

ANIMAL HERDER-MINERS OF THE ANDRONOVO CULTURE

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Introduction

The Central Asian Middle Bronze Age culture Andronovo is known to researchers as one of the strong candidates of possible tin suppliers for Near Eastern and Mediterranean civilizations. From the Ural to Yenisey, the culture's area covers millions of square kilometres. It stretches between different climatic zones; including forest steppes, grass steppes, mountainous areas, dry steppes and it is even proximate to deserts. Ruins of the Andronovo groups are frequently presented all over this region with a mobile character and strong evidences that they were dealing with metallurgical activities. (Boroffka *et al.* 2002). Chernykh describes this time period as "the second phase of Eurasian Metallurgical Province" (2008, pp.87-88), which he underlines as "*the stabilization of the system*". He interprets this development also as a factor for unification of the major cultural features; ceramic tradition, mortuary practices, and the spread of bronze products produced with tin and their appearance in the neighbouring regions.

Animal husbandry played a vital role in this dynamic environment, enabling a mobile lifestyle. Today we know from several mining regions, that the exploitation was going hand in hand with the pastoral practices. Therefore it is vital to understand the herd management and subsistence strategy of the populations to see the picture of land use and its relation with exploitation of metals and pastoral movement of groups.

Mobile Pastoralism

Pastoralism is defined as a mode of production concerned with the exploitation of domestic animals (Abdi, 2003, p.398). Instead of "village based animal herding", which is practiced sedentary and done to support agriculture, communities which are specialized on mobile form of pastoralism depend primarily on their domestic animals for subsistence and change their location seasonally or inter-seasonally to sustain

the fodder for their herd. In this respect mobile pastoralism is considered as an adaptation strategy, which is developed/practiced towards generally arid environments with strong seasonal climate (Hole, 2009, p.261). While the restrictions of the climatic conditions can be debated, the movements of traditional Kazakh herders were also following climatic and vegetation changes between their seasonal pastures.

The climate in Eurasia is significant for its continental character. Summers are short and warm, winters are long and below freezing temperatures. The most determinant factor for the Eurasian steppe belt vegetation formation is the annual precipitation values. The variations of precipitation occur in a north-south direction from high to lower values (Woodward, 2008, p.17). Areas receiving less than 300 mm annual precipitation are semi-arid. The growing season for plants (according to photoperiod) is also shorter, and it gets longer towards the south to the desert zone. The duration of snow cover is another important aspect, which has an effect towards the availability of fodder, and thus to the movements of groups. In grasslands of higher altitudes, for example in Eastern Kazakhstan, snow stays on the ground from October to May. Two other aspects are biomass and crude protein yield of the fodder vegetation, so to say the nutrition value, which the herders choose from different zones (Kerven *et al.* 2006).

Traditional Kazakh herders are known to be travelling between these distinct zones and use various movement strategies to take the advantage of them in different seasons (Kerven *et al.* 2006, p.99). According to this, two main characteristic annual cycles were classified (*Ibid*): 1) Latitudinal form: South-North-South; starting in spring and travelling a distance of 200 to 2000 km. 2) Vertical form: staying in plains in winter, spring, autumn and travelling to mountains in summer.

Were the climatic conditions the same during the Andronovo-Fedorovka time (2nd millennium BC)? Mid-Holocene is remarkable with climate fluctuations, between arid/humid and cold/warm trends. As we see above, the most important aspect which changes the vegetation zones are the differences occurring in



Fig 1: Ore deposits and settlements in Eastern Kazakhstan 1-Cherdoyak (Sn) 2-Chudskoje (Sn) 3-Delbegetej (Sn) 4-Karciga (Cu) 5-Kazaknchunkur (Au) 6- Mynchunkur (Sn) 7- Nikolaevskoe (Cu) 8- Orlovskoje (Cu) 9-Ubinskoe (Sn) 10-Uruncaj (Sn) 11-Zyrjanovskoe (Cu); A-Ayrtau B-Novaja Schulba (based on Stöllner *et al.*, 2010 Abb.1)

