SOCIAL ORGANIZATION AND INTERACTION IN BRONZE AGE EURASIA:

A Bioarchaeological and Statistical Approach to the Study of Communities

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Submitted to the Graduate Faculty of

the Dietrich School of Arts and Sciences

in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy in Anthropology

University of Pittsburgh

2013

UNIVERSITY OF PITTSBURGH

Dietrich School of Arts and Sciences

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It was defended on

October 18, 2012

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While it has recently become clear that pastoral groups have varied economies, social systems, and mobilities, current models of interaction have not integrated the variable lifeways of pastoral communities. In the case of north central Eurasia, scholars have focused their attention on sweeping changes that occurred in patterns of settlement and social institutions from the Middle (2100-1700 BC) to Late Bronze Age (1700-1400 BC). Efforts to understand this transition have resulted in models that cover broad expanses of steppe and oversimplify the existing data. In order to construct more convincing models of interaction for the Bronze Age, we must begin with comprehensive datasets of local communities. The research presented here confronts issues of social and biological variation and their role in structuring connectivity and relationships in prehistory.

To critically examine theories of interaction associated with posited social and economic developments during the Bronze Age, this dissertation investigates the shifting structure of social organization through an investigation of mortuary behaviors and ritual practices. Through a change in perspective, we re-focus on smaller micro-regional discussions of integration and interaction, addressing the relationship between the local community and the global through comparative analyses of two pastoral communities that span the Middle to Late Bronze Age. These periods are marked by a shift from aggregated to dispersed populations, broader spheres of interaction, and new forms of mortuary ritual. This research draws upon statistical analyses of mortuary remains, dietary reconstruction via stable isotopic analyses, and biodistance of dentition to develop a robust picture of changing social identities and organization. The results reveal that subsistence regimes stayed relatively uniform while inequality shifted drastically, evidenced by changes in kin centered wealth and identity signaling. This expands our understandings of social complexities of pastoral societies and adds to the growing body of literature on gender roles, status, and kinship. The Eurasian steppe is a pertinent location for the study of pastoral interactions, but few studies have examined the detailed nature of social and biological communities, or interplay between them. This project is important given that studies of pastoralist societies have infrequently contributed to comparative analyses of complex societies.

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For my grandparents: Dominic & Renata Campanile and Albert & Angela Ventresca
You taught me about love, strength, and generosity.
You lived difficult lives, but made them seem easy. I miss you every day.

PREFACE

Since I began my career in archaeology I have received support and encouragement from a great number of individuals, to whom I extend my sincere appreciation. I have been very fortunate to have exemplary scholars from my dissertation committee including Katheryn Linduff, Margaret Judd, and Michael Rosenmeier. I thank them not only for their willingness to read and comment on this dissertation, but for all of the time and energy they spent helping me move forward in my research and professional development. Above all, I express my heartfelt gratitude to my advisor, Bryan Hanks for his continual support, encouragement, and guidance during all phases of this project and over the course of my doctoral studies. I could not ask for a better mentor in my scholarly and personal endeavors.

I have received great support from Kathy Allen and Sandra Olsen who have been wonderful mentors, colleagues, and friends. I thank Claudia Chang and Michael Frachetti who helped to pave the way for my research project in Kazakhstan. In terms of my archaeological genealogy, I also thank William Walker and Tim Pauketat who advised me when I was still a young student. Special thanks to my colleagues and friends who contributed to this project by sharing insights and providing encouragement, especially Julie Hoggarth, Katie Haas, Julia Clark, Sean Foley, James Williams, James Johnson, Megan Clouden, Nicole Moga, Mike Fifth, Jason Espino, Jennifer Roland, and Jean-Luc Houle.

I am also grateful to colleagues and staff in several institutions in Kazakhstan: Karaganda State University named after E. A. Buketov, Lisakovsk Museum of the History and Culture of the Upper Tobol Region, Kostanai Governmental University, and the Kostanai Regional History Museum. In particular, I want to thank my mentors and colleagues V. V. Varfolomeev, V. G. Lohman, and V. V. Yevdokimov for allowing me to occupy their classes, laboratory, and offices over several years, and Antonina Ermolaeva for always helping me to find archaeological literature in Almaty. In regards to the rare opportunities of researching two of the greatest Bronze Age sites in Kazakhstan, I greatly appreciate my colleagues Irina Shevnina and Andrei Logvin for supporting my dissertation research and allowing me to analyze materials from the Bestamak site, and my colleagues Aleksander Simonich and Alina Kolbina who helped me to navigate archaeology in Lisakovsk and Kostanai. Special thanks as well go to all of the archaeologists and students who made the Lisakovsk Archaeological Project such a wonderful place to excavate and start a dissertation. This dissertation project, and indeed my graduate career, would not have gone forward without the support and guidance of Emma Radikovna Usmanova. She may not have brought me into this world, but she introduced me to hers, and in doing so allowed my dissertation to take life. Her encouragement, love, and kindness know no bounds.

I also extend my gratitude to all of the families that have hosted me during my many stays in Kazakhstan for my dissertation work. Thank you to the families of Alina Kolbina, Zhazira Baisautova, Olga Niyazova, and Dmitri Ivanov who opened their homes to me and treated me like family, I am eternally grateful. Special thanks to my friends at Ecomuseum, especially Dana & Alexander Yermolyonok, and Dmitry & Julia Kalmykov, for all of their advice and assistance over the past several years. The Peace Corps Volunteers in Karaganda have also been a great source of support and laughter, especially Mark Flynn and Jimmy Rabon, and fellow unicorns Katie Roders and Elena Augustine.

Finally, I am so very grateful to have the loving support of my family. I could not have accomplished this research without the guidance of my parents, Assunta and Albert Ventresca. Thank you to Vincent, Caroline, Izabella, Michael, and Luke Ventresca, and Anna, Andrew, Gia and William Krause for always reminding me what is really important in this life, my family. I also want to recognize all of my aunts, uncles, cousins, and non-related relatives that make up the Fam. As a group, you are loud, crazy, and fun, but you also form the greatest support system that anyone could ever ask for, and I am so lucky to be part of that. These thanks also go to my new family, the Millers, for all of their love, support, and encouragement. Last, but definitely not least, I thank my husband Bryan Miller for his encouragement, love, and laughter. No matter what country we wake up in, we will always make a life together. This process has been difficult, but its success is partially due to Bryan's insight, encouragement, and reading of multiple drafts of this dissertation, and I can never thank him enough.

1.0 INTRODUCTION: APPROACHES, PERSEPCTIVES AND ANALYSES

“No one culture in Russian archaeology has so many controversial interpretations and paradoxes as the Andronovo culture”. (Koryakova and Epimakhov 2007:13)

As this statement reflects, there is a profound sense that the Andronovo development defies conventional culture historical explanation. The spread of similar forms of cultural material over a vast region necessarily invites paradoxes, as the Andronovo development stretches from southern Russia to the southern border of Kazakhstan and from the Caspian Sea to western Xinjiang (Figure 1.0). Similarities in cultural materials suggests to many scholars that processes such as migration, unification, or integration occurred, however, this landscape is also peppered with detailed data from specific sites that introduce variability and diversity into the mix (Figure 1.1). Modeling for this region therefore seems paradoxical, contrasting broad sweeping narratives and detailed site descriptions. Nevertheless, there continue to be substantial gaps in method and theory between individual sites and the modeling of broader processes. This contrast is evident in two visual representations of the Andronovo in a single volume (Fig. 1.0). While Kuz'mina does not explicitly compare and contrast these maps, when placed side by side they are a visual representation of the main reasons why the Andronovo development seems contradictory. One map depicts the distribution pattern of Andronovo types (Kuz’mina 2008a:118; 2008b:472) and the other, the Andronovo cultural entity (Kuz’mina 2008b:468).

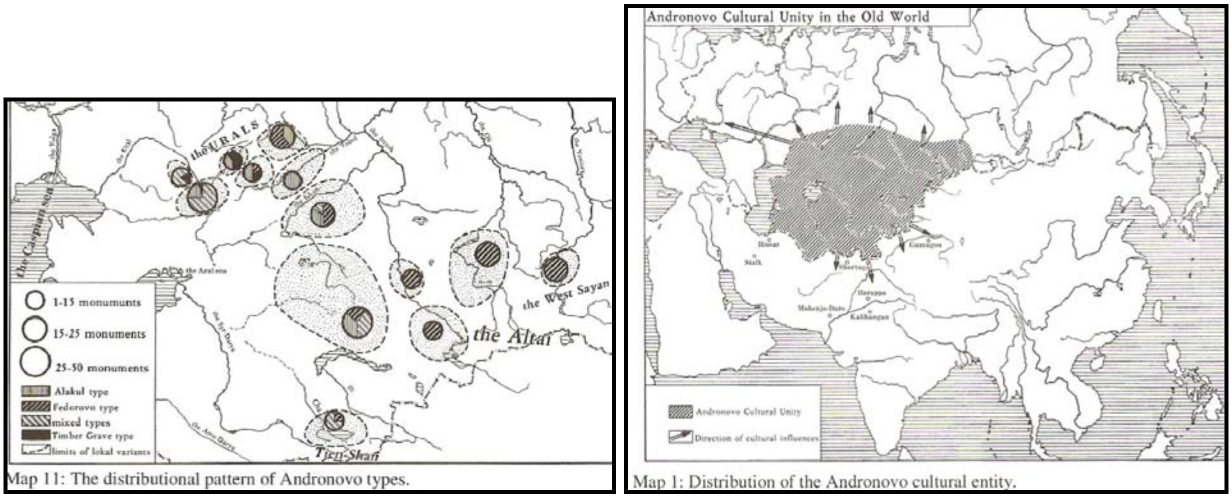

Figure 1.0 “The distribution pattern of Andronovo types” (Kuz’mina 2008a:118; 2008b:472) and the “Distribution of the Andronovo cultural entity” (Kuz’mina 2008b:468)

The true paradox is between a historical reality, where variability between sites and micro-regions is evident, and an imagined view where Andronovo cultural elements spread over an extremely vast region. Soviet scholars often used an overarching or ‘imagined’ community concept to imply that interactions or migrations were taking place in this region. This is often described in ethnic terms and divided into sub-cultures based on variation in cultural material. The Soviet concept of an overarching community is similar to more recent notions of the 'imagined' community, which is conceptualized as cross-cutting social constructs (Yaeger and Canuto 2000:6-7). Soviet scholars conceptualized the Andronovo as a set of cultural elements, which implied that interaction was occurring in this broad region. Traditional narratives by Soviet archaeologists, working within a tradition of historical study, focused on ethnogenesis or the direct migration of ethnic groups, leading scholars to search for continuities in distinct and variable archaeological materials (Salnikov 1967; Grigory’ev 2000; Kuz’mina 2007). Such approaches have overshadowed more complex processes associated with regional interaction and exchange, and continue to affect current modeling of the Andronovo development.

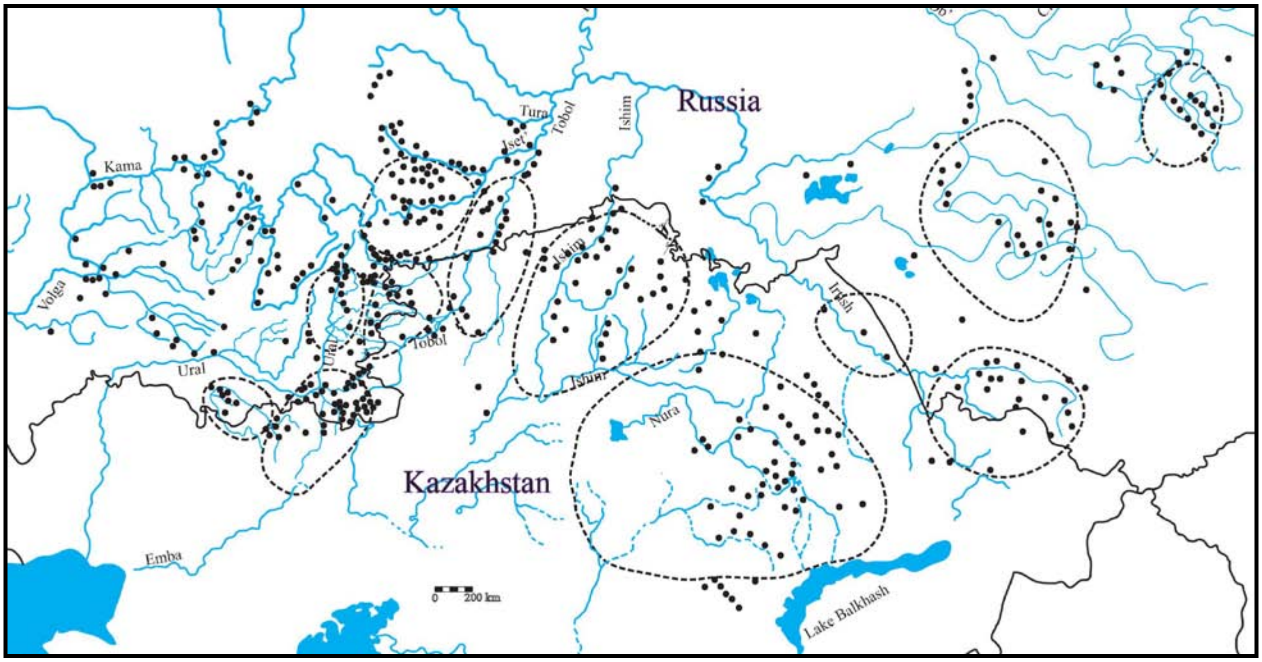

Figure 1.1 Locations of Andronovo Sites with Kuz'mina (2008a:118, 2008b:472) types superimposed. (Site locations based on: Grigor'yev 2000:291; Stefanov and Korochkova 2006:6; Koryakova and Epimakhov 2007:125; Kuz'mina 2008a:66,68)

Recent models persist in discussing the Andronovo development in broad terminology, using world systems, core-periphery, and multiple-core models to explain developments in the steppe zone (Hiebert 2002; Frank 1993; Christian 1998; Koryakova and Epimakhov 2007). Scholars have focused on discussions of the driving forces behind these models including the spread of technology, warfare, and climate change (Kohl 1996; Koryakova 1996; Anthony 2007; Koryakova and Epimakhov 2007; Kohl 2008; Anthony 2009; Kohl 2011; Frachetti 2012). However, some of the latter scholars have also broken away from world-systems models in attempts to include greater dialogue concerning local social structures and institutions (Kohl 2008; Kohl 2011; Frachetti 2012). While variability between communities and micro-regions has always been evident, recent discussions of "nonuniform institutions" (Frachetti 2012) and "social fields" (Kohl 2008; 2011) highlight differentiation in rites of burial, social and political structures. However, the engagement of local groups in wider interactions is not explained and we are missing linkages between individual sites and broader processes. This, then, leads to a very important question: how can we understand the relationship between local dynamics and large scale processes?

One of the ways these issues can be overcome is by gathering site information in a more rigorous empirical manner, and by modeling interaction and connectivity at the community and micro-scale. Previous site level analyses in Eurasia frequently lacked robust datasets, which is problematic starting at the level of field data collection and transcending into broader comparative measures. As a region, Eurasia lacks datasets that come from comprehensive pedestrian surveys, flotation and botanical analyses, statistical analyses of mortuary remains and even faunal analyses. Archaeological background research is incomplete when compared to other regions of the world. Furthermore, conflicts occur when scholars attempt to force site data into existing broad models, or when a single site is used as the template for descriptions of broader processes. Therefore, for this dissertation, a bioarchaeological approach was adopted in an effort to identify local relationships and connectivity as part of a model of *glocalization* (Robertson 1992; Gosline 2004; Khondker 2004). A bioarchaeological approach was chosen as it provides multiple datasets to examine how interactions occurred both biologically and socially, which previous culture historical approaches have been unable to answer.

Glocalization is a bottom-up approach that incorporates variation in social and biological factors by employing local data as a jumping off point for comparative research (Robertson 1992; Pitts 2008). The study of glocalization explores the ways that individuals, groups, and micro-regions are affected by, and negotiate, socializing (integrative) and globalizing (interactive) processes. Furthermore, glocalization is a means of conceptualizing change in terms of the effects of intensifying or changing networks of connectivity (Pitts 2008:494). While the late prehistoric Andronovo development has been broadly conceptualized as part of a world system of sorts (Kohl 1989; Frank 1993; Christian 1998; Kohl 1996; Hiebert 2002; Koryakova and Epimakhov 2007), this does not seem to fit what effectively is the flow of materials, technology, and knowledge over a vast area. Instead, the spread of these elements without inherent integration of local groups fits much better with models of globalization.

Building upon past research in Eurasia, I propose that we adopt new approaches to understanding *connectivity*, particularly the ways that relationships formed and persisted in local communities. One way that we can investigate patterns of relationships between individuals, objects, and communities is by conceptualizing these connections as part of a network (Brughmans 2012:299). By adopting a network approach to connectivity, we can investigate the pathways between units of analysis, which symbolize social and biological relationships. Within the network framework, pathways can be any relationship between units, including kinship, flow of materials or resources, or interaction (Wasserman and Faust 1994:8). A bioarchaeological approach to the study of relationships and pathways can clarify patterns of connectivity based on social and biological interactions such as post-marital residence, kinship, and social organization.

As a general theme, this dissertation is concerned with sets of relationships and interactions at different scales. Using the mortuary realm as my main dataset, I investigate social processes that occur within and cross-cut communities. The main focus is to examine the social and biological dynamics present between individuals and groups, and to use this data to extrapolate models to understand larger scale interactions with larger regional contexts. This topic is especially relevant to Bronze Age Eurasia and the very different types of communities that developed and interacted in the steppe, as many scholars have been interested in large scale interaction and social, cultural and economic change (Frank 1993; Kohl 1996; Koryakova 1996; Christian 1998; Hiebert 2002; Anthony 2007; Koryakova and Epimakhov 2007; Kohl 2008;

Anthony 2009; Kohl 2011; Wilkinson et al. 2011; Frachetti 2012). This research addresses a considerable amount of data from the mortuary realm, and engages with research connected to kinship and biological affinities, the multitude of individual identities and personhood, the funerary process, changing subsistence strategies and dietary status. These have become central themes in the comparative analysis of mortuary data in many regions of the world, yet, have rarely been touched on by archaeologists working in the central Eurasian steppe region.

Local level patterning should be investigated in an effort to understand the ways that each community differentially navigated broader processes. I have therefore identified several ways that connectivity could be identified within local communities:

1. *The nature of differentiation in local communities*
2. *The relationship between kinship and mortuary practices*
3. *The intersection of dietary and social patterning*
4. *Changes in correlations between social and biological patterns over time*

Thus, the main goals of this dissertation are to establish the multitude of identities (biological and cultural) that are present in local communities, reconstruct social structures and economies of local groups, and to integrate this data in order to better understand processes of interaction and integration on micro- and macro-regional scales. The need for this line of inquiry to be addressed in regard to Bronze Age communities becomes clear when previous approaches and problems in Eurasian archaeology are reviewed. The following sections highlight problematic issues in the archaeology of the Eurasian steppe and the ways this dissertation will build upon previous theoretical and analytical approaches.

1.1 APPROACHES TO EURASIAN STEPPE ARCHAEOLOGY

Anglo-American perspectives and approaches to archaeology in the Eurasian steppe have greatly transformed from a set of curious case studies during the Cold War, to a region of change and interaction that challenged our ideas of the steppe, and more recently to focused studies of microregions and their place within broader processes of social change and interaction. Early books such as *The Steppe and the Sown* (Peake and Fleure 1928) differentiated between pastoral and agricultural economic zones, which eventually came into contact. This discussion was based on case studies plucked from the archaeological record, and leans heavily on the writings of Childe (1925, 1926). It was not until the 1950's that archaeological publications from Eurasia became available, when *American Antiquity* and other journals began to translate and publish articles from *Soviet Archaeology (Sovetskaya Arkheologiya)* (i.e. Krader 1958; Smirnov 1966; Klein 1968; Alekseev 1972). These first glimpses behind the Iron Curtain allowed for the recognition of theories and ideas from regional specialists and initiated some of the first discussions between these disparate perspectives (Gorodtsov 1933; Field and Prostov 1940; Vavilov 1948; Zenkovsky 1954; Krader 1959; Akishev 1961; Mongait 1967; Kleijn 1970; Kleijn 1973; Kleijn 1977; Gjessing 1978; Trigger 1978).

As interactions between post-Soviet countries and the West have progressed, collective conferences and volumes have contributed greatly to mutual understandings of the Eurasian steppe zone. The conference, *Complex Societies of Central Eurasia from the 3rd to 1st Millennium BC,* which was held in 1999 at the Bronze Age site of Arkaim, Russian Federation, was one of the first venues where international scholars were invited to discuss and examine social complexity in terms of language and culture for both the Bronze and Iron Ages in Eurasia. The resulting volumes had a decisive focus on Arkaim and other major archaeological sites, resulting in a reconsideration of the steppe and its affect on other areas (Jones-Bley and Zdanovich 2002).

At the same time, several edited volumes were published concurrently by the McDonald Institute, starting with *Late Prehistoric Exploitation of the Eurasian Steppe* (1999), followed closely by *Ancient Interactions: East and West in Eurasia* (2002), and *Prehistoric Steppe Adaptation and the Horse* (2002). These volumes serve as valuable benchmarks, which prompted discussions of pastoralism in Eurasia and its ties to mobility, farming, and animal domestication. Simplistic views of the steppe region, as well as complicated culture historical terms, became important talking points. More importantly, shifts over time in mobility, subsistence, and technology were highlighted. Edited volumes from the Chicago Eurasian Conferences in 2002 and 2005 also produced volumes titled *Beyond the Steppe and the Sown* (Peterson et al. 2006) and *Social Orders and Social Landscapes* (Popova et al. 2007). These volumes highlight diversity of regions and concepts in Eurasia through thoughtful case studies and social models. These conferences and volumes have been cited by many prominent Eurasian archaeologists as influential for the formulation of future projects and publications, many of which are discussed below.

While the above edited volumes were a significant introduction to the problems and potentials of Eurasian steppe archaeology, few publications focused on modeling interaction or social connectivity in this region. Building upon ideas conceived by Soviet scholars, a number of regional and international scholars have attempted to model the types of interactions occurring in Bronze Age Eurasia using world systems, core-periphery, and multi-core models (Kuz'mina 1986; Frank 1993; Christian 1998; Kohl 1996; Di Cosmo 2002; Hiebert 2002; Popova 2006; Kuz'mina 2007). In 2007, several comprehensive volumes appeared that focused on the Eurasian steppe, including *The Making of Bronze Age Eurasia* (Kohl 2007), *The Horse, the Wheel, and Language* (Anthony 2007), and *The Urals and Western Siberia in the Bronze and Iron Ages* (Koryakova and Epimakhov 2007). These volumes are broad not only in their treatment of the culture historical changes, but also in terms of theoretical models proposed for the Eurasian steppe over time. Technological advances such as wheeled transport, horse breeding and use, and metallurgy were perceived as stimulants for increased interaction in Eurasia and Central Asia (Kohl 1996; Anthony 2007; Kohl 2007; Kuzmina 2007). Concepts such as 'social fields,' which reconstruct the broad contours of historical developments also have been proposed (Kohl 2008). However, while models that focus on global or larger regional developments are vital, they often overshadow clearer understandings of micro-regional social processes that occur within and between local communities (intermarriage, warfare, seasonal congregation). Therefore, these broad models need to be tested using empirically derived data on smaller scales of archaeological time, and immense 'culture areas' or buffer zones dissected using detailed multidisciplinary data. For example, a micro-regional approach has been used by Frachetti (2008b) to examine how communities interact with their landscapes. Communities within this local zone of southeastern Kazakhstan are seen as the result of internal variation, location, as well as broader regional interactions (Frachetti 2008b:169).

The more recent edited volume, *Social Complexity in Prehistoric Eurasia: Monuments, Metals, and Mobility* (Hanks and Linduff 2009), emphasizes how Eurasian steppe archaeology may contribute to studies of early complexity. This volume, like the compilations mentioned above, is the culmination of several decades of collaborative research and discussion among archaeologists working in Eurasia. Furthermore, the papers within it are some of the most robust contributions to the field, because they combine detailed archaeological research and methods with models that are a better fit for Eurasian steppe groups. Scholars have begun to focus on multi-variable explanatory models, where climate, conflict and interaction are all ingredients in the process of development (Anthony 2009). Prehistoric interaction is modeled at the macro- and micro-scale perspective, as seen in several recent examinations of Middle Bronze Age Sintashta culture developments (Anthony 2009; Frachetti 2009; Hanks 2009), and steps are also taken to better define the economic and social systems of Eurasian communities in prehistory (Epimakhov 2009; Hanks 2009). With such research, some of the attention has moved away from broad sweeping models to concentrated ones with strong supporting archaeological data.

Much of the present scholarship argues for the examination of variation in economy and social organization of prehistoric Eurasian groups, including discussions of non-uniform complexity (see Frachetti 2009; 2012), the search for ephemeral sites (Frachetti 2004; Johnson and Hanks 2011), and detailed research of mortuary remains (Epimakhov 2002; Hanks et al. in press). However, research trends in the Eurasian steppe have only recently begun moving towards smaller scales of analysis necessary to understand micro-regional and local trends. The social and economic systems that sustained communities are much better defined than in previous studies, but there remains a need for continued research into a multitude of variables such as storage, craft production, metallurgy and exchange (for exception see Hanks et al. in press). More comprehensive techniques, including geophysical, geochemical, and bioarchaeological analyses, will certainly add to relevant databases and further enhance our ability to explain social processes. Therefore, we should continue to focus on gathering and processing micro-regional and local level datasets, through a multitude of analyses, for constructing more comprehensive foundations for discussions of broader social processes found at the macro- and supra-regional scales. This dissertation aims to connect with this next phase of archaeological research and interpretation in the Eurasian steppe region through a bioarchaeological approach to connectivity and pathways. This includes investigation of the mortuary record (mortuary statistics, dietary reconstruction, biodistance) as part of a model of glocalization (Robertson 1992) to determine how individuals and communities differentially navigated broader processes. Only through continued detailed research of connectivity at the community and individual levels can we build comparative datasets that will help to fill in the lacunae of data in the Eurasian steppe, which is currently holding back our understandings of broader regional processes.

1.2 PROBLEMS AND SOLUTIONS FOR THE EURASIAN BRONZE AGE: REGIONAL MODELS, SOCIAL COMPLEXITY, AND IDENTITY

The growth of empirical work in Eurasia is significant not only for its contributions to understanding steppe groups, but also because it enhances anthropological archaeology through discussions of the different trajectories of social organization and complexity, processes of interaction, exchange, and mobility, as well as the economic foundations of societies. At the interface between theoretical and methodological developments in various regions of the world, Eurasian steppe archaeology has a great potential for contributing to understandings of local groups and micro-regions through multi-disciplinary and integrated analyses. Investigations into Eurasian steppe interactions offer a fresh perspective on regional dynamics affected by and manifested at the micro-regional and local levels. This is because the wide variety of steppe pastoral groups increasingly challenges accepted notions of complexity and social processes. However, there are key theoretical and analytical issues that continue to be problematic within studies of the Bronze Age period of the steppe region. This is especially apparent at the transition from the Middle to Late Bronze Age when changing settlement and mortuary patterns seem to gravitate towards greater mobility and interaction in the region (Hanks et al. 2007).

During the Middle Bronze Age (MBA) (2100 to 1700 BC), a combination of nucleated settlements and large populations (~200 to 700 individuals) highlight the more sedentary nature of these communities (Gening et al 1992; Grigor'ev 2000; Anthony 2007; Kohl 2007; Koryakova and Epimakhov 2007; Hanks 2009). In contrast, the subsequent Late Bronze Age (LBA) (1700 to 1400 BC) reveals increased interaction and mobility, based on smaller dispersed communities (often <100 individuals) with similar cultural materials spread over a vast area (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Kuz'mina 2007; Koryakova and Epimakhov 2007). Explaining the transition of pastoral groups from those living in aggregated to dispersed communities in terms of interaction has challenged scholars whose research on long-distance migration, mortuary behaviors, and regional interaction have accordingly generated a broad picture of the Bronze Age. Thus inquiries into the nature of interactions within and between local communities remain virtually unexplored. Some of the problematic issues relating to the traditional study of Bronze Age Eurasia include:

- Generalizing models relating to processes of interaction and social change that overlook detailed data from smaller units of analysis (at the micro-region and community levels)
- Biodistance data used over broad areas to examine processes of migration and interaction using minimal skeletal data from diverse mortuary contexts
- The equation of ethnic groups and archaeological cultures, obscuring variability at the community and individual level
- Strong circular links created between economy, mobility, and social complexity (e.g. agropastoralism = decreased mobility = increased complexity)
- Lack of detailed statistical and bioarchaeological analyses of the mortuary record
- Rigid hierarchical interpretations of status in relation to mortuary patterns, which overlook social and biological relationships

This dissertation is structured to overcome many of these issues through an integrated and multidisciplinary bioarchaeological approach to the mortuary realm. In order to move forward, this approach forces a change of scale and perspective through the following agendas:

- Approach: to build upon ethnographic studies of pastoral societies to better inform investigations of social processes
- Approach: to provide multi-scalar analyses of the mortuary record, moving from the study of the individual to the community to the micro-region
- Analysis: to provide multi-disciplinary bioarchaeological studies of identity and personhood, social organization, and processes of interaction through the use of biodistance, mortuary statistics, and geochemistry
- Approach: the investigation of pathways, relationships and connectivity present between individuals and communities, evident within local communities
- Interpretation: to extrapolate interpretations from individual↔community↔micro-region in order to build more informed understandings of macro-regional processes of interaction

The areas outlined above highlight approaches that integrate multiple scales of analysis in order to overcome generalizing models. These models are only relevant if they are informed by more detailed analyses of social and biological interaction at the community level. These multi-scalar studies are supported through bioarchaeological approaches to the mortuary record, which include studies of identity, kinship, dietary status, and social organization. The study of individual identity benefits greatly from research pertaining to the multitude of identities and relationships between individuals and material culture. This in turn allows for more nuanced understandings of social organization and the types of social processes occurring between individuals and groups. The advantage of combining these approaches and analyses is the construction of integrated interpretations that are a better fit concerning the people, structures, and processes in prehistory (Lane and Sublett 1992; Howell and Kintigh 1996; Kolb and Snead 1997; Shelach 2001; Privat et al. 2002; Brück 2004; Fowler 2004; Stojanowski and Schillaci 2006; Stojanowski 2009; Zakrzewski 2011).

Therefore, this dissertation investigates the pathways present in communities at the local and micro-regional levels in an effort to better understand processes of interaction on a macro-regional level. The following questions and their investigation within specific chapters of the dissertation, were formulated to employ these variable data sets toward the combined goal of clarifying processes of interaction and social change in Bronze Age steppe communities:

1. *In comparison with the Bestamak site (MBA), was the nature of differentiation in mortuary patterning at the Lisakovsk site (LBA) based more on sex and age-grades rather than hierarchical status or individual prestige? Does mortuary patterning at Lisakovsk display clear evidence of differentiation such as the presence of ethnic or cultural subgroups, which might have contributed to more heterogeneous social communities (e.g. multi-ethnic or multi-cultural) than during the MBA?*

2. *Did subsistence practices (e.g. pastoralism vs. agropastoralism) coincide with changes in community organization and interaction from the Middle to Late Bronze Ages?*

3. *How did biological affinity (kin groups) and residential mobility (patrilocality, matrilocality, etc.) relate to local residential structures during the Middle and Late Bronze Ages? Did changes in inter-group mobility coincide with changes in social organization or the appearance of different forms of mortuary practice that appear to be much more a part of Late Bronze Age communities?*

These questions will be answered through an integrated theoretical approach that focuses specifically on anthropological bioarchaeology, multi-scalar interaction, and glocalization. These approaches are formulated through multidisciplinary bioarchaeology, particularly statistical analyses of mortuary patterns, biodistance, and stable isotope analyses.

1.2.1 Approach: Towards an Anthropological Bioarchaeology

Anthropological perspectives offer a powerful tool for examining social developments, however, they must take into account similar as well as unique features of community organization in order to assess variability along social developmental pathways (Kohl 2008:11). For example, models of social organization that include horizontal, or heterarchical, dimensions have been shown to augment understandings of social, political and economic trajectories (Peebles and Kus 1977; Blanton et al 1996; Canuto and Yaeger 2000; Feinman 2000). As recent scholarship has indicated, there is more than one pathway to social complexity and therefore we must examine developments along more than one comparative dimension if we are to construct convincing diachronic models (Feinman 2000:34). Focusing on what might be considered the broader heterarchical and hierarchical tendencies within societies provides a framework that promotes a more thorough assessment of diversity in the nature of social organization, especially in the study of pastoral groups (Leonard & Crawford 2002).

While ethnographic literature has greatly affected the way that pastoralists have been discussed in central Eurasian archaeology, scholars rarely agree on the nature of social organization, the degree of mobility, or the degree of social complexity exhibited by certain prehistoric pastoral case studies (Anthony 2007; Kohl 2006; Koryakova and Epimakhov 2007; Kuz'mina 2007; Zdanovich and Zdanovich 2002; Drennan et al. 2011). Ethnographic analogies may be particularly helpful in the modeling of community interaction (exogamy, intermarriage, residential mobility) and archaeological patterns associated with such connections. While scholars should be cautious in using analogies in a one to one correlation with archaeological materials, ethnographies can assist in the interpretation of bioarchaeological and mortuary data by providing more nuanced understandings of social differentiation based on biodistance, residential mobility, gender differences and how these may co-vary with certain mortuary traditions and forms of disposal (Ucko 1969).

Historically, the fields of archaeology, physical anthropology and ethnography have approached the study of pastoral and agro-pastoral societies in Eurasia from different viewpoints. The methods and theories that have developed within each of these, has greatly shaped the research agendas in the field of Eurasian archaeology today. Therefore, in Chapter 3, I briefly unravel the historical perspectives of each of these fields, and give an overview of theoretical and methodological approaches to the region. The problematic separation of these fields of study has led to grave misunderstandings of local and regional events in the Eurasian steppe and thus, a more integrated research program is necessary. Ethnographic data from Eurasian pastoral societies are discussed in detail at the end of this chapter for easy comparison with archaeological material discussed in chapter 4.

1.2.2 Approach: Pathways, Multi-scalar Interaction, and Glocalization

Detailed discussions of modeling at the supra-, macro- and micro-regional levels in Eurasia are found in Chapter 2. I examine the nature of these theoretical paradigms in an effort to investigate how these models incorporate, or fail to incorporate, important facets of community interactions based on kinship, post-marital residence, sex specific migration, and social status. The glocalization model is then considered as a viable alternative for modeling pastoral interactions at multiple scales.

Investigations of glocalization explore the ways in which local communities are affected by, and negotiate, larger processes such as globalization (Gosline 2004; Khondker 2004). In this sense, globalization is not seen as 'planetary' or 'global', and instead can occur at multiple scales (micro-, macro-, supra-regional). Archaeologists often use globalization and world-systems theories to model interactions at the supra-regional and macro-regional levels. However, in order for these broad models to be effective, they must be supported by detailed micro-regional and community level research. Top down approaches such as globalization and world systems often consider interactive processes to include inherent vertical tendencies and clear inequality between regions (Kohl 2008). Relationships between macro-regions are emphasized and the impacts of micro-regional or local processes are bypassed. Thus, new approaches are necessary that turn this theory on its head, and allow for the extrapolation from the local to the global.

Glocalization is a process that can be described as the delicate balance struck by individuals and groups between socializing and globalizing forces. Where globalization is a flow of information and technology, socialization is a parallel development of social organization and structure (Gosline 2004:95). There have clearly been moments in prehistory when globalization (or interaction) has flourished, as well as times when social or political forces have garnered more control (Gosline 2004:95). Through a focus on glocalization, an effort is made to examine both social and interactive processes at the local level, which is used to inform our interpretations of larger, global, developments. This model moves us beyond the study of systems to investigate detailed social processes at multiple scales. This research integrates detailed bioarchaeological analysis with a comprehensive study of archaeological mortuary data to answer anthropological questions related to the interplay between the local (individual, community) and increasing scales of interaction and integration. The following scales will be approached through bioarchaeological analyses:

- Identity and Personhood
- Social Organization and Structure
- Social and Biological Interaction
- Interaction between Spatial Communities
- Broader Interaction Spheres

1.2.3 Analysis: Multidisciplinary Bioarchaeology

Approaches to understanding the social organization of prehistoric Eurasian groups have been open to multiple interpretations because data has often derived from a single source. Yet, complex problems often call for complex solutions, and the use of multiple independent data sources that confirm the same conclusion will decrease the viability of alternative explanations (Walker 1996; Gamble et al. 2001). This dissertation thus also seeks to implement a multi-disciplinary bioarchaeological research program, to examine the social organization of local communities through empirical analysis of cultural and biological data from two separate cemeteries of distinct periods. This diachronic study compares the diverse social structures of local groups and the different ways in which intra- and inter-community connectivity occurred. Broader questions of micro-regional interaction are also addressed through the correlation of patterns in mortuary treatment and their correspondence to biological variables, including age, gender, and kinship. Using comparative data from communities that exhibit different settlement sizes, mortuary rituals, and paleodemography also enhances this research. Building upon ethnographic studies and archaeological models of pastoral societies, this dissertation asks empirically grounded questions that focus on social organization and the nature and scale of community interactions at both the intra- and inter-group levels. An integrated bioarchaeological approach offers an effective new approach to answer lasting questions related to transitional periods of social change during the Bronze Age. Significantly, this approach highlights interpretations that rely on ethnographic data of pastoral societies, a focus on personhood and identity in the mortuary record, and the many dimensions of inequality.

1.2.3.1 Mortuary Statistics

The nature of social change and the degree of complexity in early societies are issues that have been actively and consistently investigated within anthropological archaeology (Blanton et al. 1996; Chapman 2003; Earle 1997; Feinman 2000). Since the 1970s, mortuary data has factored importantly in the comparative study of social complexity, particularly in the modeling of social organization and interpretations of ranking and inequality (Binford 1971; O'Shea 1984; Saxe 1970; Tainter 1975). These approaches have analyzed a variety of social dimensions: including age, biological sex, and what have been understood as vertical (rank, status, etc.) and horizontal (age sets, moieties, etc.) dimensions within societies (McHugh 1999; Parker Pearson 1999). In more recent years, as part of what has been broadly termed post-processual archaeology, many scholars have emphasized issues connected with gender, agency, social memory and identity (Gero 1996; Dobres and Robb 2000; Jones 2001; Crass 2001; Arnold 2005; Williams 2006). This new emphasis has had a strong impact on the theoretical nature of mortuary archaeology and has led to important new interpretations of mortuary practices. Unfortunately, these developments also have (in many cases) moved away from statistical analysis of mortuary assemblages and the use of empirical data to validate such interpretations (see Goldstein 2006 for overview).

In concert with our understanding of social organization, there is a need to evaluate previous claims for the presence of ethnic or cultural subgroups during the Late Bronze Age. Through comparison with earlier communities, is there clear evidence of more heterogeneous (e.g. multi-ethnic or multi-cultural) societies during the LBA? Due to the intense changes in settlement and mortuary patterning over time, there does seem to be a trend toward greater mobility during the LBA as analogous cultural material spreads over a vast area stretching from the Russian Urals, to southern Kazakhstan and northwestern China (Xinjiang region). It is reasonable to posit that interaction was increasing at this time, and that communities were becoming more diverse ethnically, culturally or socially. If so, did distinct ethnic or cultural differences persist in these relatively small communities, or were individuals easily integrated into local groups? Due to the location of these groups in Eurasia, on the boundary of east and west, it is plausible that interaction occurred often and that these differences might be subtle. Research focusing on mortuary patterning, specifically individual social and biological identities, would allow for greater discussions of communities both in terms of social structures and ethnic or cultural diversity. Furthermore, the examination of the different relationships and connections present in each community would highlight the multiple ways that individuals and groups negotiated pathways of interaction.

Pastoralist subsistence systems and social organization have been often assumed to exhibit high levels of mobility and low levels of social complexity. This model has recently been challenged, however, through the identification of institutionalized social stratification and ranking within pastoral societies (Palumbo 1987; McIntosh 1999; Di Cosmo 2002; Koryakova 2002; Kradin 2002; Chang 2008). In an effort to reconstruct social organization and structure, this dissertation examines individual identity and personhood within two communities. The multiplicity of identity is investigated as the combined nature of discrete identities such as age, gender, and status. In addition, an integrated approach toward the study of identity is used which combines direct representation and the use of personhood.

Chapter 6 includes a discussion of the theoretical and methodological basis for mortuary archaeology statistics. This portion of the dissertation combines skeletal and mortuary data to examine categories of artifacts associated age and gender cohorts. I emphasize the study of bronze objects, body treatment, burial construction, and other artifacts to examine differential social status in these cemeteries. This chapter serves as a precursor to final interpretations as well as to inform the reader of the mortuary rituals present at Bestamak and Lisakovsk. A central question of this dissertation relates to the nature of social organization in prehistoric Eurasian societies. What was the social structure of these communities? Was the nature of differentiation based on hierarchical status, individual prestige, or rather sex and age-grades? Gender and age related differentiation within Bronze Age societies are not properly understood, and the proposed egalitarian nature of these divisions need to be tested. There is currently a great need for the detailed examination of social organization and structure among prehistoric Eurasian groups. Research focused on variation between these communities would contribute to a greater understanding of social and cultural diversity during the Bronze Age.

1.2.3.2 Economy and Dietary Reconstruction

The comparative, anthropological study of social complexity has often focused on sedentary, agricultural societies with a range of hierarchical forms of social organization. The emergence of social complexity in pastoral groups has subsequently been tied to a reliance on agricultural products or interactions with settled societies (Khazanov 1978, 1984; Dyson-Hudson 1980; Barfield 1981). While pastoralists are often defined as those who undertake animal herding as their primary form of subsistence procurement (Chang and Koster 1994), a number of other strategies linked to variability of within group mobility and agro-pastoralist orientations have been identified (Khazanov 1978; Barfield 1981, 1993; Cribb 1991; Frachetti 2008a).

Chapter 7 includes a theoretical and methodological background for carbon and nitrogen stable isotope analysis to examine dietary intake. This chapter focuses on the creation of a baseline for examining human paleodiet in the micro-region. While human remains were collected for each individual available within both cemeteries, I chose a statistically significant number of adults from each cemetery to understand dietary intake. This chapter will focus on the following research: 1) to understand dietary intake on an individual level, and determine if diet is related to status, 2) to examine diversity in pastoral subsistence on the community level, and 3) to correlate dietary intake with social and biological groups evident from analyses of mortuary patterning and biodistance. At the micro-regional level, previous research has focused on an agro-pastoral economy as a necessary precursor to social complexity. Parallel arguments for the Bronze Age transition posit that a move from aggregated to dispersed communities was tied to increased mobility and differential dietary intake. As changes in social organization seemingly shifted at the transition from the MBA to the LBA, subsistence practices are posited to have transformed in concert. Our current understandings of pastoral economies are of extremely diverse subsistence regimes and therefore we need to address possible connections between dietary intake and social organization.

A parallel issue is that changes in social organization may be linked to shifts in herd size and composition over time and the resulting differential dietary intake. Variation in the grazing behaviors of horses versus cattle and ovicaprids (sheep) reveals that these animals may have slightly different signatures (Privat 2004:60,63), and there is a clear distinction between the consumption of terrestrial versus aquatic animals (O'Connell et al. 2000). In addition, ethnographies offer observations on social organization and the hierarchical structure of communities within a specific regional and historical context. Isotopic research indicates that dietary intake could be distinct based on the wealth, status, or locality of the individual interred (i.e. White et al. 2001; Privat et al. 2002; Privat et al. 2005). In this dissertation, I address subsistence using carbon and nitrogen stable isotopes to examine the dietary intake of individuals. Intra-community comparisons in concert with mortuary data allow for the investigation of diet as a corollary to social status. The broader objective is to compare community diet over time, determine whether variety existed between these prehistoric groups, and establish whether diet is connected to greater social processes.

1.2.3.3 Biodistance

The Middle (MBA) to Late (LBA) Bronze Age transition in north central Eurasia is a time when settlement, demography and mortuary rituals transform. The impetus behind this transition has often been attributed to cultural replacement, migratory behaviors, warfare, and climatic events studied at the macro- or supra-regional scales. While a wealth of mortuary data has been studied for these periods, analyses have unfortunately lacked a focus on demography, paleopathology, kinship analyses, and statistical measures. In concert with these trends in mortuary studies, craniometric data from bioanthropological studies are often filtered into binary racial categories of Mongoloid and Caucasoid (Ismagulov 1970; Kozintsev 2004, 2009), which have perpetuated migration theories as events in which one group wholly replaces another without allowance for interaction. Furthermore, settlement pattern studies often lack the intensive survey methods necessary to create convincing comprehensive maps of the prehistoric landscapes, and regional chronologies are frequently based on typologies of wealthy graves and visible settlements. An emphasis on large-scale dynamics and a lack of empirical approaches have repeatedly muted variation at the local levels. These issues highlight some of the difficulties that surround the contemporary study of prehistoric Eurasia.

In an effort to examine variation at the community and micro-regional levels, a comparative study of biodistance based on dentition was undertaken (Chapter 5: methods; Chapter 8: results). The goal of this analysis was to examine how biological affinities shaped relationships and connectivity in prehistory, specifically in terms of post-marital residence, kinship, and social integration. I specifically focus on the study of kinship within and between cemeteries on a local, rather than regional, scale of analysis. The goal of this intra-cemetery research was to examine the structure of age and sex variation of phenotypic traits in order to understand kinship, post-marital residence, exogamy, and sex-specific migration (Howell and Kintigh 1996; Gamble et al. 2001). In addition, inter-cemetery analysis of Bestamak and Lisakovsk was undertaken to elucidate possible changes in residential structures from the Middle to Late Bronze Age.

Ethnographic research reveals that pastoral societies often have both highly mobile and sedentary components and the recorded fluidity in the formation of residential groups indicates that these structures need to be studied in more detail (Krader 1953; Vainshtein 1980; Barfield 1981; Cribb 1991; Sneath 1999). Through the examination of kinship (biological affinity) within a community, we can determine the structure of residential groups and post-marital mobility and residence. Long-term ritual continuities during the Middle Bronze Age support the idea that few non-local individuals were marrying into these communities. In contrast, Late Bronze Age mortuary diversity and heterogeneity suggest that groups were interacting on a greater scale. Regionally, an influx of people or increased contact would have significantly affected how community interactions changed over time. Through biodistance analyses, the biological pathways present in Bronze Age communities can be investigated. In this research, I examine macro-regional interaction through a focus on micro-regional and community residential structures and mobility. The covariance of mortuary practices and kinship data allows for a greater understanding of distinct prehistoric groups, as well as support for broader diachronic change between communities (Howell and Kintigh 1996; Gamble et al. 2001).

1.3 GOALS OF THIS RESEARCH

This dissertation highlights the LBA Andronovo period through comparisons with earlier MBA developments in terms of social organization and interaction within northern Kazakhstan. More specifically, this research hopes to elucidate the ‘controversial interpretations’ and ‘paradoxes’ of the Andronovo through a bioarchaeological approach to multi-scalar investigations. The results of this project broaden our understandings of social complexities within pastoral societies and add to the growing body of literature on gender roles, status and age-sets. I approach the study of social groups as recognizable from analysis of mortuary practices, which are likely part of the negotiation of social identities related to gender and age. In addition, the identification of pathways, the relationships and connections created between individuals and groups, will further our understandings of the ways that interactions may have occurred during the Bronze Age.

More broadly, this project is important given that studies of pastoralist and agro-pastoralist societies have infrequently contributed to the broader comparative analysis of complex societies (Hanks and Linduff 2009). I argue that social complexity is not only related to social status and inequality, but to more detailed and complex social formations including intermarriage, social mobility and residence patterns, and the nature of social interactions and integration. This project also highlights diversity and variation of residential communities using a model of glocalization. Community variability should be evident through determinations of individual diet, locality, and biological affiliation. This project integrates ethnographic and ethnohistoric data as an analogy for the modeling and interpretation of data related to pastoral societies. This research also acts as a case study for future comparative analyses of interaction and community organization and contributes to the archaeological literature on pastoral societies and the variation in economies and social organization that exists within and between them. It also adds to the literature on individual diet and mobility, specifically for pastoralists, but more broadly in relation to small scale and mobile societies.

Variability in ethnographic case studies strongly suggests that in the archaeological study of pastoralist social organization, a more nuanced understanding of wealth, status and social identity must be utilized in a comprehensive treatment of the mortuary record. The proposed egalitarian nature of gender and age divisions in pastoral societies has not been effectively questioned and tested. A bioarchaeological approach using multiple lines of evidence including paleodemography, biological relationships, mortuary statistics, and geochemistry allows us to develop much stronger more empirically valid interpretations of the nature of social organization and how this is influenced by processes of interaction and integration among early pastoralist societies (Price et al 1994; Grupe et al 1997; O'Connell et al 2000; Privat et al 2002; Haverkort et al 2008).

This dissertation contributes significantly to anthropological archaeology by integrating detailed skeletal analysis with a comprehensive study of archaeological mortuary data in order to answer specific questions concerning how social organization and social changes connect with increasing scales of social interaction and integration. While mortuary archaeology has been a major component of archaeological practice in the Eurasian steppe during the Soviet and Post-Soviet periods, multivariate bioarchaeological analyses are rarely undertaken. The implementation of multi-disciplinary research combined with an anthropological perspective offers a potentially *significant* and *effective* new approach to addressing persistent questions surrounding regional social and cultural change in the Eurasian steppes. Therefore, in this dissertation, I employ a multi-disciplinary study of both human remains (biological, physical, and chemical analyses) and formal mortuary analysis (variability in grave furnishings, grave form and construction). Interpretations presented herein are based on the co-variance of biological, cultural, and chemical data examined through multivariate statistical techniques. These datasets are modeled based on the identification of pathways in an effort to examine glocalization during periods of increased socialization (MBA) and globalization (LBA).

2.0 LOCAL AND GLOBAL PROCESSES IN EURASIA

"…we need an architecture for area studies that is based on process geographies and sees significant areas of human organization as precipitates of various kinds of action, interaction, and motion—trade, travel, pilgrimage, warfare, proselytisation, colonisation, exile, and the like. These geographies are necessarily large scale and shifting, and their changes highlight variable congeries of language, history, and material life." Appadurai 2000:7

The study of prehistoric groups in the Eurasian steppe has been problematic due to the vast regions that they encompass, which stretches across portions of Russia, Kazakhstan, and Mongolia. Yet, as Appadurai (2007:7) so eloquently states, the vast geographies that dominate our maps in area studies are not persistent facts, and therefore regions should be seen as contexts for the investigation of processes and themes, rather than marked by them. There is great interest in the application of broad theories such as world systems theory (WST) and more recently globalization to understand interactions and interconnections in Eurasia on scales as large as the region itself (Kohl 1989; Frank 1993; Christian 1998; Kohl 1996; Hiebert 2002; Koryakova and Epimakhov 2007; Kohl 2008; Beaujard 2011). The applicability of world systems and globalization concepts may seem predetermined for this region, based on the presence of archaeological cultures covering a vast area that has been highlighted as a zone of interaction. However, while the breadth of these cultures is easily definable, the actual links between communities are not well understood, and detailed reconsiderations of these data have not been investigated. While geographies, and some archaeological cultures, have been examined as static entities, they instead should be examined for variable processes that inhabit geographies, including language, history, and material culture (Appadurai 2000:7). This chapter therefore confronts broad theories proposed for the Eurasian steppe in an effort to redefine the scale of interactions that occurred in prehistory and to augment scalar considerations through bottom-up approaches that favor local and micro-scale interactions. I propose that a more nuanced approach for studying social processes in the Eurasian steppe involves investigations of the different ways that individuals and groups engage and negotiate with, as well as influence, broader spheres of interaction at the local and regional levels.

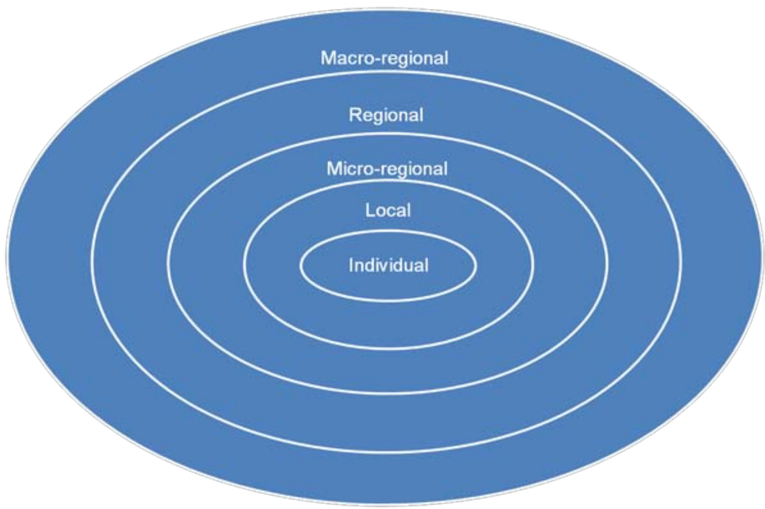

Figure 2.1 Individual, local, micro-regional, regional, and macro-regional correlates (after Kohring 2012)

The thematic focus of this dissertation is therefore one that highlights local community organization and interaction. In order to accomplish this, I first discuss the differences between scales of investigation at the individual, community, micro-regional, regional, and macro-regional levels (Figure 2.1). The building blocks of communities are, of course, individuals, who are one of the main subjects of investigation. For this dissertation, a 'community' as an analytical unit is deemed a single site, cemetery, or small group of sites/cemeteries within close proximity. Cemeteries are often used as units of analysis, even when absolute dates are not available for every burial. This of course can be problematic, as the burials may range over several hundred years, however similar problems can occur in the study of households within settlements. The micro-regional scale includes several communities and is discussed in terms of inter-community relations. This scale can correspond to communities along a single river, for example, or on several tributaries of the same river. A region usually encompasses a large number of communities, for example, an area on the scale of north-central Eurasia, as examined in this dissertation. A macro-region is a large set of regions, for example, the whole of the Eurasian steppe, which is often examined as a single zone. World systems and globalization theories have worked well on this scale as they investigate and model broad interactions between regions. The scale of analysis used becomes increasingly important in determining what can be understood in the Eurasian steppe, which is evident in discussions of the changes that occurred during the Bronze Age. However, this scalar breakdown must be understood outside of the context of constricting core-periphery dynamics (Kristiansen and Larsson 2005:38). In contrast, this type of analysis involves approaches that place the individual or the community as the unit of analysis to examine how broader processes are navigated by people and groups. The relationship between each of these scales is not linear, flowing from individual to community to micro-region, rather it emphasizes the ways that individuals and groups differentially negotiate multiple scales simultaneously.

At the transition from the Middle (MBA) to Late Bronze Age (LBA), shifting settlement and mortuary patterns are often cited as evidence of greater mobility and interaction in the Eurasian steppe (Hanks et al. 2007). Nucleated settlements and large populations highlight the more sedentary nature of MBA communities (Gening et al 1992; Grigor'ev 2000; Anthony 2007; Kohl 2007; Koryakova and Epimakhov 2007; Hanks 2009). While the subsequent LBA had smaller dispersed communities with similar cultural materials spread over a vast area which has been interpreted as a time of increased interaction and mobility (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Kuz'mina 2007; Koryakova and Epimakhov 2007). While the MBA to LBA transition has been broadly studied in terms of interaction and social change many of the proposed models focus on the Eurasian steppe zone as a system (Hiebert 2002; Frank 1993; Christian 1998; Koryakova and Epimakhov 2007). These models often discuss how systems are integrated, and therefore changes in a single unit affect the entire organism (for discussion Kohl 2011:83).

Even as archaeologists continue to search for new models that would broadly explain social organization and interaction in the Eurasian steppe, a focus on systemic approaches has not clarified regional processes. This is because Eurasia was never a fully integrated system during the Bronze Age. This does not mean that there were no structures, or a collection or organization of parts arranged together. However, the Bronze Age was never a unitary whole, or a system, defined as a group of *interdependent* elements that form a collective entity. Instead, it has been argued that interactions were based on interconnections and relationships between individuals and groups within a broader historical process (Kohl 2011:85). Interconnections occurred between 'institutions' (Frachetti 2012:5) or social fields (Kohl 2008) which included rites of burial, social structures and kinship sets that formed the bases for interaction. These pathways for connectivity were not part of a system, but were differentially structured based on variable manifestations of social, political, and economic processes. Globalization works well as an explanatory device because it does not model a system, but rather a trans-societal process of relationships and interactions (Featherstone 1990).

The process of globalization is comprised of habits, practices, and relationships that cross cut social systems and communities, yet do not homogenize them (Hodos 2010). Furthermore, glocalization models the interaction of individuals and groups at multiple scales forming the necessary links between the local and global. Glocalization was originally modeled on the Japanese term *dochaku-ka* for the adaptation of farming techniques to local conditions (Khondker 2004:4). The term glocalization also has been used in marketing, where products on the global market are localized, or changed to correspond to local interests (Robertson 1992). It is a modern concept that focuses on the ways that local communities are affected by, and navigate, broader processes such as globalization. However, glocalization is also applicable to prehistory as it emphasizes the ways that the local and global interact, as an intermediary to negotiations between scales. It explicitly examines individuals and communities separately, in efforts to understand their relationship to broader interactions. Furthermore, this model is one that cross-cuts social constructs and does not depend upon integration for the flow of materials, ideas, and knowledge. A glocalization model works well in concert with the study of pathways, or relationships and connectivity that occur between individuals and groups. It also combines research on both static and imaginary communities by investigating the pathways along which interaction take place, both face to face and broader exchanges without personal contact.

Therefore, the goal of this dissertation is to examine how individuals and local communities in two contiguous periods navigated the very different social and economic processes that occurred in these time frames. A glocalization approach recognizes the complexity of these processes, by considering change as multidirectional and differentially navigated by individual localities. By examining relationships and connectivity between groups and individuals we can better understand the pathways through which materials and knowledge flowed. All of these inquiries can be pursued as aspects of glocalization, or the ways that local communities differentially negotiated connectivity, relationships and interactions, as well as the flow of goods and information. We need to build a collection of community studies in an effort to inform discussions of larger processes of connectivity and flow, and how these differentially affected local groups in Eurasia.

In many regions of the world anthropological archaeologists have built upon decades of research into site and community specific datasets in order to frame and re-frame discussions of broader interactions. For example, during the Mississippian period the southeastern ceremonial complex was for many years an enigma (Pauketat 2004). Shared symbology, burial rites and architecture spread over a vast region, yet it was not until the community or local group became the unit of analysis that some of these trends were explained (Pauketat 2004; 2005). Similarly, the 'Horizon' concept was developed in Peru to explain the Chavin development, which highlighted similarities in ceramic, stone carving, architecture, and metalwork over a broad region (Bennett 1943; Willey 1945, 1951). However, while resemblances in style were unmistakable, these similarities did not indicate the cultural identity of groups who participated in this style (Willey 1945). The horizon concept for the Chavin was often interpreted as that of a shared common belief system evidenced through stylistic similitude related to the peaceful spread of religious concepts (Willey 1945:10) or a cult spread by a tightly integrated and authoritarian state (Lathrap 1974:149-50). Current research has begun to focus on investigating how small local communities navigated the broader processes associated with their proximity to the main site of Chavin de Huantar (Sayre 2010). Therefore, detailed datasets on local communities are being incorporated into numerous archaeological perspectives in order to better understand the interactions between these groups.

For this dissertation, analyses of connectivity and flow build upon previous research in the Eurasian steppe at both global and local scales (Epimakhov 2004; Usmanova 2005; Kohl

2007; Koryakova and Epimakhov 2007; Frachetti 2008b; Kohl 2008; Hanks 2009; Hanks and Doonan 2009; Kohl 2011). First, I discuss how connectivity and flow can be examined archaeologically, and their connection to globalization. Second, I examine the nature of exchange and interaction through several theoretical approaches in archaeology (world systems, core-periphery, community, social fields, nonuniform institutional complexity). These models are discussed in terms of the ways they have been applied to prehistoric Eurasia. Third, I discuss the 'community' based approach and its usefulness within archaeology, and its potential in the Eurasian steppes (Murdock and Wilson 1972; Kolb and Snead 1997; Canuto and Yaeger 2000; Isbell 2000; Pauketat 2000; Peterson and Drennan 2004; Varien and Potter 2008). I focus specifically on how community studies are relevant to the study of interaction in their attention to ritual and social identity (Isbell 2000; Pauketat 2000). Finally, building upon this past research, I propose that connectivity and flow need to be understood as part of glocalization, which highlights how local groups navigate, influence, and are affected by broader processes. Glocalization incorporates variation in social factors and pathways of connectivity, such as kinship, post-marital residence, sex specific migration, and status to examine interactions at smaller scales of analysis. This bottom-up approach employs local data as a jumping off point for enlightening our understandings of the interactive and integrative processes that occurred at broader regional and macro-regional levels in prehistory.

2.1 CONNECTIVITY AND FLOW

This dissertation focuses on understanding *pathways of connectivity*, specifically the way that relationships and interactions formed the framework for the spread of material culture, technology, and ideas. Individuals create and reinforce a series of relationships through interactions with other people, material culture, and experiencing their world (Wynne-Jones and Kohring 2007). While social structure and organization are often analyzed in terms of local relationships and interactions, these issues of connectivity may be understood at other scales as well. Connectivity occurs as part of social, political, and economic relationships and therefore is easily investigated from an anthropological perspective. Relationships and interactions form the underpinnings of connectivity, and structure the way that objects, materials, and knowledge flow between individuals, groups, and regions. This flow is best understood as *globalization*, or the trans-societal process of the spread of technology, information, and materials (Appadurai 2000:4). When these relationships intensify, flows increase and the globalization of ideas, objects, and materials also increases. However, when these relationships break down, flows subsequently diminish or transform to accommodate changing connectivity. Importantly, the type and intensity of connectivity present allow for discussions of the foundations of globalization and the driving forces behind transitions in material culture, settlement, and ritual from one period to the next.

Concepts of connectivity, as they are based on relationships and interactions, can be investigated through the examination of ethnographic datasets. Among pastoral populations, we might question how individuals engage and interact with other people. Furthermore, which activities among individuals and groups encourage the growth of strong relationships? A diversity of ethnographic research has illustrated the ways that communities were structured. These observations emphasize the ways that connectivity occurred in the past, which may be used as analogies for examining and interpreting prehistoric populations. These findings address processes at multiple scales of analysis including division of labor and tasks (Murdock 1934;

Vainshtein 2009; Borgerhoff Mulder et al. 2010), economic relationships and wealth (Hudson 1938; Vainshtein 2009; Borgerhoff Mulder et al. 2010), ceremonial events (Murdock 1934; Hudson 1938; Krader 1953, 1955; Abramzon 1978; Argynbaev 1978), inheritance and status (Krader 1953, 1955; Borgerhoff Mulder et al. 2010), structure of residential groups (Krader 1953,1955; Hudson 1938; Abramzon 1978; Vainshtein 1980; Sneath 1999; Bogerhoff Mulder et al. 2010), and mobility and exchange (Hudson 1938; Vainshtein 2009). Therefore, by employing ethnographic data we can discuss many different types of connectivity that may have occurred in prehistoric societies:

1. Biological Interconnections (Marriage, Kinship)
2. Common Residential Group (Spatial Community)
3. Residential Mobility (Patrilineal, Matrilineal)
4. Economic Lifeways (Pastoral, Agro-Pastoral)
5. Social Structure (Status, Age Grades, Sex, Gender)
6. Nodes of Interaction (Ideological, Seasonal)
7. Transportation (Horseback Riding, Wheeled Vehicles)
8. Ideological Relationships (Rituals, Symbols)
9. Migration (Individual, Group)

Each manner of connectivity differentially affects individuals and groups at several scales of analysis. For example, intermarriage and residential mobility can occur at the local, micro-, regional or macro-regional level and therefore could extend relationships over short or broad distances. Technologies available to individuals and groups, such as horseback riding and wheeled vehicles, would greatly affect the ability to transport goods, materials and knowledge, as well as individuals over greater distances. Groups located in close spatial proximity may not always interact on a regular basis when distances become less important due to the expansion of transportation technologies. Each of these factors plays an important part in connectivity, and the relationships that are formed between individuals and groups. Therefore, it is important that we understand both the flow of materials, objects, and individuals, as well as the scale, extent, and intensity of these flows. Each of these elements may have a different path as part of the process of globalization. The extent of connectivity can be understood through the spread of these elements. However, the path that these elements follow, or the way they are globalized, is directly related to specific relationships created through social, biological, economic, and political connections. In this context, a pathway is a relationship or a connection, whether social or biological, which links individuals and communities. Pathways can be created through kinship ties, marriage, as well as through shared identities or age groups. The formation of pathways occurs through relationships and connections, and it is through these same links that flows can intensify, weaken, break, or transform.

We can speak of the globalization of objects and materials, ideologies and rituals, symbols, technology, and knowledge. However, these flows can only be analyzed through an investigation of their connectivity and the pathways along which they proceed. This can be realized through networks analysis, which detects and interprets patterns of relationships between individuals, objects, and communities (Brughmans 2012:277). Networks analysis began as a mathematical program termed graph theory (Harary and Norman 1953), which represented a network of relationships. Network analysis is composed of a set of points (the unit of analysis) and a set of lines (pathways) between these points that symbolize relationships (Brughmans 2012:277-8). Network analysis includes a graph, or the visual structure of the network, as well as information the lines or pathways (de Nooy et al. 2005:6-7) (Figure 2.2). Archaeologically, networks analyses have allowed archaeologists to 'visualize and explore structures of relationships between archaeological data' (Brughmanns 2012:299). Similarly, social network analysis can test the strength, or intensity, of each link or pathway (de Nooy et al. 2005). This is an important development, because it can be adopted to examine the strength of links between individuals in cemeteries and mortuary rituals, as well as between different communities.

However, it is not the aim of this dissertation to undertake an analysis of networks in the Eurasian steppe. Rather, the intention is to investigate which links, or pathways, form the foundation of a network. Before networks analyses can be undertaken, we must first understand the variable forms of connectivity in Bronze Age Eurasia at smaller scales. Community scale analyses are the basis of such network approaches, as well as the foundation upon which broader models should be grounded. A networks approach could not be accomplished via exclusively broad scale perspectives that world-systems (WST) or globalization studies employ. Instead, networks analyses necessarily focus on more detailed datasets that investigate relationships, and illustrate connectivities, based on an understanding of numerous nodes (individuals or communities) rather than on proposed dynamics of broad regions.

Social network analysis has been used to examine links between communities based on shared or similar objects (Brughmans 2010) and works well at multiple scales. Furthermore, analyses of social networks can be both statistical and descriptive (Wasserman and Faust 1994:4). Social networks can be evaluated against observed network data in terms of the patterns or structures of links (pathways) between the units (Wasserman and Faust 1994:8). "In the network analytic framework, the ties may be any relationship between units; for example, kinship, material transactions, flow of resources or support, behavioral interaction…" (Wasserman and Faust 1994:8). At the core of social network analysis is the concept that individuals with matching social characteristics will interact more often, and people who interact regularly often have a common attitude or identity (de Nooy et al. 2005:59). Therefore, through investigations of common identities, both social and biological, we can construct an initial foundation through which to examine connectivity and pathways. In this dissertation, commonalities between individuals were examined through multivariate statistical analyses. The correlations or pathways of connectivity, between units of analysis symbolize social and biological relationships. As seen in the sociogram (Figure 2.2), lines represent the pathways, such as relationships and interactions, which are present between individuals. The relationships could take many forms and be related to kinship, friendship, knowledge, or exchange of materials.

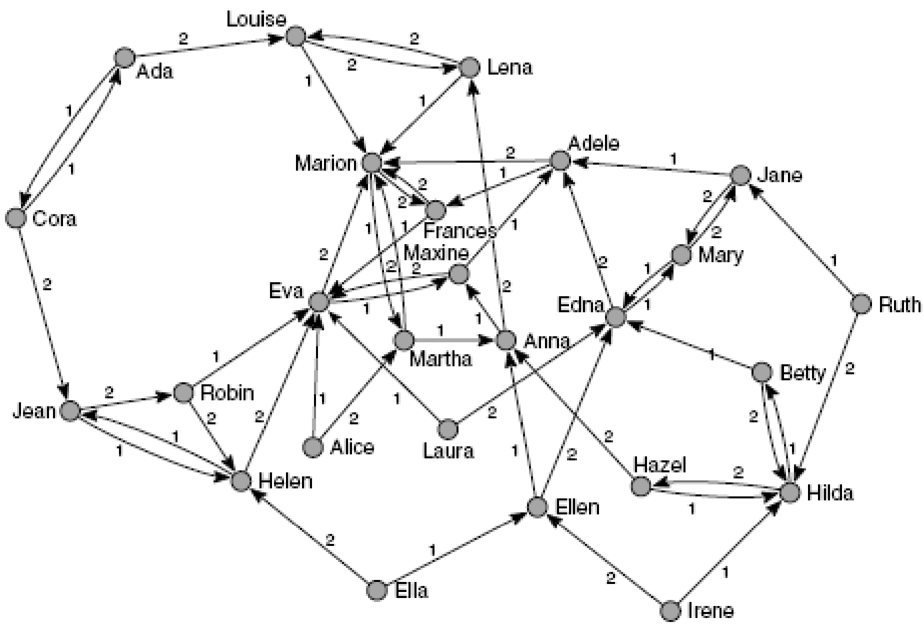

Figure 2.2 Sociogram identifying individuals (nodes) and their interactions/relationships (lines) (de Nooy et al. 2005:4)

While connectivity and flow have variable underlying structures, they do not constitute a system, as they are part of processes that cross-cut communities and societies. Glocalization is best used as a means of conceptualizing change in terms of the effects of intensifying or changing networks of connectivity (Pitts 2008:494). The effects of globalizing processes on local groups, and how they are negotiated, allows us to conceptualize how global change is navigated by those tied into a predominately local existence (Pitts 2008:494). Glocalization is a perspective that offers the potential for incorporating local experience and diversity into the grand narrative. However, glocalization also needs supporting evidence that can be gained through the examination of pathways. The pathways identified between individuals within a community form the foundation for discussions of how interactions occurred. Furthermore, this foundation can be built upon in the context of glocalization, to identify how communities navigated broader processes. In the context of glocalization I will: 1) examine the pathways (relationships) evident in each community based on mortuary patterns, 2) compare the pathways evident in each community to determine how relationships and connectivity may have changed over time, and 3) examine each local community within the context of broader changes in mortuary and settlement patterns in the region and macro-region.

2.2 GLOCALIZATION: IDENTIFYING LOCAL WITHIN THE GLOBAL

Globalization models employ community centered approaches, which may be used to validate the dynamic and varied nature of Bronze Age societies in Eurasia. However there is an increasing need for these approaches to be modeled jointly in relation to both smaller and larger scale processes. Reconstructions of social dynamics and principles of interaction and integration at the local level can be linked to broader events through integrative and multi-scalar models such as *glocalization*. The glocalization model allows for the examination of these processes at multiple scales. The study of glocalization has previously suffered from scalar issues, as it was originally formulated to examine negotiations between the local and the global, lacking an intermediate scale of analysis. In research that investigates these interactions, the question of scale is an integral part. This dissertation uses *glocalization* in a multi-scalar form as the way that different parts of society, communities, or micro-regions are both affected by, and negotiate, broader processes. This approach avoids inherent determinism in social typology, and instead provides a perspective from which to investigate and characterize social change (e.g. Kohl 2008). In this way, each of the 'glocal' units relate to globalizing processes in different ways, and the 'global' may in fact be a different scale for each.

The employment of *glocalization* as a form of analysis offers nuanced ways of understanding how individuals, communities, and micro-regions are interconnected. The focus is on understanding how individuals and groups negotiate, and are influenced by, processes of globalization. For this study, I utilize the terms *globalization* and *socialization* in reference to Gosline (2006) and I have also drawn strongly upon discussions of what I see as an analogous processes, that of social *interaction* and *integration* (Parkinson 2002). As interactions increase and a greater number of relationships are created, the scale of globalization intensifies as there is more connectivity and flow. In times of heavy integration or socialization, which occurs at multiple scales, connectivity and flow are more tightly controlled. As the spread of technological innovations occur (globalization), there is a parallel development of institutional and cultural innovation to ensure stability (socialization) (Gosline 2006:95). *Globalization* is defined as a flow of information, technology and ideas, which in modern times is based on rules of trade and investment. However, there is a distinct difference between 'global' as a scale, which can be mapped as the extent of or spread of knowledge, materials, and technology versus the process of globalization. While the extent of similar ceramic styles in prehistory might be discussed as the 'global', the process of the spread of these goods is part of globalization. Furthermore, the pathways along which these items are transmitted are based on types of connectivity. We must therefore focus on social and economic interactions in an effort to understand the ways that different materials, technologies, and knowledge may have flowed in prehistory.

Through a focus on relationships and interactions, an effort is made to determine which types of connectivity were occurring at the individual and local scales during the Bronze Age. Several types of connectivity have been outlined, however, the objective of this research is to focus on biological affiliations and kinship, social structures, and economic lifeways in two local communities. Relationships based on shared bonds are the basis for connectivity in prehistory. Through analysis of mortuary remains, biological affinities, and dietary reconstruction, we can examine connectivity within local communities. We need to understand individual identities, social structure and organization, as well as shared economic lifeways and dietary reconstruction in ways that contribute to our understandings of broader processes. Therefore, a bottom-up approach including an emphasis on the local will frame discussions of the 'global'. Furthermore, by addressing the variable forms of connectivity, we can investigate variability in interaction and integration that do not necessarily conform to a predetermined 'system', archaeological culture, or 'horizon' as the Andronovo has previously been understood.

First, as individuals differentially negotiate the process of globalization, identity and personhood are affected (Sholte 1996). Displays of identity may reinforce homogeneity within the community, or create idiosyncrasies. Identity and personhood are products of social context, which can be affected by broader processes (e.g. Lightfoot et al. 1998:202; Nystrom 2009:83-4). Identities may be linked to biological affinities, gender, age, status, lifeways, or roles within the local group (Conkey and Spector 1984; Gero and Conkey 1991; Brumfiel 1992; Dobres and Robb 2000; Sofaer 2004; Lucy 2005; Gowland 2006). Identities may also transcend the local community and create links with other individuals and groups. These relationships and interactions have a basis in similarities and are one pathway through which the flow of objects and ideas could occur. The intensity of these flows may transform over time, and allow for discussions of the degree of globalization that occurred. For example, displays of identity through personal ornamentation may reinforce homogeneity or create idiosyncrasies depending on the ways that individuals and groups navigate processes. As globalization and interaction increase, we may see an intensification of displays of identity (Gosline 2006).

Second, the structure of local communities also conveys information about connectivity between individuals and groups. The foundation of communities, whether based on kinship, age, gender, or status can inform us about the types of relationships that were important within each local group. Investigations, which focus on interpersonal connections, focus on identity as an attribute of relationships (Brück 2004). The ways and types of interaction that occur between individuals and groups can inform us about the ways that each community engages with and negotiates globalizing processes. For example, the degree of globalization within each community might be understood through examinations of biological affinity and mortuary rituals (Meskell 2001, 2007; Buikstra 2009; Knudson and Stojanowski 2009; Zakrzewski 2011). Homogeneity in burial style and assemblages for biologically diverse individuals might highlight a greater degree of integration in the community. The reverse is also true, greater heterogeneity in burial practice for non-locals signals a decrease in integrative processes, and increased globalization. The desire for differentiation between groups often intensifies in response to increased globalization (Gosline 2006).

Third, the flow or spread of objects, technology, and knowledge are greatly influenced by connectivity within local communities. The degree of non-local materials, and individuals, within a community may signal the degree to which broader interactions are taking place. Social and biological interactions play a large part in these trends. Globalization within local communities can be examined through a comparative analysis of biodistance and mortuary assemblages. While bioarchaeologists rarely use globalization or glocalization terminology implicitly, they often investigate the degree to which non-local individuals are part of residential communities. The investigation of foreign identity (White et al. 2004), migration (Price et al. 2002; Knudson et al. 2004; Ullinger et al. 2005; Turner et al. 2008), and kinship (Vach and Alt 1993) are important examples of this approach. Communities that interact regularly with other groups often have increased gene flow and this information might also reveal how the flow of individuals might have occurred. Investigations of post-marital residence trends and biological affinities within and between communities might allow for discussions of the types of glocalization or degree of globalization in a local group. Furthermore, the degree or scale of globalization may change over time and be evident through the analysis of changing trends in biological affinity, mortuary rituals, and economic lifeways. Several scenarios are envisioned, where intense globalization and interaction in one period lead to a push back and result in intense integration, and vice-versa. There is clearly a cyclical nature to these trends with times of punctuated periods of globalization or integration. From my point of view, the Andronovo development is a period when globalization and the flow of materials increased, and local communities differentially negotiated these developments.

2.3 SCALAR ISSUES IN EURASIAN ARCHAEOLOGY: PREVIOUS APPROACHES TO LOCAL AND GLOBAL TRENDS

2.3.1 Micro-regional and Local Community Approaches in Archaeology

Intermediate scales of analysis such as the 'community' have filled the void between the broader region and the study of households (Yaeger and Canuto 2000:1). Over the past decade, the concept of 'community' has been actively revisited by archaeologists, and its interpretation and use fluctuates from an empirical unit of analysis (Peterson and Drennan 2004) to more abstract social constructions of social and cultural identity (Kolb and Snead 1997; Isbell 2000). The 'real' community encompasses the spatial aspects of community as it is situated between the household and the region. In contrast, the 'imagined' community is one that focuses on social identity and interaction and is less tied to specific spatial terms. Some scholars have suggested that these two concepts are not mutually exclusive (Varien and Potter 2008; Yaeger and Canuto 2000), and by others that they are irreconcilable (Pauketat 2000; Isbell 2000). The real question, however, focuses on how scholars choose to define a 'community' in specific analytical terms?

Many archaeologists use the community concept as an empirical unit of analysis located between the household and larger regional levels of social organization (Kolb and Snead 1997; Peterson and Drennan 2004; Varien and Potter 2008). Murdock and Wilson attempted to define a community as a group that has face-to-face interactions on a regular basis (1972). The community has accordingly been described as a unit of analysis, household cluster, or village that can be identified through an examination of settlement patterns (Kolb an Snead 1997; Peterson and Drennan 2004; Varien and Potter 2008). It is assumed that spatial proximity interaction principles have not changed over time and therefore can be correlated with and patterned after current communities (Peterson and Drennan 2004). However, the application of this interaction principle among more mobile societies has not yet been fully examined in the archaeological record. The emphasis in many of these studies is the *intensity* of how people are interacting, with less emphasis on why they are interacting (Schachner 2008). The 'real' community has thus been criticized for its static nature and the use of the 'site' as the location of the community (Isbell 2000; Yaeger and Canuto 2000). It has even been suggested that the imagined community has replaced 'tribe' in Service's band-tribe-chiefdom-state typology (Isbell 2000:248). However, how can the 'community', and its socially integrative characteristics, be identified if it is not linked with spatial correlates?

Non-spatial interpretations focus on the need for a community to be the base of reproduction of organism, society, and culture (Isbell 2000). As Isbell notes, community is traditionally defined by a shared residence or space and shared life experiences (2000:243). Other scholars investigate 'imagined' communities of identity that cross-cut social constructs (Yaeger and Canuto 2000:6-7). These authors do not reject the spatial designations of the community concept, but reject the idea that this is the only way that communities are formed. They focus on the types of interactions that should be studied (biological, kinship, spatial proximity, ritual), both intra- and inter site (Kolb and Snead 1997). Imagined communities tend to be fluid designations, not static representations formulated only on a spatial basis (Yaeger and Canuto 2000). The emphasis is on why and how people are interacting, and scholars note that spatial proximity does not always imply interaction. It has been suggested that an imagined community, which cross-cut more formalized boundaries of ethnicity, social identity, and culture, can be described as a moiety or allyu, as well as age grades and gender roles (Isbell 2000:243-6). The concept of the imagined community ties in well with the concept of globalization, which cross-cuts spatial communities. With a lack of spatial correlates, the imagined community concept has been criticized for a lack of specification on what constitutes a community (Peterson and Drennan 2005:5-6).

Without a spatial designation, it can be difficult to determine what exemplifies a community, and thereby difficult to analyze interaction between communities. Therefore, for this dissertation, a ‘community’ is identified in spatial terms as a cemetery, or group of cemeteries in close proximity. However, spatially located cemeteries or settlements do not necessarily reflect community, social organization, or economy in the same way. Therefore, in many cases, these two spatial communities are best compared and contrasted for a broader understanding of ‘community’. It may be that cemetery or settlement data does not accurately depict this group, which would only be known through comparative analyses. Excavated datasets from settlements and cemeteries each are flawed in the way that they represent ‘community’. For example, in the study of households (or burials) their time of deposition and relationship between each other greatly affects the way they are understood. Furthermore, cemeteries and burial assemblages do not necessarily reflect a clear representation of social organization, status, or identity. However, burial datasets are useful, and cannot be overlooked in analyses of local communities (Chapman 2005).

In order to study interaction, the units of analysis include the individual, community (cemetery), and micro-region. Each of these can be identified in spatial terms, and analyzed using bioarchaeological methods such as biodistance, mortuary assemblages, and bone chemistry. However, the results of these analyses may conform more to discussions of ‘imagined’ communities, as they often cross-cut spatial constructs. Spatially designated communities often exhibit evidence of groupings of individuals, which can be discussed as ‘imagined’ communities. These non-spatial groupings are often based on kinship and biological affinity, identity and status, gender and age, as well as consumption patterns. The concept of glocalization combines datasets from both the spatial and imagined community concepts as it models the way that local communities navigate broader processes. For example, the biological affinity of certain individuals in different spatial communities can be used as clear evidence of interaction (Howell and Kintigh 1996; Stojanowski and Schillaci 2006). While some individuals who are kin may live in a single spatial community, they are just as likely to be spread out among several communities as discussed in ethnographies of pastoral groups (for example Hudson 1938; Krader 1953, 1955; chapter 3). Kinship ties can be used as evidence of belonging, whether this is as part of a spatially designated community or part of an ‘imagined’ community. Therefore, the investigation of the different pathways that are created between individuals, based on relationships, can be spatially linked or suspended between communities. A glocalization approach allows for the examination of the ways that connectivity occurs both within and between communities, and how these occur within broader contexts.

2.3.2 Micro-regional and Local Community Approaches to the Eurasian Steppe

At the transition from the Middle to Late Bronze Age in north central Eurasia, there is a very clear shift in settlement patterning, the demographic size of communities, and mortuary rituals (see chapter 4). The Middle Bronze Age dates from 2030 to 1700 cal B.C. (Hanks et al. 2007; Logvin and Ševnina 2013) while the Late Bronze Age dates from 1700 to 1400 cal B.C. (Hanks et al. 2007; Panyushkina et al. 2008). During the Late Bronze Age (LBA) the spread of similar archaeological materials has been interpreted as evidence of increased interaction over a vast region. Many scholars also view this as the Andronovo ‘family of cultures’, which implies that biological interactions were occurring, hence discussions of ‘colonization and expansion’ have been put forward (Koryakova and Epimakhov 2007:111-160). Few scholars have undertaken micro-regional and community approaches to the study of the Eurasian steppe. Those who have integrated these studies into their research, often reveal new insights into the prehistory of the Bronze Age. Modeling on this scale focuses on processes of cycling, nodes of interaction, non-uniform complexity, and relationships between communities and resources (Koryakova 1996; Frachetti 2008; 2009; Hanks and Doonan 2009; Hanks 2009). These detailed studies highlight the different ways that communities situate themselves within, and negotiate interactions with, broader regions. This recent comparative work allows for interesting new interpretations of prehistoric communities, and the social and economic processes within which they formed. While many of these authors do not specifically use the term ‘community’, they have analyzed data at smaller scales of analysis in a comparative manner.

Communities are often examined in terms of their inherent variability, as well as part of broader systems of interaction. Koryakova has investigated social and cultural changes during the Bronze and Iron Ages in relation to a cyclical rise and decline, or a flow from expressed complex structures, to simple extensive patterns (1996:272). At the community level, social and cultural changes were attributed to ecological and technological crises. Internally, behaviors evident within communities were determined by environmental and technological factors. However, external forces such as migration also played a part in social change, as communities were set within broader systems of interaction. Problematically, Koryakova focuses on determining whether entire archaeological cultures were complex or simple chiefdoms, rather than detailed comparisons of communities that make up these broad groups. I am in general agreement that cultural change within the steppe can be cyclical in nature, and that Sintashta and

Petrovka (MBA) developments were increasingly complex, followed by more autonomous communities during the later Andronovo period (LBA). The identification of the cyclical nature of complexity was a big step forward for Eurasian archaeology, as scholars moved beyond linear processes. Furthermore, Koryakova clearly states that environment and technology differentially affects smaller groups, even if this theory does not move past the point of discussion. That communities should be studied in terms of internal and external factors is an important realization for Eurasian steppe groups.

As a whole, the work of Frachetti highlights the different ways that local communities engage with and interact within their landscape (Frachetti 2004, 2006, 2008b). The landscape is divided into nodes of interaction, such as burials or rock-art sites, where communication occurs through symbolic representations at the site or when individuals meet (Frachetti 2008b:17-18). This model was formulated to examine local and global interactions, using data collected from a micro-region in southeastern Kazakhstan. Communities within this micro-region are discussed as the result of complex local issues including location, ecology, and internal variation as well as in relation to broader regional interactions (Frachetti 2008b:169). This research emphasizes that variability at the community level must be examined in order to move away from past perspectives that emphasized homogeneity of local groups. Each community is visualized as a piece of a puzzle, where interaction was based on distributed goods within a wider sphere of interconnections communities are tied to the landscape, and the way in which they are marked, reflect historical processes by which sites are used, reused and appropriated in new ways by groups (Frachetti 2006).

Hanks and Doonan stress that previous approaches to Eurasian steppe metallurgy highlight macro-regional interaction spheres (sensu Chernykh's "metallurgical provinces"), while local processes such as production, trade, and consumption in contrast have been muted (2009:337-9). Until recently many sites in this region lacked excavation strategies that could enhance our understandings of mining and metallurgical production, and few detailed catchment surveys were conducted. Therefore, in this case study the ‘community’ model moves beyond settlement sites to incorporate understandings of local and micro-regional trends in mining and metal activities (Hanks and Doonan 2009:339). Micro-regional data collected for this project included both settlement and cemetery data recovered using geophysical, bioarchaeological, and chemical analyses and is helping to create a fuller picture of prehistoric processes (Hanks and Doonan 2009). Strategies that include empirical collection and analysis have transformed hypotheses from those concerned with chiefdoms and hierarchical ranking, to those that investigate exploitation, exchange, and trade linked to shifting social, political, and economic practices within and between communities. Recent additions to these datasets include the study of a local catchment zone (20km) surrounding the Stepnoye site and the identification of over 59 sites (Hanks et al. 2011). In order to understand processes of metal production, as well as the social and economic characteristics of metal producing societies, there continues to be a need for detailed analyses of local communities within broader processes of interaction. Therefore, this recent work serves as a model for the integration of several lines of community centered data in an effort to develop better explanatory models for broader processes of interaction.

Community centered approaches also allow for the investigation of variability in societies in terms of organization and degree of complexity. Hanks investigates the social organization of early metallurgical societies in Bronze Age Eurasia through comparative analysis of Sintashta developments (Hanks 2009:155-8). While Sintashta sites are often posited to be evidence of complex societies, Hanks states that there has been a lack of clear settlement pattern hierarchies, social inequality in households, or social stratification in mortuary studies (2009:163). This is further supported by comparative analyses of Eurasian steppe communities, where Sintashta developments are characterized as having a greater emphasis on prestige and ritual competition related to warfare and feasting (Drennan et al. 2011). The lack of clear data from the Sintashta development (ca. 2100-1700 BC), challenges previous assumptions as to the degree of complexity, and homogeneity, associated with Middle Bronze Age developments. Through comparisons of several Sintashta period sites, as well as previous comparisons with Gorny (a Late Bronze Age site), it is clear that many factors affected these communities. This discussion highlights the great variation present between communities (Hanks 2009:160). The comparative community centered approach taken in this case emphasizes the need for discussions of long term change in the context of precise data recovered from sites and their surroundings. A model for future investigations is proposed using community centered analyses to examine Sintashta sites as intermediate scales of analysis between the household and broader region. In addition, there is a call for renewed focus on empirical data gathering including site catchment analyses, studies of soil geochemistry, as well as bioarchaeological investigations to examine differentiation between communities (Hanks 2009:161-2).

The recent focus on the collection and analysis of community centered data in Eurasia has been greatly aided by an emphasis on between-site comparative analyses. These comparisons allow for fresh interpretations of prehistoric interactions, as well as social and economic processes. Portions of the Eurasian steppe lack complete chronologies and contain large lacunae in archaeological data, which have made many attempts at regional synthesis awkward. The only way to overcome these shortcomings is through concerted efforts at understanding community and local level processes through research programs that include not only systematic survey and environmental studies (e.g. Frachetti 2004; Popova 2007; Frachetti 2008; Hanks et al. 2011) but also integrated bioarchaeology (e.g. Murphy 2000; Hanks and Doonan 2009) and chemical analyses (e.g. Hanks and Doonan 2009; Hanks et al. 2011). This dissertation is one such project that incorporates an integrated bioarchaeological approach using biodistance, mortuary statistics, and bone chemistry to investigate Bronze Age societies. While research that stresses a macro-regional approach can help to shape our understandings of broad interactions, they must be supported by sufficient detailed archaeological data and a greater grasp of varied dynamics in individual locales and micro-regions.

2.3.3 Regional and Macro-regional Approaches in Archaeology

Theoretical trends such as world systems theory (Wallerstein 1974; Gills and Frank 1992; Frank 1993; Chase-Dunn and Hall 1993; Hall and Jones 1995; Shutes 1996; Hall et al. 2010) and globalization (Appadurai 1996; Buell 1998; Sassen 1998; Appadurai 2000; Shami 2000; Gosline 2006; LaBianca and Scham 2006; Pitts 2008) were originally developed and used as explanatory models for historical and modern developments. However, they also have been applied to prehistoric phenomena in an effort to understand interactions and interconnections in the ancient world. For example, various case studies that we might broadly list under the themes of world systems theory and globalization have examined: 1) the spread of technology and ideas across disparate territories of the globe, 2) degrees of interaction and integration across broad regions, and 3) the relative effects of macro-regional networks on the regional and local networks beneath them.

World systems approaches vary greatly, as this field has evolved over time and therefore encompasses many ways of understanding the concepts of core, periphery, and semi-periphery, as well as frontiers, boundaries, tribal societies and chiefly cycling (Hall et al. 2010). Chase-Dunn and Hall prefer to define world systems as a set of intersocietal networks with different political and economic organization, where the structure of the composite units affects changes occurring in local structures (Chase-Dunn and Hall 1993:855). In contrast, Parkinson and Galaty believe that this definition (used by Chase-Dunn and Hall 1993) presents world systems as a "broad-brush, lumping perspective that masks socio-cultural variability" (2010:9). Parkinson and Galaty view world systems as most effective at wide geographic and temporal scales, between societies with similar political and economic forms of organization, and believe that this approach breaks down at smaller scales of analysis (2010). However, in some cases, world systems theory is used to examine the fit between broad theoretical models and local data (Shutes 1996:1-2; Hall and Jones 1995:13).

Globalization, according to Appadurai, is about a world of things in motion – flows of objects, images, and discourses – that have varied paths with different speeds, axes, points of origin and termination (2000:4). While globalization may be seen as a top down approach, 'grassroots globalization' or 'globalization from below' examines local organizations, communities, and networks that have complex relations with the modern state (Appadurai 2000:15). There are also processes that affect the flow or pathways, such as warfare or socially constructed boundaries. These necessarily affect the ways that local groups navigate broader processes. Globalization has been reformulated to apply to the prehistoric record in order to understand the interrelationships between global and local interactions (Buell 1998; Shami 2000). "A prehistory of globalization seeks pasts characterized by mobility, cosmopolitanism, and vertical and horizontal linkages that displace a notion of the past as stagnant and bound by empire and tradition. It excavates beneath the nation-state and decenters it from the narrative of the present” (Shami 2000:189). From other perspectives, globalization is a singular interactive network based on the spread of products, technologies or ideas (Gosline 2006; LaBianca and Scham 2006). In globalization, cultural change can be multi-directional and differentially negotiated in individual communities (Pitts 2008:494). Globalization provides a perspective that allows local events and experiences to be incorporated into the regional narrative that can be identified archaeologically through the examination of identity and social practice (Pitt 2008:494). From an archaeological viewpoint, the regional narrative can be compared to regional models, and this approach allows for discussions of individuals and groups to inform this broader perspective.

However, some scholars have associated globalization with the homogenization of culture, the solidification of identities in response to outside influence, or a form of cultural hybridization or creolization. While these are possible responses to globalizing processes, they occur at the community level, not at the broader expanse of the 'global'. Recent research examined ways to identify ancient globalizations, which should be triggered by a surge in long-distance connections that caused an array of culture change that created a 'global culture' (Jennings 2011:13,21,145). However, the 'global culture' concept has been highly criticized as a constructed overgeneralization of reality (Smith 1990; Tomlinson 2006).

Featherstone also rejects the idea of a 'global culture', especially when related to the nation state, instead, he argues that processes of integration and disintegration transcend the social unit and can be referred to as the 'globalization of culture' (1990:1). Tomlinson builds upon this, and argues that actual practices and experiences are rarely 'global' in the sense of being uniform across contexts (2006:571). "The global distribution of the cultural goods of a dominant culture has no predictable linear consequences; that cultural appropriation always involved adaptation and generates new particularities" (Tomlinson 2006:571-2). Hodos agrees with these authors, stating that the process of globalization cross cuts social systems and communities, yet does not homogenize them (2010). Therefore, as a concept, globalization has been misrepresented by scholars who see it as a process that hybridizes or homogenizes culture through the creation of a 'global culture' (e.g. Nederveen Peterse 2009; Jennings 2011).

Recently, two volumes on globalization were published from an archaeological perspective, *Interweaving Worlds: Systemic Interactions in Eurasia, 7th to 1st Millennia BC* and *Globalizations and the Ancient World*. In the latter, Jennings states that globalization is the "consequence of a dense network of interconnections and interdependencies that link people together across regions" (2011:21). This interpretation of globalization is very similar to what has been described as a world system, and Jennings does very little to downplay the similarities he thinks are evident between these two theories. Furthermore, scholars in the Interweaving Worlds edited volume use the term globalization, but the theory and modeling of world systems analysis. This misconstruction of globalization as a system supports previous discussions by world systems scholars (Chase-Dunn) who believe that globalization studies support the research goals and models of world systems analysts. However, the differences between these processes are vast and complicated as previously discussed. Globalization in the ancient world has also been distorted through its link to prehistoric cities and core-periphery dynamics (Jennings 2011:13,145). Globalization is more likely to disrupt dominant territorial bases (Scholte 1996:567), such as cities, nations or empires, as individuals and groups begin to create and solidify new connections. While it may seem easy to find a 'global culture' in a center-periphery model of early cities, how do agency and resistance come into play? What role do local communities play as part of a 'global culture' where beliefs, values, customs, behaviors, and artifacts are supposedly shared? Is there no differentiation between city dwellers and small peripheral communities?

