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Regional pastoral practice in central and southeastern Kazakhstan in the Final Bronze Age (1300–900 BCE)

A. Haruda

Department of Archaeology, University of Exeter, Laver Building, North Park Road, Exeter EX4 4QE, UK

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ABSTRACT

Detailed zooarchaeological analysis of three settlements dating to the Final Bronze Age (c. 1300–900 BCE) in central and southeastern Kazakhstan revealed the influence of cultural and environmental factors on pastoral subsistence strategies. The period is marked by consistent exploitation of horse (*Equus caballus*), cattle (*Bos taurus*), sheep (*Ovis aries*), and goat (*Capra hircus*) while proportions of wild taxa vary in accordance with local availability. In comparison with findings from a broader geographic and diachronic scale, both culture and environment were found to work in tandem to influence pastoral practices, challenging environmentally deterministic continental scale models.

1. Introduction

Broad geographical distributions of related forms of material culture found in prehistoric archaeological contexts across the prehistoric Central Asian steppe have encouraged the definition of large homogeneous cultural communities which embrace pastoral archetypes. However, the uniform deployment of pastoral economies is at odds with localized resource variation (Frachetti, 2009, 2012). While at a continental scale the steppe appears to be a uniform environment, there is significant ecological variation across this region. Localized micro-environments present varied resources and demand specific resource management strategies. For example, unique cultural and economic centers which do not conform to the pastoral ideal occurred in early prehistory, such as the horse-reliant Eneolithic Botai culture (c. 3500¹ BCE Brown and Anthony, 1998; Levine, 1999; Olsen, 2003; Outram et al., 2009; Zaibert, 2009), and the Middle Bronze Age Sintashta metallurgical extraction settlements in the trans-Urals (c. 2000 BCE Anthony, 2009; Hanks, 2009; Hanks et al., 2007). Aside from these well-researched examples, zooarchaeological studies of Late and Final Bronze Age settlements are rare, and thus analyses of responses to resource and ecological variation within this time period are necessarily reliant upon large scales of analysis.

The Central Asian steppe in the Late Bronze Age (1700–1200 BCE) was characterized by the Andronovo cultural community, a large group of archaeological cultures delineated by shared ceramic forms and burial traditions including the Fyodorovo and Alakul in Kazakhstan (Anthony, 2007; Dergachev, 1989; Hanks et al., 2007; Koryakova and Epimakov, 2007). Kurgans from this period contain inhumations,

cremations, and pits filled with the burnt remains of animal sacrifices, particularly those of sheep and goat astragali (Koryakova and Epimakov, 2007). Chariot burials are less common in this period than in the preceding Middle Bronze Age, however horses continued to be associated with burials as evidenced by high proportions of horse meat and milk lipid residues in funerary ceramics (Anthony, 2007; Koryakova and Hanks, 2006; Outram et al., 2011). Material cultures of the Final Bronze Age (1300–900 BCE) in the central and southeastern steppe included the Begazy-Dandybaev and Dongal. The Begazy-Dandybaev was marked by small-bottomed ceramic forms and stone lined cist inhumation burials and was closely followed chronologically by the nearly analogous Dongal culture. Both of these were originated in a cluster of settlement sites in central Kazakhstan in the Kent mountain range (Beisenov et al., 2014; Koryakova and Epimakov, 2007; Margulan et al., 1966; Varfolomeev, 2011). Cultural group memberships were also defined by metalworking styles, particularly in southeast Kazakhstan where the Kulsai tradition, centered on Lake Issy-kul in the Kyrgyz highlands, dated to 1100–600 BCE (Goriachev, 2004).

Mixed pastoralism was the dominant subsistence economy across the steppe through the Late and Final Bronze Age and was characterized by herds of domesticated animals that included horse (*Equus caballus*), cattle (*Bos taurus*), sheep (*Ovis aries*) and goat (*Capra hircus*) along with small numbers of Bactrian camel (*Camelus bactrianus*) and dog (*Canis familiaris*) (Koryakova and Epimakov, 2007; Kuzmina, 1994). This particular herd composition was specific to the Central Asian steppe and found consistently at settlements from the Early Bronze Age onward (e.g. at Begash c. 2500 BCE) (Frachetti and Benecke, 2009). Wild taxa were hunted, although their remains consistently decrease through

¹ E-mail address: A.haruda@exeter.ac.uk.