annual precipitation values. The Eneolithic to Early Bronze Age transition in Eurasia (second half of the 3rd millennium BC) falls into the Early Sub-boreal period (SB-1); with a cooling trend and humid climate; Middle and Late Bronze Age (2nd millennium BC) falls in the advanced or middle Sub-boreal (SB-2) with warmer but drier conditions (Khotinskiy 1984a, pp.197-198, Parzinger 2006, pp.854-855). On the other hand the regional reconstructions show different trends (for south of Mongolia Tchebakova *et al.*, 2009, for Minusinsk basin Dirksen *et al.*, 2007). New evidences obtained from relatively closer locations to Eastern Kazakhstan show that there were more humid conditions, from the turn of the Early Bronze Age to the Middle Bronze Age (3,75 kal BP/ 1850 cal BC). North, at the Big Yarovoe lake (Rudaya *et al.*, 2012), the past conditions show changes from a condition of steppe vegetation and arid climate to humid and warm, the region turning into pine forests, (*ibid*,p.36). Ozerki mire in North East Kazakhstan also shows a similar change; from approximately Early Bronze Age onwards (5100–5000 BC) pine penetrated to the Irtysh Valley and pure pine forests became dominant in the Ozerki region since then (4300 BC). Kremenetski adds that the general structure of the regional vegetation was similar to that of modern times (Kremenetski, 2002).

Pastoralism vs Agriculture: Defining a Mobility degree

The climatic trends are respected as a stimulus for the development of mobile pastoral groups of the Andronovo and their migration. It is a broad debate

and not in the scope of this short paper (see further Kuzmina, 2007; Tkacheva and Tkachev, 2008; Lamberg Karlovsky, 2002). But the terms and approach to the archaeological culture was effected by the research history's biases and this reflects on the approach to subsistence strategy models, too. One of the outcomes is the "environmental deterministic approach", and the other is "searching for the origins of Andronovo in agro-pastoral societies".

The definitions differ by publications with the given terms; transhumant, semi-pastoral, semi-nomadic, nomadic. We can conclude that all of these terms refer to a same concept; indicating that the groups were not having a fully mobile pastoral lifestyle (as like mounted nomads had)¹, rather they were more probably changing locations between different settlements on a seasonal basis. These mentioned definitions are adopted from anthropological classifications and mostly based on ethnographical examples. For example in one of the most influential works which was done by Khazanov, his classification for mobile groups of the Eurasian type of pastoralism is based on the degree of agricultural practice taking part in the subsistence strategy. We can see that, in both semi-mobile forms he explained as: A) *Semi-nomadic*; extensive in migrations, periodically changing pastures during the entire or greater part of the year, agriculture plays only a supplementary role. B) *Semi sedentary pastoralism*: agriculture is predominant the majority of the population is sedentary and occupied with agriculture. Livestock or some of it maintained all year round on pastures, sometimes quite far from the settlement and was tended by herdsmen (division of



Fig 2: Panorama from the mine Askaraly II towards west down the hill; first the graveyard and then the settlement is visible (Image from DBM)

labour). For a part of the year cattle are usually kept in enclosures (Khazanov, 1994, p.20).

When agriculture plays a dominant role in the subsistence strategy, the mobility degree of the group is assumed to get lower². In our case two more problems just happen to occur in this respect; first the role of agriculture is ambiguous and second, the types above are drawn by considering only the subsistence, and are made for explaining the effects of the mode of food production, therefore not taking into account the movements of metallurgical activities.

Researchers often proposed that the Andronovo groups might be practicing agriculture in a small scale in their summer camps, depending on the sickle, grinder, hoe-like tools present in the contexts. Often in archaeology these tools are considered as belonging to a farmers' tool box, but on the other hand they could have been used and also have been produced for several different purposes. The assumptions about agriculture also seemed convincing with the presence of settlements located in riverine areas, where the groups might have used the advantage of the flood-land for garden agriculture (see for arguments Kuz'mina 2007, p.141). While the term garden agriculture is arguable and ambiguous also, the term is used to describe that these mobile groups invested small scale labour in clearing the land, crop management and irrigation (Smith, 2001). Besides these indirect evidences, there is yet no direct evidence for agriculture found in Central and Eastern Kazakhstan, and particularly from the Middle Bronze Age levels (Ryabogina & Ivanov 2011 Kohl, 2007, p.128). Moreover researchers point out that the beginning of agriculture in the forest steppe and steppe regions of Western Siberia took

part in the late 2nd – early 1st millennium BC and that seems more convincing (Ryabogina & Ivanov, 2011, p.104).

