by an international and multidisciplinary Baikal Archaeology Project (BAP) led by scholars from the University of Alberta, Canada, and Irkutsk State University, Russia (Weber et al. 2010). The project seeks a better understanding of the processes leading to the spatial and temporal variation in hunter-gatherer adaptive strategies, including the mechanisms of culture change. Comprehensive examination of human skeletal materials from the region's cemeteries features prominently in this effort. While most of the bioarchaeological work has centered on the large cemeteries of Lokomotiv, Shamanka II, Ust-Ida I, Khuzir-Nuge XIV, and Kurma XI—all excavated over the course of the last 20–30 years. A number of other, frequently smaller collections, have been examined too, although with a narrower range of methods. This research continues to include as many additional materials from previous excavations from the entire Baikal region as are still available for examination.

Results of the chronological, archaeological, zooarchaeological, and bioarchaeological research conducted under the auspices of BAP have been presented in a large number of technical reports (Bronk Ramsey et al. 2014; Faccia et al. 2014, 2016; Haverkort et al. 2008; Katzenberg et al. 2008, 2009, 2012; Lieverse et al. 2007a, 2007b; 2008, 2009, 2011, 2014a, 2014b, 2015, 2016, 2017; Link 1999; Losey et al. 2008, 2011, 2012, 2013a, 2013b; Mooder et al. 2005, 2006; Moussa et al. 2016; Nomokonova et al. 2011, 2013, 2015; Osipov et al. 2016; Scharlotta et al. 2013, 2014, 2016, n.d.; Schulting et al. 2014, 2015; Shepard et al. 2016; Temple et al. 2014; Waters-Rist et al. 2010, 2011, 2014, 2016; Weber et al. 1998, 2011, 2013, 2016a, 2016b; White et al. n.d.), a few monographs (Weber et al. 2007, 2008, 2012) and several generalizing accounts (Lieverse et al. 2011; Losey and Nomokonova 2017; Weber 1995; Weber and Bettinger 2010; Weber and McKenzie 2003; Weber et al. 2002; Weber et al. 2010; 2011).

Our current views on the subject, summarized below, emphasize the multiple changes in the cultural patterns and recognize similarities between the Early Neolithic (EN) and Late Neolithic-Early Bronze Age cultures (LN-EBA) in addition to key differences, which were at the center of our attention earlier:

Late Mesolithic: incipient cemeteries, hunting, some fishing and sealing, small, dispersed, and mobile population, limited social differentiation.

Early Neolithic: cemeteries, hunting, fishing and sealing, large, unevenly distributed population, physical and physiological stress, differential mobility, substantial social differentiation.

Middle Neolithic: no cemeteries, hunting, some fishing and sealing, small, dispersed, and mobile population, limited social differentiation.

Late Neolithic: cemeteries, hunting, fishing and sealing, larger and evenly distributed population genetically different from EN, moderate physical and physiological stress, moderate mobility and social differentiation.

Early Bronze Age: cemeteries, hunting, fishing and sealing, large and evenly distributed population genetically continuous with LN, moderate physical and physiological stress, moderate mobility and social differentiation.

With more results and insights becoming available, the following points summarize the most interesting aspects about the nature of the middle Holocene hunter-gatherer culture history and process in the Baikal region:

1. Much spatiotemporal variation existed in diet, subsistence, genetic structure, population size and distribution, number and size of cemeteries, health and activity patterns, mobility and migrations, mortuary protocols as well as socio-political differentiation between the micro-regions of the broader Baikal region.
2. The most intriguing aspect of this variation is that the EN hunter-gatherer system appears to be more complex and spatially variable than subsequent systems.
3. Lastly, the overall impression seems to be that change between these periods in the Baikal region was rapid rather than gradual.

Even with this much progress achieved, key issues related to the mechanism leading to the documented spatial variation in hunter-gatherer cultural patterns and temporal change in the Baikal region remain to be investigated further and understood better. Previous attempts to analyze mtDNA recovered from Baikal's human skeletal remains have already provided useful insights about these matters (Mooder et al. 2005, 2006; Moussa 2016; Naumova et al. 1997; Naumova and Rychkov 1998), and it is the expectation that the much-improved methods of ancient DNA research can provide even more important insights now that encourage us to launch a new round of DNA studies on Baikal's middle Holocene hunter-gatherers. Of particular interest are genetic connections with the outside world as well as the internal genetic structure, gene flow, marriage patterns, pathogen presence, and sex of osteologically indeterminable skeletons.

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