¹ All dates presented here are calendrical. Any dates based on radiocarbon assays are calibrated to calendar years before present.

the Bronze Age (Ahinzhanov et al., 1992). Stable isotope analyses suggest that domesticated animals formed the basis of human diet until the early Iron Age, when agricultural activity was definitively identified in southeastern Kazakhstan at the turn of the millennium (Frachetti et al., 2010; Lightfoot et al., 2015; Miller et al., 2016; Motuzaitė Matuzevičiūtė et al., 2015; Rosen et al., 2000; Spengler et al., 2013a; Ventresca Miller et al., 2014a, 2014b).

Environmental variables such as temperature, pasturage, and surface water availability limit the viability of domesticated species. For example, cattle require access to water on a daily basis and are susceptible to hyperthermia, which can reduce milk production and digestive efficiency (Bendrey, 2011; Kadzere et al., 2002). Sheep and goats are much more resilient in arid climes and can ingest water through forage, and goats are better adapted to high-fiber shrub forage and resistant to dehydration (Silanikove, 2000). Together, these factors indicate that cattle are better suited and more productive in locales with an abundance of grass and surface water with few extreme heat days (Bendrey, 2011). Reviews of prehistoric Eurasian zooarchaeology that include Central Asia have found that proportions of cattle within domestic animal herds correlate most strongly with annual precipitation levels which directly affect forage amounts and water surface availability. Thus, it appears that at a continental scale, domestic animal proportions of pastoral herds are environmentally determined (Bendrey, 2011; Benecke and Von Den Driesch, 2003; Morales Muñoz and Antipina, 2003; Outram et al., 2012).

It is critical to increase the amount and detail of zooarchaeological data available across the Central Asian steppe not only to test the applicability of limiting factors such as precipitation levels, but also to explore pastoral responses to local environmental conditions. This paper presents detailed zooarchaeological analyses from three Final Bronze Age (1300–800 BCE) settlements across central and southeastern Kazakhstan to investigate local pastoral practices. These data are then compared against a broader geographic and diachronic scale to examine variation in pastoral subsistence strategies with reference to environmental limiting factors to evaluate the influence of ecology on pastoral tradition.

2. Ancient and modern environment

Central Asia, particularly Kazakhstan, is dominated by vast ranges of steppe grassland characterized by a continental climate receiving < 500 mm of precipitation per annum (FAO, 2013; Shahgedanova, 2003). More precisely, the region contains a combination of grassland, savannah, and shrubland mixed with deserts and xeric shrubland (Khotinskiy, 1984; Olson et al., 2012). Precipitation rates, soil types, topography, and plant communities vary on a north to south gradient (Lal et al., 2007; Spengler et al., 2013b). Ecoregions (Olson et al., 2012) characterize variation of homogenous macro-zones in order to examine biodiversity and are widely used for large scale ecological comparisons, however ecological naming systems such as agro-climates also incorporate aridity indices to estimate forage productivity and are therefore more useful in this context (Lal et al., 2007).

There are twenty-one agro-climatic regions within Central Asia, although six account for 90% of the landmass. Semi-arid grasslands receive between 200 and 400 mm of average annual precipitation and account for 44% of all landmass in Kazakhstan (De Pauw, 2008; Lal et al., 2007; Shahgedanova, 2003). Semi-arid grassland is found primarily in central, northern and southeastern Kazakhstan surrounding a central arid desert (Fig. 1). The characteristic soils of this agro-climatic region lie below fifty-one degrees north and transition from chernozem with 30–50 cm humus horizon to chestnut soils with a 15–30 cm band of humus which lie alongside the northern shores of Lake Balkhash and the borders of the Kyzyl and Karakum deserts. This ecosystem includes the unstable Nura rivershed which accounts for only 3% of surface water (FAO, 2013; Sorg et al., 2012).