Mining with seasonal expeditions

Unfortunately in the total picture excavated settlements are far less numbered than the graves and this limits our knowledge about subsistence and mobility. Recent research revealed some mining camp sites, which are showing a periodical use. For example, in Karnab-Sičkonči (first half of the 2nd millennium BC), the semi permanent settlement was built with tents or yurts and it was used temporarily three times. It also had goods from Bactria, and horse and camel bones indicate a long trade history. (Boroffka *et al.*, 2002, p.149; Parzinger and Borroffka, 2003). There are also different strategies of subsistence, for example in Karnab, hunted game held a considerably high percentage in the diet, behind the sheep and goat, and then following cattle (Doll, 2003). A different example comes from south of the Urals from Kargaly-Gorny (from cal. 17th to 14th centuries BC) that the extraction of copper in the mining district might be more permanent, and with obtaining supports from outside; like receiving livestock (principally cattle) (Chernykh, 2013, pp.193-94, Kohl 2007, pp.173-174, see further Antipina in Chernykh 2004 pp.234 onwards)

Kargaly-Gorny, by being slightly more permanent exploited then the others, the other examples mentioned above are classified by Stöllner as "*mining with seasonal mode or by expeditions*". He adds that a non-permanent exploitation can also produce infrastructure and installations, which are necessary for inten-

sive work on a deposit. This doesn't need to occur as a substantial transformation of the landscape, building farmsteads and /or living in permanent settlements (Stöllner 2003, pp.402-403). Another clue comes from the preparation of ore; it was handled right next to mines in Central and Eastern Kazakhstan (Garner, 2013, p.350). Other evidence comes again from the palynological researches: Kremenetski found out that there are no traces of human-induced deforestation and suggests that the volume of ancient wood cutting for metal production requirements was within the natural long-term rate of tree growth and never created catastrophic ecological problems (Kremenetski, 2002, p.23).

To sum it up, we can assume that the classifications according to the forms of subsistence are in short to explain as "the way of life". The groups occupied with mining were fully equipped herders, which we will see examples in detail further on in this paper. We are not yet able to observe a labour division between herders and miners, both the production of food and metallurgical activities were handled together in the mining landscape by periodical visits with herds.

A preliminary case from Eastern Kazakhstan

The region is significant due to its rich tin resources; most are situated in Kalba-Naryn and the Rudnyi Altai mountains. The region was researched earlier and mines (like Mynchunkur and Cherdoyak) and settlements (like Malo Krasnoyarka and Trushnikov) were found (Chernikov, 1960).

The Delgebetej (Askaraly) ore Mountains are situated in the north western part of the Kalba Naryn geological unit (Stöllner *et al.*, 2011, p.234). The region was investigated recently between 2003 and 2008, with the focus on tin mining and metallurgy³.

Researches revealed a necropolis with miners' graves Chernogorka/Mastau Baj, a contemporary settlement **Mastau Baj** and tin mining **Askaraly II** (Stöllner, 2010, p.90; Stöllner *et al.* 2011). Dated to the beginning of the 2nd millennium BC, this complex with Andronovo-Fedorovka elements triggered new questions about the mobility. The debris of a house full with animal bones showed at the first glance that the husbandry practices were intense and the house plan showed similarities with the ones in the Central Kazakhstan Region.⁴ In the graveyard miners' tools were left at least in one grave as grave offerings. Also a wheel made of pottery sherd was found and it



Fig 3: Novaya Schulba: slag, stone tools and animal bones (Image from DBM)

showed that somehow there were connections with southern cultures like at other settlements (*ibid*).