Numerous archaeologists have used both world systems and, more recently, globalization approaches to model interactions at the global and macro-regional scales (Kohl 1996; Kardulias 1999; Mbembe 2000; Shami 2000; Kradin 2002; Oka and Kusimba 2008; Parkinson and Galaty 2010; Jennings 2011); however, few archaeological investigations have studied the way that local communities fit into these broader scales (for exceptions see Kardulias 2007; Pitts 2008). Theoretical trends seem to be both moving towards incorporating smaller scales of analysis and investigating the ways that that the global interconnects with the local (Buell 1998; Shami 2000). World systems has been criticized for placing a great deal of emphasis on the superiority, or increased complexity, of one society over another as part of the process (Gosline 2006:110), yet recent scholars have made attempts at examining the way that local groups negotiate interactions in a balanced relationship (Kardulias 2007). At the same time, globalization theory is criticized for its particularistic focus and lack of ability to generalize (Kardulias 2010). While these theories draw on very similar datasets and views, in some ways they seem to epitomize the dichotomy between processual (world systems) and post-processual (globalization) archaeology. While both of these models are useful, I would argue that the former is related to understanding a system while the latter a process. Thus, an integrated use of the approaches applied in both these theories would likely create a more balanced study of broader interactions at the regional and macro-regional scales. Nevertheless, much of this research continues to focus on broad understandings and appears to incorporate the local only as a contrast. By removing local agents, the majority of these analyses lose sight of variability in the archaeological record. In contrast, this dissertation proposes a different tact, by understanding detailed social and biological processes of interaction and integration first with individuals, communities and micro-regions, which can then inform developments at broader spatial scales.

2.3.4 Regional and Macro-regional Approaches to the Eurasian Steppe

There are numerous examples of regional models used to examine social, cultural and economic developments in central Eurasia. The application of world systems, core-periphery, multiple-core and social-fields models have been used by archaeologists for several decades to explain developments in the steppe zone (Kohl 1996, 2007; Hiebert 2002; Frank 1993; Christian 1998; Koryakova and Epimakhov 2007). However, the Eurasian steppe is best compared to an impressionist painting. From far away the picture seems one of crisp and distinct elements, but up close, the crisp lines become decisively blurred, the distinct elements break down, and the diversity within the painting becomes visible. The only way to remedy this lack of attention to the details of the archaeological record in the Eurasian steppe is to engross oneself in the minutia of regional knowledge that is available only, in most cases, in the Russian language.

Theories of world systems have focused on the identification of single or multiple systems evident over large territories (Hall and Chase-Dunn 1993). Frank (1993) focuses on not a single world system during the Eurasian Bronze Age, but the interaction of several world systems. While interaction between the parts of the system may at times be indirect, there is a distinct focus on economic trade links. Frank identified the center of one world system in west/central Asia with posited links between northern Eurasia and west Asia (1993). In terms of Eurasian data, Frank (1993) relies heavily on Chernykh (1992) and his discussion of metals trade in Eurasia. While Frank attempts to "reassemble the jigsaw-puzzle of the world system in the Bronze Age" (1993:384) he regrettably is missing too many pieces and is left with a severe lacunae of data for Central Asia. Frank's article has been heavily critiqued, with scholars finding fault in his use of tertiary sources, sparse archaeological evidence to reconstruct patterns, as well as his unconvincing argument (see especially Edens, Gilman, Kohl and Lamberg-Karlovsky in comments section of Frank 1993).

Archaeologists, as well as historians, have attempted to employ broad models to explain events in prehistoric Eurasia. However, with regard to the Bronze Age, they often are drawn into pitfalls including theoretical oversights of detailed data and the continued construction of a 'pastoral periphery' in the northern steppes of Kazakhstan, adjacent to the 'agricultural core' of oasis communities in Uzbekistan and Turkmenistan. Hiebert implicitly uses a world systems approach to investigate regional links between the steppe and the sown (2002). He focuses on ceramic remains as the main evidence for identifying interconnections and regional links between what he terms the pastoral Eurasian steppe and agricultural Central Asia. Specifically, he relies on 'steppe like' ceramics in the agricultural oasis settlement of Namgaza as the main evidence to infer direct interaction between the 'nomadic' Andronovo and the settled groups of Bactria-Margiana Archaeological Complex (BMAC). While he uses the ceramic evidence cautiously, because source analyses were not undertaken, they are discussed as Andronovo style ceramics that came from the northern steppe. Hiebert also offers evidence of ephemeral sites found outside agricultural settlements near oases as evidence for pastoral encampments of steppe peoples directly interacting with agriculturalists. While the evidence for ephemeral sites and non-local ceramics is interesting, there is no reason to assume that these are specifically Petrovka or Fedorovo culture ceramics from northern Kazakhstan. First, it is very difficult to examine links between groups based only on the style of a few ceramic sherds. Second, the vast area between BMAC and northern Eurasia has been virtually unexplored archaeologically and therefore stands as an enigma between these regions. Finally, while I do not deny that exchange of ceramics may have occurred over long distances, clear evidence of direct interaction between these distant regions is still lacking. Therefore, while the ephemeral camps and ‘steppe’ like ceramics may elucidate long distance exchange, they may just as likely be evidence of local/non-local connections within BMAC, rather than the development of a world system in central Asia.

Anthony (2007:412-457) does not specifically use a world systems model, but highlights technologies that promoted interaction in the region. New technologies, such as wheeled transport and use of the horse, were the impetus for increased mobility of groups in concert with increased interaction. Anthony states that northern steppe cultures (specifically from the Sintashta and Petrovka region of southern central Russia) were closely interacting with groups in BMAC (Uzbekistan and Turkmenistan), and draws upon the same ceramics discussion that created gaps in Hiebert’s argument. Supporting evidence for these interactions includes the identification of several ‘steppe-like’ ceramics found in Bactria-Margiana that he links to the early Sintashta phase (found at Gonur) and a whole vessel that he links to the later Alakul’ (found at Togolok 1) (Anthony 2007:428-9). Anthony’s (2007:398-405,429) hypothesis that chariots were used in warfare and raiding by northern steppe groups against southern agricultural groups may also be misguided as it does not take into account the huge landmass that lies between these areas (i.e. Kazakhstan). In addition, there is a lack of evidence of trauma on human remains and a low number of ‘chariots’ recovered from this region, estimated at 16 (Anthony 2007:397), make the archaeological support for theories of warfare insufficient.

Koryakova and Epimakhov (2007) use a core-periphery model to understand developments during the Bronze Age. These authors focus on how ‘primary impulses’ from the south (Turkmenistan and Uzbekistan) affected the northern Eurasian steppes. These primary impulses were examined both in terms of the introduction of technologies as well as economies. A dichotomy is proposed between the ‘steppe and the sown’, in the likes of that suggested by Peake and Fleure (1928), and many since, to differentiate between pastoral and agricultural economies (see also Shishlina and Hiebert 1998; Peterson et al. 2006). The implication is that pastoral cultures in the northern steppe were interacting heavily with the ‘civilized’ agricultural peoples from the south (mostly from BMAC). This model draws greatly from the ‘dependency hypothesis’ that broadly characterizes pastoral economies as dependent on agricultural items provided by adjacent states (Salzman 1999; Kradin 2002). Overall, the steppe during the Bronze Age has been traditionally envisioned as a vast area of interaction in which northern steppe peoples are not culturally contiguous, but rather the result of several migrations into the area (Koryakova and Epimakhov 2007:45)

Kohl has attempted to understand the Bronze Age through several methods, including a multiple core model (1996) and the identification of shared ‘social fields’ (2008; 2011). In his multiple core model, Kohl turns the classic world systems approach on its head. Originally, world systems theories focused on issues surrounding the ‘core’ or central society that affected peripheral societies. However, for Bronze Age Eurasia, Kohl states that peripheral societies were not dependent upon core societies due to their use of transferable technologies (1996). Technologies, such as horse breeding and metal technology, could not be monopolized or controlled and therefore no asymmetrical exchange occurred between the cores and peripheries. While chariots may not have been controlled on a regional level, they may have been available only to certain individuals or groups within micro-regions. Equality is evident in exchange between the core and periphery, where they are interdependent but not detrimental to one another (Kohl 1996). While this model highlights the necessity of understanding local and peripheral societies, the examples used are those of isolated case studies rather than more detailed and contextualized micro-regional and local datasets.

In contrast to many models that focus on primacy of a core or region (such as world systems theory), Kohl (2008) also developed a model of interaction that gives no weight to scale, economy, or size of communities and instead focuses on equal interactions between social groups. Kohl's use of 'social fields' describes the unit of analysis not as the archaeological culture but the social group and its interactions. He describes overlapping social fields as regions with constant contact between groups. Interaction between these complementary regions can be both direct and indirect through exchange of metals, technology, and knowledge (Kohl 2008:497). Kohl calls on archaeologists to focus on technology, environment, subsistence and exchange and to a lesser extent social organization. He states that no core area is necessarily the primary center of development, and that the origin points of specific technologies or economies are less important than their rapid spread or adoption (2008:500-1). The 'social fields' approach has been heavily critiqued by world systems proponents because they see this model as unclear and impossible to test empirically (Hall et al. 2010). Furthermore, it remains unclear how the application of 'social fields' will move the field forward due to its lack of focus on *how* and *why* people were interacting. While Kohl's focus on technology and subsistence seems like a difficult endeavor, a bioarchaeological approach to the study of social and biological interactions (e.g. post-marital residence, kinship, social organization) might clarify the base of relationships and interconnections.

Recently, two scholars have revised and strengthened their models of broad Eurasian steppe interactions (Kohl 2011; Frachetti 2012). These models similarly focus on explaining the spread of key innovations such as chariot technology and metallurgy throughout Eurasia. In a recent publication, Kohl (2011) discussed world systems theory (WST) and modeling of macro-historical processes in Eurasia in terms of their utility in advancing our understanding of the Bronze Age. Kohl states that "one of the real strengths of the world-systems model is its focus on the relevant unit of analysis; i.e. on the area that was integrated economically and politically to the extent that can be considered 'systemic'…" (2011:83). However, the Eurasian steppe during the Bronze Age did not constitute a single unit or unified whole which was politically integrated (Kohl 2011; Frachetti 2012), therefore the use of the world systems model is not a good explanatory device. I agree that WST is not the best fit for modeling the Bronze Age, and that Eurasia was not politically integrated during this time frame. Instead, a complex set of interconnections and interactions are posited for this region, which Kohl explains through his concept of web-like 'social fields' (2008, 2011). Furthermore, the diffusion of technology is seen not as part of an integrated system, but due to contact and participation in broader processes. Therefore, while the broad theory of social fields is interesting, the specific ways that individuals and groups interact is still not clear. While the 'social fields' approach emphasizes the need for interactions to be understood on a local scale, these interactions are only modeled based on posited 'continuous contact' between mobile herders (Kohl 2011:82).

Frachetti (2012) proposes a model of nonuniform institutional complexity, where institutions are defined as the "organizational and ideological norms that shape practical interactions of agents and communities" (Frachetti 2012:5; North 1990). These institutions, including rites of burial, social and political structures, as well as kinship and age sets, drew societies into wider interactions, similar to some of the processes described as 'social fields' by Kohl (2008). While nonuniform institutional complexity and diversity within communities is important to our understandings of local groups, the ways that these institutions engaged in interactions and connections are not currently explained. Furthermore, the mere presence of nonuniform institutional complexity does not explain "the dynamic structure of steppe communities" nor the types of interaction that "engendered a wide distribution of technologies, material culture, and ideology across Eurasia" (Frachetti 2012:6). Frachetti emphasizes that wheeled vehicles and bronze metallurgy were prestige items that fostered the growth of nonuniform political structures (2012:5-6). In addition, these items are posited to be part of a pan-regional ideology that is illustrated by Sintashta (MBA) burials, which expose links between chariots, horses, and sociopolitical power. While the concept of a pan-regional ideology during the Bronze Age is an important one, the interpretation of burials with chariots and horses as those of ‘political leaders’ misconstrues present datasets and interpretations (Epimakhov 2002; Zdanovich and Gaiduchenko 2002; Hanks et al. 2011). In reality, the majority of ‘chariot’ burials at Sintashta sites, estimated at 16, are not centrally located in kurgans (mounds) and do not have definitive evidence of wealth or political status (Epimakhov 2002:50-51). Frachetti focuses on the fact that connections between communities, in terms of shared trade, building conventions, ideological symbolism, and technological innovation, were not the result of these communities being subsumed under a shared political structure (2012:19). I absolutely agree with this statement, and this idea is very much in line with globalization, which is not a system, but a trans-societal process of interconnection and interaction (Featherstone 1990). Furthermore, the use of nonuniform institutional complexity ties in well with glocalization, or the different ways that local communities negotiate broader processes of globalization and socialization. While communities are not homogenized by the process of globalization, they can be united by it (Robertson 1990). Therefore, while a model of nonuniform institutional complexity may hope to explain broad processes, it does not clarify how local communities navigated these broader relationships. While material culture was likely shared over significant distances during the Bronze Age, this model does not explain how local communities took part in interactions, the production of goods, or exchange

These final papers are important, because they similarly envision the Eurasian Bronze Age as a period that lacked overarching political structures (in contrast with Anthony's model for Sintashta), and yet was linked through interactions and connections. Furthermore, the spread of material culture does not imply a corresponding transfer of social practices, values, or social organization. These concepts are critical to our understandings of broader historical events in northern Eurasia, as well as the need for more nuanced models to explain broader processes. It can also be argued that connectivity during the Bronze Age was largely dependent upon existing relationships from earlier periods (e.g. Frachetti 2012). The only way to understand these relationships and interconnections is through an examination of local or community level social organization, interactions, and structure.

Although generalizing approaches that use a broad brush to paint prehistoric interactions are necessary, it is only through the understanding of local conditions in several micro-regions that we can then test hypotheses of interaction on a 'global' or Eurasian steppe scale. Many of the above approaches are plagued by the use of sparse material culture to identify systems that span macro-regions and even continents (see comments in Frank 1993). For the central Eurasian steppe, substantial problems of incomplete chronologies and large lacunae in archaeological discoveries and surveys, especially in regions of sparse modern occupation, continue to plague our understandings. While recent work has attempted to fill in chronological gaps, continued projects that include the use of absolute dating need to be undertaken (for recent dating projects see Hanks et al. 2007; Panyushkina et al. 2008). The lack of systematic archaeological survey projects in many former Soviet Union countries, as well as outdated archaeological maps, adds to the confusion. For much of this research to be supported, the sourcing of archaeological materials must be undertaken in concurrence with the identification of areas of raw materials (metals, lithics, clay). In Eurasian archaeology, modeling of regional events and diachronic change are only relevant if they are informed by more detailed analyses of local communities. The reconciliation of broad approaches, based upon detailed local data, bridges the gaps in our understandings of prehistory, and creates stronger regional and macro-regional models.

2.4 CONCLUSION: CONNECTIVITY AND FLOW DURING THE BRONZE AGE

In the context of broad processes occurring during the Bronze Age, globalization is a much more effective model than world-systems and other broad regional approaches as it models a process rather than a system. World systems theory (WST) implicitly defines interactions as systemic, which often devolve into "typological exercises that attempt to identify cores, semi-peripheries, or other idiosyncratically postulated units of the system" (Kohl 2011:77). However, the reason that world systems approaches do not work for north central Eurasia during the Bronze Age, is that while interaction occurred at numerous scales, communities were not incorporated into a fully integrated system. One of the strengths of globalization is that it models the ways that individuals and groups were interconnected, and participated, in broader processes. Globalization is not a system, but rather a trans-societal process of interconnections and interactions (Featherstone 1990), which are comprised of practices, habits, and relationships that cross cut social systems and communities (Hodos 2010). While communities are not homogenized or integrated by the process of globalization, they can be united by it, even though they differentially negotiate this process (Robertson 1990).

Therefore, while it is clear to many archaeologists that interaction increased from the MBA to LBA, the social processes that occurred simultaneously are currently understudied. There have clearly been moments in prehistory when globalization and interaction flourished, as well as times when socialization, or the control of individuals and communities, became oppressive (Gosline 2006:95). Therefore, it may be more productive to think of this transition as a tipping of the scale during the LBA, favoring globalization (interaction) over socialization (integration), when the transfer of information and goods suddenly becomes more liberal. This is clearly a time when there is a transformation of socializing processes and the ways that interaction occurred. An examination of patterns evident at the *local* level may illuminate the changes seen at the broader *regional* level. To comprehend changes in north central Eurasia, it is imperative that we understand how communities differentially fit into the larger region.

Coherence among communities in Eurasia during the Bronze Age may be due to the scale of interaction and connectedness, which can be modeled as part of globalization. Globalization is a much more intuitive framework for discussions of change and interaction during the Bronze Age as it can easily incorporate individual and community datasets related to identity and social structure. While a globalization model alone may not explain the forces driving change, it works well in concert with discussions of connectivity between individuals, groups, and regions. While globalization has been used in archaeological contexts, it often is misappropriated for periods in prehistory when strong polities or empires existed which often interacted with peripheral societies. However, core-periphery dynamics are often equated with integration, imperialization, or world-systems, as many prehistoric examples posit the blending of new cultures into a singular system or integration of disparate regions into ‘imagined’ communities. In contrast, globalization is a process that often occurs outside of systems and integration. While globalization has been used by some scholars to examine Roman imperialism (Hingley 2005; Jennings 2011) or Greek colonization (Malkin 2011), these uses seem to misinterpret how the process of globalization occurs. Global connectivity should not be equated with integrative processes by empires or for the expansion of world systems, as it is a process that is de-centered. As in modern globalization, there need not be a core-periphery dynamic as part of this process. Instead, globalization cross-cuts social units and is best understood through a network approach to prehistory where relationships are modeled at multiple scales.

Through the examination of connectivity during the Bronze Age, the conduits by which relationships and interactions occurred can be modeled. These pathways can then be explored through the adoption of globalization as an explanatory framework. The combined use of these concepts allows for the examination of multiscalar links between individuals and groups during the Bronze Age. This dissertation focuses on the social and biological links created between individuals and local communities. This data is then employed in a bottom-up approach to illuminate the ways that broader scale processes may have occurred, especially the ways that these processes differentially occurred during the Middle and Late Bronze age periods respectively. While this final goal may prove difficult, it is imperative that scholars attempt to reconcile global and local processes in order to provide a holistic narrative of Bronze Age events. In this context, globalization and glocalization are used as explanatory frameworks for understanding connectivity and flow for two prehistoric communities. Connectivity and flow are models of processes and structures rather than systems, which is how I envision the prehistoric Bronze Age in north central Eurasia.

3.0 EURASIAN PHYSICAL ANTHROPOLOGY: HISTORICAL PERSPECTIVES AND CRITICAL ANALYSES

"This quest for the origins of the Indo-Europeans has all the fascination of an electric light in the open air on a summer night: it tends to attract every species of scholar or would-be savant who can take pen to hand. It also shows a remarkable ability to mesmerize even scholars of outstanding ability to wander far beyond the realm of reasonable speculation to provide yet another example of academic lunacy" Mallory 1989:143

As Mallory succinctly states, the quest for the origins of the Indo-Europeans often leads scholars to speculate and make assumptions outside of a reasonable realm of academic scholarship. This is partially because the search for the origins of a group, whether tied to language, material culture, or ethnicity is extremely problematic. Renfrew states that "early models - used by successive generations of scholars all too ready to equate a culture with a people (from Gordon Childe to Irving Rouse) and a people with a language – have yielded reconstructions for the origin and spread of languages which amount to a travesty of archaeological interpretation" (1988:438). Prehistoric archaeological cultures and material remains cannot be directly linked to specific languages, and therefore do not offer testable hypotheses. Questions pertaining to the genesis of language, and 'ethnos', are inextricably tied to pre-Soviet and Soviet anthropological perspectives, where direct connections between archaeological cultures, language groups, and biological communities have been posited. This perspective has invariably shaped many of the broad models proposed for the Eurasian steppe. Therefore, the origins of these historical viewpoints are investigated to highlight their impact on current theoretical and methodological trends in Eurasia that have built upon these previous perspectives in order to examine migratory events, the temporal study of linguistics, and the origins of ethic groups.

In an effort to overcome the problematic nature of archaeology and physical anthropology in Eurasia, new approaches to the mortuary record need to be undertaken including smaller scales of analysis, integrated bioarchaeological approaches, and importantly, the use of ethnography to strengthen archaeological interpretations. A model, which focuses on relationships and connectivity in local communities, has the ability to reconcile broad approaches through the incorporation of detailed individual and community data. Social and biological relationships in prehistory represent pathways, or relationships and connectivity between individuals and groups, which form the foundation of a model of glocalization. Variable pathways can be linked to identities, gender, biological affiliation, consumption patterns, and social structure. Therefore, a bottom-up approach using detailed archaeological datasets creates more nuanced understandings of broader inter-societal processes. It is only through the use of more intuitive models for prehistory that we can overcome previous models that sought to advance particular political and nationalistic goals.

The literature discussed in this chapter was specifically chosen to orient the reader in terms of a bioarchaeological approach to the mortuary record. The rise of the study of 'ethnos' in archaeological and anthropological literature is discussed in relation to links between material culture, language, and ethnicity. The reader must understand how ethnicity and 'ethnos' were discussed within pre-Soviet and Soviet scholarship in order to comprehend the underpinnings of current methods and theories in archaeology. This is followed by a discussion of the rift between physical anthropology and archaeology in former Soviet Union countries, which makes bioarchaeological approaches difficult. Finally, this literature is discussed in the context of building upon this previous research using bioarchaeological methods for understanding the mortuary record in prehistoric Eurasia.

3.1 HISTORY OF ARCHAEOLOGICAL AND PHYSICAL ANTHROPOLOGICAL RESEARCH IN EURASIA: THE RISE OF 'ETHNOS'

Approaches to the archaeological record during Tsarist Russia somewhat mirrored those in America in the 18th century, in terms of a focus on antiquarian explorations of ancient monuments (Bulkin et al. 1982). While important publications and museums were founded at this time, including the Hermitage, archaeological theory and method in Russia lagged behind many European countries (Bulkin et al. 1982). At the transition from the Tsarist period, to post-revolutionary times, Russian scholars such as Gorodtsov were publishing their seminal works (Gorodtsov 1927; 1933). The influence of V. A. Gorodtsov had an impact not only within Russia, but also in America. Gorodtsov, like his contemporary V. Gordon Childe, was distinctly part of the culture historical paradigm and is well known for creating many of the standards still used for the excavation of burial mounds in Eurasia (Bochkaryov 2001; Popova 2006:68-9). The detailed recording and classification of burial monuments and settlements in the Soviet Union originated with his published work (in Russian and English) on the typological method in archaeology (Gorodtsov 1927; 1933). Gorodtsov was also one of the first archaeologists to use stratigraphic evidence to determine chronological placement of what he considered distinct groups, or archaeological cultures (Bochkaryov 2001). However, by the time his work on typology was published, the Soviet period had begun, and many young scholars began to reject his work in favor of a Marxist approach (Bulkin et al. 1982).

At the beginning of the Soviet period, V.I. Lenin founded the Academy of the History of Material Culture. The academy was headed by N.Y. Marr, a linguistics scholar who was also an archaeologist (Bulkin et al. 1982; Slezkine 1996). Marr introduced 'Japhetic theory' into archaeology, which traced ethnolinguistic groups attached to specific territories through time (Bulkin et al. 1982). 'Japhetic theory' eventually became synonymous for the study of a linguistic lineage (languages of the Caucasus) as well as a racial group (Schnirelman 1995; Slezkine 1996:837). This early linkage of linguistically identified groups with archaeological cultures and/or biological groups explains the foundation of scholarly undertakings during the early Soviet period. However, many archaeologists continued to elaborate the typological approach, with a focus on the development of technology as the cause of social change (Trigger 1989:215). Many Soviet (physical) anthropologists closely followed Marr, and divided living populations into categories based on linguistic groupings. The majority of anthropometric studies in Russia were undertaken on populations linked to territories based either on material culture divisions or linguistic divisions (Slezkine 1996).

In the early 1920's, Soviet archaeologists rejected naked artifactology (veshchevedenie) as well as their defining terminology, as the term 'archaeology' was considered anti-Marxist (Slezkine 1996:846; Bulkin et al. 1982). Therefore, scholars began to self-identify as historical experts of material culture and prehistory (Slezkine 1996:846). Soviet (physical) anthropologists were forced to reject 'biologism' and state that there was no causal connection between biological race and particular linguistic, cultural, and social groups. However, the science of studying races (rasovedenie) continued to exist based on a perceived biological reality, which was identified through anthropological analysis (Slezkine 1996:847). The goal of Soviet 'race science' was "to study the biological peculiarities of ethnic groups" in order to differentiate between them (Iarkho 1932).

Trigger states that the 'birth of Soviet archaeology' occurred during the Cultural Revolution, as part of the campaign to bring intellectual life in line with Marxist philosophy (1989:216). During this time, the ideas of Marr were combined with those of Marxism to fit scholarly disciplines into historical materialism. Early approaches discounted hypotheses that dealt with diffusion, migration and conquest as explanations of historical change. In Marxist terms, archaeologists were to reconstruct societies, by defining their modes of production, technology, social organization and ideology (Miller 1956; Akishev 2002). Under Marr, archaeologists were to ignore evidence of ethnic movements, and to study the archaeological sequence in a region as an in situ history of a single group (Trigger 1989:226). The evolution of language mirrored the evolution of societies, based on alterations in socioeconomic organization (Trigger 1989:212). It was not until the 1930's and beyond, that Soviet scholarship began to examine the problem of ethnogenesis, and to trace the 'ancestral roots' of certain nationalities (Bulkin et al. 1982). This may have resulted from the growth of national pride, especially related to the 'Great Patriotic War' and the later 'Cold War'. Interestingly, as concepts of culture, ethnos and diffusion were rejected, the study of ethnogenesis was highlighted as a 'historical process of the formation of a given ethnic community' (Slezkine 1996:846-861). This ethnic community was formed through anthropological (racial), linguistic and ethnographic traits, which could be uncovered by the combined research of archaeologists, anthropologists, linguists and ethnographers. Each society was posited to proceed through the same stages: clan, tribe, peoples, and finally communist society (Schnirelman 1995:124-125).

During the reign of Stalin (1941 to 1953), things changed drastically with published statements by the leader in relation to linguistics, and his rejection of the teachings of Marr (Trigger 1989; Slezkine 1996). These published statements were used by many scholars, and incorporated into their fields of study (for instance Tochkarev and Cheboksarov 1951; Debets et al. 1952). The Institute for the History of Material culture was renamed the Institute of Archaeology. The study of ethnogenesis moved from a stationary scheme to include migratory events (Trigger 1989:230). In addition, increased variety in the archaeological record became evident as the study of ethnic groups and cultural differentiation was encouraged (Bulkin et al. 1982). Soviet archaeology and the Marxist-Leninist paradigm had a dramatic impact not only on the study of Eurasia, but also world archaeology in the last century. The work of Semenov (1964), who used experimental archaeology to examine use-wear on bone tools was especially enlightening methodologically and led to new theoretical breakthroughs in understandings of prehistoric societies.

In the post-Stalin era, there was a renewed diversity in theoretical outlook, mainly those that were complementary approaches to Marxism (Trigger 1989:235). Bulkin et al. discuss the trend for a study of the "law-governed, sequential development of history as a response to economic formations (modes of production)" (1982:279). Increased efforts to search for laws that apply to all societies paralleled the themes of processual archaeology in America. However, when Soviet and former Soviet archaeologists refer to 'theoretical archaeology' it is often aligned with the post-processual archaeological paradigm, and the search for uniqueness in the archaeological record. While some of these trends seem to mirror those in America, such as those related to technology and ecology, I focus specifically on Soviet ethnogenetic research. This research has greatly affected the way that archaeologists and (physical) anthropologists have approached the mortuary archaeology and the study of human skeletal remains in Eurasia, which is discussed below.

Archaeological ethnogenetics was developed in order to investigate the ethnic origins of the Scythians and Slavs (Bulkin et al. 1982). Problematically, archaeological cultures were equivocated with specific ethnic groups (for detailed discussion see Mongait 1967), and 'ethnic indicators' were assumed to be static. It is clear that archaeologists were still grappling with ethnogenesis and possible links between archaeological cultures and ethnic groups during the Soviet period (Mongait 1967; Bulkin et al. 1982). As a result, the study of ethnogenesis still forms the foundation for many studies in north central Eurasia. Interestingly, the debate continues, as scholars focus on ethnogenesis and migratory events related to the Andronovo and the Indo-Europeans. As recent as 2002, scholars were calling for the differentiation of ethnic categories and 'archaeological cultures' (Yablonsky 2002). 'Ethnos' continues to be discussed in terms of the identification of similar cultural materials (as in the Andronovo). However, when stretched over long distances (e.g. the Scythian triad), unifying cultural elements are 'distributed beyond ethnic limits' (Yablonsky 2002). Therefore, populations within core areas were understood as genetically tied, with surrounding areas of diffusion, migration or trade and exchange of items.

The idea of 'ethnos' within Soviet archaeology was based on fixed criteria including language, racial group, dress, house forms, cuisine, and cultural traditions (Schnirelman 1996; Kohl 1998). These criteria are closely linked to the ways in which the Soviet Union identified contemporary ethnic groups within contentious territories. The Soviet idea of 'ethnos' and the classic concept of an archaeological culture are both based on these fixed criteria. Archaeological cultures were believed to be the direct ancestors of current ethnic or national groups. This description of ‘ethnos’ can be contrasted with more modern notions of ethnicity as ‘relationships between groups which consider themselves, and are regarded by others, as being culturally distinctive’ (Eriksen 1993). Ethnicity is a dynamic situation of contact between groups, where these groups are malleable and constantly changing (Kohl 1998). However, while concepts of ethnicity likely extend into prehistory, and can sometimes be identified through archaeological materials, modern ethnicities cannot be traced directly through time to archaeological cultures (Kohl 1998:231). The Soviet concept of ethnos often equates archaeological cultures with living ethnic groups and therefore allows for misrepresentations of archaeological data. Research into ethnogenesis, or the origin points of ethnic groups, continues to be undertaken in Eurasian archaeology. However, this type of research encounters severe difficulties due to the lack of interaction between scholars in archaeology and anthropology.

3.2 THE CHASM BETWEEN ARCHAEOLOGY AND PHYSICAL ANTHROPOLOGY

In former Soviet Union countries, physical anthropology and archaeology are completely separate fields of study, with the latter comprising part of history departments and the former anthropology. This separation has amplified the division between biological and cultural data, greatly hampering the use of bioarchaeological approaches. In contrast, the study of anthropology in the American tradition is often a four-field approach including linguistics, physical anthropology, cultural anthropology, and archaeology (Kohl 2007:458). A lack of interdisciplinary bioarchaeological analyses in former Soviet republics, have greatly affected interpretations of the mortuary record. A deficiency of integrated projects which combine geochemistry, mortuary statistics, and biodistance analyses among other analyses have stunted research of the mortuary realm. Further, as there are few physical anthropologists in Russia and Kazakhstan, the physical analysis of archaeological collections is not always completed. This often leaves the analysis of human remains in the hands of archaeologists who have little training in field and lab methodologies. Therefore, human remains are often given sex and age designations based on general skeletal size, overall cranial shape, and associated mortuary assemblage. For example, as Koryakova and Epimakhov have noted "sex and age of the deceased was a condition of the composition of the goods included in the grave. Weaponry except for knife-daggers…was an accessory of male burials. Ornaments, awls, and needles are considered female attributes" (2007:80).

Physical anthropologists are also affected by the constraints of archaeological field methods and theoretical paradigms. A lack of absolute dates for burials, and in extreme cases a lack of relative dates, can be extremely problematic as the 'archaeological culture' to which each individual belongs is disputed among archaeologists (Solodovnikov 2009). This has led to the publication of results by physical anthropologists, which include human skeletal remains that many archaeologists believe are incorrectly attributed to a culture or period. In addition, physical anthropologists in Eurasia often approach archaeologically recovered human remains as static groups based on archaeological cultures, language, ethnicity or geography. Historically, archaeologists in Eurasia have equated archaeological cultures with ethnic groups (Mongait 1967), and the search for the ethnogenesis of specific archaeological cultures has included research done by physical anthropologists. Furthermore, archaeologists who lack a clear of understanding of methodologies used by physical anthropologists, sometimes misinterpret the final results of anthropological research. While one physical anthropologist will state the possible sex of a subadult, it is understood by other physical anthropologists that this data is not for scientific use. However archaeologists often use this data as a positive identification of biological sex.

A common trend in Eurasia is for physical anthropologists to publish dissertations that contain data from human remains that have never previously been analyzed. This tendency has caused many scholars to claim materials from excavations and refuse other scholars access to these collections. Students are actively discouraged from undertaking projects that include previously analyzed collections, and comparative research is rare. This seems contradictory to general scientific approaches where continued testing of previous theories and methods are undertaken. In addition, few cemeteries are fully excavated, therefore the total sample size for each site is relatively low. Therefore, the analysis of human skeletal remains in correlation with mortuary contexts is rarely undertaken (Lindstrom 1994; Kradin 1995; Zdanovich 1997). Combined, these problems have led to a lack of collaboration, few comparative analyses, and small sample sizes of often less than twenty individuals for the majority of physical anthropology research in Eurasia.

Craniometry is a respected field of study in Russia and other former Soviet countries and cranial measurements are almost always completed by an (physical) anthropologist based on standard methods. Few reports of Bronze Age human skeletal materials in north central Eurasia have been published, but those that have focus on the delineation of groups into binary ‘racial’ categories such as Asian (Mongoloid) or Caucasian (Europoid), distilling vibrant and variable datasets. These categories are based almost exclusively on craniometric analyses (Ismagulov 1970; Kozintsev 2004, 2009) and few scholars have addressed massive problems associated with the categorization of populations into these static groups (for a critical discussion of these issues see Armelagos and Van Gerven 2003; Caspari 2009; Edgar and Hunley 2009). The binary division of individuals into static groups can mask important variation in the archaeological record, is not an accurate or productive way to describe human variation, and discounts biological variation that occurs between individuals as well as among larger population groupings (Edgar and Hunley 2009:2). Furthermore, the use of fixed categories has perpetuated migration theories as events where one group wholly replaces another without interaction. While many Eurasian scholars focus on the division of skeletal populations into binary categories, there is diversity present within these populations. Alekseev and Gokhman (1984:37-8) discuss Bronze Age populations, which exhibit mixed 'Mongoloid' and 'Caucasoid' features, as well as subgroups within these categories including 'Pamir-Ferghana', as a subcategory of 'Caucasoid'. This example hints at the greater diversity present within these populations, which undermine the conventional categories that are often adhered to.

This binary division has been reiterated in discourse surrounding the 'Tarim mummies' and Bronze Age groups in Xinjiang (Mallory and Mair 2000; Thornton and Schurr 2004, 2005). Mallory and Mair contend that mummies found in the Tarim Basin have Caucasian or 'Europoid' features, were Indo-European speakers, and migrated southeast across the Eurasian Steppe to their current location (2000:317-318). More recent craniometric analyses of individuals from Xinjiang were interpreted as having mixed origins and connections both with the Caucuses and the Indus valley (Thornton and Schurr 2004:91; Hemphill and Mallory 2004). Research on the aDNA of Bronze Age samples have combinations of motifs that define them as West Eurasian or East Eurasian haplotypes, along with motifs that are atypical for these groups (Thornton and Schurr 2004:94; Cui 2002). The results of these analyses reveal that scholars often highlight binary divisions, as the general public easily understands them. However, these findings are misleading because substantial genetic variation is clearly present within these divisions. For example, within 'Europoid' or 'Caucasian' subcategories were identified which can be linked to the Ferghana valley, located in northern Kyrgyzstan, a location very far from modern European boundaries (Alekseev and Gokhman 1984:37-8). As many of the sites and individuals under discussion are located in Eurasia, it is perfectly reasonable that individuals and populations are of mixed origin with links to both western and eastern populations.

In population studies, scholars often compare materials from different sites to understand the broader region. Skeletal collections are divided based on geographic or archaeologically derived ethnic or cultural groups. As Solodovnikov stated, some of these archaeological designations are disputed, which puts the anthropological researcher on unstable grounds (2009:160). Compounding these problems is the use of 'standard' or average measurements for many metric studies, or the use of a single individual as 'representative' of a community or micro-region for non-metric analyses (e.g. Ismagulov 1970; Alekseev and Gokhman 1984). Population studies of prehistoric groups also suffer from small sample sizes related to extended periods of time. For example, Ismagulov examined 39 crania for Bronze Age Eurasia, which lasted for approximately 1000 years and has a culture area at its broadest point that stretches from the southern Urals to China (1970). This author is highly respected for his work in Eurasia, however, the small number of individuals used to examine population change and interaction over time is extremely problematic (for discussion Stojanowski and Schillaci 2008:51-52). The study of human skeletal remains continues to offer challenges as scholars focus on identifying regional homogeneities in populations rather than discussing local variability.

The study of ethnogenesis was initiated to examine the process of formation of ethnicity, which is a conglomeration of anthropological (racial), linguistic, and ethnographic traits (Kleijn 1973; Slezkine 1996). What began as a way to project ethnic divisions back through the millennia, and trace indigenous traditions, grew into a problem of the 'origins' of the Slavs or particular group of people (Grekov 1939; Tretyakov 1948; Formozov 1959; Kleijn 1977:15). Genetic studies have been derailed by nationalism, connections with Indo-Europeans, and the search for the homeland of particular ethnic groups. Therefore, we must move past research that focuses on origins of culture, languages, and ethnicities in order to understand prehistory. Instead, we need to formulate questions that are concerned with smaller scales of analysis, involve bioarchaeological methods, and use ethnography as a foundation for informed interpretations.

3.3 BUILDING UPON UNSTABLE FOUNDATIONS: CURRENT THEORETICAL PROBLEMS

While many would argue that approaches linked to the genesis of ethnos, culture and language have been abandoned in recent years (Koryakova and Epimakhov 2007:20-1); the foundations of archaeology and anthropology were built upon these skewed models of change and interaction. Kuz'mina (2007) discussed recent theories posited for the Bronze Age, which included western impulses and migration, assimilation, ethnogenesis, the 'foreign' nature of archaeological cultures, linguistic ties to archaeological material, and relationships between the steppe and the sown. These theories can be boiled down to investigations of the origins of ethnic groups and archaeological cultures, the use of genetic terms to describe material culture similarities, investigations of migratory events, and the temporal study of linguistics. Each of these is problematic, not from a theoretical standpoint, but because the methods and datasets used as support for these models are flawed (e.g. small sample sizes, individual measurements as representative of a group or culture, etc.). These models are discussed below in reference to Bronze Age developments in the Eurasian steppe in order to examine the problematic nature of these approaches. The only way to overcome some of this research is to understand the means and ways it has previously been studied.

The search for origins of an ethnic group, especially when equated with archaeologically derived material culture, is extremely problematic. This is undertaken through examinations of similar artifacts or burial construction at sites separated by long distances. This is especially problematic for the Middle and Late Bronze Ages, where huge expanses of Eurasia are covered by amorphous zones, which are supposed to spatially represent the area once occupied by an archaeological culture. Previous theories propose that the ethnogenetic basis for these groups could be from Iran or Azerbaizhan (Grigory'ev 2000; Salnikov 1967), as well as from within the micro-region. Arguments for ethnogenesis from outside of the region rarely discuss the ways that local communities dealt with new individuals, and instead opt to characterize these events as full scale replacement. In addition, the processes by which similarities in material culture occurred, such as exchange, interaction or diffusion, are understudied and seemingly undervalued. Research that equates material culture with a specific ethnic group tends to overlook the complex nature of communities in prehistory and the degree to which individuals and communities differentially negotiated their identities (see also Kolb and Snead 1997; Canuto and Yaeger 2000; Varien and Potter 2008).

Beyond ethnos and ethnicity, material culture similarities are often described in genetic terminology. However, physical anthropological data and biodistance techniques are not used as supporting evidence for these connections. Only material culture, such as ceramic vessels, burial construction, and grave assemblages are used to form links. For example, the Late Bronze Age Andronovo 'culture' has similarities in vessel form and decoration over a large area, as well as great variety in vessel form and decoration within each community or subgroup. Similarities in vessel form and decoration have led to discussions of the Late Bronze Age in overarching terms including the Andronovo Horizon, Andronovo 'community' of cultures, Andronovo culture-historical community, and Andronovo family of cultures. Terms such as 'family' of cultures posits a genetic or genealogical connection between subgroups subsumed under the Andronovo umbrella, which are based on archaeological materials rather than skeletal remains (Koryakova and Epimakhov 2007:21). Diachronic similarities in artifact morphology, ornamentation and traits (e.g. archaeological cultures) are often proposed to reflect the stability of genealogies and therefore ethnic groups over time. In many ways, ethnicity is understood to include possible genetic relationships, similarity in language, dress and material culture. However, the self-identified nature of ethnicity and the ways that it may cross-cut communities, has not yet reached the scholarship of the Eurasian steppe. Variation within Andronovo has led to the recognition of two main subgroups, the Alakul' and Fedorovo, which are differentiated based on burial treatment in the form of cremation or inhumation, ceramic style and construction, settlements and mortuary assemblages. However, researchers continue to struggle with understanding whether multicultural aspects (Korochkova and Stefanov 2004, 2006), ethnicity (Koryakova and Epimakhov 2007), status (Korochkova 2002), gender (Usmanova and Logvin 1998) or age grades contributed to these perceived differences.

The spread of material culture over broad areas, has also led scholars to focus on migratory events. As new forms of material culture are identified in Eurasia, migration is often seen as the impetus. However, the scale and type of migration or mobility, as discussed by Anthony (1997) are almost never investigated. Instead, discussions revolve around the ethnogenesis of these groups, whether they were precursors or successors to one another, the result of migratory events, or if they were part of the same 'family' of cultures. Furthermore, investigations of migratory events often are in need of robust supporting data that is multidisciplinary in nature. Unfortunately, reconstructions of prehistoric migration and interaction often use archaeological cultures as expressions of ethnic identity (Salnikov 1967; Grigory'ev 2000). This approach masks archaeological facts, and leads researchers to oversimplify archaeological research and interpretation (Frachetti 2004:179). While many scholars use material culture to examine connections, these could also be evidence of diffusion, exchange, and interaction. Migration, as a process, and the behaviors associated with movement and mobility can occur in a predictable manner based on analyses of social organization, trade, and transportation technology (Anthony 1997:896). However, we must be careful of the evidence we use to model migrations, such as craniometric data, over broad regions (for discussion Frachetti 2011:205). For example, data from the physical analysis of human remains, especially biodistance using dentition, can be used as support for genetic connections, or the full-scale replacement of one group by another.

Much physical anthropological research is tied to discussions of the Indo-Europeans by Eurasian scholars. The search for the ethnogenesis of a culture or language is highly problematic (Hanks 2000), as associations between language and culture are tenuous at best and language should not be treated as an artifact. Many linguists have questioned whether it is possible to determine the temporality of language families, as many languages lack a systematic and therefore testable background (Embelton 1986; Heggarty et al. 2005; Heggarty 2006). Therefore, attempts to determine a single genesis point for an archaeological culture or language should be abandoned and replaced with an examination of the social processes occurring in prehistory that are currently overlooked. The links between language and material culture as well as language and genetics need to be re-examined (for discussion Hanks 2000). While models of migration and movement based on archaeological materials and human genetics are worthwhile, linguistic data will never have the necessary hard evidence to either support or refute these hypotheses. Even if archaeological materials are used to provide a test control for genetic models of population movements "we are still left with the highly problematic nature of cultural transmission and certain socio-cultural questions regarding the ethnicity and linguistic affiliation of populations within prehistory" (Hanks 2000:292). The spread of language is unfortunately coupled with broad scale patterns such as the spread of material culture, while the processes that allow for cultural transmission are muted.

Modeling of prehistoric migratory events, diffusion and exchange, ethnicity, and genetic relationships are all valid forms of research. However, when the foundation of these studies is couched in direct connections between material culture, and language or a specific ethnicity, it becomes challenging. In order to overcome this situation, there is a need for modeling of prehistoric societies to be reformulated, and support for these models founded upon underpinnings that include multidisciplinary research. In an effort to formulate new models for the Eurasian steppe, a focus on ethnographic research is imperative.

3.4 BUILDING STABLE FOUNDATIONS: ETHNOGRAPHIC MODELING AND MULTIDISCIPLINARY BIOARCHAEOLOGY

While ethnographic literature has greatly affected the way that pastoralists have been discussed in central Eurasian archaeology, scholars rarely agree on the nature of social organization or the degree of social complexity exhibited by certain prehistoric pastoral case studies (Anthony 2007; Kohl 2006; Koryakova and Epimakhov 2007; Kuz'mina 2007; Zdanovich and Zdanovich 2002). Instead of focusing on previously proposed models with unstable foundations, we need to rethink the way that models are constructed and used for Eurasian pastoral societies. Models should explain the dynamic nature of prehistory, including relationships between individuals and groups, and must take into account ethnographic data. While scholars should be cautious in using analogies in a one to one correlation with archaeological materials, ethnographies can assist in the interpretation of bioarchaeological and mortuary data by providing more nuanced understandings of social differentiation and how these co-vary with certain mortuary traditions and forms of disposal (Ucko 1969). New models must also focus on better explanations of pastoral social practices and interactions. As a good portion of ethnographic data focuses on local groups, their lifeways and interactions, there is a need for parallel investigations of smaller scales of analysis in archaeological research. Archaeological investigations must explore the lives of individuals, the community, as well as the micro-region as part of a bottom-up approach. Ethnographic analogies may be particularly helpful in the modeling of community interaction (exogamy, intermarriage, residential mobility) and archaeological patterns associated with such connections.

Archaeological interpretations must have links to ethnographic datasets that relate to the way individuals and groups differentially negotiated their surroundings. Archaeological interpretations should include correlations between artifact patterning and detailed ethnographic views of identities, gender, age, social interaction and social organization. However, there clearly are pitfalls in the use and abuse of ethnoarchaeology and anaology (Wylie 1985; David and Kramer 2001). The direct historical approach, where direct connections are made between archaeological culture areas and present-day populations is clearly problematic, as it "limits the explanatory power of research and denies ancient populations the ability to change" (Wendrich and Barnard 2008:13). However, equally problematic are ethnoarchaeological projects that have very concentrated and limited aspects which are then used as bridging arguments over broad regions (Wendrich and Barnard 2008:14). Therefore, ethnographic analogy and ethnoarchaeology must be used cautiously as the middle-range between empirical data and higher order conceptual themes (Raab and Goodyear 1984). Those critical of analogy believe that it distorts and limits what archaeologists can understand about the past (for discussion Wylie 1985). However, while ethnographic research must be used carefully, it offers detailed accounts of known occurrences and patterns related to social organization, identity, habitation, and human interactions (Wendrich and Barnard 2008:14). The work of Cribb is especially pertinent to this discussion, as he compared and contrasted ethnoarchaeological and archaeological research to create stronger middle range theories related to the archaeology of nomadic peoples (1991).

Ethnographic research in the Eurasian steppe must be viewed in a critical manner if it is to be useful in guiding archaeological interpretations of patterning. The majority of ethnographic research worldwide examines societies that do not have pastoral economies. Furthermore, when pastoral societies are studied ethnographically, there has been a distinct focus on Africa (Evans-

Pritchard 1940, 1951) and the Near East (Salzman 1980). While these groups are pastoral and mobile, their degree of mobility, environments, and cultures can be very different than the Eurasian steppe. Therefore, while general information about pastoral groups can be gleaned from this research, ethnographic data used in this dissertation focused on groups found in the Eurasian steppe. Ethnographic datasets of peoples in the Eurasian steppe, while not proposing that these groups are a continuation of ancient inhabitants, can be beneficial as there is a greater likelihood that lifeways and environments will match more closely to the archaeological sites under study. As Khazanov (1984:15) has mentioned, food procurement (i.e. pastoral lifeways) are different from those of food producers especially in patterns of movement. Furthermore, pastoral lifeways from region to region can be significantly different in the ways that animals are culled and consumed (Makarewicz 2011:186). Therefore, more detailed ethnographic and ethnoarchaeological research of Eurasian pastoral groups is necessary.

We should also be cautiously critical of scholarly work in regard to its origin, as part of fieldwork or library based research, what differential findings mean based on diverse sources, and how these can be used as part of middle range theory in archaeology. Ethnographic research in Eurasia was often conducted by Soviet ethnographers, whose early studies focused on collecting datasets that were either broad universal generalizations or isolated descriptions of early tribes (Bogoraz 1926:129). During the reign of Stalin, modes of production became the centerpiece of Soviet ethnography, following a Marxist tradition (Slezkine 1991:477). Furthermore, in Soviet social sciences, ethnicity was "viewed as absolutely 'natural' an 'independent variable' and a primary cause of phenomena" (Tishkov 1992:380). The ethnic community included physical characteristics such as a common territory, economy, and language (Tishkov 1992). Scholars based their ethnographies on previous reports of Eurasian pastoralists (e.g. Murdock 1934; Krader 1953, 1955; Argynbaev 1978) or compilations of data from the Human Relations Area Files (HRAF) (Borgerhoff Mulder et al. 2010). Other ethnographers have undertaken comparative research between their original ethnographic fieldwork and previous reports of Eurasian pastoral groups (Abramzon 1978). Furthermore, some datasets are available on communities in the Eurasian steppe, albeit in vastly different regions, including southeastern Kazakhstan (Hudson 1938), south Siberia near Tuva (Vainshtein 1980, 2009), Kyrgyzstan (Abramzon 1978), as well as Mongolia and North China (Humphrey and Sneath 1999). When detailed ethnographic data is available for specific groups, or generally for pastoralists, there is the possibility for conflicting information between ethnographic datasets. However, this information should not been seen in a negative light, instead this variation highlights the multiple alternative lifeways of pastoral communities in the broader region.

Variability in ethnographic case studies strongly suggests that in the archaeological study of pastoralist social organization, a more nuanced understanding of wealth, status and social identity, as well as their material correlates must be utilized in a comprehensive treatment of the mortuary record. While differentiation in pastoral societies is often divided along age and gender lines, the proposed egalitarian nature of these divisions have not been effectively questioned and tested. However, institutionalized social stratification and ranking has been indentified within pastoral societies in Africa (McIntosh 1999), Europe (Palumbo 1987), and Asia (Di Cosmo 2002; Koryakova 2002; Kradin 2002; Chang 2008). Therefore, a bioarchaeological approach using multiple lines of evidence allows for the development of much stronger, more empirically valid interpretations of the nature of social organization and how processes of interaction and integration among early pastoralist societies influence this.

This dissertation undertakes a bioarchaeological approach to the mortuary record of Bronze Age north central Eurasia. This research focuses on patterns in relationships found at the intersection of biological and cultural data, which works well in concert with ethnographic datasets. This undertaking enhances archaeological interpretations of local communities, using ethnographic data relating to kinship, social organization, food consumption practices and social mobility. Ethnographic research in this chapter examines identities, differentiation, and stratification at the individual and community level. Furthermore, social organization and structure, and the ways that individuals and groups interact in broader spheres are also explored through ethnographic studies. Ethnographic descriptions of social and biological processes, including relationships and interactions, at several scales form a foundation upon which to address broader connections and events. A bottom-up approach, as is followed by many ethnographers who focus on small communities, allows for the creation of a foundation of data on which to build social models and a comparative framework (Garro 2000). Furthermore, what gives ethnographic data an edge is that face-to-face encounters associated with fieldwork are investigated by observing actors engaged in social activities (Beaulieu et al. 2007:678). A glocalization model was chosen, as it reinforces the idea that individuals and communities differentially negotiate broader processes of interaction and integration, which accounts for variation in the archaeological record. While globalizing and socializing processes transcend communities, micro-regions, and macro-regions, they do not homogenize these differentially scaled groupings. Instead, each individual and community mediates these processes in different ways, which is reinforced by ethnographic data that exhibits variation on similar levels. In times of warfare or conflict, individuals and communities may be more restricted in their ability to mediate broader processes, as interpersonal relationships and connections can be affected by these factors.

3.4.1 Ethnography of Identity and Differentiation

In an effort to understand broader dynamics in prehistory, we first need to investigate identities, differentiation, and social stratification at the local level. As part of the dissertation research, ethnographic data on Eurasian pastoral societies was explored in order to better understand social processes in prehistory. Particular attention was paid to the construction of identities related to biological sex and age, gender, the division of labor and tasks, and the overall wealth of individuals and their position in society. In addition, specific age-related events that were highlighted in ethnographies such as birth of a child, the naming ceremony, first haircut, eruption of first teeth, male circumcision, sexual maturity, and marriage were also considered (Abramazon 1978; Vainshtein 1980; Borgerhoff Mulder et al. 2010). These findings led to questions relating to the types of identities highlighted in pastoral societies and the numerous ways that differentiation occurred between individuals. Finally, specific ethnographic observations that offered more salient interpretations of pastoral culture, community, and society were utilized to create a foundation for a more holistic interpretation of bioarchaeological datasets through analogy (e.g. Walker et al. 1998).

Division of Labor

In ethnographies of pastoral societies, tasks and labor are explained in relation to the individuals that undertook them. In his extensive reading on the Kazakhs, Murdock discusses a division of labor by sex, where men tend to flocks and herds, wage war, and manufacture tools and utensils

(1934:159). In contrast, women milk the animals, make cheese and khumiss, cook, sew, embroider, engage in trade, as well as make felt, rugs, and clothing (Mudock 1934:159). Vainshtein who studied the south Siberians in Tuva explained that the milking of mares could be undertaken by either men or women, and usually involved rounding up the herd. The foal was lassoed and tied to a post, which drew the mare in close, and allowed for the mare to be lassoed and held for milking (Vainshtein 2009:66-67; Human Planet: Grasslands). Comparative discussions of the division of labor among pastoral societies worldwide revealed that men typically owned and herded livestock, while women spent considerable time in livestock-related tasks (Borgerhoff Mulder et al. 2010). In Tuva, other activities such as hunting and fishing were often undertaken by men, and in some traditions women were forbidden to come into contact with weapons or tackle (Vanshtein 2009:167). When they are able, children begin undertaking tasks such as gathering fuel, fetching water, holding sheep during milking, and caring for younger children (Murdock 1934:156). In terms of games, girls were seen playing with stick dolls, while boys played with carved animal figurines and shot birds with a sling or bow and arrow (Murdock 1934:156). Furthermore, while children are given tasks that likely are accorded them due to age (and possibly biological sex), they learn many of them at a young age by watching and helping their parents (Murdock 1934:156). Based on these findings, there is a clear division between individuals (based on age/sex) in terms of activities, which might be evident in the mortuary record. Furthermore, certain animals might be found in mortuary contexts of individuals based on their close relationship, either in terms of ownership, milking, or herding. Burials of children may also indicate the tasks they undertook, or items played with, which in some ways might mirror those of adults as they often worked alongside older relatives. However, the division of labor should not be thought of as a static entity, rather a possible starting point for the examination of differences between the sexes and age cohorts.

Economic Relationships and Wealth

Stratification and differentiation often occurred in pastoral societies based on economic relationships. In Kazakhstan during the 1920's, poor and middle class individuals were in a precarious position, as the loss of animals might force them to be hired herdsmen for the wealthy, caravan drivers, or semi-sedentary agriculturalists (Hudson 1938:29,57). Wealthy communities left animals on the pasture under the charge of hired herdsmen, which were sometimes kin related (Hudson 1938:18). Additionally, Krader found that poor families tended to rely on hunting, while the wealthy herded (1953), which was verified by Vainshtein (2009:187) who said that poor herders boosted their economy by hunting. Fishing was also practiced, but mostly by poor herdsmen of the steppe who resorted to eating fish (Vainshtein 2009:199-89). More recent research on pastoral and agro-pastoral wealth was compiled with HRAF data from East Africa (Datoga, Sangu), West Africa (Juhaina Arabs) and Asia (Yomut Turkmen) (Borgerhoff Mulder et al. 2010). This research revealed that forms of wealth including material (livestock), relational (water, pasture, and resources), and embodied (knowledge and physical capital) affected the ways that individuals and communities differentially negotiated micro-regional interactions (Bogerhoff Mulder et al. 2010). These different types of wealth were then ranked in terms of significance with material wealth (livestock) being the most significant (61%), while embodied wealth (26%) and relational wealth (14%) ranked as less important.

General findings within modern and historic pastoral and agro-pastoral groups in Africa and Asia reveal that livestock was considered a form of wealth, yet there were also instances when comparatively less wealthy individuals were hired as workers. However, many individuals hired in 1920's Kazakhstan were described as working for kin (Hudson 1938:57,71). Wealth and status were often linked to the subsistence activities of individuals (hunting/fishing/herding) and hence tied to dietary intake. Therefore, archaeologically, differentiation and stratification could have occurred based on 'wealth' and might be evident in the mortuary realm based on animal remains (wild/domesticated), artifact count, or through distinct biological identities of individuals with few items. Studies also indicate that diet and wealth are often related and therefore archaeologically one may find that: 1) dietary intake was different based on the wealth, status, or locality of the individual interred and 2) overall health (presence of pathologies) might be different based on the wealth or status of the individual.

Ceremonies and Events

Ceremonial events are frequently highlighted in ethnographic research of pastoral groups, including birth, naming ceremony, male circumcision, betrothal, sexual maturity, and marriage. Among the Kazakhs, the birth of a child and their naming were ceremonies with little recognition, possibly due to high infant mortality (Murdock 1934:156). Male circumcision was held between the ages of 7 and 12 as part of the Muslim tradition (Murdock 1934:156), and the parents were expected to give a feast (Hudson 1938:42). Betrothal could occur at many points during childhood and adulthood (Murdock 1934:156), was often pre-arranged and could occur at age nine and older (Hudson 1938:42). After betrothal, the bride wealth payment of livestock began to be paid to the wife's family and varied based on the means of the groom and desirability of the future wife (Krader 1953:544; Krader 1955). At the time of marriage, a dowry was given to the woman by her family, which included a tent, household goods and livestock, which were under her control (Krader 1953:546; Abramzon 1978). Among Kazakhs and Kyrgyz dowries may have included a 'wedding headdress' and a veil that was the sign of young brides

(Argynbaev 1978) or silver headpieces and silver ornamented garments (Krader 1955:73). If dowries are given, they are sometimes comprised of gifts from relatives accumulated at different age-related ceremonies (Valikhanov 1964; Vainshtein 1980). Based on ethnographic data, archaeological patterns may include: 1) distinct differences between adult male and female graves, 2) adult female graves with items related to their marital status (headdress/ ornamentation), and 3) child burials containing special items related to age and sex related ceremonies.

Inheritance and Status

Historical pastoral societies in Eurasia often are patrilineal in descent and inheritance, therefore women were thought to lack control over wealth and material goods. However, among pastoral societies worldwide while the majority practiced patrilineal inheritance (66.7%), some also practiced matrilineal (6.7%), and the remaining gave items to all children without gender constraints (26.7%) (Borgerhoff Mulder et al. 2010:37). Krader states that Kazakh women were often given an inheritance which was allocated to them when they wedded, giving up any further portions of the paternal estate (Krader 1953:548). The status of Kazakh and Buryat women greatly changed over their lifetime according to Krader, who states that women had little social status before they were married, an increase in status and control over her dowry when married, and even higher status once a woman bore a male child (1955:74). Therefore, based on ethnographic research, we might identify differential status of individuals based upon biological sex and age, as a form of inheritance or descent. Furthermore, women may have different statuses at different stages of their life, and therefore age at death and mortuary practices might clarify these differences.

Bioarchaeological research is uniquely suited to confront the multiplicity of identity, as it combines studies of the social and cultural, with the physical body. In this dissertation, identities are examined through the investigation of biological affinities and kinship, mortuary statistics, as well as consumption patterns. Based on ethnographic findings, a portion of this dissertation is used to investigate the more intricate levels of society including individual identity and personhood, with a specific focus on gender and age differentiation. The study of the individual has greatly transformed from a search for the direct link between social persona and rank or status (Binford 1972), to detailed understandings of the negotiation and contextualization of identity in the mortuary realm (Buikstra and Beck 2006).

3.4.2 Ethnography of Social Structure and Stratification

As part of a bottom-up approach, society structure is seen as a blend of differentiation based on the social and biological identities of individuals, including gender, age, status, trade (vocation), biological affinity, kinship, and diet. However, relationships and interconnections within each community highlight the underlying organizing principles of the society. Ethnographic studies of social organization and structure emphasize the inherent complexities within these communities. For example, ethnographies can help to clarify the structure of residential communities, as well as the degree and types of interactions occurring between them. The use of ethnographic analogies allows for more plausible interpretations of archaeological data concerning social structure and inequality present in local communities and the broader region.

Residential Groups

Ethnographic and ethnohistoric research on the social organization and structure of Eurasian pastoralists has traditionally highlighted the significance of clans and lineages within a genealogical perspective (Krader 1953; Abramzon 1978). Detailed analyses of some Kazakh and Kyrgyz groups reveal that the smallest social unit is the *aul* or village, which group into larger units such as lineages and clans named after a founding ancestor (Krader 1955:75). Local communities or villages (*aul*) were often described as patrilineal in descent, patrilocal, and exogamous (Krader 1953:534; Vainshtein 1980; Bogerhoff Mulder et al. 2010). However, ethnographers of Kazakh peoples differentiated between groups that were exogamic versus residential (Hudson 1938:99), or highlighted the dual nature of broader social structures which linked individuals either politically or consanguineally (Krader 1955:68). Furthermore, while patrilocal residence may be preferred in many communities, there are many instances of variability. The Kazakh *aul* or village sometimes incorporated individuals from other groups through the mother's line, in addition to individuals hired as workers (Hudson 1938:27). While wealthier Kazakh *aul* (villages) often had a single kin group related through patrilineal lines, poorer *aul* (villages) could combine several unrelated kin groups to form a community (Krader 1953:538-540). Recent data from Mongolia supports this, revealing that some families live with the wife's kin (Sneath 1999). Krader stated that when Kazakh women moved to the *aul* (village) of their husband, they often underwent a change in status, that was accompanied by a sobriquet (nickname) and that this new name 'emphasized the discontinuity in her social being' (1953:547).

Ethnographic studies have recorded fluidity in the formation of pastoral residential groups because these societies often have both highly mobile and sedentary components (Krader 1953; Barfield 1981; Cribb 1991; Sneath 1999). Among Eurasian societies in 1920's

Kazakhstan, Krader (1953) found that poor individuals (who farmed and hunted) tended to live in permanent structures while wealthier families (who farmed and herded) were more mobile. In contrast, Sneath's ethnographic research in Mongolia, when compared with previous research in China and Russia, found that wealthy families had sedentary lifestyles while poor families lived in mobile gers or yurts (Sneath 1999).

These ethnographic cases provide an important perspective on inter-group relationships and residence patterns, which may help to guide investigations and interpretations of prehistoric materials. For example, bioarchaeological patterns within such residential groups may include: 1) evidence of adult men and women with non-local or diverse biological traits, 2) differential status or ornamentation connected to non-local/biologically different individuals, and 3) presence of subgroups with different biology but common material culture. Therefore, the intersection point of biological and mortuary data may reveal patterns that can enhance interpretations of local communities. However, other factors may also be involved, including the possible presence of traveling craft specialists, non-local individuals, and components of local communities that were more mobile. These complex patterns may be more difficult to interpret in the archaeological record.

Non-local Individuals: Mobility and Exchange

What was often overlooked in early ethnographies was the presence of non-local individuals in local communities. However, in relation to Kazakh groups, Hudson (1938:70) describes numerous individuals that were intermittently tied to local groups or lived within villages even thought they lacked a blood relation in the male line. These included itinerant visitors, travelers, merchants, artisans, servants, free-lance warriors, wandering mullahs (Hudson 1938:70-72), as well as shamans and healers. In addition, sometimes wealthy individuals who were not blood related to the group were allowed to occupy land for fodder and spend the winter with these communities (Hudson 1938:71). Vanshtein describes the migratory nature of individuals in Tuva who were skilled in the manufacture of crafts (2009:198). While the basic necessities of life, such as dwellings, clothes, utensils, ceramics, and some tools were made by each household, high quality or specialized items were often produced by expert craftsmen. Professional craft makers in Tuva were often engaged in smithing, casting, and the production of jewelry, while similarities in these items were interpreted as evidence of the small number of individuals undertaking these tasks (Vanshtein 2009:198-99). Jewelry making was especially distinct as a trade, as evidenced by a 1931 census of metal smiths in Tuva where only 75 of 546 households had tools for making jewelry, therefore bronze articles were highly valued (Vainshtein 2009:204).

Therefore, individuals that were not blood related or non-local were sometimes incorporated into existing communities. Furthermore, those that were not incorporated may have taken part in transient and craft related mobility that is rarely discussed in relation to the archaeological record and may have left no trace. The movement of individuals through communities, who left behind material goods, but were not a permanent part of the group, needs further investigation. It is possible that these individuals were not able to move freely during some periods, while during others they had few barriers. These case studies highlight the variable nature of residence in local communities. These cases may guide interpretations of archaeological patterns, especially in terms of the presence of non-local individuals and craft specialists.

Social Inequality

While traditional, pastoral systems were assumed to exhibit high levels of mobility and low levels of social complexity, this model has recently been challenged, through the identification of institutionalized social stratification and ranking within pastoral societies (Palumbo 1987; McIntosh 1999; Di Cosmo 2002; Koryakova 2002; Kradin 2002; Chang 2008). Inequality has been discussed as an essential part of pastoral systems (Chang and Koster 1994), and some posit that pastoral inequality was founded in a consanguineal principle of ranking lines of descent (Krader 1955:85). Anthropological perspectives are a powerful tool for examining social developments, however, they must take into account similar as well as unique features of community organization in order to assess variability along social developmental pathways (Kohl 2008: 11). For example, models of social organization that include horizontal, or heterarchical, dimensions have been shown to augment understandings of social, political and economic trajectories (Peebles and Kus 1977; Blanton et al. 1996; Canuto and Yaeger 2000; Feinman 2000). As recent scholarship has indicated, there is more than one pathway to social complexity and therefore we must examine developments along more than one comparative dimension if we are to construct convincing diachronic models (Feinman 2000: 34). Social differentiation is often inferred from mortuary assemblages and identified as either vertical (hierarchical) or horizontal (heterarchical). Vertical ranking, which is often based on a form of wealth, is evident when successively higher positions are held by fewer individuals and may include ascribed status for children (Peebles and Kus 1977). Horizontal dimensions should reveal subgroups of equal size, with similar demography, and parallel occurrences of social distinctions in each division (Binford 1971; O'Shea 1984). Focusing on what might be considered the broader heterarchical and hierarchical tendencies within societies provides a framework that promotes a more thorough assessment of diversity in the nature of social organization, especially in the study of pastoral groups (Leonard & Crawford 2002). Some sort of stratification is present within 81% (11/16) of pastoral and agro-pastoral groups worldwide (Borgerhoff Mulder et al. 2010:45). In addition, societies may be structured by age and gender cohorts that cross-cut vertical and horizontal divisions which further complicate our understanding of prehistoric social organization.

Ethnographic data reveals that there is much variation found within pastoral and agro-pastoral communities in terms of relationships, wealth, and social organization. However, some general patterns emerge from these studies. Ethnographic patterns highlight that the proposed egalitarian nature of these societies needs to be tested, as a large number have some form of stratification. In addition, the link between subsistence economy and degree of social complexity should be re-examined (e.g. Houle 2010). Differentiation within many of these communities is based on gender and age divisions, and distinctions between individuals were identified in terms of wealth, status, identity, diet, and post-marital residence. A multitude of internal factors plays into the formation of these communities, but broader factors also play a part. The continued negotiation of broader processes by individuals and groups shapes the way that interconnections occur. The intersection point between biological and mortuary data may reveal patterns that enhance interpretations of individual identity, social organization, and community interactions.

3.5 CONCLUSION

Pre-Soviet and Soviet anthropological perspectives often highlighted direct connections between archaeological cultures, language groups, and biological communities. This perspective has influenced the current state of modeling and theoretical trends in Eurasia, which tend to focus on broad changes over vast areas. The splintered nature of archaeology, physical anthropology, and ethnology in Soviet, and more recently Post-Soviet, universities further contributed to these issues. To overcome these broad models a stronger focus on bioarchaeological techniques, more detailed scales of analysis, and the incorporation of ethnographic data sets as analogies for interpretation, should be employed. A bioarchaeological approach using multiple lines of evidence including biodistance, formal mortuary statistics, and chemical analysis of diet allows for the development of much stronger, more empirically valid interpretations of the nature of social organization and how this is influenced by processes of interaction and integration among early pastoralist societies (Price et al 1994; Grupe et al 1997; O'Connell et al 2000; Privat et al 2002; Haverkort et al 2008).

The combined use of bioarchaeological methods and ethnographic analogy has the ability to create useful models for understanding prehistoric pastoral and agro-pastoral groups. Detailed local data reconciles broad approaches by bridging the gaps in our understandings of prehistory. Models such as glocalization offer more nuanced ways to examine the archaeological record, and incorporate ethnographic datasets. Globalizing processes cross-cut communities, macro- and micro-regions and form common threads that are evident based on material culture. The glocalization model assumes that local variation exists, and that each community, or individual, differentially negotiates socializing and globalizing processes. Therefore, pathways as part of glocalization can be identified based on 1) constructions of individual identities, 2) gendered or age based differentiation, 3) relationships and interconnections between biologically affiliated individuals, 4) dietary status and consumption patterns, 5) reconstruction of social structure and organization, and 6) residential community formation. This data is then interpreted based on ethnographic models of pastoral and agro-pastoral groups. Only through the analysis and interpretation of these intricate interconnections can broader models of interaction be tested. Empirically gathered, processes, and interpreted data from these lower levels of the archaeological food chain garner strong support for macro- and supra-regional theories.

4.0 THE MIDDLE AND LATE BRONZE AGE IN NORTH CENTRAL EURASIA: ARCHAEOLOGICAL AND ANTHROPOLOGICAL PERSPECTIVES

“Мы имеем десяток выделенных археологических культур, непонимание исторических процессов и полную девальвацию основного понятия ‘археологическая культура’ поскольку часть различных культур выделена на идентичных материалах, относящихся к жизнедеятельности единого населения прошлого.”
“We have identified dozens of archaeological cultures, but there is a continued misunderstanding of historical processes and a complete devaluation of the basic concept of ‘archaeological culture’ since these different cultures are separated based on identical materials, which relate to common activities of the population of the past.”
(Mosin and Botalov 2006:3)

The Bronze Age in northern Eurasia is a period of time for which a myriad of archaeological cultures have been identified based on material remains. Scholars have used the same materials in repeated attempts to re-invent these time periods by lumping, splitting, and reorganizing archaeological culture names and their associated material goods within this micro-region. One of the goals of this dissertation is to summarize and distill the culture history of this area and make it understandable. The culture history of this region is extremely complex and also somewhat convoluted as it encompasses portions of two countries. During the Soviet Union, archaeologists from both Russia and Kazakhstan were part of the same academic circle. Information sharing was at its height, and discussions between scholars from these countries occurred regularly. However, post-Soviet politics have greatly affected how archaeology and information sharing occur between these now separate nations.

Compounding these current issues, are previous theoretical paradigms in Eurasia that linked ethnicity, language, and material culture (for discussion chapter 3). The equation of archaeological cultures with specific ethnic groups, which share common origins and successions, is extremely problematic. Genetic relationships within and between these cultures have not been examined in detail, rather material culture is seen as the source of genealogical relationships (Koryakova and Epimakhov 2007:21). Therefore, any diachronic similarity within archaeological materials is proposed to reflect the stability of genealogies and ethnic groups (e.g. Ismagulov 1970; Alekseev and Gokhman 1984). Archaeological cultures are misrepresented in scholarly work as being genetically homogeneous, for instance the use of 'family of cultures'. Additionally, the culture history of the region has been hampered by discussions of artifact morphology, ornamentation, and assemblage traits as representing aspects of cultural identity and ethnicity. Unfortunately, ethnicity is discussed in terms of the archaeological culture as a whole, and is often unrelated to individuals or groups. Archaeological cultures as expressions of ethnic identity, allow archaeologists to reconstruct prehistoric migration and interaction (Salnikov 1967; Grigory'ev 2000). However, this 'pots as representative of people' approach has masked archaeological facts and led current researchers to "distill the actual material from this history of research and interpretation" (Frachetti 2004:179). Overcoming these issues may be one of the biggest challenges of Eurasian archaeology.

As discussed in Chapter 2, there is a need to test supra-regional models with more detailed local and community level datasets. These broad models are partially the result of the span of culture-historical designations in Eurasia. Large swaths of land are covered by specific archaeological cultures, which often exhibit great variability, however this variation is masked in an effort to explain broad culture groups to non-specialists. While scholars who work in the region have a deep understanding of inherent variability and difference, they tend to focus on explanations that iron out disparities. Culture-historical trends suffer from these discussions, as there is a distinct focus on identifying homogeneity in archaeological cultures over time.

Figure 4.1 Location of the Bestamak and Lisakovsk sites in northern Kazakhstan near the Russian border (dashed line)

This chapter provides a general view of chronological and culture historical discussions surrounding the Bronze Age of the Eurasian steppe. Archaeological materials located in north central Eurasia, including the southern Urals and northern Kazakhstan, will be highlighted, especially the sites of Bestamak (2032-1663 cal BC) (Logvin and Ševnina 2013) and Lisakovsk (1780-1660 cal BC) (Panyushkina et al. 2008) (Figure 4.1). A general outline of the culture history of the Eurasian steppe will be examined from 2150 to 1400 BC. The concept of the Andronovo community, or so-called "horizon", is discussed in detail to examine its use as an umbrella term for both the Middle and LBA. There is great need for this concept to be clarified in terms of its chronological position as well as how it relates to material culture remains. Towards this goal, I examine previous studies of cultural material related to economy and diet, settlements, and cemeteries. In addition, bioarchaeological studies, which have undertaken the physical and anthropological study of human remains, are summarized and related to archaeological materials. Finally, previous attempts at understanding social organization in north central Eurasia are discussed in detail. Via a methodical analysis of data from north central Eurasia, culture-historical processes are characterized and the concept of the Andronovo is dissected in order to illuminate details of specific sites within the broader context of this archaeological culture.

The goal of this chapter is to create syntheses for both the Middle and Late Bronze Ages, in regard to the Sintashta, Petrovka, and Andronovo cultural groups. These archaeological cultures are used as comparative case studies for understanding social change in the prehistoric past. This chapter is an attempt to examine and define material culture of the region to create a baseline of comprehensible data for future researchers. This framework leans heavily on past research accomplished in the Eurasian steppe, with the goal of producing a clear timeline of archaeological cultures and their associated material remains. While this chapter builds upon previous publications, it is a more comprehensive consideration of the literature in both English and Russian. Nevertheless, the proposed chronology is only a slight reworking of other attempts, and does not significantly change the way that regional scholars understand these cultures.

4.1 CHRONOLOGY

For this dissertation, I have chosen to use a general temporal and cultural scheme devised by Chernikov (1949; 1954; 1960) that is used by many scholars in Russia (Figure 4.2). In contrast, scholars in Kazakhstan tend to use a chronology developed by Akishev (1963). These schemes divide archaeological culture groups into different time periods for the Bronze Age. This is the same scheme that is used by many prominent authors who discuss the Bronze Age and therefore I will continue in this trend (e.g. Anthony 2007; Kohl 2007; Koryakova and Epimakhov 2007).

Archaeological Culture	Chernikov	Akishev
Sintashta, Petrovka	Middle Bronze Age	Middle Bronze Age (Early)
Andronovo (Alakul', Fedorovo)	Late Bronze Age	Middle Bronze Age (Late)
Late Srubnaya, Sargary or Dandybai-Begazy	Final Bronze Age	Late Bronze Age

Figure 4.2 Archaeological cultures and their associated time periods

The chronological focus of this dissertation includes two periods of time which feature great continuity in cultural material and have been divided into sets of dates ranging from 2030 to 1630 cal B.C. and 1700 to 1400 cal B.C. (Hanks et al. 2007; Panyushkina et al. 2008; Logvin and Ševnina 2013) (Figures 4.2 and 4.3). These periods are discussed as the Middle Bronze Age (MBA) and Late Bronze Age (LBA) throughout this dissertation. However, the chronology of this region will not be presented as clear cut and straightforward, as there is no clear 'horizon marker' which delineates these two periods. For these respective periods of time, relative date ranges and even radiocarbon dates are sometimes contested (for discussion Kohl 2007:19-21,131). Nevertheless, absolute dates (e.g. radiocarbon) rather than traditional dating (cross-correlation of material data) are utilized in this dissertation as these are based on proven techniques and scientific methodologies. In some cases for the Bronze Age, ^{14}C dates are much older than previous dates based on traditional techniques (Koryakova and Epimakhov 1007:13). Throughout Eurasia, absolute dates based on radiometric techniques (with calibration) are becoming the norm in programs of dating (e.g. Görsdorf et al. 2001; Hanks et al. 2007; Panyushkina et al. 2008; Svyatko et al. 2009; Logvin and Ševnina 2013). While we are far from achieving a fully accepted chronology, as many regions lack radiocarbon dates, new techniques for the calibration of radiocarbon dates are becoming effective and minimizing the date ranges for archaeological materials.

Archaeological Culture	**Radiocarbon Dates**	**Archaeological Sites Tested**	**References**
Sintashta/Petrovka (MBA)	2032-1633 cal BC (1 σ)	Bestamak	Logvin and Ševnina 2013
Sintashta (MBA)	2040-1700 cal BC (2 σ)	Sintashta, Kamennyi Ambar-5, Krivoe Ozero, Ust'e	Hanks et al. 2007 Epimakhov et al. 2005
Petrovka (MBA)	1920-1680 cal BC (2 σ)	Ust'e, Kulevchi	Hanks et al. 2007 Epimakhov et al. 2005
Alakul' (LBA)	1880-1520 cal BC (2 σ)	Kulevchi, Urefty	Hanks et al. 2007 Epimakhov et al. 2005
Fedorovo (LBA)	1880-1670 cal BC (2 σ)	Urefty	Hanks et al. 2007 Epimakhov et al. 2005
	1780-1660 cal BC (1 σ)	Lisakovsk	Panyushkina et al. 2008
Alakul'-Fedorovo (LBA)	1750-1520 cal BC (2 σ)	Urefty, Kamennaya Rechka III, Solntze-Talika	Hanks et al. 2007 Epimakhov et al. 2005

Figure 4.3 Calibrated radiocarbon dates for the Middle and Late Bronze Ages

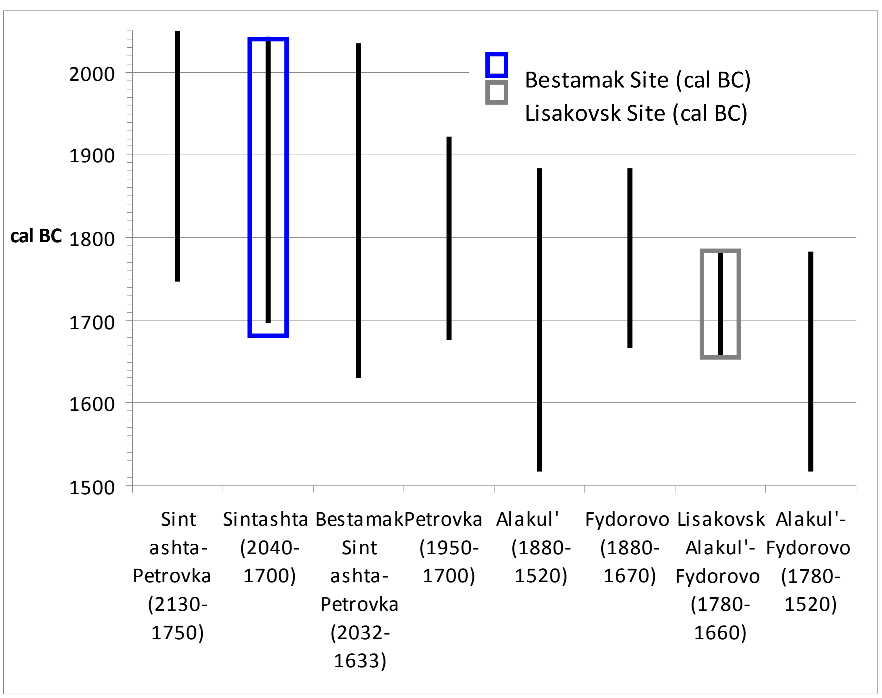

Figure 4.4 Calibrated radiocarbon ages for the Middle and Late Bronze Ages (compiled from Hanks et al. 2007 with additional data from Panyushkina et al. 2008; Logvin and Ševnina 2013)

Calibrated radiocarbon dates for the MBA and LBA are presented here, with data from the Bestamak and Lisakovsk sites identified (Figure 4.4). Bestamak has evidence of both Sintashta and Petrovka cultural material, and radiocarbon dates were generated through the testing of bones (not noted whether human or animal) from several burials, three of which were analyzed in this dissertation (Nr. 104, 111, 131) (Logvin and Ševnina 2013:232). Radiocarbon dates for these burials at Bestamak date the site from 2032 to 1633 cal BC (Logvin and Ševnina 2013:232). The Lisakovsk dates were calibrated using ^{14}C wiggles and a composite floating tree-ring chronology (Panyushkina et al. 2008). A total of five burials had remains of wood that were analyzed in order to compare tree-rings for chronology and cross-dating, as well as ^{14}C dates (Panyushkina et al. 2008). In general, when relative dates for archaeological culture groups are compared to absolute dates, the difference is approximately 300 years (relative dates from Kuz'mina 2008:111,118,158-9,248; Panyushkina et al. 2008:467). While radiometric techniques cannot solve all the problems of cultural chronologies, they do allow for more detailed depiction of the Bronze Age to emerge. For instance, the overlap between many of these archaeological cultures may change the way that they are discussed in the future.

4.2 THEORIES ON THE NATURE OF SOCIAL ORGANIZATION IN NORTH CENTRAL EURASIA

"При описании степени сложности общества применимы понятия ранга и социальной стратификации"
"When describing the complexity of a society we must apply the concepts of rank and social stratification" (Zdanovich 1997:9)

This chapter highlights the marked changes that occurred between MBA and LBA, reflecting a period from 2130 to 1500 cal BC. These changes are particularly evident in north central Kazakhstan where settlement patterning, demography, and mortuary rituals underwent significant transformations (Salnikov 1967; Potemkina 1983, 1985; Zdanovich 1983, 1988; Habdulina and Zdanovich 1984: Melnik 1984; Kuz'mina 1986, 2007; Anthony 1990; Matveev 1998; Grigor'yev 2000; Zdanovich and Batanina 2002; Korochkova and Stefanov 2004; Matveev et al. 2002; Kohl 2007; Koryakova and Epimakhov 2007). Developments in social, economic and political complexity seemingly reached an important apex for Bronze Age societies at Sintashta and Petrovka (MBA) sites, based on elaborate mortuary practices and aggregated populations (Salnikov 1967; Gening et al. 1992; Anthony 2007). In contrast, the subsequent Andronovo (LBA) period is described as a time of decreased social hierarchy combined with increased interaction and mobility (Koryakova and Epimakhov 2007).

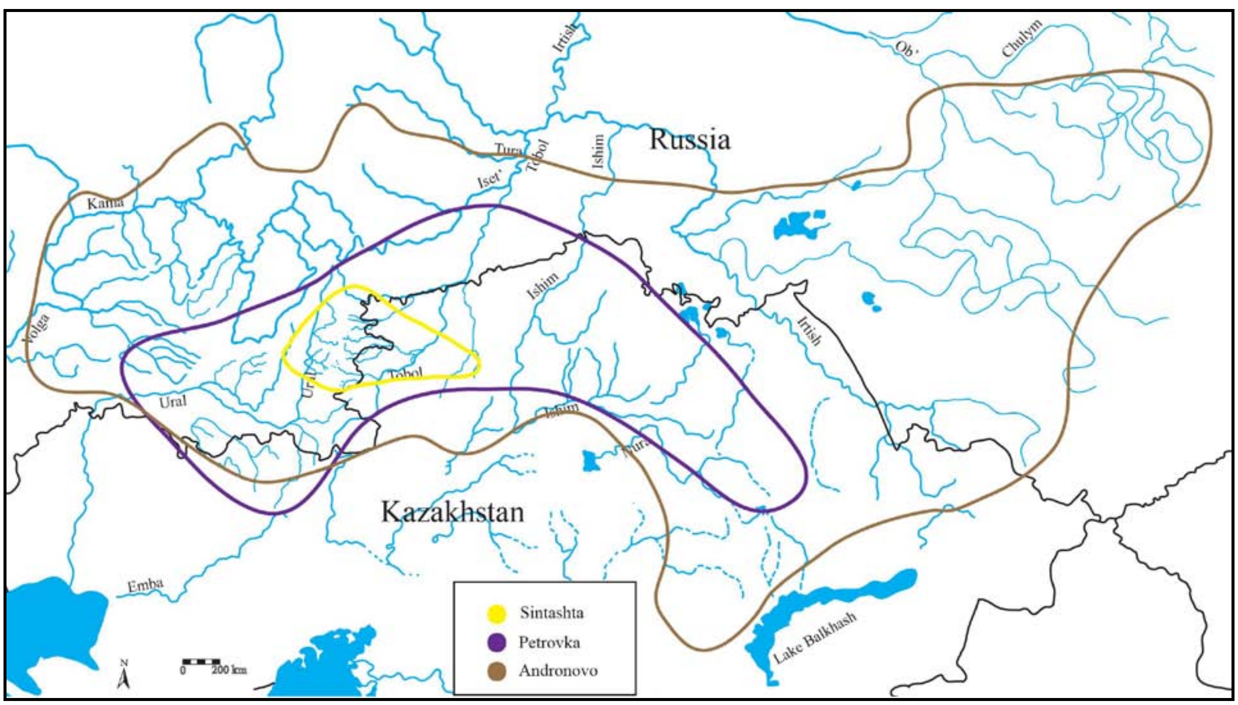

Figure 4.5 Culture areas defined for Sintashta, Petrovka and Andronovo based on settlements and cemeteries attributed to these archaeological cultures (compiled based on Grigor'yev 2000:291; Zaykov et al. 2002; Epimakhov 2002:12; Stefanov and Korochkova 2006:6; Koryakova and Epimakhov 2007:83,125; Kuz'mina 2008:66,68)

Settlement patterns for the LBA reveal an increase in the number of residential sites combined with a decrease in the demographic size of settlements (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Kuz'mina 2007; Koryakova & Epimakhov 2007). Social complexity and status have not been clearly identified through household excavations in settlements and therefore mortuary practices have been used to interpret social differentiation. In contrast to MBA sites, it seems that a stronger cultural diversity developed within local LBA Andronovo communities, marked by a diversification in style and ornamentation on bronze and ceramic items. Mortuary practices during the LBA are also less elaborate, rarely contain wheeled vehicles, and the ritual inclusion of sacrificed animals sharply decreases.

These sections address the ways that scholars have characterized social organization during the MBA and LBA. There is a great divergence of opinion as to the nature of social organization and level of 'complexity' of these societies. What drives these societies in terms of transformations in complexity? In order to answer this question, recent theories of Bronze Age social organization are discussed in detail in reference to the archaeological data. The emergence of social complexity during the MBA is highlighted by discussions of chiefdoms and "towns", while the more diverse LBA is debated in terms of broad spheres of interaction in conjunction with less complex local groups (Koryakova 2002:106).

4.2.1 Middle Bronze Age Social Organization

Societies seemingly reached a new level in social and political complexity during the MBA that had not been identified previously. These findings are based mainly on Sintashta sites and their elaborate mortuary practices and aggregated populations (Salnikov 1967; Gening et al 1992; Anthony 2007). The organizational nature of Sintashta communities has been highly debated with scholars theorizing that they were simple chiefdoms (Berezkin 1995:36; Epimakhov 2002), complex chiefdoms (Koryakova 1996; 1998), or a type of proto-state society (Zdanovich and Zdanovich 2002). In contrast, Petrovka communities, which are believed to be either slightly later or contemporaneous with Sintahsta developments, are posited by some to be less sophisticated both in terms of settlement construction and investment in funerary ritual (Koryakova and Epimakhov 2007:82-96). However, both of these culture groups are discussed in relation to MBA developments.

The emergence of Sintashta and Petrovka as cultural phenomenon are tightly intertwined with studies of ethnogenesis, culturogenesis, and Proto-Indo-European traditions (Ivanov 2002; Jones-Bley 2002; Pyankov 2002). Therefore these cultural groups are often believed to have non-local origins. Connections with early complex societies in other regions are hypothesized based on similarities in architectural traditions, settlement shape, and similar burial features including 'chariots' and body position, as well as analogous vessel form and decoration. The proposed complexity of Sintashta developments has allowed authors to argue this was the result of migration from the Near East and Anatolia (Grigoryev 2002) or Eastern Europe (Kuz'mina 1994; Vinogradov 1999). However, analyses of the 'origins' of specific archaeological cultures or ethnic groups actually do little to move forward studies of social organization or interaction (see Chapter 3). Non-local origins of archaeological developments do not explain interaction and migration, and therefore mute the social processes behind these events. Therefore, while many scholars attempt to make these connections, the genesis of archaeological cultures will not be discussed here in detail. Furthermore, while links between archaeological cultures and Indo-European developments have been widely published, these connections are extremely difficult to establish and therefore have been criticized extensively (e.g. Arnold and Haβmann 1995; Krell

1998; Hanks 2000). Consequently, these studies will not be discussed here and instead this section focuses on discussions of the social complexity during the MBA and the possible ways that it may have emerged.

Interpretations of the archaeological record differ substantially in terms of the relative complexity of societies. This is partially due to different comprehensions of what makes a group or culture complex. The emergence of social complexity, and the models used to understand this concept, allow for various trajectories of development (Hanks and Linduff 2009; Drennan et al. 2011). How are steppe societies defined in terms of social complexity? What are the driving forces behind cultural transformation?

Koryakova has written extensively on Sintashta and Petrovka developments in terms of social complexity (1996, 1998, 2002, 2009). The focus of much of her work examines both the external and internal factors of change in these societies. The 'alien' nature of these developments is attributed to migration from the east or north (Koryakova 2002:107). Determinations of complexity by Koryakova are often comparative in nature, and examine the cyclical nature of social change. Therefore, determinations of complexity often relate to the whole of archaeological cultures as either complex or simple chiefdoms (Koryakova 2002). This is somewhat problematic, as the communities that make up these broader groups are not discussed in detail. While differences between specific communities are not fully examined, Koryakova envisions that behavioral distinctions between groups exist and are predetermined by local environment and technology (1996:272). These are considered internal factors of change, however, Koryakova also envisions that external factors such as migration also affected these groups. Sintashta culture is discussed as a complex chiefdom that is socially stratified with two hierarchical levels based on settlement patterns. This society was believed to have sufficient ‘surplus product’, as well as a redistributive system in terms of animal sacrifice in burials (Koryakova 2002:110). In contrast, the Petrovka culture is seen as representing a somewhat lower level of complexity than Sintashta, which is based on new forms of social organization and technological innovation (Koryakova 2002:110). The social organization of the Petrovka contained ‘eroded and obliterated’ characteristics of the Sintashta culture, and these new forms occurred alongside the formation of a new world system (Koryakova 2002:110).

Zdanovich and Zdanovich posit that Sintashta developments were complex chiefdoms and proto-states, forming a ‘country of towns’ marked by fortified settlements. Cemeteries are also conceived to reveal complexities through horses and chariots, animal sacrifice, and kurgan construction (2002:251). Posited military expansions to the west and east spread this culture into other areas. Over time, these developments broke down, and fortification walls became smaller and burial rites simplified (Zdanovich and Zdanovich 2002:252). Complexity during the Sintashta is posited to be evident in burials of elite individuals in the center of kurgans buried with specific artifacts, namely weapons, scepters, and ‘chariots’ (Zdanovich and Zdanovich 2002:261). The elite are discussed in terms of their possible function in society as individuals who performed functions in administration, military, and religious activities (Zdanovich and Zdanovich 202:262).

Anthony posits that the intensification of warfare and conflict, among other factors, transformed Sintashta culture (2009:48). Climate change, in particular a cool, arid trend, is hypothesized to have peaked at 2200 to 2000 BC, the time of initial Sintashta developments. As a result of this trend, communities settled in marshy lowlands to have access to winter fodder (Anthony 2009:50). Anthony hypothesizes that settled groups needed to defend these shrinking marshlands, and this conflict dissolved previous social order and created new opportunities to take power (2009:50). Links between the earlier Abashevo culture and Sintashta are conceived as the means for the spread of ‘warfare culture’, but “Sintashta chiefs placed many more weapons in graves” (Anthony 2009:53). In addition, proposed trade contacts with the civilizations of southern Central Asia created new relationships that altered metal production, warfare, and competition among steppe groups. Fortified settlements, weaponry in graves and ‘chariots’ were all used as evidence of warfare for early Sintashta societies (Anthony 2009:54). According to Anthony, the frequency of weapons in Sintashta graves was higher than those of Poltavka, Catacomb or Abashevo cultures. He also posits that feasting was present in Sintashta cemeteries, and animal sacrifices were part of aggrandizing behavior of these tribal societies (Anthony 2009:62-3).

“No doubt, the historical reality is much more diverse than the theoretical models usually suggested by scientists.” (Epimakhov 2002:139). As Epimakhov asserts here, the emergence of complexity cannot be reduced to a single factor and communities likely were specialized and therefore left behind different types of sites. In his view, Sintashta is a middle range society where sex and age distinctions are of great significance in burial, while military and industrial specialization is not very distinct (Epimakhov 2002:143). This is in contrast to the features of settlements, where manifestations of militarization such as fortification are evident. However, the lack of trauma on human remains makes discussions of warfare difficult to prove (Epimakhov 2002). The emergence of the Sintashta pattern is dependent on several factors, including: the 1) coordination of group activity, 2) hierarchy of sites, 3) stratification of funeral rites and presence of elite group, and 4) specialized industries (Epimakhov 2002:144). These characteristics of complexity are important, however the processes that occurred along with these developments are still muted by this discussion. In a recent publication, Epimakhov posits that Bronze Age communities are not very complex, as they lack ranking in mortuary data, and their economy is very much affected by ecological concerns (2009:85).

Zdanovich and Gayduchenko (2002) examined Sintashta burial rituals in relation to animal sacrifice. They determined that these rituals were closely related to ideas of fertility, reproduction, and the multiplication of goods and wealth (Zdanovich and Gayduchenko 2002:224). Specifically, the selection of animal remains reflects either female sheep of reproductive age, or pairs of animals, including females with their young or stallion and mare pairs (2002:224). This type of research allows for the identification of some general patterns for the ritual use of animals in burials. Importantly, the authors concede that animal rituals differ between Sintashta sites (Zdanovich and Gayduchenko 2002). While many Sintashta sites have animal remains in burial contexts, the specific use of animals may differ both within and between communities. Therefore, comparisons of these differences may highlight diversity in social organization or human/animal connections in prehistory.