There are two distinct agro-climatic semi-arid grasslands: a central

plateau of rolling hills and occasional outcrops of granite centered on the Nura, and flatter grasslands with lighter soils that contain less humus which radiate from these central highlands (Lal et al., 2007). Resource availability in the central steppe is localized with a mosaic of plant communities characterized by stable xerophilic poly-zonal species which vary in proportion by underlying geology and soil salinity (Robinson et al., 2003). These include *Artemisia* spp., *Chenopodia* spp., *Festuca* spp., *Stipa* spp. and are interspersed by azonal plant communities found in riparian environments, which are dominated by *Salix* spp., and *Rosa* spp. (Shahgedanova, 2003). These azonal plant communities are key grazing resources, as they provide additional forage in winter and summer when other plants have died back (Robinson et al., 2016). Grassland productivity peaks in June/July at 36 gCm⁻² with an annual NPP between 140 and 168 gCm⁻² (Eisfelder et al., 2014; Lal et al., 2007). Granitic outcrops, such as the Kent mountains, provide windbreaks (Ivashenko, 2008) and retain higher biodiversity along altitudinal gradients than the surrounding steppe, with relic forests and associated sylvan fauna. These outcrops within the central plateau offer additional resources beyond azonal riparian communities as well as bronze ore and semi-precious stone.

Northern Kazakhstan and the western Siberian plain are characterized as a sub-humid band of forest-steppe with birch and pine patches interspersed with grassland and laced with streams, rivers, and lakes (Lal et al., 2007). This agro-clime comprises just 6% of the total landmass within the borders of Kazakhstan and is underlain by a thick (> 50 cm) band of chernozem (Shahgedanova, 2003). Annual precipitation within this region ranges from 300 to 400 mm per year and encompasses the watersheds of the Tobol and Ishim which are unstable with extreme fluctuations year on year (De Pauw, 2008; Sorg et al., 2012). However, the nival-pluvial Irtysh river basin is stable and accounts for 34% of total surface water resources in Kazakhstan (FAO, 2013). The productivity of this region is difficult to establish, as much of the natural agro-clime was converted to rain-fed agriculture during the Soviet 'Virgin Lands' program of the twentieth century, and modern estimates of annual NPP (225 gCm⁻²) reflect a mix of agriculture and grasslands (Eisfelder et al., 2014).

The deserts that lie to the south and east of the steppe in the Chu and Aral Sea basins along the Syr and Amu Darya are cold deserts and comprise 38.6% of total landmass (Shahgedanova, 2003). Limited annual precipitation (0–200 mm per year) and snowmelt support ephemeral spring biomass, but this growth is outlasted by more resilient arid plant communities of *Artemisia* spp., *Astragalus* spp., and *Salsola* spp. (De Pauw, 2008; Robinson et al., 2016). Annual productivity in this region of grey-brown soils ranges from 120 to 70 gCm⁻² and despite having the lowest NPP in Central Asia, these agro-climes are still utilized heavily year-round by sheep pastoralists (Eisfelder et al., 2014; Robinson et al., 2016).

The southeastern corner of Kazakhstan cannot be described as a single agro-clime, and may be imagined more precisely as a mosaic of small localized ecozones which vary by altitude (Chupakhin, 1987; Rosen et al., 2000; Shahgedanova, 2003) or even as an ecotone (Spengler et al., 2013a). This corner of Kazakhstan, also known as the Semirech'ye (Seven Rivers), is the glacial-nival hydrological basin of Lake Balkhash and accounts for 28% of surface water resources (FAO, 2013). The mean annual precipitation in this drainage is the highest in Kazakhstan (100–800 mm per year), fed by slow melting snow and glaciers (De Pauw, 2008; Sorg et al., 2012). This constant supply of water results in a reliable and rich pasturage at various altitudes. Orographic variation and therefore the timing of snowmelt governs the seasonality of peak biomass productivity and the annual NPP of for broadleaved and coniferous forests is 264.1 gCm⁻² and 263.8 gCm⁻² respectively (Eisfelder et al., 2014). The biodiversity here is the greatest in Kazakhstan, as plant and animal communities vary from alpine forest species to arid steppe biomes. Brown chestnut soils of the mountains and foothills transition to the grey-brown dry soil of the desert in a south to north range (Chupakhin, 1987).

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