The second find spot is near to a copper deposit situated 180 km north-west of Ust-Kamenogorsk and approximately 80 km north of Askaraly (Stöllner 2011, pp. 235). The settlement is situated on one of the old terraces of the Schulbinka river, which is a northern tributary of the River Irtysh. On this sandy terrace ore, hammerstones and crucibles revealed that the place was used for ore processing (Fig 3). The geomagnetic measurement showed signs of settlement and due to the scattered slags and the sondage excavation the site was identified as a workshop with smelting facilities. Pits filled with slags and another one filled with crucibles indicated that a considerable metallurgical smelting activity was carried out on a household level. The smelting of copper was very simply handled with an inefficient process which was carried out under weakly reduced atmospheric conditions (Hauptmann in Stöllner *et al* 2011, pp.235-236). One object with saw teeth on each side, produced from a polymetallic ore, shows possibilities that it was obtained from the deposits of Talovsk-Rulicha or the Orlovskoe pole, which is located north of Irtysh (*ibid*).

The site was used at least for three episodes. Two fire places dated with C¹⁴ into the 29th and the other into the 24th century BC from fire pits, but left no archaeological material. Another feature with small pieces of slag as well as ceramics correlated to the end of the 3rd millennium BC Early Bronze Age (Elunino-Krotovo Samus) culture (Stöllner *et al.*2011, p.236). And also Andronovo Fedorovka tradition ceramics and other finds are evident. The questions of the

beginning of tin-bronze metallurgy and if the deposit used in the Andronovo-Fedorovka times are important to understand the small scale regional interrelations, and the copper ore supply. The new archaeometallurgical investigations on the slags of Novaya Schulba showed that the copper ore is belonging to the Rudny Altai (Stöllner et al 2013, p. 390). The settlement's location underlines that it was appealing for fuel, water, grazing grounds which attracted people to stay in this river terrace (*ibid.*) Also the pine forests and valley forests which grew in the steppe belt were known to be very important for successful metal production (Kremenetski, 2003, p.23) and they are in close proximity to the settlement. The scarce architectural remains and only some fire pits nearby the terrace edge show where the actual dwellings were situated. They were also interpreted as simple tents with fireplaces in the centre. These also brought out questions about the organizational pattern, if the people in Novaja Schulba were depending on larger settlements (Stöllner et al.2011, p.236).

Recent evidences on herd management and land use

A distinctive characteristic of the Eurasian steppe pastoralism is the composition of herds; which includes three categories of livestock; small (sheep and goat), large (cattle) and transportation animals (horses and camels⁵) (Khazanov, 1984, pp.25-27). The herders in the region have these mixed flocks even today. These animals are mostly herded by the same household with no specialized horse breeders or sheep breeders. This type of herding is called "multi animal pastoralism"; to herd different animals together or by turns in a pasture (*ibid.*). Management of a herd with different animals have benefits; it reduces the risks of mass loss of animals from diseases, which are peculiar to species, and gives advantage over certain weather conditions. Because finding fodder in winter on snow covered pasture is one of the main problems in Central Asia. The horse can pasture grass covered with 30-40 centimetres of snow, sometimes even 50 centimetres, and then the other herd animals are driven after them to the pasture (Khazanov, 1984, pp.25).

The species included in a herd and also their proportions to each other might differ due to some factors. These factors are: biological particularities of animals, natural geographical conditions and economical, socio-political factors (Khazanov, 1984, p.25). Kazakh nomads consider cattle as hard to herd for long distance travels, while sheep have the endurance for travelling to long distance pastures and can be eas-

ily herded and need less water. Therefore the different mix of the herds from different settlements is a clue to reflect the variability of the solutions for different land uses. The variations in percentages also differ according to the ecological zones. In the north forest steppe zone there are more cattle than sheep in the herds (for an example see Bendrey, 2011). According to numerous ethnographic researches, nomadic systems in dry and/or mountainous regions are unsuitable for extensive cattle herding. On rocky terrains or in mountainous region, the cattle have difficulties moving (Chang, 2003). On the other hand it has to be mentioned that the percentages of cattle differs between steppe and desert regions more strikingly. In steppe regions there are more large stock than in the desert regions also with the agriculture higher in the general balance of economy the number of the kept larger stock tends to increase (Kohl, 2007, p.158; Khazanov, 1994). These of course should not be taken as a rule, because having a large stocked herd when travelling to semi arid - semi desert regions gave more advantages to the herder, as known from animal husbandry techniques (Kerven et al 2006).

According to the archaeo-zoological investigations from both sites (Doll, 2013) the representation of cattle versus caprine (sheep/goat) are nearly equal in percentages (around 40 %).