Hanks examined Sintahsta social organization from a micro-regional perspective in relation to metallurgical production (2009). He considers the actual characteristics of Sintashta social complexity to be an enigma, and asserts that we need to investigate the unique social and spatial characteristics of communities engaged in the production and consumption of metals (Hanks 2009:147-8). There were likely many factors involved in the emergence of the Sintashta culture, including environmental issues, warfare, and production. While arguments for warfare are supported by indirect evidence such as settlement fortifications, episodes of burning at sites, and weaponry in graves, there are few other signs of warfare such as trauma on human remains or mass burials (2009:151). The scale of warfare, metals production, and interaction are not well understood or substantiated at this time, therefore communities and their broader interconnections need to be investigated. More comprehensive empirical data is necessary to answer more detailed questions related to the degree of social organization, community production, and broader patterns (Hanks 2009:162-3).

Frachetti believes that Bronze Age societies had evidence of non-uniform complexity, and therefore can be investigated in terms of heterogeneity in social and ritual institutions (2009). Each community is comprised of several institutions including burial form, settlement conventions, ideology, economic organization, and political organization. The constraints of each of these institutions are differentially negotiated by communities based on social or political relationships (Frachetti 2009:23). For the MBA, diversity in communities is evident, with some that were ‘chiefdom-like’ and other contemporaneous groups of mobile pastoralists (Frachetti 2009:27-8). Frachetti then compares Sintashta and Petrovka, and the latter are determined to be ‘smaller scale’ and less sociopolitically organized (2009:29). These groups are explained as having different economic strategies and demographic organization (Frachetti 2009:29-30).

In a more recent publication, Hanks et al. (in press) examine warfare and social practice during the Bronze Age. They highlight conflict in prehistory as cyclical, and investigate the nature of martial symbolism in the mortuary realm. The connections between conflict, martial symbolism, and social categories are examined in relation to changes through time in the region. They envision a clear decline in warfare from the Middle to Late Bronze Age, as less emphasis was placed on fortification of settlements and weaponry in burials during the late Petrovka and Alakul’ phases (Hanks et al. in press). Unfortunately, human remains from both of these periods lack evidence of trauma that could be used as evidence of interpersonal violence. Nevertheless, a lack of evidence of trauma does not mean that violence did not occur in these communities, as these individuals could have been buried outside of excavated cemeteries or lacked direct injury to bone. The authors also state that there is no clear distinction between elite and non-elite burials. While many male burials had weapons, recent research highlights the gendered nature of burials, with the identity of women highlighted through ornamental bronzes (Hanks et al. in press). Analysis of metals from the site of Stepnoye reveals that ornamental items often had different concentrations of copper and tin bronze. Therefore, color and sound quality may have been important considerations for the use of these items in jewelry and ornamentation. Therefore, while the emergence of Sintahsta weaponry and 'chariots' in burials may be evidence of individual or family status, within several hundred years new bronze items were being produced for women which fundamentally changed expressions of identity (Hanks et al. in press).

These studies reveal that scholars are suggesting that more detailed studies of local groups must be understood in order to build better models of social organization for MBA societies. Furthermore, based on the theories presented, social change and the emergence of complexity was likely based on multiple factors which disproportionately affected, and were differentially navigated, by local groups. Therefore, the nature of social organization during the MBA can only be understood through further detailed research into the ways that local communities differentially negotiated their social, economic, and ecological environments.

4.2.2 Late Bronze Age Social Organization

In contrast to the previous period, LBA developments are much less well known and theorized. Previous research on the LBA emphasizes the highly contested Andronovo horizon, which many scholars characterize as a time of increased mobility (i.e. 'nomadic' pastoralism) and decreased social hierarchy (Koryakova and Epimakhov 2007:323). Settlement patterns for the LBA reveal an increase in the number of residential sites combined with a decrease in the demographic size of settlements (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Kuz'mina 2007; Koryakova & Epimakhov 2007). When compared with earlier periods, the Andronovo seems more heterogeneous, with more ornamental bronze items, variability in assemblages, and the intermixing of inhumation and cremation, suggesting a stronger cultural diversity developed within these communities. Horizontal and vertical status differences have not been clearly identified through household excavations in settlements and archaeologists have tended to rely primarily on cemeteries to interpret social organization.

Traditional interpretations highlight either the migration and colonization of central and southern Central Asia by Andronovo subcultures or the immigration of cultures into the northern steppe from Iran or Azerbaizhan (Kuz'mina 2007; Grigory'ev 2000; Salnikov 1967). While few theories of social organization have been posited, there is a distinct focus on ethnic relationships within and between Andronovo subcultures. Therefore, ethnic delineations are important, as they constitute one of the many ways that scholars posit Andronovo societies were organized. In contrast, Korochkova believes that the Fedorovo burials represent not another ethnic group or culture, but rather a group of different social status, which may explain the presence of mixed Alakul and Fedorovo settlements and cemeteries (1993; 2004). While variation between local groups exists, interaction and differentiation have been overlooked in favor of focusing on similarities and the identification of specific cultural zones (for critical analyses see Frachetti 2004; Frachetti and Mar'yashev 2007). The LBA (Andronovo) is often analyzed in a comparative context with earlier periods, and therefore is seen as less complex, but spread over a larger area.

Koryakova characterized Andronovo groups as ones that lacked monumental architecture, developed rituals, and distinct grave goods (1996:259). This is clearly not the level of social complexity achieved during the previous period, and has fueled discussions of the cyclical nature of social trends in Eurasia. Koryakova has termed the Andronovo development as simple or group-oriented chiefdoms (1996:260). The Andronovo period is posited as a more ‘communal’ period of time when elite control collapsed and military tension decreased. Climatic change included cooler yet more humid conditions allowed for increased nomadism, which in turn helped these groups to ‘spread their achievements and participate in the general historical process’ (Koryakova 1996:261).

Current attempts to model social change during the LBA in Kazakhstan have identified mobility and interaction between smaller residential units (Frachetti 2002, 2004; Frachetti and Mar’yashev 2007). Frachetti puts forth a local model for southeastern Kazakhstan that focuses on the increased specialization of pastoral exploitation in the southern steppe region as a response to changing power dynamics and increased political complexity. However, for the northern steppe, a shift towards decentralization is evident during the LBA (Kuz’mina 2007; Koryakova and Epimakhov 2007). Is it possible that due to this deflation in power, local communities increased specialization in both economic and occupational niches? Based on archaeological materials recovered from previous excavations, it is clear that interaction and trade was increasing during the Andronovo period (Frachetti and Mar’yashev 2007; Usmanova 2005).

Frachetti uses the concept of nodal interaction, to examine how small local pastoral groups were affecting each other (2004; 2008b). In the mountainous region of Semireche, situated in southeastern Kazakhstan, correlations between archaeological sites and ecological zones were investigated in regard to land use and interaction. In his most recent work, Frachetti discusses cycles of organizational consolidation, or higher mobility and fractioning within different communities (2009:34). In addition, variability in ceramic styles reveals different types of interaction occurring at each community rather than a broad trade-linked economy (Frachetti 2009:38). This non-uniform cyclical change and inter-site variability is evidence that LBA communities had fluctuating institutions and socio-economic arenas (Frachetti 2009:40-41). However, the region under study by Frachetti (SE Kazakhstan) is quite far from the macro-region of research of this dissertation (north central Kazakhstan) and therefore these types of interactions may be drastically different based on local environmental conditions and variation in patterns of interaction and exchange.

In contrast to the views of Frachetti that the LBA had increased mobility and fractioning within communities, Koryakova and Epimakhov frame the LBA in terms of stabilization, colonization, and expansion of the Andronovo development (2007:111). They posit that the extent of the Andronovo network of interaction expanded during this time, linking most of central Eurasia (Koryakova and Epimakhov 2007:150). Local communities are envisioned as stable entities where local traditions were combined with Andronovo components. Social organization of these communities is hypothesized to be based on kinship ties, however sex and age categories can also be clearly identified in funerary rituals (Koryakova and Epimakhov 2007:147). Overall, there is little evidence for social stratification within these groups, which are conceived as heterogeneous rather than hierarchical. The transition from more complex societies (MBA) to less complex (LBA) is posited to be due to climatic change, inability to maintain demographic aggregation, and new economic strategies (Koryakova and Epimakhov 2007:324-5).

Interestingly, the perspectives of Frachetti (2009) and Koryakova and Epimakhov (2007) differ both in terms of interpretations of broad and local scales. They disagree as to the stability and role of local communities as well as the ways in which interaction and spread of material culture items occurred. Koryakova and Epimakhov posit that there was a broad exchange network that linked most of central Eurasia (2007:150). Andronovo subcultures moved into the forest zone, which prompted a 'cultural transformation' as local communities incorporated Andronovo elements into local traditions and were integrated and subsumed under Andronovo influence (2007:150-1). Andronovo subcultures 'colonized' and assimilated local populations, which accounts for cultural variability in some communities (Koryakova and Epimakhov 2007:151). In many ways, this argument is similar to discussions of 'Hellenization' where new areas are colonized and local communities subsumed into a broader 'imagined' community (Malkin 2011). However, these models fail to incorporate the diverse ways in which local communities take part in broader processes as well as the ways that elements of material culture are differentially incorporated into the cultural retinue (Dietler 2010). In contrast, Frachetti posits that communities exhibit variation and fluctuating institutions, as interactions occur at each community rather than at as part of a broader linked economy (2009:38). However, Frachetti does envision that links are present as "the Bronze Age archaeology of southeastern Kazakhstan illustrates how distant regional systems were articulated, albeit tenuously, through a network of pastoralist societies" (2009:41). Using detailed information from southeastern Kazakhstan, Frachetti has built a model of regional interaction between pastoralists, metallurgists, and others that occurs within social and ecological structures (2009:41). However, this model continues to lack specific data on exactly what links or pathways of interaction were present. Individuals and communities differentially negotiated ritual, interaction, and trade, which must be examined in more detail in future studies. One way of undertaking this research is through an identification of the pathways of connectivity and flow that are part of glocalization, or the ways that individuals and groups navigate broader processes. Detailed studies like this are especially pertinent for the Andronovo development as there is evidence both for similar and divergent material culture patterns.

4.3 THE BRONZE AGE IN NORTH CENTRAL EURASIA

Current views of the culture history of north central Eurasia are heavily influenced by radiocarbon dates from recent research projects (Epimakhov et al. 2005; Hanks et al. 2007; Panyushkina et al. 2008; Koryakova et al. 2011). It is now clear that Sintashta material culture precedes Petrovka at many sites by at least 100 years (Figure 4.3). In addition, the end of the Sintashta culture and good portions of the Petrovka overlap with the Alakul' and Fedorovo. However, these 'culture groups' are currently separated into Middle (Sintahsta and Petrovka) and Late Bronze Ages (Alakul' or Fedorovo). I continue this trend of separating the MBA and LBA in my research for several reasons 1) archaeological culture groups have many similarities in terms of settlement size and extent of interactions, 2) ceramic ornamentation is clearly different between the currently proposed MBA and LBA groupings, 3) the separation of these groups (e.g. Sintashta and Petrovka) is often difficult for scholars to discern. While many sites have evidence of mixed deposits of these material culture remains, there continues to be a separation between these middle and later stages of development in current literature. The main sources of differentiation between these groups are based on settlement size and shape, ceramic form and ornamentation, and burial rites.

While I have discussed the MBA (Sintashta and Petrovka), and MBA (Andronovo: Alakul'/Fedorovo) as separate developments, I concede that the cultural material and chronologies associated with these developments may not always be clear. For example, based on settlement excavations, there is clear evidence of the overlap between these archaeological cultures. Furthermore, due to the current paucity of radiometric and dendrochronological dating schemes, as well as a general lack of comprehensive survey data, we may be missing the detailed overlap and interplay between these currently delineated culture groups. Until specific radiocarbon dates are achieved at a number of sites, the interplay between these cultures will continue to perplex archaeologists working in the region. The interactions and interconnections between local groups are currently masked by incomplete knowledge and datasets.

Is it possible that aggregated Sintashta and Petrovka sites occurred alongside smaller, possibly more mobile communities? Which archaeological sites endured for long periods of time and bridged the gap between the MBA and LBA? These types of interactions and sites need to be investigated in order to understand the Bronze Age in north central Eurasia. Whether local groups should be separated into two periods of time, or whether they existed simultaneously cannot be tested in this dissertation. However, this research investigates one community from each of these posited periods (MBA and LBA) in an effort to comprehend the social organization of these groups from a comparative perspective. Through analyses of the relationships and connections evident within each of these communities, we may begin to understand how each of these communities differentially navigated broader regional processes.

Therefore, for this dissertation, archaeological culture groups are split into two time periods, namely the Middle and Late Bronze Age. First, MBA developments are discussed in terms of Sintashta and Petrovka archaeological cultures. These groups are examined from a comparative perspective in an effort to examine how previous scholars have differentiated them. Second, the LBA is outlined in terms of the Andronovo family of cultures, specifically the Alakul' and Fedorovo subcultures. The Alakul' and Fedorovo are compared in an effort to determine the nature of the material culture associated with each. These time periods are examined in terms of previous research on economy and diet, settlements, cemeteries, bioarchaeology, social differentiation and identity as well as future prospects. This is an effort to consolidate information and provide a foundation of data for each period, as well as identify general transitions that occurred over time.

4.4 THE MIDDLE BRONZE AGE: SINTASHTA AND PETROVKA COMPLEX OF CULTURES

While many scholars discuss the clear differences between the Sintashta and Petrovka archaeological cultures, it is extremely complicated to attempt to disentangle the material remains. As sites are excavated, initial determinations of time period and archaeological culture(s) are associated with them. Yet, other scholars do not always accept such designations. Therefore, the literature often designates a single site as Sintashta, Petrovka, Sintashta-Petrovka, and Petrovka-Alakul'. This is a convoluted presentation of the material, as original reports are often unavailable and would likely only further complicate the situation as the original scholars may have designated the site in an alternative manner that does not fit any current or past designations. Relative chronologies and cultural designations are often determined based on a combination of ceramic vessel style, settlement fortification silhouette, and mortuary rituals. Therefore, in order to examine developments during the MBA from an objective viewpoint, Sintashta and Petrovka material remains are discussed as a single development or split by variability depending on the dataset available. Whether these archaeological cultures are lumped into Sintashta and Petrovka or split into separate groups, they need to be discussed in a comprehensive manner as they collectively represent the MBA in north central Eurasia.

The MBA (2150-1750 cal BC) in the region of north central Kazakhstan and southern Russia is primarily associated with the Sintashta and Petrovka complex of cultures (Hanks et al. 2007). Related material culture for the Sintashta covers a comparatively small area around the southeastern Ural Mountains, near the Ural and Tobol Rivers, while the Petrovka extends over this area and also towards the Ishim River (Figure 4.7). In some discussions, this time period is subsumed under the umbrella of the Andronovo family of cultures or cultural community (Kuz'mina 2007; Frachetti 2004). However, it is clear that cultural materials from this period are very different from 'classic' Andronovo developments, and therefore are discussed separately. The Sintashta and Petrovka complex of cultures is extremely well known due to the presence of large settlements (ca. 3.5 ha) at sites such as Arkaim, Sintashta, Ust'ye and Alandskoye. Most of these settlements have been identified through aerial photography (Zdanovich and Batanina 2002), and several have been partially excavated (Gening et al. 1992; Vinogradov 1995; Grigor'ev 2000; Zdanovich and Batanina 2007; Merrony et al. 2009; Hanks et al. 2011). However, the bulk of data recovered related to these archaeological cultures continues to be from excavations of cemeteries and kurgan (mound) burials from a large number of sites in Russia and Kazakhstan.

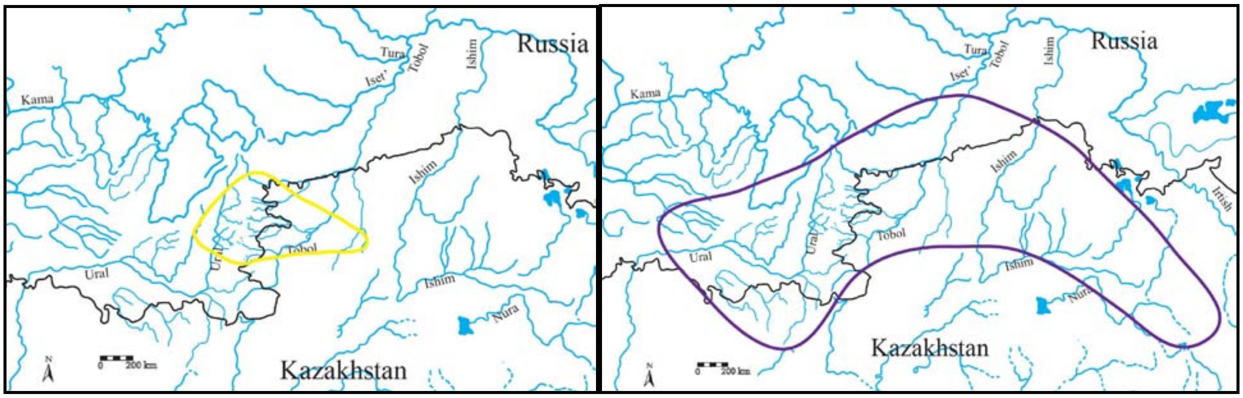

Figure 4.6 MBA Sintashta (left) and Petrovka (right) Culture Areas (compiled based on Zaykov et al. 2002; Epimakhov 2002:12; Koryakova and Epimakhov 2007:83,125)

The division or consolidation of Sintashta and Petrovka archaeological cultures has become increasingly problematic (Figure 4.6). Archaeologists working in Russia tend to separate these sites based on regional location, and often map the boundaries of these archaeological cultures along national borders (for example see Koryakova and Epimakhov 2007:58). Sites located in the Trans-Ural steppe zone have been associated with Sintashta culture, while those in northern Kazakhstan and western Siberia are often designated as Petrovka culture (Zdanovich and Zdanovich 1980; Zdanovich 2002; Koryakova and Epimakhov 2007; for discussion see Logvin 2009). However, for other scholars, these cultures are synchronic, and cannot be divided based on regional location or material culture (Tkachev 2002; Logvin and Shevnina 2008; Logvin 2009). Recent radiocarbon dating of these archaeological cultures reveals that Sintashta developments are slightly earlier than Petrovka at some sites (Hanks et al 2007). In addition, several archaeological sites contain goods attributable to both of these culture groups (Vinogradov 2003; Kalieva and Logvin 2002; Kupriyanova 2008; Koryakova et al. 2011).

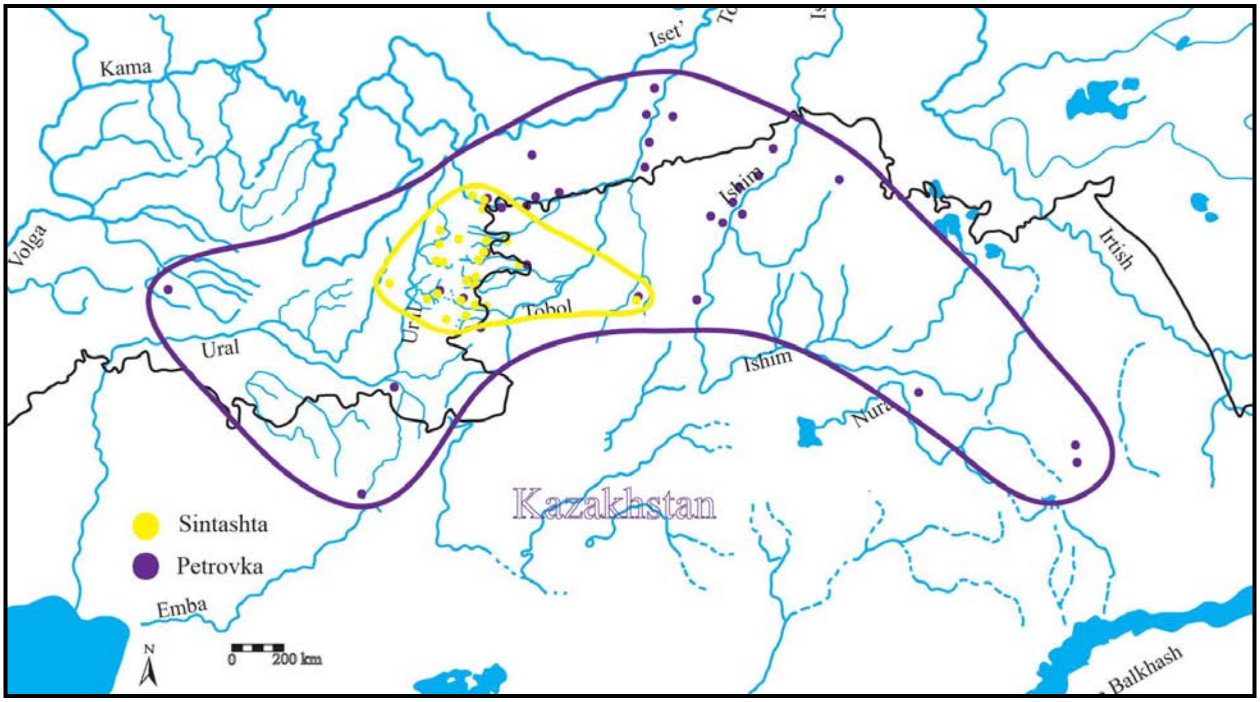

Figure 4.7 Map of north central Eurasia with sites attributed to Sintashta and Petrovka cultures (compiled based on Zaykov et al. 2002; Epimakhov 2002:12; Koryakova and Epimakhov 2007:83,125)

Beyond the spatial plotting of these archaeological cultures, scholars tend to separate them in terms of social complexity, based on investments in settlement construction and funerary rituals. There is a general view that Sintashta sites are more sophisticated than the Petrovka sites in terms of settlement construction (Koryakova and Epimakhov 2007:82) as well as labor investment in funeral ritual which decreases as part of the Petrovka culture (Koryakova 2002; Koryakova and Epimakhov 2007:96). However, as we will see in the comparison of these two cultures, they share many similarities. The location of the Petrovka archaeological culture is placed inaccurately in the region by many scholars. For example, the majority of sites with Petrovka materials identified by Koryakova and Epimakhov (2007:82), are not incorporated into their mapping of the Petrovka archaeological culture area (Koryakova and Epimakhov 2007:58). Unfortunately, many scholars utilize such 'culture area' maps without considering the complete distributions of sites attributed to the Petrovka culture, which are actually more widespread

(Figure 4.7). Furthermore, scholars in Kazakhstan often feel that their contributions and discoveries related to both the Sintashta and Petrovka cultures are often downplayed by their Russian colleagues. The rift between these two countries in terms of archaeological discoveries has widened since the breakup of the Soviet Union, however this has begun to change in recent years. Contrary to current understandings of this region, there is at least one settlement related to the Sintashta and Petrovka culture in Kazakhstan, namely the site of Bestamak, which has both a settlement and cemetery.

Beyond discussions of which sites belong to which archaeological culture, are important issues regarding the emergence of these cultures. There is much debate about theories concerned with how these archaeological cultures came into existence, whether populations migrated to the area or are local developments (for discussion see Tkacheva and Tkachev 2008). Currently, many scholars feel that Sintashta and Petrovka developments are based on long term continuities in material culture from the Chalcolithic period (Matyushin 1982; Logvin 1991; Tkacheva and Tkachev 2008). In contrast, other scholars have attempted to determine the origin point of migration processes that formed these cultures (Smirnov and Kuz'mina 1977; Koryakova 1996; Grigor'ev 2000:281; Koryakova and Epimakhov 2007). Further still, some scholars have identified these cultures as combinations of local and migrant populations (Zdanovich and Zdanovich 1995). There is, however, evidence of long-term use and reuse of sites such as Bestamak stretching from the Neolithic to LBA (Kalieva and Logvin 2002) as well as Begash in southeastern Kazakhstan stretching from the Early Bronze Age to Wusun period (2460 cal BC to 550 cal AD) (Frachetti and Mar'yashev 2007).

4.4.1 Economy and Diet

Archaeological evidence reveals that Bronze Age societies maintained livestock and nearly all scholars agree that meat and milk products formed a major component of their subsistence economy (Khazanov 1984; Cribb 1991; Kosintsev 2000, 2003; Frachetti 2002; Outram et al. 2009). The vast majority of faunal remains recovered from settlements reveal a foundation on cattle and sheep/goat, with some use of horse (Kosintsev 2000; Bachura 2009; Kosintsev and Gasilin 2009; Kosintsev 2010). However, based on the recovery of implements interpreted as sickles, it has been suggested that MBA sites were undertaking horticultural or agricultural subsistence practices as a mixed agro-pastoral lifeway (Zdanovich 1997:15; Zdanovich and Zdanovich 2002). Implements such as stone pestles and sickles could have been used for the processing of wild grains and therefore are indirect evidence for agriculture (Epimakhov 2010). Additionally, research on botanical remains from several Sintashta sites included the identification of only wild forms of millet, wheat, and barley from either house floors or the interior of ceramic vessels that reportedly grow locally (Gayduchenko 2002:403-406).

Recent research has shown that there were few dental caries, affecting only 2 of 35 individuals, and little tooth wear on individuals recovered from the Kamennyi-Ambar 5 (Hanks 2008b; Judd et al. 2008; Judd et al. 2009) and the Bolshekaraganskogo cemeteries (Lindstrom 2002). A paucity of tooth wear, few dental caries, and high prevalence of calculus deposits is most likely associated with a high protein diet that lacks carbohydrates and coarse foodstuffs (Hillson 1979; Lillie 1996; Judd et al. 2008). Furthermore, a pilot study of stable isotopes on 14 individuals from the Bolshekaraganskogo cemetery (near the settlement of Arkaim) indicated a diet primarily focused on animal protein rather than plants (Privat 2002). The Bolshekaraganskogo study revealed that nitrogen isotope ratios could be linked to consumption of cattle and ovicaprid meat and milk products rather than horses (Privat 2002). More recently, it has been suggested that the remains of fish have factored strongly in the diet of many prehistoric steppe communities while evidence for use of agricultural items is lacking (Anthony et al. 2005; Privat et al. 2005; Privat et al. 2002). These isotopic results are supported by the recovery of a diverse collection of fish from fortified settlements of the MBA (Gayduchenko 2002; 2010). The diverse nature of pastoral economies highlights the need to re-examine dietary intake among these groups in relation to social organization (Chang and Koster 1994).

4.4.2 Settlements

Many settlements dating to the MBA have been identified through aerial photography, and subsequently several have been excavated or sampled (Zdanovich 1997; Zdanovich and Zdanovich 2002; Batanina and Hanks in press). However, settlements that have been excavated are not always published in detail and there is an ensuing lacuna of data. While the focus of this dissertation is primarily mortuary data, I have included several specific types of information comparing Sintashta and Petrovka settlements in terms of: 1) chronology, 2) enclosures, and 3) demography and house size. This supporting data will document the ways that Sintashta and Petrovka have been differentiated based on settlement data. This discussion explains why and how these cultures have previously been lumped or split, and further clarifies these archaeological phenomena. Most importantly, this data serves as supporting evidence for understanding settlement patterning and social organization during the MBA to be used as a comparative sample with the LBA.

There are approximately forty settlements identified that date to the MBA and are associated with the Sintashta and Petrovka cultures. The majority of these settlements were identified through the study of aerial photography (Zdanovich and Batanina 2002), and are easily recognized on the surface because the majority are fortified. Fortified settlements tend to be located 20 to 70 km apart (Grigor'ev 2000; Koryakova and Epimakhov 2007) and it has been suggested that smaller unfortified settlements may be located in areas between fortified settlements (Zdanovich 1997). Sintashta settlement patterning is discussed not as a hierarchy, but rather a dichotomy of large fortified 'group' centers and small 'isolated' villages (Zdanovich 1997:11). However, the published map of the Arkaim site with four nearby unfortified settlements (Zdanovich 1997:14) has been heavily disputed (Epimakhov 2002:142) and evidence of other isolated villages and unfortified settlements has not yet been recovered (Johnson and Hanks 2012). There are also several large settlements without fortifications that are often not discussed in the literature, including Bestamak (Kalieva and Logvin 2002), Kulevchy III, Semiozerki II and Konezavod III (Grigor'ev 2000:283-4). These settlements have proven difficult to excavate and understand due to complicated stratigraphy, and no detailed publications are available. In addition, the shape and extent of fortification walls at the settlement of Ol'gino were only clarified through recent magnetometry and excavation (Merrony et al. 2009).

Fortified settlements have a variety of configurations, from simple enclosures to evidence of large-scale ditches with earthen walls. Enclosed settlements are often oval, round, or rectangular in shape, and the latter is considered to be stratigraphically later by many scholars (Zdanovich and Batanina 2002; Koryakova and Epimakhov 2007). Excavations of sites with both oval/round and rectangular enclosures, such as Ust'ye, are often cited as clear evidence of this chronology (Vinogradov 1995). This site also fueled interpretations that differential shape of enclosures was related to certain archaeological cultures, with oval/round forms being attributed to Sintashta, and rectangular enclosures to the later Petrovka culture (Zdanovich and Zdanovich

1995; Grigor'ev 2000). Often, oval or round enclosures associated with Sintashta groups are added to or overlain by rectangular enclosures of later Petrovka groups. However, this separation needs to be further investigated both chronologically and typologically. Many sites have materials from both culture groups, therefore the use of settlement shape as a cultural determinant needs to be questioned. While further radiometric testing should be undertaken, it is possible that only absolute dendrochronological evidence will resolve these problems (for discussion Kohl 2007:19-21).

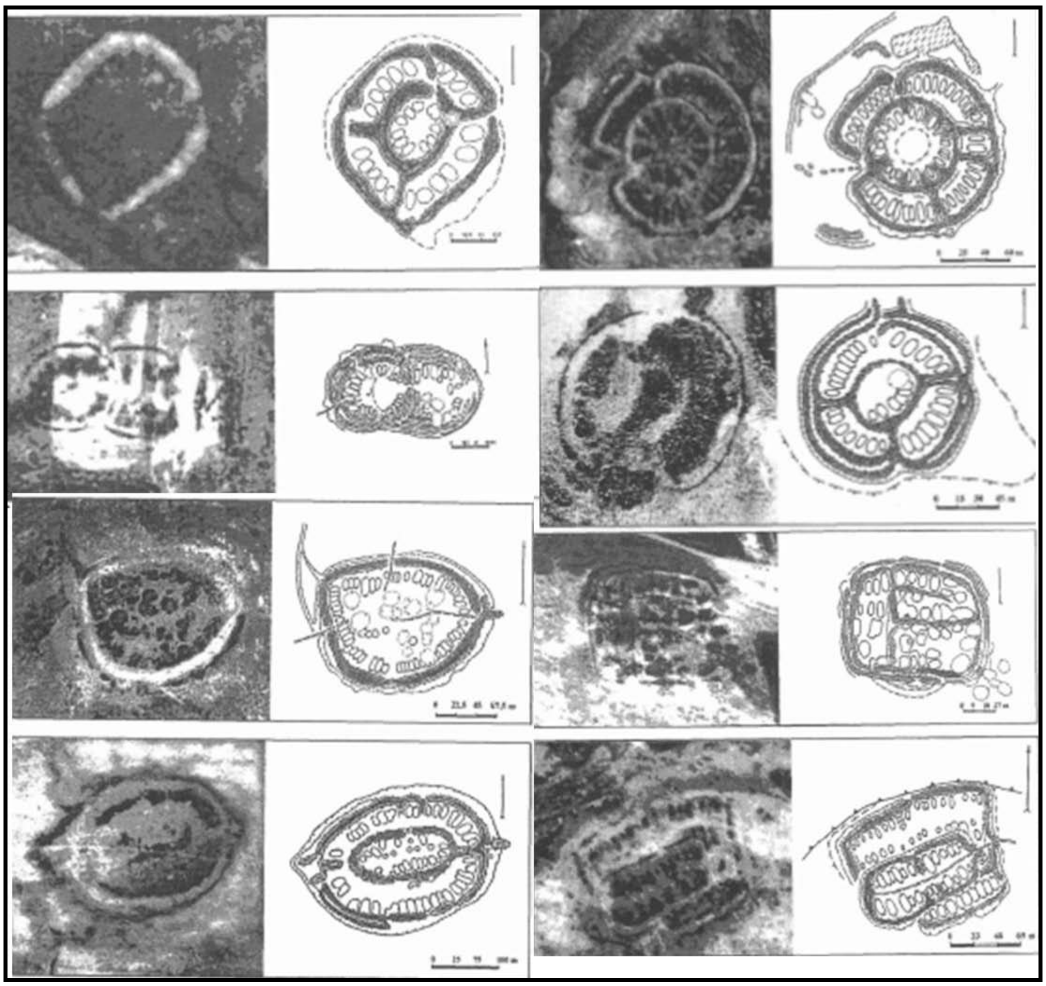

Figure 4.8 MBA Settlements: aerial view (left) and drawn plan view with outer wall and houses outlines (right) (Zdanovich and Batanina 2002:124,127,130,134)

Settlement chronologies have recently been explained in a new way, with oval settlement enclosures dating to the earliest phase (Alandskoe, Bersuat, Isinei I, Kizilskoye, Rodniki and

Stepnoye), rounded to the middle phase (Arkaim, Sintashta I, Sarym-Sakly, Kusiak, Inisei II, Kamennyi-Ambar/Ol'gino, and Zhurumbai) and rectangular enclosures to the final phase (Chekatai, Konoplyanka, Andreevskoe, Chernorech'ye, Sintashta II, Ust'e, Bakhta and Karnysty) (Zdanovich and Batanina 2002; Hanks and Doonan 2009; Merrony et al. 2009). Therefore, many settlements that contain portions of both oval/round and rectangular enclosures likely exhibit evidence of repeated construction events by populations with similar cultural materials (Vinogradov 2003). For instance, the site of Kamennyi-Ambar/Ol'gino has structures from several different time periods, including several after the construction of the fortification had ceased (Koryakova et al. 2007). As new dating projects are undertaken and excavations of settlements continue, our understanding of the relationship between Sintashta and Petrovka archaeological remains continues to change.

Based on the partial excavation of settlements, there are a variety of demographic estimates for MBA sites. The Sintashta settlement of Arkaim is posited to have at least sixty seven house structures within the enclosure (Zdanovich 1989) with house size ranging from 100 to 250 m^2 (Koryakova and Epimakhov 2007:72). As the house sizes are quite large, population estimates have ranged from twenty to thirty people per household (Epimakhov 1996; Grigory'ev 2000). These nucleated settlements are posited to have had populations of between 200 and 400 individuals (Gening et al. 1992; Anthony 2007; Kohl 2007; Koryakova and Epimakhov 2007). However, some estimates propose populations of a single settlement range from 500 to 700 people (Grigor'ev 2000:258). The former estimate seems more plausible, as settlements often have several construction episodes, with portions having fallen into disuse over generations. In addition, these estimates do not account for storage space or craft production, which likely occurred in household contexts (Johnson and Hanks 2012). The houses at many of the Sintashta as well as Petrovka sites are relatively similar in size, and houses were often linked by shared inner walls. The interior layout of most houses is similar, each containing pits that have been interpreted as a well, a chimney, and a furnace for metallurgy (Gening et al. 1992; Zdanovich 1997b). It is clear from the permanent nature of enclosures, the size of households, and population estimates, that we currently understand MBA settlements to have been those of sedentary or semi-sedentary populations. However, it is possible that smaller and ephemeral sites will be identified once intensive survey has been undertaken outside of enclosed settlements.

4.4.3 Cemeteries

MBA cemeteries are often located on the flat portions of first and second river terraces and may contain burials of dozens or hundreds of individuals (Koryakova and Epimakhov 2007). Cemeteries are often identified and delineated based on the presence of kurgans visible on the surface (Figures 4.9 and 4.10). Kurgan construction consists of planned circular mounds of either dirt or stone surrounded by a circular ditch. The ditch encapsulates a central area below the middle of the mound, which can contain from one to several burials (Figure 4.9). Single burials within this encapsulated area are often located centrally, and if additional burials are present they are located peripherally. However, sometimes when several burials are located within this encapsulated area, none are centrally located (Figure 4.9). The ditch itself can also contain burials of individuals, some of which may have been placed at a later date (Koryakova and Epimakhov 2007:77). While kurgan burials predominate discussions of mortuary practices during the MBA, there is also evidence of burials that are located outside of mounded structures (Figure 4.10). The cemeteries of Sintashta and Bestamak have a combination of kurgan and flat burials (Figures 4.10 and 5.1). The site of Bestamak is used as an example of differential burial practices as part of the Petrovka culture by some authors. They claim that burials arranged peripheral to the main kurgans are more numerous at Petrovka sites, and rarely occur at Sintashta sites (Koryakova and Epimakhov 2007:96). However, this can be problematic as areas peripheral to large kurgans at Sintashta and Petrovka sites are often left unexcavated.

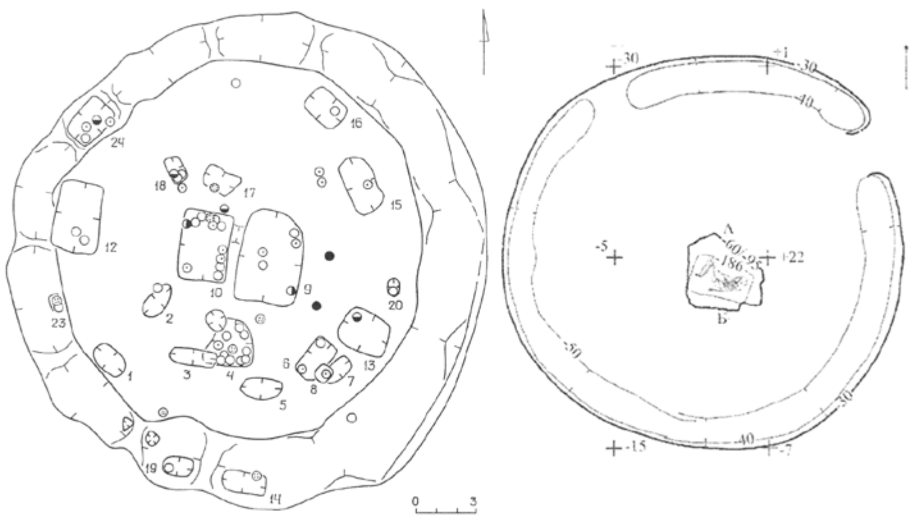

Figure 4.9 Examples of MBA Kurgan Burials: Multiple Burials (Bolshekaraganskii Mogil’nik, Kurgan 25 - Zdanovich 2002b:127) and a Single Burial (Mogil’nik Aleksandrovskii IV, Kurgan 2 -Malyutina et al. 2010:186) both with surrounding ditches

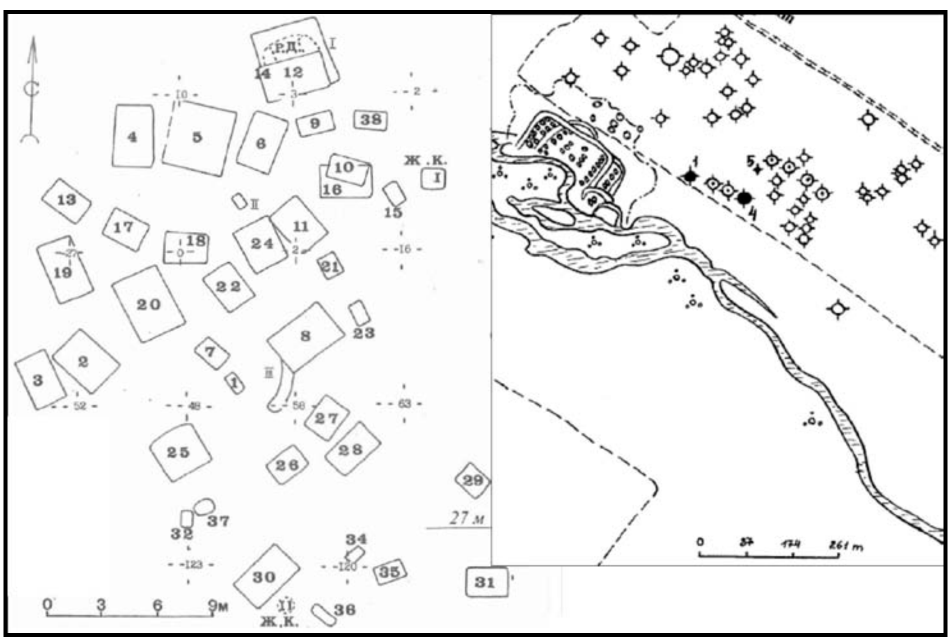

Figure 4.10 Examples of MBA Cemeteries: Flat (Gruntovoi) Cemetery of SM (Sintashta) (Gening et al. 1992:112) and Stepnoye Kurgan Cemetery (kurgans marked by hatched circles) (Hanks and Doonan 2009:346)

Sintashta and Petrovka cemeteries may contain as few as three and as many as dozens of kurgans, though individuals may also be placed in multi-period flat cemeteries. The height of Petrovka kurgans is generally less, no more than 0.7 m, and they are hardly visible on the surface (Koryakova and Epimakhov 2007:84). While Petrovka kurgans often contain many burials, there are exceptions to this rule. Placement of burials within the central area of the kurgan is not as variable as at Sintashta sites and usually there is a single central burial with one, two or three adult individuals. Zdanovich examined four Sintashta cemeteries and determined that most burials contained a single individual or paired individuals, with only about 17% of burials found containing large groups or mixed burials (Zdanovich 1997:40). The ritual placement of individuals within burials tends to be very similar at cemeteries designated as Sintashta and Petrovka. Individuals are often buried alone and placed on their left side with ceramic vessels deposits near the head or feet. Interestingly, when two individuals are present, they can either be situated side by side, with both individuals placed on their left side, or facing one another. In instances where individuals are facing one another these are often interpreted (based on associated burial goods) as a male (on left side) facing a woman (on right side) (Kalieva and Logvin 2002; Shevnina and Boroshilova 2009).

One of the most interesting funerary rituals during the MBA is the great number of animal sacrifices. These included a wide variety of animals such as horse, cattle, sheep/goat, wild boar, duck, and dog as well as wolf and fox. At Bolshekaraganskogo cemetery, female species made up 80% of the animals, while males only made up 10%, and young animals the other 10% (Gayduchenko and Zdanovich 2000). This data is from a single kurgan and clear differentiation between the types of animals buried with adult males, females, and children was identified (Gayduchenko and Zdanovich 2000). In addition, the portion of the animal placed in the burial may be significant, with some animals sacrificed ‘whole’, while others were only buried in parts (Zdanovich 2005). The placement of the animal in terms of location within the burial, or in an adjacent pit, may also be an important factor of Sintashta and Petrovka burials that has not been fully addressed (Koryakova and Epimakhov 2007:78-79,90,93).

Approximately half of all burials excavated show evidence of intrusion and looting, and even forms of "ritual robbing" that may have occurred soon after deposition have been identified (Koryakova and Epimakhov 2007:78). However, those graves with complete assemblages show a great diversity of items. Grave offerings often include ceramic vessels, spearheads, adzes, knife-daggers, darts, sickles, needles, spindle whorls, pestles, anvils and abrasive stones (Koryakova and Epimakhov 2007:79). Body ornamentation includes pendants, headdresses, beads, earrings, and bracelets. In addition, there currently are an estimated 16 spoke wheeled vehicles included as part of the burial retinue at Sintashta and Petrovka sites (Gening et al. 1992; Vinogradov 2003; Koryakova and Epimakhov 2007). A single ‘chariot’ base and draft assembly have been recovered from Krivoe Ozero (Vinogradov 2003), while the remainder of these vehicles are only identified by organic staining of spoke-wheels. This great diversity of items recovered from mortuary contexts may allow for a detailed examination of social structure and status at Sintashta and Petrovka cemeteries.

While absolute dates relevant to Sintashta and Petrovka developments are few, the majority of mortuary contexts are dated relative to associated ceramics recovered. Sintashta and Petrovka ceramics were manufactured on a mold made from an existing ceramic vessel with a textile placed over it. Tempered clay was placed over the textile in order to create the shape of the vessel. These vessels are usually flat bottomed with profiled or straight walls. Sintashta vessels have an internal rib in the transition from neck to shoulder, while Petrovka vessels lack this rib. Stylistically, Petrovka pots had very stable traditions and a limited number of elements (including triangles, lines and zigzags) all made from flat comb stamps. In contrast, Sintashta potters included a wider variety of design elements in addition to those seen among the Petrovka. However, while these ceramic traditions have been used for relative dating, they have also been used to determine to which culture group particular burials belong. As variety and variability are strong, even within a single burial, differentiation between Sintashta and Petrovka ceramics is extremely difficult to determine (Figure 4.11). Researchers often disagree strongly about cultural designations, and stylistic elements used as determinations are often questioned.

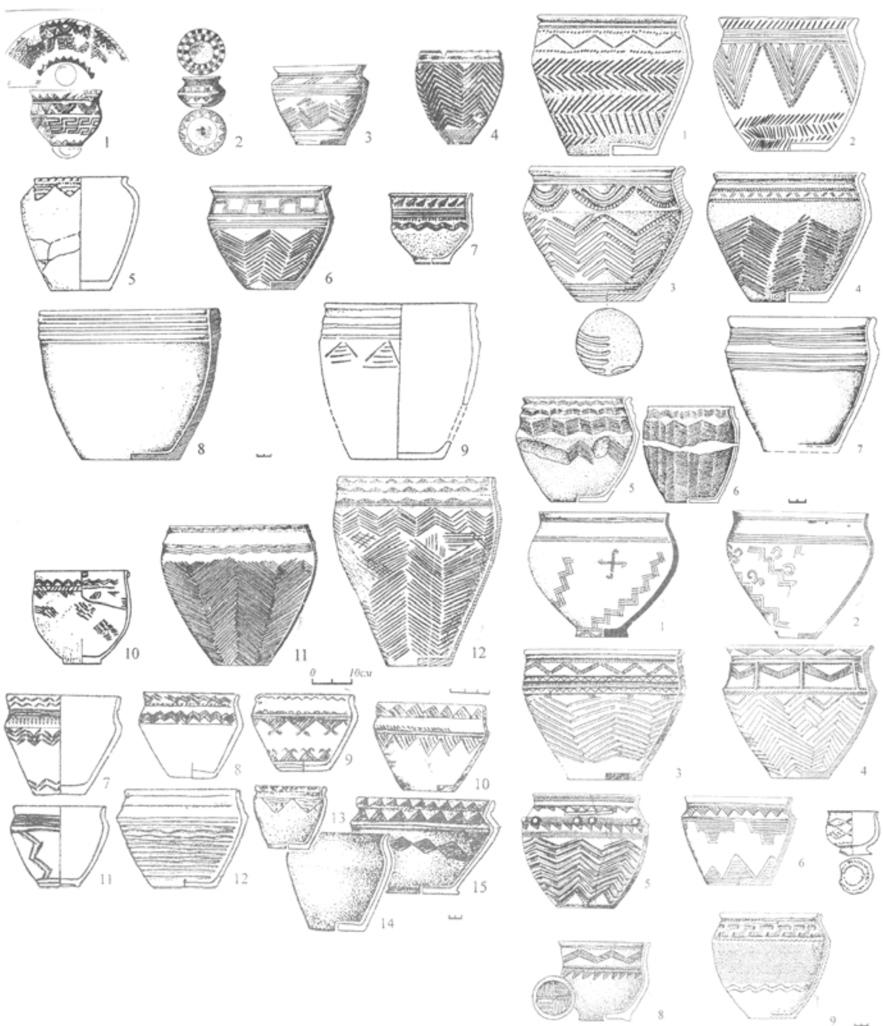

Figure 4.11 Examples of Sintashta vessels upper left (Grigor'yev 2000:269), upper right (Grigor'yev 2000:271), lower right (Grigor'yev 2000:268) and Petrovka vessels lower left (Grigor'yev 2000:286)

4.4.4 Bioarchaeology

The combined use of archaeological and biological data is the foundation of bioarchaeological analyses. Unfortunately, few archaeologists in Eurasia have the opportunity to correlate physical anthropological data with archaeological contexts (Lindstrom 1994; Kradin 1995; Zdanovich 1997). As previously discussed, there are several issues that affect bioarchaeological studies in former Soviet Union countries. First, the fields of anthropology and archaeology are separate fields of study, which has had a tendency to complicate collaboration. Second, a lack of trained physical anthropologists has led archaeologists to make sex and age determinations based on associated funerary remains and other less than scientific methodologies. Finally, a focus on archaeological cultures as the equivalent of ethnic groups has falsely led physical anthropologists to compare and contrast these groupings as biological realities.

In general, the study of craniometry and craniomorphology are the two most prevalent methods used for the study of prehistoric groups. These studies often connect ‘populations’ to specific archaeological cultures (Ismagulov 1970) or geographic features (Ginzburg and Trofimova 1972; Alekseev and Gokhman 1984). Scholars tend to use average measurements for a set of skeletons from a specific region and time period to create a standard for that type. For example, Alekseev and Gokhman (1984) examine skeletal collections from northern and western Kazakhstan during the Eneolithic and Bronze Age and compare them to surrounding regions. For each region, average skeletal measurements (such as ‘upper facial index’) of several individuals from different archaeological sites are given. A serious problem with this, and other similar studies, is the small sample sizes used to create these standard measurements for regions and as a representative index for archaeological cultures (Ismagulov 1970; Alekseev and Gokhman 1984). These samples include skeletal remains that lack absolute dates and have been attributed to various archaeological cultures, leading recent researchers to question their previous use (Solodovnikov 2009). Craniometrics, craniology, and studies of dentition are also used to categorize skeletal populations as either Mongoloid or Caucasoid (Europoid) (see Chapter 3). However, few of these analyses examine differentiation within localized areas using large sample sizes from cemeteries of a single period of time.

While the division of skeletons into categories such as Mongoloid or Caucasoid (Europoid) is often binary, there is some discussion of degrees of mixing of these two categories (Alekseev and Gokhman 1984). Diversity is evident in how the Caucasian category is sometimes divided into Proto-European, Pamir-Fergana, and Eastern Mediterranean. However, many scholars, when faced with the issue of diversity continue to place individuals into one of these binary categories (Kozintsev 2009; Ismagulov 1970). This is especially problematic, as the central Eurasian steppe is situated in a region that may be relevant for the examination of physical differences between prehistoric groups. This becomes clear in a recent analysis that compares craniometric data from Russia, Kazakhstan, China, and central Asia (Hemphill and Mallory 2004). The results show that steppe groups from Kazakhstan and Siberia are more similar, while groups from southern central Asia, including Bactria-Margiana are dissimilar (Hemphill and Mallory 2004:207).

Demographic data is often available for archaeological cultures as a whole, combining data from several cemeteries, but rarely published for a single cemetery. For example, individuals at several Sintashta sites (Bolshekaraganskoi, Kamennyi Ambar-5) were examined by Lindstrom and determined to have an average age at death of 31 years (Lindstrom 2002). Zdanovich compared this data with information from several nearby archaeological culture groups (Yamnaya, Katakombnaya and Srubnaya) that revealed that Sintashta sites had a much lower median age at death (1997:28-31). However, several prominent physical anthropologists have expressed doubt about the median age determined for the Sintashta, stating that the average age at death in prehistory was stable at 40 years of age (Alekseev 1972: 20; Zdanovich 1997:31). The proposed median age at death for the site of Bestamak was also low, with men ranging from 24-28 years, and women from 23-27 years (Logvin 2002). At the site of Kamennyi Ambar-5 a total of 97 individuals were analyzed and the demographic profile had a predominance of children 5-12 years of age (n = 22) and adolescents (n = 15), with very few adults recovered (Judd et al. 2008; Judd et al. 2009). While this overwhelming presence of older children and adolescents is unusual, no skeletal evidence of chronic infection or fatal trauma was visible (Judd et al. 2009).

The general lack of focus on health, disease processes, paleopathology, diet, and trauma in many paleoanthropology reports is difficult to address. This may stem from a lack of texts available on these subjects in the Russian language combined with the fact that the departments of physical anthropology and archaeology are completely separate. When these issues are addressed, it is often in the form of a single chapter in a formal book about one cemetery, published as a consolidated volume for the site (see Lindstrom 2002; Rykushina 2003). However, general information on overall health of certain communities can be gleaned from these texts. Rykushina found that at Krivoe Ozero many of the adults suffered from inflammation of the skull (10 of 11 adults examined) or mastoid process (6 of 10 adults) (2003). In addition, infections of the alveolar bone were common (8 of 10 adults), as was enamel hypoplasia (7 of 8 adults) (Rykushina 2003). At Kamennyi Ambar-5 and Bolshekaraganskogo, little evidence of chronic pathology, dental disease, or trauma was identified (Hanks et al. 2008; Judd et al 2009; Lindstrom 2002). The Bestamak site had evidence of a single adult male with a traumatic injury of the arm (Logvin 2002). In terms of dentition, at Krivoe Ozero, dental caries were identified among 66.7% of the adult individuals who had intact crania (n=9) (Rykushina 2003:360). In contrast, few dental caries and a paucity of tooth wear were evident at the Bolshekaraganskogo cemetery (Lindstrom 2002) as well as the more recent analysis of the Kammenyi-Ambar 5 community (Judd et al. 2009). All adults at Kamennyi-Ambar 5 were identified as having calcified plaque, while only 21.9% had evidence of dental enamel hypoplasia (Hanks et al 2008; Judd et al 2009). Overall, there seems to be some variability in terms of age at death, demographic profiles, and health at Sintashta and Petrovka cemeteries. These differences may be due to variation in environment, economy, dietary intake, and overall stress. However, this variation can only be addressed by continued research by trained physical anthropologists on these topics, as well as their correlation with archaeological contexts and data.

4.4.5 Social Differentiation and Identity

This section will address the way that social organization has been examined in terms of Sintashta and Petrovka developments. First, general ideas about social complexity during this time period are discussed in relation to both mortuary and settlement data. While theories of social organization are often posited, few detailed analyses of rank and stratification have been undertaken. Therefore, in the second part of this section, previous research is presented which touches on topics such as gender and age differentiation, especially in relation to the mortuary record. Results of previous research will serve as a starting point for inquiries into the social organization of Sintashta and Petrovka groups as discussed in this dissertation.

Social complexity and status for both Sintashta and Petrovka cultures have not been clearly identified through household excavations in settlements and therefore mortuary practices have been used to interpret social differentiation. The occurrences of burials that contain wheeled vehicles, horse sacrifice and weaponry have frequently been used to support the idea that Sintashta and Petrovka communities were hierarchical (Akishev 2002; Zdanovich and Zdanovich 2002; Anthony 2007; Koryakova and Epimakhov 2007; Outram et al. 2010). However, less attention has been given to secondary burials within kurgan ditches, areas between kurgans, and to flat grave cemeteries (Gening et al. 1992; Zdanovich 1997). The presence of collective burials and single burials within kurgan structures that contained children has similarly added confusion to discussions of social categories of differentiation (Zdanovich 1997; Zdanovich and Zdanovich 2002). Patterns of social hierarchy, especially concerning non-elites and horizontal social structures, have not been elucidated in previous analyses of mortuary practices from Sintashta sites (Epimakhov 2002).

Nevertheless, some attempts have been made to examine social structure in the mortuary record, especially in terms of gender differences. At the site of Arkaim, differentiation between individuals based on the biomass of associated sacrificed animals revealed differences between adult males and females, as well as children (Gayduchenko and Zdanovich 2000; Zdanovich and Gayduchenko 2002). The authors concluded that a greater number of animals were found sacrificed and placed in the burials of men relative to burials of women and children. In addition, different types of animals were placed in burials based on categories of age and sex (Gayduchenko and Zdanovich 2000; Zdanovich 2005).

At the site of Bestamak, researchers undertook a comparison between adult male and female burials and posited that women had relatively high status in comparison to men (Kalieva and Logvin 2002). Adult graves of men and women contained similar artifacts, such as ceramic vessels, projectile points, knives and awls. In addition, axes and adzes were associated almost exclusively with male burials (Kalieva and Logvin 2002: 48), and ornamental items, such as rings, bracelets, needles, bronze and paste beads, were predominantly found with adult females (Logvin et al. 2009). However, there are exceptions, as one burial attributed to a male had the full set of 'female' artifact types (Kalieva and Logvin 2002: 48). At Bestamak, the placement of bodies in burials is also of interest, especially for studying gender differences between adults. Most individuals were placed on their left side, however, when found in pairs, one individual (usually the female) was placed on the right side and faces the male (Kalieva and Logvin 2008). Problematically, some individuals determined to be biologically 'female' are subadults, and therefore the sexing may be inaccurate. However, this does not fully discount initial documentation of sex differentiation in mortuary rituals at Bestamak as well as other Sintashta and Petrovka sites.

Expressions of 'femaleness,' or womanhood, have previously been examined through the study of decorative headwear, including braid ornaments and pendants, in burial contexts (Usmanova and Logvin 1998; Kupriyanova 2006; Kupriyanova 2008; Usmanova 2010). Recent research by Kupriyanova (2010) addresses changes in ornamentation, jewelry, and dress between the Sintashta, Petrovka and Alakul' cultures. Rich burial goods and complex dress are posited to be evidence of the role of women as 'priestesses' (Kupriyanova 2008:142-145). There are even occurrences of men dressed as women, with very rich graves that are interpreted as religious 'ministers' (Kupriyanova 2008:156). In general, Kupriyanova's volume examines the different ways that the female identity is expressed over time through ornamentation, jewelry, and dress. As stated previously, a focus on male warriors has often overshadowed patterning connected to gender, status, and social identity (Hanks et al. in press). Recent research has begun to reconsider interpretations that are androcentric in nature in favor of a more holistic perspective.

D. G. Zdanovich combines physical anthropological and archaeological data from several different Sintashta cemeteries to examine social organization and stratification (1997). First, grave length and width is compared to age, number of individuals in a single burial, and grave construction. It is clear from this analysis that several different categories of interment can be identified, including a correlation between age and size of burial pit (Zdanovich 1997:45). Second, prestige items, such as stone maces and bronze (or bone) 'lapatochki' (spatulas), were associated with either peripheral or central graves depending on the number of individuals interred (Zdanovich 1997:53). While several interesting links between individuals and mortuary practices are identified, the data used is sparse and from several different cemeteries. For example, to discuss warrior burials, the data chosen incorporates 104 burials from four cemeteries, including Sintashta Mogilnika, Bolshekaraganski kurgans 24 and 25, Solntse 2, and Kamennyi Ambar-5 kurgan 2 (Zdanovich 1997:57). While interesting correlations between mortuary ritual and gender have been identified, there are few definitive results of this broad study.

Epimakhov (2002) investigates the social organization of MBA societies based on mortuary remains from several sites. The analysis undertaken is one of the most detailed of its kind for the Eurasian steppe. Several different types of information were included such as burial size and depth, grave assemblage, and animal remains in the burial. The results of this analysis reveal heterarchical differentiation between men and women. While women were often buried with breastplates (narudniki) or badges (blyashki) as well as jewelry, men were buried with weapons including spears, axes, and chisels, as well as 'chariots' or parts of the 'chariot package' (cheek pieces in burials which lack organic staining from wheels) (Epimakhov 2002:50). Epimakhov states that gender and age differences are difficult to interpret, and that an elite group can only be recognized if certain categories of equipment are chosen as markers of high status (2002:51). In addition, the location of the burial, body position, and orientation, which were previously posited as evidence of different groups, did not prove useful in clarifying divisions between individuals (Epimakhov 2002:50). In the end, Epimakhov posits that there was a military hierarchy, with mild elements of internal hierarchy within Sintashta cemeteries. Anthony takes this evidence further, focusing on how a colder climate forced communities to aggregate and settle in marshy areas, which was the impetus for conflict and competition (2009:67). Evidence of warfare included weaponry and chariots in burial assemblages, with an estimated 16 chariots recovered from Sintashta and Petrovka cemeteries (Anthony 2007:397). Furthermore, evidence from 5 Sintashta cemeteries revealed that 54% of burials identified as adults (with artifact assemblages) contained weapons (2009:55). These weapons include items such as spears, bows, arrows, knives, and axes (Epimakhov 2002:99). However, the inclusion of these items in burials might be interpreted in a multitude of ways, for instance they could be interpreted as tools rather than weaponry. In addition, these items were also recovered from the burials of children. While these results seem impressive, the degree to which appropriate physical anthropological sexing and aging techniques were used is unknown. Therefore a focus on bioarchaeological investigations would greatly improve our knowledge of these sites.

There is also evidence of possible differentiation between individuals within separate age categories during the MBA. A discussion of burials at some of the main Sintashta sites (Bolshekaraganskogo, Kamennyi Ambar, Krivoe Ozero, Nekropol Sintashta, and Solntse II) revealed that approximately 60% (n=160/275) of all excavated burials contained children and teenagers (Berseneva 2008). While subadults have previously been used to examine gender, current data from these cemeteries reveals that it is not possible to discuss gender in terms of child burials (Berseneva 2008:148). At Bestamak, child burials tend to be different based on the age grade of the individual (Shevnina and Boroshilova 2009). Children under the age of seven were likely to have pottery, young cattle, jewelry made of paste or stone, and astragali buried with them, with rare occurrences of bronze tools. Children between the ages of eight and fifteen were buried with young and old cattle and horses, as well as adzes, knives, plaques, chisels, and bronze ingots (Shevnina and Boroshilova 2009). This detailed analysis reveals that age grades were an important part of MBA communities, and that some graves of children between the ages of ten and fifteen contained elements of what are considered both adult and child burial assemblages.

4.4.6 Conclusions and Future Prospects

The previous sections have reviewed a portion of the foremost previous analyses connected with mortuary practices during the MBA in north central Eurasia. While Sintashta and Petrovka cultural developments were discussed in tandem, these sets of material culture are likely an earlier and later version of a single phenomenon. It is clear that differentiation and variation exist, both within and between what have been described as two separate cultures, as well as the sites that constitute them. The delineation of these cultures into totally separate developments depends greatly on the overlay of these material remains at specific sites. However, at the current time there continues to be debate concerning the chronological position of these two archaeological cultures, whether they were at some point contemporaneous, whether one transitioned into the next, or whether they were two separate developments. Furthermore, these two entities have not been discussed in a comprehensible manner to which a majority of archaeologists agree, as many sites continue to be disputed in terms of which material culture group they belong. Therefore, future analyses of Sintashta and Petrovka material remains should focus on further absolute dating regimens, especially of the overlay of these developments at settlements. In addition, ceramic and metal assemblages associated with each of these developments must be analyzed stylistically, materially, and in terms of production in a systematic and empirical manner in order to compare and contrast the material culture of these groups.

In summation, the MBA exhibits several noticeable patterns. First, diet and economy reveal a subsistence regime based in pastoralism, with complimentary foodstuffs including freshwater fish and wild plants indicative of more diverse patterns. These complimentary elements need to be further identified, in order to examine differentiation between communities and to understand the complexity of pastoral subsistence economies. Second, while variations between settlements in terms of shape and size exist, the majority of these sites are large and aggregated, with little differentiation between household sizes. However, there is a need for further investigation of non-fortified and ephemeral sites possibly located in north central Eurasia to clarify the full extent of settlement patterning. Thirdly, while a great number of kurgan cemeteries have been investigated, flat burial grounds needs to be identified and studies, as these burials may represent additional level(s) of social structure. Fourthly, the addition of physical anthropological data as a correlate for archaeological data has begun to amplify the understandings of MBA developments. The study of epigenetic traits and metric data should shift from a focus on population studies to community or cemetery studies in order to examine local events. In addition, a renewed focus on paleodemography, paleopathology, trauma and health may compliment dietary studies and increase our knowledge of individuals as well as local communities. Finally, the study of social organization will be greatly impacted by this collective knowledge. Current research reveals that hierarchies are present at some cemeteries, however the lack of analyses of complete datasets has hampered these undertakings. Therefore, these analyses should be used as building blocks to be empirically tested in order to comprehend the social organization and structure of MBA communities.

4.5 LATE BRONZE AGE: THE ANDRONOVO DEVELOPMENT

> *"No one culture in Russian archaeology has so many controversial interpretations and paradoxes as the Andronovo culture".* (Koryakova and Epimakhov 2007:13)

LBA (1700-1400 cal BC) cultural developments have been referred to as the 'Andronovo culture' or 'Andronovo family of cultures'. Often, this archaeological development is discussed as a 'horizon' based on the recovery of analogous cultural material over a vast area stretching from the Russian Urals, to southern Kazakhstan and northwestern China (Xinjiang region). Previously, Sintashta and Petrovka (MBA) developments were included as part of the 'Andronovo cultural community', but have since been separated due to clear differences in settlement and mortuary patterns. These patterns reveal that during the LBA, a seemingly immense interaction sphere appeared that included similarities in ceramic styles, settlements, and mortuary practices. The spread of cultural materials over an immense region is often understood as a trend towards greater mobility and expansion (Kuz'mina 2008b). When viewed at a large scale across a vast region Andronovo developments seem homogeneous, however closer inspection of the material remains reveals variability and heterogeneity. This immense area encompasses innumerable environmental and ecological zones and while diversity between local groups certainly exists, differentiation between them has been insufficiently studied. In addition, comprehensive studies of the Andronovo reveal that while spheres of influence cover an immense area, groups of sites cover much smaller zones and are extremely variable in terms of material remains (Figure 4.12).

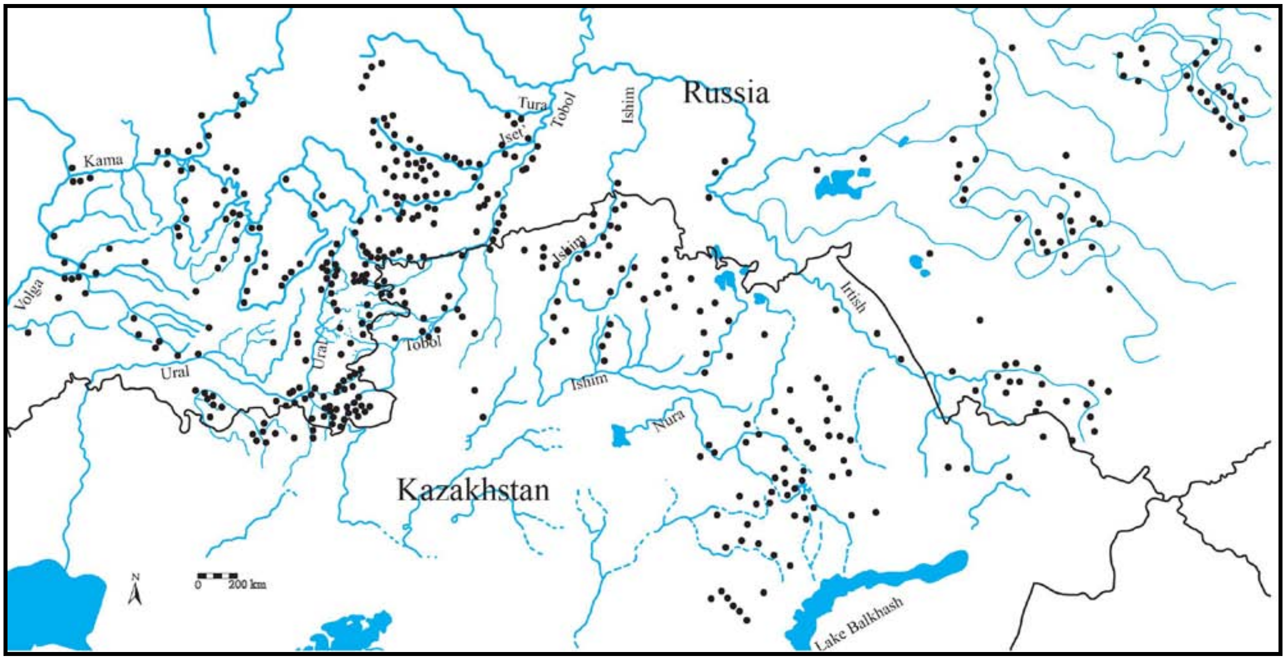

Figure 4.12 Map of north central Eurasia with archaeological sites attributed to the Andronovo (Alakul' and Fedorovo) (compiled based on Grigor'yev 2000:291; Stefanov and Korochkova 2006:6; Koryakova and Epimakhov 2007:125; Kuz'mina 2008:66,68)

In contrast to the earlier Sintashta and Petrovka developments, the Andronovo development is described as a period of decreased social hierarchy combined with increased interaction and mobility (Koryakova and Epimakhov 2007). On a broad level, regional assessments reveal little evidence of hierarchy, due to a lack of 'elite' burials, while settlement patterns demonstrate an increase in the number of residential sites combined with a decrease in the demographic size of settlements (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Kuz'mina 2007; Koryakova & Epimakhov 2007). Settlement excavations have rarely uncovered more than a few households, and few are fully excavated. Available household data that can be used to assess status and inequality is thus insufficient. At this time, mortuary sites currently offer the best source of data for addressing questions pertaining to social organization. Therefore, the following sections will outline the data available in terms of economy and diet, settlements, cemeteries, and bioarchaeology in order to better understand the social structure and organization of these LBA communities. Specifically, these sections will compare the material culture of the main subgroups of the Andronovo development, namely the Alakul' and Fedorovo archaeological cultures.

Due to the immense interaction sphere of the Andronovo development, Soviet scholars have often used an overarching or 'imagined' community concept to imply that interactions and migrations were taking place (Figure 4.13). However, locating an 'imagined' community over such a vast area is highly problematic, especially because variation between spatially located communities is unknown. Posited interactions are based on the identification of similar cultural materials, especially vessels types and ornamentation. Variation within the Andronovo 'family of cultures' has led to the recognition of two main subgroups, the Alakul' and Fedorovo, which are differentiated based on burial treatment, cremation or inhumation, ceramic style and manufacture, settlements, and mortuary assemblages. It is unclear, however, exactly how multicultural aspects (Korochkova and Stefanov 2004, 2006), ethnicity (Koryakova and Epimakhov 2007), status (Korochkova 2002), gender (Usmanova and Logvin 1998) or age grade divisions contribute to these perceived differences. It seems that a stronger cultural diversity developed within local Andronovo communities, marked by a diversification in style and ornamentation on bronze and ceramic items. Mortuary practices during the LBA are less elaborate, rarely contain chariots, and the ritual inclusion of sacrificed animals sharply decreases. However, many cemeteries include two or more distinct types of funerary ritual and body treatment (e.g. cremation and inhumation).

While general trends for the Andronovo are evident, including dispersed populations and diversity in mortuary ritual, regional scholars continue to debate how to define this broad phenomenon. Discussions highlight the increasing number of divisions of the Andronovo, the bases for such divisions, and determinations of which subcultures qualify as the ‘Andronoid type culture’ (Matveev et al. 2002:444; Koryakova and Epimakhov 2007:126-7). Currently, many scholars agree that the Alakul’ and Fedorovo terms are appropriate, and these designations have been heavily utilized in the literature. However, there are some scholars that continue to use other archaeological culture names that they associate with the Andronovo, including Tazabag’yab, Beshkent, Vakhsh, Cherkasul, Pkhomovo, Suzgun and Elovka (Hemphill and Mallory 2004; Koryakova and Epimakhov 2007). As these archaeological cultures are not present in the northern steppe, they will not be discussed in this dissertation.

Geographically, most Alakul’ sites are located within an immense territory that includes the trans-Urals region as well as portions of northern, western and central Kazakhstan. In contrast, most Fedorovo sites are located in central and eastern Kazakhstan. However, excavations at the site of Urefty I, in the far northwestern reaches of regions attributed to the Andronovo, contains mixed deposits of Alakul’, Fedorovo, and Alakul’-Fedorovo archaeological materials (Stefanov and Korochkova 2006). As more sites are identified, it is increasingly common to find the archaeological correlates that have been used to delineate these groups intermixed at a single site (Usmanova 2007). The chronological relationship between these two subgroups is a crucial underpinning to hypotheses on the association between these archaeological cultures. Regional scholars disagree on temporal interactions between these groups because stratigraphic positioning seems to place Alakul’ sites earlier than Fedorovo. Korochkova and Stefanov state that in the Trans-Urals area there is a ‘multicultural’ aspect to kurgan burials that show the chronological similarity of the two cultures (2004). However, it was not until recently that radiocarbon dating began to be used in order to formulate a chronology for the Bronze Age and to understand temporal relationships between archaeological cultures (Hanks et al. 2007; Panyushkina et al. 2008). Based on the most recent chronology of absolute dates for these cultures, they seem to exist in the same time period (1900-1500 cal. BC) (Hanks et al. 2007:362; Panyushkina et al 2008). However, there continues to be an absence of a stable chronological sequence based on absolute dates in many areas of central Kazakhstan as well as east of the Ural Mountains in Russia.

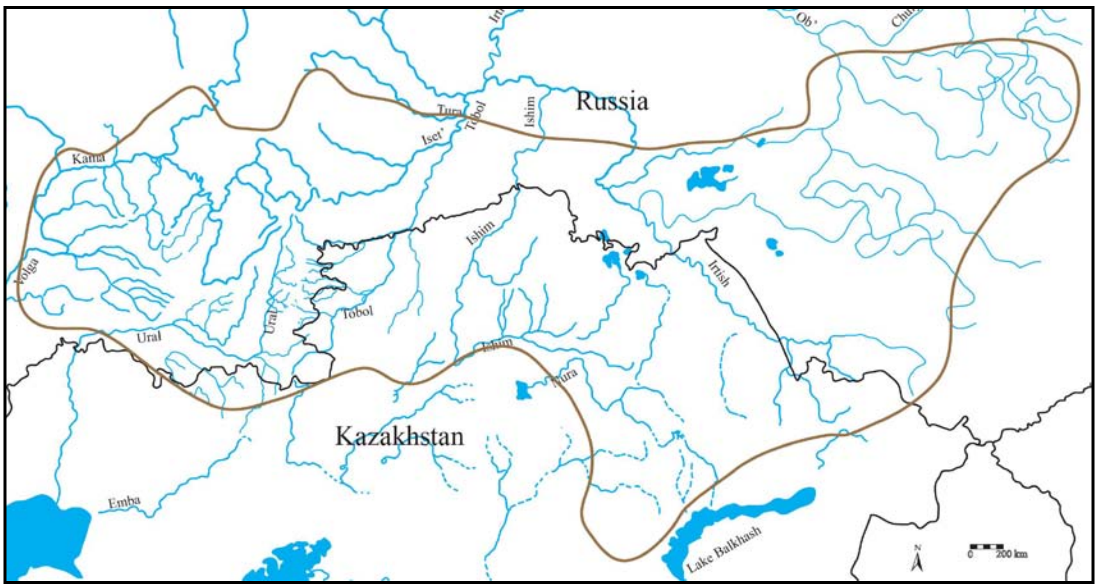

Figure 4.13 Andronovo development based on locations of attributed sites (compiled based on Grigor'yev 2000:291; Stefanov and Korochkova 2006:6; Koryakova and Epimakhov 2007:125; Kuz'mina 2008:66,68)

Current absolute dates have revealed that Alakul', Fedorovo, and mixed Alakul'-Fedorovo sites are temporally contiguous within areas south of the Ural Mountains and in north central Kazakhstan. Calibrated dates (Hanks et al. 2007; Panyushkina et al. 2008) are available from the Alakul' site of Kulevchi (1880 to 1690 cal. BC), and the mixed Alakul'-Fedorovo sites of Lisakovsk (1780 to 1660 cal. BC), Kamennaya Rechka II (1750 to 1520 cal. BC) and Solntsze-Talika (1740 to 1530 cal. BC). In addition, the site of Urefty which is the northernmost site has burials that are Alakul' (1690 to 1520 cal. BC), Fedorovo (1900 to 1650 cal. BC) and Alakul'-Fedorovo (1700 to 1520 cal. BC). It is clear that the majority of these sites, whether single or multi-component, have relatively similar absolute dates that are several centuries earlier than previously proposed. As the subcultures that make up the Andronovo development are chronologically similar, they are often discussed in collectively.

Traditional interpretations persistently highlight the migration and colonization of central and southern Central Asia by Andronovo subcultures or the immigration of cultures into the northern steppe from Iran or Azerbaijan (Salnikov 1967; Grigory'ev 2000; Kuz'mina 2007). This fascination with ethnogenesis and the direct migration of ethnic groups has led scholars to search for continuities within temporally distinct archaeological materials in order to determine the specific point of origin for archaeological cultures. Sub-cultures identified within the Andronovo, such as the Alakul' and Fedorovo, are often proposed to be different ethnic groups which has led to a search for the location of their ethnogenesis, or 'homelands'. Many of these theories are strongly tied to issues surrounding the Proto Indo-Europeans and Indo-European and Indo-Aryan language branches (Mallory 1989; Anthony and Brown 1991; Kuz'mina 1994, 2007; Gimbutas 1997; Renfrew 2002). Previous theories propose the origins of Fedorovo to be from Iran, Azerbaizhan, and Trans-Uralian forest cultures (Salnikov 1967; Grigory'ev 2000). In contrast to these theories of ethnogenesis, Korochkova believes that the Fedorovo burials represent not another culture, but rather a different social status group, which may explain the presence of mixed Alakul' and Fedorovo settlements and cemeteries (2004). Most scholars believe that the Alakul' culture formed out of Sintashta and Petrovka cultural developments (Koryakova and Epimakhov 2007:138). Nevertheless, a few dissenters continue to push for a clear 'genetic' link between the Petrovka and the Alakul' (Zdanovich 1988), while others see a direct connection between Sintashta and Alakul’ (Matveev 1998). Unfortunately, such approaches have greatly overshadowed the explanation of the complex processes behind, and results of, regional interaction and integration. While direct migration may have occurred, the social processes behind it are rarely discussed (for exception see Anthony 1990). Therefore, the following discussion of the Andronovo will focus on how the Alakul’ and Fedorovo are differentiated, and their connections to local cultural adaptations from the Middle to Late Bronze Age.

4.5.1 Economy and Diet

Changes in social organization may be associated with economic transformations, therefore, it is important to understand the economic foundation of these societies. Current archaeological evidence reveals that Andronovo societies maintained livestock and nearly all scholars agree that meat and milk products formed a major component of their subsistence economy (Khazanov 1984; Cribb 1991; Frachetti 2002; Outram et al. 2009). Tkacheva discusses whether Andronovo groups may have switched from local cattle breeding to a more nomadic way of life (1999). This possible transition has not been heavily studied, and zooarchaeological analyses of faunal remains from settlements are sparse. Current research suggests that the remains of fish may have factored strongly into the diet of many prehistoric steppe communities while evidence for use of agricultural items is lacking (Anthony et al. 2005; Privat et al. 2005; Privat 2002). Additionally, wild faunal remains have been recovered in cultural contexts at Bronze Age pastoral sites (Frachetti and Benecke 2009). A renewed interest in the diverse nature of pastoral economies highlights the need to re-examine dietary intake among these groups in relation to social organization (Chang and Koster 1994).

4.5.2 Settlements

For the LBA, the majority of excavations have focused on cemeteries and burials rather than settlements. Settlement patterns reveal an increase in the number of residential sites combined with a decrease in the demographic size of settlements (Evdokimov 1983; Potemkina 1983; Habdulina and Zdanovich 1984; Tkacheva 1999; Kuz'mina 2007; Koryakova & Epimakhov 2007). Few settlements have been fully excavated at any of the Alakul' or Fedorovo sites, and those that have been excavated have focused on often only a few houses which reveal unattached households within settlements (Koryakova and Epimakhov 2007:139). Therefore, the main markers of these archaeological cultures have been identified based on the mortuary record.

The spatial distribution and density of archaeological sites in the study area have been established through archaeological surveys, which focus on the identification of surface features along riverine systems or the ground testing of sites identified through aerial photography. While the incomplete nature of this information has made demographic estimates for the region somewhat problematic, examination of shifting patterns in settlement over time may be possible (for similar analysis see Popova 2006). As such, published settlement pattern data and paleodemographic estimates will be reviewed in the dissertation in order to link shifts in the size and density of settlements with changes in subsistence, mobility and social organization.

In contrast to the previous period, LBA households were not located within fortified embankments, but rather, clustered together in groups of five to twenty along river banks (Kuz'mina 2007:36-8). The houses were semi-subterranean and were often located in a single row or a set of two parallel rows with entrances facing the river (Kuz'mina 1994:403; Malyutina 1994; Kuz'mina 2007:39) (Figure 4.14). At some sites there is evidence for wooden palisades that enclosed these small settlements, however the use of these enclosures is posited as one that served to guide or protect cattle from environmental conditions. Houses were usually rectangular in form, and frequently were linked by underground passages (Kuz’mina 2007:41). The average size of houses ranged from 80 to 200 square meters (Kuz’mina 1994; Malyutina 1994; Vasina et al. 2004; Petrova 2007). While the interiors of Andronovo houses have been inadequately studied, several different types of hearths have been identified (Kuz’mina 2007:44). Common hearths which are linked to domestic use, hearths consisting of several chambers, and hearths with connecting ‘slots’ filled with ceramic and metallurgical slag have all been excavated (Kuz’mina 2007:45-6). These different hearth types found within settlements may be evidence of a division of labor and therefore economic specialization between houses. However, the lack of detailed published data on households limits what can be inferred about household or economic specialization during the LBA in this region.

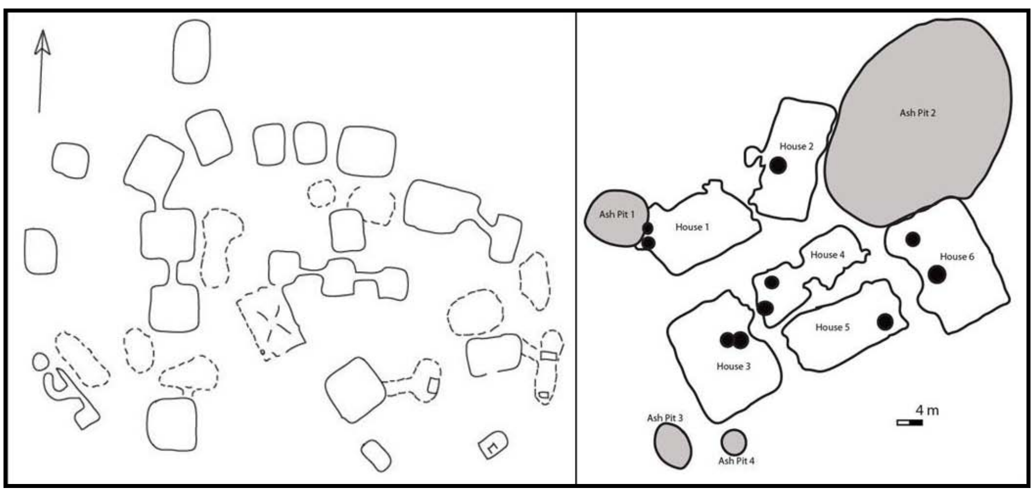

Figure 4.14 Alakul’ Settlement of Atasu (Kuz’mina 1994:403) and Fedorovo Settlement of Cheremukhovyi Kust (Zakh and Ilyushina 2010:42)

Demographic estimates for the LBA are often linked to house size and number. At the completely excavated settlement of Cheremukhovyi Kust, scholars estimated there were between 100 and 120 individuals (Zakh 1995:73; Zakh and Ilyushina 2010: page number; Koryakova and Epimakhov 2007: page number). This settlement has a total of six houses in a very small area, with associated layers of ash, which may be evidence of midden deposits used over an extensive period of time (Zakh and Ilyushina 2010). Comparatively, MBA household structures are much larger, and relative estimates of twenty to thirty people per household are common (Epimakhov 1996; Grigor'yev 2000). However, these totals may not be accurate, as the number of individuals per household can be overestimated and it is difficult to determine if all houses were occupied simultaneously. Several scholars have posited that the average family size is 7 to 8 people (Evdokimov 1984:16). Therefore, with a smaller number of people (~10) determined per household, estimates may range closer to fifty individuals per settlement.

4.5.3 Cemeteries

Andronovo cemeteries are located on the flat banks next to rivers and lakes as well as on bluffs overlooking rivers (Koryakova and Epimakhov 2007:139; Usmanova 2007). The majority of currently known cemeteries have dozens of above ground kurgan burial constructions, which makes them easier to identify (Koryakova and Epimakhov 2007:130-1). The size and height of kurgans is extremely variable ranging from approximately four to twenty meters in diameter and 30 to 100 cm in height (Kuz'mina 1994; Stefanov and Korochkova 2006; Koryakova and Epimakhov 2007; Usmanova 2007). Circular kurgans often have a central area located underneath mounded soil, which is outlined by a ring of stones and a ditch (Figure 4.15). The stone ring and ditch encapsulate a central area below the mound that can contain from one to several burials. After the initial construction of a kurgan, it is not unusual to have burials added at a later date. These additional burials are often located within the stone ring, under the stone ring, inside the kurgan ditch and outside of kurgan zones (Figure 4.16). Extreme variety in burial location is found, especially at the Lisakovsk site where there are several classic kurgans, numerous stone enclosures, as well as flat burials (Usmanova 2007). In addition to cemeteries, some burials have been identified in household floors at settlements, and are usually attributed to children (Koryakova and Epimakhov 2007:130).

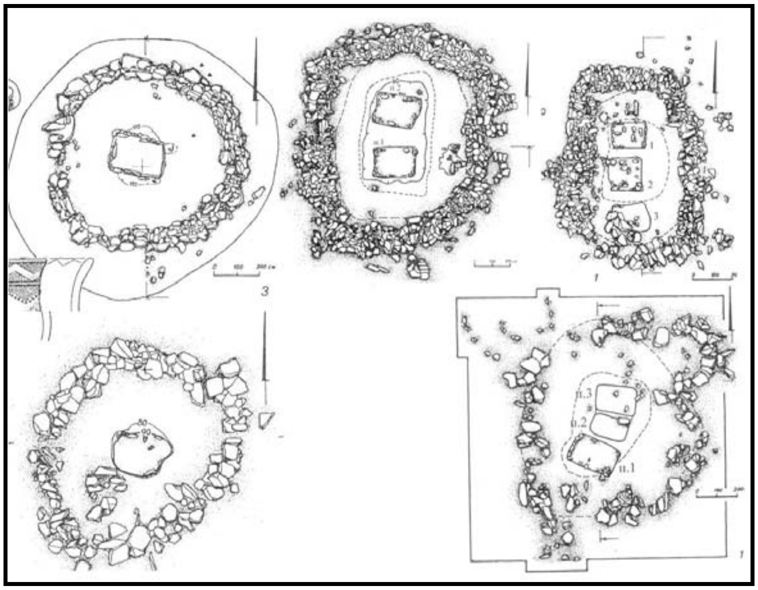

Figure 4.15 Examples of LBA Kurgan Burials from the Urefti cemetery with Single, Double, and Multiple Graves (Stefanov and Korochkova 2006:49-50, 53-54)

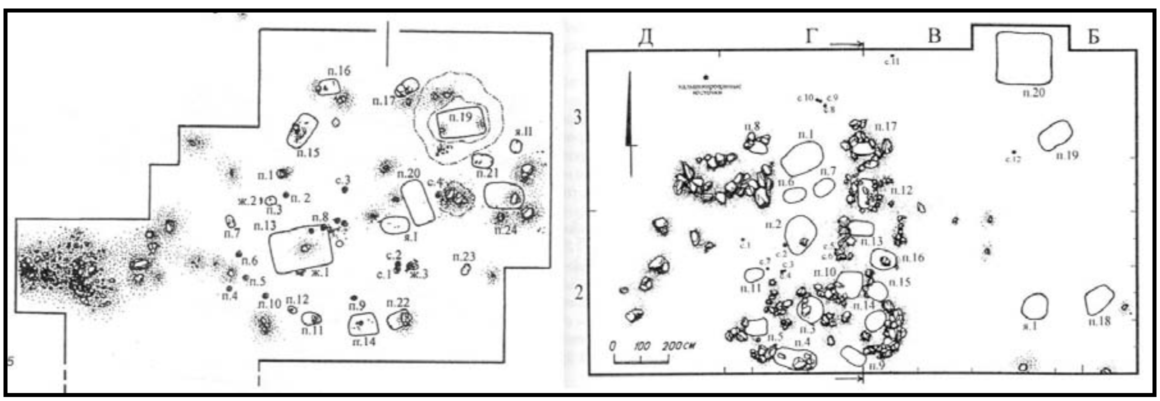

Figure 4.16 LBA cemeteries at Urefti with evidence of Kurgan, Enclosure, and Flat Burials (Stefanov and Korochkova 2006:61,75)

Several scholars have attempted to summarize the different mortuary rituals associated with the Alakul' and Fedorovo subcultures (Figure 4.17). Differences between how scholars characterize these subcultures are visible in the table below, including body treatment, grave construction, and grave assemblages. However, variability evident between subgroups is problematic to assessments of the proposed 'clear' differences between the Alakul' and Fedorovo (Kuz'mina 2008b). Every scholar identifies different rituals associated with each subculture based on a specific archaeological site. However, these discrepancies may be due to geographic or environmental variation, or even chronological disparities. The reality is that these subcultures cover a vast area, and that few scholars have attempted to examine differentiation between these groups (for exception see Kuz'mina 2008b). The work of Kuz'mina reveals that when each of these subcultures is separated into distinct zones, there is a great variety of differentiation in material culture and grave construction techniques (2008b). Therefore, for this dissertation, material evidence of the Alakul' and Fedorovo will be compared and contrasted within north central Eurasia.

		Korochkova & Stevanov 2004	**Koryakova & Epimakhov 2007**	**Kuz'mina 2008b**
Burial Construction	Round or rectangular enclosures of stone	Fedorovo	Fedorovo	Alakul'/Fedorovo
	Earthen Kurgans	Alakul'		Alakul'/Fedorovo
Grave(s) within Kurgan	1 or 2		Alakul'/Fedorovo	Fedorovo
	1 or 2 or 3	Fedorovo		
	Many	Alakul'	Alakul'	
Grave Pit Orientation	Cardinal Directions	Fedorovo		
	East/West			Fedorovo
Lining of Grave Pit	Pits lined with stone boxes	Fedorovo	Fedorovo	Fedorovo
	Pits lined with wood	Alakul'	Alakul'/Fedorovo	Fedorovo
Body Treatment	Cremation	Alakul'/Fedorovo	Alakul'/Fedorovo	Fedorovo
	Inhumation	Alakul'/Fedorovo	Alakul'/Fedorovo	Alakul'/Fedorovo
Items in Burial	Jewelry or Ornamentation	Alakul'	Alakul'/Fedorovo	Alakul'
Rituals	Fire Rituals		Alakul'/Fedorovo	Alakul'

Figure 4.17 Separation of Alakul' and Fedorovo Mortuary Rituals (left blank if data missing)

While diversity within both subcultures is clearly apparent, it is important to examine how scholars have determined to which group particular sites belong. Therefore, this section will outline the proposed material culture indicators for each group based on a comparison of several scholars (Korochkova and Stefanov 2004; Koryakova and Epimakhov 2007; Kuz'mina 2008) (Figure 4.17). Alakul' cemeteries often have kurgans, or low earthen mounds on top of burials, as well as stone rings which lack earthen mounds. While Korochkova and Stefanov state that the graves were marked with obelisks, no other authors mention this for Alakul' sites (2004). Grave complexes include: 1) multi-grave kurgans with one or two central burials surrounded by peripheral burials, 2) kurgans with single or double central graves and no surrounding interments, 3) multi-grave burials that lack central graves. Some of the larger kurgans may contain up to forty or fifty burials, while smaller kurgans contain only a single burial (Koryakova and Epimakhov 2007:133). In contrast, kurgans of the Fedorovo culture are generally smaller in size than Alakul' and are differentiated by circular or square stone rings that enclose them (Koryakova and Epimakhov 2007). These 'fences' are constructed of stones that are either piled on top of one another or standing vertically. Within these stone fences, earth or stones are piled up to form a mound. However, these stone fences may also lack any mounded structure within them, and instead act as an enclosure within which graves are placed. Each kurgan typically has between one and three rectangular graves centrally located within the stone fence (Korochkova and Stefanov 2004).

The construction techniques of each burial can also be significant for comparing the Alakul' and Fedorovo. At Alakul' sites, central graves within kurgans often have walls lined with wood. Even in non-forested regions, wood-lined burials are not uncommon and it was necessary to transport logs from as far as forty kilometers away (Usmanova personal communication 2005). Fedorovo burial construction is much more variable, with grave walls of stones, wooden frames, or unlined (Koryakova and Epimakhov 2007:141; Kuz'mina 2008b).

Body treatment is one of the most important characteristics used to differentiate between these subcultures, with the Alakul' posited to have practiced inhumation and the Fedorovo cremation (Ustyuzhanin 2004). However, several authors have noted that cremation and inhumation were used by both groups to some extent (Matveev 1997; Stefanov and Korochkova 2006:15,18,128-129; Koryakova and Epimakhov 2007:127; Kuz'mina 2008b:160,170). The majority of Alakul' graves contained a single individual, usually on their left side in a semi-flexed position. However, it is also common to encounter burials where two individuals (usually male and female) or even three individuals (man, woman, child) are placed together. While most Fedorovo kurgan burials include a single cremated individual buried in a central grave, double burials have been identified in the eastern extents of this culture area (Koryakova and Epimakhov 2007:142). Cremation of individuals is attributed to the Fedorovo tradition and is found in conjunction with burned grave-pit walls, burned materials in mound fill and evidence of burning on the roof of the burial chamber (Sotnikova 2006; 2007).

In discussions of the Andronovo development, the Alakul' and Fedorovo are further delineated by distinct material assemblages recovered from mortuary contexts. Ceramic vessels are often described as chronologically significant, with distinct ornamentation, and differential construction. However, the methodology for distinguishing between these two types of vessels is often not explained in the literature. The following discussion of vessel differentiation may not relate to all Andronovo sites, therefore, this data must be used with caution when attempting to determine 'cultural' affiliation. Alakul' vessels were made using a mold, while Fedorovo vessels were fully made by hand without molds, and these distinct construction techniques may allow for differentiation between the two types (Koryakova and Epimakhov 2007:142). Problematically, at the Lisakovsk site which has both Alakul' and Fedorovo material remains, all of the vessels were made using molds (Lohman 1998) and therefore do not fit the established pattern. Vessel form has also been used to examine differentiation, as Alakul’ vessels have sharp shoulders, while Fedorovo vessels have rounded shoulders (see figures 5 and 23 Kuz’mina 2008b:90,119; Salnikov 1967). The majority of the aforementioned vessels have a flat bottom and wide opening (Figure 4.18). In addition, some Fedorovo sites also have a distinct ceramic form, which is rectangular in shape with four pinched corners and very shallow Figure 4.18).