Doll interprets it as "their meat supply was mostly covered by beef" (Doll, 2013, p.20) as the cattle yield more than a sheep does. The representation in an archaeological context might not be exactly reflecting the original herd pattern, which the community might have had (personal communication with Doll). The representation of slaughtered animals in that location, when the location is a semi-permanent site, the observed situation could be due to the very seasons' pattern and this might depict a different picture on a different settlement of the same group. On the other hand, it is possible to assume that the results are representing the importance of cattle management as much as sheep. In fact in Mastau Baj there is a cattle *calcaneus* showing signs of fracture and healing which might be indicating that the animal was herded to mountainous landscapes (*ibid*) and might also be used for loading.

How to use a herd in a sufficient way is an important knowledge for herd management. Herder's harvest strategy is primarily directed to an underlying goal, to promote the long term propagation of the herd (Redding, 1981 in Zeder 2006, p.187) Therefore an animal owner decides to keep the individuals of the herd for producing lambs, wool and milk and only separates some of them for producing meat (Greenfield,

1988, p.574). Selectively culling the young males gives steady supply of meat and helps to preserve the pasture land too (Redding, 1981 in Zeder 2006, p.187). The ages of the sheep in the archaeo-zoological context gives hints to these decisions (Payne, 1973). In Mastau Baj the survival age pattern of sheep shows that a significant part of the herd achieved an older age (3-4 years and even much more) next to animals culled around age 1-2 for meat, which points out a mixed wool/milk and meat oriented strategy and similar patterns are also observed in different parts of Kazakhstan (Doll, 2013, p.24; Outram *et al.* 2012, p.2430). Horses are only represented around 3% in Mastau Baj faunal assemblage with few percentages and they were sub-adult or adult animals. Their rest is interpreted as kitchen refuse (Doll, 2013, p.27).

Where did they let their animals graze?

The conditions around the settlements are not restrictive. Today the Mastau Baj-Askaraly complex is situated in the ecosystem of flat intermountain valleys with deserted sagebrush, feather grass steppes on light-chestnut soils and locally with shrubs in micro-depressions of relief (WWF). The lands on the Delgebetey mountains around Askaraly are not steep but more in an undulating pattern. The settlement situated on a flat land with feather grass steppe ecology. Therefore it can be considered as a suitable terrain for herding and also for cattle, which is actually the same for today. River Char is not active in summer since the rivers in the region are winter fed and mostly carry higher volumes of water flow in May when the snow melts and today there are dams on the Irtysh. In any case there are ground waters for water supply.

Novaja Schulba is situated on the river terrace of Schulbinka and located in an eco-region of wavy inclined plains with *Artemisia* shrubs, feather grass and feather grass steppes on sandy and loamy sand and chernozem and with aspen and birch. Some of the lands are transformed today and used as arable land (WWF). Actually the lands are also suitable for rain-fed agriculture. The sheep teeth found in the settlement are extremely worn, relatively to their age, which proposes that the sandy soil of the riverside area might be the main fodder ground for the herd (personal observation and Doll). This is in accordance with the percentages of cattle and sheep ratios in Novaja Schulba. As it is expected to be on grass steppes, the fodder was probably not collected with sickles most of the time in year, but animals were fed on the fodder themselves. So for a preliminary assumption it allows to say that they might be spending most of the year

around that vicinity and/or maybe they were mostly using the river as a route for changing their summer and winter grounds.

What else did the people eat?

Next to domestic animals above, small percentages of wild animals like rabbit and deer were hunted and also they ate chicken. The recent investigations on lipid residue analysis for the Central Kazakhstan, Middle Bronze Age Andronovo sites show that the milk and meat were procured of sheep, cattle and horses (Outram, 2012). However it is not enough to assume that people were leaning on meat and dairy products only, first because of the possible dietary problems it can cause, and second a famine or pest would end up as a big crisis in their subsistence. In both settlements there are no indications for cereal cultivation, neither that it was practiced in an agricultural level. Yet to be cautious, it should be remembered, that Mastau Baj is partly excavated, so there are no fire places found and investigated for this purpose.