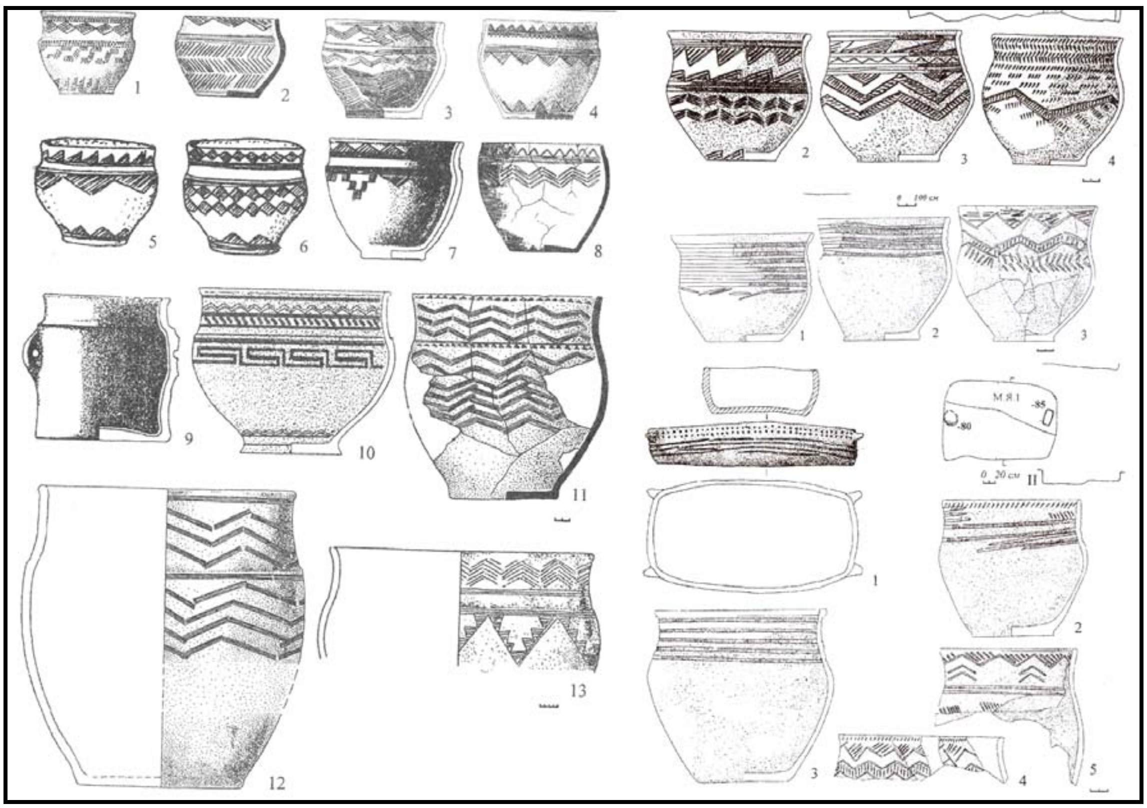

Figure 4.18 Examples of Andronovo Ceramics: Alakul’ sites of Verkhnyaya Alabuga, Alakul’, Alekseevskii, Priplodnyi, Yazevo, and Mirnyi (on left) (Grigor’yev 2000:306) and Fedorovo site of Smolino I (on right) (Grigor’yev 2000:325-328)

These subcultures often had different design features and ornamentation on vessels. Alakul’ vessels are often decorated with triangles made from medium to large flat stamps covering only the shoulder and neck (Koryakova and Epimakhov 2007:130). Fedorovo ceramics follow somewhat more strict design rules that included three-zone decoration, comb stamping, and decoration with mainly geometric motifs such as triangles, swastikas, and angular lines

(Zotova 1965; Koryakova and Epimakhov 2007:142; Kuz'mina 2008b:89). In contrast according to Mikhailov, Alakul' vessels have a three zone decoration, and those without are mixing of the Alakul'-Fedorovo ornamental traditions (1990:7-8). Korochkova states that at Urefty some vessels have characteristics of both Alakul' and Fedorovo motifs (2002:193). Vessel ornamentation between these two subcultures is confusing and often difficult to differentiate especially based on figures presented in Kuz'mina (2008b:90). However, recently, the formal analysis of ornamentation was undertaken by Rudkovskii (2010), which built upon the work of Zotova (1965). Rudkovskii delineates between the two cultures through an analysis of vectors, stating that Alakul' ornaments follow straight lines of grids and Fedorovo oblique lines (2010:76). This research seems extremely promising in terms of examining ornamentation among Andronovo subcultures, and examines assemblages from twenty-six sites and 2442 vessels. In addition, from this analysis, clear differentiation between Alakul' and Fedorovo vessels is evident, and the author posits that the site of Lisakovsk contains vessels of both types (Rudkovskii 2010:81).

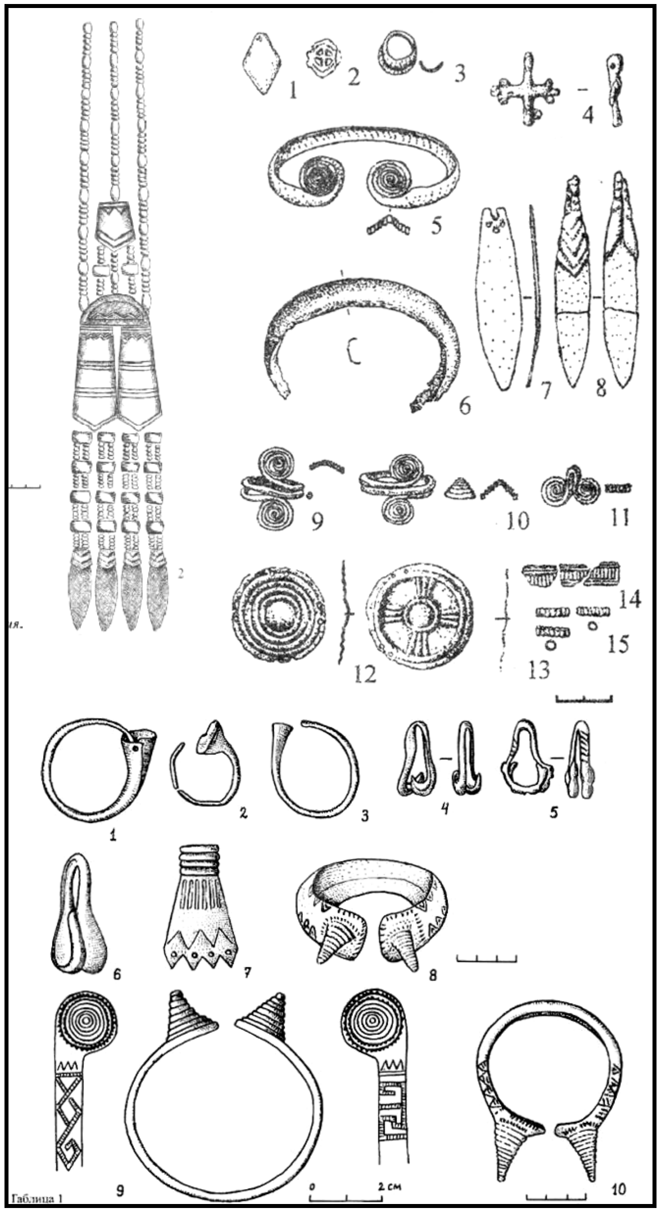

Figure 4.19 Examples of Alakul' (upper) and Fedorovo (lower) Bronze Ornamentation: hair decoration/braid pendant – site of Lisakovsk (Usmanova and Logvin 1998:32), bronze jewelry - site of Mirnyi (Grigor'yev 2000:303), bronze jewelry - sites of Grafskie Razvalinyi and Lisakovsk (Kupriyanova 2008:40)

In terms of mortuary assemblages, ceramics are recovered with high frequency, in addition to bronze items and faunal materials. Alakul' grave good assemblages tend to have a greater number and type of total artifacts than Fedorovo including ornaments (beads, bracelets, animal canine amulets and earrings), hair decorations and braid pendants, as well as ceramic vessels (Figure 4.19). Fedorovo burials tend to have simple assemblages including several ceramic vessels, as well as some bronze knives and jewelry. Fedorovo bronze jewelry and ornamentation is usually in the form of beads, bracelets with conical spirals at the ends, and pendants (Koryakova and Epimakhov 2007; Kuz'mina 2008b). Formal analysis of bronze ornamental items has been undertaken to examine comparative typologies of jewelry between several Alakul' sites (Evdokimov 1992; Flek 2008, 2010; Kupriyanova 2008).

Animal sacrifice is an important part of both Alakul' and Fedorovo burial ritual. However, in comparison to the earlier Sintashta and Petrovka development, where complete animal remains predominated, only animal heads and appendages tended to be recovered (Koryakova and Epimakhov 2007:134). Alakul' animal sacrifices included cattle, sheep/goat, and horse, which were found within burials, in kurgan ditches, as well as in special pits (Usmanova 2005; Koryakova and Epimakhov 2007:134). Fedorovo burials tended to have less animal remains present, but were more likely to use horse or sheep/goat rather than cattle (Korochkova and Stefanov 2004; Kuz'mina 2008b).

The list of traits associated with each of these subcultures is highly problematic for several reasons. First, each scholar has a somewhat different understanding of the traits indicative of each culture, a problem often stemming from a bias toward materials from sites that each individual researcher has excavated (Korochkova and Stefanov 2004; Kuz'mina 2008b). Variation among these sites may be due to geographic, environmental, or social differences between these culture groups. Second, the use of an 'inventory' of traits for each culture may not be specific enough, and therefore can be applied to many archaeological cultures and sites in the region. Thirdly, many of these traits are based specifically on the mortuary record alone, and do not take into account material remains recovered from related settlements. Continued lumping and splitting of cultures within the Andronovo, has not moved us forward in answering questions about interaction and social organization during the LBA.

Problematic to the analysis of Andronovo mortuary contexts is that a good number of them were looted. This destruction of a significant portion of the mortuary record makes the separation of Andronovo into subcultures even more difficult. However, there remains a large amount of data available related to these archaeological cultures, and they must be studied in increasing detail. While several scholars have attempted to differentiate between these two subcultures, there is also a great degree of discussion surrounding sites that have mixed assemblages such as Lisakovsk and Urefty (Usmanova 2005; Stefanov and Korochkova 2008). These sites are extremely important in understanding the ways in which these two culture groups interacted within the steppe zone. In addition, the different assemblages present in localized regions might help to explain how different types of interaction occurred.

4.5.4 Bioarchaeology

Bioarchaeological analysis correlates biological data with archaeological contexts, an integration which has proven problematic in Eurasian studies. As discussed previously, biological data can be difficult to procure, and is often only completed decades after large kurgan excavations are complete. Bioarchaeological studies in former Soviet Union countries are further hampered by several issues including: 1) the separation of the fields of physical anthropology and archaeology into different departments, 2) a lack of trained physical anthropologists available to undertake analyses, 3) sex and age determinations by archaeologists based on funerary remains and other non scientific methods, and 4) the equation of archaeological cultures and ethnic groups by archaeologists, falsely leading physical anthropologists to use these groupings as biological realities.

The study of human skeletal remains can be problematic, as scholars tend to focus on identifying regional homogeneities in populations rather than discussing local variability. This search for similarity has been extended to continents, as anthropological analyses are used to delineate human remains into binary ‘racial’ categories (Mongoloid/Caucasoid). These categories are based almost exclusively on craniometric analyses (Ismagulov 1970; Kozintsev 2004, 2009). Many scholars have addressed problems associated with the categorization of populations into these static groups (for discussion related to this binary division see Armelagos and Van Gerven 2003; Caspari 2009; Edgar and Hunley 2009). In Eurasia, the use of these two fixed categories has perpetuated migration theories as events where one group wholly replaces another without interaction. This is especially problematic for LBA Andronovo groups, as the spread of this culture is posited as evidence of migratory events. A focus on population studies within physical anthropology as well as an equation of ethnic group and archaeological culture have hampered discussions of Andronovo interactions.

The bulk of physical anthropological data available for LBA is used to undertake population studies, where comparative analyses of skeletal collections from specific geographic areas or archaeological culture zones are used to examine similarities. Detailed skeletal data is often distilled into a ‘standard’ for each of these regions based on cranial measurements (e.g. ‘upper facial index’) or epigenetic traits (Ismagulov 1970; Ginzburg and Trefimova 1972; Alekseev and Gokhman 1984; Kozintsev 2009; Solodovnikov 2009). It is difficult to determine from many of these studies the site or burial from which the skeletal remains were recovered, and virtually impossible to use this information for further bioarchaeological studies. In addition, these skeletal remains have few absolute dates, and some remains have mistakenly been attributed to certain cultures and must be used with caution (Solodovnikov 2009).

However, these studies are not wholly without merit, as some verify that variability is evident within these binary categories (Mongoloid/Caucasoid), especially in regards to Andronovo developments (Ginzburg and Trefimova 1972:96). The category of Caucasian has been divided into Proto-European, Pamir-Fergana, and Eastern Mediterranean revealing that geographic differentiation exists (Alekseev and Gokhman 1984). Recent analyses of craniometric data from Russia, Kazakhstan, China, and central Asia, reveal two categories of Bronze Age steppe groups, one from Kazakhstan and Siberia and another from southern central Asia, including Bactria-Margiana (Hemphill and Mallory 2004:207). Finally, while regional research into populations reveal that variability is evident, more detailed studies of local communities need to be undertaken.

In terms of health, pathology, trauma and demography, there is also a pronounced need for smaller regional and local scale studies. Only a few have been published for a handful of cemeteries in north central Eurasia for the LBA. Demographic data was collected from two Andronovo sites, Elovskii-2 and Chernoozer'e-1 located in western Siberia. At these cemeteries the average male age at death was 37 years, and average female age at death was 32 years (Zubova 2008). At the site of Elovskii-2, the demographic profile was approximately 33% adult males, 27% adult females, and 40% children. Finally, at two cemeteries on the Upper Tobol River, demographic data also revealed a great number of children (Matveev 1997). At the site of Chistolebyazhsk, 88.4% of burials were children, while only 9.3% were adults. The site of Khripunovsk contained 37.9% child burials and 58.7% adults (Matveev 1997).

Overall health of the Elovskii-2 and Chernoozer'e-1 populations varied, with evidence of individuals suffering from tooth decay, dental calculus, odontogenic osteomyelitis, as well as traumatic dental injury (Zubova 2008). In addition, at Elovskii-2 it was more prevalent for men to have dental enamel hypoplasia than women, even though men tended to live longer (Zubova 2008). At the site of Lisakovsk, a single individual was found to have died from trauma to the occipital portion of the crania (Usmanova and Kirgizbaev 1998:33). A study of four individuals from the Lisakovsk site compared long bone measurements with individuals from several other archaeological culture groups, including the Yamnaya, Srubnaya, and modern populations to investigate stature (Nechvaloda 1998:50-51). These few attempts at understanding health, trauma, and demography during the LBA are extremely valuable in terms of comprehending local groups. With increased comparative research, this type of data will allow for an increased understanding of local communities, regional populations, as well as the transition from the MBA to the LBA. This dissertation engages in small-scale local studies to examine this transition, as well as to extrapolate this data to the broader region.

4.5.5 Social Differentiation and Identity

For the LBA, there is a general lack of data from permanent settlements, ephemeral camps, and seasonal settlements, as well as less prominent flat grave cemeteries. Therefore, the basis for reconstructions of social organization is relegated almost exclusively to cemeteries containing kurgan architecture. The inadequacies of investigated archaeological materials have been the root cause for a number of theories on 'nomadic steppe warriors' during the Andronovo period. While mortuary assemblages do contain evidence of knives and daggers, they lack any evidence of wheeled vehicles, and instead tend to favor ornamental items and personal effects (Usmanova and Logvin 1998). While the mortuary record has the ability to inform us on individual status and wealth, as well as community structure, these have not been fully explored. In general, changes in material culture are often associated with migratory events and posited interactions between local and migratory groups (for discussion see Tkacheva and Tkachev 2008). The posited link between archaeological cultures and 'ethnic' groups is particularly evident in discussions of the Alakul' and Fedorovo. Burials are often divided in terms of 'ethnicity' (i.e. Alakul' or Fedorovo), which is posited to be the main factor in burial differentiation (Rafikova 1998; Kuz'mina 1994, 2008). These divisions have never been empirically tested to determine if they can be used consistently to examine several cemeteries from the same period.

Few scholars have focused on the examination of differentiation between individuals, or the ways that societies and individual locales were organized during the LBA. Some scholars posit that there were no great wealth differences or social stratification in Andronovo societies and that prestige goods and imported objects were limited (Koryakova and Epimakhov 2007:149-150). However, there does seem to be some age and sex differentiation within Andronovo cemeteries related to animal remains, jewelry and ornamentation, as well as body treatment. For example, Potemkina correlated the ages of individuals with different sacrificed animals, and determined that horses were more likely to be placed with adults, cattle with juveniles and adults, and sheep/goat with infants (1985).

Differential status at the site of Rublevo VIII revealed that children (under the age of 13) were buried with fewer ceramic vessels and generally lacked bronze ornaments (Papin and Popova 2008). Amongst teenager and adult burials, approximately half of the burials contained jewelry and bronze ornamentation. Men and women were equally likely (50% and 45.5% respectively) to be buried with jewelry, however women often had increased variability in type of ornament (Papin and Popova 2008:126). It is clear that gender and age differences do occur within Andronovo cemeteries. Discussion of differentiation at Rublevo VIII may be especially significant because this cemetery was flat, e.g. lacked kurgans, and people were laid in rows, which is qualitatively different than most other cemeteries of this period (Papin and Popova 2008). The sites of Chistolebyazhsk and Khripunovsk on the upper Tobol River were investigated by Matveev (1997). Matveev argues that cremation was not an expression of Fedorovo culture as has previously been stated, but instead is used to distinguish women of specific ages. While this is an interesting attempt at examining gender differentiation, when skeletal remains were absent or poorly preserved biological sex determinations were based on artifact assemblages (Matveev 1997).

4.5.6 Conclusions and Future Prospects

The above sections described previous research on LBA Andronovo developments in north central Eurasia. In regards to the sub-cultures associated with the Andronovo development, specifically the Alakul' and Fedorovo, their identification and division seems related to differentiation seen at specific archaeological sites, environmental, or chronological issues. At this time it is extremely difficult to differentiate between sub-cultures and to determine which sets of material remains are representative of each. Future research into the absolute dating of LBA sites may help to shed light on this problem, especially in conjunction with further stylistic analyses of available ceramics. In terms of the extent of the so-called Andronovo cultural community, continued research into local variability is an absolute necessity.

A synopsis of the LBA reveals several patterns. First, diet and economy is understudied during this period, and this type of research needs to be emphasized. While it is clear that pastoralism is the main subsistence base, a focus on complimentary elements of the diet and economy need to be examined, especially in terms of local communities. Second, the detailed study of settlements and households needs to be undertaken on a large scale. As few settlements and ephemeral sites are currently known, increased full-coverage, regional sized, pedestrian surveys should be undertaken. In addition, a focus on the microstratigraphy of households, and their associated features, would greatly increase our knowledge of the local economy and household production. Thirdly, kurgan excavations have revealed the majority of data related to Andronovo developments, but the study of flat cemeteries and areas outside of kurgans needs to continue. In addition, increased use of statistical analyses and bioarchaeological methods is necessary to move forward in terms of Andronovo mortuary research. Fourth, the addition of physical anthropological data as a correlate will greatly increase our knowledge of LBA developments. This data should shift from a focus on populations to local communities in an effort to examine diversity within the Andronovo cultural development. Finally, studies of Andronovo social organization often are relegated to discussions of their 'lesser complexity' in comparison with earlier and later groups. However, the LBA is significant because it is a time when similar cultural materials spread over a large region. Therefore, increased studies of local social organization need to be undertaken to understand inherent diversity and differential complexity of the Andronovo development.

4.6 COMPARATIVE DISCUSSION OF BRONZE AGE COMMUNITIES

Due to the nature of culture historical data recovered from the MBA and LBA in north central Eurasia, we currently lack clear understandings of the degree of social complexity, nature of social organization, and extent of interactions in the region. A dichotomy is often produced where posited complex societies of the MBA are followed by the less complex groups of the LBA. However, in many cases, the *type* of complexity and the processes that occurred within these societies is muted in an effort to create contrast.

Theories of social complexity posited for the MBA rest on correlations with climate and periods of warfare. However, these must be discussed in further detail. Prehistoric climate is not well understood for the north central Eurasian steppe during the Bronze Age, as few detailed studies have been undertaken. Research into climatic change in central Eurasia has either focused on a small number of sites over a broad area to investigate general changes, for example the investigation of 8 lakes across northern Kazakhstan (Kremetski et al. 2007) or focused on detailed information from a single site, for example a peat bog (e.g. Lopez et al. 2003). An overall lack of knowledge of local ecological conditions parallels a paucity of data available for local zones surrounding archaeological sites. The steppe and forest-steppe regions are affected by continental climate which causes drastic variation in seasonal conditions (Frachetti 2004:99). Today this region has ten year alternating wet and dry cycles, along with recurring droughts (approximately every 8 to 12 years) (Koryakova and Epimakhov 2007:5-6). Scholars disagree on the climatic conditions during the Bronze Age with differing theories on whether the climate has been stable, become more arid, or increased in humidity (Demkin and Demkina 2002; Matveev et al. 2002; Anthony et al. 2003; Koryakova and Epimakhov 2007; Anthony 2009). However, research programs have begun to focus on regional and microregional approaches to determining temperature fluctuations (Demkin and Demkina 2002). Matveev et al. note that between two sites only 50 km apart there is a significant change in the vegetation recovered from cultural layers and they posit that the climate in one area was slightly more humid by comparison

(2002:447). Therefore, until climatic data is collected and analyzed for many local communities this data should not be used as a basis for making claims about Bronze Age groups.

Warfare and conflict are also topics for which we have little direct evidence. Indirect evidence of warfare includes the presence of fortified settlements, 'chariot' burials, weapons as part of funerary assemblage, and the location of settlements in areas to protect winter fodder. Each of these has multiple explanations, which need to be examined in detail. Settlements are identified as 'fortified' based on the presence of ditches, which surround the outer walls. However, not all scholars believe that these were for defensive purposes, and current data reveals that these had multiple purposes. Based on recent excavations, Koryakova et al. state that the ditch was polyfunctional, used to collect water, for economic affairs, as well as for garbage disposal (2011:65). Furthermore, the location of settlements in marshy lowlands and the first terraces of rivers, rather than in defensive locations, is difficult to explain if these communities were dealing with endemic warfare.

While 'chariots' are often cited as clear evidence of warfare and elites, these items have not been studied to their full extent. Beyond spoked wheels, we have little data on the construction of the upper portions of these vehicles. Is it possible that they are wagons or carts rather than chariots? Few scholars have seriously considered the multiple uses of wheeled vehicles in the funerary realm. Furthermore, only an estimated 16 'chariots' have been recovered from this region in comparison with the large number of burials excavated. In early Bronze Age China (Shang period) for example, chariots were used as part of ritualized warfare by the aristocracy and eventually replaced by infantry in the later period (Lewis 1990:60,169). Chariots seem to be discounted in the Chinese texts, with writings discussing how often they were overturned or stuck in the mud (Lewis 1990:109,158). Burial assemblages are also used as indirect evidence of warfare and conflict in prehistory. Items such as bronze adzes, axes, and knives are posited to substantiate the presence of warriors and elites in these communities. However, the lack of trauma on human remains does not support theories that propose that conflict was a regular occurrence. Furthermore, the presence of weapons in burials may have been more likely during times of peace rather than conflict, as described by Härke for the Anglo-Saxons (1990). Therefore, while these items may be evidence of previous times of conflict, or the presence of symbolism related to warfare (for discussion Hanks et al. in press), we must re-evaluate theories which propose that this was one of the organizing principles of MBA societies.

Social complexity is also heavily debated for the MBA, with scholars positing that these communities were proto-states, complex chiefdoms, or simple chiefdoms. There seems to be a disconnect between scholars who focus on community level or micro-regional datasets and those who desire to examine regional developments. Community analyses have revealed that in the mortuary realm differentiation occurs between men and women, and may be related to age grades as well. While some scholars classify individuals as ‘elite’ or ‘warrior’ based on funerary assemblage, these do not always form a specific strata of the community. Furthermore, these individuals are not always located in central graves of kurgans, and therefore may have had more heterogeneous roles in the community. The identification of associations between animal assemblages in burials with concepts of fertility, reproduction, and wealth have also called into question the nature of burial rites. Scholars whose focus is on larger developments often overlook the nature of differentiation in the mortuary realm, which seems more closely related to gender and age grades. No clear hierarchy of individuals based on mortuary rituals is present in these communities, and therefore the degree of social complexity of these groups remains unknown.

In contrast to the previous period, the LBA is considered much less complex in terms of social organization. However, the complexity of this period has not been evaluated to the extent that it should. It is characterized by increased mobility, smaller settlements, and increased cultural heterogeneity. Theories posited for the LBA often are associated with migration and colonization, ethnic delineations, and interaction. The spread of Andronovo cultural materials over a vast region is often associated with changes in climate, and as previously discussed, climatic change often varies based on the environmental niche of the community. Therefore, while climate is certainly a factor in culture change, it should not be used as a deterministic endeavor, especially over broad regions.

Within the Andronovo development, the presence of two main subcultures is posited, namely the Alakul' and Fedorovo. While the differentiation of these subcultures continues to be a subject of disagreement, there is clearly great variability in the archaeological record. This variety has been interpreted as evidence of migration, colonization, ethnic groupings, and processes of interaction. However, few of these theories have been rigorously tested in north central Eurasia. Migration and colonization research often lacks the anthropological data that might illuminate biological differences between individuals or communities. The use of material culture as evidence of ethnicity is also highly problematic (see discussion in Chapter 3). Subcultures within the Andronovo are often regarded as 'ethnic' groups, yet this theory has not been tested using bioarchaeological or anthropological data. Furthermore, scholars continue to debate which mortuary rituals and material culture should be associated with each group, creating problems in culture historical divisions (Figure 4.17).

Social complexity within the LBA is almost wholly unknown and often only discussed in relation to the earlier MBA. Communities are posited to be simple or group-oriented chiefdoms, increasingly specialized, or organized based on sex and age grades. Each of these theories takes a decidedly different tact in exploring community organization. Current research on social organization reveals that gender roles are heavily differentiated in the LBA, and that age grades also play an important part in societies. A focus on female ornamentation may be an important break from earlier periods, which many scholars envision as dominated by male endeavors. The degree of specialization of communities during the LBA in north central Eurasia is still questioned, and an influx of settlement and household data would help to answer many questions related to social organization, specialization, and interaction.

While the complexity of LBA communities is often comparatively described as less than that of the MBA, few scholars have identified what is meant by complexity. Degrees of complexity are often associated with settlement size and demographics, rather than other factors. For example, during the MBA the spread of material culture covers a micro-region and is somewhat homogeneous. In contrast, the LBA is much less homogeneous but the spread of material culture is on a broader macro-regional scale. Is it possible that the social organization during the LBA is less complex, while the complexity of interaction is more intense? There is clearly a need for complexity to be investigated on many levels with integrated datasets in order to fully understand Bronze Age developments. We need to re-evaluate theories that cannot be supported by current datasets and instead focus on understanding complexity of local community organization and interaction.

Culture historical approaches to Bronze Age developments have led researchers to treat archaeological cultures as real entities, easily identified and compared. However, archaeological cultures are a poor reflection of actual social processes in prehistory. As this chapter highlights, archaeological cultures in Eurasia have been designated differently based on material culture correlates. Nevertheless, descriptions of these cultures are often fluid which makes them ineffective as the foundation of prehistoric modeling. Therefore, we must confront these potential issues through the empirical collection and analysis of archaeological datasets.

5.0 BIOARCHAEOLOGY IN CONTEXT: APPROACHES, METHODS, AND DATA

"Interdisciplinarity allows a discipline to grow and prevents it from stagnation, not through the addition of new forms of evidence or the quantitative increase of sources, but because it generates new frameworks and methodologies to approach the evidence."
Isayev 2006:602

Bioarchaeology is an integrated discipline that has elements of biological, behavioral, geochemical, and social research. As an interdisciplinary endeavor, bioarchaeology has the ability to anticipate results that would not have been achieved if each of the disciplines worked independently (Isayev 2006:600). This is particularly evident in mortuary studies where the separate fields of mortuary archaeology and physical anthropology are often united as part of a bioarchaeological program of research. Bioarchaeology, and more specifically four-field anthropology, is not without detractors who feel that holistic research controls and limits anthropology by reducing social phenomena to biology as well as attacks interpretive approaches which are at odds with positivism (Segal and Yanagisako 2005:11). However, there have been great benefits to research programs that are holistic and integrative, which is particularly true in the study of social processes such as the formation and negotiation of identity, organization of society, as well as community integration and interaction. The combined use of ethnographic, biological and archaeological datasets has greatly increased our knowledge of individuals and communities in prehistory.

The goal of this chapter is to discuss approaches to the mortuary record that have informed and structured this program of research. First, a brief history of bioarchaeological research is presented. Second, these approaches are discussed in the context of *multi-scalar research* and *glocalization*, to determine how bioarchaeological research presents a productive fit for these models. Third, methods of bioarchaeological research are examined in relation to identity and personhood, social organization and structure, as well as interaction on the micro-regional level. Fourth, cemetery data is introduced for both case studies Lastly, the coding systems used for skeletal remains and mortuary practices are outlined.

5.1 BIOARCHAEOLOGICAL APPROACHES

5.1.1 The Emergence of Bioarchaeology

Initial approaches to the mortuary record in archaeology and physical anthropology were descriptive, the former examining objects and the latter skeletal biology (Armelagos 2003). However, they were also very different, as one espoused a social science approach to material remains and the other a scientific approach to the categorization of humans. In the 1950's, schisms developed within the fields of archaeology and physical anthropology, moving away from description and towards processual and analytical approaches. New approaches to physical anthropology abandoned typological classification, and began anew with theory driven research and hypothesis testing (Washburn 1951, 1953). While many physical anthropologists neglected Washburn for decades, eventually his contributions productively moved the field forward (Armelagos 2003). In the 1960's the New (processual) Archaeology adopted an empirical approach to investigating the mortuary record in regard to social organization and complexity (Binford 1962; 1964). This new focus on empirical methods greatly influenced the field of study, as well as future bioarchaeological approaches. It was not until the 1970's that the biocultural approach began to infiltrate archaeology and interactions between humans and their social, cultural and physical environments began in earnest (Blakely 1977) as well as the biocultural dimensions of archaeology (Buikstra 1977). Bioarchaeology grew out of a biocultural-oriented approach (Buikstra 1977), while borrowing process and regional-level analyses from processual archaeology (Armelagos 2003). Biocultural developments in physical anthropology were closely followed by a backlash in archaeology against the processual approach and its search for generalizations. The appropriately termed postprocessual archaeology focused on the varied and heterogeneous reasons for, or causes of, a practice (Ucko 1969).

The intersection of these disciplines has had a strong impact on the nature of mortuary studies, and has led to important new interpretations. There has been a general development of important scientific methods within bioarchaeology, such as bone chemistry analyses (e.g. stable isotopes, aDNA, etc.), paleodemographic modeling, and the detailed physical analysis of human remains (e.g. paleopathology, dental non-metric traits, etc.). Unfortunately, these developments have (in many cases) moved away from statistical analysis of mortuary assemblages and the use of empirical data to validate such interpretations (see Goldstein 2006 for overview). In fact, several scholars have suggested that this gap between theory and method is one of the most problematic issues currently confronting the field of bioarchaeology and mortuary studies (Goldstein 2006; Sofaer 2006; Hanks 2008a; Knudsen and Stojanowski 2008). It therefore may be argued that bioarchaeological research must focus on productively bridging the perceived gaps between social theory and scientific method in order to contribute more productively to anthropological modeling and comparative study of social change in the past. Current trends espouse contextual approaches to the mortuary record, which couch human remains within historical and archaeological studies (Buikstra and Beck 2006). New approaches integrate the social, with reference to postprocessual archaeological viewpoints and newfound biological perspectives of identity (Sofaer 2006, 2011). The amalgamation of these viewpoints and approaches has greatly influenced the theoretical and methodological foundation of this dissertation.

5.1.2 Bioarchaeology in Context: Multi-scalar and Glocalization Theories

General trends in physical anthropology and archaeology reveal parallel developments from descriptive disciplines, to the rise of empiricism, and finally to analyses that investigate human variation. The emergence of bioarchaeology was greatly influenced by these trends, and has begun to develop similar methodological and theoretical inclinations. As these disciplines overlap in relation to mortuary research, there is a need to frame them in the context of proposed theories and methods for this dissertation (see Chapter 2). A multi-scalar approach is constructed as part of the glocalization model, which imitates the interplay between socializing and globalizing processes. Each of these scales of analysis is addressed in terms of relevant research in the fields of archaeology, physical anthropology, and bioarchaeology that productively move us forward towards a greater understanding of Bronze Age interaction and integration.

Multi-scalar investigations are especially constructive in concert with a bioarchaeological approach, as the incoming datasets provide detailed information for each level of analysis. The multiple scales of research include the examination of individuals, communities, and a broader micro-regional perspective. Detailed bioarchaeological analyses include discussions of personhood and identity, the funerary process and agency of the living, biological affinities and kinship, social organization, as well as dietary intake and status (Lane and Sublett 1992; Howell and Kintigh 1996; Kolb and Snead 1997; Shelach 2001; Privat et al. 2002; Brück 2004; Fowler 2004; Stojanowski and Schillaci 2006; Stojanowski 2009; Zakrzewski 2011). The incorporation of in depth data at the individual and community scales of analysis allows for a more comprehensive picture of micro-regional Bronze Age integration and interaction to emerge.

The interpretive and integrative framework within which a multi-scalar bioarchaeological approach will be undertaken is 'glocalization'. The study of glocalization explores the ways that individuals, groups, and micro-regions are affected by, and negotiate, socializing (integrative) and globalizing (interactive) processes. While globalization is defined as the flow of information, technology and ideas, the rules that affect this flow can be understood as socialization, which includes language, cultural habits, and living patterns (Gosline 2006:94). The general ebb and flow of integration and interaction are often apparent in the archaeological record, however, the detailed processes that underlay these processes are poorly understood. An effort to understand these processes on multiple scales may be possible through a bioarchaeological approach to the mortuary record as discussed in detail in the following sections.

5.1.2.1 Identity and Personhood

This section conveys the multitude of ways that bioarchaeological analyses allow for the investigation of identity and personhood. For instance, how are individuals and groups affected by broader processes of globalization and socialization? Can these processes be investigated in the mortuary realm at the level of the individual? Research of individuals is a difficult scale of analysis, because they must be understood in context of relationships with other people as well as their communities. Investigations of social identity, biological affinity, and patterns of consumption may highlight interconnections, and the processes surrounding these relationships. The history of identity research has profoundly affected the way that individuals are perceived in prehistory, however current integrated approaches have resulted in more nuanced understandings. Investigations of mortuary rituals must include discussions of the funeral process and the agency of the living. Personal identities and choices of the living may be easier to understand in the framework of personhood, and the relationships between burial goods and the person. In this vein, burial characteristics and assemblages are investigated separately in order to determine how each of these differentially interacts with the individual.

Studies of identity can be vague, as they often present a multitude of definitions within changing theoretical and methodological trends. For this research, identity refers to the way that people perceive themselves, and can be expressed in a variety of forms. Archaeological research first began to examine the social dimensions of societies through discussions of social persona, or the composite of social identities that a person maintained in life and acknowledged for consideration at death (Goodenough 1965; Binford 1971:225). Through the mortuary record, many facets of social persona and identity were examined including social position or status (Saxe 1970:4), a composite of social identities (Saxe 1970:7), vertical rank and status (Binford 1971; Peebles and Kus 1977), and role (Binford 1971). These approaches espoused a direct approach to the mortuary record where the disposal of the dead reflects their status in life (Binford 1971; Tainter 1978). The 'decisions' of the living in relation to the disposal of the dead were rarely discussed (for exception Saxe 1970:9).

Postprocessual archaeology and bioarchaeology have re-shaped the study of identity to include a variety of social dimensions including concepts of gender (Conkey and Spector 1984; Gero and Conkey 1991; Brumfiel 1992), age (Sofaer 2004; Lucy 2005; Gowland 2006), agency (Dobres and Robb 2000), status (Jones 1997), and rank (Peebles and Kus 1971; Brown 1981). This research greatly transformed the study of mortuary contexts, and included discussions of the interplay between social and biological identities. While many of these previous studies examined identity as a discrete entity, rather than part of an integrated whole, there recently has been a call for the investigation of the multifaceted nature of identity as part of a bioarchaeological program of research (Meskell 2001, 2007; Buikstra 2009; Knudson and Stojanowski 2009; Zakrzewski 2011). The multiplicity of identity has been addressed by some scholars, as evident by certain papers in Powell et al. (1991), Gowland and Knüsel (2006), Knudson and Stojanowski (2009) and Agarwal and Glencross (2011). These approaches highlight the interplay of social and biological identities to understand the individual to a fuller extent.

One important issue that may be lacking in a bioarchaeological approach to the mortuary record is a discussion of those that mourn and inter the dead, and the rituals associated with the funerary process and social memory (for exceptions Knudson and Stojanowski 2009). As part of postprocessual archaeology, there has been an intense focus on the mortuary realm in relation to reuse and recycling of grave items (Schiffer 1987), heirloom artifacts, funerals and graves as dynamic events and places (Parker Pearson 1999), and most important, the agency of those burying the dead (Metcalf and Huntington 1991; Parker Pearson 1999; Arnold and Wicker 2001). This concept must be explored in bioarchaeological analyses that propose to examine identity, especially those that examine mortuary assemblages.

the dichotomy between the direct representation approach to individual identity is integrated with approaches that examine ways the living create variability in the mortuary realm and shape the identities of the dead (e.g. Parker Pearson 1993; Jensen and Nielsen 1997; Chapman 2000; Gamble et al. 2001; Joyce 2001; Flad 2002; Brück 2004; Hanks 2008a). This combination of these two viewpoints, allow for improved interpretations of mortuary practice. In addition, concepts such as personhood, allow for the analysis of individuals as agents in society and in this way burial goods are understood as a part of the personal identity of an individual (Harris 1989; Fowler 2004). A broader focus on interpersonal connections allows for investigations of identity as an attribute of relations (Brück 2004). The study of personhood distinctly moves away from direct representation and ‘ownership’ of burial items, and investigates the interplay between the deceased and items associated with them through burial.

The aim of this research is to use integrated bioarchaeological analysis to examine individual identity and personhood, while consciously interpreting which items in the grave are connected to the person and which are part of the funerary process. Previous attempts have examined the spatial location of artifacts within the grave, mortuary construction, placement of animal remains, as well as the temporal arrangement of these items (Parker Pearson 1994; Jensen and Nielsen 1997; Chapman 2000; Gamble et al. 2001; Joyce 2001; Flad 2002; Brück 2004; Hanks 2008a). For multiple burials it was often difficult to determine which person was associated with which items. While specific artifact placement within the grave in relation to the individual is available for some of the burials examined, many of the graves were previously looted and original artifact placement was unknown. Therefore, for this research I have identified five specific actions/activities: mortuary construction (above and below ground), animals in the grave, body placement and position, burial assemblages, and dietary consumption patterns.

Burial characteristics are separated in an effort to investigate the interplay between the deceased and the items associated with them through burial. Stratigraphic relationships between the deceased and funerary items are important to the nature and intention of their deposition. Those items deposited close to the body are likely more closely related to the identity of the individual, while those items deposited at a later date may be part of the funerary process applied by the living (Flad 2002:30-1). Therefore, artifacts placed in close spatial proximity to the individual (human remains) were analyzed using multivariate statistics. Groupings of individuals by particular assemblages were then correlated to age, gender, and kin groups to examine the multitude of identities present in each cemetery. Additionally, when possible, the specific placement of items in relation to the individual is discussed in detail in order to understand the relationship between objects and an individual deposited in the grave. For example, while the location of ornamental items in relation to the head or neck of the individual versus the feet may be significant, this data is not available for all individuals.

Animal remains were often interred in the grave pit just above the head of the deceased. In Bronze Age Eurasia, few of these animals are fully articulated, and instead are often recovered in the form of ‘head and hoof’ type deposits (e.g. Olsen 1999; Hanks 2003:110,290; Olsen 2006). The placement of animals in the grave is examined separately from objects in order to comprehend animal and human connections. Deposits of animals recovered within mound/kurgan fill, ditches, and sacrificial pits were not included in this analysis. Remains of animals recovered from the grave fill, rather than kurgan mound fill, are likely sacrificial deposits, rather than evidence of feasting during construction (Hanks 2003:292). Many of these deposits may represent the livelihood or lifeways of the individuals related to milking and herding, rather than direct ‘ownership’. Problematic to this analysis is the lack of specific information from burials as to the exact location of animal remains in the graves, the position of the animals, the anatomical elements present, and the age of the animal (Zdanovich and Gayduchenko 2002:212-215). Therefore, only general ideas of animal/human connections are interpreted as part of this research.

The placement and position of the human body may signify individual identity from the point of view of the mourners, as placement of the body is a cultural treatment (White et al. 2009). Single burials often have individuals placed on their left side, in either a fully flexed or slightly flexed position. However, double burials tend to have individuals placed on their sides facing one another. Whether individuals were placed in the burial simultaneously, or at separate times, is often unknown. During the Bronze Age in Eurasia, these burials are of great interest because the hands of one individual are often placed in relation to the second individual, under their head or near their face (e.g. Kalieva and Logvin 2002; Usmanova 2005). Unfortunately, these unique circumstances of burial have not been analyzed in relation to biological data such as sex, age or kinship designations. Therefore, the physical positioning of individuals has not been evaluated in relation to their interpersonal connections.

Mortuary construction techniques vary substantially during the Bronze Age, from flat burials that lack overarching construction, to those enclosed by stone rings, or full kurgans (earthen mounds) with stone enclosures and ditches. Burial size and depth can also be important in terms of degree of labor undertaken to bury an individual (Tainter 1975). Burial construction may have less to do with individual identity in life, and relate more to the wishes of those burying the deceased, as mourners construct these settings. Built environments such as cemeteries can act as constant reinforcements of social order and memory within a community (Williams 2006). Therefore, mortuary construction techniques are examined in terms of the desires that the mourners wished to remember the individual rather than in terms of individual identity.

Patterns of consumption include both conscious and unconscious expressions of identity and dietary status. Consumption is a biological act, but is also be imbued with social meanings, as the chemical composition of food is incorporated into human tissue (Fowler 2004; White et al. 2009). The dietary intake of individuals can therefore be used to examine the formation of dietary identities, through the study of carbon and nitrogen stable isotopes. Comparative analyses that investigate connections between social and biological identities may be further supported through dietary data that reaffirms the separation of individuals into certain subgroups within the cemetery. Therefore, patterns of consumption will be examined in concert with biological and social trends associated with identity formation during the Bronze Age.

The above mentioned datasets, including mortuary assemblages, animal remains, body positioning, and burial construction are then compared to previously determined sets of biological data including subgroups based on biological affinity and kinship, gender, and age. The goal of comparative analyses is to investigate the multitude of ways that individuals might navigate broader trends such as globalization or socialization. Individuals often navigate globalizing processes by adhering more strictly to their identities; therefore biologically distinct or non-local individuals might have unique objects, knowledge, or diets (Gosline 2006). In contrast, socializing processes integrate individuals into the group, creating homogeneity in identities, with few non-local items (Pitts 2008:503). However, when navigating globalizing forces, individuals may need to subtly re-negotiate their identities (Pitts 2008:504). Globalizing and socializing processes may differentially affect individuals, and be navigated differently by them, based on gender, age, or kinship ties. For example, in periods of increased interaction, individuals may have a greater ability to exchange materials, as there are more pathways open to them for making connections. The actual level of resolution for investigations of identity (intra/inter-community) and context (mortuary/domestic) strongly influence our reconstructions and interpretations of individuals in the past. Identity and personhood are products of social context and interaction; therefore these concepts are reflected differently based on the scale of analysis (e.g. Lightfoot et al. 1998:202; Nystrom 2009:83-4). Identities are also considered imperative to broader level interactions, and as such are investigated as facets of social organization and structure. Bioarchaeological analysis of the pre-Inka population at Chachapoya revealed a biologically heterogeneous population lacking correlations with material manifestations of identity (Nystrom 2009:93). This lack of biological and material correlation reveals that this community did not have a strong identity, however, after Inka conquest a regional level identity was created (Nystrom 2009:95-6). Social identity is often created through interaction between groups (Barth 1969), as in this case when the pre-Inka community at Chachapoya only became materially homogeneous after interaction and conquest by the Inka (Nystrom 2009:96). Identity formation in this example was catalyzed by conquest, as local communities negotiate broader processes in numerous ways in their interactions with other groups (Knudson and Blom 2009).

5.1.2.2 Community Organization and Structure

The goal of this section is to discuss the ways that community structure and organization are investigated from anthropological perspectives, and to examine these concepts in the framework of glocalization. For this dissertation, a “community” is identified in spatial terms as a cemetery, as discussed in Chapter 2. Spatially designated cemeteries possess high-resolution data for investigating concepts of identity and personhood that cross-cut residential groups. Therefore, we need to determine the underlying organizing principles of communities. How do communities differentially contend with globalizing and socializing processes? The study of individuals within their communities, and the different structures of societies, allow for a greater understanding of these processes. Anthropologists have used diverse approaches to the study of community organization, which has shaped the way societies were interpreted in the past.

From an archaeological perspective, the study of social organization and structure was regarded as an important part of the investigation of prehistoric societies (Saxe 1970, 1971; Binford 1971). Many of these scholars were searching for generalizations to determine the relative complexity of societies rather than how societies revealed these complexities. However in the 1980's mortuary archaeologists argued that a sole focus on ranking and social organization was inappropriate (Hodder 1982; Parker Pearson 1982; Pader 1982), while others began to concentrate on investigations of gender and symbolism (Shanks and Tilley 1982; Conkey and Spector 1984). Critical discussions of mortuary archaeology and its associated theoretical trends were accurate, but instead of supplementing the study of social organization with these approaches, were mostly abandoned (for discussion Goldstein 2006:379). As part of physical anthropology and bioarchaeology, intra-cemetery variation has been investigated to examine kinship, post-marital residence, gender differentiation, status, and age-structure (Bondioli et al. 1986; Howell and Kintigh 1996; Rubini 1996; Stoodley 2000; Robb et al. 2001; Mooder et al. 2005; Stojanowski and Shillaci 2006; Irish and Konigsberg 2007; Sosna 2008).

Community based approaches have suggested that archaeological research should extend beyond hierarchy and status in order to investigate the active nature of identity, ethnicity, and other horizontal (heterarchical) forms of differentiation within early societies (Yaeger and Canuto 2000; Levy 1995). For example, studies of pastoral societies in Africa highlight the "co-occurrence of vertical hierarchies with multiple, horizontally arrayed, ritual associations" (McIntosh 1999:1). Unfortunately, pastoralist societies such as those found in Eurasia and Africa are ignored frequently in investigations of social complexity because they reveal complexities that defy generalizations of prehistoric ranking (as discussed by McIntosh 1999). A ‘community-centered’ approach, as part of glocalization, offers a more comprehensive model for investigating segmentary and heterarchical power structures that underlie horizontal differentiation. A renewed focus in bioarchaeology on the multiplicity of individual and community identities has introduced new social dimensions into the study of these aspects of societies (Knudson and Stojanowski 2009; Zakrezewski 2011). Bioarchaeological research examines the intersection of biological, cultural, historic, and ethnographic datasets to answer questions related to broader processes such as the formation of identity and social structure (e.g. Nystrom 2009).

The underlying principles of social organization and structure undergo constant negotiation, and renegotiation, of internalized rules, rituals, and roles as part of individual identities and society (Morris 1991, 1992:9). As Sahlins stated, “the historical process unfolds as a continuous and reciprocal movement between the practice of structure and the structure of practice” (1981:72). The negotiation and navigation of relationships, whether these are social or biological, form the foundation for the organization and structure of societies. Therefore, the investigation of patterning in mortuary remains, biological affinities, and consumption reflect social representations of identity, and allow for a fuller examination of relationships within communities as well as their structure and organization. The goal of these investigations is to examine the context of these relationships, and the way that individuals interacted and integrated in communities. The study of gender, age, status, trade (vocation), biological affinity and kinship, and diet allows for a deeper understanding of the interplay between the social and biological processes at work within communities.

Social organization can be influenced both by socializing processes, and globalizing trends, which can be understood through the study of glocalization. In order to understand the different ways that communities glocalize, we need to determine the underlying social and biological relationships present. Biological interactions can be examined in the mortuary realm through biodistance studies of individuals. Genetic relationships based on morphological traits of dentition highlight biological affinities within a community. The presence of rare traits within a cemetery would signal that these individuals are non-local, which in combination with gender has previously elucidated post-marital residence patterns (e.g. Howell and Kintigh 1996; Stojanowski and Schillaci 2006). Furthermore, kinship and cemetery structure analyses have identified family groups and determined if cemeteries were structured based on kinship (Stojanowski and Schillaci 2006).

The number, diversity, and type of identities held by non-local individuals permit discussions on the different ways that they negotiate globalizing and socializing processes. In addition, dietary intake and assemblages of non-local individuals should show significant signs of diversity. A biological basis for social identity constructions may also signal that ethnicity is an important part of social organization (e.g. Nystrom 2009). The more heterogeneous, or homogenous, nature of identities can highlight the structure of communities. For example, gender roles that are strictly defined in a community may be evidence that gender is one of the main facets of community structure and identity. However, a combination of several facets of differentiation by age, gender, or lifeway may be evidence of the more heterogeneous nature of social structure.

In order to determine the ways that local communities differentially navigated broader processes in prehistory, biodistance data must be correlated with mortuary assemblages. For example, biodistance research of local communities near Tiwanaku differentially manipulated their identities (Knudson and Blom 2009:204). Both communities had heterogeneous biological affinities and strontium signatures, however based on mortuary remains identities in one community were homogeneous, while in the other more heterogeneous. Therefore, shared material culture did not naturally mean that populations had similar biological stems, which was reiterated in a study of the American southwest (LeBlanc et al. 2008).

What is the overlap between patterns of variation in biology, culture and diet? The examination of each dataset separately allows us to consider if identity is similarly reflected in several groupings, as well as the relationship between and among each of these mechanisms. These datasets are used to examine time depth, and the degree to which changes in social and biological trends occurred in different periods. The goals of this research are to use the cemetery as the local, or community level, of analysis to infer a range of social and biological processes. First, biological affinities are used to examine kin groupings within the cemetery, archaeological patterns are then correlated with this data. Second, individuals with diverse biological affinities are investigated to determine if non-local individuals are present in the cemetery, and to interpret post-marital residence patterns. Third, consumption patterns and biological affinities are compared to determine if dietary status is linked to kin groups or non-local individuals. Finally, patterns of identity are used to infer aspects of social structure and the multiple ways that people negotiate community relationships.

5.1.2.3 Community Interaction at the Micro-regional Scale

How do communities differentially navigate processes of globalization and socialization? Micro-regional approaches inform and examine larger spatial zones, as well as longer spans of time. On a broad level, micro-regional analyses focus on interactions between communities, which may be the result of biological, social, and cultural processes. Bioarchaeological approaches to community interactions have focused on examining cemeteries in terms of kinship, biodistance and post-marital residence (Konigsberg 1988; Gamble et al. 2001; Schillaci and Stojanowski 2002), and the formation of community identity (Stojanowski 2009). In a similar vein, archaeological approaches often focus on the examination of identity (Brück 2004; Shelach 2009), social organization and differentiation (Rothschild 1979; Palumbo 1987; O'Shea 1995; Shelach 2001; Metcalf 2006), exchange (Shennan 1982), and social integration (Kuijt 1996). All of these micro-regional studies focus on processes of interaction and interconnection. These processes often crosscut community boundaries and therefore are an integral part of our understandings of prehistory. In this case, interactions occur between individuals and groups, but may be easier to identify in the context of broader community interconnections (Parkinson 2002). These same concepts are investigated from a temporal perspective, through the analysis of social organization and individual identity in communities from continuous periods. Does diversity in kinship, diet, and identity change from one period to the next? In the context of the significant demographic and mortuary changes that occurred from the Middle to Late Bronze Age, there is a need to understand not only the social structure and integration of communities over time, but also to comprehend the different types of interaction occurring between contemporaneous groups.

Biological affinities are examined in several ways in relation to inter-community studies. The investigation of diversity, or the number of kin groups within each cemetery, could change over time, indicating different degrees of interaction from one period to the next. The extent to which individuals were integrated into communities, in terms of identity and diet, might also change between communities. The overlap or lack thereof, between these datasets allows for greater insight into the variations in not only community structure and organization, but also the different ways that communities negotiate globalizing and socializing processes. The investigation of biological diversity from one period to the next signals the intermixing of whole groups, or specific individuals, based on gender (e.g. post-marital residence patterns). In contrast, a lack of biological diversity in one community or period would indicate the closed nature of the society, which can be tied to an increase in socialization, or overarching control of individuals and groups.

Significant changes in identity may also relate to changes in globalizing and socializing processes. Bioarchaeological approaches examine long-term identity formation and maintenance through investigations of multiple individuals and communities over time. How is gender and age represented in each community, and do these representations change over time? Diversity in the roles or vocations of individuals signal that the community produces many of the items it needs, and that little outside contact is necessary. However, a community where a great number of individuals have similar vocations might be evidence of the role the community as producer in broader interactive global processes.

The aim of this research is to investigate interactions between communities, and temporal changes on a micro-regional scale. The organizing principles of a community are indicative of the ways that groups interact in terms of broader developments. Therefore, we must understand these principles in order to model the glocalization of communities in relation to socialization and globalization. Investigations of identity, kinship and diet at different temporal scales may allow for stronger interpretations of the ways that identity is maintained, or recreated, in different communities. Kinship ties and biological diversity may also transform over longer temporal scales signaling that changes occurred in the vacillation between globalization and socialization.

5.1.2.4 Interpretations: Bioarchaeology and Ethnography

In an effort to formulate more convincing interpretations of bioarchaeological datasets, ethnographic data is used as a comparative set of case studies. The use of ethnographic, ethnoarchaeological, and historic data has become increasingly important in both bioarchaeology and mortuary archaeology as a corollary for mortuary remains (for discussion see Cox 1995; Perry 2007). Comparisons of these datasets include ethnographic information that pertains directly to the mortuary record including discussions of kinship relationships, descent patterns, personal wealth and inheritance, dowries, age-related ceremonies, post-marital residence, and dietary patterns. The known ways that individuals differentially navigate social and biological roles in studied pastoral societies give added insight into our interpretations of prehistoric behaviors. While ethnographic data (see Chp 3) is not be used in a one to one correlation with archaeological materials, it offers nuanced understandings of social and biological differences, and how these may co-vary with forms of burial (Ucko 1969).

5.2 CODING SYSTEMS

Sets of human skeletal remains were given original sample numbers for use in biodistance, mortuary statistics, and stable isotope analysis. For each set of human skeletal remains, several sample numbers could be given based on the collection of available materials including human bone, human dentition, as well as associated faunal material and soils. The separation of these types of data allowed for an easy double check of the number and type of samples collected for each individual. In addition, the Bestamak and Lisakovsk cemeteries were coded with different sets of numbers. Bestamak burials were coded starting with 3500, and Lisakovsk burials were coded starting with 3000. For example, numbers could be given for skeletal material (3000), dentition (3001), associated animal remains (3002) and a soil sample (3003). Numbers were given only when these items were examined, recorded, and collected for future analysis. For final analyses, a system was devised to combine numbers in order to have a single line of data associated with each set of human remains in the Excel database.

A coding system was also established for each category of data recovered from burial contexts. For each set of human remains, data pertaining to original excavation dates, cultural affiliation, mortuary assemblages, burial construction, as well as body position and treatment were recorded. As significant changes in numbering systems have occurred over time, burial information was recorded from the original burial tag, the original report, as well as from subsequently published monographs when possible. The coding system for each of these categories is described in detail below. Coding for biodistance analyses are discussed in detail in chapter 6. When data was missing for these categories it was left blank on the Excel worksheet.

5.2.1 Age and Sex

Age-at-death was estimated from epiphyseal union, primary ossification centers, presence of dentition, suture closure, epiphyseal union, pubic symphysis, auricular surface, degenerative joint disease (Phenice 1969; Acsádi and Nemeskéri 1970; Milner 1992; Buikstra and Ubelaker 1994; Ubelaker 1999), and dental wear (Scott 1979; Powell 1985). The biological sex of subadults, those under the age of 18, was not assigned. An age range was given for each individual. These ranges were then coded as follows: 0- Indeterminate, 1- Infant (0 to 2 yrs), 2- Child (2 to 12 yrs), 3- Adolescent (12 to 18 yrs), 4- Adult (18 to 35 yrs), 5- Older Adult (35 to 50 yrs), and 6- Eldest Adult. Sex designations were undertaken for all adult individuals and were based on the pelvis and skull. Individuals were graded on a scale from 1 to 5: 1- Female, 2- Likely Female, 3- Indeterminate, 4- Likely Male, 5- Male (Phenice 1969; Acsádi and Nemeskéri 1970).

5.2.2 Dental disease

Evidence of pathologies on bone and dentition is an essential element of paleoepidemiological analyses and are associated with stress and dietary intake. Therefore, general health in each of these communities needs to be understood in an effort to examine the complexities of social change. However, for this dissertation, only dental pathological conditions will be examined as they offer very clear evidence of diet and stress. For dentition, both permanent and deciduous teeth were recorded as part of the dental inventory. The investigation of dentition including the presence of calculus, enamel hypoplasias, caries, and alveolar resorption differentially allow for the examination of diet and health in prehistory (Goodman and Clark 1981; Rose et al. 1985; Goodman et al. 1988; Lukacs 1992; Lillie 1996). The identification of caries, calculus, hypoplasias, and resorption were recorded on Arizona State Museum recording forms using previously outlined methods (Hillson 1979, 1996, 2001; Scott 1979; Goodman 1989; Buikstra and Ubelaker 1994).

Dentition was examined by the researcher in an effort to investigate the overall health of individuals within each cemetery. Each set of dentition was evaluated using Arizona State Museum recording forms. Dental caries, abscesses, dental calculus, and enamel hypoplasias were recorded (Moore and Corbett 1971; Brothwell 1981; Goodman 1989; Buikstra and Ubelaker 1994:55-57). While all of these conditions were originally coded in detail, they were eventually transformed into presence/absence scores. Periodontal disease was recorded as: 0=absent, no resorption; 1=slight, less than one half of the root exposed; 2=moderate, more than one half the root exposed; 3=severe, evulsion of the tooth, remnants of the alveolus discernible; 4=complete, tooth evulsed, alveoli completely obliterated. The periodontal scores was eventually transformed into presence absence, with 0=absent and 1 through 4=present. While these transformations do not offer the degree of detail necessary for an in-depth study of health, they do offer sufficient data for an assessment of overall health of a community.

5.2.3 Cultural Affiliation

Cultural affiliation was determined by the excavating archaeologist and was published in the final yearly report. The designation of cultural affiliation is often based ceramics and material culture items found in association with individuals (Logvin 2002; Logvin and Shevnina 2004, 2008; Logvin et al. 2009). These items are part of broader culture historical trends to associate specific materials as archaeological cultures. For Bestamak, the cultural affiliation was coded as: 0=unknown, 1=Petrovka/Novikumak, 2=Sintashta/Novikumak, and 3=Alakul'/Petrovka. For Lisakovsk cultural affiliation was coded as: 0=unknown, 1=Alakul', 2=Fedorovo, and 3=combination of Alakul' and Fedorovo.

5.2.4 Mortuary Assemblage

All mortuary data was gathered from existing archaeological reports and published materials (Logvin 2002; Logvin and Shevnina 2004, 2008; Logvin et al. 2009). Each category of data was recorded as count data after being separated into material types including bronze, stone, bone, bronze, ore, groundstone or lithics, and ceramics, clay or paste. Within each of these groupings a separate column was created for each category of artifact including paste beads, bronze knives, horse remains, etc. (see Appendices A and B). Two additional categories were used which tallied the total number of bronze items, and the total number of artifacts. Count data was coded as absent (0) or present (1, 2, 3, 4…) for each individual and category of artifact. Count data was then converted to presence/absence for use in statistical analyses for the majority of the categories. Missing data was recorded as blank on the data sheets as to not interfere with the statistical program.

5.2.5 Burial Construction

Data on burial construction included both above and below ground structures, however each site was coded slightly differently based on burial types. At Bestamak, few individuals were recovered as part of kurgan (earthen mound) complexes, therefore these were coded as kurgan present (1) or absent (0). No other above ground structures were evident during excavations. In contrast, above ground kurgan (earthen mound) construction at Lisakovsk was coded in more detail. Stone rings were coded on a scale as full ring (5), ¾ ring (4), ½ ring (3), ¼ ring or less (2), rocks covering grave (1), or none (0). Ditches which often were located just outside the stone rings were coded similarly as full ditch (5), ¾ ditch (4), ½ ditch (3), ¼ ditch or less (2), or none (1). The location of the grave pit within the burial structure was coded as in the center of the kurgan/enclosure (4), under the stone ring (3), in the ditch (2), or outside of these areas (1). The number of individuals within each kurgan complex was also recorded as 'number of burials' with only a single burial coded as (1), and more than one coded with a number (2, 3, 4….). Both cemeteries were coded in terms of the wooden structures that were located within the burial pit, which were coded as present (1) or absent (0). The size of the burial was recorded in terms of depth, length and width in centimeters, and then the total volume of each burial was calculated as (length*width*depth) and recorded in square meters.

5.2.6 Body Position and Treatment

The position of the body was recorded in terms of cardinal direction, degree of flexure, and side. The cardinal direction for each individual was based on the orientation of the skull. These were coded as unknown (0), north (1), south (2), west (3), east (4), northwest (5), northeast (6), southwest (7), and southeast (8). The position of the legs was coded as straight, or not flexed (0), slightly flexed (1), fully flexed (2), or unknown (3). The position of the body was recorded in terms of the side it was laying on, and coded as unknown (0), left (1), right (2), or back (3). In addition, the treatment of the body was recorded as either inhumation (1), cremation (2), or unknown (3).

5.3 BIOARCHAEOLOGICAL METHODS

The aim of this dissertation is to integrate biodistance, mortuary statistics, and dietary reconstruction. First, biodistance is undertaken to examine kinship and biological affinities within each cemetery. This data is set up as a framework to determine if kin based relationships formed the basis for differentiation in these communities. Biologically similar individuals are clustered into groups, and this data is compared to mortuary data. Second, multivariate statistics is utilized to examine the ways that mortuary assemblages differentially cluster with certain individuals. The links between biological (age/sex/kinship) and cultural (burial goods, construction, body placement) are investigated in an effort to interpret social structure and organization. Third, dietary data is combined with previous results to determine if consumption patterns were diverse or homogeneous within these communities or subgroups. Individual diet can be intertwined with both social and biological trends in local communities. Finally, these three datasets will be used to interpret the Middle to Late Bronze Age transition, as well as specific questions about broader social themes during each of these periods. Interpretations are based on the interplay of datasets recovered from these analyses in order to understand interaction and integration on the scale of the individual, community, and micro-region. These three datasets were specifically chosen because they allowed for the creation of a full picture of lifeways during the Bronze Age.

5.3.1 Mortuary Statistics

Mortuary data utilized includes funerary construction techniques, body position and orientation, and the type and quantity of grave goods (Appendices A and B). Funerary construction information consists of the size, shape, depth and volume of each burial as well as its location either within a kurgan (mound), within a stone ring, in a ditch or under a stone ring, or outside of these areas. Additional data recorded included body position and treatment including cardinal direction, side, and flexure of the skeletal remains, as well as whether the body was cremated or inhumed. Several anthropological categories were included in this analysis, such as age and sex designations. In addition, clustered biodistance data was used to create subgroups that were biologically related, each of these was given a cluster number and correlated with mortuary data.

Categories of data were recorded on an ordinal scale, a nominal scale, or as count data. An ordinal scale was used to code traits on a gradual scale based on level of expression. For example, stone rings surrounding kurgans were coded in terms of their degree of completeness. A significant portion of the artifacts were originally recorded as count data, and then converted to presence/absence for statistical analysis. Nominal data was scored as presence/absence for categories such as inhumation/cremation and whether wood formed part of the burial structure. Missing data was recorded as a blank on the data sheets so that it did not interfere with data analysis. A full description of coding techniques is discussed in the coding section of this chapter.

Once data was collected, the co-variance of biological and cultural information was undertaken using multivariate statistical analysis. Each cemetery was evaluated using the same statistical techniques and then compared to examine diachronic change. Specifically, cluster analysis was used to evaluate correlations in the mortuary record between artifact types and counts, body treatment, burial size, orientation and construction, with biological sex, kinship clusters and age designations. Multivariate statistical analysis has been effectively utilized to examine identity, rank and status, gender, age-grades, horizontal and vertical dimensions, and social differentiation (Peebles and Kus 1977; Pader 1982; O'Shea 1984; Palumbo 1987; McHugh 1999; Shelach 2009). In data analysis, variables were used to create a similarity matrix using the Gower coefficient to create a distance measure. The Gower coefficient works well with datasets that have both nominal and presence/absence data and can accommodate missing data (Howell and Kintigh 1996). A similarity measure is calculated for each case by counting up the number of matches with valid attributes. In order to create a dissimilarity matrix, this final number is calculated as 1 minus the similarity value. Therefore, if two cases have four matching attributes out of 7 valid attributes the Gower coefficient for the similarity matrix would be 4/7 or 57%, and the dissimilarity value would be 43%.

Using the dissimilarity matrix, clusters were formed using hierarchical grouping based on Ward's method (1963). This method creates mutually exclusive groups in order to understand relationships within the dataset. Each set of clusters had an r^2 value that was determined by the amount of variance that is explained by the clusters. The r^2 value is from 0 to 1, with those approaching 1 explaining the most variance. Clusters were only chosen if they had r^2 values that ranged from 0.70 to 1 (70% to 100% variance explained). After clusters were formed, a chi-square test was used to determine if these clusters were significant when correlated to independent variables such as age, sex, or kinship groups. The results of significance tests were recorded as p-values that were noted both as a percent and a value. The lower the value, the higher the degree of significance of the relationship. Significance values have been designated as *not significant* from 0.01% to 79.9% (p=99.99 to p=0.201), *somewhat significant* from 80% to 89.9% (p=0.200 to p=0.101), *significant* from 90% to 94.9% (p=0.100 to p=0.051) and *very significant* from 95% to 99.9% (p=0.050 to p=0.001).

The formation of clusters explains connections between individuals and places them into groups, however other measures can also help to explain differentiation between individuals. Measures of diversity (Rhode 1998; Plog and Hegmon 1997; Stirling and Wilsey 2001) and wealth (Chapman 1981:42) can also be applied to mortuary datasets to determine variability in an assemblage and may reveal unique differences between individuals. Measures of diversity and wealth can also be applied to mortuary datasets to examine differences between individuals. Scores were calculated for diversity (S) per individual. This calculation is often used in reference to species within a specific ecological zone and is discussed in terms of 'richness' (Stirling and Wilsey 2001), however in this case it refers to the variety of artifact classes per individual and discussed as a measure of diversity (Rhode 1998; Plog and Hegmon 1997). The presence of an artifact within the burial of an individual is counted as 1, therefore an individual with 2 vessels, 3 bronze bracelets, 1 bronze knife, and a horse skeleton would have a diversity score of S=4.

Discussions of wealth are often linked to total artifact count, or counts of specific materials (for discussion Bradburd 2010). In Bronze Age Eurasia, wealth is discussed in relation to bronze items in the grave, or what are believed to be imported items. For this research, total artifact counts, as well as total pieces of bronze are discussed as additional information to support previous clustering of individuals into groups based on burial assemblages, or to examine the different ways that these scores relate to kinship groupings. Material wealth in pastoral societies is linked to livestock, jewelry, rugs, and other transferable items (Borgerhoff Mulder 2010). The transmission of this wealth occurs through social institutions, such as kinship and social ties (Bradburd 2010). Therefore, it is imperative that links between social groups and possible signs of wealth are examined.

5.3.2 Dietary Reconstruction

Carbon and nitrogen stable isotopes have routinely been used to reconstruct human and animal diets (DeNiro and Epstein 1978; Balasse et al. 2000; White et al. 2001; Privat et al. 2002; Ambrose et al. 2003; Privat et al. 2005). The study of dietary intake is rooted in the basic principles of the food chain, because consumption patterns are incorporated into animal tissue. Bone collagen has a turnover rate of years, and thus reflects the average isotopic composition, and dietary intake, of an individual (Ambrose 1993; Wild et al. 2000). For this research, a total of 51 individuals were sampled for carbon and nitrogen isotopic as well as C:N analyses. A sample of adult individuals was chosen from each cemetery in order to have confidence levels between 90 and 95%. In all, 22 adults from Bestamak, 29 adults from Lisakovsk, and 6 animal bones from Lisakovsk were chosen for analysis.

Bone samples were prepared following similar methods described in Richards and Hedges 1999 (see also Privat et al. 2001) with some modifications. Samples of 0.5 to 1.0 grams of bone were cleaned with a Dremmel® tool, washed ultrasonically in deionized water and broken into fragments (Schoeninger et al. 1989). Bone fragments were then soaked in a 1.0 M HCl solution overnight, rinsed with deionized water, and gelatinized at 95°C overnight in 10^{-3} M HCl solution (pH 3). A porosity C (25-50 μm) fritted disk was used to isolate the liquid fraction by filtration. The liquid fraction was then evaporated to 5 ml and freeze-dried to make the final 'collagen' product. Carbon and nitrogen isotope and C:N (atomic) ratio values were measured on 0.5 to 1 mg of 'collagen' using a GV Instruments, Ltd. (now Isoprime, Ltd., a subsidiary of Elementar Analysensysteme) Isoprime™ stable isotope ratio mass spectrometer and coupled EuroVector high temperature elemental analyzer with a diluter kit for sequential isotope analyses. By international standards, nitrogen isotope values are expressed in conventional delta (δ) notation as the permil (‰) deviation from air, and carbon isotope values are similarly expressed in conventional delta (δ) notation as the permil (‰) deviation from the Vienna PeeDee Belemnite (VPDB).

As local environments can differ substantially, a baseline of carbon and nitrogen stable isotopes was constructed to compare isotopic values of humans and animals. The baseline consisted of isotopic ratios of animal remains collected from the same time periods and locales as the human remains. In addition, isotopic ratios of previously analyzed modern samples of Eurasian (lacustrine) fish were used as a relative measure to compare with human dietary intake (Dufour et al. 1999; Privat 2004). The aim of dietary reconstruction is: 1) to examine individual diet in relation to previously identified biological and social groups, 2) to determine if differentiation by diet is related to status, and 3) to examine if consumption patterns changed over time. Biological and social groupings based on biodistance and mortuary statistics will be examined in light of stable isotopic data to determine if correlations exist. Do any of these groups have differential dietary intake? Diet will also be examined in light of specific individuals who may have special status. Finally, consumption patterns will be compared between the middle and late Bronze Age to determine if they are related to previously identified changes in settlement patterning, demography and mortuary rituals.

5.3.3 Biodistance Analysis

Analysis of cemetery structure in terms of biological affinities identifies the composition of kin subgroups and membership. I chose to undertake biodistance analysis of dental morphological traits, as dental remains were the most numerous at both cemeteries (Appendices C and D). This data was used to investigate both intra-cemetery biological affinities between individuals, as well as intra-cemetery variation in biological diversity. A total of 43 dental non-metric traits were recorded for use in determining genetic similarity (Turner et al. 1991). This suite of traits is part of the Arizona State University Dental Anthropology System and is used by researchers to promote comparability of datasets (Irish and Turner 1990; Irish 2010). These specific traits are used for biodistance analysis as they have a high genetic component (Larsen 1997; Scott and Turner 1997) and they are assumed to be selectively neutral (Scott and Turner 1997); they exhibitnoor only slight, sexual dimorphism (Turner et al. 1991). The ‘standard’ protocol (Turner et al. 1991; Scott and Turner 1997) is used here and includes scoring bilateral traits when possible, however only the side showing the greatest trait expression was used in statistical analysis due to the somewhat fragmentary nature of the remains (per Scott and Turner 1997; Gamble et al 2001;). While this strategy has been criticized for under representing frequencies of dichotomous traits in poorly preserved remains (Green et al. 1979) it is used here because it treats asymmetry, assuming that the “maximum genetic potential of each trait is recorded” (Irish 2010:381; see also Turner et al. 1991; Scott and Turner 1997). This method maximizes the sample size, in comparison to methods where only one or the other antimere is used (Turner et al. 1991).

Dental non-metric traits were originally recorded on an ordinal scale, as count data, or on a nominal scale. An ordinal scale was used to code traits on a gradual scale, with lower scores indicating slight expression, and higher with distinct expression. Count data was used to score root and cusp number, as a real representation of the expression. Nominal data was scored as presence/absence for a significant portion of the dental traits. The sample sizes for these cemeteries are small, and there was a good amount of missing data. Therefore, before analysis was undertaken, ordinal scale traits were transformed into presence/absence based on previously identified methods (Turner 1984:67-74; Ullinger et al. 2005).

Binomial probabilities were calculated for 43 non-metric traits in two cemeteries (Figure 5.1). Only those traits that exhibited variability in this sample were used in biodistance analyses. Variability was determined as any traits that had a binomial probability of 0.15 or more from either site, meaning that these traits were 15% (or more) likely to be non-random. The traits that had binomial probabilities in the range of .15 to .99 were used in biodistance analysis and are shaded in Figure 5.1. The binomial probability was calculated as the binomial mass function which determines the likelihood that X=x, or the probability that the trait would be successful

(Kaas and Bruhman 1980; Howell and Kintigh 1996). The formula for the binomial mass function is: **$P(x, n, p) = (n/x)(p)^{x}(1\text{-}p)^{(n\text{-}x)}$ or b(x;n,p)=n!(p^x(1-p)^(n-x))/x!(n-x)!)**

Where x=the number of successes, n=number of trials, and p=probability of success for the population. For each of the traits, the percentage of the population that had valid observations was calculated (p) for both cemeteries combined. This population percentage was used to determine the population probability for each of the traits within each cemetery. The binomial probability is used in problems with a fixed number of trials and when these trials have outcomes that can only be presence or absence.

Dental Non-Metric Trait - Mandible	**Bestamak** (Pres./# Valid Obs.)	**Bestamak** (Binomial Prob.)	**Lisakovsk** (Pres./# Valid Obs.)	**Lisakovsk** (Binomial Prob.)
Shoveling 1st Incisor	0/18	0.00	0/15	0.00
Double Shovel 1st Incisor	3/16	0.24	2/15	0.28
Canine Distal Access Ridge	0/19	0.53	1/11	0.26
Odontome - Premolars	2/23	0.20	0/20	0.38
Lingual Cusps - Premolars	18/24	0.11	10/19	0.10
Anterior Fovea	12/22	0.12	15/21	0.12
Groove Pattern 1st Molar	20/24	0.21	17/21	0.21
Groove Pattern 2nd Molar	14/25	0.13	9/21	0.14
Cusp Number 1st Molar	3/23	0.24	3/23	0.24
Cusp Number 2nd Molar	21/24	0.08	13/21	0.07
Deflect Wrinkle 1st Molar	2/22	0.20	4/18	0.16
Distal Trigonid Crest 1st Molar	0/23	0.00	0/20	0.00
Protostylid - Molars	19/30	0.03	8/28	0.02
Cusp 5 1st Molar	20/23	0.19	21/22	0.28
Cusp 5 2nd Molar	2/24	0.06	8/23	0.06
Cusp 6 1st Molar	1/23	0.34	3/23	0.13
Cusp 7 1st Molar	3/24	0.19	1/23	0.28
Root Number Canine	15/15	1.00	8/8	1.00
Tome's Root 1st Premolar	2/19	0.25	2/9	0.25
Root Number 1st Molar	0/19	0.00	0/11	0.00
Root Number 2nd Molar	6/19	0.12	1/13	0.15
Dental Non-Metric Trait - Maxilla				
Winging 1st Incisor	5/5	1.00	2/2	1.00
Shoveling 1st Incisor	7/17	0.18	6/19	0.18
Shoveling 2nd Incisor	9/21	0.08	8/19	0.08
Double Shovel 1st Incisor	5/19	0.19	7/20	0.17
Double Shovel 2nd Incisor	3/24	0.21	1/19	0.30
Interrupt Groove 1st Incisor	3/18	0.22	1/13	0.32
Interrupt Groove 2nd Incisor	8/24	0.16	3/13	0.22
Tuberculum Dentale 2nd Incisor	10/22	0.16	5/14	0.20
Tuberculum Dentale Canine	13/18	0.04	5/17	0.04
Canine Mesial Ridge	7/14	0.18	9/14	0.19
Canine Distal Access Ridge	2/16	0.27	1/14	0.36
Metacone 2nd Molar	27/27	1.00	20/20	1.00
Hypocone 2nd Molar	25/27	0.04	12/20	0.03
Cusp 5 - Molars	6/30	0.15	3/27	0.19
Carabelli's Trait - Molars	10/30	0.15	9/27	0.16
Parastyle 3rd Molar	0/21	0.54	1/13	0.26
Enamel Extension	0/30	0.31	2/22	0.15
Root Number 1st Premolar	6/21	0.15	5/10	0.16
Root Number 2nd Molar	14/20	0.15	9/10	0.21
Congenital Absence 3rd Molar	0/23	0.56	1/17	0.28
Odontome - Premolars	0/25	0.00	0/18	0.00
Peg Shaped 3rd Molar	4/22	0.13	0/14	0.19
Cemetery Sample Size	**n=34**		**n=43**	

Figure 5.1 Dental Trait Distributions by Cemetery

Transformed data was used to create a dissimilarity matrix using the Gower coefficient to create a distance measure. This matrix was calculated for individuals with five or more shared non-metric traits. The Gower coefficient works extremely well with datasets that have both nominal and presence/absence data. In addition, this coefficient can accommodate missing data in order to form a dissimilarity matrix (Howell and Kintigh 1996; Gamble et al 2001). A dissimilarity measure is calculated for each case, for example: Case A: 1, 0, ., ., 3, 0, 1; Case B: 1, 0, 0, ., 3, 1, 1. For these cases, 0 is absence, 1 is presence, 3 is nominal data, and . is missing data (Howell and Kintigh 1996). These two cases have four matching attributes out of seven valid attributes, and therefore a Gower coefficient of 4/7 or 57%. Therefore, the dissimilarity between these two attributes is calculated as 1 minus the similarity value for each case. Therefore, for the above case, the Gower dissimilarity coefficient would be 1 - 0.57 = 0.43, or 43%.

Finally, clusters were formed from the dissimilarity matrix using Ward's method of minimum variance (Ward 1963). Ward's method is a hierarchical grouping procedure that clusters cases into mutually exclusive groups in order to understand relationships within the collection (Ward 1963). Clusters are formed as the distance of the members of a cluster from the mean of that cluster. In this method, the distance is the error sum of squares, or the total sum of all squared distances of all points from the means of the clusters to which they belong (Shennan 1988:241). The goal of this method is to join individuals successively, so that the minimum error sum of squares is used (for discussion and examples Shennan 1988).

5.4 THE BESTAMAK AND LISAKOVSK COMMUNITIES

5.4.1 Bestamak Cemetery (Middle Bronze Age)

Located in northern Kazakhstan within Kostanai Oblast' (administrative region), the site of Bestamak is situated on the right bank of the Buruktal River (Figure 5.2). The Buruktal is a small tributary of the Ubagan River, which is a tributary of the Tobol River. The site, which includes both a settlement and a cemetery, were excavated intermittently from 1981 until 2007 by a variety of researchers including V.N. Logvin, S.S. Kalieva, G.V. Kolbin, E.V. Podzyuban, A.V. Logvin, I.V. Shevnina, A.V. Kolbina, A.V. Neteta and S.A. Boroshilova. Few reports of the settlement and cemetery have been published, therefore mortuary datasets were culled from unpublished excavation reports with permission of the original researchers. No systematic analysis of burials from this site occurred prior to the initiation of this dissertation. Several small studies of the mortuary site have been published, which include discussions of status, gender, and the lives of children (Kalieva and Logvin 2002; Logvin 2002; Shevnina 2003; Logvin and Shevnina 2004; Logvin and Shevnina 2008; Logvin et al. 2009; Shevnina and Boroshilova 2009). The physical anthropological study of human remains, including dental morphological traits, has previously been undertaken by A.V. Kolbina who is in the process of publishing these materials. Settlement data for Bestamak has never been officially published, and little information is publicly available. This may be partially due to the complicated stratigraphy at the site and difficulty of excavation and interpretation (A. V. Logvin and I. V. Shevnina pers. comm.).

Figure 5.2 Location of Bestamak Site (1) in northern Kazakhstan

In this study I treat the cemetery of Bestamak as a ‘burial community’, using only burials that correspond to the Middle Bronze Age (2100-1700 B.C.). Other burials recovered from this cemetery span several periods stretching from the Neolithic to Middle Age. The cemetery is composed of both flat and kurgan (earthen mound) burials in an area measuring 68 by 138 meters (Figure 5.3). More than 170 burials were excavated from the Bestamak cemetery, however only 60 were relatively dated to the Middle Bronze Age and are used in this analysis. Recent radiocarbon dating of the cemetery gives it a range of dates from 2032 to 1633 cal BC (Logvin and Ševnina 2013). However, these dates are for only three burials, therefore the remainder of the cemetery is dated based on associated cultural material and designated as one of the following culture-historical groups: Sintashta/ Novykumak, Petrovka/Novykumak, Petrovka, and Alakul'/Petrovka. Culture-historical designations were determined by the original excavators based on their extensive knowledge of the material culture of this region.

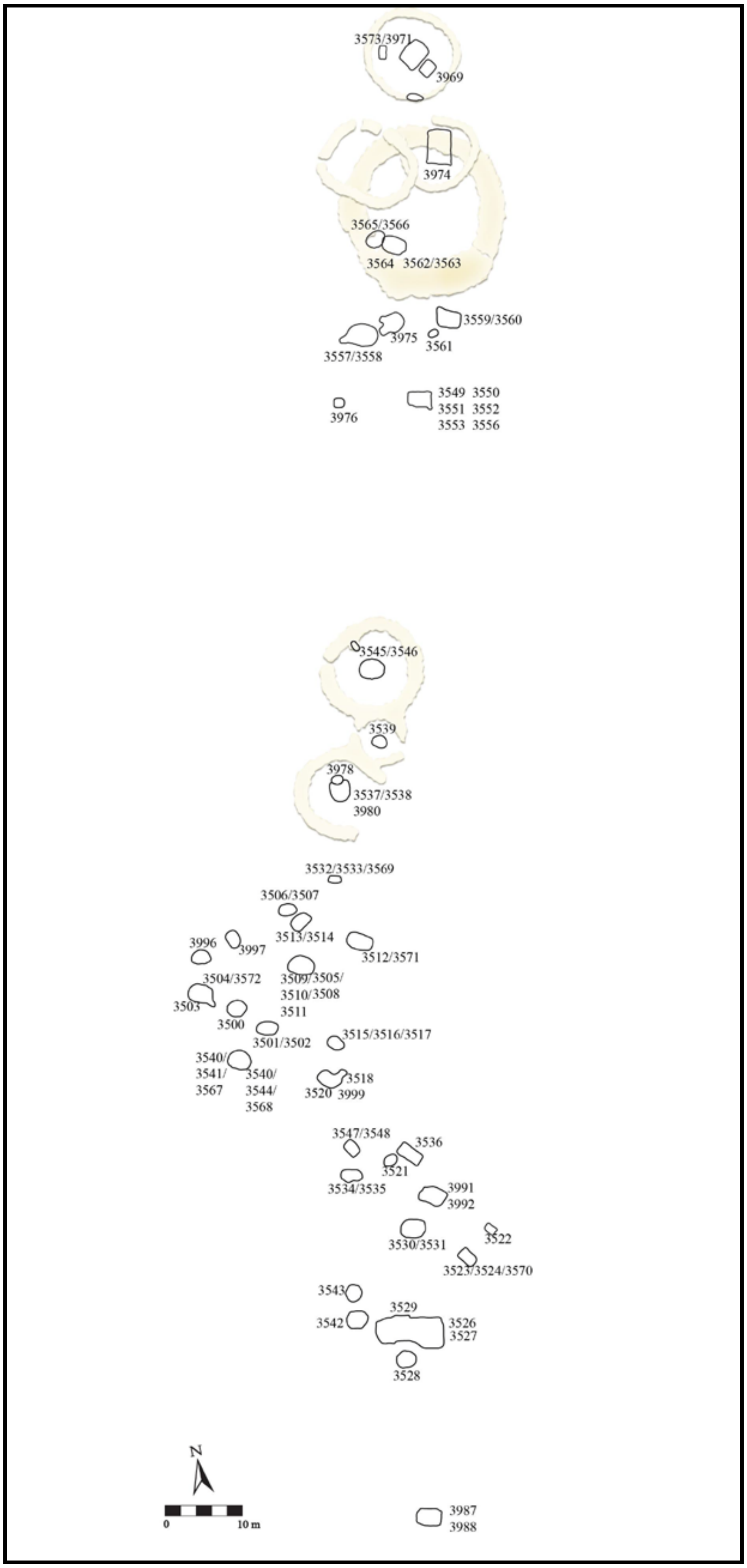

Figure 5.3 Plan view of the Bestamak cemetery (after Kalieva and Logvin 2002)

In total, I examined 44 individuals from burials that contained single, double, and multiple individuals. The preservation of the human remains can be described as fair to good, however few complete skeletons were recovered. In addition, an unknown number of crania initially recovered from these burials were collected by physical anthropologists and stored in separate locations. Since the breakup of the Soviet Union, these remains have not been returned to the original excavators, nor has craniometric or dental data been published. The current whereabouts of these remains are unknown, and therefore are believed to have been lost or may be missing provenience. Of the 44 individuals examined, only 15 of 33 adults (45.5%) could be positively designated as male or female (Figure 5.4). As the analysis of skeletal material often results in a range of biological ages, individuals were split into age groups. Age ranges at Bestamak consisted of children (15.9%), adolescents (9.1%), adults (34.1%), older adults (18.2%), eldest adults (4.5%), and adults of indeterminate age (18.2%) (Buikstra and Ubelaker 1994). No infants were recovered during excavations, which may be a result of taphonomic processes, or a different spatial location of burial for these remains.

Category	Age Range	Male	Female	Indet.	Total Count
Infant	0 to 2	-	-	-	0
Child	2 to 12	-	-	7	7
Adolescent	12 to 18	-	-	4	4
Adult	18 to 35	2	6	7	15
Older Adult	35 to 50	3	3	2	8
Eldest Adult	50+	1	0	1	2
Indeterminate Adult	18 to 50+	-	-	8	8
Total		6	9	29	44

Figure 5.4 Age and Sex of Individuals from Bestamak (Available for Dissertation Research)

A second set of burials within the Bestamak cemetery were previously examined in terms of age and sex, but unfortunately were unavailable for analysis (pers. comm. Lindstrom). For these burials, only general age categories (i.e. subadult or adult) were used. The biological sex of individuals was often identified through skeletal analysis, but not used in this study, as inter-observer error can be extremely problematic, especially in terms of fragmentary skeletal materials. In addition, one grave (Burial #3990) had an assemblage that lacked human skeletal remains, but contained personal items including stone projectile points, a bronze awl, and a ceramic tube. While this may be a cenotaph that should be examined, the presence of only one such burial makes it difficult to incorporate into statistical analysis, and therefore was excluded from this study.

Category	Age Range	Total Count
Subadult	0 to 18	11
Adult	18 to 35	3
Indeterminate Age	Unknown	2
Total		16

Figure 5.5 Age of Individuals from Bestamak (Not Available for Dissertation Research)

A total of 44 individuals were biologically aged and sexed and another 16 individuals were analyzed in the field by a physical anthropologist (Lindstrom), but not available for examination (Figure 5.5). Therefore, a total of 60 individuals were used in statistical mortuary analysis for the Bestamak cemetery. General age frequencies for these burials include subadults (30%, n=18), adults (63.3%, n=38), and individuals of indeterminate age (6.7%, n=4). At Bestamak 60 individuals were interred in 46 burials. The majority of burials at Bestamak were single burials (78.3%, n=36). There were fewer double burials (17.4%, n=8) and two multiple burials (4.3%) - one that contained 3 people and one with 6 people. The burial with 6 individuals is rare for this time period and contained cultural materials associated with the Middle Bronze Age. It is very difficult to determine if the interment of multiple individuals in a single grave occurred simultaneously, or over a length of time. Adding to this difficulty is that many of the burials were looted, possibly in prehistory or later, and are likely missing items as well as skeletal remains.

Body position at Bestamak has often been cited as evidence of gender differentiation, especially in double burials (Figure 5.6). Men were frequently placed on their left side and women on their right side facing each other and posited to be husband and wife (Kupriyanova 2008; Shevnina and Boroshilova 2009). However, a great number of these individuals are subadults, and biological sex identification not possible (Kupriyanova 2008; Shevnina and Boroshilova 2009). In single burials, individuals are most often placed on the left regardless of gender (60%). Double burials may therefore be special cases that may reflect gender relations as much as kinship relations between two individuals, such as the burial of an adult man and his young child. In addition, the only triple burial identified at the cemetery may reflect a family unit or siblings, with two unsexed adults placed on their left sides and a child between them.. Unfortunately, for Bestamak we lack detailed chronological information required to test whether these individuals were placed simultaneously, or over larger spans of time (for similar issues see Chapman 2005 on megalithic tombs in Europe). There are no instances of cremation identified at the Bestamak cemetery to date; however these types of burials are not unusual for Bronze Age Eurasia and are identified at the LBA site of Lisakovsk (Usmanova 2005).

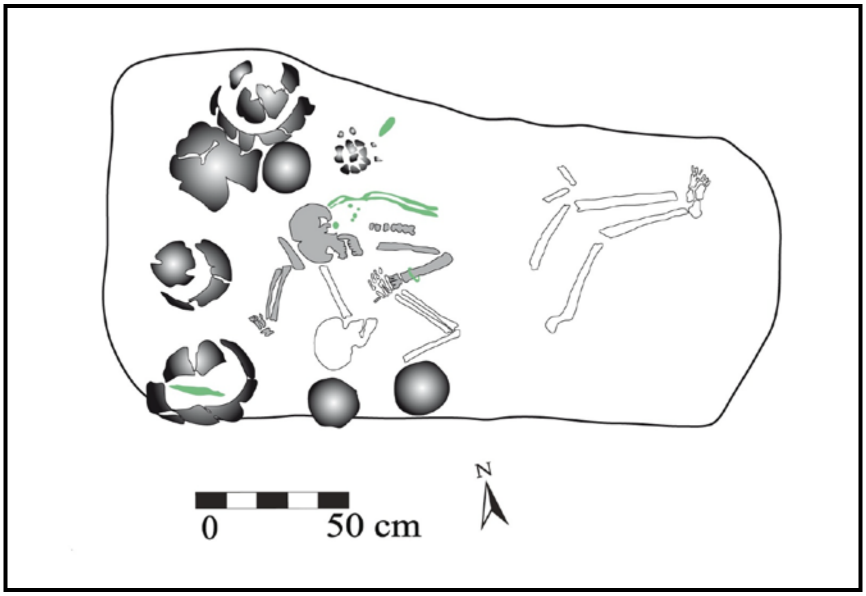

Figure 5.6 Double burial from Bestamak - Bronze objects in green (after Kalieva and Logvin 2002:47)

Burials are usually rectangular in shape, and often measure from one to three meters in length, and one to two meters in width (Appendix A). Burial depth varies from as little as half a meter to over three meters. There is much variation in relation to the inner construction of burials, with less than half of the burials containing a wooden structure or lining, placed on top of or surrounding the individual. This cemetery contains seven kurgans (earthen mounds) with surrounding ditches and flat graves. Kurgans are circular in shape, with one central or several burials, and an outer ditch marking their extent. The number and placement of burials within a kurgan may be indicative of differential status within a community due to the higher degree of construction and management necessary.

Grave assemblages almost always include ceramic vessels as well as animal remains. Ceramic vessels often have an open form, including straight or rounded walls with fluted necks, and flat bottoms that can also be incised (Figure 5.7). Ceramic decorations often include incised lines and toothed stamps to create geometric designs. There is much variation in the designs present on these vessels, which can cause confusion in the placement of these into specific archaeological culture groups. Animal remains exist in many forms in burials and are often placed on top of the individual. The main animals recovered at Bestamak include cattle, sheep/goats, and horses, with the occasional pig, dog, wolf, and fox. Animal remains can be complete and articulated, but are more likely to be found in pieces and parts, most often 'head and hoof' deposits. In addition, it not unusual to find a single canine tooth of a dog, wolf or fox that might have been hung from clothing or worn. The presence of shells in burials is not uncommon, as this region was once covered by sea, therefore fossils and shells are found in riverbeds even today.

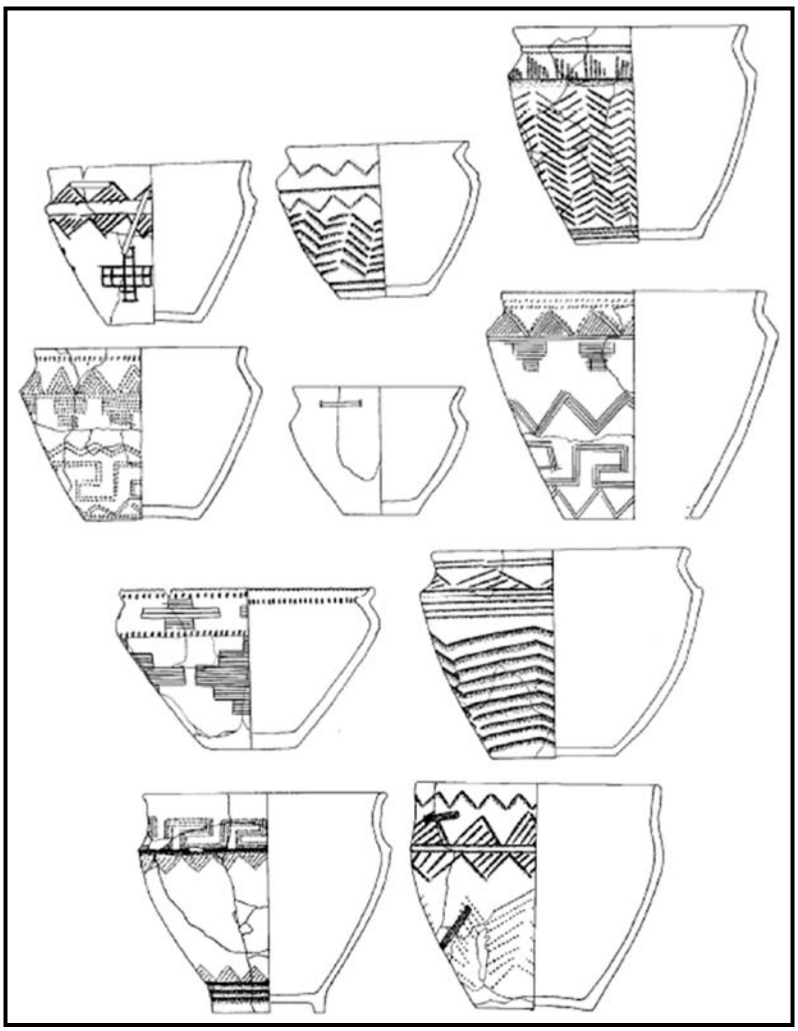

Figure 5.7 A selection of ceramic vessels from Bestamak (from Kalieva and Logvin 2002)

Metal objects, especially bronzes, are the most often recovered objects from burials and are considered evidence of wealth and status. Items can be divided into categories based on form and function even if they were never used in this capacity. Objects we might consider functional include, knives, axes/adzes, hooks, needles awls, nails, and sickles (Figure 5.8). Bronze ornamental items often recovered near or on the body include bracelets, earrings, rings, clamps, beads, badges, and pendants (Figure 5.9). Some of these items are regularly recovered as part of a headdress or braid plait consisting of beads and pendants (Figure 5.27). These are posited to have been worn hanging from the back of the head either attached to a hat or to the individuals' hair (Usmanova and Logvin 1998; Kupriyanova 2008; Usmanova 2010). Bronze 'staples' (skrepky or skobochky) were sometimes found holding together ceramic vessels, which may have been heirloom items. It is unlikely that these vessels were used in a traditional sense, as many of them have large breaks and holes where the staples enter the vessel. However, they could be used for storage, decoration, or other purposes. There also are staples recovered outside of the context of vessels and likely had multiple uses.

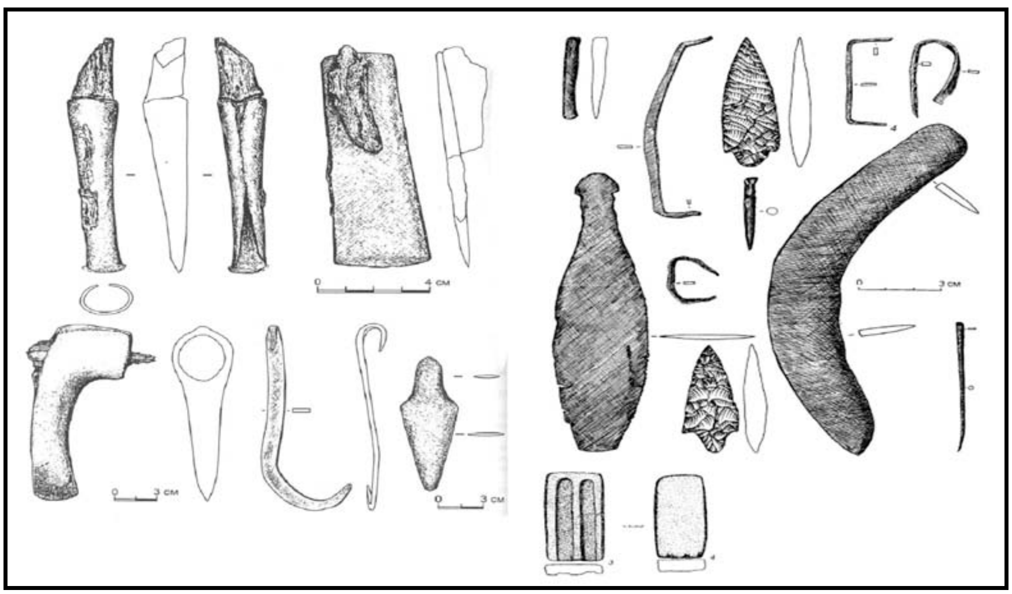

Figure 5.8 A collection of bronze tools (adze, axe, meat hook, sickle, knife), bronze staples, stone projectile points, and stone mold for bronzes from Bestamak (Kalieva and Logvin 2002:40, 43; Logvin and Shevnina 2008:194)

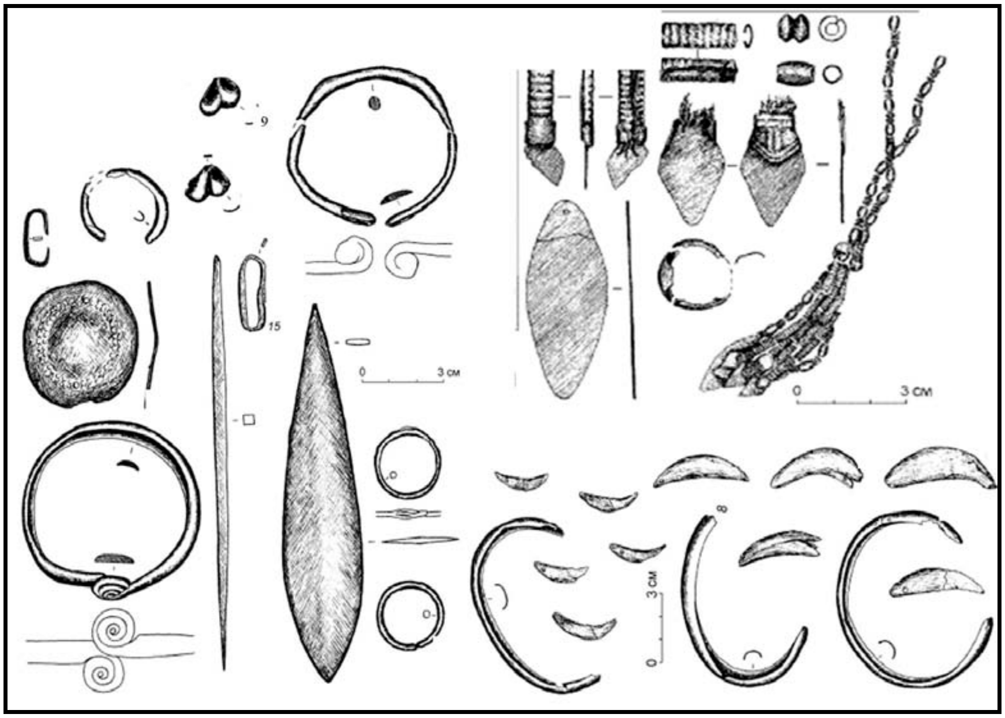

Figure 5.9 A collection of bronze jewelry, braid plaits, bracelets, earrings, pendants, badges, as well as animal tooth pendants from Bestamak (Kalieva and Logvin 2002:51,52,56)

The Bestamak cemetery is unique due to the large block excavations that were undertaken. This excavation technique allowed for the examination of areas outside readily apparent kurgan mounds and ditches, which verified that flat burials were present within some Middle Bronze Age cemeteries. The presence of both flat and kurgan burials is important, as we are attempting to understand differential identity and social organization, and therefore need a cross section of the community. Therefore, only through a greater comprehension of the Bestamak 'community', can we progress in our understandings of the Middle Bronze Age in this region as a whole.

5.4.2 Lisakovsk Cemeteries (Late Bronze Age)

The Lisakovsk site is located in Kostanai Oblast (administrative region) in northern Kazakhstan (Figure 5.10). The site is comprised of a cluster of seven cemeteries (numbered 1 through 7) and a settlement located within a 12 km zone along the banks of the Tobol river near the city of Lisakovsk (Figure 5.11). Cemetery number 1 is located next to the settlement, and therefore is not marked on the map. Several books have been published on the cemetery including *Lisakovsk Burials I: Facts and Parallels* and *Women's Costumes in Bronze Age Kazakhstan* (Usmanova 2005; Usmanova 2010). Published articles about the cemeteries have focused on headdresses and braidplaits (Usmanova and Logvin 1998) and funeral rites (Usmanova et al. 2005). These volumes are detailed accounts of the rituals and clothing at the Lisakovsk site, however neither includes the statistical analysis of burials. The physical anthropological study of human remains has only partially been undertaken by A.V. Kolbina, and has never been published. While settlement data for Lisakovsk has never been officially published, a group of pithouses (~6) on the bank of the Tobol River was previously excavated (Usmanova pers. comm.).

Figure 5.10 Location of the Lisakovsk site in northern Kazakhstan

The cemeteries that comprise the Lisakovsk site are treated as a single burial community. However, only burials that correspond to the Late Bronze Age (1700-1400 B.C.) are used for statistical analyses . These seven cemeteries were composed of several types of burials including kurgans (earthen mounds) with ditches, stone covered or enclosed burials, and flat burials which lacked stone or earthen markers. All cemeteries are aligned along a 12 kilometer stretch within the Tobol River floodplain. Cemeteries 2 through 5 (Figures 5.12, 5.13, 5.14) are located on the left bank of the Tobol River, while cemeteries 6 and 7 (Figures 5.15 and 5.16) are located on the right bank. Cemetery 1 and the settlement are in close proximity, on the right bank of the Tobol River, close to the city of Lisakovsk. Each of these cemeteries is mapped separately, however cemetery 1 is confusing because it consists of five separate groups (Figure 5.17). Each of these groups is then mapped separately as group A (Figure 5.18), group 3a (Figure 5.19), group B (Figure 5.20), group G (Figure 5.21), and group V (Figure 5.22). Each group is denoted in its distance and direction from the settlement, with group A located 500 meters to the southeast from the settlement, and group 3a located 80 meters directly south of group A. Group B is located 250 meters northeast of group A, and 600 meters to the east of the settlement. Group G is located 300 meters southwest of the settlement, while group V is located 700 meters to the south of the settlement.

Radiocarbon dating and dendrochronological analysis of timbers were recently completed for portions of the site (Panyushkina et al. 2008). Calibrated ^{14}C ages (1σ) were averaged for each of the cemeteries and resulted in the following dates for the LBA: Lisakovsk 1 (1860-1770 cal BC), Lisakovsk 4 (1800-1700 cal BC) and Lisakovsk 5 (1770-1680 cal BC) (Panyushkina et al. 2008:465). These dates are significant, as they are centuries older than previously thought based on ceramic seriation (1500-1400 BC) (Usmanova 2005). The more specific dates for portions of the cemeteries have pushed back the dates for the site as a whole to 1860-1680 cal BC (Panyushkina et al. 2008). Previous dates given to graves were based on associated cultural materials, designating burials as Alakul’, Fedorovo, or Alakul’/Fedorovo. The original excavators, who have extensive knowledge of the material remains in this region, determined these culture-historical designations. Therefore, while new dates for the site have pushed back the original time frames, general culture-historical names for these burials are intact.

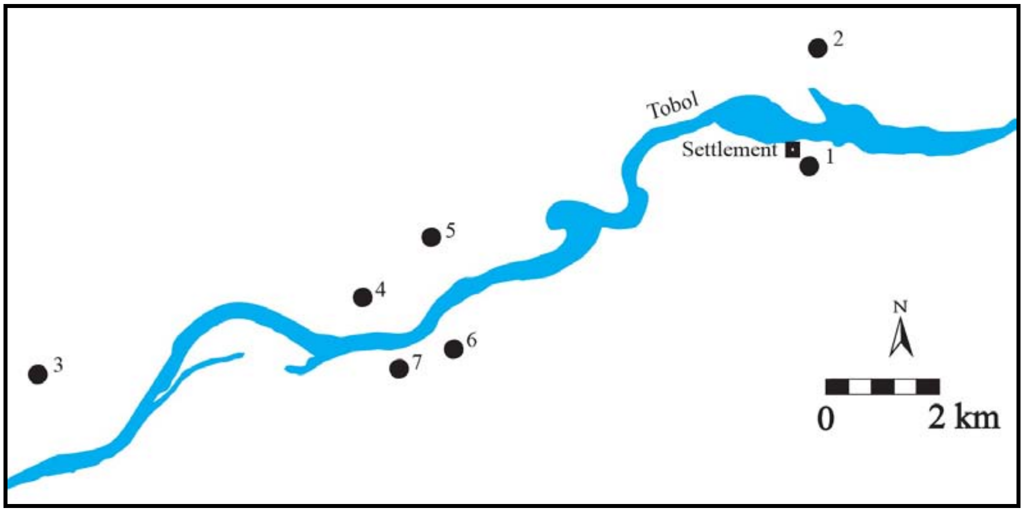

Figure 5.11 Lisakovsk Cemeteries 1 through 7 and Settlement

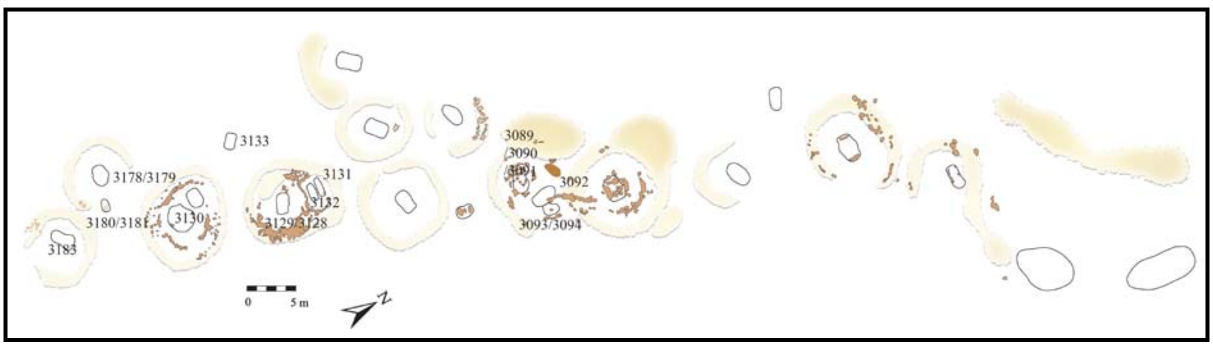

Figure 5.12 Lisakovsk Cemetery 2

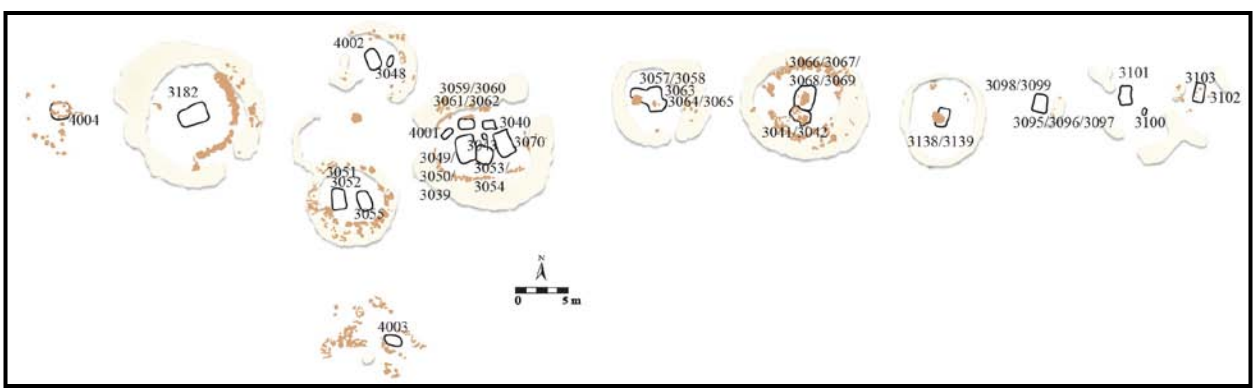

Figure 5.13 Lisakovsk Cemetery 3

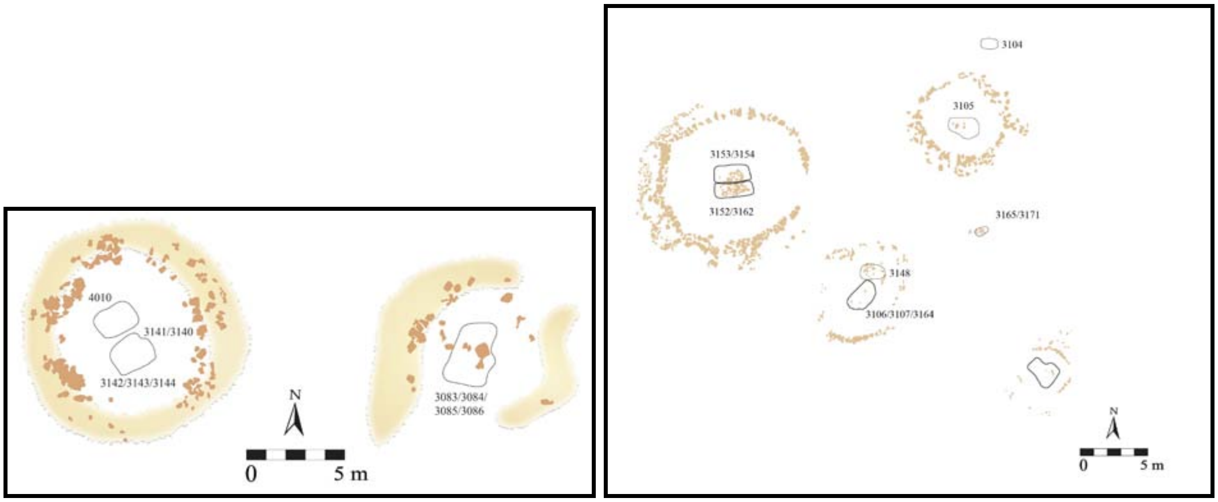

Figure 5.14 Lisakovsk Cemeteries 4 and 5

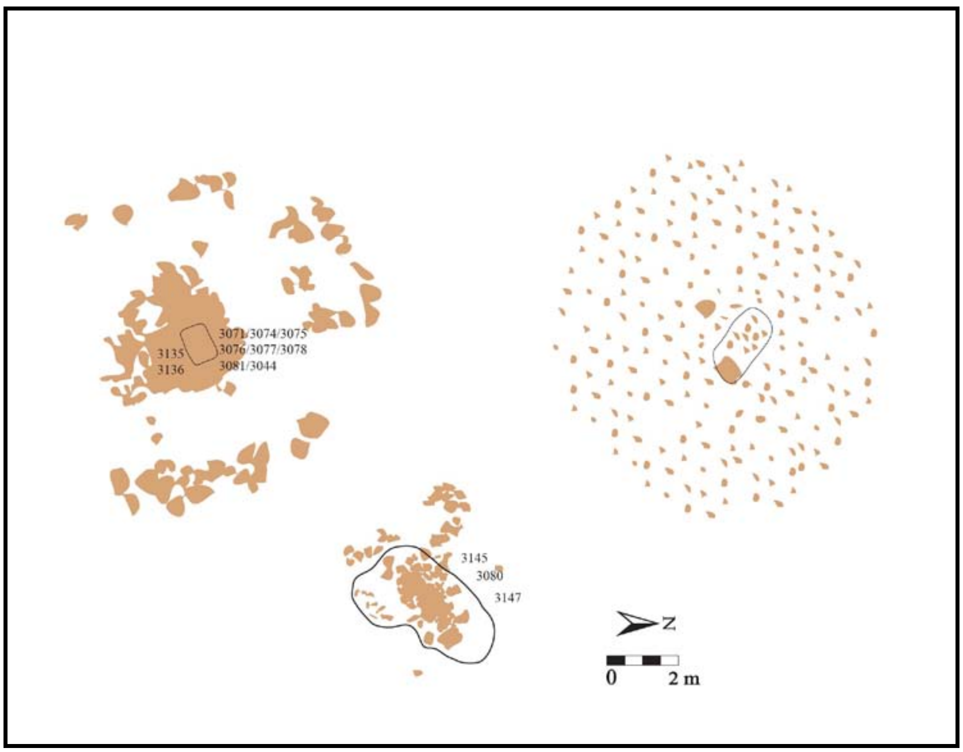

Figure 5.15 Lisakovsk Cemetery 6 (light brown features are stone)

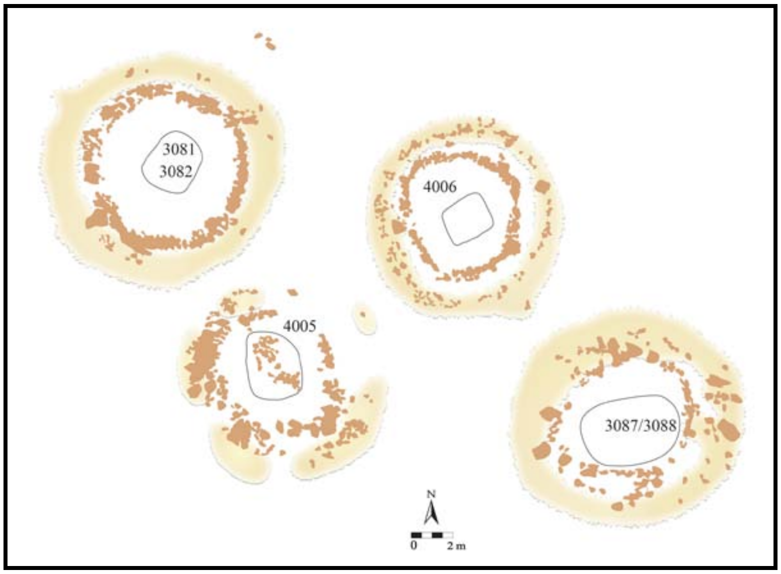

Figure 5.16 Lisakovsk Cemetery 7

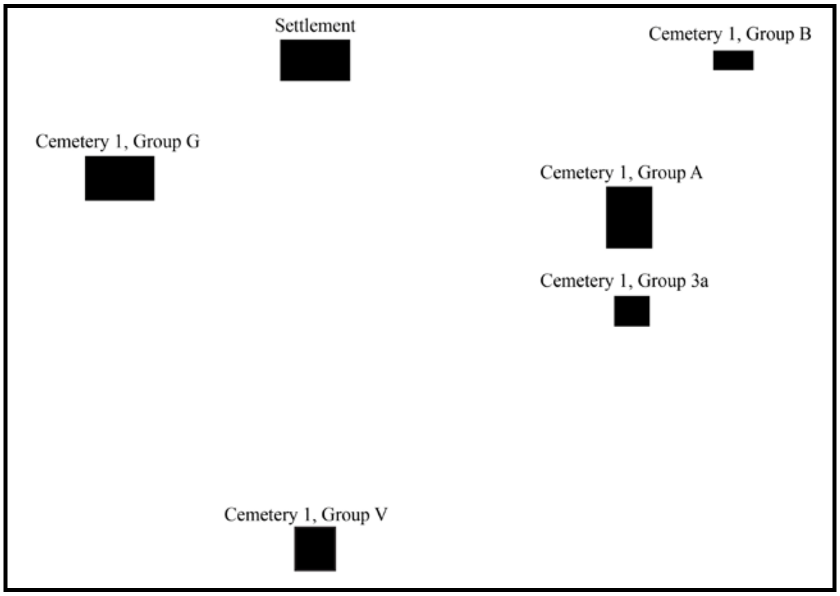

Figure 5.17 Spatial Relationships within Lisakovsk Cemetery 1 (Groups A, 3a, B, G, V) and Settlement

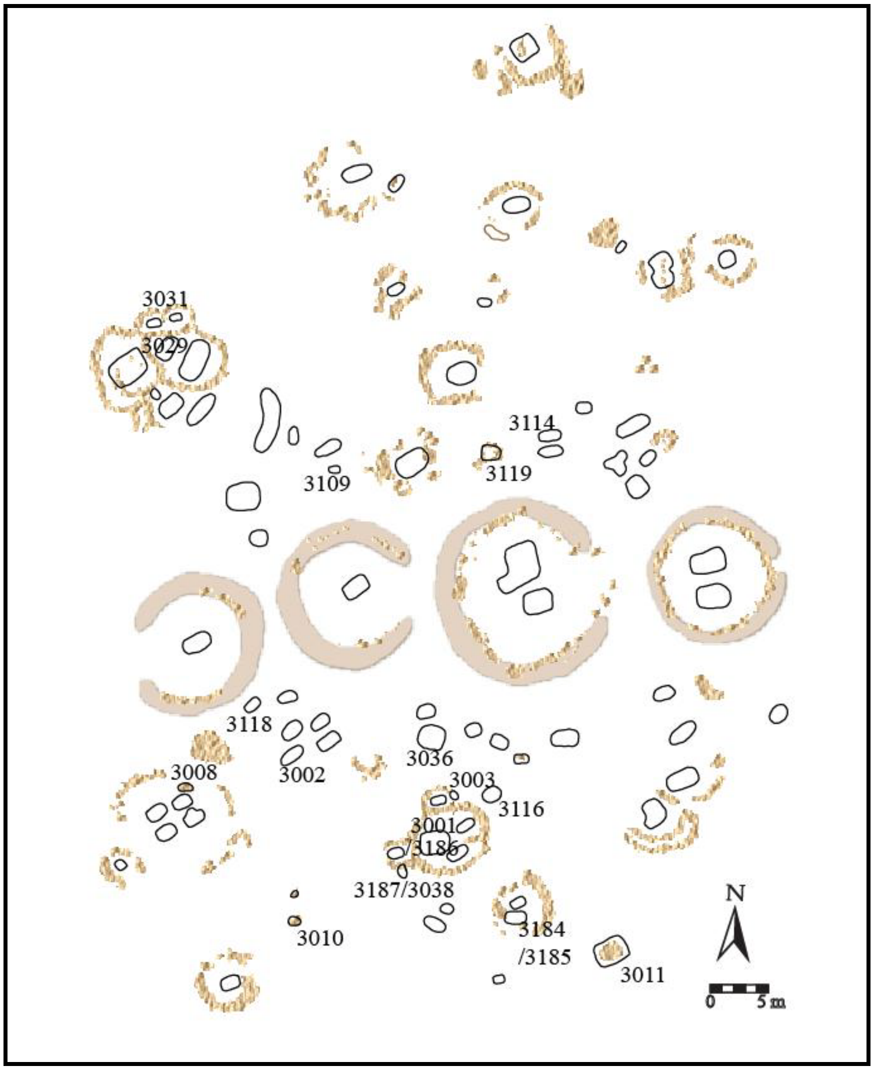

Figure 5.18 Lisakovsk Cemetery 1, Group

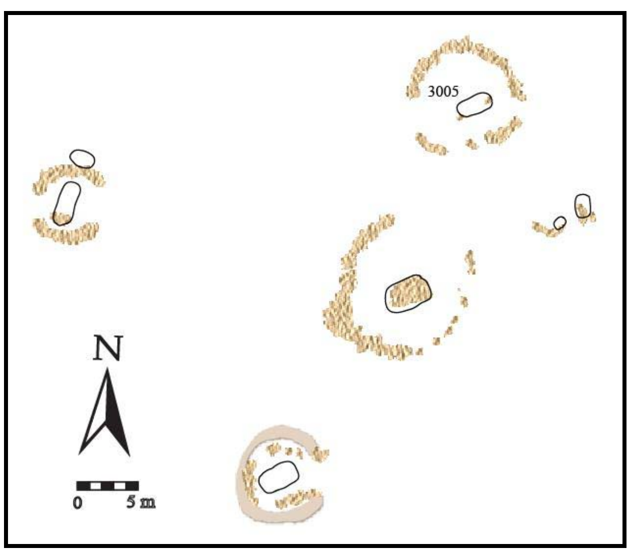

Figure 5.19 Lisakovsk Cemetery 1, Group 3a

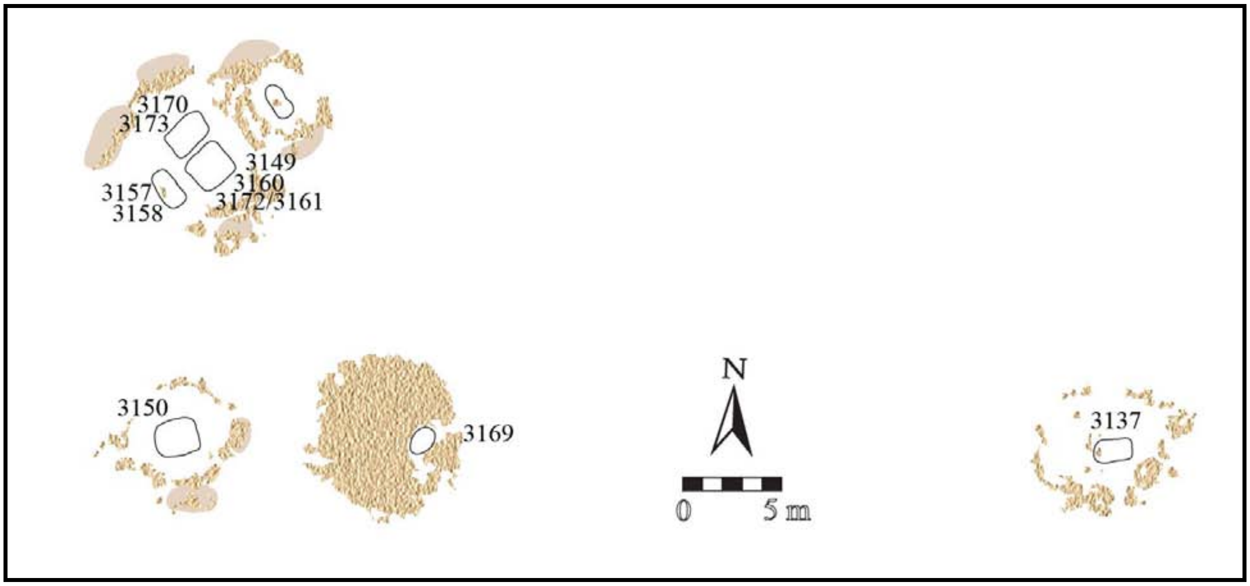

Figure 5.20 Lisakovsk Cemetery 1, Group B

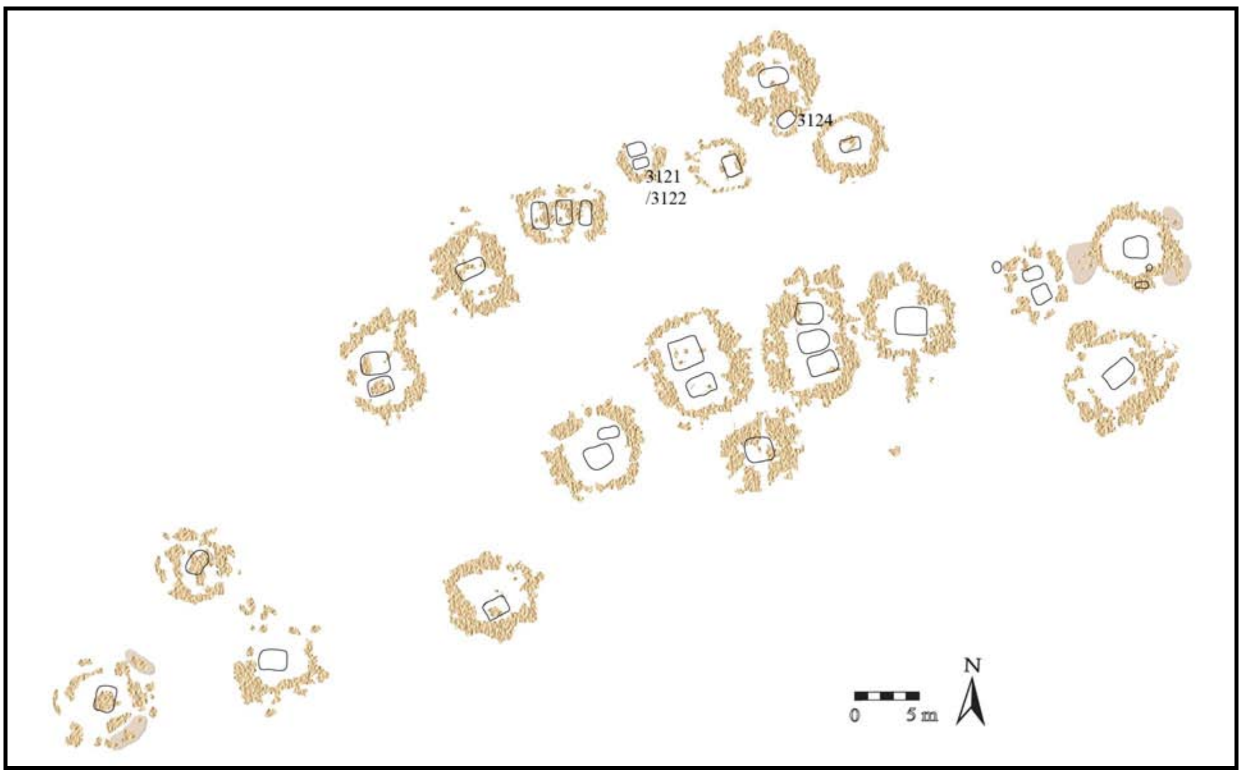

Figure 5.21 Lisakovsk Cemetery 1, Group G

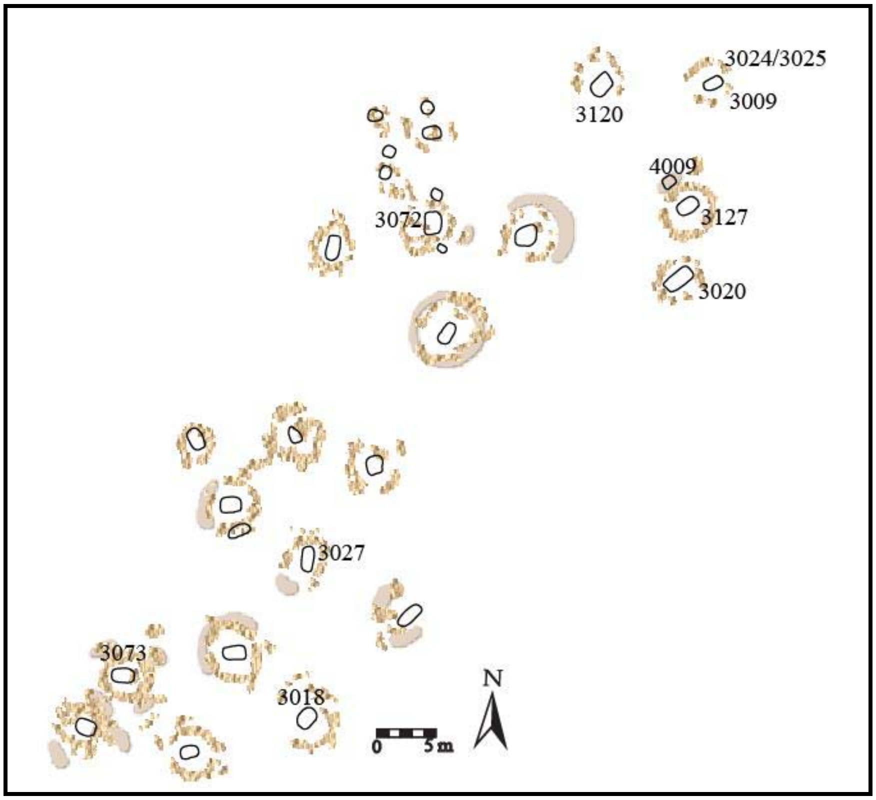

Figure 5.22 Lisakovsk Cemetery 1, Group V

A total of 88 individuals were examined from burials that contained one or two individuals. Preservation of human remains from the site ranged from good to poor, and few complete skeletons were recovered. An unknown number of crania initially recovered from these burials were sent to separate locations during the Soviet Union for analysis by physical anthropologists. The resulting analysis of these remains has not been published, and their current whereabouts are unknown. Of the 88 individuals examined, only 8 of 38 adults (21.5%) could be assessed as male or female (Figure 5.23). Age groups were distributed as follows: infants (6.8%), children (27.3%), adolescents (7.9%), adults (18.2%), older adults (6.8%), eldest adults (2.3%), adults of indeterminate age (15.9%), and those whose age was indeterminate (14.8%).

Category	Age Range	Male	Female	Indet.	Total Count
Infant	0 to 2	-	-	6	6
Child	2 to 12	-	-	24	24
Adolescent	12 to 18	-	-	7	7
Adult	18 to 35	1	3	12	16
Older Adult	35 to 50	3	0	3	6
Eldest Adult	50+	1	0	1	2
Indeterminate Adult	18 to 50+	-	-	14	14
Indeterminate Age	Unknown	-	-	13	13
Total		5	3	80	88

Figure 5.23 Age and Sex of Individuals from Lisakovsk

Strategies of body treatment including both inhumation and cremation were used in these cemeteries. Often, these treatments are attributed to a specific cultural group, with inhumation attributed to the Alakul' and cremation to the Fedorovo, however this division is not clear for all burials. Because of body treatment techniques, the total number of individuals in each burial was difficult to determine. For double burials it is very difficult to determine if the interment of individuals in a single grave occurred simultaneously, or over a length of time. Adding to this difficulty is that many of the burials are looted, possibly in prehistory or later, and may be missing items as well as skeletal remains. The body positions of individuals at Lisakovsk are difficult to assess due to the presence of cremations, a great deal of looting of burials, and poor bone preservation at the site.

Burial pits are often rectangular in shape and measure from one to three meters in length and one to two meters in width (Appendix B). Depth varies from as little as thirty centimeters, to over two meters. The inner construction of these burials varies, some containing a wooden structure or lining above and surrounding the individual, and others lacking this structure. As discussed, above ground burial construction at Lisakovsk is extremely variable. Kurgans are often circular in shape with surrounding stone rings and ditches reaching a meter in depth.

Kurgans vary in overall size, but usually have a single centrally located burial or several burials inside the stone ring and ditch features. Burials located within kurgan structures are believed to belong to individuals with higher status due to the degree of construction necessary (Zdanovich and Zdanovich 2002). Burials surrounded by stone enclosures, or stone rings, have also been found at Lisakovsk. Enclosures usually measure less than two meters and are either circular or rectangular in form. Sometimes several enclosures are combined to share walls, and form what seem to be burial groups. In addition, many flat burials have been excavated that lack kurgan, stone rings or enclosures, and ditch features.

Burial assemblages often include one to several ceramic vessels, with great variety in shape and design (Appendix B). Ceramic decorations include stamping and incised lines represented by geometric shapes (triangles, meanders, zigzags). Many of these vessels have an open form with straight or rounded walls with fluted necks and flat bottoms. There are also ceramics that are rectangular and flat-bottomed, with very short walls and four pinched corners (Figure 5.24). Vessels are placed either at the head or the feet of the individual at the bottom of the burial pit. In contrast, animal remains are placed on top of, or in the fill above, the individual. The main animal remains recovered from Lisakovsk are sheep/goat, horse, and cattle often as part of ‘head and hoof’ deposits. A good number of sheep/goat or cattle astragal bones of were also recovered. The presence of shells in some burials is also not unusual, as shells and fossils can be collected from most river beds.

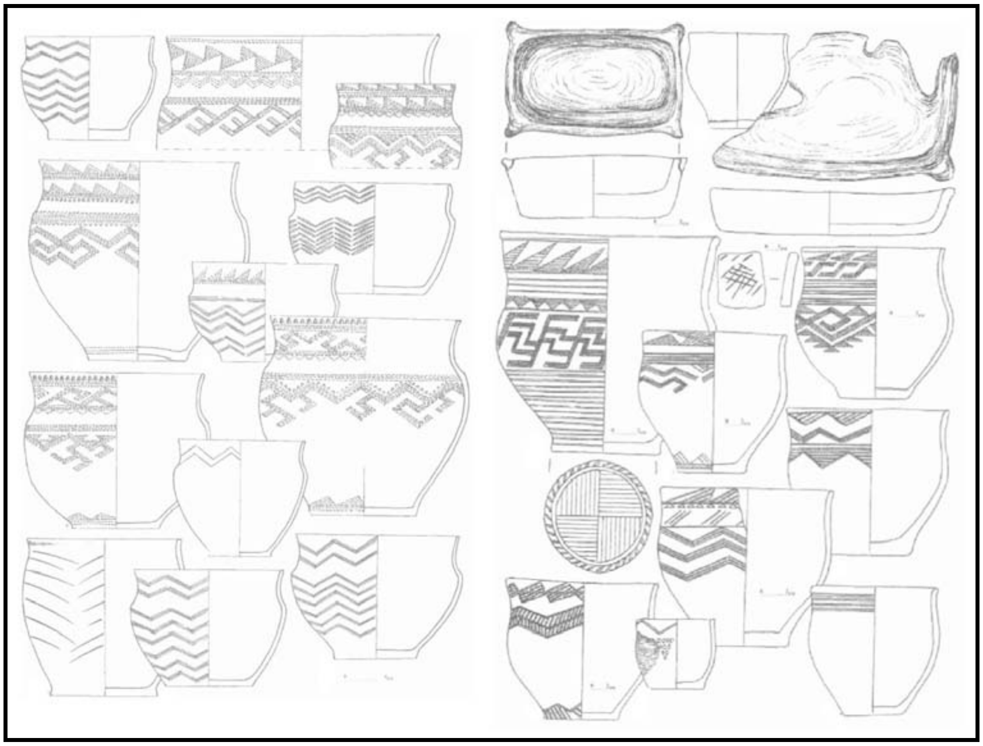

Figure 5.24 Selection of Ceramic vessels from Lisakovsk (Usmanova 2005:195, 205)

In addition to animal remains, the most frequently recovered objects are of bronze. These items can be divided into categories based on form and function, even though they may have never used in this capacity. Functional items include knives, axes/adzes, needles, awls, and nails (Figure 5.25). Bronze ornamental items, which are often recovered on or near the body, include bracelets, earrings, rings, clamps, beads, badges, and pendants (Figure 5.26). Bronze clamps and beads are regularly recovered as part of braid plaits and headdresses that were likely worn hanging from the back of the head as part of a cap or attached to the hair (Figure 5.27) (Usmanova and Logvin 1998; Kupriyanova 2008; Usmanova 2010). Some ceramics are posited to have been heirlooms, as they are held together by bronze staples (skrepky or skobochky). Many of these vessels have large cracks as well as small holes perforating the sherds so that the staples could hold them together. These vessels could be used for storage, decorative, or other purposes. There also are staples recovered outside of the context of vessels and therefore must have had other uses.

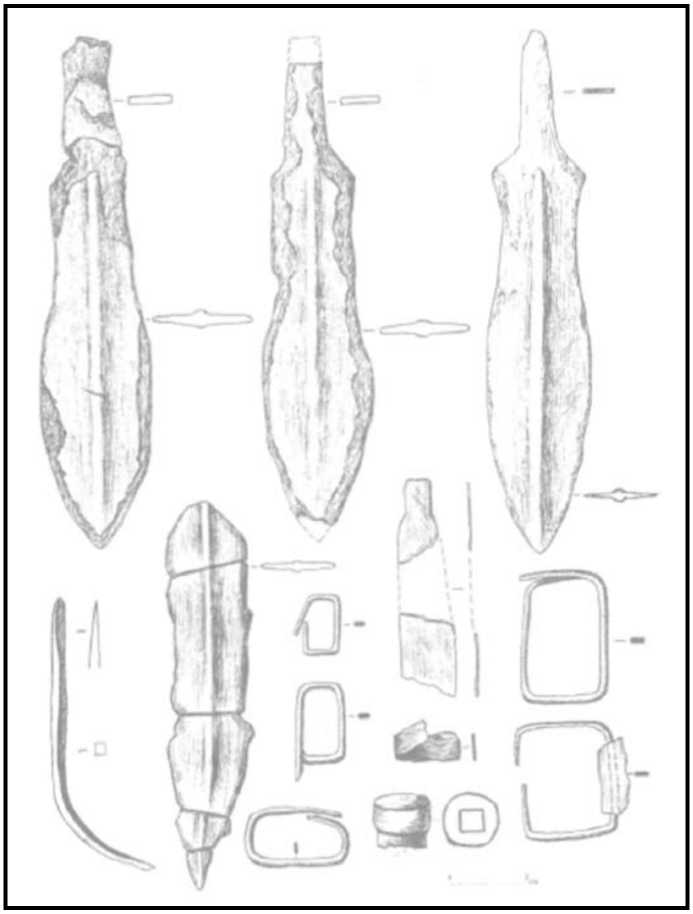

Figure 5.25 A collection of Lisakovsk bronze knives, nails, and staples (Usmanova 2005:216)

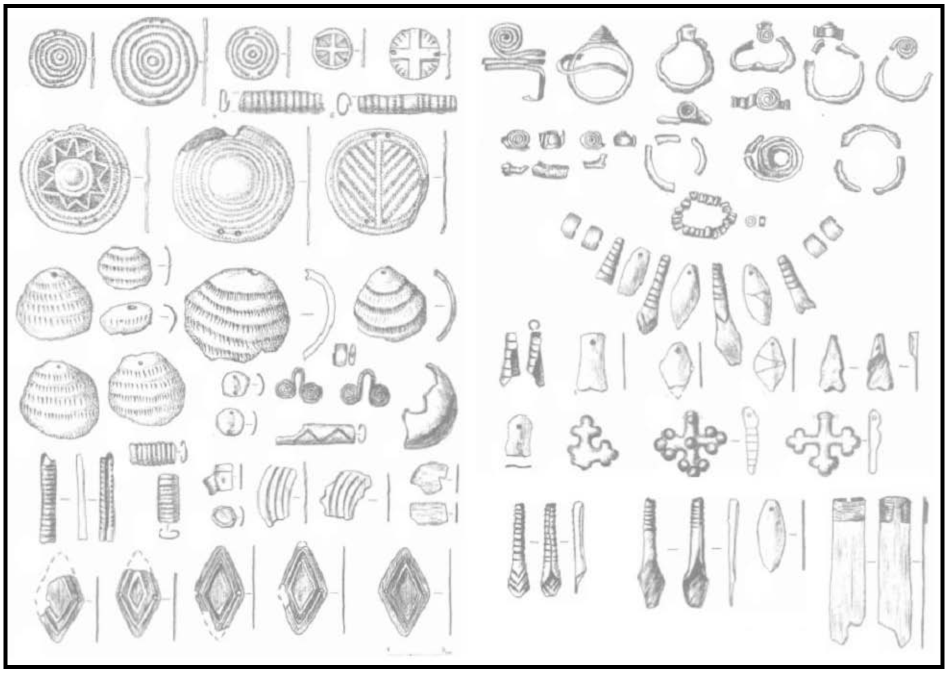

Figure 5.26 A collection of Lisakovsk bronze badges (blyashki), shell and bronze pendants, bronze rings, bronze beads and pendants, and portions of bronze braid plaits (Usmanova 2005:215,213)

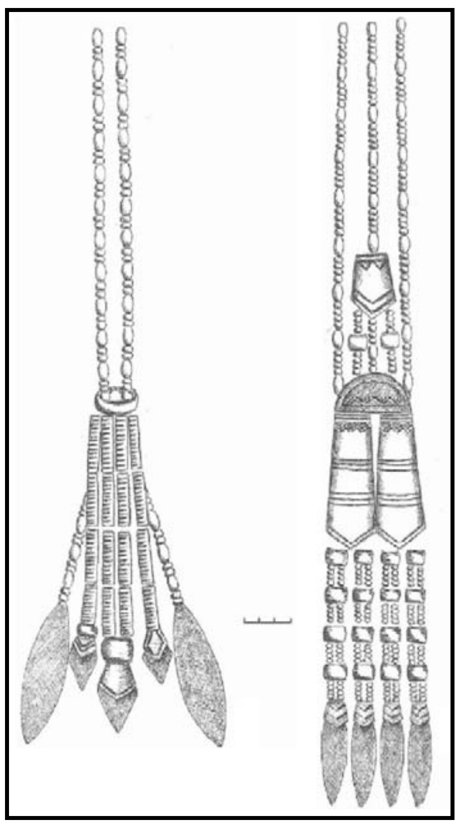

Figure 5.27 Reconstructed braid plaits (headdresses) from Bestamak (left) and Lisakovsk (right) (Usmanova and Logvin 1998:32)

5.4.3 Demographic Data (Bestamak and Lisakovsk)

As a comparative measure, age-at-death distributions and population estimates were calculated for the Bestamak and Lisakovsk cemeteries. The age-at-death distributions of these cemeteries are very different, especially because Bestamak lacks infant burials, while the Lisakovsk site has a great number of infant and child burials (Figure 5.28). This may partially be due to taphonomic processes, but more likely due to different types of burial or funerary rituals for children under two years of age. Bestamak also has a much higher percentage of adults (69%) than Lisakovsk (43%) (Figure 5.29) which makes the age-at-death distribution different than would be expected from a predicted death profile where many more children and elderly would be present.

	Bestamak (%)	Lisakovsk (%)	Bestamak (count)	Lisakovsk (count)
Infant (0-2)	0	7	0	6
Child (2-12)	12	27	7	24
Adolescent (12-18)	7	8	4	7
Subadult Indet.	12	0	7	0
Adult (18-35)	33	18	20	16
Older Adult (35-50)	13	7	8	6
Eldest Adult (50+)	3	2	2	2
Adult Indet.	20	16	12	14
Unknown Age	0	15	0	13
Total	100	100	60	88

Figure 5.28 Comparison of age-at-death distributions for Bestamak and Lisakovsk

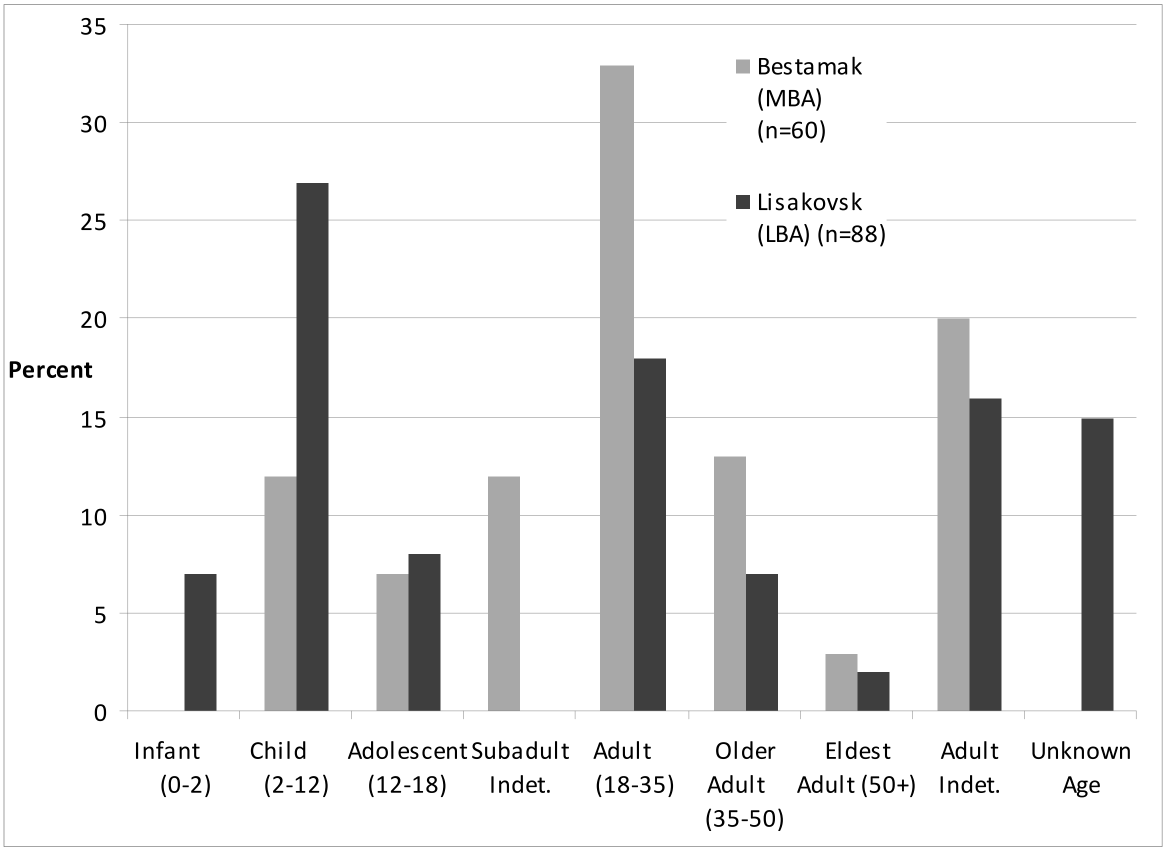

Figure 5.29 Comparison of age-at-death distributions for Bestamak and Lisakovsk (Percentages)

5.4.4 Dental Indicators of Health (Bestamak and Lisakovsk)

The crude prevalence and frequencies of individuals affected by dental disease is presented in Figure 5.30) For both sites combined, only a single individual had a carious lesion. A lack of caries conforms to general patterns for hunter-gatherer populations and pastoralists who have a high protein and low carbohydrate diet (Powell 1985; Lillie 1996) or a noncariogenic diet including items such as sorghum (Turner 1979). In addition, a high degree of calculus deposition at Bestamak and Lisakovsk, 82% and 70% of individuals respectively, further supports this dietary trend. The presence of calculus is often associated with high protein diets that lack carbohydrates and sugars (Hillson 1979; 1996; 2001).

		Total Bestamak	Male	Female	Total Lisakovsk	Male	Female
Individuals with Dentition	%	56.7	-	-	48.9	-	-
	n	34/60	4.0	9.0	43/88	4.0	3.0
Periodontal Disease	%	84.2	75.0	87.5	60.0	100.0	100.0
	n	16/19	3/4	7/8	3/5	2/2	2/2
Caries	%	0.03	0.0	0.0	0.0	0.0	0.0
	n	1/33	0/4	0/9	0/44	0/4	0/3
Calculus	%	82.4	100.0	100.0	69.8	100.0	100.0
	n	28/34	4/4	6/6	30/43	4/4	3/3
Enamel Hypoplasia	%	85.3	75.0	88.9	67.4	50.0	100.0
	n	29/34	3/4	8/9	29/43	2/4	3/3
Abscess	%	63.2	50.0	62.5	28.6	50.0	50.0
	n	12/19	2/4	5/8	2/7	1/2	1/2
Total teeth examined	n	732.0	70.0	214.0	479.0	46.0	55.0
Average (teeth per individual)	n	21.5	17.5	23.8	10.9	11.5	18.3

Figure 5.30 Comparison of the frequency of dental pathology between Bestamak and Lisakovsk. Disease is recorded by % (affected individuals/number evaluated) and n (number of affected individuals/number of individuals evaluated)

The numbers of individuals with periodontal disease is relatively high at Bestamak (84% of 19 individuals) and Lisakovsk (60% of 5 individuals). Dental hypoplasias are evident on 85% of individuals at Bestamak and 67% of individuals at Lisakovsk. This is a high level of hypoplasia activity for these populations, which occur in childhood and can be linked to weaning stress, diet, disease, as well as genetics (Goodman and Armelagos 1988, 1989). Dental abscesses were observed among 63% of 19 individuals at Bestamak and 29% of 7 individuals at Lisakovsk. In general, the Bestamak community had higher levels of each of these pathological conditions, and therefore was comparatively less healthy than the Lisakovsk community. Health differences between the sexes at the sites was difficult to assess due to the small number of individuals that could be assigned as male or female. While a general trend towards women having higher levels of periodontal disease, calculus, enamel hypoplasia, and abscesses is evident, this could not be confirmed as significant due to the low number of individuals evaluated.

6.0 INDIVIDUAL AND COMMUNITY IDENTITY IN THE BRONZE AGE: A BIOARCHAEOLOGICAL AND STATISTICAL APPROACH

As discussed in chapter 4, the Middle to Late Bronze Age transition in north central Eurasia is often viewed in terms of a substantial shift in complexity. Developments in social, economic, and political complexity reached an apex during the MBA, with elaborate mortuary practices and aggregated populations. In contrast, the LBA is described as a time of decreased social hierarchy in concert with increased interaction. Along with these broad changes, social identity and status are posited as having transformed from hierarchical to more heterarchical forms. However, our current understandings of social structure, identity, and status for the Bronze Age are poorly understood. The goal of this chapter is to detect the intersection of biological and social datasets in an effort to investigate social organization and structure in local communities. Intra- and inter-community patterns are evaluated using multivariate statistical analyses of mortuary practices, as well as biological sex and age grades. Scholars routinely have focused on the usefulness of mortuary data in the study of the form and structure of early societies (Binford 1971). Mortuary practices, however, are not mirrors of social organization, and other factors that may condition mortuary practices such as gift giving, heirlooms and misrepresentation need to be evaluated (Tainter 1978; Parker Pearson 1999; Chapman 2000). While mortuary evidence can be difficult to interpret through varied lenses of context and practice, it continues to be used as an important and useful indicator of social structure in prehistoric societies (Peebles and Kus 1996; Palumbo

1987; O'Shea 1984; Pader 1982; Shelach 2009). Therefore, this chapter outlines the methods and results of the statistical analysis of mortuary data for each of these cemeteries in order to understand identity, status, and social organization during the Bronze Age. Additionally, the results of biodistance analyses are summarized in order to frame the discussions of identity and social organization in the context of known biological affinities.

6.1 EXPLORING IDENTITY, STATUS, AND SOCIAL ORGANIZATION IN THE MORTUARY RECORD

As discussed in chapter 5, this research approaches the study of individuals, groups, and micro-regions through the theory of glocalization. This is a *bottom up approach* that explores how individuals and groups at each scale are affected by, and negotiate, socializing and globalizing processes. These processes are models of pathways that were navigated by individuals and groups in different ways. The multitude of identities and personhoods present in communities and micro-regions are based on the different ways that socializing and globalizing processes are negotiated. Therefore, the question becomes, what different identities are present within each community and micro-region? How do individuals and groups construct identities in order to negotiate socializing and globalizing processes? In order to explore these questions in more detail, we must first examine the theoretical basis for individual identity and status, as well as community organization. Previous scholars often espouse the direct approach to the mortuary realm, where the disposal of the dead is directly related to their status in life (Binford 1971). However, current understandings of identity and status in the mortuary record undertake more nuanced and integrated approaches. These approaches are concerned with the agency of the living in the funerary process, personhood, relationships between burial goods and the dead, interpretations based on the placement of goods in burials, as well as reconciliation of the direct representation approach (Saxe 1970; Harris 1989; Dobres and Robb 2000; Brück 2004; Fowler 2004). Furthermore, biological data is being incorporated in new ways to include concepts of gender, age-grades, biological affinity, kinship, and health into bioarchaeological analyses. The integration of these datasets has allowed 'identity' to be understood as a multiplicity of identities and characteristics for each individual. Furthermore, the multiple identities present within local communities, in concert with information on biodistance and mortuary patterns, can be used to reconstruct social organization. Measures of wealth and diversity were also calculated for each individual in terms of mortuary assemblages and examined in correlation with identities and status of the deceased.

Previous uses of ethnographic datasets, such as Human Relations Area Files (HRAF), reveal that some mortuary variables reflect the broad structure of a community rather than individual identity (Carr 1995). The internal organization of the cemetery, energy expenditure in mortuary construction, and body placement were found to correlate with underlying social structure, while grave furniture and goods were more likely to be associated with personal identity (Carr 1995). The multifaceted nature of identity reflects how this concept can be understood as an attribute of relationships (Brück 2004). Relationships occur between individuals and groups, as well as objects (Fahlander and Oestigaard 2008). Therefore, I have separated different behaviors associated with the mortuary realm in order to investigate the interplay between objects, the deceased, and the placement of items. When known, the stratigraphic location of objects in relation to the burial chamber and individual can elucidate how multiple identities were constructed in the mortuary realm.

In this section, variation in mortuary assemblages, body placement, and burial construction are discussed in detail. First, mortuary assemblages are explored based on the location of objects in relation to the individual as well as funerary pit stratigraphy. However, as many of the burials examined were looted, the exact position of goods is not always known. Therefore, faunal remains, bronzes, and tools are discussed based on their location in unlooted burials for each period. Each category of objects, as well as body placement and burial construction, are explained in terms of their relationship to individual identity, social status, or social structure.

During the Bronze Age in north central Eurasia, faunal remains were often placed in the upper portion of the burial pit, above the deceased individual. Only remains found in the burial pit are discussed in this dissertation, even though there were faunal remains deposited in external pits, ditches, and mound fill. The data for these other contexts are not well established in existing reports and therefore could not be used with any degree of confidence. Because detailed analyses of faunal remains have not been undertaken for all burials, only general interpretations of animal/human connections are presented. The remains of animals in burials have previously been interpreted as evidence of social status for certain individuals, particularly those buried in large graves with horses and 'chariots' (Zdanovich and Zdanovich 2002; Zdanovich 2005; Anthony 2009). This hypothesis is tested through correlations with age and sex designations, other grave goods such as bronze items, as well as general measures of wealth and diversity.

In general, bronze objects are often posited to be a direct reflection of wealth and status in prehistoric burials. In north central Eurasia during the Bronze Age, these items are often placed in close proximity to the individual. Therefore, they may be personal items that signify individual identity, and are correlated with age, gender and/or familial data. While the exact placement of these items is known for some burials, the vast majority were found close to the skeleton, but not in situ. Bronze objects are discussed in terms of their possible function, and placed into categories such as tools, ornamental objects, and jewelry. Several scholars have provided detailed discussions of ornamental bronzes and jewelry recovered from burials in terms of their placement, use, and relation to social status (Usmanova and Logvin 1998; Usmanova 2010; Kupriyanova 2010). Often bronze objects are posited as ornamental because they could have been sewn onto clothing, attached to headdresses, hats and braids, or worn as jewelry (Kupriyanova 2008; Usmanova 2010).

Bronze age burials frequently contain tools, which are often recovered in close proximity to the deceased. Therefore, tools are often interpreted as being related to the occupation or status of the individual. In the mortuary record, tools are used to explore possible gendered tool use within the society (Bruhns 2006). Bronze tools such as knives, axes, staples, needles, and awls were the only non-ornamental bronzes recovered. Other tools include ground stone metates and slabs, spindle whorls, lithics, awls and needles, ceramic tubes and molds, as well as slag and ore have been recovered. The processing of metals might be associated with certain objects such as slag, raw ore, ceramic tubes, as well as ceramic molds for metal objects. Ground stone metates, pestles, and slabs could have been used in the grinding of ores in metal production, grinding pigments, or the processing of foods. Bronze sickles have previously been attributed to use in agricultural pursuits, but based on ethnographic and dietary data were more likely used to cut fodder for animals. In Mongolia, ethnographic data shows herders using sickles to cut fodder for animals (Figure 6.20). Items such as spindle whorls, awls, and needles were likely used in the production of materials, clothing, and fishing nets.

The overlap of faunal remains and bronze objects in burials allows for the exploration of multiple identities for a single individual. This overlap might highlight relationships between specific object combinations and sex and age groups. Combined datasets were also used to test previous assumptions, such as the correlation between males, horses, and objects associated with warfare or fighting. The use of multiple objects as a basis for clustering encourages different depictions of individuals and the layered nature, or multiplicity of, identity. Furthermore, through analyses of the complete artifact assemblage, overall measures of wealth and diversity are undertaken for each burial. Diversity (S) is a measure of variety within a burial, where each artifact category is tallied as a single count no matter the number of artifacts in that category (Rhode 1988). Therefore an individual with bronze beads, bronze bracelets, sheep remains, horse remains, and an abrasive would have a diversity score of S=5. Diversity reflects the relative 'richness' of artifact categories within each burial. In contrast, wealth is measured based on the total artifact count or the total count of bronze items. Bronze objects are often considered signs of wealth based on their purported limited availability, and high degree of labor and specialization involved in their creation (Vainshtein 2009:204). Wealth and diversity measures are utilized as supporting evidence for previously constructed clusters based on grave assemblages, biological clustering, and dietary intake.

The positioning of the deceased in the burial can be examined on two levels, in terms of individual identity as well as in general homogeneity of burial practice. The placement of the body is a cultural treatment undertaken by the mourners and might be interpreted as their social classification of the individual (Carr 1995). This identity is an external view of an individuals' life. In addition, the placing of the individual is one way for mourners to take part in the funerary ritual. While body placement may reveal identity in life, it can also be used to examine broader rituals in the mortuary realm (White et al. 2009). Homogeneity in placement and positioning of individuals might reveal that there was a standard set of rituals for burial undertaken by those that are part of the funerary process. However, increased heterogeneity in placement might signal that a ritual standard was not always followed. This may be interpreted in several ways, however one might conclude that heterogeneity in burial might be due to each family burying the deceased in a different way. Therefore, it should prove interesting to correlate placement with kinship, age groups, and biological sex.

Finally, above ground construction varies greatly during the Bronze Age, with evidence for kurgans (mounds), stone rings and enclosures, ditches, and flat graves that lack above ground identification. Furthermore, burial size and depth varies greatly and is related to the amount of labor used to bury an individual. Total energy expenditure has previously been associated with vertical social position and age in cross-cultural studies (Carr 1995). There is a proposed relationship between the amount of labor and time necessary to construct a burial and the overall status of the individual at death. If this is the case, burial construction should correlate well with overall wealth and diversity measures, which have also been associated with social status. However, the lack of correlations between these datasets may reveal the more heterogeneous nature of mortuary rituals. Therefore, mortuary construction may reveal less about the individual, and more about the structure of the community. In addition, correlations between construction and groups based on kinship, age, sex, or grave assemblages might support previous findings in relation to identities.

6.2 STATISTICAL MORTUARY METHODS

Multivariate statistical methods were used to investigate differentiation using mortuary data, including burial assemblages, body placement, and burial construction. Statistical methods include the creation of dissimilarity matrices, clustering of datasets, and chi-square tests. These statistical methods are explained in further detail in chapter 5 (section 5.1.2). Datasets were correlated with previously analyzed biological information, hypothetical family groups, as well as diversity and wealth measures. First, a similarity matrix was constructed for each cemetery using the Gower coefficient (Howell and Kintigh 1996). This coefficient was used to create a distance measure, which compared each individual in the matrix. Individuals were compared by counting the number of shared matches they had with valid attributes. To create a dissimilarity matrix, the final number was calculated as one minus the similarity value for each individual. Clusters were formed using the dissimilarity matrix as a base and applying Ward's method of hierarchical grouping (Ward 1963). Individuals were clustered into mutually exclusive groups in an effort to understand relationships within the collection. Cluster grams have r^2 values, which determine the amount of variance explained by the formation of each set of clusters. The r^2 values range from 0 to 1 with those approaching 1 explaining the most variance. After clusters formed, a chi-square test determined if clusters were positively correlated with independent variables such as age, sex, biological groupings, and measures of diversity and wealth. The results of the chi-square significance tests were recorded as p-values, where the lower the value, the higher the degree of significance. Significance values are designated as *not significant* when p=99.99 to p=0.201 (0.01% to 79.9%), *somewhat significant* when p=0.200 to p=0.101 (80% to 89.9%), *significant* when p=0.100 to p=0.051 (90% to 94.9%) and *very significant* when p=0.050 to p=0.001 (95% to 99.9%).

6.3 RESULTS OF MORTUARY STATISTICS: THE BESTAMAK CEMETERY (MBA)

In this section, I review the results of statistical mortuary analysis for the cemetery of Bestamak. A total of 60 complete sets of human remains were available for the statistical analysis of mortuary rituals, and of these, 44 were physically analyzed. The results of multivariate statistical analyses are presented in two parts. First, multivariate statistical analyses of the mortuary assemblage, body placement, and burial construction are employed to explore intra-cemetery individual identity. These identities were then correlated with biological variables such as sex, age, and kinship. Second, results of the identification of possible individual identities and social status were utilized in an effort to interpret social organization in the Bestamak community. This bottom-up approach allows for the initial exploration of individual identities to form the foundation for discussions of the nature of social structure.

6.3.1 Intra-cemetery Burial Variation and Patterning

6.3.1.1 Faunal Assemblage

Variation in the deposition of faunal remains in burial contexts correlate significantly with gender categories and age grades within the cemetery. As many of the animal deposits were recovered from grave fill rather than above grave contexts, they are likely sacrificial deposits rather than evidence of feasting activities. Variation between animal remains in burials can therefore be linked to specific animal/human relationships and occupations. These might include occupations or identities associated with such activities as herding, shearing, and milking. However, previous discussions of animal remains at Middle Bronze Age sites have associated animal sacrifice with elite individuals (Zdanovich and Zdanovich 2002), aggrandizing behaviors (Anthony 2009) or reproduction, fertility, and the multiplication of goods and wealth (Zdanovich and Gayduchenko 2002). Intense variation between sites for this period has led to a variety of different assumptions about the mortuary record in terms of animal remains. At the site of Bestamak, there is a lack of specific information on the portion of animal deposited, positioning of the body, and animal age. Therefore, only general interpretations of animal/human connections are presented in this section.

The number and type of faunal remains recovered within each burial was transformed into presence/absence data and clustered using multivariate statistics. A total of 11 clusters formed (r^2=0.90) when all individuals were used in analysis (Figures 6.1 and 6.2). However, in a chi-square test, the correlation between clusters and sex was not significant at 66% (p=0.436) and between clusters and age was also not significant at 48% (0.524). Because all individuals were used in this analysis, there is a great deal of variation within the 11 cluster solution. Of the males identified within the cemetery, their animal assemblages were the most homogeneous, with remains of either sheep/goat and horse or cattle. Some males and subadults were also associated with the remains of pigs, which is extremely rare in north central Eurasian prehistory. While males had somewhat homogeneous burials, there was a great deal of variation between females. Many females were buried with horse, sheep/goat, and astragal, while others were also buried with the remains of fox, wolf and dog. Average diversity scores for faunal materials buried with females (S=2.67) and children (S=2.13) were much higher than scores of males (S=1.40) or adolescents (S=1.50). Based on clustering and diversity scores, it seems that males and adolescents had the fewest categories of animal remains in their burials. However, females and children had highly diverse assemblages. In order to explore this data in further detail, the cemetery was split into adult and subadult categories.

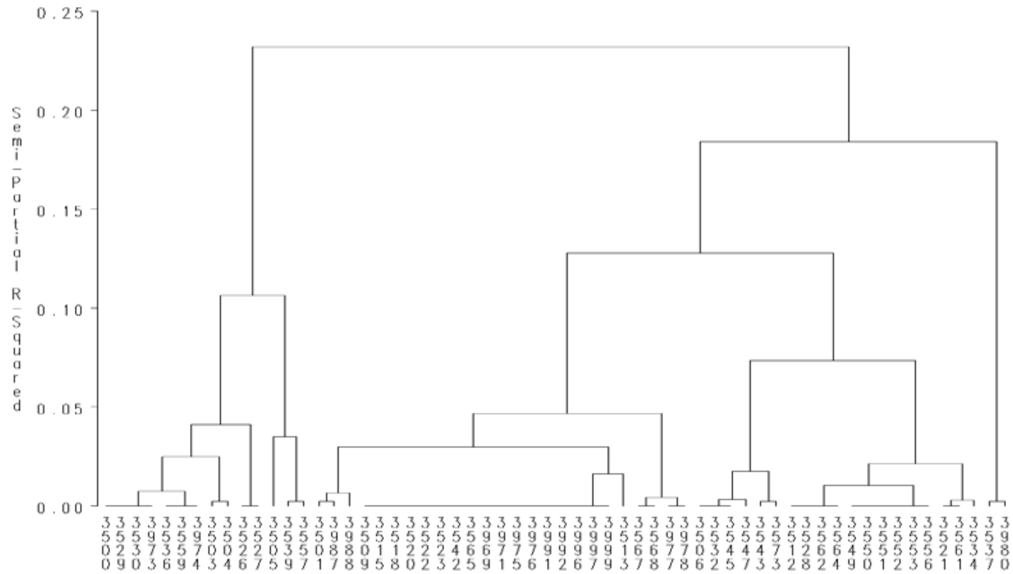

Figure 6.1 Bestamak Faunal Remains (All Individuals)

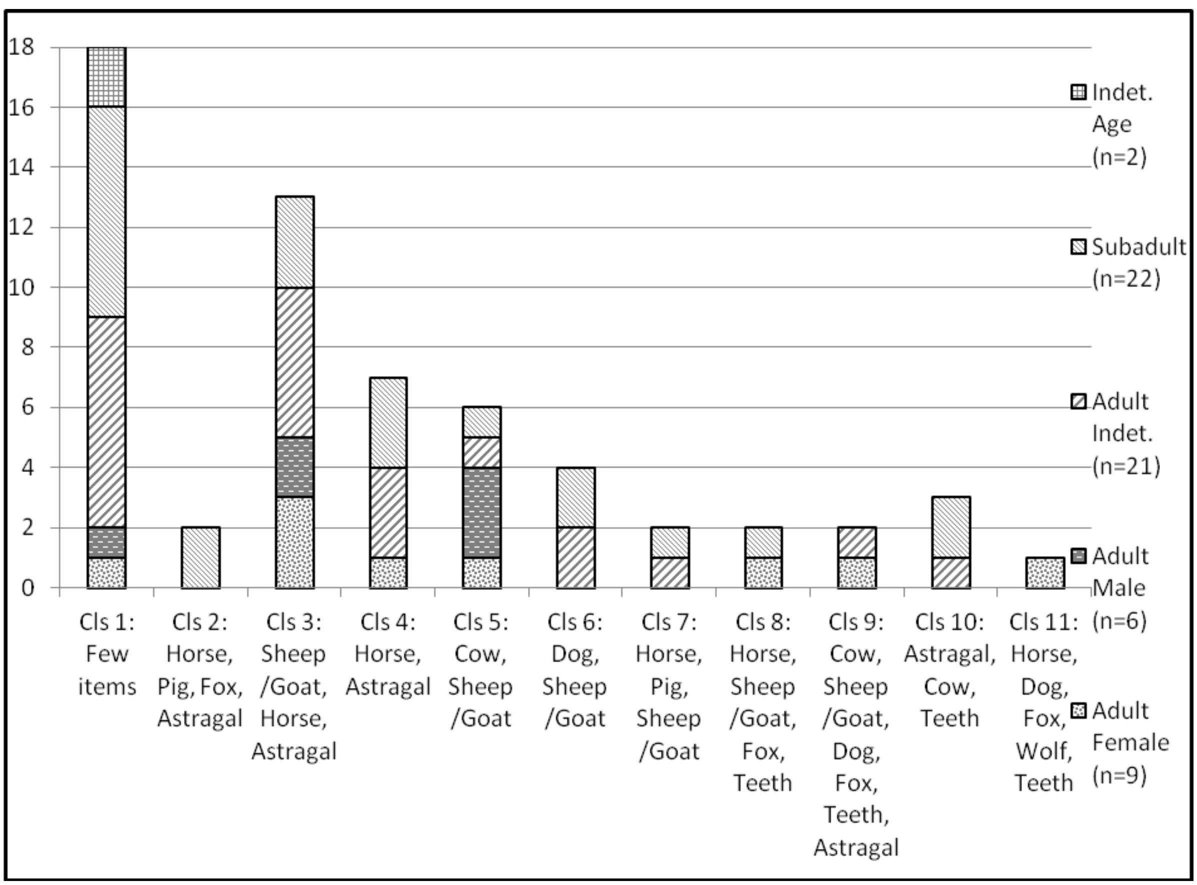

Figure 6.2 Bestamak Faunal Remains (All Individuals)

Much of the differentiation in the 11 cluster solution was based on age or sex categories, however these were not significant. In order to explore this in more detail, the cemetery was divided into categories of adult (18+) and subadult (<18). For the adults, 6 clusters formed (r^2=0.89) using the categories of cow, sheep/goat, horse, astragal, dog, fox, and wolf (Figures 6.3 and 6.4). The correlation between clusters and the independent variable sex was very significant (p=0.059), while the correlation between clusters and the independent variable age was not significant (p=0.212). These clusters reveal that males had much more homogeneous sets of faunal remains such as sheep/goat and cow, or horse and astragal, while females had much more heterogeneous assemblages. Diversity scores for females (S=2.67) were very high relative to males (S=1.50) and indeterminate adults (S=1.43). Female burial assemblages were much more diverse and included the remains of dogs, foxes, as well as wolves.

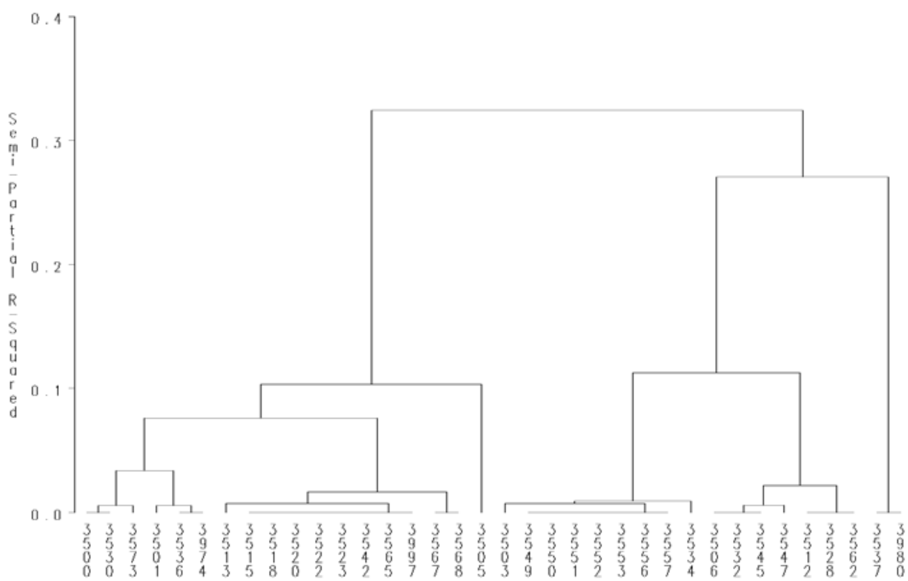

Figure 6.3 Bestamak Fauna (Adults)

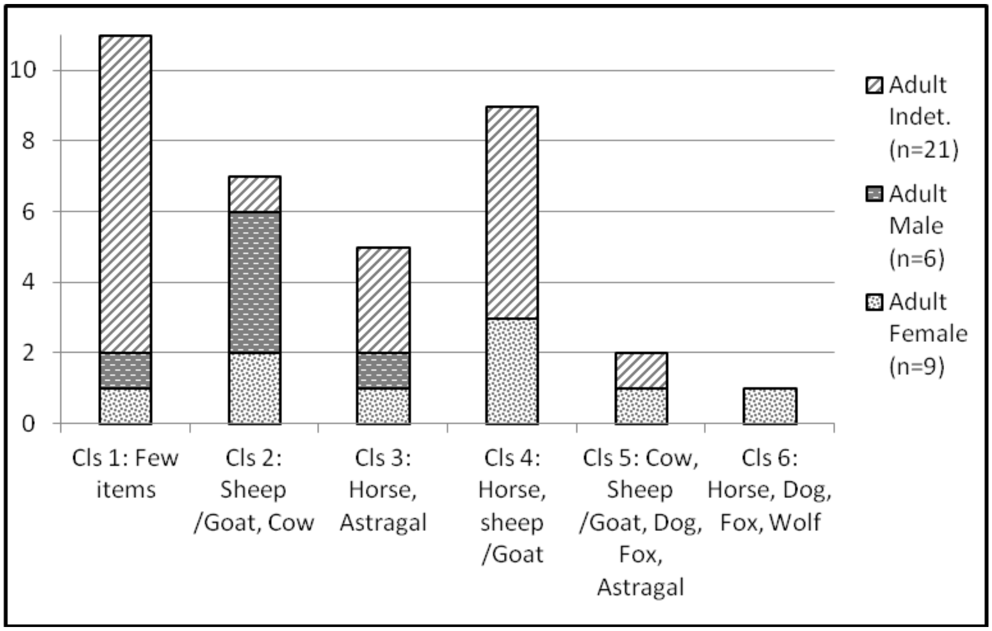

Figure 6.4 Bestamak Fauna (Adults)

Among subadults, individuals were separated into two age groups, children (2 to 12 years) and adolescents (12 to 18 years). No infants (0 to 2 years) were identified within this cemetery. A total of 4 clusters emerged using the categories of horse, sheep/goat, cow, pig, dog and astragals (r^2=0.75) (Figures 6.5 and 6.6). The remains of fox and wolf were not recovered from subadult burial contexts. A chi-square tests of clusters and age resulted in a correlation that was somewhat significant at 80% confidence (p=0.203). Subadult burials clustered in similar ways to adults, with half of individuals lacking animal remains. The separation between adolescents and children is not clear based on animal remains, as they occupy the same clusters. Cluster 3 is unique in this respect, because only children (n=3) and indeterminate subadults (n=2) are buried with the remains of sheep/goat, dog and astragal. The most interesting aspect of this analysis was the recovery of children and adolescents with horse remains (clusters 2 and 4), which are often posited to be associated only with adult male burials.

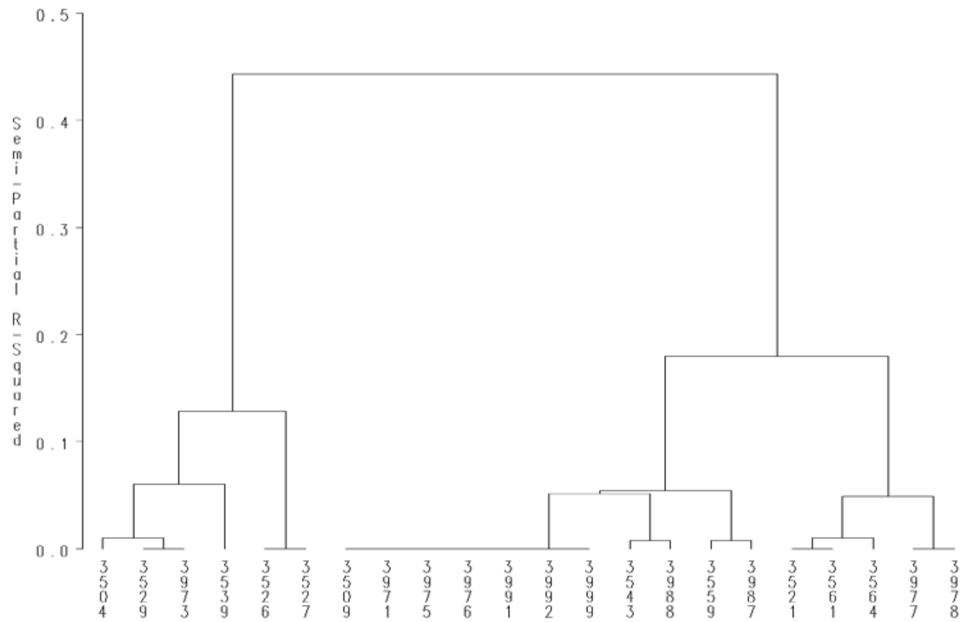

Figure 6.5 Bestamak Fauna (Subadults)

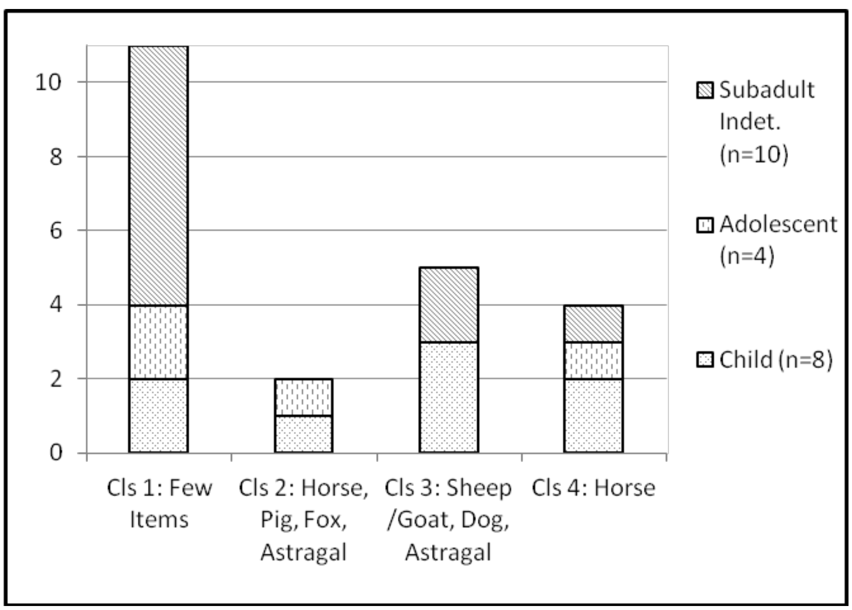

Figure 6.6 Bestamak Fauna (Subadults)

Astragal (the ankle bone) of sheep/goat or cattle are often found in burial assemblages during the Bronze Age. Astragals were recovered in 14 burials at this cemetery, including thos of females (14%), indeterminate adults (29%), adolescents (7%), children (29%) and indeterminate subadults (14%). Therefore, the previously suggested relationship between astragals and subadults is not very clear. However, females and children are more likely to have astragal bones in their burials than other people in the cemetery, and the parallel between graves of females and children will be discussed in further detail below.

Based on these results, animal remains can be linked to specific age and gender categories. First, adults and subadults have similar levels of variation in animal remains, although the exact clusters are unique for each group. Adult females and children populate every single cluster within their respective groups (Figures 6.4 and 6.6), and have the most diverse assemblages. Therefore, heterogeneity is evident among females and children. This is further explored through associations with other artifact categories. However, males have the most homogeneous assemblages, especially in terms of animal remains, where they are buried with a few items, sheep/goat and cow, or horse, and astragals. Horse remains have previously been associated with adult males, however at Bestamak, horse remains were recovered in burials of children (n=3), adolescents (n=2), indeterminate adults (n=9), females (n=5), and males (n=1). The nature of horse sacrifice is much more heterogeneous than previously believed, at least in terms of the Bestamak site (contra to these publications? Outram et al. 2011:119-20; Frachetti 2012:9,17-18). At this site, it seems that female identity is linked to horse remains. The mix of homogeneous and heterogeneous practices in terms of animal remains will have to be further supported by other mortuary practices.

6.3.1.2 Bronze Objects

Bronze objects are often highlighted as indicators of status when recovered in mortuary contexts. At the Bestamak site, bronze objects include knives, axes, rings, earrings, bracelets, staples, clamps, badges, pendants, beads, awls and needles. These objects can be split into two categories, ornamental and functional bronzes. Ornamental objects include items that are worn, such as rings, earrings, beads and bracelets, as well as clamps, badges and pendants. Clamps are often recovered from the hair, or along the back of the body, as they were part of headdress or braid ornamentation. Pendants were either worn on the ear, or like badges, sewn onto clothing and hats. Non-ornamental objects include bronze knives, axes, staples, needles, and awls. Bronze staples were used to restore broken vessels (Figure 6.7). These vessels are often presumed to be heirlooms due to the nature of their breakage and use in mortuary contexts. Investigations of bronze objects in burial contexts reveal intense variation between individuals, as well as some age and gender differences. Therefore, their use as an item that signifies status or prestige may be relevant. In terms of individual identity, the type or category of bronze object recovered, as well its stylistic nature is important. Bronze objects are therefore examined from several vantage points, in terms of the entire collection, ornamental items, and in terms of wealth, which is discussed in a separate section below. Unfortunately, as many of these burials were looted, the exact location of bronze objects in relation to the body is rarely known, and therefore the interpretations presented are somewhat limited by a lack of detailed data.

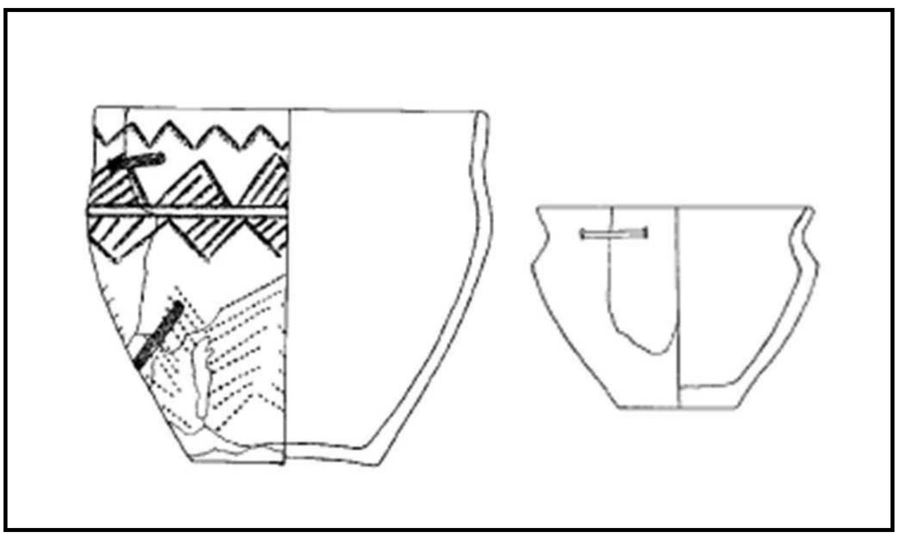

Figure 6.7 Bestamak Ceramic Vessels with Bronze Staples

First, clusters were created using bronze items to examine differentiation within the cemetery. These included bronze knifes, awls, needles, mirrors, hooks and sickles, axes, as well as ornamental bronzes such as pendants, bracelets, badges, and beads. A total of 10 clusters formed (r^2=0.90) when all individuals were considered (Figures 6.8 and 6.9). While the correlation between cluster and age was not significant (p=0.539), the correlation between clusters and sex was very significant (p=0.001). These clusters reveal that bronze items are used to differentiate individuals in terms of gender. In addition, bronze assemblages for subadults tend to mirror those of adults, with similar types of differentiation. Interestingly, several items that previously were believed to be gender specific, are knives, awls, needles, and bracelets which were recovered from both male and female burials. The use of weapons to identify males, and jewelry for females, does not differentiate between males and females, or adults and subadults. This is especially pertinent to knives, which are found in burials of subadults, females, and males, and should be regarded as tools, akin to awls or needles. Gender differentiation was evident with only a few items, only males were recovered with hooks, while females were recovered with badges. In addition, the majority of axes are buried with males (n=4), and only a single axe was recovered with a female individual. Therefore, there are some items that are often related to a specific biological sex in burial. Overall diversity measures reveal that males have higher scores (S=3.83) than females (S=3.78), while indeterminate adults (S=2.24) have lower scores than subadults and (S=2.82). Measures of diversity reveal that subadult assemblages cluster similarly to adults, but overall are less diverse than than those of adults.

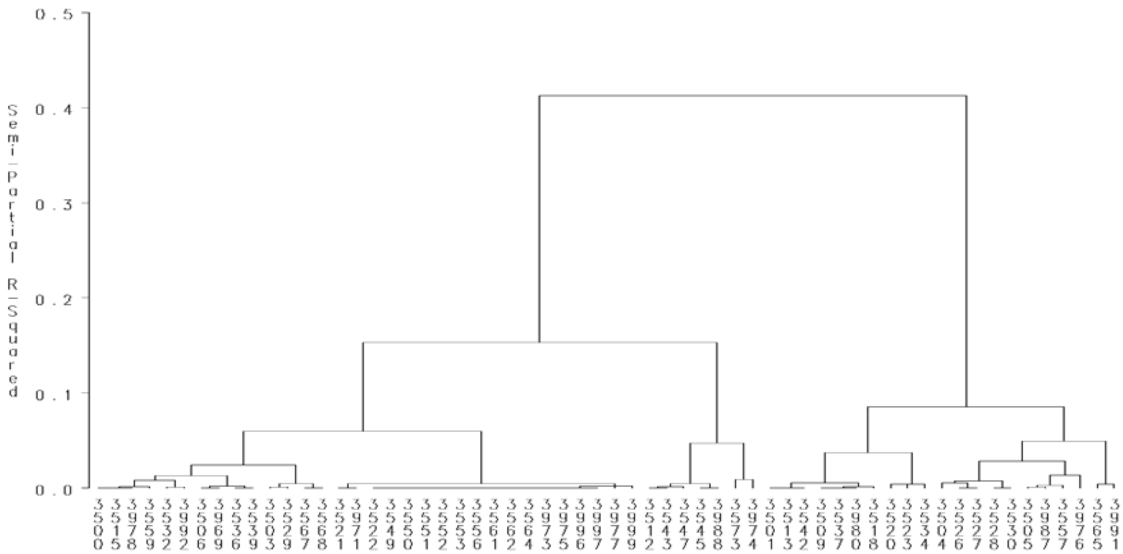

Figure 6.8 Bestamak Bronze (All Individuals)

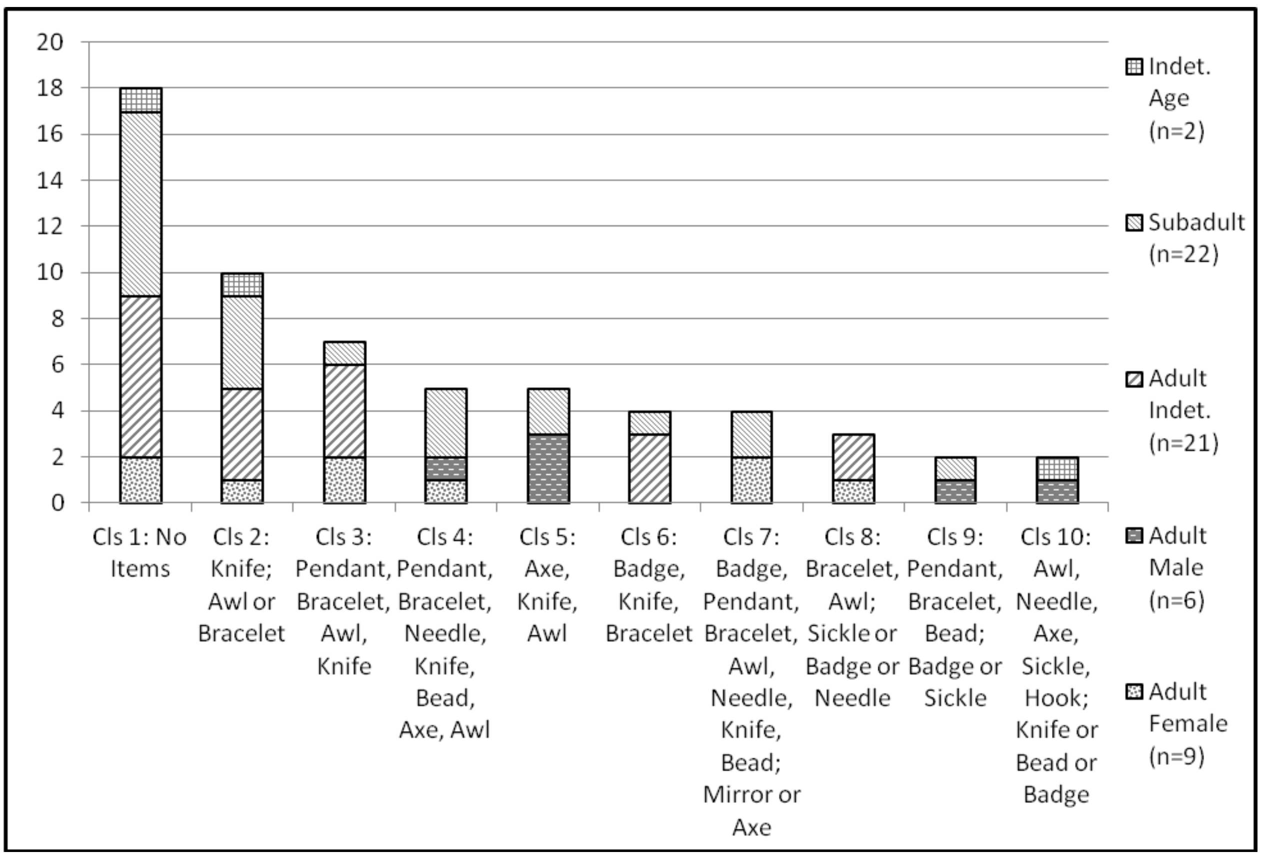

Figure 6.9 Bestamak Bronze (All Individuals)

Clear differentiation between adults is present when the entire assemblage is used, therefore this needs to be examined in more detail. When these same objects were used in cluster analysis of adults, a total of 7 clusters formed (r^2=0.87). The correlation between bronzes and age was not significant (p=0.521), while the correlation between bronzes and sex was significant (p=0.057). These clusters support earlier findings that gender divisions are present within the cemetery, and these divisions can be identified through statistical analysis of bronze objects in burial assemblages (Figures 6.10 and 6.11). Females have assemblages that contain ornamental bronze items such as bracelets, pendants, badges, and beads, as well as more functional items such as knives, awls, sickles and axes. In contrast, males are buried with assemblages of bronze awls, needles, knives, sickles, hooks, as well as bracelets, pendants and beads. Only two clusters are populated by both males and females, cluster 1 with no items and cluster 3 with a mix of ornamental and functional items (cluster 3). The 7 cluster solution supports data from the full cemetery. Gender divisions are evident in terms of females with bronze badges, and males with hooks and axes. Based on these clusters, it is clear that knives cannot be used as indicators of biological sex.