Another interesting point which might be mentioned about Mastau Ba: the investigations showed that there is extensive practice of marrow extraction even from the smaller bones (Doll, 2013). At the first glance this practice reminds of food stress among the population. On the other hand it brings out the question: could it be a solution for supplement to diet? Outram suggests that when the agricultural part of the diet is insufficient and in those cases of diets with less carbohydrate intake, the fatty bone marrow can prevent the muscle breakdown in risk of consuming high animal protein (see Outram, 2005).

More eclectic solutions for subsistence and land use?

What we know about the diet so far it consists of herd animals (sheep/goat, cattle, horse) also some wild animals and fish (O'Connell *et al.*, 2003). And as mentioned above there are no evidences yet for agriculture of any kind.

For a short debate here, we can mention the differences between hunter-gatherers and pastoral nomads drawn by Cribb (2004, pp.21-23) based on Binford's description of hunter-gatherers: "**hunter-gatherer** schedules his movements with regard to consumption; **the pastoral nomad** is tied to a schedule of pastoral production... Whereas the hunter-gatherer exploitation strategy is an eclectic one..., that of the pastoralist is driven by a single overriding preoccupation- the search for pasture for his flocks".

When we consider the negative evidences for agriculture at hand the subsistence strategy and the prerequisites to choose the locations for special purpose sites - considering ore extraction and metallurgical activities - we can assume that the settling and probably movements of the groups were closer to the hunter-gatherer like strategies from the point of broad-spectrum land use. The advantages of the land in-need for the pastoral people of Andronovo would not only be fodder areas, but ore resources and also accessible other sources like water, fuel, edible plants⁶, fishing areas⁷ and hunting grounds for wild animals. It would be different than the needs of herdsman strategies defined through the direction of the best fodder lands only.

Conclusion

Multi-animal herding, dairy products and wool production were already settled in the Middle Bronze Age. And it was practiced along also with the exploitation of the mines and household scale metallurgical production in Mastau Baj and Novaja Schulba. The type of the form of movements either latitudinal or vertical and/or zonal between Central Kazakhstan and Eastern Kazakhstan is not revealed yet⁸. Also the diet of the communities still stands as a question, broad spectrum land use and diverse supplements to subsistence via wild forms of edible plants, and/or with traded made-ready cereal products must be researched. If the tin was exported by Central Asia what was received back still waits to be answered.

Notes

- 1 This is also debated, even in the times of mounted nomads Scythian's there were groups which were more settled and dealing with agriculture. Khazanov (1994) also mentions that in this respect, his "pastoral nomad proper" type of subsistence strategy without agriculture might never have occurred.
- 2 Sedentism is considered as an indication of an agricultural practice. It is true that the domesticated plants, especially cereals are in need of continuous human care to reproduce and to survive environmental conditions (Smith, 2001, p.16) Yet we know that there are sedentary forms of subsistence strategies as food procurement.

- 3 In "Kupfer und Zinn im Erzaltai - Bronzezeitliche und früheisenzeitliche Rohstoffgewinnung in Ostkasachstan" project founded by Gerda Henkel Stiftung and managed by Prof. Th. Stöllner -Deutsches Bergbau Museum in cooperation with Margulan Institute of Kazakhstan and Ust-Kamenogorsk Museum.
- 4 In Atasu settlement a similar structure was excavated by Margulan and his team (Margulan et al. 1966) . The one in Mastau Baj is the only example of this kind of structure in Eastern Kazakhstan.
- 5 In the Middle Bronze Age context camel bones are seldom.
- 6 The drought resistant crops such as spring wheat, oats and millet are known to be cultivated in the steppes (Cosmo 1994, p.1094). The use of pseudo-cereals, intensive gathering or collecting them is also possible (see Kohl 2007, pp.157).
- 7 The earlier excavated settlements by Chernikov in 1960's Malo Krasnoyarka and Trushnikovo are both located on the shore of the Irtysh. The fish consumption would have been an important factor.
- 8 This paper is a part of the ongoing phd. project named Economy and Mobility of Central and Eastern Kazakhstan. Funded by Gerda Henkel Stiftung, under the graduate collage RITak. Project aims to deal with most of the problems mentioned in the text about movement patterns and diet by combination of several isotope analysis.

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