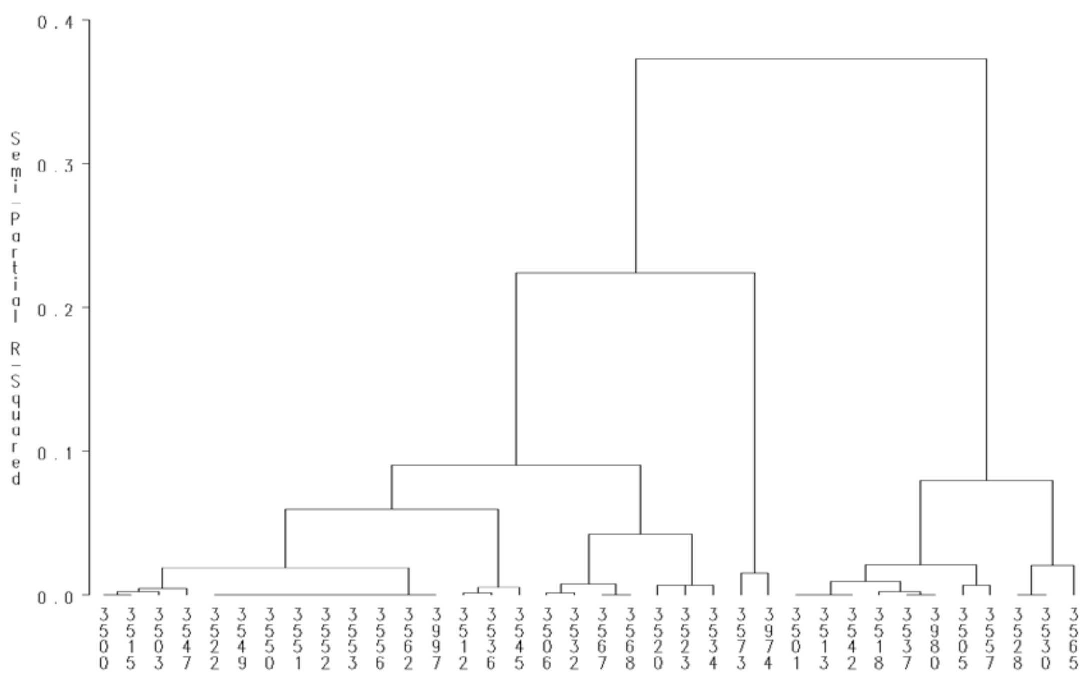

Figure 6.10 Bestamak Bronze (Adults)

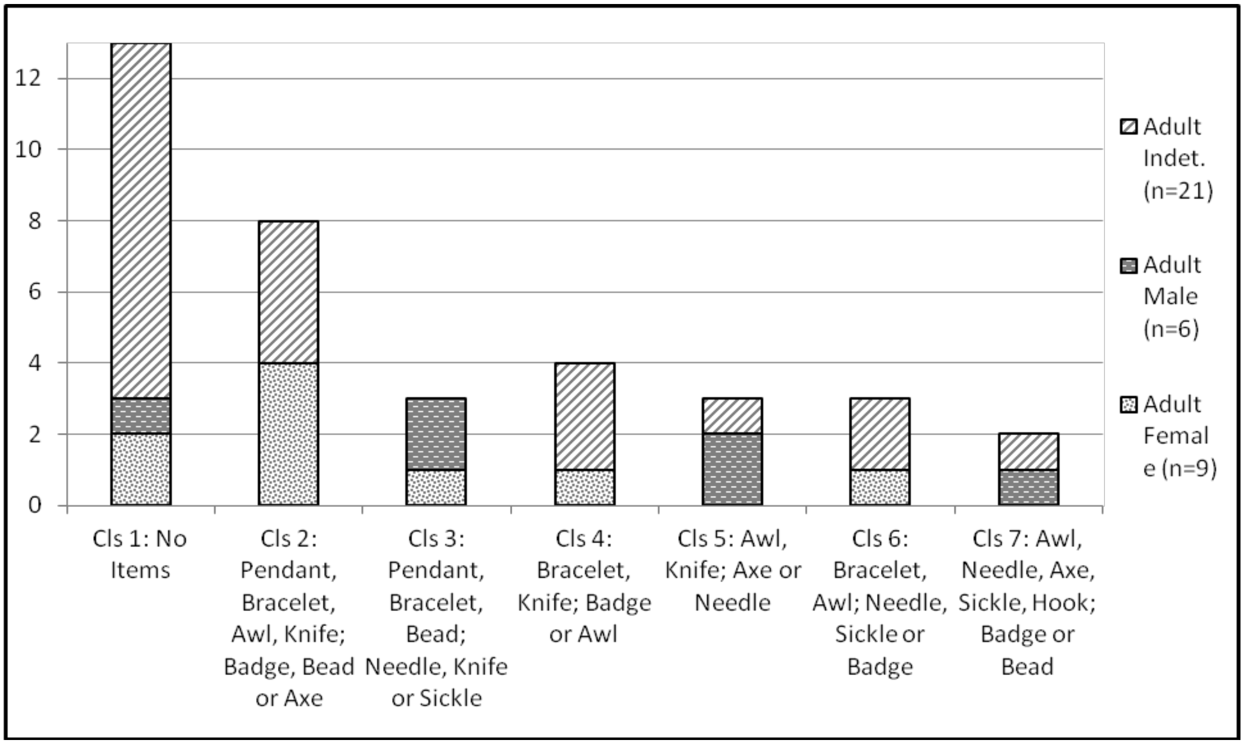

Figure 6.11 Bestmak Bronze (Adults)

A similar set of artifacts was used to examine subadult burials, where a total of 22 individuals were recovered. However, bronze sickles and hooks were excluded from this analysis as they were not buried with subadults. When bronze objects were included within multivariate statistical analysis, a total of 5 clusters formed (r^2=0.84). The correlation between bronze items and age was not significant (p=0.675). Each of the clusters has individuals from both age groups, except for cluster 5 which has adolescents and indeterminate individuals (Figures 6.12 and 6.13). Therefore, age was not an important factor in relation to bronze burial goods. Some of these clusters mirror those seen in the above adult profile with assemblages of tools (clusters 3 and 4) or combined assemblages of tools and ornamental bronzes (clusters 2 and 5). While many subadult burials lacked bronze objects (41%), clear differentiation between subadult individuals existed in this community.

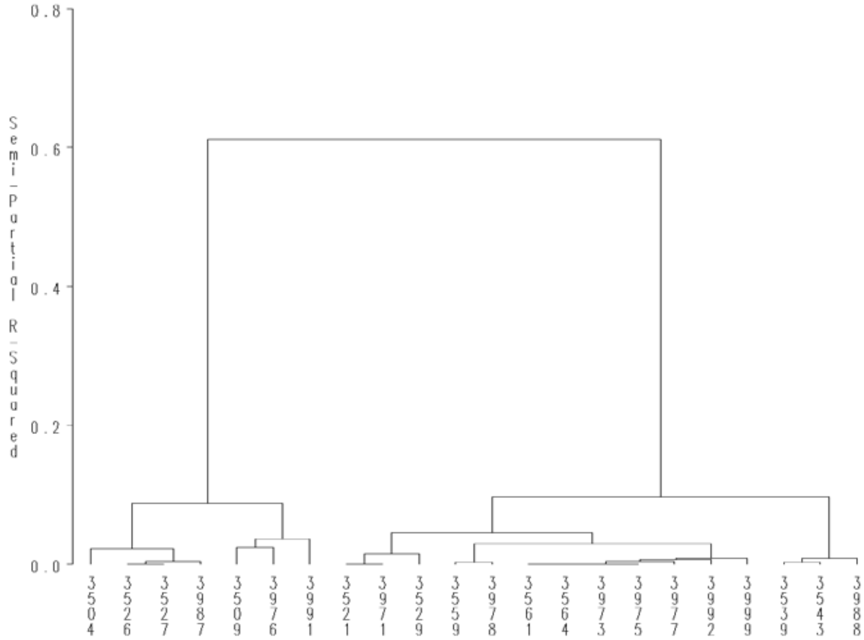

Figure 6.12 Bestamak Bronze Objects (Subadults)

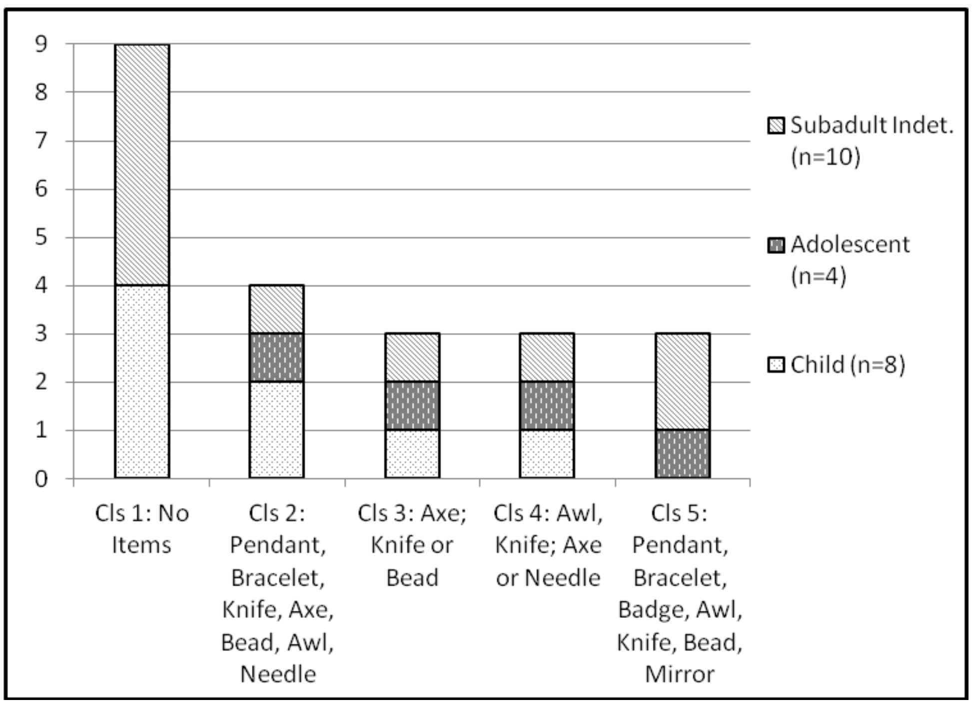

Figure 6.13 Bestamak Bronze (Subadults)

As ornamental items are a significant portion of bronze in the cemetery, the use of these objects in burial also needs to be examined in more detail. Several scholars have examined the placement, use, and associated social status of bronze ornamental objects (rings, earrings, bracelets, clamps, badges, pendants, and beads) (Usmanova and Logvin 1998; Usmanova 2005; Kupriyanova 2010). Objects such as rings, earrings, and bracelets are found on the body, while pendants were worn on the ears or sewn onto clothing and hats. Badges and beads were strung onto necklaces, or sewn onto clothing or hats (Usmanova 2005; Kupriyanova 2008) while bronze clamps were usually recovered along the spinal column of the individual and reconstructed as portions of braid decorations or headdresses (Usmanova and Logvin 1998; Usmanova 2005:118-120). During the Bronze Age, ornamental bronze objects are often associated with female burials. However, as we have seen, this does not always hold true. Therefore, multivariate statistics examined categories of ornamental bronzes for all individuals in and a total of 9 clusters formed (r^2=0.98) (Figures 6.14 and 6.15). The correlation between the clusters and independent variables sex and age were not significant (p=0.38 and p=0.78) Cluster 1 included all categories of individuals that lacked ornamental bronzes, and was therefore labeled 'no items' (n=28). While adult females were buried with pendants, bracelets, beads, badges, and earrings, adult males were only buried with pendants, bracelets, and beads. Bronze badges and earrings were not recovered with adult males in this cemetery, but were recovered with females and subadults. Furthermore, while it seems that subadults have some of the most diverse assemblages in the cemetery as they make up 8/9 clusters, females actually have much higher average diversity scores (S=1.78) in terms of ornamental bronze assemblages than subadults (S=1.36) or males (S=1.00).

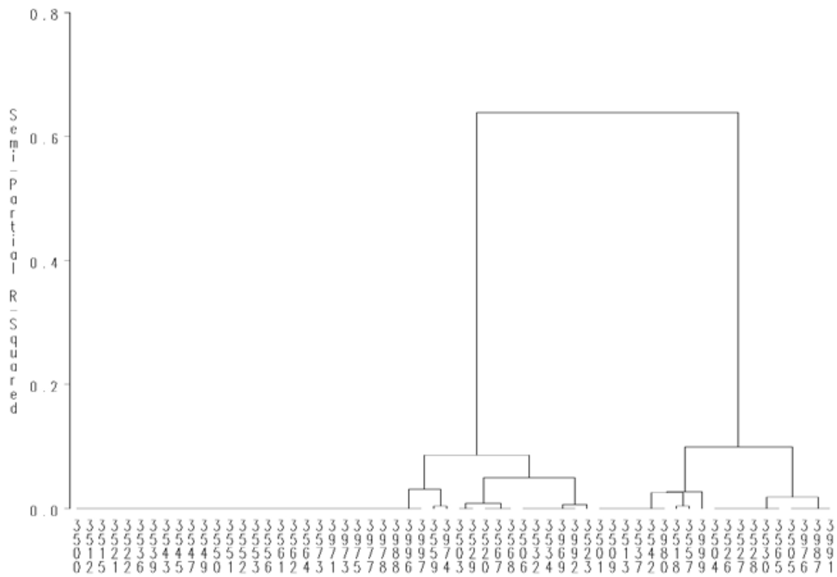

Figure 6.14 Bestamak Ornamental Bronzes (All Individuals)

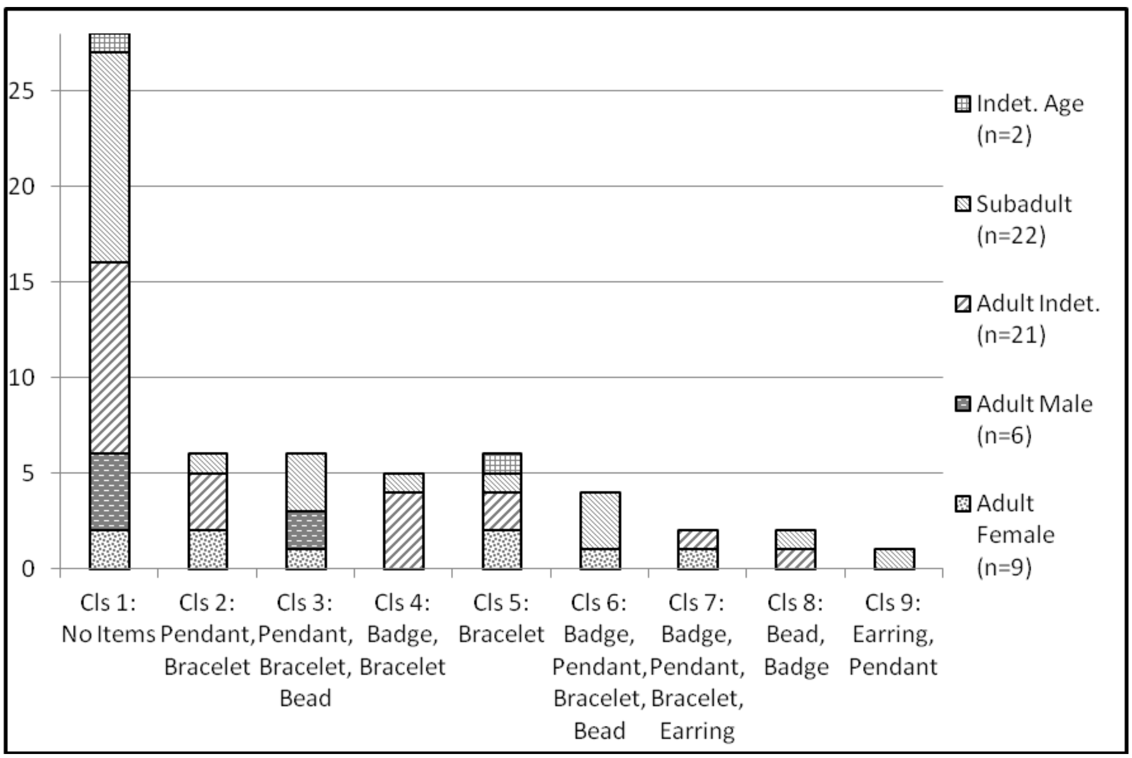

Figure 6.15 Bestamak Ornamental Bronzes (All Individuals)

As the independent variables sex and age were not significant when correlated with all individuals in clustering, adult and subadult categories were separated to explore ornamental bronzes in more detail. Among adults, bronze earrings, badges, pendants, and bracelets were often clustered together, beads were not used as they were not important in cluster formation. A total of 5 clusters formed (r^2=0.95) for adult individuals (Figure 6.16 and 7.17). The correlation between clusters and independent variable sex was somewhat significant (p=0.184), while the correlation between clusters and age was not significant (p=0.488). In this cemetery, there seems to be a clear division between male and female, with females having much more diverse assemblages than males. Overall, males lacked badges (Figure 6.52) as part of their burial assemblage, but were sometimes buried with items such as bracelets and pendants. This is important because these ornamental items have previously been linked only to female burials. While gender divisions are evident between individuals buried with ornamental bronzes, only specific items are gender specific, such as badges and earrings. The diversity of these assemblages is quite similar to those reported above, with females having a much higher average score (S=1.78) than males (S=1.00).

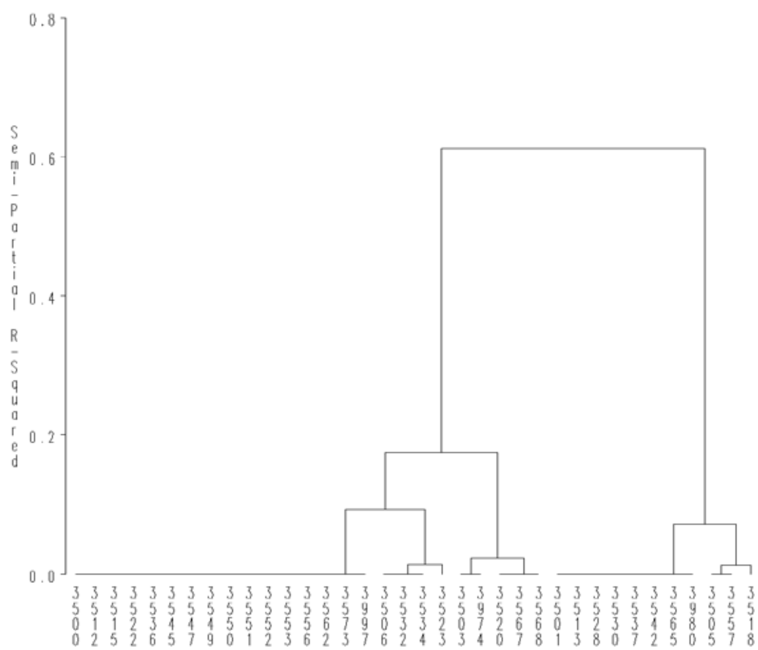

Figure 6.16 Ornamental Bronze (Adults)

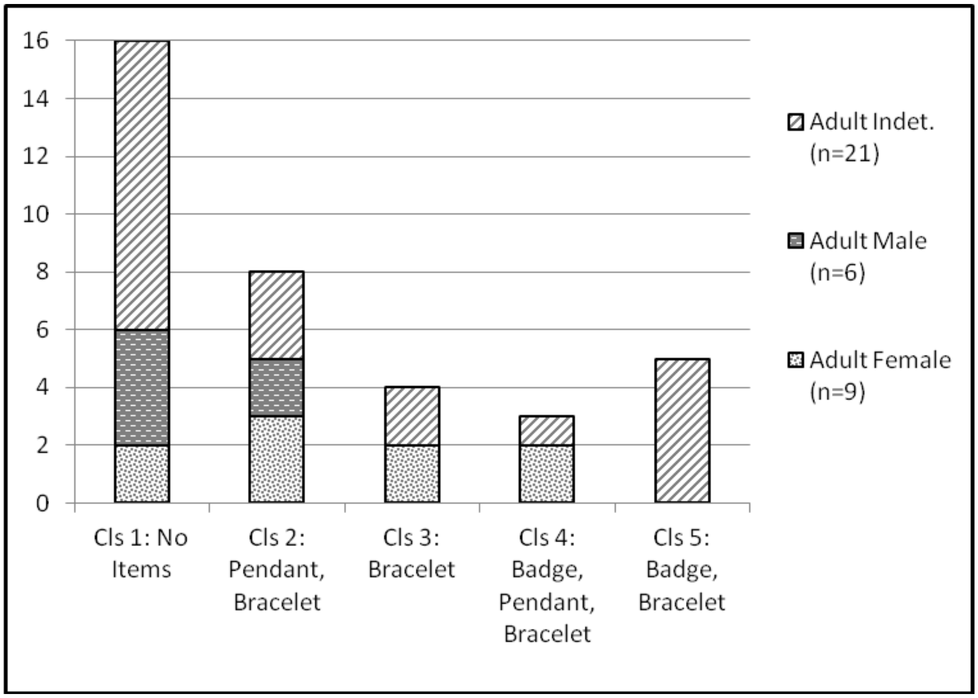

Figure 6.17 Ornamental Bronze (Adults)

Among subadults, bronze ornamental items including pendants, bracelets, beads, badges, and earrings were used in multivariate statistics (Figure 6.18 and 7.19). A total of 5 clusters formed (r^2=0.96), yet the correlation between these clusters and independent variable age was not significant (p=0.804). There are interesting differences between children and adolescents in relation to ornamental bronzes, as only half of the subadults in the cemetery were buried with ornamental bronzes, and among this group there is variation. While these do not mirror the exact clusters of adults, differences do exist. In the case of subadults, beads are more common, while badges are less so. Of the four subadult burials with badges, only one could was given an age estimation, that of a adolescent. Therefore, while this individual may have been categorized as a 'subadult' by the methods chosen here, they may have been seen as an adult based on community standards.

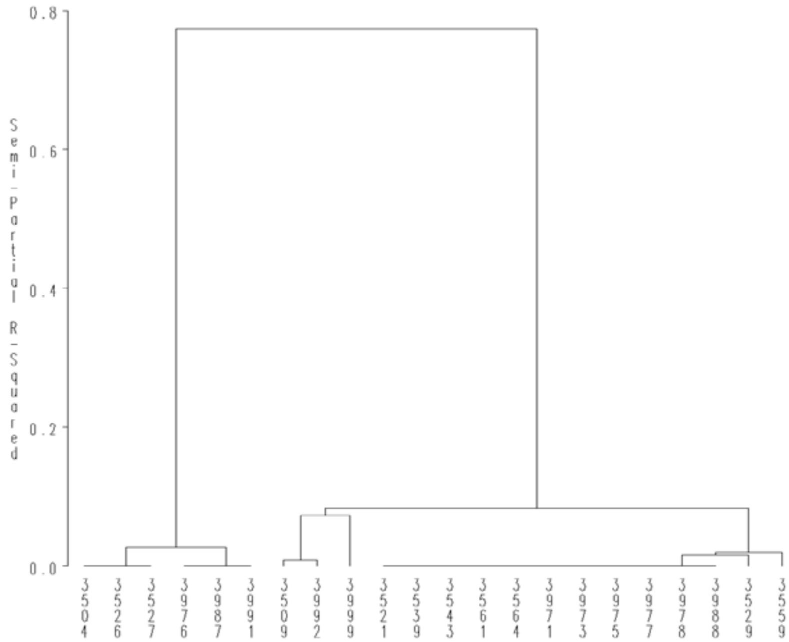

Figure 6.18 Ornamental Bronze (Subadult)

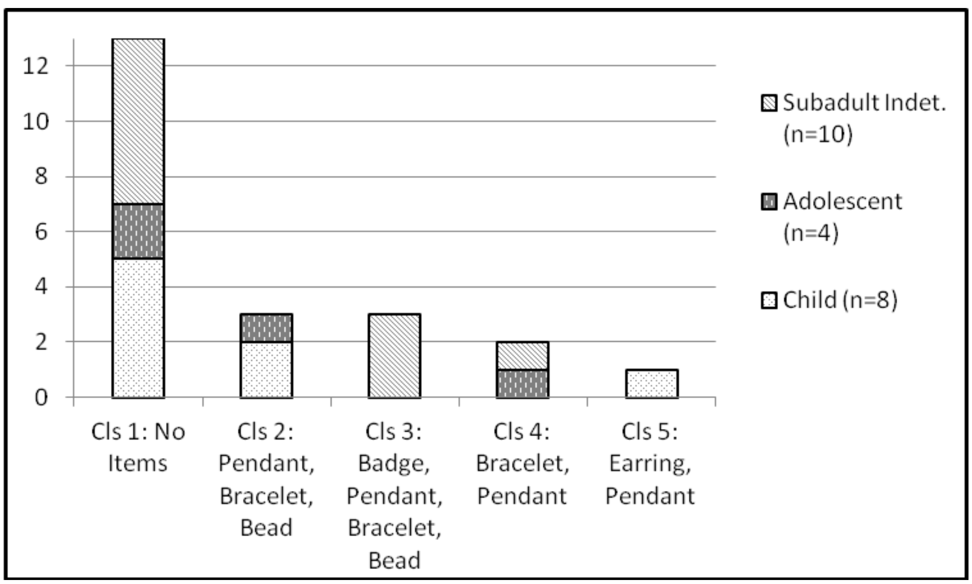

Figure 6.19 Ornamental Bronze (Subadult)

Based on the results of statistical analyses of bronze objects, it is clear that hooks, axes, and badges mark gender divisions. In addition, overall diversity scores in terms of bronzes are much higher for females (S=3.83) than males (S=2.24). Bronze objects reveal that males and females are more evenly heterogeneous than seen in their association with animal remains. Age differentiation is also present between adults and subadults. Often, subadult clusters strongly mirror those of adults, albeit with less diversity. Therefore, it seems that some subadults are buried with assemblages identical to those of adults. These subadults are treated in a manner that may be associated with an ascribed identity, one given based on the status of their family. However, as kinship did not appear to be an important factor at Bestamak (Chapter 8), these linked statuses may be based on achievements, status, or wealth of their parents. At Bestamak, there is a great degree of differentiation between individuals, with a good portion of adults and subadults lacking bronze objects, and others buried with diverse bronze assemblages. Therefore, differentiation does not seem to be based on age, but instead may be linked to gender and social status.

6.3.1.3 Tools

As revealed in the above analyses of bronze objects, much of the differentiation between individuals may be tied to gender. These gender differences play out in burial contexts through the use of either ornamental items or tools. Therefore, this section will examine a larger selection of tools from the site. However, for this analysis, subadult and adult individuals will be separated to explore detail in clustering. The presence of tools in mortuary contexts has been used to examine craft production in societies, as well as the individual identities of those who may have taken part in production. The following items were used in statistical analyses as they are considered craft tools or results of production activities, these include ground stone metates, ground stone slabs, spindle whorls, lithics, awls and needles, ceramic tubes and molds, bronze sickles, axes, and hooks, as well as slag and ore. Several of these items are related to metallurgy including slag, raw ore, ceramic tubes posited as vents for metallurgical furnaces, and ceramic molds for the production of bronze objects. Spindle whorls, awls, and needles were used for the production of materials and clothing, leatherworking, and possibly to construct nets. Ground stone metates and slabs were used either as part of the metallurgical process, for grinding minerals, or in food processing. Bronze sickles were also recovered from the site, however, dietary intake during this period seems to lack wild or agricultural C_4 plants such as millet and barley (see chapter 7). Instead, it is likely that sickles were used to cut fodder for animals, as they are currently used among Mongolian pastoralists (Figure 6.20).

Figure 6.20 Mongolian pastoralists using sickles to cut fodder for their animals
(photo courtesy of Jörg Janzen)

When tools were used in analysis, a total of 10 clusters formed (r^2=0.81) for only the adult individuals in the cemetery (Figures 6.21 and 6.22). The correlation between these clusters and age is somewhat significant (p=0.147), while the correlation between clusters and sex was not significant (p=0.529). From these clusters, it is clear that males and females are buried with specific tools which set them apart from one another. Slag, ore, ceramic tubes, ceramic molds, ground stone slabs, bronze sickles and bronze axes were more likely to be buried with males. Age differences reveal that individuals ranging from 18-35 years were more likely to be buried with bronze knives and awls (Figure 6.23). Overall, individuals aged 18-35 and 35-50 had the exact same diversity scores (S=4.13). However, older individuals (35-50) populated more clusters, and therefore had more diverse clusters of artifacts buried with them than younger individuals. Finally, as the correlation between clusters and sex is not significant, specific tools were selected to further explore gender and age differentiation.

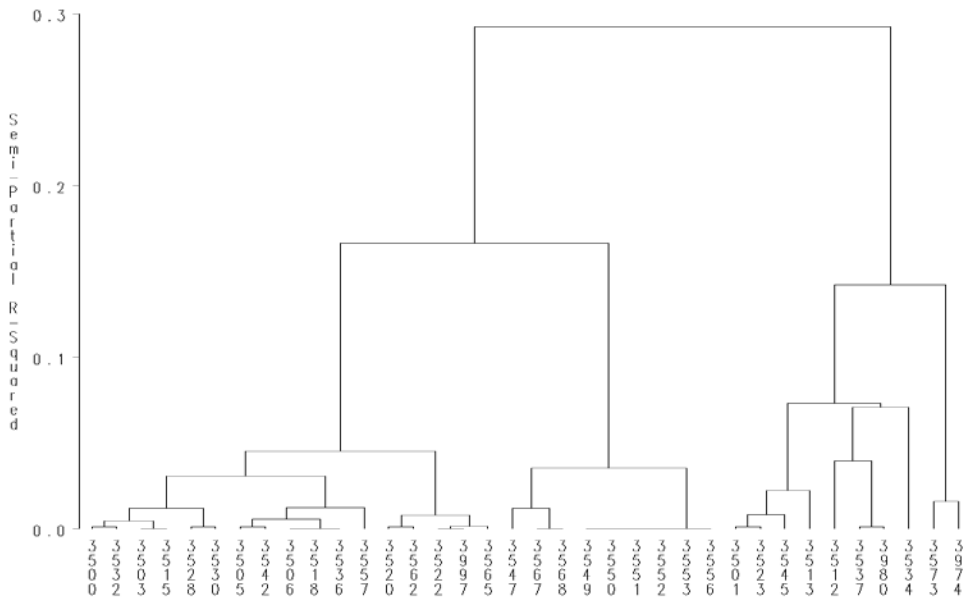

Figure 6.21 Bestamak Tools (Adults)

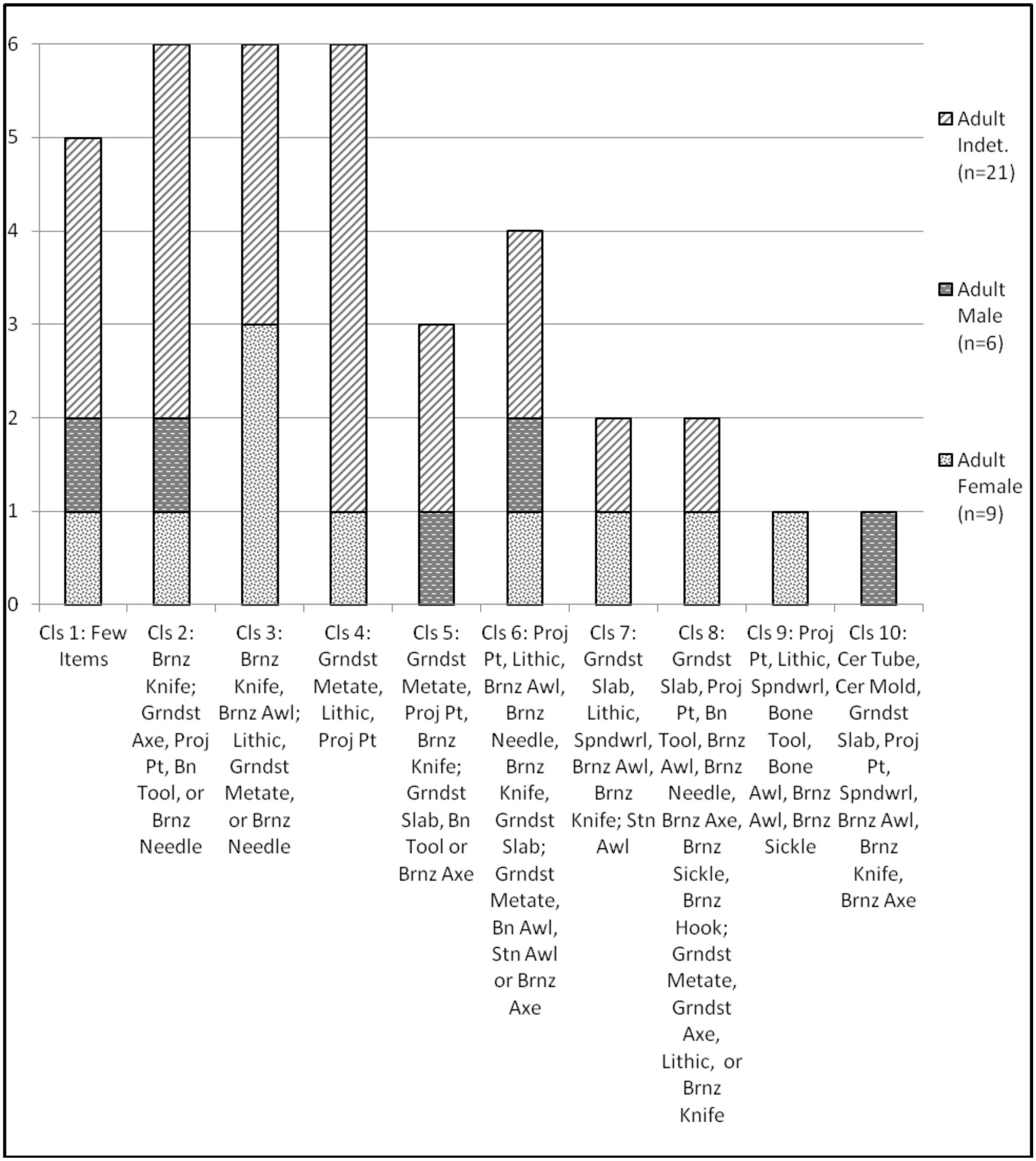

Figure 6.22 Bestamak Tools (Adults) by Sex

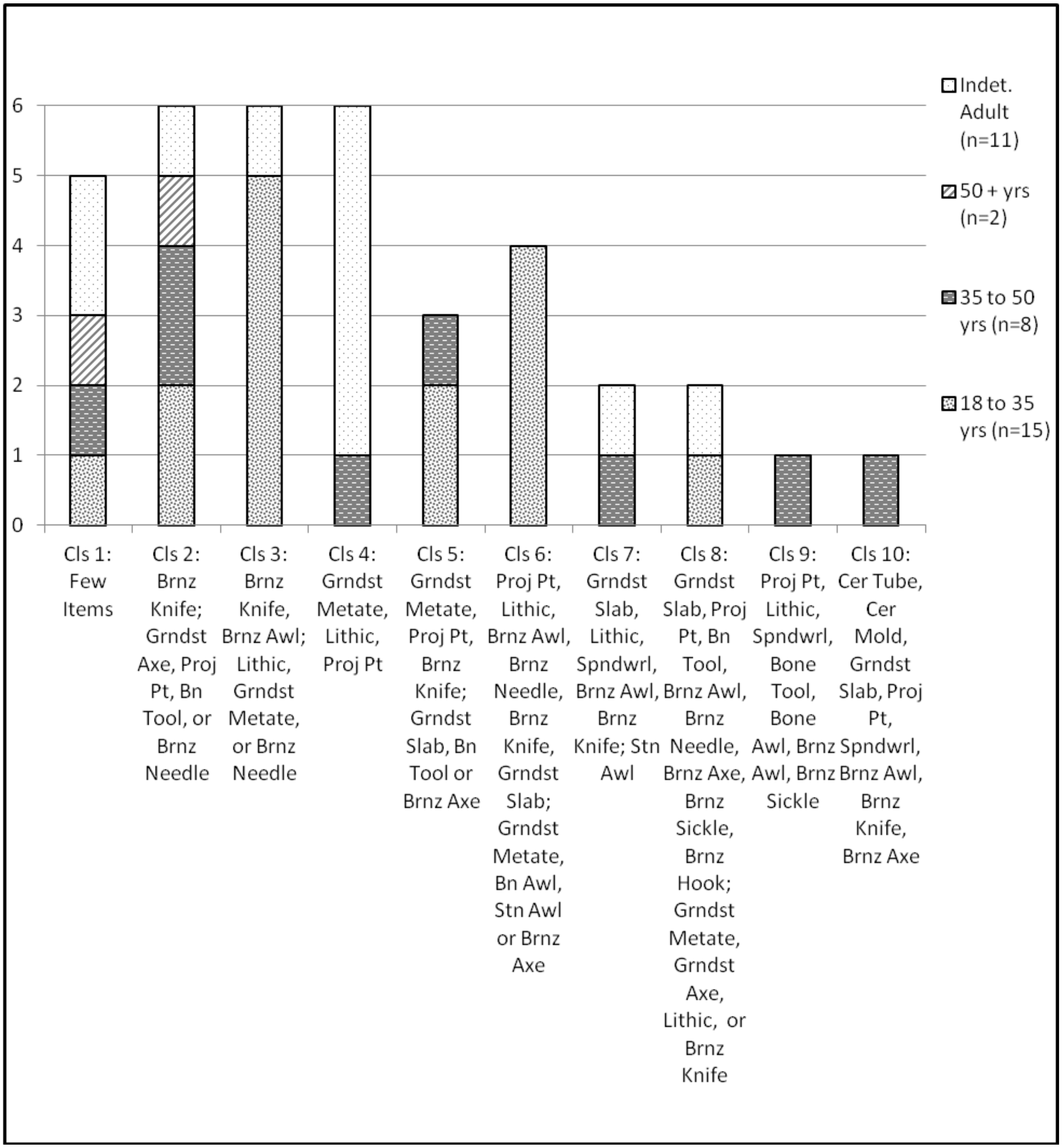

Figure 6.23 Bestamak Tools (Adults) by Age

In order to further explore age grade and gender differentiation among adults, several groups of objects associated with craft specialization or occupation were analyzed. First, objects that connected to weaving and leatherworking were selected including spindle whorls, bronze needles, as well as bone, stone and bronze awls. A total of 5 clusters formed (r^2=0.933) that reveal variation between individuals based gender (Figure 6.24). Awls were recovered from 52.8% of burials and needles from 30.6% and neither can be attributed to a specific group of individuals based on age or sex. However, while females populate every cluster, males only populate 3 of 5 clusters. Items such as spindle whorls were buried with mostly females (n=2), but also males (n=1) and indeterminate adults (n=1). The second group of objects are tools that might be connected to metallurgy, including ground stone slabs and metates, ceramic molds and tubes, as well as ore and slag. When these items were used in multivariate analysis a total of 6 clusters formed (r^2=0.92) (Figure 6.25). Ore and slag were only recovered from burials of males or indeterminate adults, however few other items were gender specific. Only a single adult individual was recovered with a ceramic tube and ceramic mold linked to metallurgical activities. Therefore, while only males are associated with byproducts of metallurgy (slag and ore), there are few other objects that support this conclusion. The combined use of several different material types in the cemetery may reveal more useful clusters of individuals as discussed below.

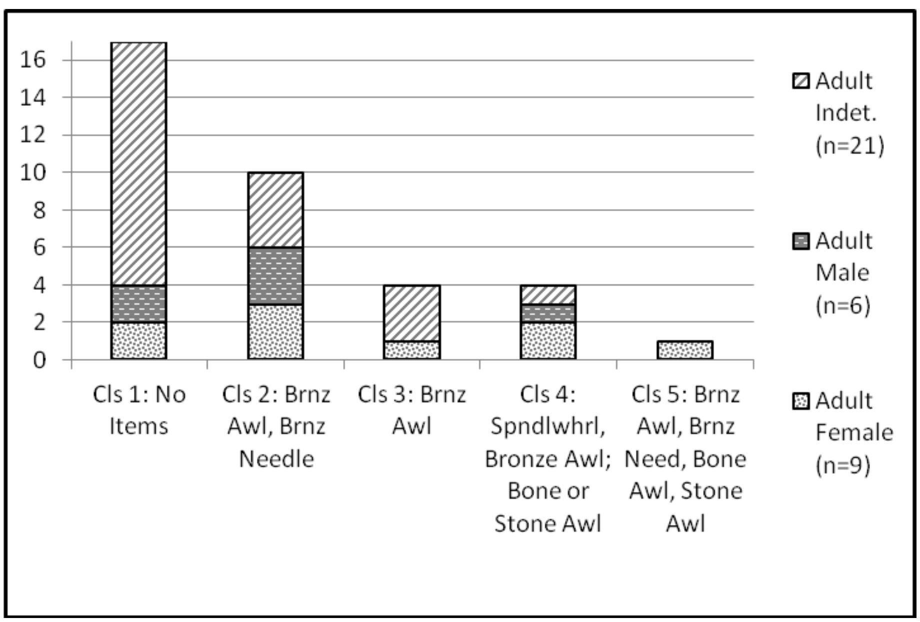

Figure 6.24 Bestamak Weaving and Leatherworking Tools (Adults)

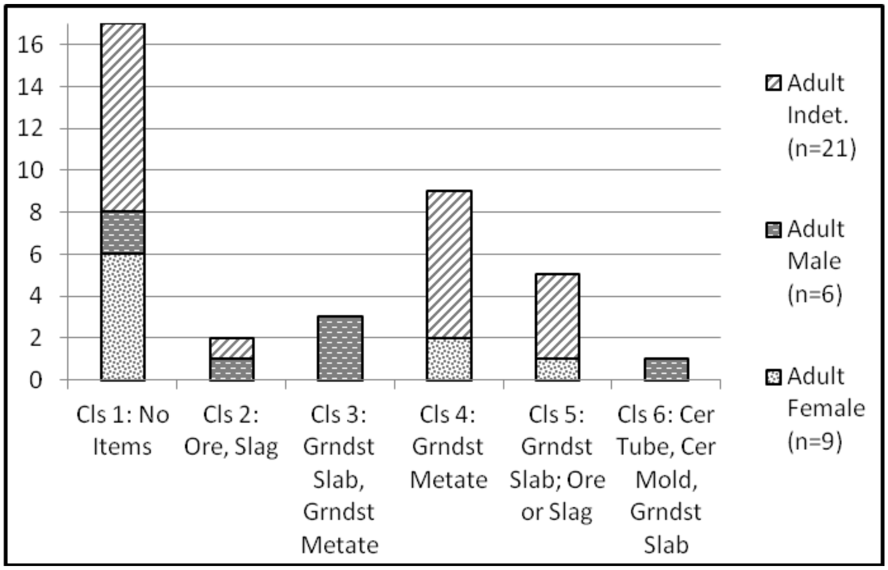

Figure 6.25 Bestamak Metallurgical Tools (Adults)

The results of these analyses allow for few connections to be made between craft production or specialization and gender or age grades. However, the results are added support for gender divisions as one of the main types of differentiation at the cemetery. Females are more likely to be buried with items such as spindle whorls and have more diverse assemblages related to weaving and sewing. In contrast, males were buried with items associated with metal production including slag, ore, and ceramic tubes and molds. Ground stone items are recovered in many different contexts, and they are not found in association with other artifacts that might indicate how they were being used. These themes are further explored through analysis of faunal, bronzes and tools at the cemetery in the next section.

6.3.1.4 Selected Fauna, Bronzes, and Tools

The combination of several categories of artifacts in burial contexts has proven to be the most useful in examining social differentiation at Bestamak. Items used for multivariate statistical analyses consisted of animal remains (horse, sheep/goat, cattle, fox, and astragals), bronze objects (knives, axes, bracelets, pendants, badges, awls, and needles), as well as bone spindle whorls, lithics, and ground stone slabs. The use of these artifact categories allows us to further explore gender and age grade divisions within the cemetery, as well as investigate individual identity.

First, the combined use of faunal remains, bronzes, and tools are examined to determine if specific categories of items were gender specific (Figures 6.26 and 6.27). A total of 8 clusters formed (r^2=0.79) when horse, cattle, sheep/goat, and astragals, along with bronze badges, knives, axes, awls, bracelets, pendants, needles were used in statistical analyses. The correlation between clusters and independent variable sex was significant (p=0.071) while the correlation between clusters and independent variable age was not significant (p=0.288). Clusters 2, 4, and 6 are populated by females and subadults, while clusters 5, 7, and 8 are populated by males and subadults, and clusters 1 and 3 include males, females, and subadults. These clusters reveal that differentiation between individuals was not based on age grades, as subadults were identified in 7 of 8 clusters. However, these clusters lend further support to divisions of the cemetery by biological sex. In an effort to further understand this differentiation, adults and subadults were clustered separately.

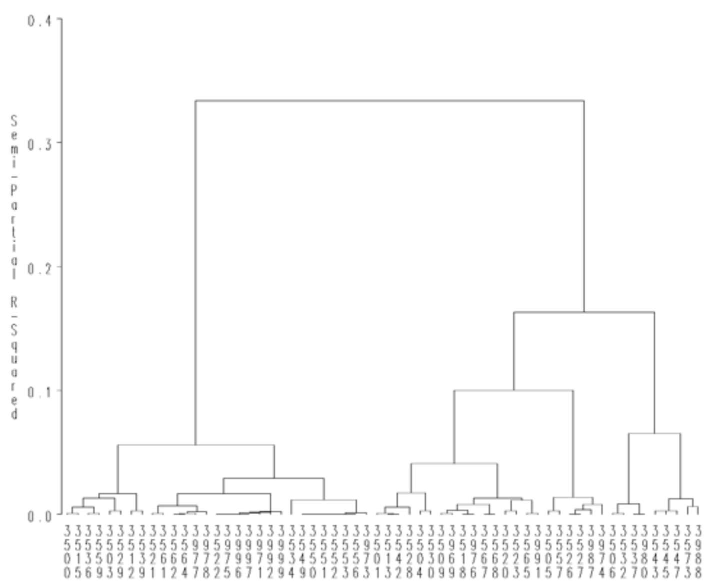

Figure 6.26 Bestamak Selected Faunal Remains and Bronze (All Individuals)

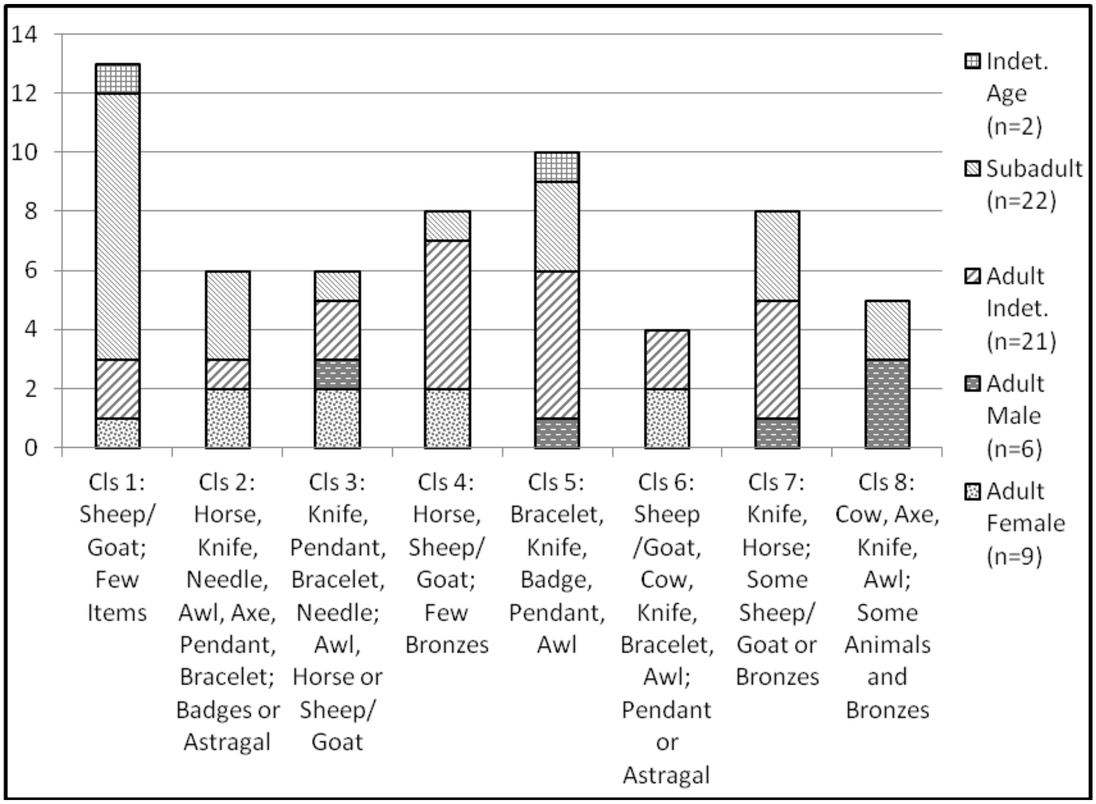

Figure 6.27 Bestamak Selected Fauna and Bronze (All Individuals)

A closer examination of clustering among adults highlights clear differentiation between burial assemblages by gender with a high level of variance explained in the formation of 9 clusters (r^2=0.85) (Figures 6.28 and 6.29). The strength of the correlation between sex and clusters was very significant (p=0.018), while the correlation between age and clusters was not significant (p=0.285). Five clusters are formed connected with the female and indeterminate sex adult categories (1, 2, 4, 6, 7), two are populated by males (8, 9) and one is populated by males and adults (5). A single cluster contained both males and females, and included bronze items such as knives, bracelets, pendants, awls and needles (3). The combination of categories of bronze and animal remains reveals that gender was one of the main foundations of differentiation in burial practice. Males are buried with animal remains and bronze tools (axes, awls, knives) but few ornamental bronzes. In contrast, females have extremely diverse assemblages of animals, bronze tools, and ornamental bronzes. In an effort to examine more specific instances of occupational specialization or lifeway, animal remains are correlated with tools and ornamental bronzes separately below.

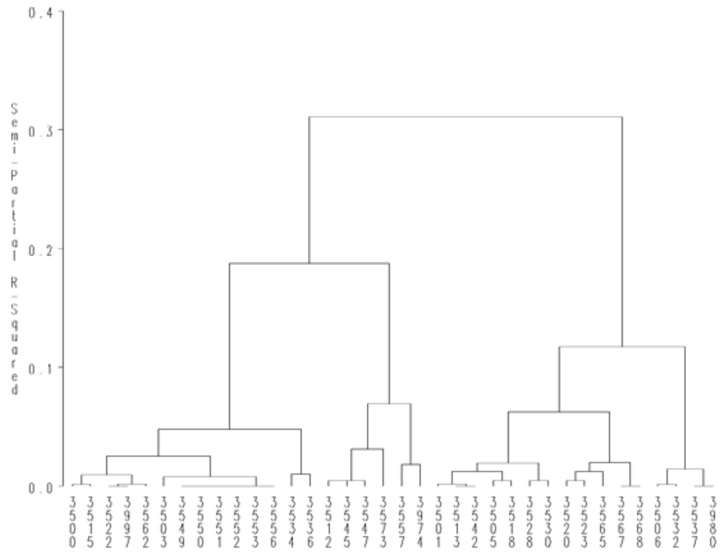

Figure 6.28 Bestamak Selected Fauna and Bronzes (Adults)

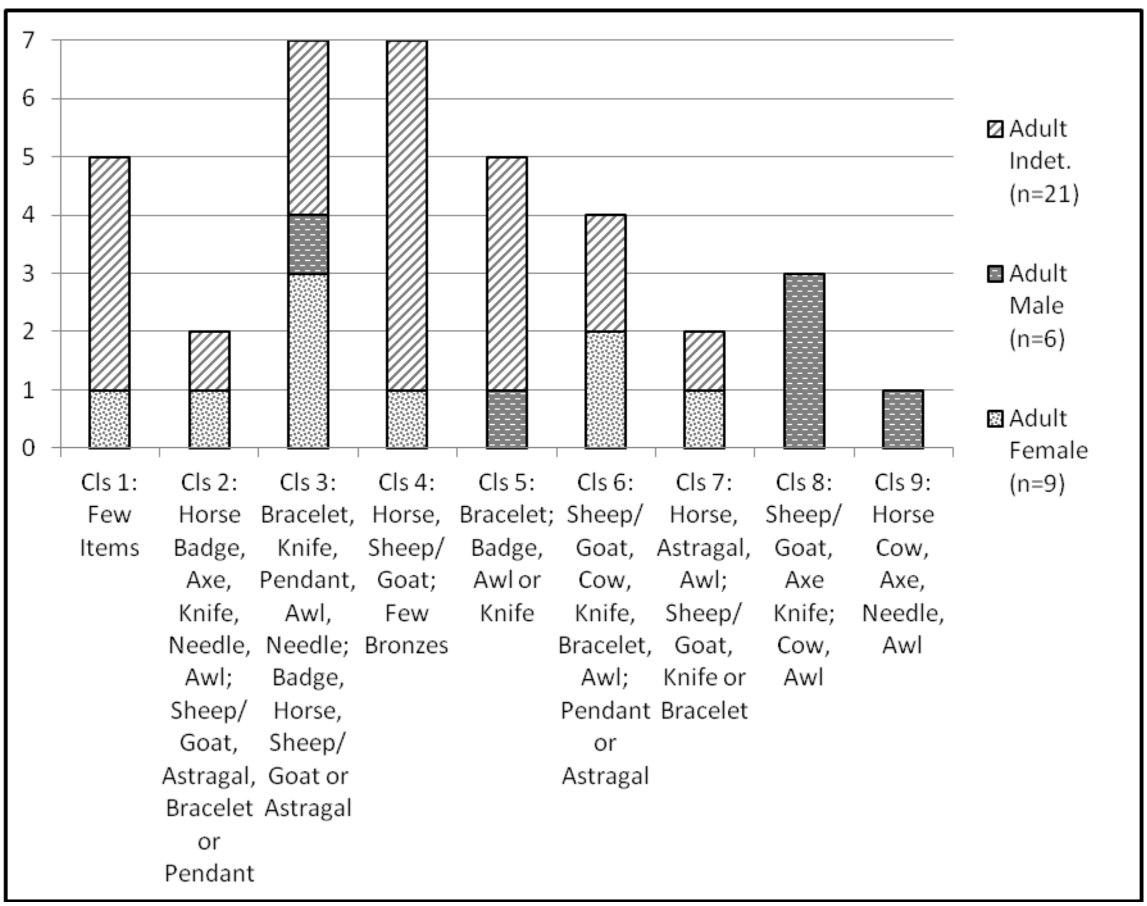

Figure 6.29 Bestamak Selected Fauna and Bronzes (Adults)

Among adults, correlations between animals and ornaments, further support previous discussions of gender divisions and status based differentiation. First, ornamental items of all materials (beads, pendants, bracelets, badges, earrings, and rings) were combined with animal remains (horse, sheep/goat, cow, dog, fox, and wolf) for clustering. Pig remains were excluded, as they did not contribute to the formation of clusters. A total of 7 clusters formed (r^2=0.88) (Figures 6.30 and 6.31). The correlation between clusters and sex was somewhat significant (p=0.142), however the correlation between clusters and age was not significant (p=0.644). In this case, females have greater diversity, both in terms of ornamental items as well as animal remains. Females are also more likely to be associated with horses than males, and badges are only recovered with females. However, males are buried with ornamental items, as seen in cluster 3, where a mixed group of individuals were recovered with bracelets, pendants, and beads. In addition, one woman has both ornamental items (badge, bracelet, pendant, ceramic bead) as well as unique animal remains such as those of horse, dog, fox, and wolf (Cls 7). Within the cemetery there are some individuals that have significantly more wealth or diverse assemblages and these will be discussed in the next section. In concert with these findings, analysis of tools and animal remains also resulted in 7 clusters (r^2=0.88) (Figures 6.32 and 6.33). The correlation between clusters and sex was somewhat significant (p=0.158) while the correlation between clusters and age was not significant (p=0.256). Again, females have the most diverse assemblages among these clusters, and knives are ubiquitous among individuals. While males are more likely to be buried with axes, hooks and sickles, as well as sheep/goat and cattle, females are likely to be buried with knives as well as the remains of horse, cow, sheep/goat, dog, fox, and wolf.

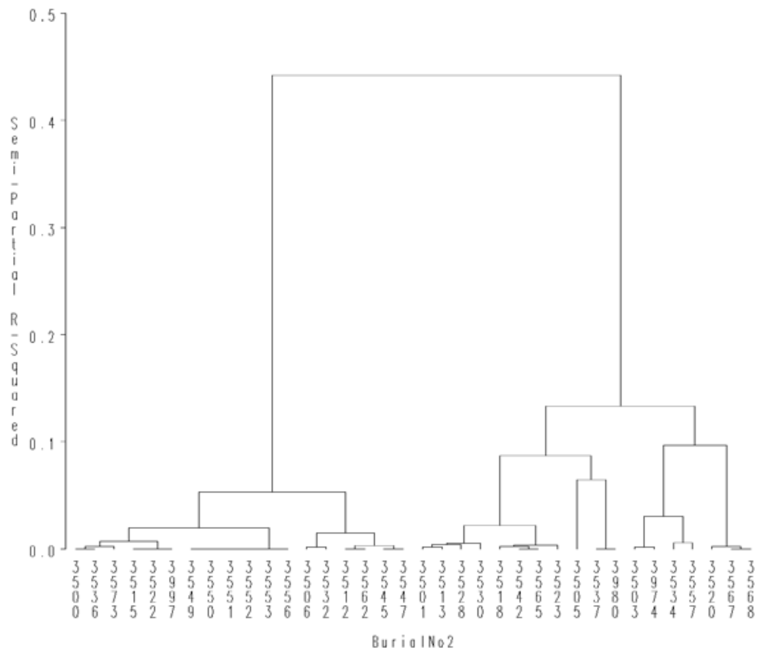

Figure 6.30 Bestamak Ornamental Objects and Faunal Remains (Adults)

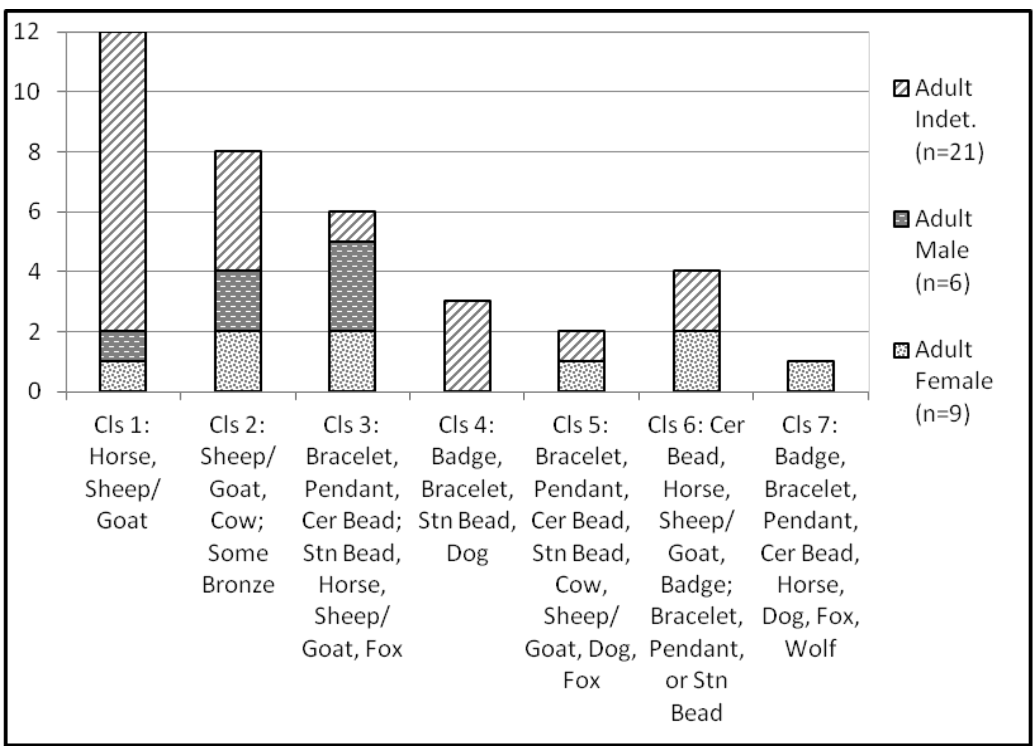

Figure 6.31 Bestamak Ornamental Objects and Faunal Remains (Adults)

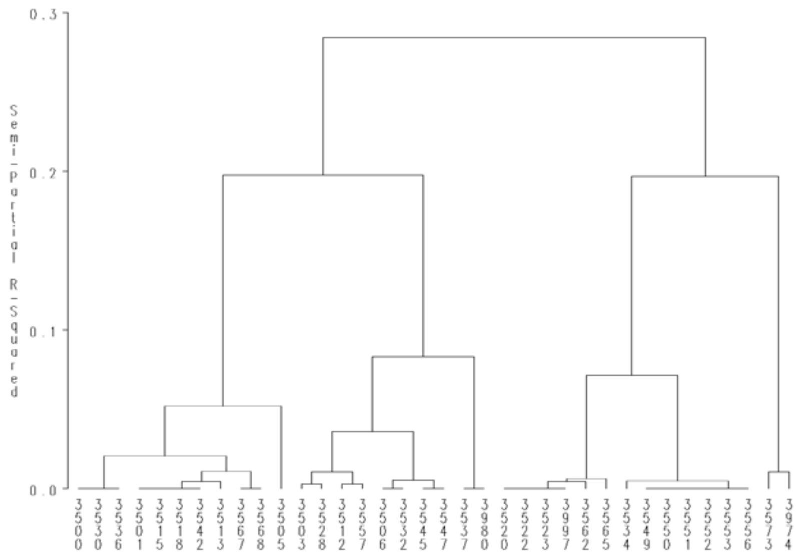

Figure 6.32 Bestamak Tools and Faunal Remains (Adults)

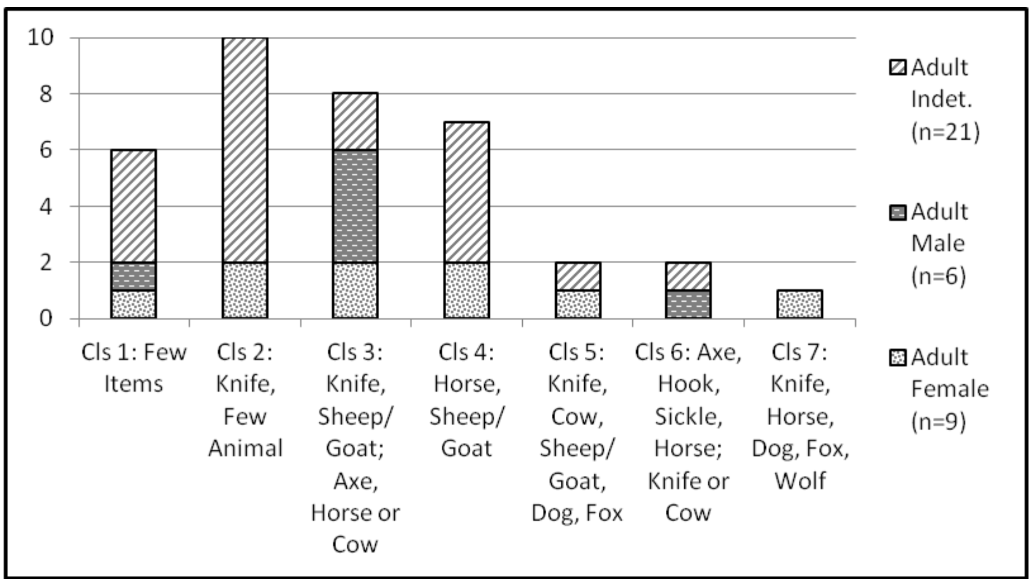

Figure 6.33 Bestamak Tools and Faunal Remains (Adults)

These two datasets reveal that there are important differences between the burial assemblages of males and females. Male assemblages are more homogeneous, and tend to include bronze tools (axe, hook, sickle) as well as some animal remains (sheep/goat, cow, horse). In contrast, the burial assemblages associated with females are extremely diverse, including animal remains (sheep/goat, cow, horse, dog, fox, wolf), ornamental bronzes, but few tools. Furthermore, females are included in 6 of 7 clusters for both sets of data, while males are included in only 3 of 7. Much more differentiation is occurring between females at this site, which may relate to a form of hierarchical or heterarchical status. Based on the results of biodistance, it does not seem that this status is based on kinship, however marital status or family wealth may play a part.

6.3.1.5 Body Position

This section examines individual body position in the grave in correlation with grave goods and biological groupings. At the cemetery of Bestamak, three main categories of body position were recorded and include the side the individual was interred on, the cardinal direction of their head, and the degree of flex of the legs. The majority of individuals (n=60) were placed in the burial on their left side (68%) or had an unknown placement (27%). Very few were placed on their right side (2.5%) or on their back (2.5%). Among adults, little variation was evident in the side that the individual was placed for burial. However, much greater variability was present in the direction of the head of the individual, whether north, west, east, northwest, northeast, or southwest (Figures 6.34 and 6.35). A total of 5 clusters formed when the side the individual was interred on and the cardinal direction of the body/head were examined (r^2=0.95). Females were always placed with the top of their head facing west or northwest. In contrast, males were placed with the top of their head towards the north, west, northwest, east or southwest. The correlation between clusters and independent variables sex and age are both very significant (p=0.053 and p=0.015). The side the individual was laid on correlates well with the degree of leg flexure, however this does not further clarify these datasets. Unfortunately, when body position was correlated with the burial assemblage, no clear associations were identified. Furthermore, no clear correlations were evident between any form of body position and biodistance clusters.

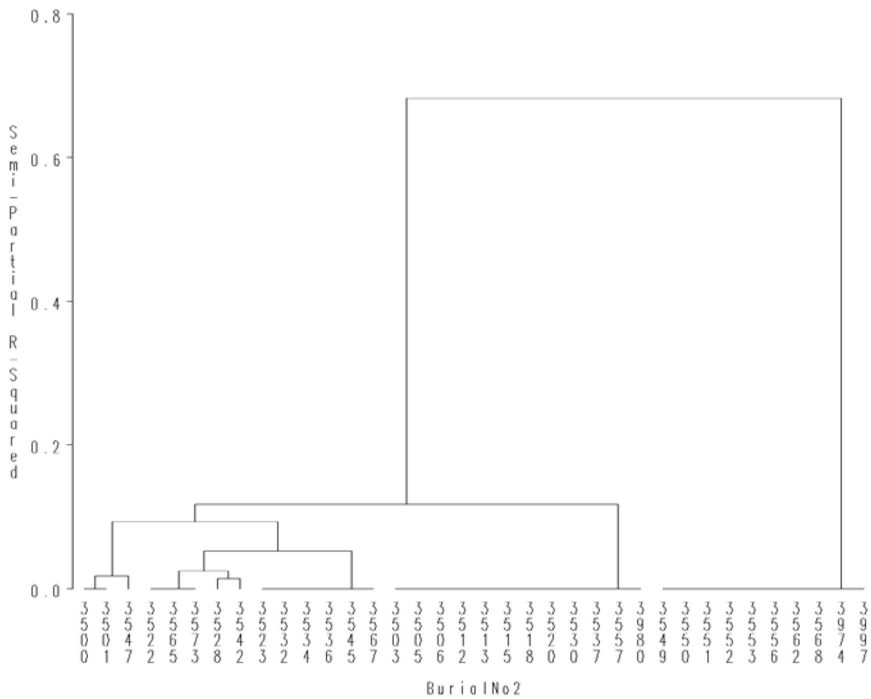

Figure 6.34 Bestamak Body Position: Side and Direction of the Head (Adults)

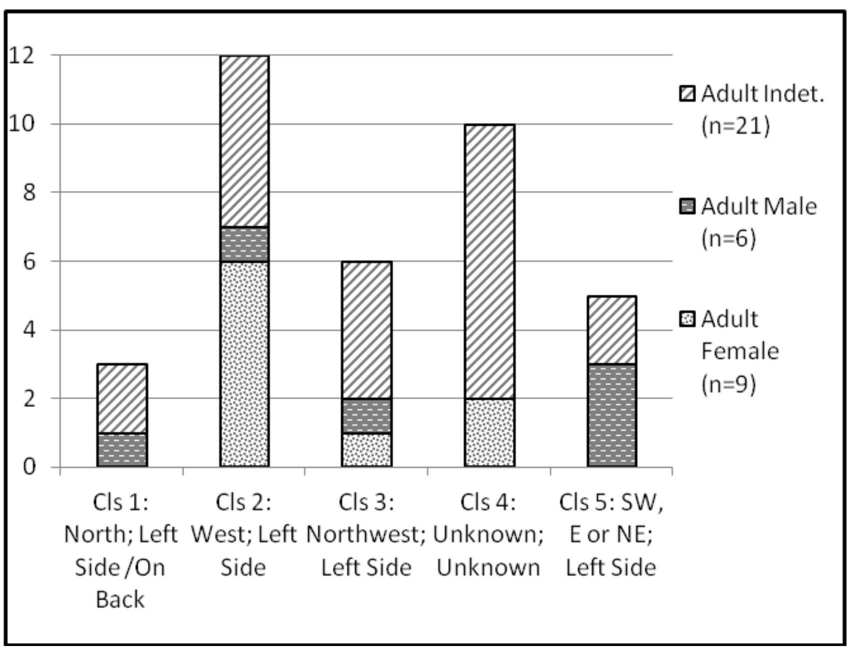

Figure 6.35 Bestamak Body Position: Side and Direction of the Head (Adults)

6.3.1.6 Burial Construction

Burial construction includes many forms, including both above and below ground structures. Above ground included the construction of circular kurgans (mounds) above the grave, often with associated circular ditches. However at Bestamak, there are also many individuals buried in flat graves, which lack above ground construction. The internal structure of the grave was also examined, as some included wooden beams or litters placed at the base of the pit. Often, only a small part of wood remained in the burial, and therefore was coded as present or absent. In addition, the overall burial size, length, width and volume were recorded and used in analysis. Burial construction is often associated with the status of the individual as understood by the mourners. The more grandiose the above and below ground construction, the purported higher the status of the individual (Tainter 1975; Carr 1995). However, these types of distinctions need to be understood diachronically, elaborate displays may be acceptable in certain periods and denounced in the next (Cannon 1989). As only a few individuals were identified in kurgan (mound) structures, which therefore could not be used in cluster analysis. When the presence of wood and total grave pit volume (in cubic meters) were used in statistical analysis a total of 4 clusters formed (r^2=0.97) (Figures 6.36 and 6.37). However, the correlation between burial construction and sex was not significant (p=0.245), and the correlation between burial construction and age was also not significant (p=0.384). The results of this clustering reveal that females, indeterminate adults, and subadults were present in all 4 clusters, while males were only present in 3 clusters. Adult males were absent from small tombs without wooden construction.

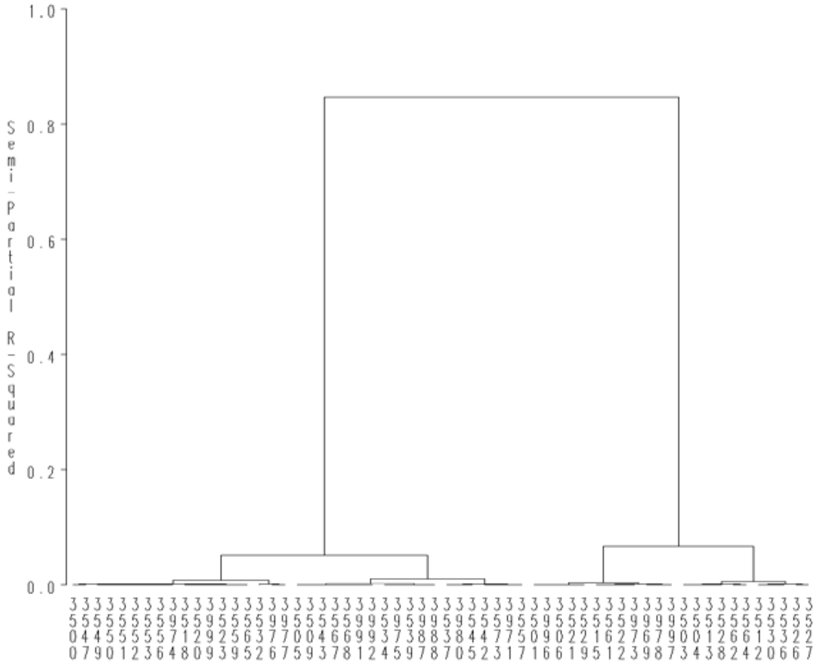

Figure 6.36 Bestamak Burial Construction: Size by Volume and Wooden Litter (All Individuals)

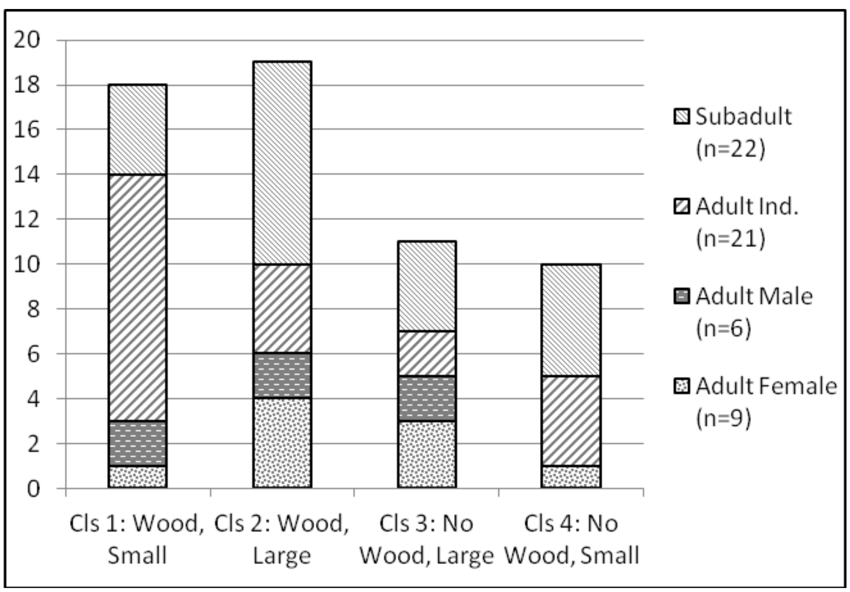

Figure 6.37 Bestamak Burial Construction: Size by Volume and Wooden Litter (All Individuals)

When only adult burials were examined, a total of 4 clusters formed (r^2=0.98). Among adults, the correlation between sex and clusters is not significant (p=0.418), nor is the correlation between age and clusters (p=0.148). Burial size was determined by cubic meters, based on the recorded length, width and depth of each burial. The four clusters were: small burials (0.5 to 3.2

cubic meters) that lacked a wooden litter, small burials (2.7 to 9.4 cubic meters) with a wooden litter, large burials (12.1 to 37.3 cubic meters) with a wooden litter, and large burials (7.9 to 15.8 cubic meters) without a wooden litter. Females were identified in all clusters, while males were not recovered from burials that were small and lacked a wooden litter (Figures 6.38 and 6.39). Therefore, if grave pit size and wooden construction is linked to status, then overall, males have higher status than females and subadults. This is further discussed below in the section on social organization and individual identity.

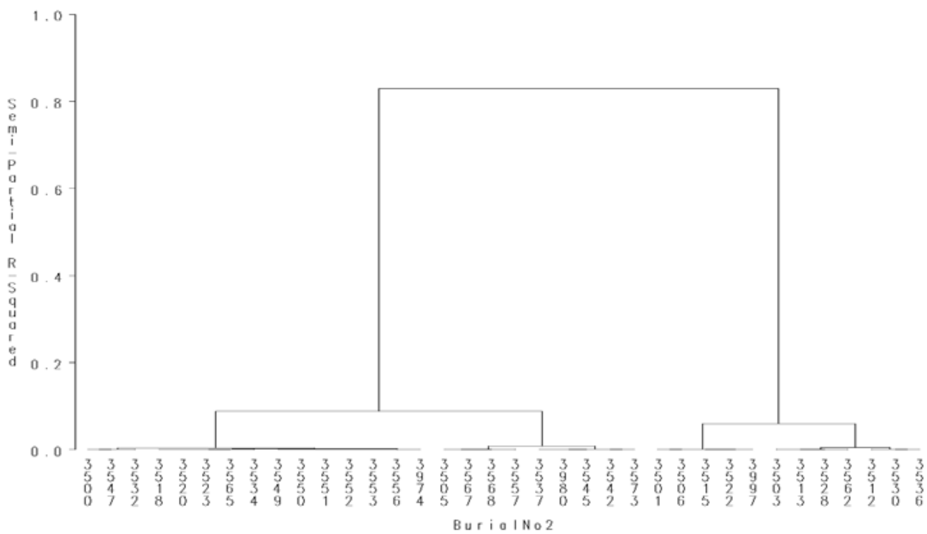

Figure 6.38 Bestamak Burial Construction: Size by Volume and Wooden Litter (Adults)

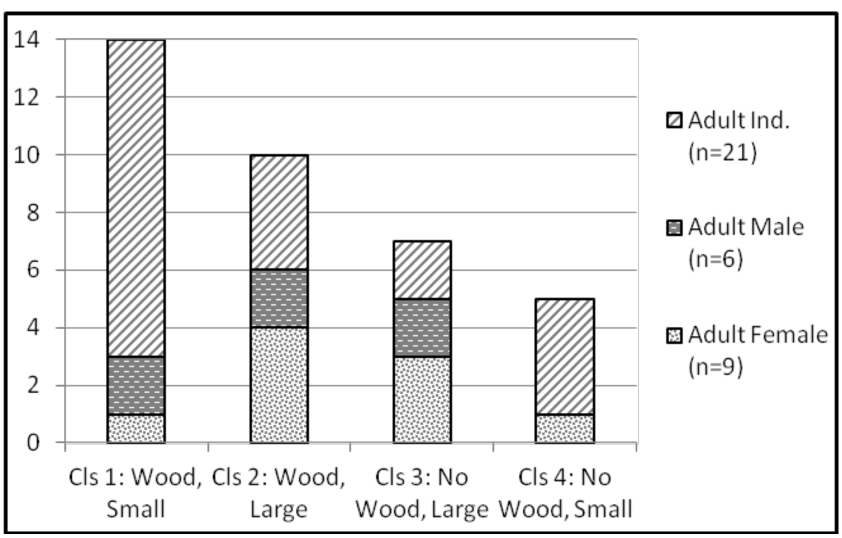

Figure 6.39 Bestamak Burial Construction: Size by Volume and Wooden Litter (Adults)

6.3.2 Identity and Social Structure at Bestamak

This section of the dissertation explores differentiation at the individual and community level for Bestamak. First, multiple lines of evidence were used to examine the types of identities present within the cemetery. Investigations of the multiple and layered nature of identities takes into account factors such as biological affinity, the varied nature of mortuary practices, and cemetery structure. Second, these variables were compared to biological age and sex, as well as measures of wealth and diversity. The objective of these analyses is to examine the multiplicity of identity found within the cemetery in an effort to understand the foundation of social structure. Third, the results of these analyses were interpreted with reference to ethnographic accounts in order to create working hypotheses. These hypotheses are used to explain the findings, as well as compare them with other communities.

Through multivariate statistical analysis of mortuary practices at Bestamak, different social identities of individuals were assessed. While many adult individuals were unsexed, when adults were investigated it became clear that gender divisions played an important role in this community. While the initial objective of mortuary statistics was to examine identity, certain items in the burial assemblage might more easily be associated with activities. The activities that individuals are engaged in are essentially linked to the many and layered identities of the individual. Clear divisions between adult individuals were based on biological sex, with males were more likely to be buried with bronze tools including axes, hooks, and sickles, as well as ceramic molds for bronzes, ceramic tubes, ore, and slag. Females were more likely to be buried with bronze ornamental items (badges), spindle whorls, and horse remains. In burial, each of these items may signify several activities, and therefore need to be discussed in detail.

In the burials of males, bronze axes are particularly problematic, as they have previously been associated with warfare, yet lack other functional interpretations. Many of these might have been used to cut down trees, as wood is often used in burial and settlement construction. Of only six individuals buried with axes, five of them (83%) had wooden construction in their burial pits. Furthermore, there was very little evidence of trauma or violence on human remains at this cemetery. Other functional items include bronze hooks and sickles which are only buried with males. The hook has been interpreted as a tool to hang meat after butchering, still used today in Kazakhstan, while sickles were used to cut fodder for animals as in present day Mongolia (Figure 6.20). These two items are associated with herding activities, one for the processing and butchering of meat and the other with foddering the herd. However, the sickle could also have been used to cut plant matter for human consumption or building materials, which is discussed in relation to dietary intake (chapter 7). Males are also buried with metallurgical items, especially byproducts of metal production such as slag and ore. In addition, a single male individual was buried with a ceramic mold and ceramic tube both interpreted as items used in metallurgical activities. Male burial assemblages tended to have functional rather than ornamental items, and were relatively homogeneous in comparison to females.

Burial assemblages of females were much more diverse than those of males, however they are associated with fewer items that were signifiers of biological sex. Objects that were often associated with females include ornamental badges, bronze clamps, spindle whorls, and horse remains. Bronze badges were recovered from twelve burials at Bestamak, belonging to females (n=2), indeterminate adults (n=6), and subadults (n=4). Often these ornamental badges were worn as part of a headdress, cap, or sewn onto clothing. As badges are often stylistically dissimilar, they may be evidence of status or the non-local nature of some females. However, stylistic analyses have not been undertaken on these items. While both females and subadults have these items, it may be an indicator of an identity related to womanhood or marriage. Individuals buried with bronze headdresses and braid plaits, which sometimes include badges, and are often posited as female. Ethnographically, the Kazakh and Kyrgyz often wear headdresses or veils as a sign of their marital status (Argynbaev 1978; Krader 1955:73). The burial of individuals with headdresses and braid plaits has therefore been interpreted as a sign of womanhood or marriage (Usmanova and Logvin 1998; Kupriyanova 2008; Usmanova 2010:73-87). Of the six individuals with headdresses, four are found within double burials where the deceased were placed facing one another. Double burials such as these are often interpreted as those of a male/female pair or married couple. However, a good number of the 'females' within these burials were subadults, which makes sex determinations difficult. Therefore, the meaning behind these adornments could be interpreted as marking a ceremonial age of womanhood or as evidence of marriage. Additionally, these burials are comparably wealthy in artifact count and diversity, highlighting the unique status of these individuals in their community. Similar burials of females during the Middle Bronze Age have been interpreted as religious, possibly with priestly functions (Kupriyanova 2008:142-4).

Spindle whorls were recovered from the graves of females, who may have been engaged in weaving activities. These items are often associated with awls and lithics, which seem to be part of a general tool assemblage for many of the deceased. In terms of animal remains, horses are overwhelmingly recovered from the burials of females. This highlights a special association between females and horses that could be evidence of ritual and functional connections. Recent ethnographies from Mongolia describe how wild horses are caught and held by individuals on horseback and then milked by females (Vainshtein 2009:66-67; Planet Earth Series: Wild

Mares). As horse remains do not seem to be a large portion of the diet during the Middle Bronze Age, the use of horse milk for ritual consumption is possible (chapter 7). Furthermore, fermented mare's milk (kymis or airag) is a special drink that is strongly associated with festivals that occur in the early spring such as the Kazakh new year (Nauryz) and Mongolian new year (Tsagaan Sar).

A group of items that are found buried with both males and females, include needles, awls, projectile points, knives, bronze pendants and bracelets. These objects are linked to activities and identities that are not connected to a binary division of gender, a specific age, or kinship group. Needles and awls were likely used in activities such as sewing and leatherworking, while projectile points, lithics, and knives had multiple uses. The ubiquity of these items in adult and subadult burials is therefore not surprising. Bronze ornamental items such as pendants and bracelets may not have had a functional use, however they could have signified the special status or wealth of individuals. Many pendants were covered in gold and researchers have posited that they were either attached to clothing and caps, or worn on the upper ear (Usmanova 2010). Variations in the spiraled designs on bronze bracelets have also been divided into Sintashta or Petrovka (Kupriyanova 2008). However, as many graves with these items have not been dated, it is difficult to tell if these delineations are correct. Unfortunately, bracelets are not recovered with a specific biological sex or age group, and therefore are used as indicators of individuals with special status or wealth in this community.

Objects in funerary assemblages were therefore separated into two categories, functional and ornamental. Functional items are those that can be directly linked to activities in the cemetery. These activities include cutting wood, weaving, sewing, leatherworking, herding, foddering, butchering, milking, and smelting. And, ornamental items may have been related to wealth, status, residential (non-local) and/or personal identity. However, some objects lie on the border of these two categories, such as bronze axes and knives/daggers, which could have both a functional and ornamental use in mortuary ritual. Therefore, at Bestamak, it seems that many identities are present that can be linked to crafts and occupations, and these are in addition to identities linked to higher status or wealth based on bronze objects.

General trends for the Bestamak community highlight that both adult and subadult groups have similar levels of differentiation. Clusters based on mortuary data include those which lack burial assemblages, those that have few items and little variety, and those that have great numbers of artifacts and variation. Differentiation seems to be heterarchical based on the presence of several clusters that are held by a similar number of individuals. There is often one cluster of individuals with a meager burial assemblage, while the rest of the clusters have a great degree of variation in categories. This type of differentiation is mirrored in the subadult mortuary realm, where one cluster of individuals has a meager assemblage, while the remaining clusters have few individuals and equal levels of diversity. For example, few items recovered in adult burials were subsequently absent in the graves of subadult burials, including bronze hooks and sickles, as well as wolf and fox remains. Differentiation between adults based on artifact assemblages is mirrored among subadults with similar sets of clusters. Bronze objects formed 7 clusters for adults, and 5 clusters for subadults, while ornamental bronzes formed 5 clusters for both adult and subadult groups. In terms of animal remains, a total of 6 clusters formed for adults, while subadults had 4 clusters. The similarity between these groups is unusual, because adult differentiation seems to be based on gender divisions. It may be that the recognition of gender divisions began at a very early age or that subadults were given gifts in burial that matched their parent’s identities in regard to activities, wealth, or status.

Variety, or diversity, in assemblages is also important to understanding adult and subadult groups. Box plots of diversity (S) were created for total assemblage, bronze objects, and animal remains. Diversity scores are one way of determining the degree of variety evident in an assemblage, and may help to show a unique type of differentiation between individuals. Furthermore, box plots of total artifact count used as a proxy for wealth, were also created for the entire assemblage and bronze objects. These box plots compare values for adult males, females, indeterminate adults, adolescents, children, and indeterminate subadults. For the entire assemblage, diversity scores reveal that adolescents have the highest average scores, as well as the highest peak values (Figure 6.40). On average, children have the least diverse assemblages, while adult males and females have similar average diversity scores. However, several burials of children (2-12 yrs) (n=2) have some of the highest peak diversity scores along with adolescents (12-18 yrs) (n=1), indeterminate subadults (n=1), and indeterminate adults (n=2). If artifact count for the entire assemblage can be envisioned as a determinant of overall wealth, then adolescents have the highest average wealth in the cemetery, followed by children, males, and then females (Figure 6.41). However the range of wealth values is certainly the longest for children and adolescents, followed by females and then males. Among males, there is a very small amount of differentiation by wealth as well as diversity.

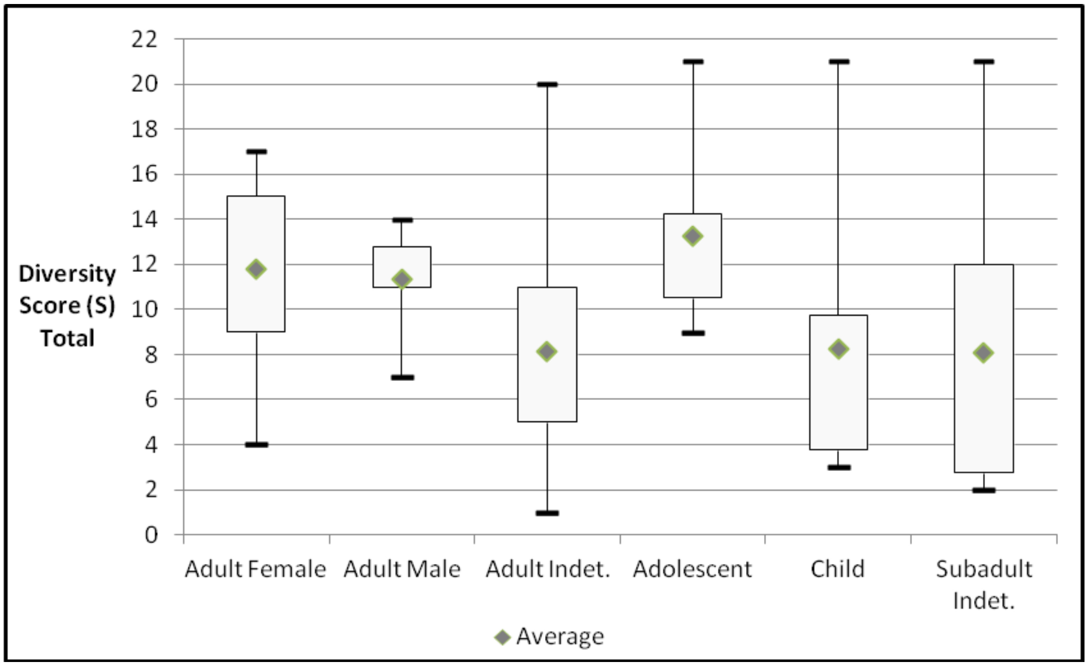

Figure 6.40 Bestamak Box Plot of Diversity (S) with Error Ranges (All Individuals)

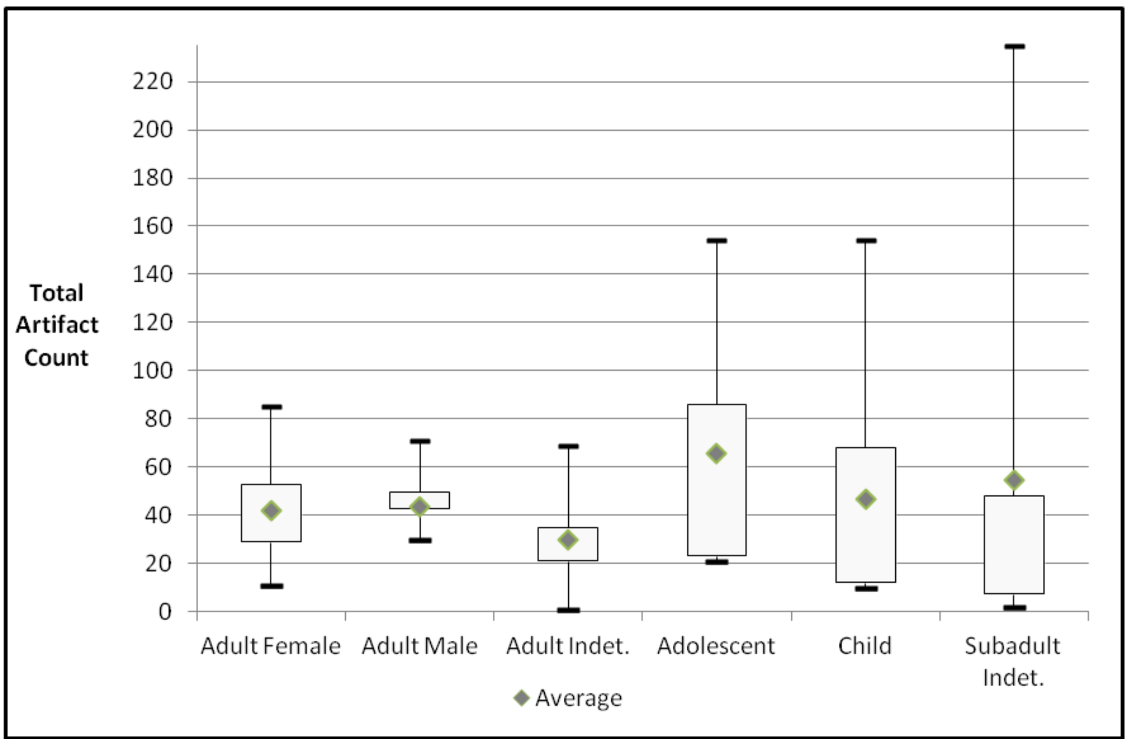

Figure 6.41 Bestamak Box Plot of Total Artifact Count with Error Ranges

A box plot of diversity (S) in animal deposits depicts high average values for females in comparison to males and subadults (Figure 6.42). Females tend to have 2.2 different types of animals buried with them, while average scores for the rest of the community are relatively similar in terms of animal remains. The overall range of values is not very different between individuals, with 0 to 4 categories of animals recovered per individual. Females have the most diverse assemblages in terms of animal remains, which highlights the possibility that females had higher or greater levels of status. However, an examination of bronze objects in burial allows for a different picture to emerge. A box plot of diversity (S) of bronze artifacts depicts high average values for adolescents, somewhat lower average scores for adult males and females, and very low average scores for children (Figure 6.43). When compared with the total number of bronze objects, a similar situation occurs, with the average count for adolescents and females much higher than the rest of the community (Figure 6.44). However, while adolescents have a much wider range in the number of bronze objects, the sample size for these individuals is quite small (n=4). In contrast, males have the smallest range of bronze objects, as well as very homogeneous diversity scores ranging from 3 to 6 types of bronze artifacts. Females and adolescents have the most diverse assemblages overall in terms of bronze items with between 0-8 and 4-9 objects, respectively. However, total count of ceramics reveal that adolescents and children have the highest average number of ceramics, as well as the largest range in ceramic count (Figure 6.45). Some subadults had up to 15 vessels as part of their burial assemblage, which is unique for this cemetery.

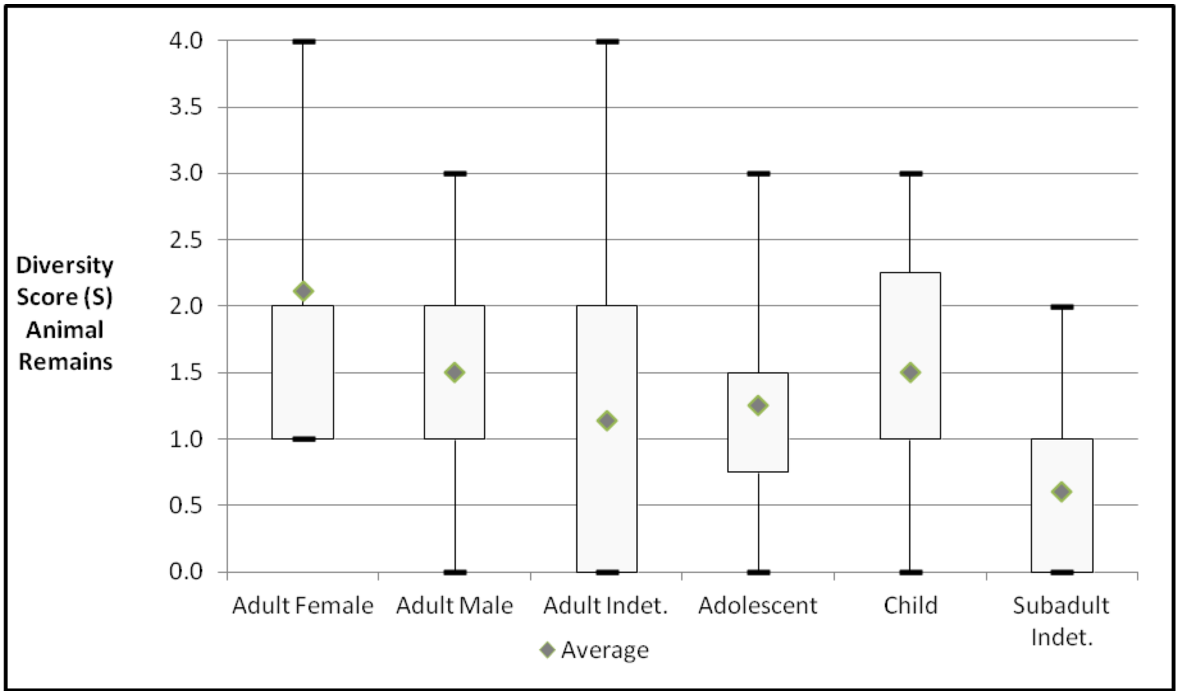

Figure 6.42 Bestamak Box Plot of Diversity (S) for Animal Remains with Error Ranges (All Individuals)

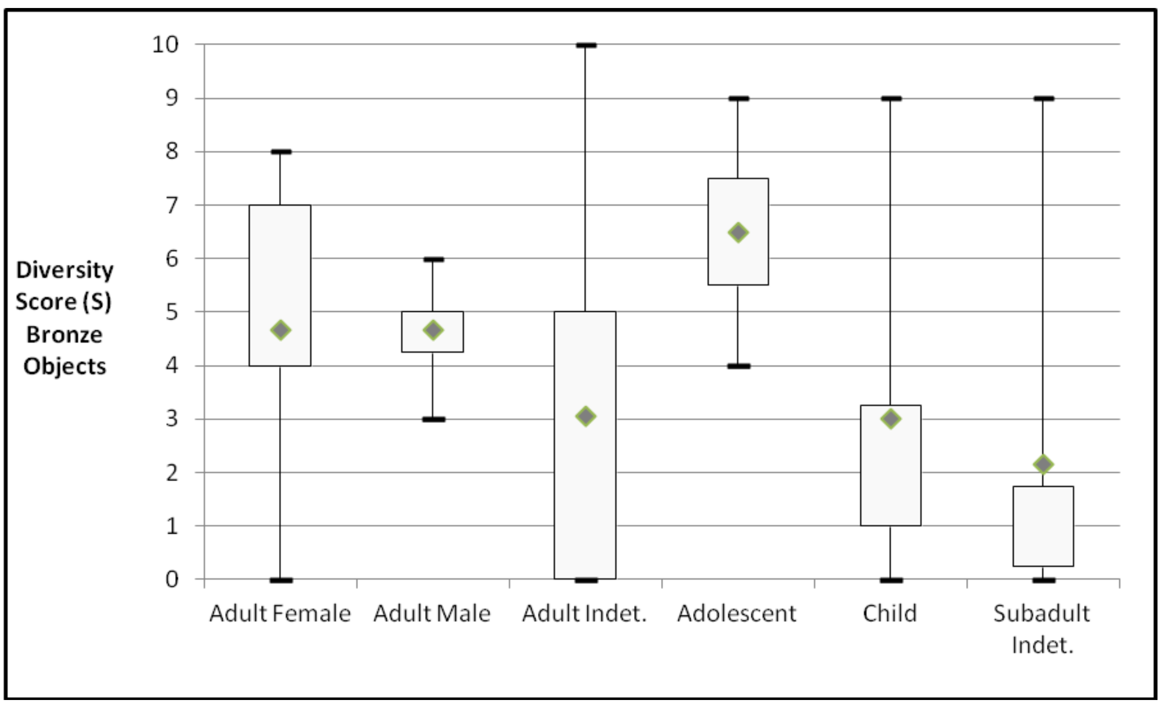

Figure 6.43 Bestamak Box Plot of Diversity (S) for Bronze Objects with Error Ranges (All Individuals)

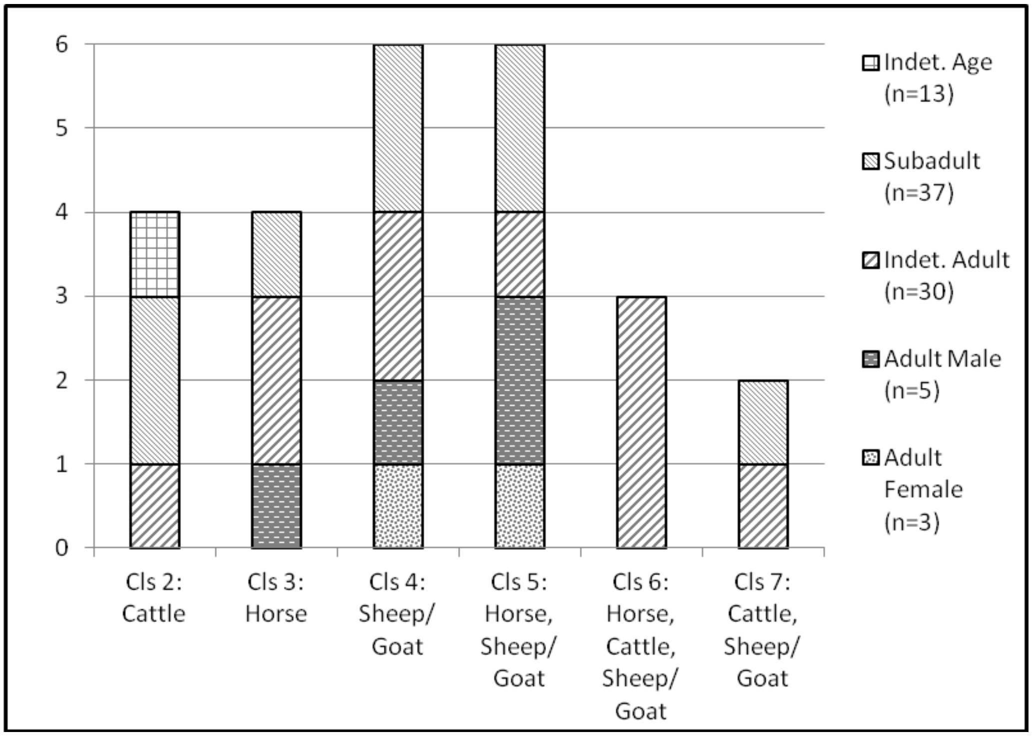

Figure 6.44 Box Plot of Total Artifact Count for Bronze Objects (All Individuals)

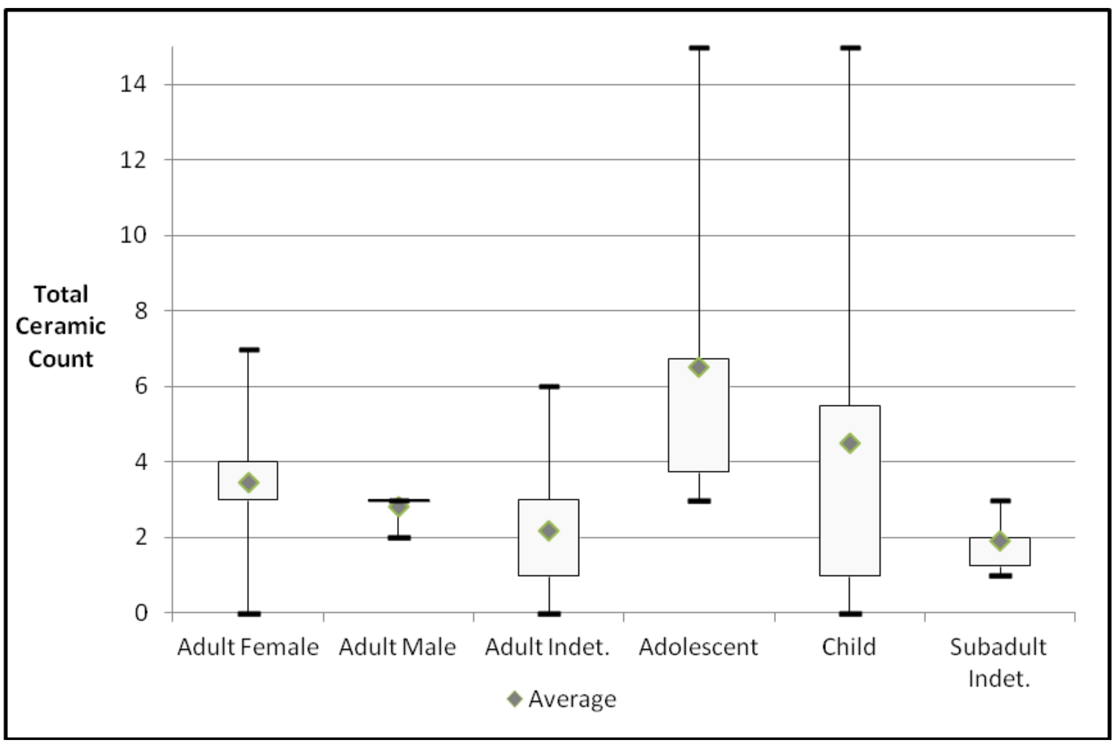

Figure 6.45 Bestamak Box Plot of Total Artifact Count for Ceramics with Error Ranges (All Individuals)

The social organization of the Bestamak community is built upon a foundation of gender divisions and heterarchical structures. Divisions between individuals based on biological sex are evident based on associations with specific artifact groups. While males are more likely to be buried with tools and metallurgical items, females are more often buried with bronze ornamental objects. Among specific artifact groups, a heterarchical division between individuals is evident. For bronze objects, ornamental bronzes, and animal remains, as well as combinations of these items, clusters are heterarchically based. This includes one cluster of individuals who lack objects and a set of small clusters with equal numbers of individuals. The set of small clusters do not form a hierarchical pyramid of successively fewer individuals with greater diversity or numbers of items. Instead, these clusters have differential diversity of items and a mix of adults and subadults from the cemetery. Furthermore, when adults and subadults are separated and reanalyzed, the clusters often match in terms of the number and content.

Genetic similarities between individuals do not correlate with mortuary practices at this cemetery. When biological affinities were investigated through biodistance analysis of dental non-metric traits, the results of these analyses indicate that the mortuary population at Bestamak clusters into six hypothetical family groups (chapter 8). However, the lack of a genetic basis for clustering does not preclude the possibility that families or individuals within hypothetical family groups had differential wealth or status. Furthermore, these findings do not preclude the possibility that subadults have a form of ascribed status. For example, child (2-12 yrs) burials at the site have a great number of artifacts, ranging from 10 to 154 objects. One child was buried with 154 items, including 51 pieces of bronze (counting each bead separately), and was between 3 and 5 years of age. Clearly this individual did not achieve a high status in his or her lifetime, and instead was likely buried with items based on family wealth or status. However, the family or parents of this child may have achieved higher status or wealth in their lifetime, and passed on part of this wealth to their child in the form of a mortuary assemblage. The results of multivariate statistical analysis reveal that the Bestamak community was much less complex than previously imagined. This community is discussed in terms of elite individuals and warriors (Zdanovich 1997:57; Anthony 2009). While some forms of wealth and status are evident for individuals at the cemetery, it is often associated with ornamental bronze items. Furthermore, the existence of objects related to everyday activities and occupations make this community one that appears to be free of overarching hierarchical structures. Instead, this society may be interpreted as one with a foundation in gender divisions, achieved status and wealth for adults, and ascribed status for subadults. Therefore, while individual status may be important during this period, and at this site, it seems unlikely that there was a class of elite individuals that controlled wealth.

6.4 RESULTS OF MORTUARY STATISTICS: THE LISAKOVSK CEMETERY (LBA)

In this section, I evaluate the results of statistical analysis for the Lisakovsk cemetery. At the Lisakovsk cemetery, 88 out of 124 sets of human skeletal remains (70%) could be confidently linked to mortuary data. A number of examined individuals were not linked to mortuary data due to confusing numbering sequences, absent tags or identification, or missing human remains. Only those human remains, mortuary assemblages and datasets that could be confidently linked were included in this analysis. The results of multivariate statistical analyses are presented in two parts. First, multivariate statistical analyses of the mortuary assemblage, body placement, and burial construction are used to examine intra-cemetery individual identity. Identities were correlated with biological variables including age, sex, and kinship. Second, social organization was reconstructed through an examination and discussion of individual identities and social status. A bottom-up approach to understanding social structure at Lisakovsk allows for the foundation of the society to be understood through identity research.

6.4.1 Intra-cemetery Burial Variation and Patterning

6.4.1.1 Variation in Faunal Assemblages from Mortuary Contexts

Only animal remains placed in the burial pit in close spatial proximity to the deceased were used in multivariate statistical analyses. The location of these remains may have less to do with feasting and instead may therefore be evidence of human-animal connections. The relationship between the individual and animal is likely not 'ownership' bur rather connected to practices such as herding, milking, and shearing. However, full faunal analysis has not been undertaken for animal remains and only general interpretations are presented. Previous assertions that animal remains are evidence of social status are tested against other mortuary datasets.

Data regarding the number of faunal remains recovered from each burial were transformed into presence/absence data and clustered using multivariate statistics. When all individuals were used in clustering procedures, a total of 7 clusters were formed (r^2=1) and the correlation between these clusters and age is significant (p=0.076), while the correlation between clusters and sex is not significant (p=0.266). The majority of individuals lacked faunal remains and therefore clustered together (71.6%; n=63). This large cluster is not shown, as it makes understanding the remaining six clusters difficult. The remaining clusters had between two and six individuals, and were mutually exclusive (Figures 6.46 and 6.47). Differentiation by animal remains is not gender specific, as males and females are found in many of the clusters. However, there does seem to be some differentiation by age, as only adults aged 18 to 35 years were recovered with all animal categories (horse, cattle, sheep/goat). Diversity scores (S) are the highest for males (S=1.2), females (S=1), indeterminate adults (0.6), and then children (0.4). Adolescents lacked animal remains in their burials at this cemetery. Subgroupings (adult/subadult) had a similar number and type of categories, where subadults had 6 clusters, the adults had 7 clusters, the extra being the category of all faunal remains. Only a small portion of subadults were buried with faunal materials (21.6%, n=8), while double the number of adults (42%, n=16) were buried with faunal remains. To examine differentiation further, the adult and subadult categories were separated and further analyzed.

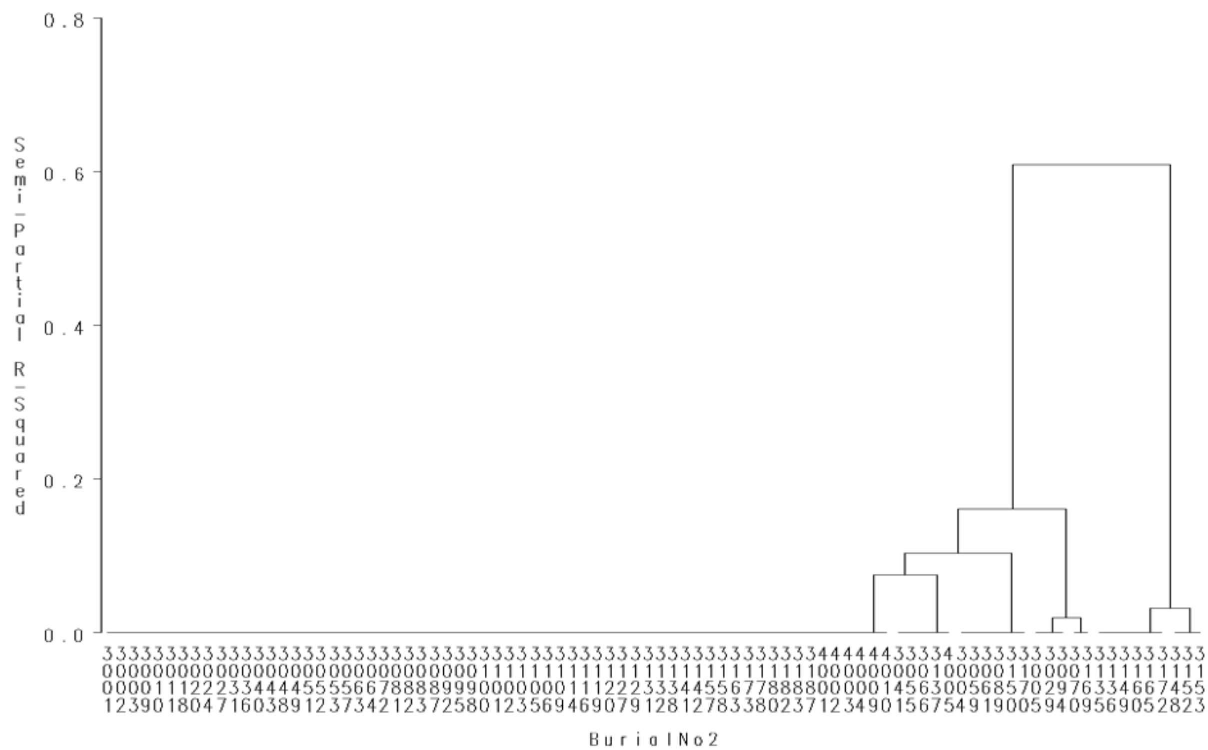

Figure 6.46 Lisakovsk Faunal Remains (All Individuals)

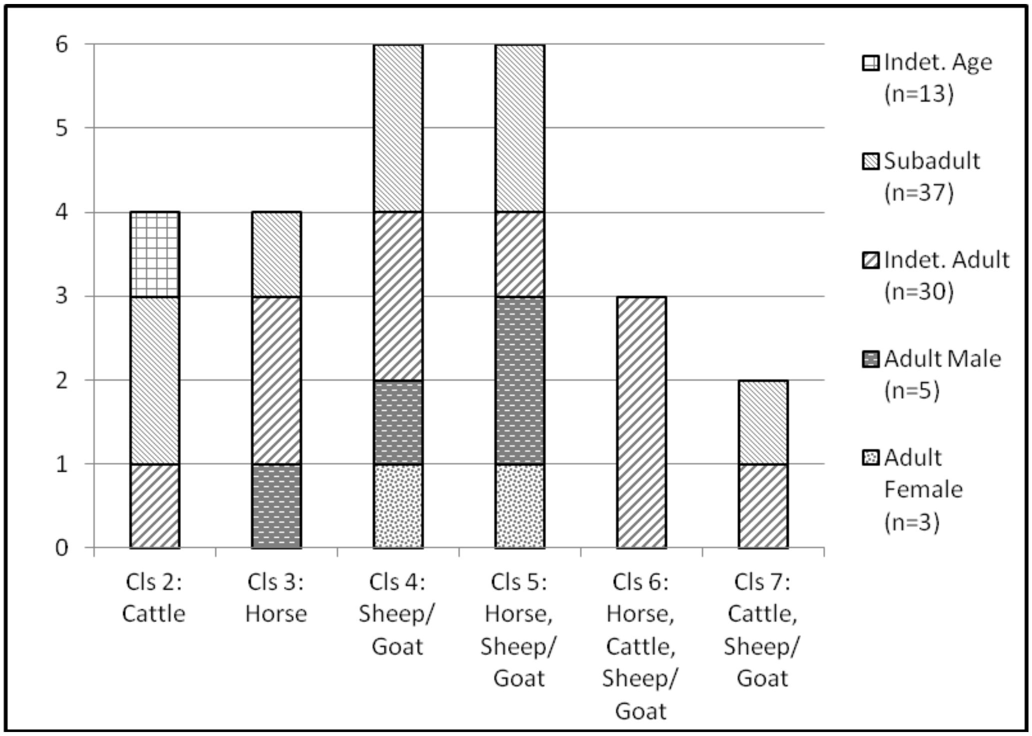

Figure 6.47 Lisakovsk Faunal Remains (All Individuals) [Cluster 1 Not Shown]

Among adults buried with animal remains, however the majority of individuals were buried without faunal accompaniments (n=22, 58%). When adults are split into male, female and indeterminate, few patterns are evident due to the low number of individuals who could be positively attributed to a category for sex (n=5 male; n=3 female). For adults, a total of 6 clusters formed (r^2=0.91) (Figures 6.48 and 6.49). A chi-square test revealed that the correlation between clusters and sex was somewhat significant (p=0.149), while the correlation between clusters and age was not significant (p=0.413). Males were more likely to be associated with horse remains than females (n=3 male; n=1 female). Age differences lack strong patterns, with the most variability evident among the 18 to 35 year old age group (S=1.25). However, this age group also has the most individuals whose ages were confidently estimated (n=16) and the correlation between age and clusters is not significant.

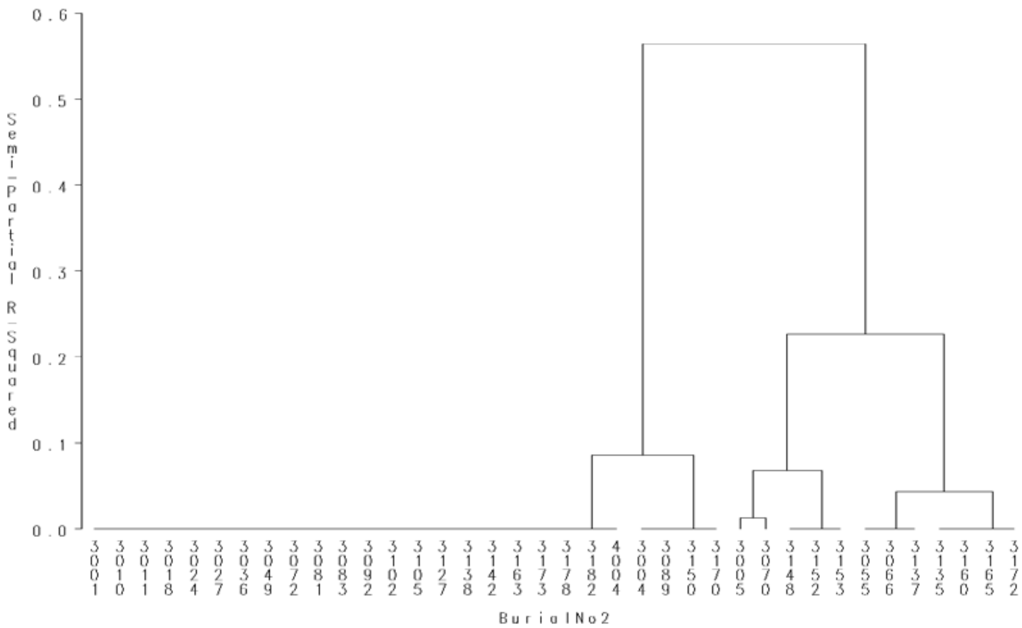

Figure 6.48 Lisakovsk Faunal Remains (Adults)

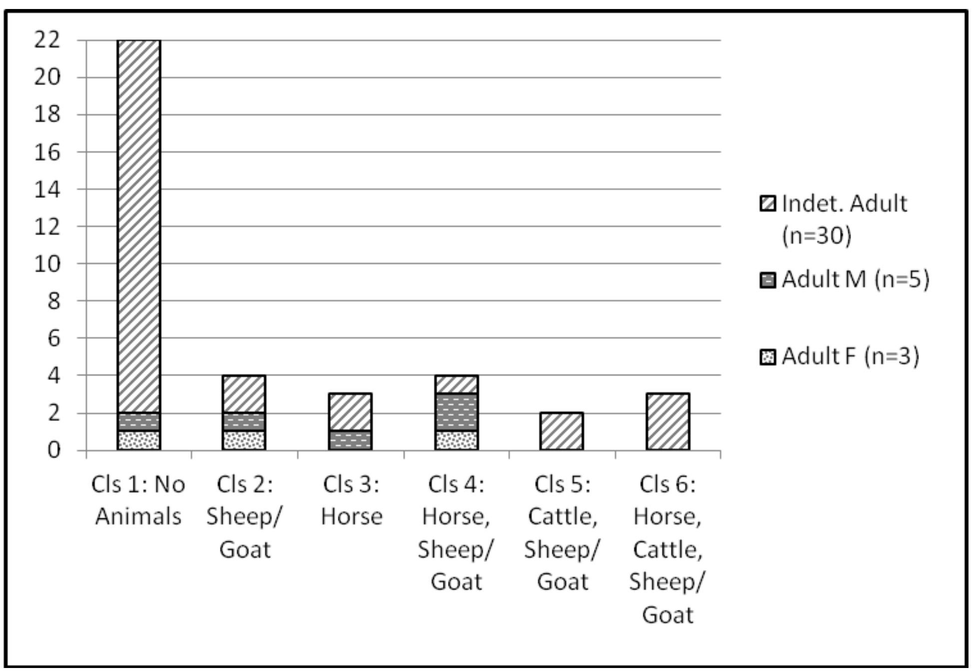

Figure 6.49 Lisakovsk Faunal Remains (Adults)

Among subadults, a total of 6 clusters formed (r^2=0.97) (Figure 6.50 and 6.51). However, the correlation between these clusters and age is not significant at 22.9% (p=0.771). Among infants (< 2 years) a total of 33% were buried with cattle and/or sheep/goat, while among children (2-12 years) only 23% were buried with animals including horse, cattle and sheep/goat.

Interestingly, among adolescents 12-17 years (n=7), no animal remains were recovered. This lack of faunal materials from graves of adolescents is important, as this age group often experienced differential burial based on their liminal status in society.

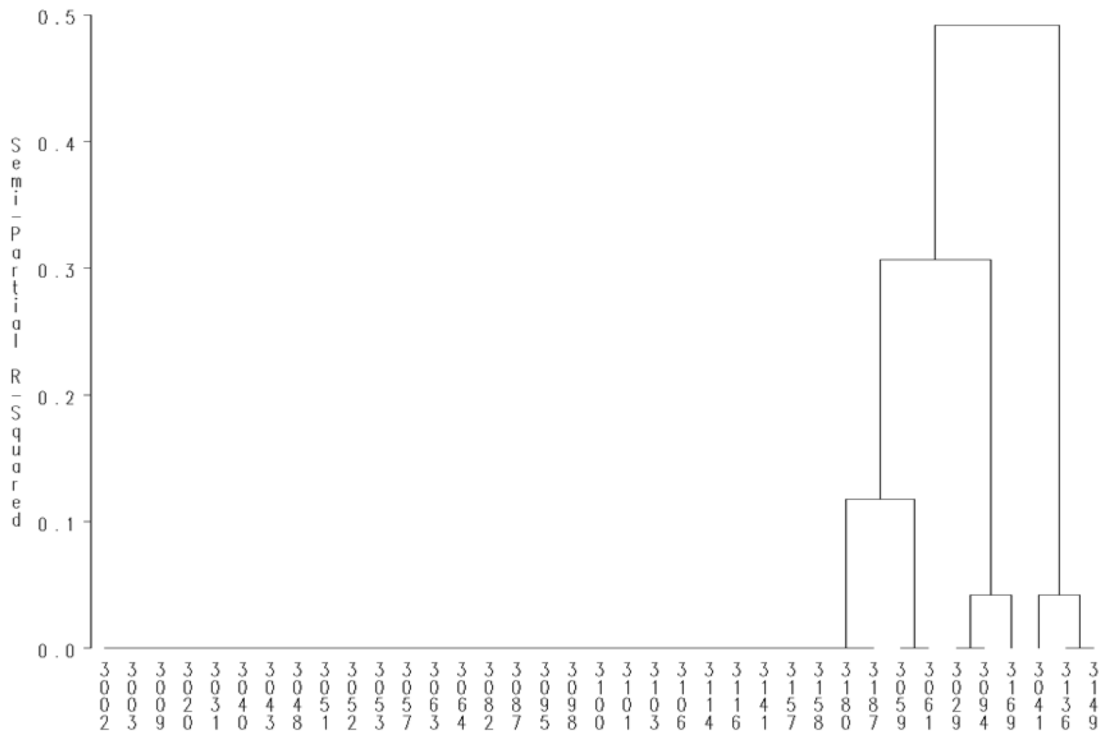

Figure 6.50 Lisakovsk Faunal Remains (Subadults)

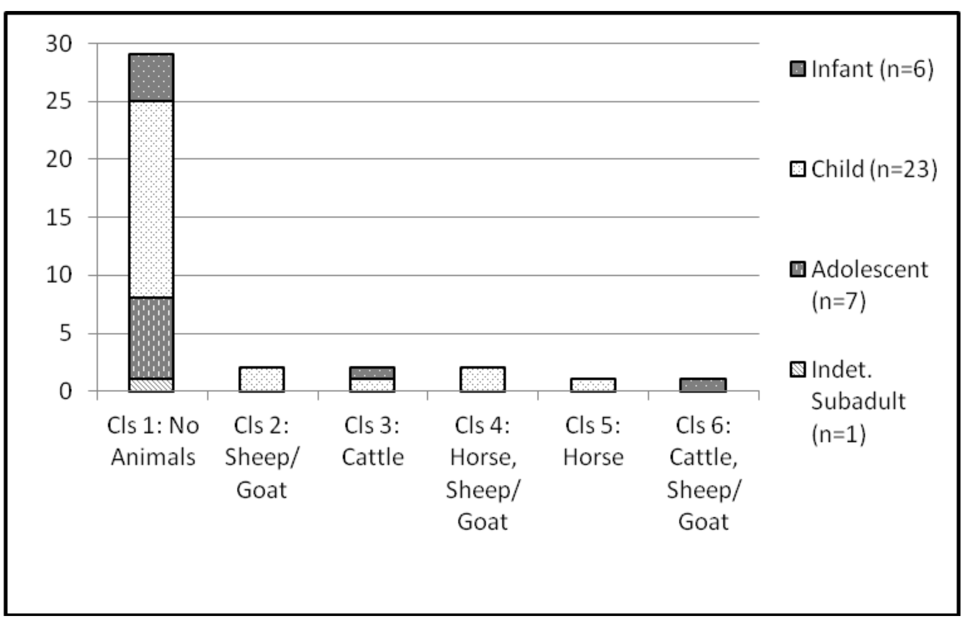

Figure 6.51 Lisakovsk Faunal Remains (Subadults)

6.4.1.2 Bronze Objects

Bronze artifacts were the most numerous at the cemetery and have often been considered high status items when recovered in mortuary contexts (Kalieva and Logvin 2002; Logvin and Shevnina 2008; Logvin et al. 2009). Several different categories of bronze were utilized to undertake clustering and included bronze knives, rings, earrings, bracelets, staples, clamps, badges, pendants, and beads. The majority of these items are ornamental, and reconstructions of their placement and use has been undertaken by several scholars (Usmanova and Logvin 1998; Usmanova 2005, 2010; Kupriyanova 2010). Bronze pendants were sewn onto clothing or attached to headdresses, while badges were hung from the hat or worn as part of a necklace. Bronze clamps were recovered along the spinal column of the individual, and are reconstructed as portions of headdresses and hair braid plaits (Usmanova 2005; Kupriyanova 2010). Bronze knives and staples are the only non-ornamental bronzes in this group. Cracked ceramic vessels were often restored using bronze staples and then placed in burials (Figure 6.52). Restored vessels are presumed to be heirlooms due to the nature of their breakage and use in mortuary contexts.

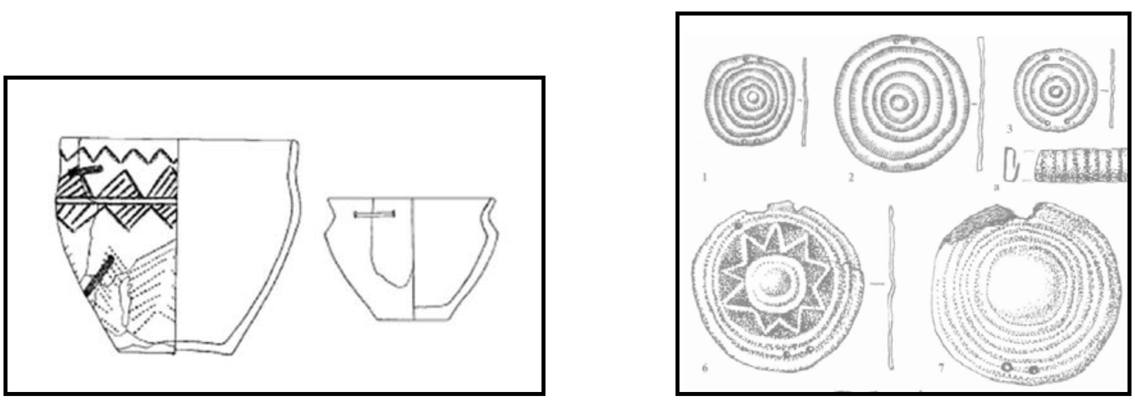

Figure 6.52 Example of Ceramic Vessels (Bestamak) with Bronze Staples (left) and of Bronze Badges (Lisakovsk) (right)

When categories of bronze jewelry including rings, earrings, and bracelets as well as badges and pendants were used in multivariate statistics on the entire cemetery, a total of 8 clusters formed (r^2=0.95). The correlation between the clusters and age groups is significant (p=0.068), while the correlation between clusters and sex is very significant (0.006). Subadults are more likely than adults to have been buried with ornamental bronzes. Only 19% (n=17) of all individuals were buried with ornamental bronzes (Figures 6.53 and 6.54). Within this group, 65% were subadults (n=11), and 35% were adults (n=6). Among the adults, two of the six found with ornamental bronzes were females, while no males were part of this group. This difference may hinge on the fact that many of the ornamental bronzes were jewelry (rings, bracelets, earrings), sewn onto clothing (pendants), used in headdresses (pendants, badges) or made into necklaces (badges). Among subadults, ornamental bronzes were placed in the burials of children and adolescents, but not infants.

Figure 6.53 Lisakovsk Ornamental Bronze (All Individuals)

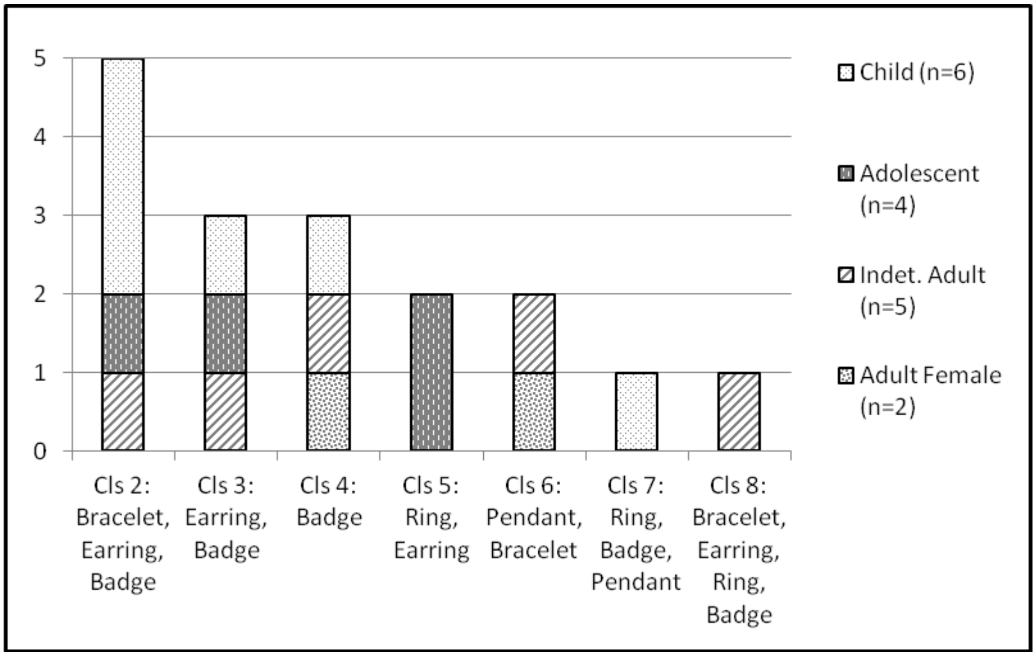

Figure 6.54 Lisakovsk Ornamental Bronze (All Individuals) [Cls 1 Not Shown]

Several differences occur between individuals based on ornamental bronze objects. First, among subadults, infants lack ornamental bronze objects in their graves. This is not unusual, as infants often have differential status when they are less than two years of age. Additionally, children and adolescents are scattered throughout the remaining clusters, except for the most diverse, cluster 8 which contains bracelets, earrings, rings, and badges. In contrast, while few adults were confidentely sexed (n=9), the correlation between sex and clusters is very significant. While males lack ornamental bronzes in their burials, two adult females at the cemetery were buried with ornamental bronzes. Overall counts of ornamental bronze objects reveal few individuals with high numbers of bronze objects (Figure 6.55). Additionally, subadults are twice as likely as adults to be buried with ornamental bronze objects.

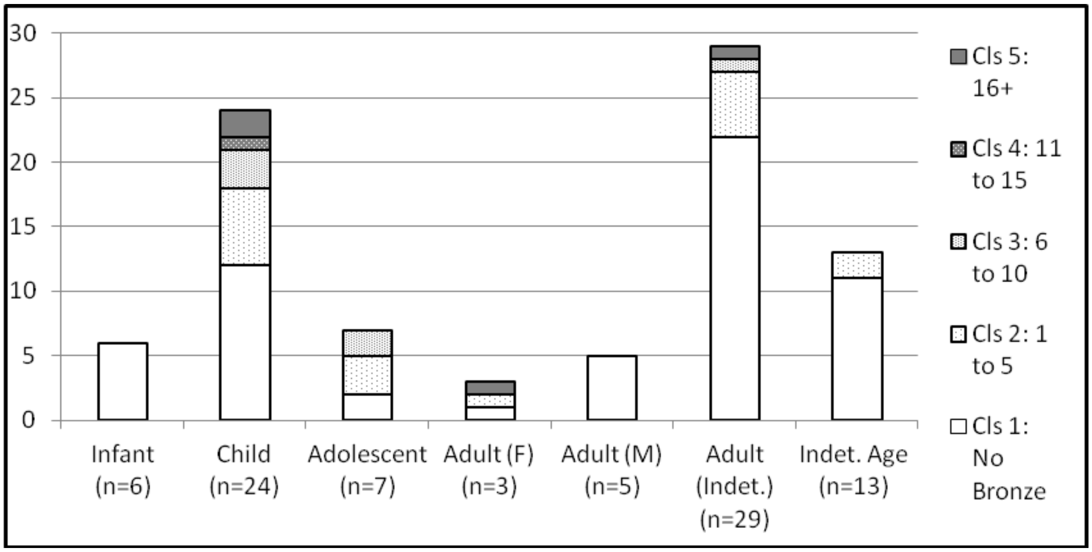

Figure 6.55 Lisakovsk Ornamental Bronze by Count (All Individuals)

6.4.1.3 Tools

At the Lisakovsk cemetery, very few tools were recovered in burial contexts. In contrast with the Bestamak cemetery, this site lacked awls, needles, and axes. However, some individuals were buried with tools including a stone topor (adze), lithic flakes, bronze knives, and bronze staples. Very few of these items were recovered and therefore they will not be discussed at length. The stone topor/adze was recovered in the burial of a child (6-12 yrs) and an adolescent (9-15yrs). This burial also included many bronze ornamental objects: badge, pendant, earring and clamps. As clamps were often found along the spine of the individual, they are often interpreted as braid plaits or portions of a headdress (Figure 6.56). Through biodistance analysis, it was determined that these individuals are phenotypically similar (see chapter 8:27-28).

The two bronze knives recovered were identified in burials of adults aged 18 to 35 years of age. The biological sex of these individuals is unknown. Bronze staples, often used in the reconstruction of ceramic vessels were recovered from three burials. These burials consist of a female individual, a double burial with two children, and a burial of an individual of indeterminate age. As staples are used to reconstruct vessels, they may be evidence of these items being used as heirlooms and therefore passed down to a subsequent generation. Finally, lithic flakes were recovered in a variety of burials, and are not associated with a specific age grade or biological sex.

6.4.1.4 Ornamental Bronzes and Animal Remains

Data was then clustered using datasets that were collapsed into the following categories: animals (horse, cattle, sheep/goat), bronze jewelry (bronze earrings, rings, and bracelets), bronze pendants (bronze pendants and badges), bronze clamps (hair ornaments), and astragals (ankle bones of sheep/goat or cattle). When these categories were used to examine all individuals, a total of 9 clusters formed (r^2=0.96) (Figures 6.56 and 6.57). The correlation between the 9 clusters and age was significant at (p=0.067), and the correlation between the clusters and sex was very significant (p=0.003). Forty-five individuals (51.1%) lacked these categories of artifacts and formed cluster 1, which is not shown. The other clusters revealed marked differences between groups of individuals. Females and indeterminate adults populated the two central clusters with ornamental bronzes and animal remains. Subadults and adults populated the three clusters on the right with ornamental bronzes and hair clamps. Infants, children, adult males, and indeterminate adults populated a single cluster with only animal remains. Children and adolescents populated a second cluster with only astragals, while the final cluster of animal remains and astragals correlated with children and indeterminate adults. While astragals have been found in adult burials, they were more likely to be buried with subadults. Astragals are contemporary commonplace object in central Asia, as children play games with them in both Kazakhstan (Asik) and Mongolia. Therefore, based on these clusters, mortuary practices may differ based on the biological sex of the individual, and based on age. No children are buried with a combination of ornamental bronzes and animal remains, the grouping of these items are reserved for adult females. Infants are buried with only animal remains, and lack bronze items and astragals in their graves.

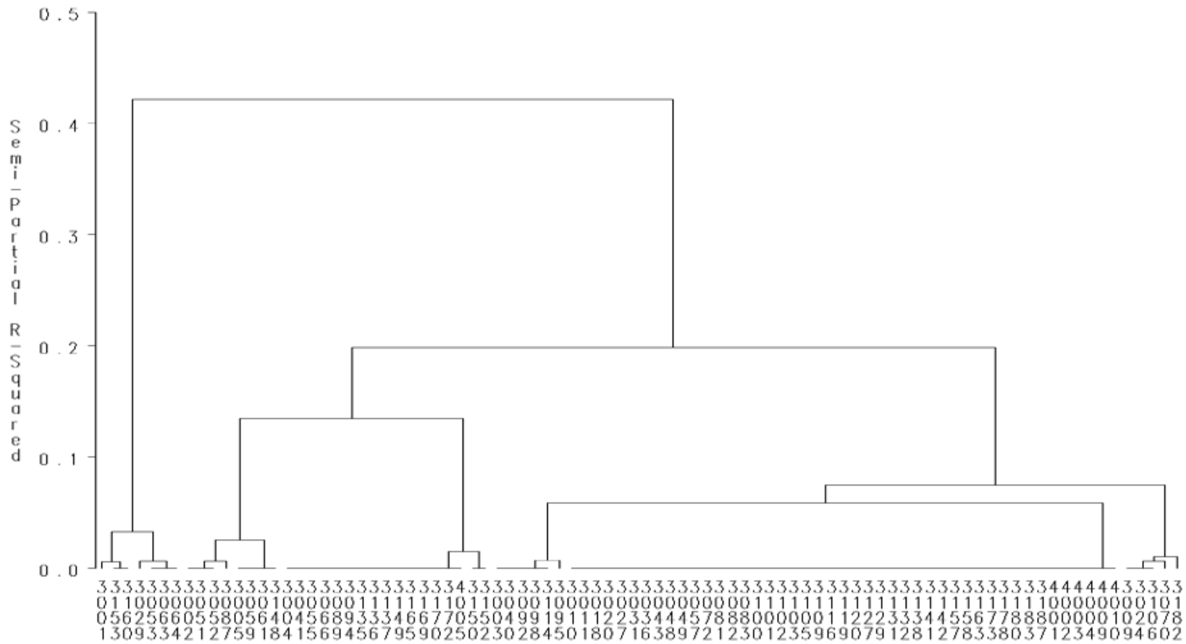

Figure 6.56 Lisakovsk Faunal Remains, Ornamental Bronzes, Hair Clamps, and Astragals (All Individuals)

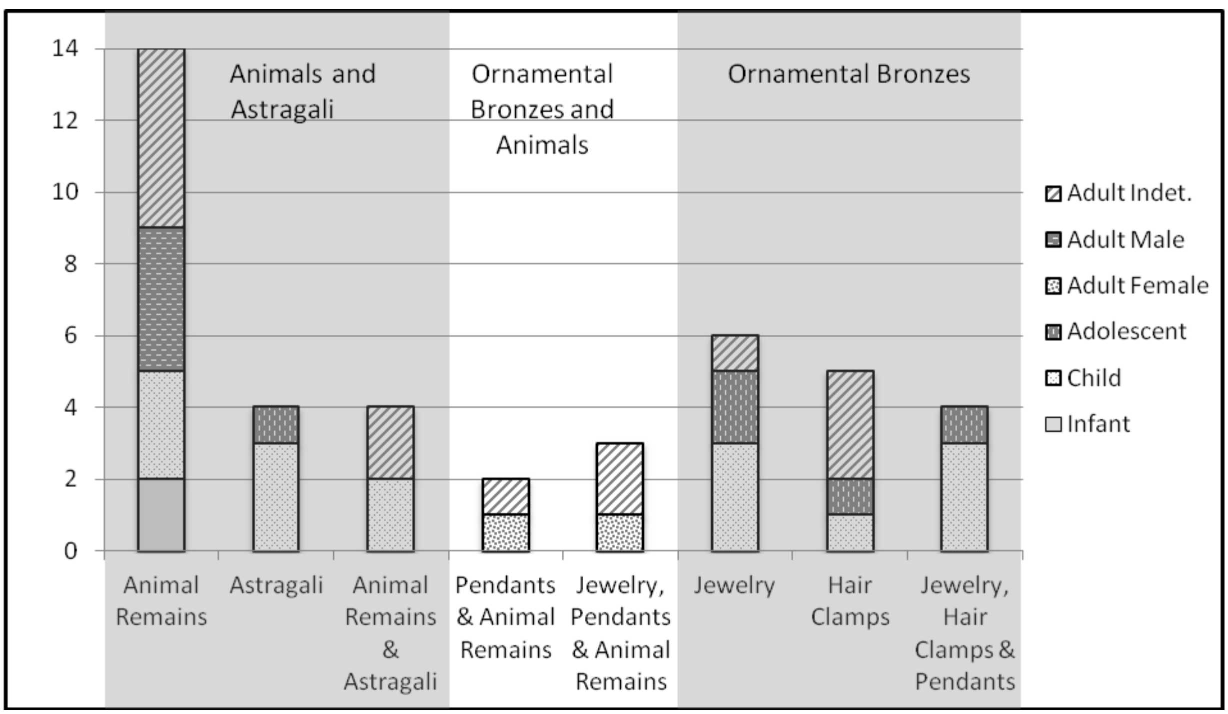

Figure 6.57 Lisakovsk Faunal Remains, Ornamental Bronzes, Hair Clamps, and Astragals (All Individuals)

In order to further explore differentiation within each age group, individuals were separated into categories of subadult (<18 years) and adult (>18 years). A parallel structure of differentiation is found within each of the age groups. This becomes apparent when animal remains, astragal bones, bronze jewelry, bronze pendants, and bronze hair ornaments were used as the main categories of data (Figure 6.58). While the main structure is similar, adults have smaller proportions of individuals at the upper levels in comparison to subadults. For adults, 24% have mixed assemblages of bronze ornaments and animal remains, while 29% have only animal remains. This is likely a split of the different biological sex groups at the cemetery. Among the subadults, it is possible that there is a similar division. However, the burial of male children with some type of adornment may be possible, as strict divisions by biological sex may not be undertaken in mortuary rituals for children.

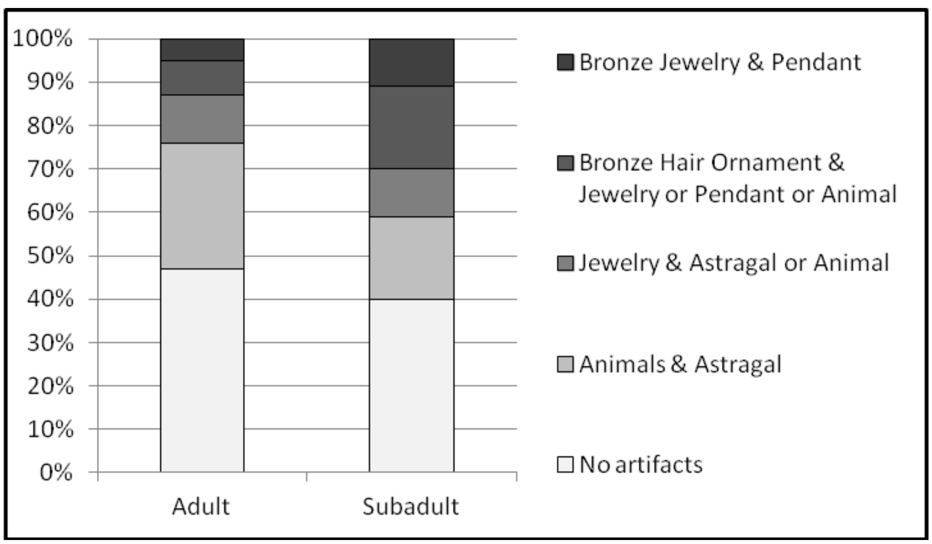

Figure 6.58 Comparison of Adult and Subadult Burial Assemblages at Lisakovsk

Using animal remains (horse, cattle, sheep/goat) and astragals, as well as bronze pendants, jewelry, and hair clamps, a total of 5 clusters (r^2=0.89) formed for adult individuals (Figures 6.59 and 6.60). A chi-square test was used to examine the relationship between these 5 clusters and sex, which revealed a significant correlation (p=0.079). Among adults 47% lacked these categories of artifacts (female n=1, indeterminate n=17) and therefore clustered together. A clear division between the biological sexes of individuals is evident within these clusters. Cluster 2 consisted of eleven individuals (male n=4, indeterminate n=7) who were buried with animal remains, and sometimes astragal bones. In contrast, cluster 3 had a total of four individuals (female n=2, indeterminate n=2) who were buried with bronze pendants, animals, and sometimes jewelry. There is gender difference between adults, as males were buried with animal remains and astragal, and females buried with animal remains, bronze jewelry, and pendants. The remaining two clusters are likely associated with females as they similarly contain a mix of animal remains and bronze ornamental items. Overall, these clusters seem to indicate that mortuary rituals for males were more homogeneous, and possibly were standardized. Mortuary rituals for females are more heterogeneous and diverse, implying that females may have had more levels of status than males in this society.

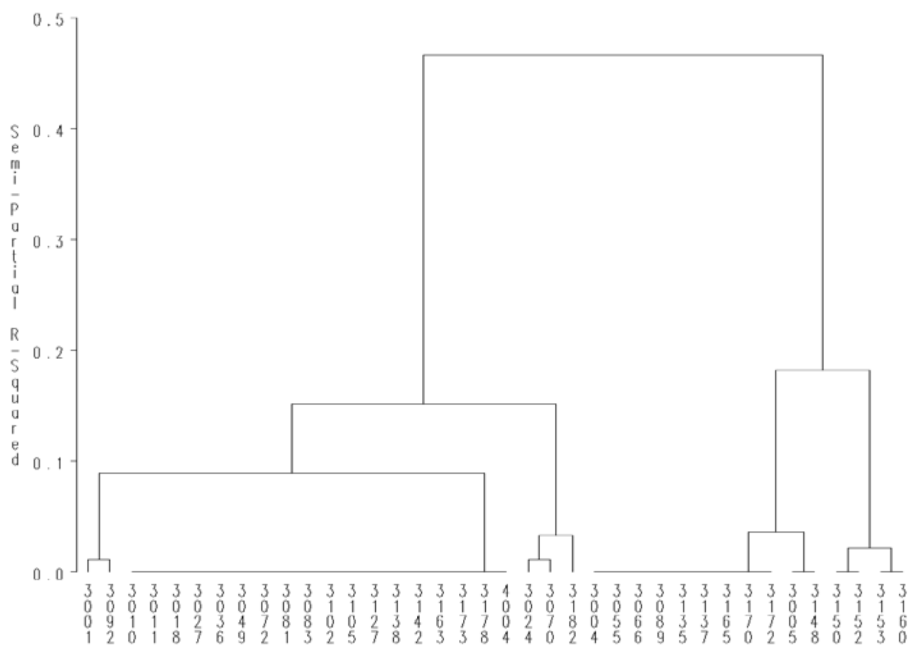

Figure 6.59 Lisakovsk Faunal Remains, Astragals, and Ornamental Bronze (Adults)

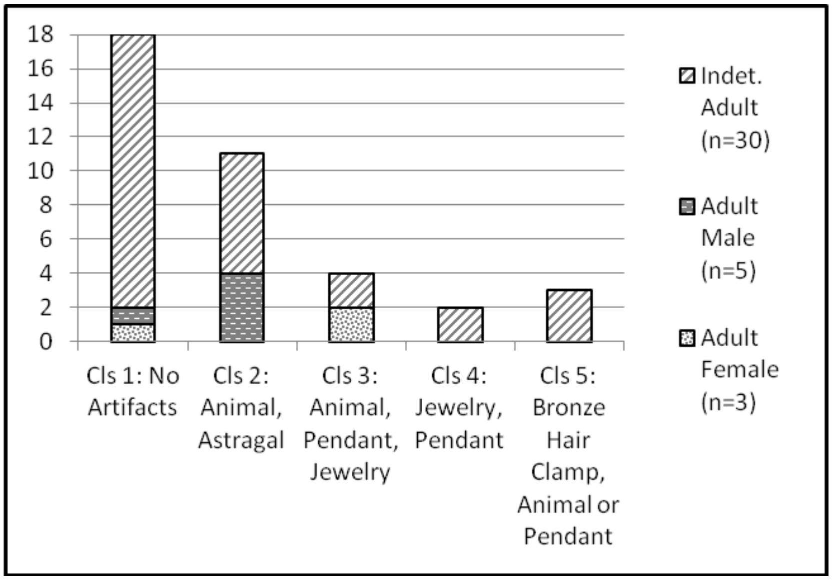

Figure 6.60 Lisakovsk Faunal Remains, Astragals, and Ornamental Bronze (Adults)

Among subadults, a total of 6 clusters formed (r^2=0.95) that are similar in structure to the adult clusters (Figures 6.61 and 6.62). However, the correlation between these clusters and age was not significant (p=0.680). Children and adolescents populate the majority of clusters, with only a few infants being buried with assemblages that include animal remains and astragals. Among subadults, there are definitely status differences, as some individuals were buried without any burial assemblages. However, among those with assemblages, there is a similar division as seem among adults, with a split between those with animal remains and those with bronze ornaments. Differentiation between those with assemblages is heterarchical, and may be related to social status that is ascribed rather than achieved. Children (2-12 yrs) and infants (0-2yrs) may have been given gifts at burial by their families, and those attending to their mortuary rites.

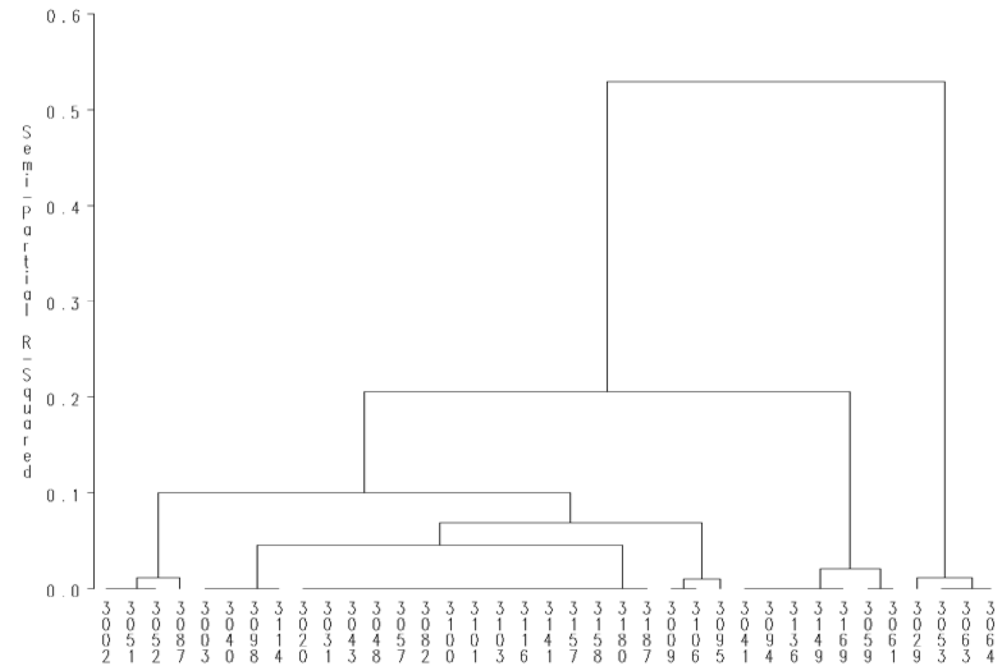

Figure 6.61 Lisakovsk Faunal Remains, Astragals, and Ornamental Bronze (Subadults)

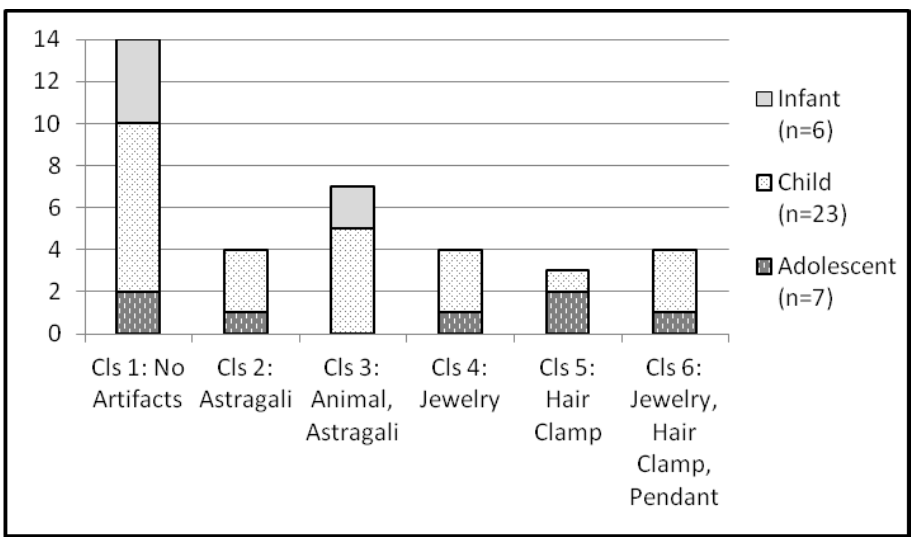

Figure 6.62 Lisakovsk Faunal Remains, Astragals, and Ornamental Bronze (Subadults)

6.4.1.5 Body Position

The position of the body within the burial is often associated with social or biological status within the cemetery population. At the cemetery of Lisakovsk, three main categories were recorded including the position of the individual, the cardinal direction of their head, and the degree of flex of the legs. A majority of individuals were placed in the burial on their left side

(32%) or had an unknown placement (62.5%). Very few were placed on their right side (4.5%) or placed on their back (1%). Much greater variability was present in the direction of the head of the individual, whether south, west, northwest, or southwest (Figures 6.63). Females were placed with the top of their head facing south or southwest. In contrast, males were placed west or southwest. However, indeterminate adults were found in all four categories (s, w, nw, sw) which somewhat negates these findings. The correlation between head direction and sex was very significant (p=0.007). Age may also have been a factor in the direction of the head of the individual, with those aged 18-35 placed facing south, west, and southwest (Figure 6.63). Those aged 35-50 were placed with heads west and southwest, while the two older individuals aged 50+ years, were placed west. The correlation between age and direction of the head of the individual was also very significant (p=0.027). While these findings are interesting, they do not correlate with other mortuary practices, or the hypothetical kin groups created through biodistance analysis (chapter 8).

Figure 6.63Lisakovsk Individuals: Cardinal Direction of Head (by Sex) and Cardinal Direction of Head (by Age)

6.4.1.6 Burial Construction

Burial construction, and the amount of work undertaken by those burying the deceased, can also be associated with social differentiation. Construction includes both above and below ground structures and the materials used for these structures. At the Lisakovsk cemetery several types of construction are evident in graves, both internally and externally. Internal structures, if present, are often made of large wooden logs which formed a litter that laid overtop the individual. Above ground structures included circular earthen kurgans, within which graves were placed. Kurgans often were surrounded by deep circular ditches (1 to 2 meters), and some of these ditches also contained burials. Furthermore, a ring of stones was sometimes laid at the inner edge of the ditch. Smaller above ground works include graves enclosed by stone rings, or covered with flat rocks. Additionally, many flat burials that lacked these features were present within the cemetery.

At Lisakovsk, large wooden structures were often placed within the burial pit forming an overlay above the individual. These structures consisted of logs placed in a rectangular form overlain by logs laid crosswise. As wood is currently not found in the immediate area around the cemetery, wooden burial structures are believed to signify a greater level of mortuary labor. These burial structures are more often found in adult burials (16.1%) than child burials (6.9%), and do not seem to correlate with a specific biological sex (Figure 6.64). When individuals from different age groups were examined, it becomes evident that only a few individuals from each age group have wooden structures in their burials. This may indicate that there was a small group of higher status individuals in the cemetery, however, wooden structures in burials do not correlate to any of the previously identified artifact clusters or biodistance clusters.

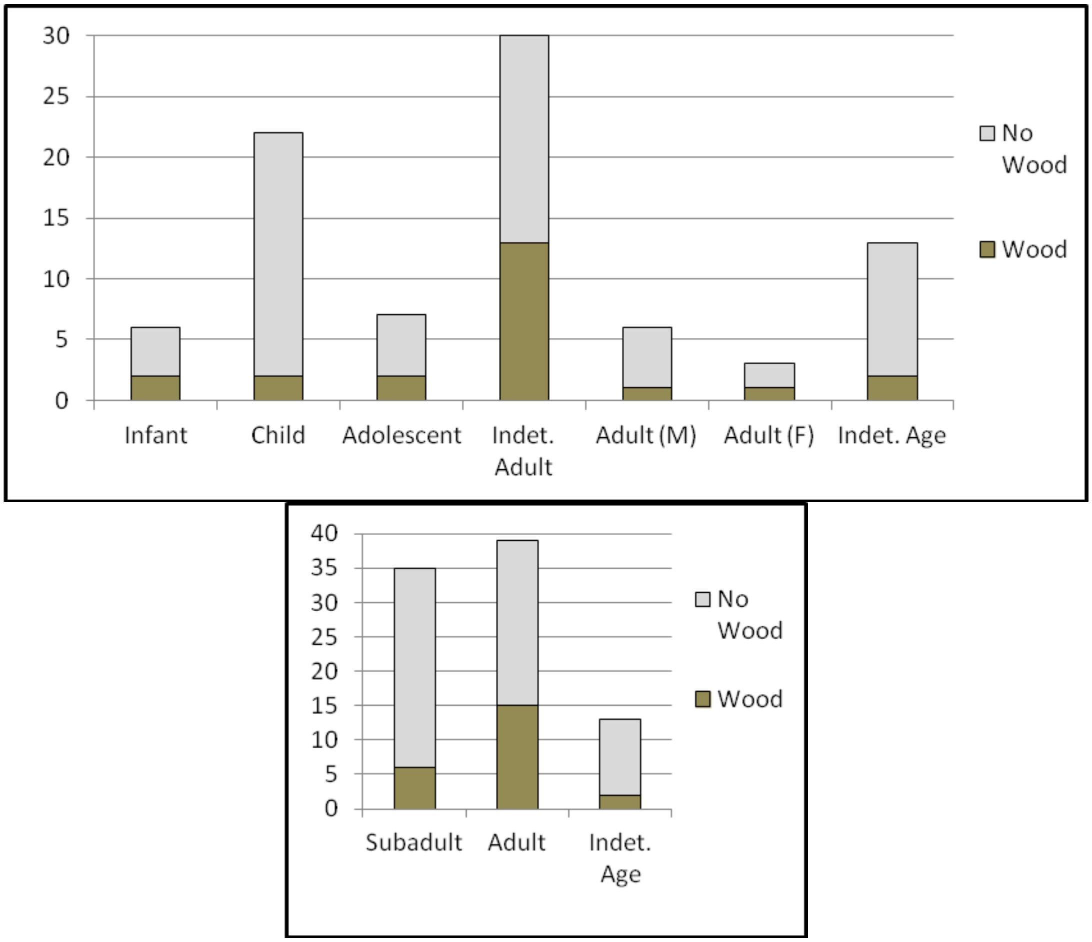

Figure 6.64 Lisakovsk Burials: Presence of Wooden Construction (by Age) and Presence of Wooden Construction (by Adult and Subadult)

Burial location refers to the position of the grave in relation to above ground construction. A pattern emerges, where a similar variety of burial locations are evident for each age group (Figure 6.65). Four categories were coded for grave locations: in the center of a kurgan/enclosure (4), under a stone ring (3), in kurgan ditch (2), outside of these areas (1). Unfortunately, the burial location also does not correlate to any other clusters, artifactual or biological, at the Lisakovsk cemetery. However, females are only located in the center of a kurgan or enclosure, while all other groups had more variety in burial location. As there were few females positively identified within the cemetery, this may be due to the vagaries of sampling.

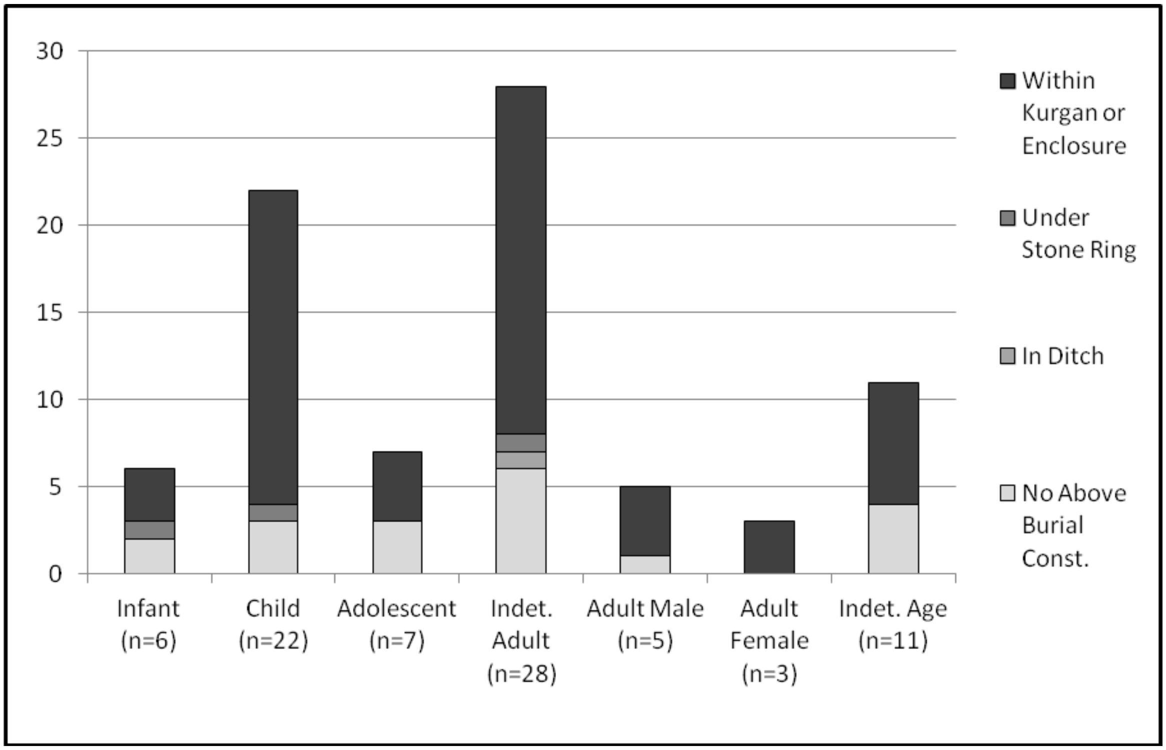

Figure 6.65 Lisakovsk Burial Location (All Individuals)

The total volume of each grave pit was also examined to determine if it might be used as a measure of differentiation between individuals or groups. Burial volume does not correlate to artifact count (Figure 6.66). Subadult burials tended to have a smaller volume, as expected, albeit with very high artifact counts for some individuals. Adult burials tended to have somewhat higher volumes, with a variety of artifact counts. Burial volume, or grave size, did not correlate with specific artifact clusters or kinship groups within the cemetery.

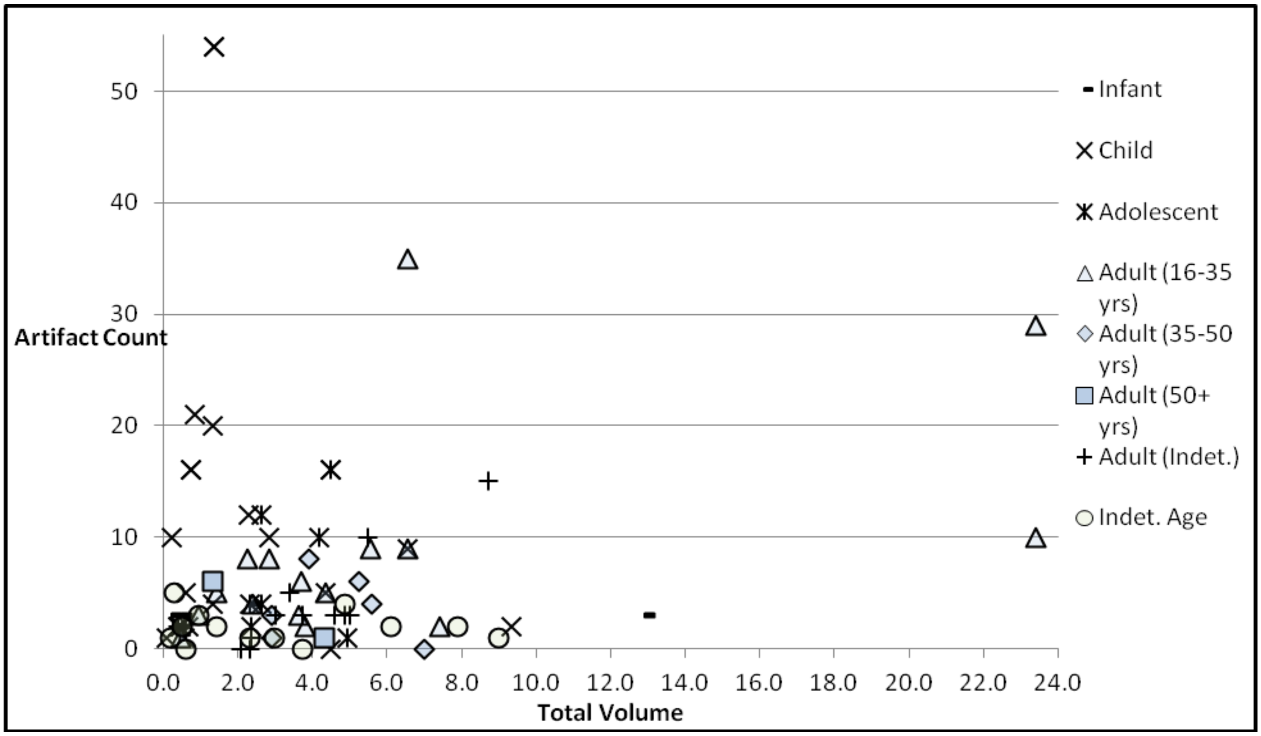

Figure 6.66 Lisakovsk Burial Volume and Artifact Count (All Individuals)

6.4.2 Identity and Social Structure at Lisakovsk

Differentiation is explored at both the individual and community levels for Lisakovsk where multiple lines of evidence are used to examine the types and configurations of social identities within the cemetery. Biological affinity, mortuary practices, and cemetery structure were all taken into account for an investigation of the multiple and layered nature of identities. Furthermore, these variables were compared to biological age and sex, in addition to measures of wealth and diversity. In order to understand the foundation of social structure within the cemetery, we must first examine the multiplicity of identities. Social structure is explored through analyses of the more heterarchical or hierarchical nature of differentiation within the community. The Lisakovsk community tends to be more heterarchical, as many categories of the burial assemblage, body placement, and construction reveal subgroups of equal size and diversity. Additionally, biological affinities of individuals buried at Lisakovsk were investigated through biodistance analysis of non-metric traits (chapter 8). The correlation of these traits indicates that this community is split into five hypothetical family groups. Clusters of hypothetical kin groups correlate well with bronze objects, revealing the possibility that individuals with higher status were genetically similar. Social status of individuals may be based on kinship and kin groups may support each other in an effort to maintain wealth and status.

The first objective of this research was to investigate the relationship between mortuary patterning and social identities (gender and age related) of individuals through multivariate statistical analysis.. It was determined that adult identities were linked to biological divisions in sex and age. While few individuals at Lisakovsk were positively identified as male (n=6) and female (n=2), there were some divisions based on biological sex. Females were more likely to be buried with ornamental bronze objects, as well as a combination of bronze objects and animal remains. In contrast, males were more likely to be buried with animal remains and astragals. Among adults buried with ornamental bronzes (n=6), two were females and the remaining were indeterminate adults. Ornamental bronzes include jewelry (rings, bracelets, earrings), as well as pendants and badges (sewn onto clothing or used in headdresses). Ethnographically, pastoral societies in central Asia often are depicted wearing clothing and headdresses embellished with metal objects and coins (Margulan 1986; Levshin 1996). Interpretations of ornamental bronzes often include ‘wearing’ the wealth of the family, signs of marriage, or evidence of a dowry. Furthermore, the combination of ornamental bronzes and animal remains in burials was reserved for adult females, as no other subgroups have these items. The combination of these items may indicate a special status for females in the society. Mortuary rituals for females were heterogeneous and diverse, implying that females may have had comparatively greater variability in status and identity than males in this society.

Males were often buried with animal remains and astragals, and have the most diverse animal assemblages. Animal assemblages for males include horse, sheep/goat or horse and sheep/goat. Unfortunately, the exact placement of these items in the burial is often unknown which makes for difficult interpretations. Clustering of mortuary remains indicate that rituals for males were homogeneous, and possibly even standardized, as they often only contained animal remains. Unfortunately, burial construction and body placement were much more diverse and did not correlate well with any other part of the mortuary assemblage.

Differentiation based on age cohorts was also evident at Lisakovsk, mainly indicating differences between adults and subadults. When animal remains were clustered, only adults had all three types of animal (horse, cattle and sheep/goat) in their burials, as opposed to the remaining clusters that contain both adults and subadults. Subadults populated every other cluster of animal remains, and even infants were recovered with animal remains. Within the bronze assemblage, of the individuals recovered with ornamental bronze objects, 65% were subadults. Among subadults, ornamental bronzes were placed in the burials of children and adolescents, but not infants. Interestingly, no subadults were buried with assemblages that contained both animal remains and ornamental bronze objects. Additionally, adults aged 18-35 years were the only individuals to be buried with bronze knives (n=2), however the biological sex of these individuals was indeterminate.

Overall trends at Lisakovsk in terms of mortuary practices reveal that divisions in biological sex and age are extremely important. Therefore, box plots were created for the entire assemblage to explore measures of diversity (S) and wealth. Diversity is a measure of the types of data present in the assemblage, while artifact count is used as a proxy measure of wealth. For the entire assemblage, diversity scores (S) reveal that indeterminate adults, adult females, and subadults all have similar diversity ranges (Figure 6.67). On average, females have the highest diversity (S) in their assemblage, in addition to the highest average artifact counts (Figure 6.68). Among subadults, adolescents and children have somewhat low average diversity, but a large range in diversity values. In regard to artifact count (wealth), adolescents have low average scores and a small range of values, while children have moderate artifact count values and yet a very large range. Adult male and subadult individuals have some of the lowest average scores for both diversity and wealth, as well as the smallest ranges of values. These results reveal that females have the most variation in wealth values and the most variation in burial assemblages based on measures of diversity.

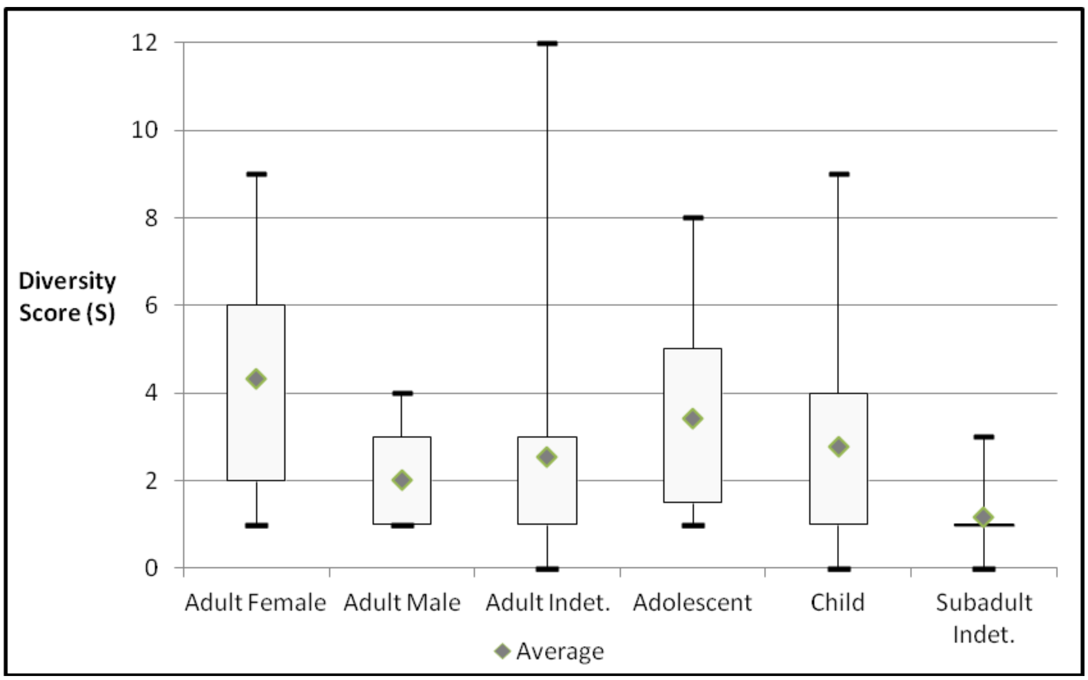

Figure 6.67 Lisakovsk Box Plot of Diversity (S) with Error Ranges

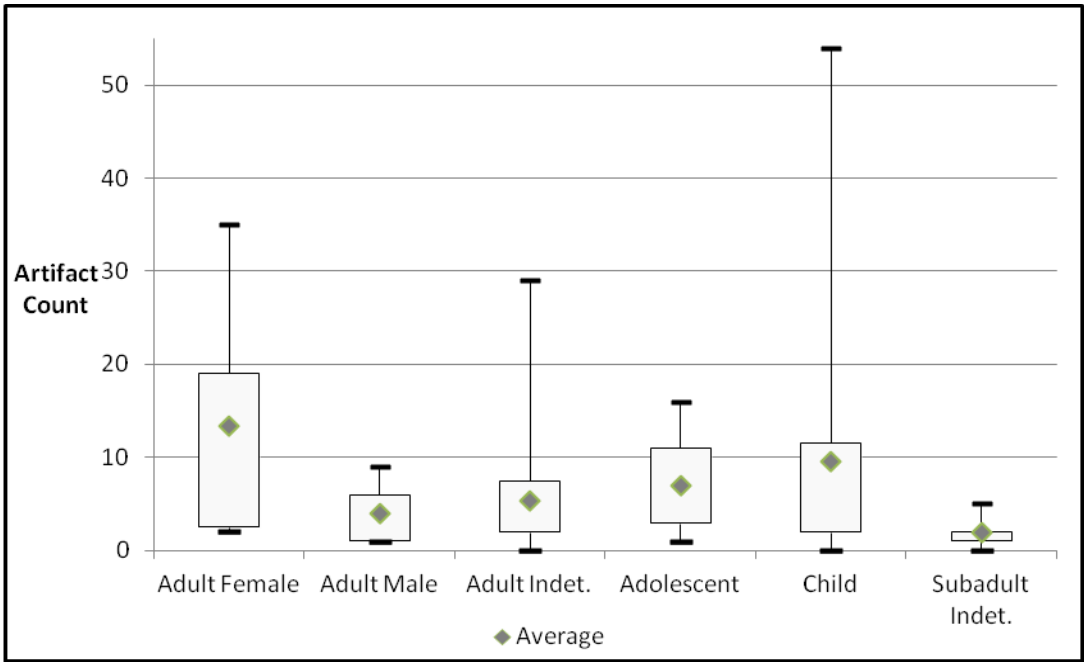

Figure 6.68 Lisakovsk Box Plot of Artifact Count with Error Ranges

Box plots were also created for diversity in terms of animal remains and bronze objects, as well as overall count of bronze objects. A box plot of diversity (S) of animal remains depicts higher average diversity for males than other individuals in the cemetery (Figure 6.69). Adolescents are not buried with any animal remains in this cemetery, which is unusual. Children have moderate to low diversity in terms of animal remains. In terms of animal remains, it seems that males have the most variation in assemblages. An examination of bronze objects in burials reveals that females have the highest average artifact count (7.67), as well as the highest average diversity score (S=2) in terms of bronze objects (Figures 6.70 and 6.71). An important caveat is that some items with many pieces (e.g. headdresses, necklaces) that likely made up a single object were counted in terms piece by piece. Lower average scores are present for subadults and indeterminate adults, while adult males lack bronze objects entirely. These findings reveal that adult females likely had more forms of differentiation in terms of status or wealth than other individuals at the cemetery. In addition, as subadults were also found with bronze objects, some individuals within this subgroup also had differential status or wealth. In the case of ceramic vessels, individuals were very similar in terms of total count, with a range of 0 to 6 ceramics per person (Figure 6.72). However, females had slightly higher average totals for ceramics in relation to other individuals in the cemetery.

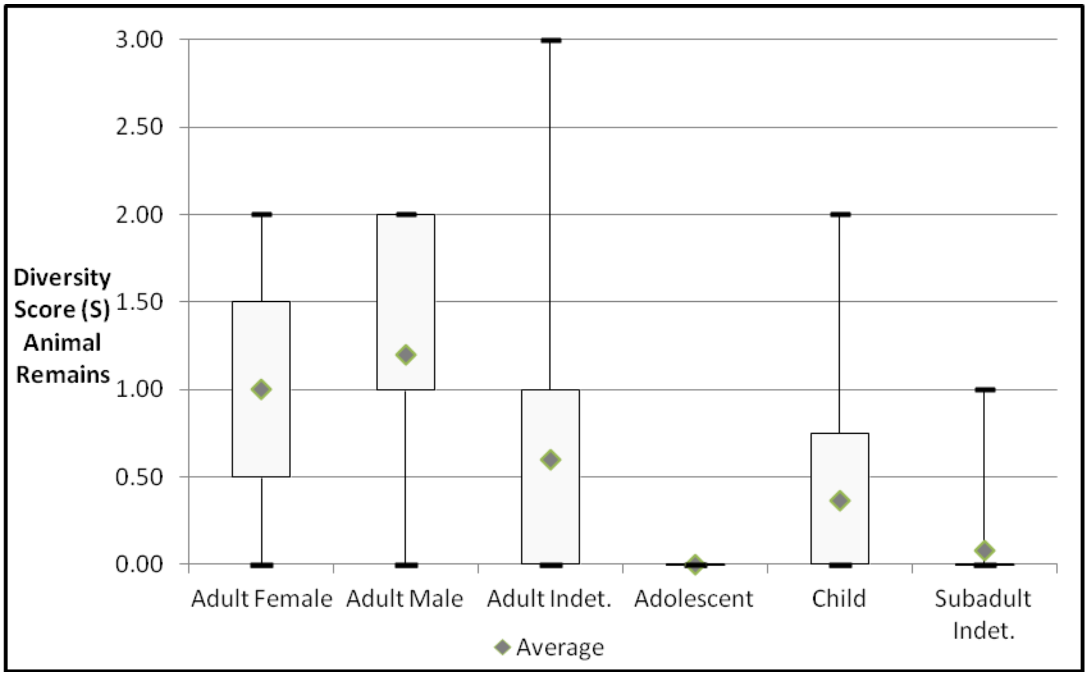

Figure 6.69 Lisakovsk Box Plot of Diversity (S) of Faunal Remains with Error Ranges

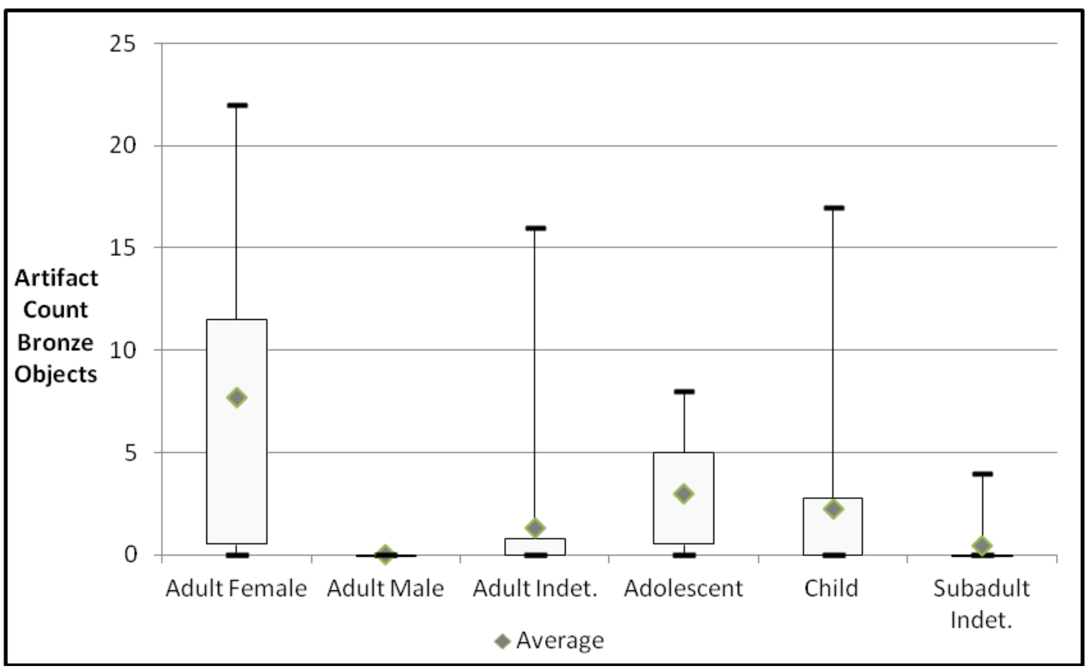

Figure 6.70 Lisakovsk Box Plot of Bronze Objects (by count) with Error Ranges

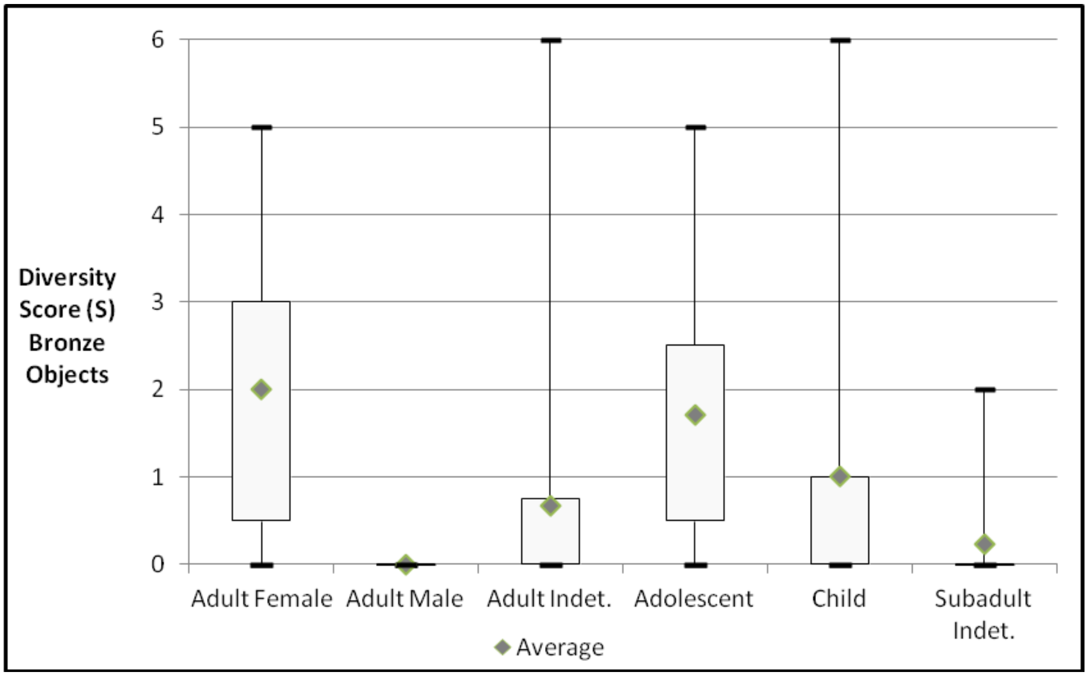

Figure 6.71 Lisakovsk Box Plot of Diversity (S) for Bronze Objects with Error Ranges

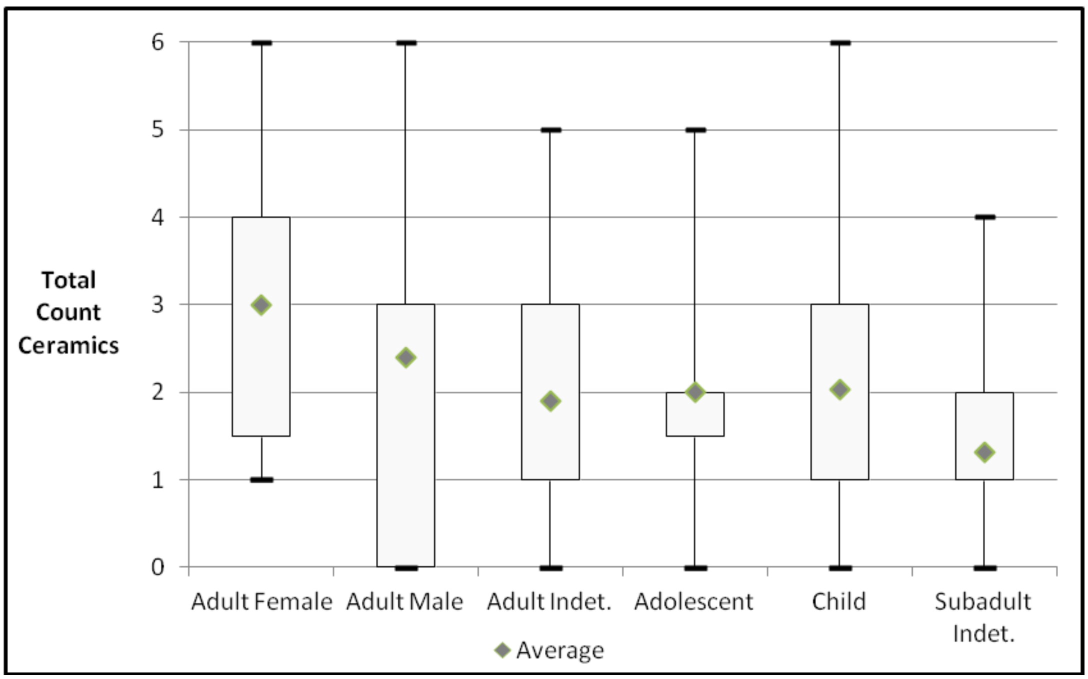

Figure 6.72 Lisakovsk Box Plot of Ceramics (by count) with Error Ranges

The main trend for the Lisakovsk community is that adult and subadult groups have similar levels of differentiation. Clusters often include a large subgroup of individuals who lacked burial assemblages, in concert with several other subgroups with few individuals and a variety of artifact combinations. The combination of a single cluster with many individuals and a meager assemblage, as well as a set of clusters with few individuals and artifact diversity seems heterarchical in nature. Social differentiation at Lisakovsk reveals that adult mortuary practices are imitated in the subadult mortuary realm. Evidence for this is based in similar number of clusters with similar material and artifact types. For example, in terms of animal remains, both subadult and adult groups formed similar clusters in number and content. The same can be said for a selection of bronze tools and ornaments, where subadults were present in 5 of 8 clusters, while adults were recovered in 7 of 8 clusters. In clusters that combined animal remains and bronze objects, subadults were present in clusters with animals and astragals, as well as ornamental bronzes, but not in clusters of animals and bronze objects. These results highlight that the majority of adults and subadults had very similar systems of heterarchical status, except for situations where females had additional items. Therefore, age and gender must have been important factors in grave decisions.

Social organization of the Lisakovsk community is built upon a foundation of gender divisions and heterarchical structures. While males are often buried with animal remains, females are buried with bronze ornamental objects, or combinations of animal remains and bronzes. At this cemetery, females may have a special status, evident by their burial with both animal remains and bronzes. While some subadults are buried with either bronze objects or animals, they are never recovered with both categories in a single assemblage. As clusters of subadult and adult subgroups have similar results, it may be possible that gender differentiation was identified early in life, and that specific items were given based on this division. Furthermore, wealth, in the form of bronze objects, is associated with individuals in certain hypothetical family groups. The results of biodistance analysis split the cemetery into five subgroups and bronze objects were recovered in the burials of individuals in two of these subgroups. Therefore, individuals that were genetically similar had higher status items placed in their burials. However, differentiation also occurred within these 'high status' kin groups. While social status or wealth may have been based on kinship, being a member of the higher status kin group did not always equate with high status. There was clear inequality between individuals within hypothetical family groups. Based on these findings, adults within the main kin group may have had the opportunity to achieve status and wealth over their lifetime, evident by burial assemblages with high diversity and number of items. As many of the high status items are buried with females, they may have worn the 'wealth' (or an indicator of the wealth) of the family (Krader 1955:73). Another possibility is that due to increased interactions in the region, individuals felt the need to more closely associate with their kin or ethnic group (Barth 1969:10; e.g. Nystrom 2009). Some of the items worn by females may have served a dual purpose of identifying them, through styles and patterns, as a member of a certain group. Furthermore, evidence for subadult burials that are comparatively wealthy or high status are evidence of a possible ascription of status to these individuals. Instead, they may have been buried with items based on the wealth, status, or identity of related kin. The results of multivariate statistical analysis reveal that the Lisakovsk community exhibits differentiation that has a heterarchical basis, but is also linked to gender divisions. The highest status females and males are buried with dissimilar assemblages, while the remainder of the community had few items in their mortuary assemblages. Additionally, subadults have similar assemblages as those of adults, forming a parallel system of differentiation.

6.5 CONCLUSION

The goal of this chapter was to examine differentiation at both the Bestamak and Lisakovsk cemeteries in an effort to explore identity and social structure during the Bronze Age. Furthermore, the comparison of these two cemeteries allows for more detailed interpretations of local communities as material culture differentially yields information about both identity and social structure. As discussed previously, interpretations of identity and social structure necessitate that mortuary practices are understood holistically. This combined research approaches interpretations of the mortuary realm with regard to how the living make decisions for the dead, as well as a direct reflection of the status or identity of the deceased. Artifact placement and stratigraphic location within the burial are an important part of understanding this difference, and yet much of this information is not available for the Bronze Age cemeteries as prehistoric and historic looting has occurred. Therefore, burial assemblages located in the region surrounding the body were used in multivariate statistics. Additionally, animal remains located just above or next to the individual are used as evidence sacrificial deposits, and interpreted as evidence of animal human connections and livelihoods.

Furthermore, wealth and status are explored in terms of artifact counts and diversity scores (S) for the entire, and specific portions of, the assemblage. The roles that are evident in mortuary rituals should be seen as relating to status, rather than reflecting it (Parker Pearson 1982:101). Therefore, status should be understood not as a direct reflection of mortuary rituals. As Arnold (1991:29) has suggested more generally regarding mortuary ritual patterning, “Social inequality can either be denied, reflected, or exaggerated by mortuary ritual, depending on the stability and developmental level of the social system”. Therefore, such measures are not seen as absolute truths, but rather another way of comprehending the datasets at hand. I would add that social inequality is sometimes denied or transformed based on looting of burials in prehistory, which has undoubtedly affected the nature of burial data available for analysis. While mortuary practices can have multiple meanings, and interpretations of social inequality can be precarious, as scholars we need to overcome our misgivings and make an attempt to understand the mortuary realm. Therefore, many of the interpretations presented for the Bestamak and Lisakovsk communities likely have alternative explanations. However, ethnographic data is used as a foundation for the creation of working hypotheses for these local communities.

Identities within each cemetery differed greatly based on artifact assemblages. At Bestamak, many activities related to craft specialization appear to be an important component of ritualized practice. These activities are differentially linked to gendered categories of males and females within burials. Metallurgical tools and byproducts as well as bronze axes, hooks and sickles were found in male burials, while spindle whorls were found primarily in female burials. In this case, male identities may be linked to activities including smelting and metallurgical processing, herding and foddering, butchering, and wood cutting. In contrast, females were associated with weaving, and few other items with clear functionality. Other activities that were not easily distinguished included items for sewing (needles) and leatherworking (awls), which were recovered with both males and females.

Another form of status and possible social identity included personal ornamentation in the form of bronze objects. Personal ornamentation was recovered with both males and females, and these items were extremely varied in type and style. Bronze ornamental objects are interpreted as an indication of differential identity or status, and therefore inequality in the community. Females were buried with bronze badges and clamps, both which were often sewn onto clothing and headdresses. Other bronze objects such as bracelets, pendants, and beads were worn by individuals of all ages and genders. Animal remains were found with many individuals, however the horse was strongly linked to burials of females.

At the cemetery of Lisakovsk, identity was not linked to tool kits or activities, and instead had a greater emphasis on social status and kinship. Differentiation between males and females was linked to the specific artifact groupings based on cluster analysis. Females were buried with ornamental bronzes including rings, bracelets, earrings, pendants, and badges. Females were also sometimes buried with a combination of bronzes and animal remains. In contrast, males were not buried with bronze objects, and instead had assemblages that included animal remains and astragals. For both Bestamak and Lisakovsk, females were sometimes buried with bronze headdresses, braid plaits, which in ethnographic accounts were described as a sign of womanhood or marriage (Margulan 1986; Levshin 1996).

Based on ethnographic analogies, females were often given a dowry at the time of their marriage that they had control over (Krader 1953:546; Valikhanov 1964; Abramzon 1978; Vainshtein 1980). Therefore, one interpretation of these items is that they were a sign of marriage. However, ethnographies also highlight the way that wealth is 'worn' in pastoral societies, evident even in historic groups that sew coins and jewelry to clothing and head coverings (Levshin 1996). The latter explanation may be the case at Lisakovsk, where only females and subadults are buried with bronze objects. However, at Bestamak, the majority of bronze ornamental objects are split equally, except for bronze badges. Badges are recovered only in the burials of females and therefore are likely a signifier of womanhood. At Bestamak, only horses are differentially buried with females, possibly signaling a special connection with this animal. Ethnographic accounts reveal that when wild horses are milked at certain points in the year, females have the task of extracting the milk while the animal is held (Vainshtein 2009:66-

67; Planet Earth Series: Wild Mares). While this is interesting evidence, it is unclear whether females also undertook this activity in prehistory. Further indirect evidence, such as testing of ceramic vessels in burial contexts for milk fats might support these types of interpretations. This type of analysis was recently conducted on vessels from the eneolithic site of Botai in north central Kazakhstan and revealed evidence for horse milking (Outram et al. 2009).

These communities have both similarities and differences in terms of individual identities, mortuary practices, and the expression of social and economic differentiation. At Bestamak, there is an increased ritualization of activities, which are connected to craft specialization. However, this community clearly saw these activities as important enough to be cited in mortuary ritual and used some of these items to differentiate between individuals based on biological sex or gender. The community also had evidence of inequality, as not all individuals were buried with bronze objects. If bronze items were considered a sign of wealth or status, then the community can be divided based on these items. A large portion of the community were recovered with bronze items (70%, n=42), however there is a great degree of diversity of artifact type in each cluster (Figure 6.9). Furthermore, among subadults there was a clear delineation between those individuals with burial assemblages and those without which was not related to age. Therefore, while inequality and status differentiation existed, it was not clearly associated with a specific biological sex, age grade, or kinship group. Instead, within each of these subgroupings there were individuals with bronzes and without. Therefore, inequality may have been part of achieved status or wealth in this society. These findings are interpreted as the beginnings of expression of both social and economic differences. At Bestamak differentiation between males and females emphasized particular trades or crafts, while general social structure emphasized inequality based on economic differences or status related to bronze objects.

At Lisakovsk, divisions between the sexes are more refined, as the separation between males and females is distinct. Among adults there is a lack of identification with specific activities and crafts, and instead a renewed focus on mortuary rituals associated with animals and ornamental bronzes. While males are associated with animal remains and astragals (possible game pieces), females are associated with bronze items as well as animal remains. Subadult clusters seem to mimic those of adults, except for the combination of bronzes and animals. Therefore, females seem to hold the wealth and status in this society, which is intriguing for this community. Furthermore, the majority of individuals with bronze items were identified within two closely related kin groups. It is possible that at a time of increased interaction in the broader region, females more closely aligned themselves to kin groups or families. This may have been highlighted through the use of ornamental bronze, or styles of bronze, to identify oneself. In contrast, adult males were associated with animal remains, possibly signifying their pastoral lifeway, and connections to herding activities. Based on clustering of animal remains and bronzes, the population split into four groups. Those without these items made up 51% of the individuals, those with animal remains or astragals made up 26%, those with bronzes 17% and those with both animal remains and bronzes 6%. These clusters seem to be evidence of a hierarchy, but are not interpreted as such because animals and bronzes could both be indications of wealth. Instead, this differentiation is believed to be gender based. There is also an increase in inequality between individuals as over 51.1% lack bronze objects (n=45). These results are interpreted as the beginnings of expression of inequality related to kinship in concert with more defined ritualization of gender roles. Furthermore, subadults in this society have similar forms of differentiation, and therefore may be given items in burial as an early form of gender identification or based on family wealth and status.

While differences between Lisakovsk and Bestamak are interesting, the way that these communities were interacting within the broader region is important to interpretations of identities and social structure. As discussed previously, the Middle Bronze Age (Bestamak) is a period when aggregated communities formed in the steppe region. In order for these large groups to form, there must have been a great degree of socialization, or normalization of institutions, to ensure stability. Socialization can be understood as the rules that govern the flow of information and technology that occur with globalization. In a time of increased socialization, there is more integration within a community. This seems to be true of Bestamak, where gender differentiation is based on activities and crafts, but where status is not specific to males or females. Furthermore, overall wealth and status in the society, based on bronze objects, reveals a heterogeneous form of differentiation. Individuals are integrated into the community through similarity in burial construction patterns and kinship does not play a part in differentiation and inequality. In contrast, during the Late Bronze Age (Lisakovsk) a greater number of small communities are spread over the landscape. This period is interpreted as a time of increased interaction of local groups based on the presence of similar burial patterns and ceramic vessels over a vast area. This can also be described as a time of increased globalization, when information, technology, and ideas flowed freely. At times of globalization, individuals and groups are more likely to exhibit differentiation in terms of personal identity, as seen in the Lisakovsk cemetery. Females tended to wear personal ornamentation that might link them to specific kin groups or communities. In addition, greater inequality between individuals is evident, as 51% lack animals and bronzes in their burial assemblages. This greater inequality may be associated with an increase in the possibility for achieved status, albeit more likely for those associated with the leading kin groups in the community. These findings will be further discussed in the following chapter, a discussion of the results of mortuary statistics, biodistance analysis and stable isotopes for both cemeteries (chapter 9).

7.0 PALEODIETARY RECONSTRUCTION

Anyone who has spent significant time in the Eurasian steppe understands the importance of meat and milk to the pastoral economy. Even in a time of increased globalization and the loss of certain pastoral lifeways, these traditions stand strong. From the first sip of fermented horse or camel milk, to the mistake of taking a large bite of a hardened milk biscuit, pastoral products are cemented into the mind. Nearly all scholars agree that meat and milk products formed a major component of the prehistoric pastoral subsistence economy, and it is clear from archaeological evidence that Bronze Age societies in Eurasia maintained livestock (Khazanov 1984; Cribb 1991; Frachetti 2002; Outram et al. 2009). However, our current understanding of the pastoral economy includes more diversity than previously considered. While evidence for agricultural and horticultural items is lacking, fish are now thought to factor strongly into the diet of many steppe communities (Privat 2002; Anthony et al. 2005; Privat et al. 2005).

Carbon and nitrogen stable isotopes have been routinely used to examine diet in animals and humans as well as to investigate specific correlations between economy and diet (Privat et al. 2005; Katzenburg et al. 2009; Tarfuri et al. 2009; Hollund et al. 2010; Lillie et al. 2010), diet and ethnicity (White et al. 2001), and diet and status (Privat et al. 2002; Ambrose et al. 2003; Montgomery and Evans 2006; Jørkov et al. 2010). Human dietary intake must be analyzed within social and environmental contexts, with special consideration of animal foddering, environmental zones, and dietary diversity. Comparisons of modern herbivores in terms of carbon stable isotopes revealed significant differences in diet between wild and domesticated animals (Makarewicz and Tuross 2006). This difference, attributed to foddering of domesticated animals, may be an important factor in prehistory as well. Environmental niches can also significantly affect the carbon and nitrogen isotopic signatures of animals. In prehistoric Britain, significantly higher $\delta^{15}N$ values were identified for animals that grazed in salt-marshes rather than from other zones (Britton et al. 2008). This dataset reveals that along with higher nitrogen isotopic values, corresponding $\delta^{13}C$ isotopic values were less negative.

The goal of this chapter is to examine dietary intake at the individual, community, and micro-regional scales of analysis (see chapter 2). In this research, I examine the interplay between diet and social identity and status (including age, gender, wealth) as well as diet and biological affinity (kinship and post-marital residence). Dietary intake may vary based on biological and social groupings, which can inform our understandings of social structure. In addition, I address community diet in the context of larger micro-regional processes and culture change. When mortuary and settlement patterning transform during the Middle to Late Bronze Age transition, are there concurrent changes in subsistence? Demographic changes in residential communities at this transition may have had an effect on herd size and composition, resulting in differential animal consumption by humans. In addition, variation in the dietary intake of pastoral groups may be evidence of larger social processes occurring in the region, such as a change in the mobility of groups and interactions between communities.

This chapter provides an overview of carbon and nitrogen stable isotope analysis and paleodietary reconstruction based on human remains analyzed from the cemeteries of Bestamak and Lisakovsk. First, previous research on diet and economy in north central Eurasia derived from isotopic data and human dental studies is discussed in detail. Then a general introduction to stable isotope analysis is provided to give the reader an overview of the ways that dietary reconstruction can be undertaken. The materials and methods specific to this study are explained in detail in this chapter, as well as in Chapter 5. Finally, the results of stable carbon and nitrogen isotopic analyses are provided, and the final section examines these results in light of comparative data from statistical mortuary analyses (Chapter 6) and biodistance analysis (Chapter 8).

7.1 PREVIOUS RESEARCH: DIETARY RECONSTRUCTION IN NORTH CENTRAL EURASIA

As previously discussed, the link between subsistence economy and social and cultural change in the Bronze Age is an important one. Pastoral lifeways, particularly diet, are understudied, especially in correlation with demography, paleopathology, and social organization. Current research into the human diet in the Eurasian steppe focuses on the use of chemical analyses to reconstruct prehistoric dietary intake (O’Connell et al. 2003; Privat 2004; Privat et al. 2005; Outram et al. 2009; Outram et al. 2010; Hanks et al. in press). These findings are supported by more traditional research methods including the examination of human dentition, faunal and botanical remains (Kosintsev 2000; Gayduchenko 2002; Epimakhov 2002; Lindstrom 2002; Logvin 2002; Gayduchenko 2010). There are, however, renewed discussions of the variability in pastoral diet, and the degree to which fish, wild cereals, wild plants, horticultural, and agricultural items were consumed.

What is the relationship between the economy and social organization? At the shift from the Middle to Late Bronze Age (2100 to 1400 B.C.), significant changes occurred including a transition from demographically nucleated settlements with more uniform mortuary rituals, to small dispersed communities with more dynamic mortuary rituals. Middle Bronze Age sites, by virtue of their aggregated nature and seemingly more complex mortuary remains, are occasionally posited to have been agro-pastoral (Zdanovich 1997:15). This hypothesis is often supported by the presence of sickles and stone pestles at some settlements (Epimakhov 2010) and the reported recovery of very small amounts of millet (*Panicum*), wheat (*Triticum*), and barley (*Hordeum*) at the settlements of Alandskoe and Arkaim (Gayduchenko 2002). However, as discussed in chapter 6, sickles and stone pestles can have a variety of functional and rituals uses. In addition, as communities became more dispersed during the Late Bronze Age, scholars have posited a switch to increased nomadism (Tkacheva 1999). The relationship between increased mobility and changes in herd size and composition is yet another branch of the prehistoric economy that is not well understood (Morales-Muniz and Antipina 2003; Bendrey 2011). Greater knowledge of individual and community dietary intake is therefore an essential part of understanding broader social and economic processes within the region.

Previous research on subsistence and dietary intake in north central Eurasia includes the examination of dental wear and pathologies, analysis of faunal and botanical remains, and chemical analyses of bone collagen and lipids. Research into human dentition at MBA sites reveal few dental caries and little tooth wear on individuals at the Kamennyi-Ambar 5 (Hanks 2008b; Judd et al. 2008; Judd et al. 2009) and Kurgan 25 at the Bolshekaraganskogo cemetery (Lindstrom 2002). A combination of few dental caries, a paucity of tooth wear, and high prevalence of calculus deposits is often associated with a high protein diet, one that lacks carbohydrates and coarse foodstuffs (Hillson 1979; Lillie 1996; Judd et al 2008). The recovery and analysis of faunal remains from several Middle Bronze Age sites (Arkaim, Alandskoe, Kuisak, Bersuat, Semiozyornoe II and Sintashta) reveal the primary use of cattle and sheep/goat, with somewhat lesser use of horse (Gayduchenko 2002; 2010). In addition, fish bones and scales have been recovered from these sites, and were suggested to have contributed to the dietary intake (Gayduchenko 2002; 2010). Faunal research at Lisakovsk (cemetery and settlement) indicates that the dominant remains are of cattle (based on Number of Identified Specimens - NISP) (Outram et al. 2010). At the settlement, the dominant remains are cattle (67.4%, n=1474), with sheep/goat also prominent (28.6%, n=625), and only a few horse (4.0%, n=89). In contrast, within cemetery contexts, there are an abundance of cattle (41.5%, n=223), sheep/goat (29.8%, n=160), and horse (24.7%, n=133), as well as some dog remains (4.0%, n=21) (Outram et al. 2010:121-2). However, few remains of fish bones, grains, or cereals were obtained from this site because soil flotation was not used as a recovery method.

One of the first isotopic studies in the Eurasian steppe was undertaken on 14 individuals from the Bolshekaraganskogo cemetery (Privat 2002). This study indicated a diet primarily focused on animal protein rather than plants, and nitrogen isotope values linked human diet to the consumption of meat and milk products from cattle and ovicaprids, rather than horses. Interestingly, other sites from this period were posited to have evidence of freshwater fish consumption by humans, based on high $\delta^{15}N$ values (Privat 2004: Appendix 1). For example, the site of Bestamak had individuals with average $\delta^{15}N$ values ranging from 10.5 to 13.6‰, while Kamennyi Ambar 5 had average $\delta^{15}N$ values ranging from 11.3 to 14.8‰. Privat suggests that these sites were populated by individuals with dietary consumption patterns that included both terrestrial animals and freshwater fish (2004:75-76). Furthermore, individuals at the Late Bronze

Age (Alakul) site of Isiney I had average $\delta^{15}N$ values ranging from 10.5 to 11.9‰, and their dietary intake was proposed to consist mainly of terrestrial herbivores and few fish (Privat 2004:Appendix 1). Evidence from Bronze Age sites provides clear evidence that dietary variability is present between (and possibly within) communities and locales over time.

While clear distinctions between the human consumption of terrestrial versus aquatic animals (O'Connell et al. 2003) is evident, diversity in animal diet cannot be discounted as a factor in human dietary change. The work of Privat was also important in discounting fermented milk as a source of higher $\delta^{15}N$ values, as the fermentation process was shown to not significantly alter the nitrogen isotopic values of milk (Privat 2004:98-101). While freshwater fish is one possibility for differential human diet, changes in grazing behavior and location may also be a factor. Different herbivores are known to have varied isotopic signatures based on variation in grazing behaviors, such as the differences between horses and cattle/ovicaprids (Privat 2004; Hollund et al. 2010; Lillie et al 2010). More recent research has identified differences between herbivores based on environmental niches, with higher nitrogen and carbon isotopic values characteristic of animals grazed in marshy areas (Britton et al. 2008).

At several LBA sites, including the Lisakovsk settlement and cemeteries, the chemical analysis of lipids from ceramic vessels was undertaken, and revealed a different outlook on foodways during the Bronze Age (Outram et al. 2010). Chemical analysis undertaken on sherds from both the cemetery and the settlement of Lisakovsk separated lipids into ruminant dairy, ruminant adipose, and horse adipose tissues (Outram et al. 2010:124). In funerary and settlement contexts, few containers held equine fat and ruminant adipose/fat, and therefore the dominant lipids were those related to remnants of ruminant dairy proteins (Outram et al. 2010: 124-5). From this data, it would seem that individuals at the Lisakovsk site were consuming mostly cattle, sheep, and goat, as well as the occasional horse. However, there was a lack of evidence for storage or cooking of freshwater fish in the containers examined (Outram et al. 2010:121,124). While detailed data on the differential use of containers at cemeteries as well as a few settlements allows for more thorough reconstructions of mortuary and household rituals, stable isotopic data of the Lisakovsk site should reveal a more intimate picture of individual dietary intake. Future research should focus on the detailed excavation of settlements dating to the LBA, as these are understudied, especially in regard to the subsistence based of local communities.

7.2 CARBON AND NITROGEN STABLE ISOTOPIC ANALYSES: MATERIALS AND METHODS

Isotopes are naturally occurring forms of an element that have the same number of protons in the nucleus but different numbers of neutrons, resulting in different atomic weights. Stable isotopes do not undergo spontaneous radioactive decay. Isotope abundances in natural materials vary based on biological, biogeochemical and even human processes (Rubenstein and Hobson 2004). Stable isotopic analysis of dietary intake is couched in basic principles of the food chain, as consumed food is incorporated into the tissues of the animal. While variation can occur between tissue types of a single individual, taken as a whole, carbon and nitrogen isotope values are essentially homogeneous within a species when dietary intake is controlled (DeNiro and Shoeninger 1983).

The testing of animal tissue to determine dietary intake depends on the type of tissue examined and its rate of formation and remodeling. Some tissues, such as skin and fat have turnover rates of days or weeks (Tieszen et al. 1983; Sponheimer et al. 2003), while bone collagen has a turnover rate of years (Ambrose 1993). Thus, bone collagen reflects the average isotopic composition, and therefore dietary intake, of an individual over a period of years (Wild et al. 2000; Hedges et al. 2007). In contrast, proteins present in human teeth reflect the diet at the time of tooth formation (Balasse 1999). Similarly, hair preserves a record of diet over time as it grows with the most recent dietary information is preserved near the scalp (Minagawa 1992; Sponheimer et al. 2003). Therefore, diet can be examined at several temporal scales through the analysis of different tissues. However, many of these soft tissues such as fat, skin and hair are often not available to archaeological researchers as they do not survive the taphonomic processes. As a result, bone and dentition are used more often to reconstruct dietary intake. Bone collagen is particularly useful in determining the intake of different types of dietary protein (Ambrose and Norr 1993; Harrison and Katzenberg 2003; Jim et al. 2004). As the turnover rate of collagen is on the scale of years, it reflects the long-term dietary input of an individual, and can also be extremely useful in revealing long term dietary trends.

7.2.1 Carbon and Nitrogen Stable Isotopes

Isotopes are atoms whose nuclei contain the same number of protons, but different numbers of neutrons, and therefore have different atomic masses. Stable isotopes, as their name suggests, remain stable over time and do not degrade. Isotopes are measured based on the ratio (R) of the number of atoms of one isotope to the number of atoms of another isotope of the same chemical element in the same system (e.g. $^{15}N/^{14}N$; $^{13}C/^{12}C$) using the standard delta (δ) notation (Hoefs 1997; Schoeller 1999; Coplen 2011).

$$\delta = (R_{(sample)} - R_{(standard)}) * (1000/R_{(standard)})$$

Stable isotope ratios are measured relative to internationally recognized standards based on the specific element and material analyzed. For carbon, the standard is the PeeDee Belemnite Limestone (PDB), and for nitrogen the standard is air. The per mil value (‰) is 10 times the percent difference in the isotope ratio relative to its standard (Schoeller 1999). As elements cycle through different biological and geochemical cycles, various isotopes undergo fractionation at different stages. The processes that cause stable isotopes of certain elements to vary in abundance, or fractionate, can generally be characterized as nonequilibrium (kinetic) effects or equilibrium effects (Criss 1999:15). Kinetic fractionation results from one-way chemical or physical processes, including the evaporation of water, absorption and diffusion of gases, the bacterial decay of plants, and metabolic effects (Mook 2005:36). Equilibrium, or thermodynamic fractionation is part of an isotope exchange mechanism that can be a reversible chemical or physical process such as evaporation/condensation (Mook 2005:36). Measurements using modern mass spectrometers allow us to observe differences in chemical and physical property changes of isotopic compounds (Mook 2005:32).

During the photosynthetic process, plants differentially discriminate against ^{13}C, which allows for their assignment into different photosynthetic groups (Smith and Epstein 1971; O'Leary 1988). There are three different types of plants (C_3, C_4, CAM), which all ultimately gain their C from the same source, namely atmospheric CO_2. However, each of these types of plants has a different mode of photosynthesis, and therefore different isotopic values. C_3 plants are characterized by $\delta^{13}C$ values typically between -21 and -35‰, with an average isotopic value of -28‰, C_4 plants, in contrast, have $\delta^{13}C$ values of -12‰ to -16‰, with an average value of -14‰, and CAM plants most often exhibit $\delta^{13}C$ values of -10‰ to -20‰ (O'Leary 1988).

Therefore, C_3 plants can be isotopically differentiated from both C_4 and CAM plants, as the $\delta^{13}C$ ranges of these plants do not overlap (O'Leary 1988).

Archaeologists have used $\delta^{13}C$ analyses to test for the presence of C_4 plants such as millet, sorghum and certain species of amaranth and chenopodium in the human and animal diet. This has often led to questions of the timing of prehistoric domestication (Tykot 2006). In Eurasia and elsewhere, this analysis has been used to evaluate prehistoric consumption of cereals (Katzenberg et al. 1995, 2009; Privat 2004). Carbon isotopic data from Eurasia suggest that increased consumption of cereals did not begin until the Iron Age (Privat 2004). While carbon isotope analysis can differentiate between the consumption of C_3 and C_4/CAM plants, this method does not differentiate between the use of horticultural and agricultural items. Therefore, in the reconstruction of human diet, carbon isotope values can only be used to determine if cereals were directly consumed by humans, or indirectly through consumption of animals with different feeding habits (Minagawa 1992).

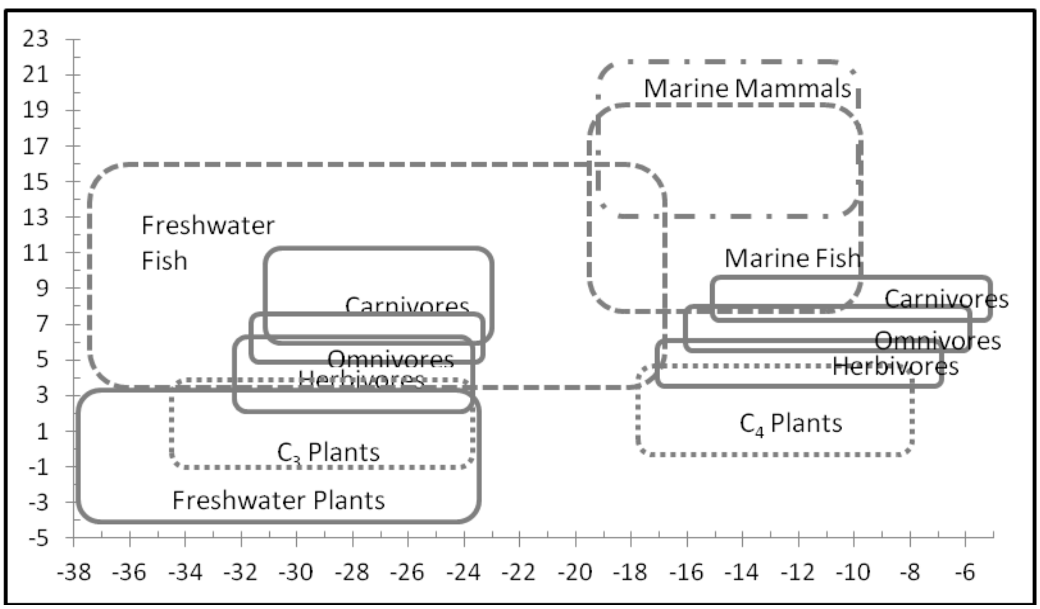

Figure 7.1 Approximate Isotope Values for Terrestrial and Aquatic Ecosystems (based on Dufour et al. 1999 and Privat 2004)

There are two naturally occurring stable isotopes of nitrogen, ^{14}N and ^{15}N. Analysis of the nitrogen isotope composition of samples tends to reflect the position of the individual in a food chain with an approximate 3-5‰ increase in $\delta^{15}N$ relative to diet (the so-named 'trophic level effect') (Schoeninger and DeNiro 1984; Schoeller 1999; Hedges and Reynard 2007). In a terrestrial food chain, for example, the $\delta^{15}N$ of an herbivore's bone collagen is higher by 3-5‰ when compared to the plants it consumes (Figure 7.1). Higher $\delta^{15}N$ values may also be associated with aquatic food chains because aquatic food chains tend to be longer than terrestrial food chains (i.e., aquatic food chains maintain more trophic levels) (Schoeninger et al. 1983). In addition, the consumption of animal protein in any form (flesh, eggs, milk) will result in higher $\delta^{15}N$ values in carnivores, relative to herbivores (vegans) (Katzenberg and Krouse 1989; Minagawa 1992; O'Connell and Hedges 1999). This trophic level effect is generally not relevant for changes in $\delta^{13}C$ values (O'Connell and Hedges 1999).

Variation in trophic levels within pastoral societies is affected by the primary economy, age of the individual, and animal culling patterns. Pastoralists have the ability to sustain high trophic levels based on their high quantity of milk and meat intake (Hedges and Renyard 2007). Recent studies reveal that animal protein continues to provide Mongolians with the majority (70%) of their dietary intake (FAO 2006). The trophic level effect is also evident for infants who are breastfed, as they exhibit $\delta^{15}N$ values that are approximately 3‰ higher than their mother (Mays et al 2002). The tissues formed during this period of breastfeeding will also exhibit higher $\delta^{15}N$ values, thus the study of bone collagen to understand the dietary intake of children and adolescents can be problematic depending on the age of weaning (Mays et al 2002). Juvenile animals that consume milk also have higher $\delta^{15}N$ values compared to adults of the same species

(Durrwachter et al. 2006). Therefore, humans that consume juvenile animals also will have higher $\delta^{15}N$ values compared to those that consume older animals.

Nitrogen isotopic studies have been effectively used to evaluate differential food consumption patterns in relation to status, as well as overall dietary trends in a community. Recent studies in Eurasia that examine dietary patterns of pastoralists, have attempted to explain the relatively high $\delta^{15}N$ values for these groups. Many authors have posited that the basic prehistoric pastoral diet of terrestrial meat and milk products is likely supplemented by fish consumption (Katzenburg and Weber 1999; Lillie and Richards 2000; O'Connell et al. 2003; Iacumin et al. 2004; Privat 2004; Shishlina et al. 2007; Katzenburg et al. 2009; Shishlina et al. 2009; Lillie et al. 2010). Similarly, in northern Europe, nitrogen isotope values of human remains from medieval Anglo-Saxon cemeteries reveal that 'poor' men (minimal grave goods) likely consumed more freshwater animals (birds and fish) or omnivore protein (pigs) in contrast to 'wealthier' men (substantial grave goods) who consumed more herbivore meat and milk (Privat et al. 2002). The correlation of dietary data with social datasets allows for a more detailed picture of prehistoric lifeways to emerge.

7.2.1.1 Bone Selection

Bone samples analyzed in this dissertation were obtained from three institutions: *Karaganda State University named after E. A. Buketov, Lisakovsk Museum of History and Culture of the Upper Tobol Region*, and *Kostanai Regional History Museum* with permission of archaeological and anthropological researchers. Human long bone samples were collected with a preference for the midshaft of the left femur. However, when the femur was not available, preference was for the midshaft of another long bone. In the absence of long bones, any other bone was sampled, including hand and foot bones in some cases. Similar selection processes were undertaken for faunal remains used in this dissertation. Faunal bones were identified by genus, and by species where possible, by Jennifer Roland (University of Pittsburgh). All human and faunal samples used in isotopic analysis were collected from adult individuals. Adult humans were considered those individuals above 18 years of age based on physical analysis. Faunal samples were identified as adult by the faunal specialist named above. Juvenile individuals were not selected for this analysis, as the isotopic composition of juvenile bones may include the 'weaning effect', or a mixture of weaning and post weaning isotopic influences (see section 7.1.2.2).

A total of 22 human individuals from Bestamak and 29 human individuals from Lisakovsk were sampled for carbon and nitrogen isotope analyses, as well as C:N elemental analyses (see Chapter 5 section 5.1.3). This represents only a portion of the total number of skeletal remains that were physically examined from these cemeteries (Figures 7.3 and 7.4). A sample of adults was chosen from each community and sample sizes for each cemetery were computed in order to have confidence levels between 90 and 95%. The Bestamak site has a total sample size of 45, therefore, for stable isotope analysis, a total of 22 adults were chosen for analysis. The Lisakovsk site has a total sample size of 138 individuals, therefore samples of 29 adults were chosen for analysis.

7.2.1.2 Collagen Extraction

Collagen extraction was undertaken on human samples from both cemeteries, as well as faunal samples from the Lisakovsk site. All samples were prepared following similar methods described in Richard and Hedges 1999 (see also Privat et al. 2001) with some modifications. Approximately 0.5 to 1.0 g of bone was obtained from each individual using a handsaw. Bones treated with glue or marked with ink were not sampled. The surface of the bone was cleaned using a hand-held rotary Dremmel® tool and grinding attachment at low speed in order to remove contamination and cancellous (i.e., ‘spongy’) bone. Samples were cleaned ultrasonically in deionized water and then broken into smaller fragments with a percussion mallet, but not powdered, as this may affect protein retention (Schoeninger et al. 1989). The bone fragments were then soaked in a 1.0 M HCl solution overnight, rinsed with deionized water, and gelatinized at 95º C overnight in 10^{-3} M HCl solution (pH 3). The liquid fraction was isolated by filtration through a Porosity C (25-50 μm) fritted disk, evaporated to 5 ml at 65º C and then freeze-dried to make the final ‘collagen’ product.

7.2.1.3 Mass Spectrometric Analysis

Approximately 0.5 to 1 mg of the ‘collagen’ product was measured for carbon and nitrogen isotope, and C:N (atomic) ratios using a GV Instruments, Ltd. (now Isoprime, Ltd., a subsidiary of Elementar Analysensysteme) Isoprime™ stable isotope ratio mass spectrometer and coupled EuroVector high temperature elemental analyzer with a diluter kit for sequential isotope analyses. When possible, samples were run in duplicate. By international standard, $\delta^{13}C$ values are expressed in conventional delta (δ) notation as the per mil (‰) deviation from the Vienna PeeDee Belemnite (VPDB). Nitrogen isotope results are similarly expressed in conventional delta notation as the per mil deviation from air. Analytical precision for the collagen samples was ± 0.25‰ and ± 0.15‰ for $\delta^{13}C$ and $\delta^{15}N$, respectively, based on repeated measurement of USGS-40 and USGS-41 glutamic acid reference materials. Duplicate $\delta^{13}C$ and $\delta^{15}N$ values for individual collagen samples varied by as much as 0.84‰.

7.3 RESULTS: CARBON AND NITROGEN ISOTOPIC ANALYSES

7.3.1 Testing for Collagen Alteration

The validity of isotopic data as a dietary measure is based on the assumption that contamination of the collagen has not occurred post-mortem. For collagen, C:N ratios are the most commonly used measure of diagenesis and its potential impact on $\delta^{13}C$ and $\delta^{15}N$ values. Bone collagen with a C:N ratio that falls outside the range of 2.9 to 3.7 is considered to have been affected by post-mortem alteration (DeNiro 1985; Shoeninger et al. 1989; Ambrose and Norr 1993). For this research, 49 of 51 human bone samples (96%) and 6 of 6 animal bone samples (100%) had atomic C:N ratios between 3.0 and 3.6 (Figure 7.2). These ratios fall within the range of 2.9 to 3.7, indicating that collagen was not contaminated and/or degraded (DeNiro 1985; Schoeninger et al. 1989; Ambrose and Norr 1993). Only two samples fell outside of the acceptable range for C:N ratios (3.70 and 3.76 respectively) and were therefore not used in this study. The results of stable isotope analysis are presented below for each cemetery with unacceptable ratios shaded (samples 3503 and 3176) (Figures 7.3 and 7.4).

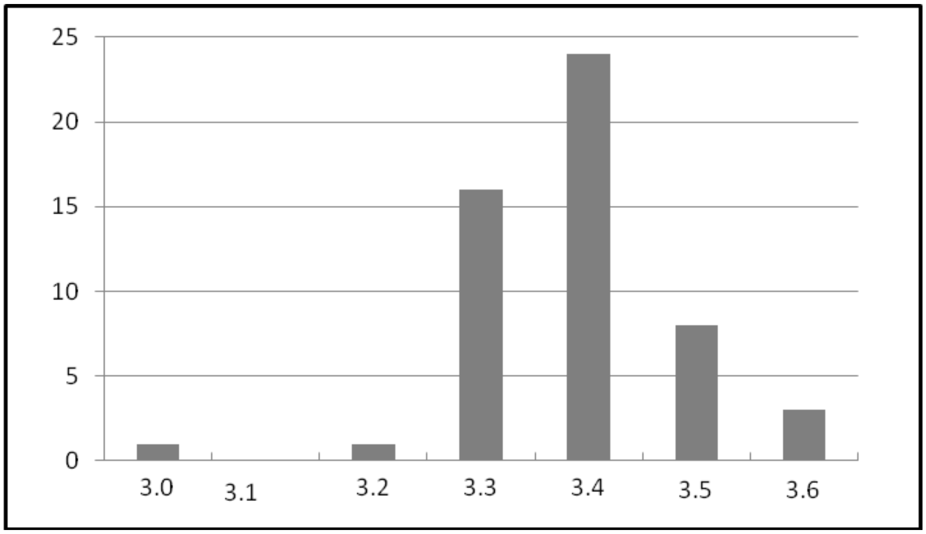

Figure 7.2 Frequency of C:N values for all samples reported in this study (n=55)

Sample I.D.	Period	Species	Corr. $\delta^{13}C$	Corr. $\delta^{15}N$	C:N (Atomic)	Age	Sex	Bone Sampled
B 3501	MBA	Human	-19.42	11.56	3.5	24-35	Indet.	R. Tibia
B 3503	MBA	Human	-18.50	11.79	3.7	Adult	Indet.	Long Bone
B 3507	MBA	Human	-19.17	11.60	3.4	20-30	Female	L. Femur
B 3508	MBA	Human	-19.22	11.10	3.5	20-30	Female	R. Femur
B 3512	MBA	Human	-19.42	11.40	3.5	35-50	Male	Long Bone
B 3513	MBA	Human	-19.37	12.15	3.5	19-24	Female	L. Femur
B 3515	MBA	Human	-19.58	11.27	3.5	35-50	Indet.	L. Femur
B 3518	MBA	Human	-18.80	11.94	3.5	18-22	Indet.	R. Femur
B 3520	MBA	Human	-19.24	11.28	3.4	23+	Indet.	R. Femur
B 3523	MBA	Human	-18.75	12.63	3.5	18-24	Indet.	R. Femur
B 3531	MBA	Human	-18.62	12.51	3.4	18-24	Female	L. Femur
B 3532	MBA	Human	-19.51	11.04	3.5	30-55	Indet.	R. Femur
B 3534	MBA	Human	-18.99	09.53	3.5	24-60	Female	L. Femur
B 3538	MBA	Human	-19.24	11.09	3.4	30-60	Female	L. Femur
B 3540	MBA	Human	-17.63	14.08	3.5	18-24	Indet.	R. Femur
B 3542	MBA	Human	-19.01	11.13	3.6	Adult	Indet.	R. Femur
B 3545	MBA	Human	-18.74	11.52	3.4	18-30	Male	R. Tibia
B 3547	MBA	Human	-19.25	12.13	3.5	25-30	Male	L. Tibia
B 3550	MBA	Human	-19.37	11.96	3.5	Adult	Indet.	R. Femur
B 3558	MBA	Human	-18.30	13.98	3.6	18-50	Female	R. Femur
B 3566	MBA	Human	-18.67	11.90	3.6	30-55	Male	Fibula
B 3575	MBA	Human	-18.92	11.18	3.5	20-44	Male	L. Humerus

Figure 7.3 Bestamak Isotopic Results

Sample I.D.	Period	Species	Corr. $\delta^{13}C$	Corr. $\delta^{15}N$	C:N (Atomic)	Age	Sex	Bone Sampled
L 3001	LBA	Human	-18.76	11.53	3.4	35+	Indet.	Rib
L 3004	LBA	Human	-18.95	11.64	3.3	Adult	Indet.	R. Femur
L 3013	LBA	Human	-18.85	12.45	3.5	Adult	Indet.	R. Femur
L3016	LBA	Human	-18.94	09.91	3.4	Adult	Indet.	L. Tibia
L 3036	LBA	Human	-18.55	12.03	3.3	Adult	Indet.	R. Femur
L 3070	LBA	Human	-18.70	12.05	3.3	20-30	Indet.	R. 3rd Metatarsal
L 3071	LBA	Human	-18.62	13.88	3.3	40-50	Indet.	Ulna
L 3081	LBA	Human	-18.86	12.08	3.3	30-50	Indet.	L. Tibia
L 3093	LBA	Human	-19.40	11.54	3.3	22-30	Indet.	L. Tibia
L 3102	LBA	Human	-18.67	12.37	3.3	20-30	Indet.	L. 5th Metatarsal
L 3105	LBA	Human	-19.02	11.97	3.4	Adult	Indet.	R. Femur
L 3110	LBA	Human	-19.29	11.21	3.4	35-50+	Indet.	L. Femur
L 3112	LBA	Human	-18.82	13.48	3.4	20-35	Female	R. 1st Metatarsal
L 3130	LBA	Human	-18.87	12.82	3.4	35-50+	Male	Parietal
L 3137	LBA	Human	-17.49	14.35	3.3	45-59	Male	R. Femur
L 3139	LBA	Human	-19.03	12.45	3.4	24-40	Female	R. Humerus
L3142	LBA	Human	-19.03	11.23	3.4	24-40	Indet.	L. Radius
L 3150	LBA	Human	-18.96	11.93	3.4	30-39	Female	R. Tibia
L 3155	LBA	Human	-17.62	13.14	3.0	Adult	Indet.	L. Femur
L 3160	LBA	Human	-18.50	12.54	3.4	17-25	Female	L. Femur
L 3161	LBA	Human	-18.56	10.87	3.4	35-44	Indet.	L. Tibia
L 3165	LBA	Human	-18.77	11.27	3.5	35-44	Male	R. Femur
L 3167	LBA	Human	-18.33	12.20	3.3	30-45	Female	L. Femur
L 3168	LBA	Human	-18.98	11.68	3.3	Adult	Indet.	R. 4th Metatarsal
L 3170	LBA	Human	-19.08	12.04	3.4	40-50	Male	R. Femur
L 3173	LBA	Human	-18.83	12.03	3.4	35-45	Male	R. Femur
L 3176	LBA	Human	-18.94	12.07	3.8	30-39	Male	R. Femur
L 3178	LBA	Human	-19.68	09.95	3.5	20-30	Indet.	L. Ulna
L 3184	LBA	Human	-18.67	11.87	3.3	Adult	Indet.	Rib
L3023	LBA	Bos	-18.96	08.32	3.5	Adult	Indet.	-
L3067	LBA	Equus	-20.16	04.61	3.5	Adult	Indet.	-
L3159	LBA	Ovicaprid	-18.75	07.09	3.5	Adult	Indet.	-
L3177	LBA	Ovicaprid	-19.40	05.98	3.4	Adult	Indet.	-
L-DOG	LBA	Canine	-18.80	08.75	3.5	Adult	Indet.	-
L-SG	LBA	Ovicaprid	-19.36	07.36	3.6	Adult	Indet.	-

Figure 7.4 Lisakovsk Isotopic Results

As discussed above (section 7.2.1.1), bone samples were collected with a preference for the midshaft of the left femur. When this bone was not available, preference was for the midshaft of another long bone. However, in the absence of long bones, any available bone was sampled for this study, including hand and foot bones (Figures 8.3 and 8.4). In studies of intra-individual skeletal elements, carbon and nitrogen isotopic values were identical for femora and humeri (DeNiro and Schoeninger 1983), vertebrae and femora (Schoeninger 1989), and femora and ribs (Jørkov et al. 2008). While it is clear that replacement rates for skeletal elements may differ, little isotopic variation is present in the skeletal remains of a single individual with a constant diet (Sealy et al. 1995). Only a single bone, the petrous, has recently been identified as having a parallel association with enamel due to its early formation (Jørkov et al. 2008). Therefore, while many different skeletal elements form the foundation of this research, there is little correlation between specific skeletal element and abnormal isotope value at the sites of Bestamak and Lisakovsk (Figure 7.5). Instead, the greatest variation occurs between femori of different individuals.

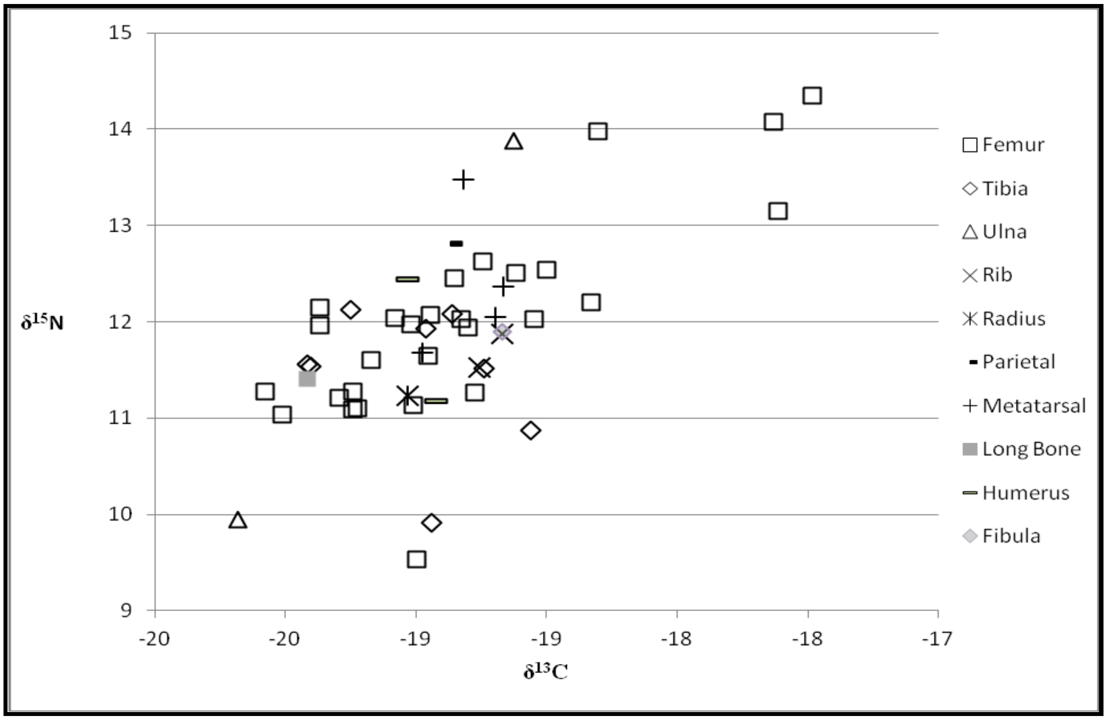

Figure 7.5 Isotopic Values of Different Bones Selected for Analysis

7.3.2 Local Environment, Climate, and Vegetational History

Stable carbon and nitrogen isotopic studies are tied to the local environment where consumption practices occurred (Iacumin et al. 2004; Rubenstein and Hobson 2004; Hollund et al. 2010). Unfortunately, no samples of local plant species were sampled as part of isotopic analyses for this project. Therefore, local environmental differentiation and climate are discussed from the perspective of previous research in the region. The Kostanai oblast (administrative region) located in north central Kazakhstan consists of two broadly defined vegetation subprovinces, the Northern Kazakhstan forest-steppe and the Trans-Ural - Turgay (Rachkovskaya and Bragina 2012:124-5). The forest-steppe encompasses only a small section of the northeastern part of the Kostanai oblast and includes *Betula* and mixed *Populus* and *Betula* forests interspersed with meadow steppes and rich forb and feather grass steppes (Rachkovaskaya and Bragina 2012:126).

Small sections of vegetation can also include sedge marshes and willow brushwoods, especially in depressions. In comparison, the majority of the oblast is considered part of the Trans-Ural - Turgay subprovince which contains a full range of steppe vegetation communities. These include steppes of rich forb and feather grass and forb and feather grass in the north, with fescue and feather grass steppes on the slopes on low hills near rivers (Rachkovskaya and Bragina 2012 126-7). Furthermore, small vegetation communities of sagebrush, bunch grass and other xerophytic forbs, fescues, and feather grasses are present nearby. Several areas also have relic pine forests interspersed with meadow communities and complex steppes on lake terraces (Rachkovskaya and Bragina 2012:127). Modern land use within the oblast suggests that at least 64% of the land surface in the oblast is arable, and that natural pastures have productivity levels ranging from 500 to 1,500 kg/ha in steppe meadows (Rachkovskaya and Bragina 2012:129-133). Vegetation communities in Kostanai oblast are largely categorized by two sub-provinces, however there are also many smaller vegetation communities in the region. Both archaeological sites discussed in this dissertation are located within areas of open steppe, however they differ because Bestamak is found in an area dotted with small salt marsh ponds while Lisakovsk is located on the high banks of the Tobol River.

Climate change is also relevant to stable carbon and nitrogen isotopic datasets, as it may affect the water and vegetation that is consumed by animals and humans. While very little climate change research has been published for north central Eurasia, several broad trends in vegetational history are evident based on lake cores undertaken at Mokhovoe Lake within Kostanai oblast (Kremenetski et al. 1997). This lake is located between the Tobol and Ubagan Rivers and therefore relatively close to the archaeological sites under study. Sedimentation at the lake started circa 6000 years BP, with a hiatus around 4500 to 2900 years BP (Kremenetski et al.

1997). Between 6000 and 4500 years BP the vegetation in this region was forest-steppe and grass steppe with some patches of birch forest. These findings are interpreted by the authors as a long period of favorable climatic conditions when vegetation groups expanded and the herb cover of the steppe was more mesophytic, containing plants that needed a regular source of water (Kremenetski et al. 1997:403). The hiatus (4500-2900 BP) was characterized by the authors as a period when there was a drier, more continental climate, with decreased forest area (Kremenetski et al. 1997:403). However, a lack of sedimentation does not preserve pollen and therefore vegetation inferences should not be made. As the sites of Bestamak and Lisakovsk were occupied during this hiatus, the extent of variation in climate and local environment continue to be unclear. However, during the period after the hiatus starting at 2900 BP the area developed into a peat swamp probably resulting from increased climate moisture (Kremenetski et al. 1997:403-405).

7.3.3 Construction of a Baseline

Several studies suggest that local environmental variability is one of the main factors affecting carbon and nitrogen isotopic values of animals and humans (Iacumin et al. 2004; Rubenstein and Hobson 2004; Hollund et al. 2010). In an effort to enhance the reconstruction of human diet for each of the prehistoric communities, a comparative baseline was created using prehistoric animal remains recovered from burial contexts (Figure 7.6). This baseline compares isotopic values of humans and animals from the same environmental locale and period of time. This study utilizes existing carbon and nitrogen isotopic values from the site of Bestamak (Privat 2004) and new isotopic values for the site of Lisakovsk. Specifically, the dataset from Bestamak includes $\delta^{13}C$

and $\delta^{15}N$ values from 1 sample of *bos*, 1 *ovicaprid*, 2 *canine*, and 1 *equus* (Privat 2004), while the Lisakovsk dataset includes $\delta^{13}C$ and $\delta^{15}N$ values from 1 *bos*, 3 *ovicaprid*, 1 *canine*, and 1 *equus*. As no archaeological samples of freshwater fish were available from these sites for analysis, average carbon and nitrogen values for modern and prehistoric Eurasian riverine fish from Ukraine (Lillie et al. 2010) and southwestern Siberia (Privat 2004) were used as representative samples. These samples are from riverine contexts that are similar to those found in northern Kazakhstan. In lieu of the collection of modern samples, these fish isotopic values are the closest corollary available for north central Eurasia. From Ukraine, three unknown fish and a black sea roach (*Rutilus frisii*) were used to create an average (Lillie et al. 2010:6). In contrast, unknown fish (n=6), northern pike (*Esox lucius*) (n=8), European perch (*Perca fluviatilis*) (n=6), and carp (*Carassius carassius*) (n=10) were used to create an average value for the southwestern Siberian samples (Privat 2004:191-2,200-1).

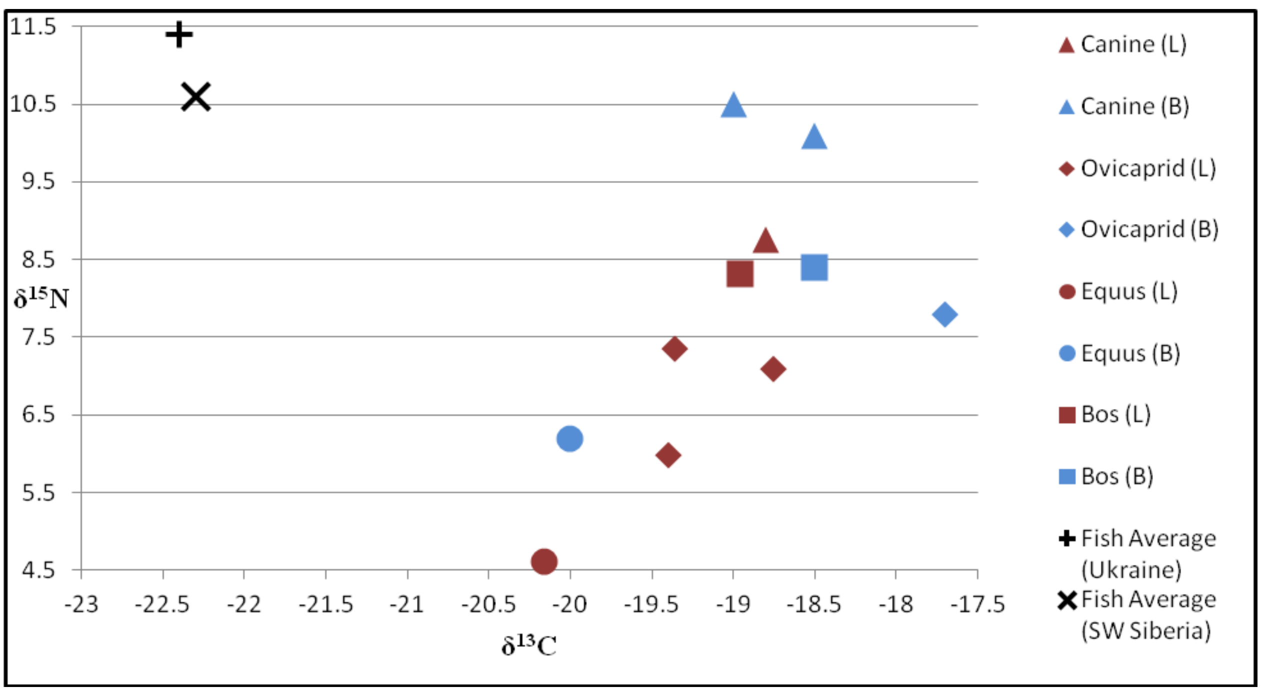

Figure 7.6 Isotopic Values for Terrestrial Species at the sites of Bestamak (B) and Lisakovsk (L); (Fish Averages: Ukraine see Lillie et al. 2010, and SW Siberia see Privat 2004:191-2)

Overall, terrestrial faunal $\delta^{13}C$ and $\delta^{15}N$ values range from -17.7 to -20.2‰ and 4.6 to 10.5‰, respectively (Figure 7.6). Two tailed T-tests of mammal $\delta^{15}N$ values from the two sites reveal that the differences between these groups are significant (p=0.144), while the carbon isotope values are not as significant (p=0.262). Animals from Bestamak and Lisakovsk were compared in order to investigate differences in isotopic values between animals in these two locations (Figure 7.6). As stated above, there is a somewhat significant difference between these animals in terms of nitrogen isotopic composition. Dietary intake of animals is dependent upon multiple factors including environment, feeding habits, and foddering. First, animals that consume marsh plants tend to have from 1.6‰ to 3.5‰ higher nitrogen values (Britton et al. 2008), and riparian, or riverine areas, are especially attractive to livestock due to their gentle topography and easy access to water (Papanastasis 1992:150). Second, foddering of animals can significantly change their isotopic signatures based on the type of feed used. If fodder ferments during storage, does its isotopic signature change? Changes in the isotopic signature of fodder would greatly affect the prehistoric domesticated animals that consumed these items. This is especially pertinent for domesticated animals living in the harsh winters of the Eurasian steppe. Furthermore, during periods of herd starvation in Mongolia, people have supplied livestock with fodder which consisted of the meat and milk products of other herbivores from their herd (Annika Erikson – pers comm).

Differences in animal dietary intake are compared between the two sites based on variation in $\delta^{13}C$ and $\delta^{15}N$ isotope values. The animals recovered from Bestamak have higher $\delta^{15}N$ values than those at Lisakovsk. Comparatively, elevated $\delta^{15}N$ isotope values and higher $\delta^{13}C$ values in northwestern Europe during the Bronze Age were present for animals who fed in salt marshes in comparison with other areas (Britton et al. 2008). This may be the case between the two sites discussed here, as Bestamak is located in a marshy area while Lisakovsk is located at a higher elevation along a large river. While there is a significant difference between the $\delta^{15}N$ isotope values of fauna at the two sites, an isotopic baseline was constructed using all available data from both sites, averaged by species, as a comparison for human $\delta^{13}C$ and $\delta^{15}N$ values (Figure 7.7).

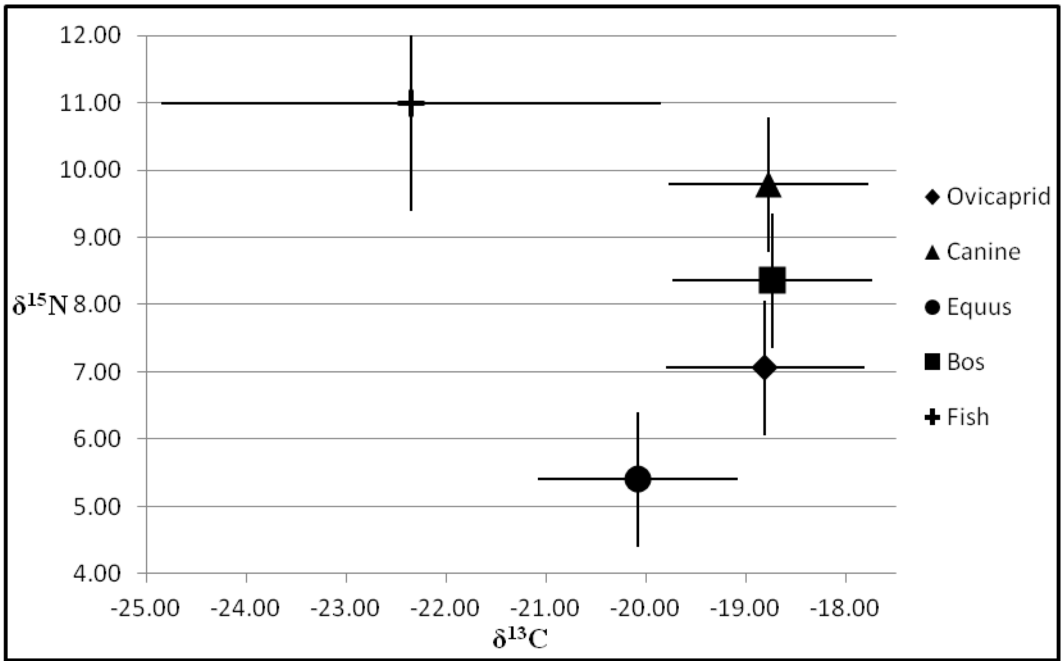

Figure 7.7 Average Faunal Isotopic Values (with standard error) by Species

7.3.4 Local Environment, Climate, and Vegetational History

Stable carbon and nitrogen isotopic studies are tied to the local environment where consumption practices occurred (Iacumin et al. 2004; Rubenstein and Hobson 2004; Hollund et al. 2010). Unfortunately, no samples of local plant species were sampled as part of isotopic analyses for this project. Therefore, local environmental differentiation and climate are discussed from the perspective of previous research in the region. The Kostanai oblast (administrative region) located in north central Kazakhstan consists of two broadly defined vegetation subprovinces, the Northern Kazakhstan forest-steppe and the Trans-Urals - Turgay (Rachkovskaya and Bragina 2012:124-5). The forest-steppe encompasses only a small section of the northeastern part of the Kostanai oblast and includes Betula and Populus-Betula forests interspersed with meadow steppes and rich forb - feather grass steppes (Rachkovaskaya and Bragina 2012:126). Small sections of vegetation can also include sedge marshes and willow brushwoods, especially in depressions. In comparison, the majority of the oblast is considered part of the Trans-Ural - Turgay subprovice which contains a full range of steppe vegetation communities. These include steppes of rich-forb - feather grass and forb - feather grass in the north, with fescue - feather grass steppes on the slopes on low hills near rivers (Rachkovskaya and Bragina 2012 126-7). Furthermore, small vegetation communities are present including sagebrush, bunch grass and other xerophytic forb - fescure - feather grasses. Several areas also have relic pine forests interspersed with meadow communities and complex steppes on lake terraces (Rachkovskaya and Bragina 2012:127). Modern land use within the oblast reveals that 64% of the land surface in the oblast is arable, while natural pastures have productivity levels ranging from 500 to 1,500 kg/ha in steppe meadows (Rachkovskaya and Bragina 2012:129-133). Vegetation communities in Kostanai oblast are categorized as two subprovinces, however there are also may smaller vegetation communities in the region. Both archaeological sites discussed in this dissertation are located within areas of open steppe, however they differ because Bestamak is found in an area dotted with small salt marsh ponds while Lisakovsk is located on the high banks of the Tobol River. Further research on the local vegetation surrounding each site needs to be undertaken to understand the possible diversity present in each micro-region.

Climate change is also relevant to stable carbon and nitrogen isotopic datasets, as it may affect the water and vegetation that is consumed by animals and humans. While very little climate change research has been published for north central Eurasia, several broad trends in vegetational history are evident based on lake cores undertaken at Mokhovoe Lake within Kostanai oblast (Kremenetski et al. 1997). This lake is located between the Tobol and Ubagan Rivers and therefore relatively close to the archaeological sites under study. Sedimentation at the lake started circa 6000 BP, with a hiatus around 4500/4000 and 3000/2900 BP (Kremenetski et al. 1997). Between 6000 and 4500 BP the vegetation in this region was forest-steppe and grass steppe with some patches of Birch forest, a hiatus covers the time from 4500 to 2900 BP. These findings are interpreted as a long period of favorable climatic conditions when vegetation groups expanded and the herb cover of the steppe was more mesophytic, containing plants that needed a regular source of water (Kremenetski et al. 1997:403). The period of hiatus was characterized by a drier and more continental climate, with decreased forest area. The sites of Bestamak and Lisakovsk were occupied during the drier period of time, however the extent of variation in climate and local environment continue to be unclear.

7.3.5 Middle to Late Bronze Age Dietary Trends

Noticeable changes in mortuary and settlement patterning at the Middle to Late Bronze Age transition are posited to have occurred in concert with a shift in subsistence. Furthermore, the demographic dispersal of communities over a broad landscape is often purported to have affected or even been the result of changing herd size and composition. These changes would likely have a strong effect on human consumption patterns due to behavioral transitions. However, results of carbon and nitrogen stable isotope analyses as well as overall dental health and pathologies reveal similarities between Bestamak (MBA) and Lisakovsk (LBA). Therefore, while broad changes occurred in social and spatial realms, overall subsistence economies and consumption patterns seem to have been relatively stable.

As previously discussed in Chapter 5, human dentition was examined for the presence of pathologies including calculus, enamel hypoplasias, caries, and alveloar resorption (Figure 5.21). These data are used as supporting evidence for dietary intake and health during the Bronze Age. At both sites, only a single individual had a carious lesion and the majority of teeth examined had little dental wear. However, an average of 75% of individuals at Bestamak and Lisakovsk had evidence of calculus deposition on dentition. A lack of caries and the presence of calculus are often associated with populations that have high protein and low carbohydrate diets (Hillson 1979; Powell 1985; Lillie 1996). These types of diets are often found among groups categorized as living hunter/gatherer or pastoral lifeways.

Local environments surrounding these two sites are only slightly different, with Bestamak located in a more marshy area than Lisakovsk. This seems to be supported by a significant difference in animal $\delta^{15}N$ average values between these two locales ($p=0.144$). The average $\delta^{15}N$ isotope value of animals at Bestamak was 9.7‰ and at Lisakovsk was 7.0‰, however the sample sizes were very small, $n=5$ and $n=6$ respectively. However, there is extensive evidence that a negative relationship exists between water availability and $\delta^{15}N$ isotope values for herbivores (Murphy and Bowman 2006). Therefore, further analyses of marsh plant isotopic values must be undertaken in order to understand the relationship between $\delta^{15}N$ values, water availability, and herbivore consumption. Average human $\delta^{15}N$ values between the two sites are not significantly different, or the number of individuals sampled is too small for significance testing. However, $\delta^{13}C$ values in human remains at Lisakovsk were higher than at Bestamak (p=0.0868). While individuals at Bestamak were likely consuming animals with slightly higher $\delta^{15}N$ isotopic values this difference did not affect overall human $\delta^{15}N$ isotopic values. Although $\delta^{13}C$ isotopic values between humans are significant, they are only slightly different and therefore need to be evaluated with further research into the plant and animal species present in these locales. Differences in $\delta^{13}C$ isotopic values at the two sites could be influenced by multitude of factors including water stress or the consumption of waterfowl. In particular, waterfowl could be indicated by lower $\delta^{13}C$ isotopic values, without inherent high $\delta^{15}N$ isotopic values (Richards et al. 2001).

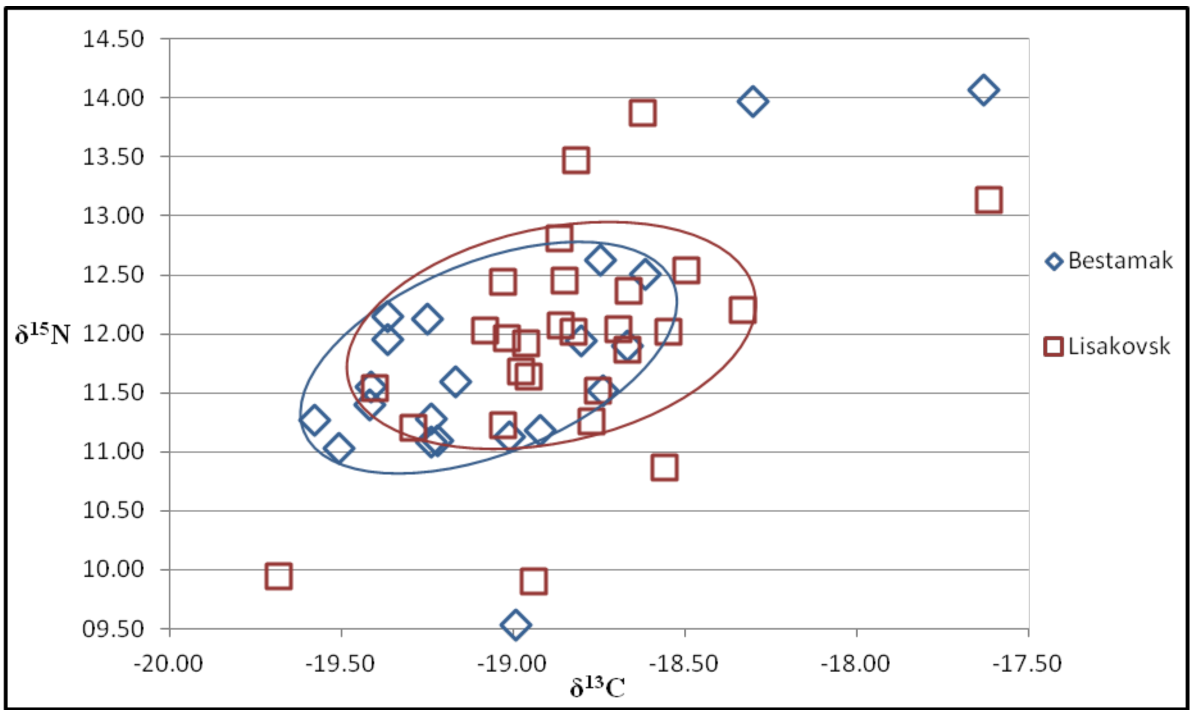

Figure 7.8 Comparison of Carbon and Nitrogen Isotopic Values for Humans at Bestamak (MBA) and Lisakovsk (LBA)

7.3.6 Bronze Age Dietary Intake

As discussed above, only slight differences in $\delta^{13}C$ and $\delta^{15}N$ values are evident between the Bestamak and Lisakovsk cemeteries. Subsistence and dietary intake have previously been discussed for the Bronze Age as dependent upon the consumption of meat and milk of large herbivores (cattle, sheep/goat, horse). While agro-pastoralism has also been posited, very little botanical evidence has been presented. In addition, the consumption of fish has not previously been confirmed through the identification of fish bones or lipid analysis of ceramic vessels, yet the proximity of these sites to riverine and marsh resources make them good candidates for the inclusion of fish in the local diet. The Bestamak site is located in an area littered with small freshwater ponds and plants, and the Lisakovsk site is located in an area of lush steppe on the banks of the Tobol River.

Nitrogen isotopic values of bone collagen for individuals at Bestamak ranged from 9.5‰ to 14.1‰, with an average of 11.8‰ (Figure 7.9). The average $\delta^{15}N$ value for individuals at Lisakovsk was 12.0‰, with values ranging from 9.9 to 14.4‰ (Figure 7.10). These average human $\delta^{15}N$ values are higher than the average values reported for fish (11.0‰), cattle (8.4‰), sheep/goat (7.1‰), and horse (5.4‰). High $\delta^{15}N$ values for human bone collagen suggest that human dietary intake cannot solely be explained by the consumption of herbivore meat and milk. Freshwater fish, which have high $\delta^{15}N$ values compared to terrestrial herbivores, may be one possible source. While high $\delta^{15}N$ values of animal bone collagen might also be at play, due to foddering or differential consumption of plant species, the average $\delta^{15}N$ values for animal collagen at each of these sites fits well within the expected norms for the region (Privat 2004).

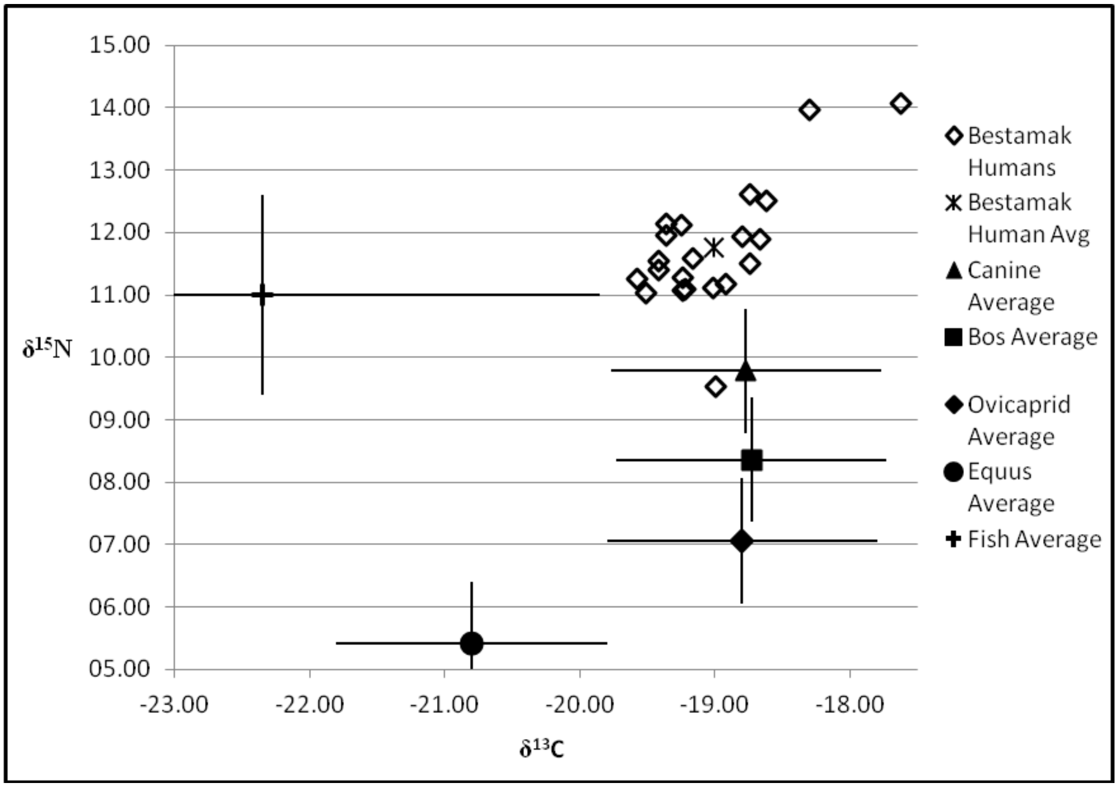

Figure 7.9 Isotopic values of the Bestamak community in relation to average values for terrestrial species and freshwater fish

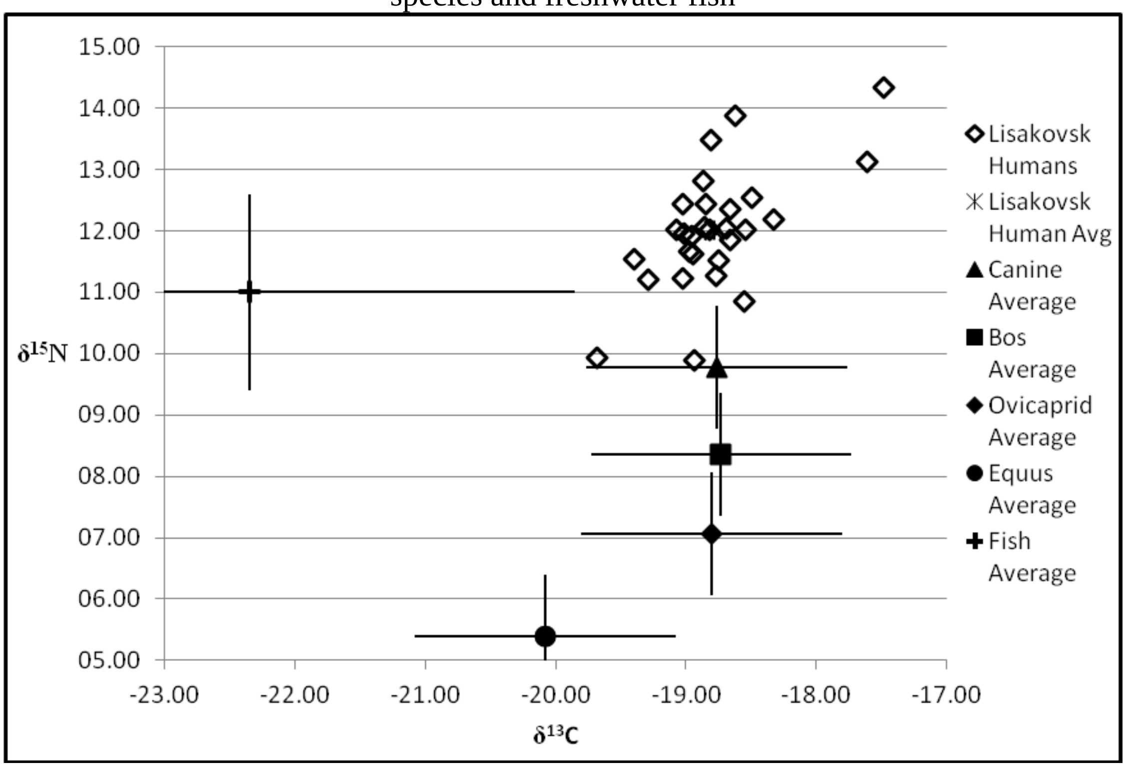

Figure 7.10 Isotopic values of the Lisakovsk community in relation to average values for terrestrial species and freshwater fish

The range of $\delta^{13}C$ values for human bone collagen at Bestamak is small (-19.6‰ to -17.6‰), with an average value of -19.0‰. Individuals from Lisakovsk had $\delta^{13}C$ values ranging from -19.7 to -17.6‰, and an average value of -18.8‰. These values fall between the isotopic range for both C_3 and C_4 plant consumption. The range of isotopic values for C_4 plants such as millet or maize often vary from -12 to -16‰, with an average of 14‰, while C3 plants typically exhibit $\delta^{13}C$ values between -21 and -35‰, with an average isotopic value of -28‰ (O'Leary 1988). These $\delta^{13}C$ values are not unusual, as these sites are located in an area of mixed C_3/C_4 plant zones identified as steppe bordering forest-steppe with moderate moisture (Sokolov 1968). However, if humans were eating freshwater fish, then $\delta^{13}C$ values should be closer to those of freshwater fish consumers which range from those similar to fish averages (-22.4‰ and -22.6‰) to a maximum of -17.6‰ (Privat 2004:70). It is important to note that the study of collagen alone, without comparison to apatite, can be problematic as collagen tends to reflect primarily protein in the diet rather than whole diet. When foods low in protein are consumed in small amounts, they may not be reflected in the stable isotope values of collagen (Harrison and Katzenberg 2003).

Based on comparisons with the isotopic baseline constructed, the human $\delta^{13}C$ and $\delta^{15}N$ values are interpreted as dietary patterns that exhibit a primary dependence on terrestrial resources (cattle and sheep/goat protein) as well as secondary use of freshwater resources (fish). Trophic isotopic patterns indicate that animals consuming freshwater fish as their primary resource should exhibit $\delta^{15}N$ values of approximately 13.1‰ or higher (Privat 2004:70), which is clearly not the case at Bestamak or Lisakovsk (Figures 7.5 and 7.6). Mean $\delta^{13}C$ values from fish average -22.5‰, while herbivore $\delta^{13}C$ values average -19.4‰ (Figures 7.9 and 7.10). As human $\delta^{13}C$ values at these two sites average closer to -19‰, it seems likely that fish were not eaten in great quantity. In addition, there was likely only minor consumption of horse meat and milk, as the $\delta^{13}C$ and $\delta^{15}N$ values for the horse are much lower (Figures 7.9 and 7.10). However, very few horse remains were tested for $\delta^{13}C$ and $\delta^{15}N$ isotopic values (n=2) and therefore it is difficult to make final conclusions with this small comparative dataset.

7.3.7 Intra-cemetery Dietary Differentiation

In addition to diachronic investigations of overall dietary trends, the results of the $\delta^{13}C$ and $\delta^{15}N$ analysis of human collagen also allow for discussions of differentiation between individuals based on dietary intake. In general, the combined data from Bestamak and Lisakovsk cemeteries seem to group together rather than exhibit two distinct trends. However, when each cemetery is evaluated on its own, there are a few individuals that appear as outliers in terms of stable isotopic values. At Bestamak, two individuals have high $\delta^{13}C$ and $\delta^{15}N$ values in relation to the rest of the community (Figure 7.11). Samples 3540 and 3558 have $\delta^{15}N$ values of 14.1‰ and 13.9‰ respectively, and $\delta^{13}C$ values of -17.6‰ and -18.3‰. At Bestamak as a whole, the average $\delta^{13}C$ value is -19.0‰ and the average $\delta^{15}N$ value is 11.8‰. Two tailed T-tests separately comparing $\delta^{13}C$ and $\delta^{15}N$values of these individuals with the rest of the community reveal that at 95% confidence the difference between these individuals and the community is significant ($p<0.001$, $p<0.001$). While high $\delta^{15}N$ values may indicate greater consumption of fish by these individuals, $\delta^{13}C$ values near -18‰ could indicate the consumption of C_4 plants.

These adult individuals were both recovered with groundstone slabs and pestles. Five burials at Bestamak contained groundstone and pestles, yet only two of these had bone collagen measured for isotopic analyses. Of these individuals, one was determined to be female, while the other was indeterminate in regards to biological sex. Due to their significantly different collagen isotopic values, these individuals are posited as having a slightly different diet than the other members of the community. Biodistance analyses reveal that these two individuals are from two separate clusters and are therefore not closely related to each other. However, their role in the community could be interpreted as being associated with groundstone slabs and pestles, as well as differential diet, which might mean a special social status related to specific food processing items.

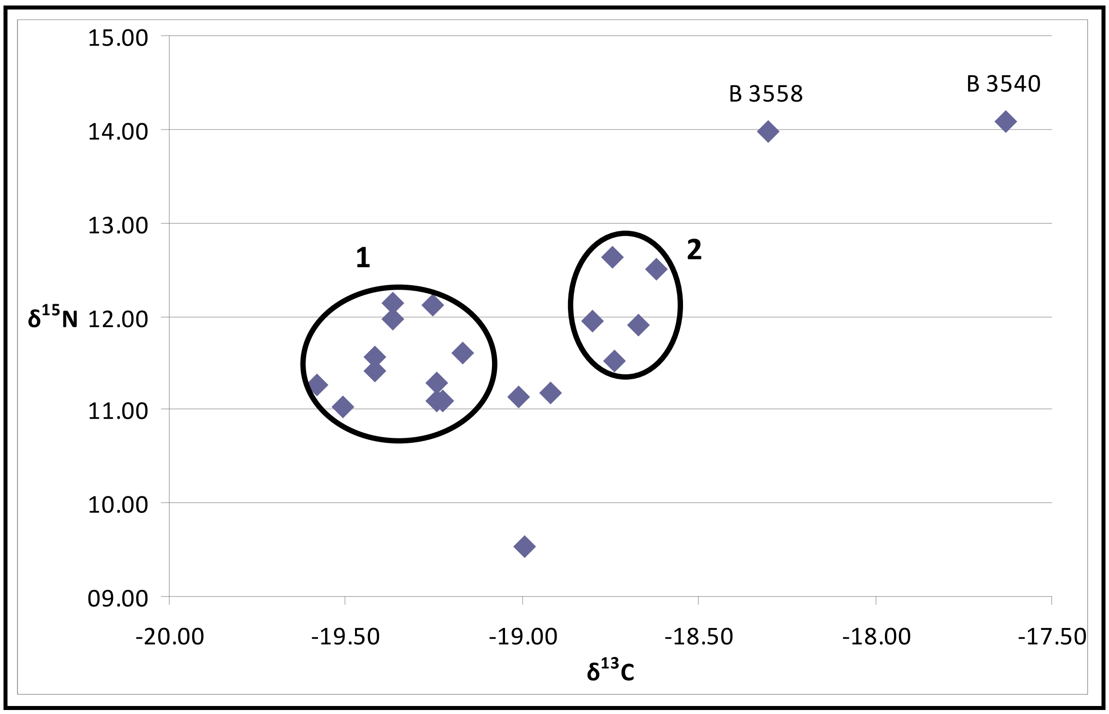

Figure 7.11 Isotopic values for two distinct groups within the Bestamak community (Group 1 on left, Group 2 on right)

Isotopic values for the rest of the individuals at Bestamak split into two separate groups differentiated largely in terms of $\delta^{13}C$, but also in terms of $\delta^{15}N$ (Figure 7.11). Group 1 (n=5) has an average $\delta^{13}C$ value of -18.7‰, while Group 2 (n=11) has an average $\delta^{13}C$ value of -19.3‰. A two-tailed T-test of carbon isotopic values revealed that at 95% confidence the difference between groups is significant ($p<0.001$). Group 1 has an average $\delta^{15}N$ value of 12.1‰, while group 2 has an average $\delta^{15}N$ value of 11.5‰. A two-tailed T-test of nitrogen isotope values at 95% confidence is also significant (p=0.022). This data suggests that these groups have a slight difference in dietary intake, but there is no significant correlation between these groups and a particular gender (male/female), age grade or mortuary assemblage. Therefore, while the slight difference in consumption patterns could be socially dependant, no strong correlations are apparent. In addition, analysis of biological affinities between individuals in these two groups found that they were dispersed randomly into each of the six biological clusters generated from the whole population (Figure 8.1). When only individuals in groups 1 and 2 were used to examine biological affinities, they were again randomly distributed into clusters (Figure 7.12). Differences in dietary intake may therefore relate to a) differential consumption of a particular animal or plant species or 2) consumption of similar species, where the consumption patterns of these species are different (e.g. dependant on different grasses). The latter may relate to the location of animal grazing areas, and their reliance on different proportions of C_3 and C_4 grasses or based on marshy and steppe areas.

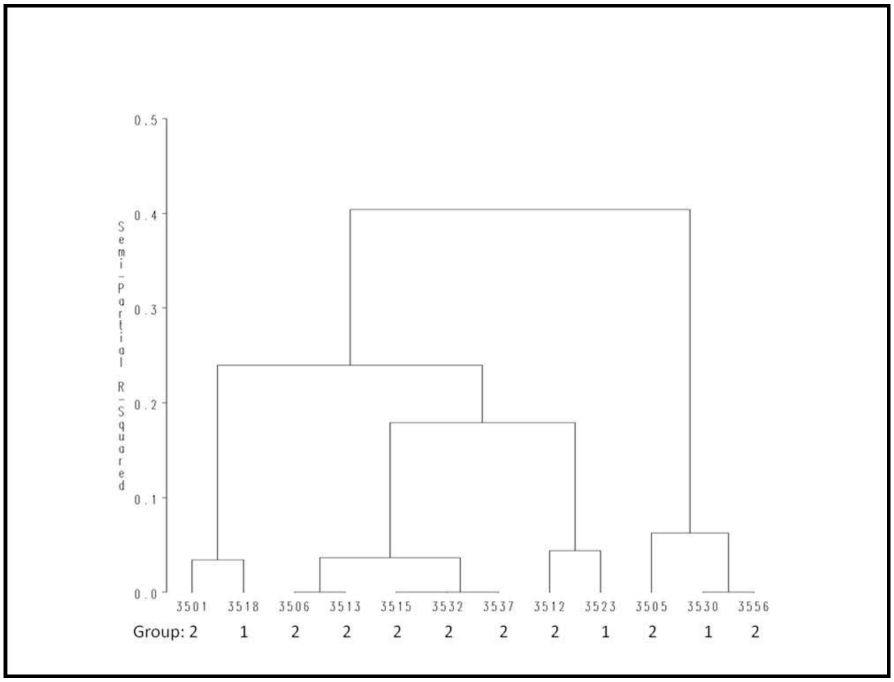

Figure 7.12 Biodistance Results of Groups 1 and 2 at Bestamak (Differentiated by Isotopic Values)

When considering human remains at Lisakovsk cemetery, several individuals seem to be outliers in terms of dietary intake (Figure 7.13). Two individuals have comparatively low $\delta^{15}N$ values: samples 3178 (10.0‰) and 3016 (9.9‰). A two-tailed T-test between individuals with low $\delta^{15}N$ values and the rest of the individuals tested indicates that at 95% confidence the difference between these two groups is very significant (p=0.0008). Several other individuals exhibited comparatively high collagen $\delta^{15}N$ values, including samples 3112 (13.5‰), 3071 (13.9‰), 3155 (13.1‰), and 3137 (14.4‰). However, a two-tailed T-test of individuals with high $\delta^{15}N$ values and the rest of the individuals indicates that at 95% confidence the difference between these groups is not significant (p=5.124). Finally, two individuals were characterized by higher $\delta^{13}C$ values than the rest of the group, namely samples 3137 (-17.5‰) and 3155 (-17.6‰). However, a two-tailed T-test between these individuals and the rest of the community indicates that the difference between them is not significant (p=1.0713).

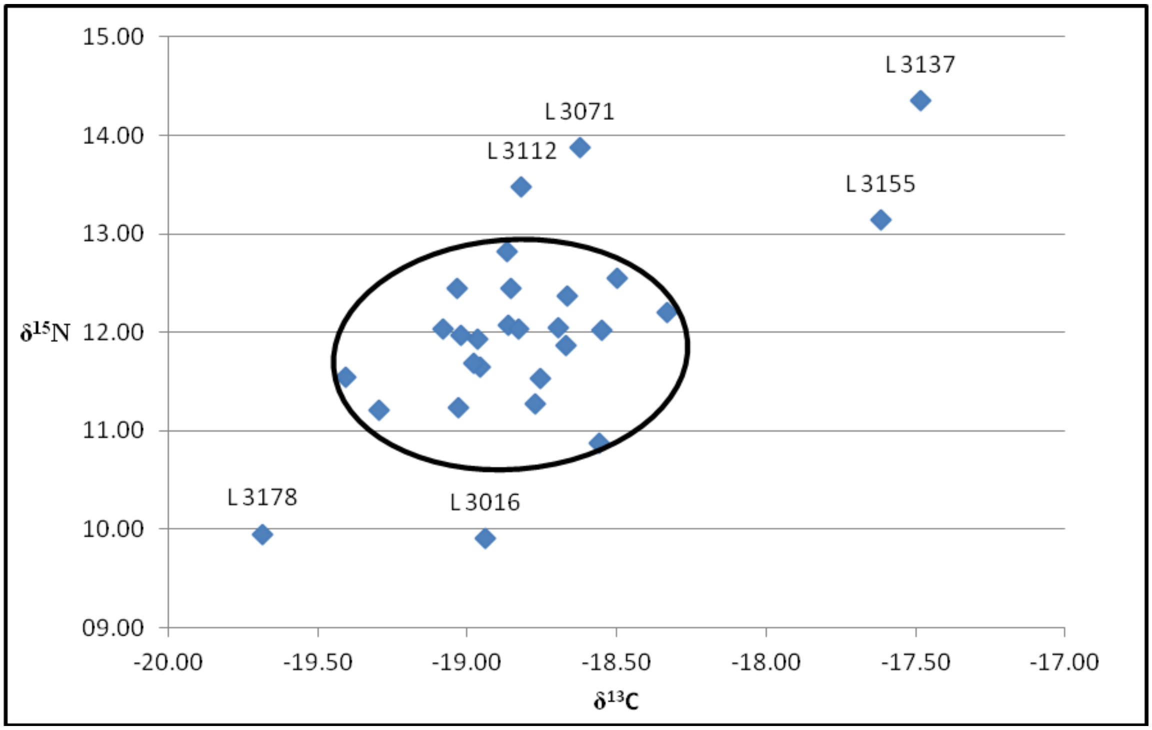

Figure 7.13 Isotopic Values for Individuals at Lisakovsk

Therefore, only the individuals with low $\delta^{15}N$ values appear significantly different from the rest of the population. Low $\delta^{15}N$ values may be due to a lack of fish in the diet, and a focus on cattle and sheep/goat meat and milk. In addition, these individuals might have consumed more horse meat and milk than other community members, as horse bone collagen tested from this site has low $\delta^{15}N$ values (5.5‰). However, while $\delta^{13}C$ values of these individuals lie outside of the normal range for C_4 plants such as millet, a mixed diet would not necessarily fall within the range of a C_4 diet. Of the two individuals with comparatively low $\delta^{15}N$ values, one cannot be linked to a specific grave assemblage and the other was buried with only a single ceramic vessel. However this second individual (sample 3178) was buried in a ditch, an unusual placement for this cemetery. This may be evidence that this person was of low status due to the low number of associated burial goods, inconspicuous placement, and lack of diversity in the diet. Neither of these burials contained dentition for biodistance analysis.

7.4 CONCLUSION

This chapter has examined dietary intake at the individual and community levels in order to better understand subsistence practices during the Bronze Age, as well as their possible relations to other social or biological parameters. Many authors have posited that along with changes in settlement patterns, mortuary rituals, and demography from the Middle to Late Bronze Age, the later period also exhibited increased mobility of communities along with changes in herd size and composition (Tkacheva 1999). In addition, some authors have hypothesized that communities had agro-pastoral economies based on the size and scope of settlements as well as presence of sickles (Zdanovich 1997) which are also present at the site of Bestamak. However, the data analyzed for this dissertation shows that there is little to no evidence for the presence of C4 plants in the diet of Bronze Age groups. If these items were consumed, it likely made up a very small portion of the dietary intake and these groups would subsequently continue to be categorized as pastoralists.

Stable isotopic data from Bronze Age human remains recovered from Bestamak and Lisakovsk suggest that subsistence patterns were based mainly on herbivore meat and milk. Although the majority of individuals at Bestamak and Lisakovsk seemed dependent mainly on cattle and sheep/goat products, it is possible that some individuals relied on herds with different compositions of animals and subsequently different consumption patterns. Foddering regimes of the herd could also have a significant effect on the dietary signatures of human consumers. In addition to herbivore meat and milk, freshwater fish was another likely component of the diet. This is not surprising, as both of these communities are located in areas of riverine resources. Pastoralism as a subsistence endeavor has often been categorized narrowly, yet new datasets such as these indicate that diversity in dietary intake is the norm. This research also reveals that little change occurred in consumption patterns between communities from the Middle to Late Bronze Age. This lack of change is extremely important for our understanding of Bronze Age groups. When broad changes in customs occurs between two periods of time, associated transitions in subsistence and economy are often purported to coincide. However, it seems that very little change occurred in consumption patterns, and therefore it is likely that little changed in terms of herd composition or availability of animals. The size of herds may have changed drastically, but not much in regard to this line of inquiry can be discerned from isotopic analyses.

Intra-community consumption patterns reveal that the majority of each community regularly consumed animal products, and that their consumption was not afforded to individuals of differential status. Social divisions evident between males and females in terms of mortuary remains, discussed in chapter 7, are not mirrored in terms of dietary intake, although the quality of food and the specific animal product consumed (meat/milk/blood) cannot be tested. Only a few individuals at each cemetery were outliers in terms of isotopic values in relation to the rest of the community. At Bestamak, two individuals characterized by high $\delta^{15}N$ and $\delta^{13}C$ values were buried with groundstone slabs and pestles. These anomalous values suggest a diet based on herbivore meat/milk, with more freshwater fish, and the possibility of some C_4 plants. This dietary difference does not seem to be a function of wealth, but rather role, occupation, identity, or status, as few individuals were buried with objects for grinding. It is possible that these individuals (one of which was female) were of special status associated with the processing of plant materials. In contrast, at Lisakovsk, two individuals identified with anomalously low collagen $\delta^{15}N$ values are interpreted as having diets based on herbivore meat and milk, possibly with more horse meat intake than other individuals. Of these, only one individual could be linked to a particular mortuary assemblage, which consisted of a single ceramic vessel. Additionally, as this person was buried in a ditch, which is unusual, they may have had a differential status than others in the community. Normally, individuals with less freshwater fish and more herbivore protein would be considered high status, as animals are often a form of wealth in pastoral societies. However, due to the lack of other burial goods for this individual, this does not seem the case. One caveat is that if these individuals were women, their low $\delta^{15}N$ values might be due to a physiological effect of gestation at the late stages of pregnancy (Mojtahedi et al. 2002).

In conclusion, there was very little variation in human bone collagen between the two sites examined in north central Kazakhstan and only small measures of differentiation between individuals in each cemetery. However, as discussed in chapters 6 and 7, there is a great deal of diversity in biological affinities and mortuary ritual both within and between these periods of time. Therefore, while many social, biological, demographic, and ritual changes were occurring, consumption patterns were comparably static. Pastoralism is a highly adaptive lifestyle that can be undertaken in communities that range from small to large, mobile to settled, and in environments that range from lush to desolate. Despite the considerable transitions that occurred during the Bronze Age, we should not assume that everything was transformed. The pastoral lifeway and economy remained constant in the face of changing social, ritual, and demographic traditions.

At the transition from the Middle to Late Bronze Age when interaction increased and the reach of the ‘global’ changed drastically, there seems to be little change in the economies of local communities. As part of a model of globalization, there might be an expectation that increased interaction and exchange would include an impact from domesticated cereals. It may be the case that local groups that were located in closer proximity to settled agriculturalists did have more diverse economies and diets during the Bronze Age. However, the two communities compared in the present study lived in similar environments in north central Eurasia, far from communities that had an agricultural economy. As this region was occupied by mainly pastoral groups, the lack of domesticated or wild cereals is not surprising. When grains were recovered from Bronze Age sites in southeastern Kazakhstan, they were often found in ritualized burial contexts rather than household or settlement zones (Frachetti et al. 2010). Therefore, even if domesticated cereals are recovered from Bronze Age contexts, they likely made up little of the dietary intake and instead were used as a burial offerings or part of the ritual process. These findings highlight that domesticated cereals were not necessary as part of a pastoral lifeway. The 'global' in globalization should not imply that interactions were on a world-wide scale, but rather that they covered a broad area of interaction and exchange, stretching over large parts of central and northern Kazakhstan. During the LBA the Andronovo horizon or 'family of cultures' was based on similarity in ceramic styles and burial construction over a vast area. However, this period also showed much variability in the way vessels were constructed, as well as in terms of mortuary rituals and objects. It is therefore likely that there were similarities, and differences, among and between communities in terms of local economy and dietary consumption patterns.

8.0 BIODISTANCE ANALYSIS

The objective of this chapter is to examine biological affinity within and between cemeteries on a local scale during the Bronze Age. The analyses in this chapter investigate clusters of individuals with similar phenotypic traits in relation to biological age and sex, and mortuary rituals in order to understand kinship, post-marital residence, exogamy, and sex-specific migration. In addition, biological affinities (chapter 8) were correlated with previously discussed isotopic datasets (chapter 7) that evaluate if dietary intake was different between kin groups. Furthermore, diachronic inter-cemetery analyses of Bestmak and Lisakovsk explore changes in residence patterns during the Bronze Age. Individual mobility, biological affinities, and social relationships are poorly understood for local communities in this region and time period. Furthermore, the incorporation of ethnographic research in Eurasia may contribute to stronger interpretations of bioarchaeological datasets.

The analyses here first explore biological affinity within each cemetery to determine if variability exists. Variability is evident through the clusters that are formed, which serve as hypothetical family groups. Group membership is also tested using mortuary data as support for clusters identified using biodistance data. Positive correlations between these datasets might allow for the identification of non-local individuals or residence patterns. In addition, the way that non-local individuals were integrated, or made distinct, through mortuary rituals allows for a more thorough understanding of the social organization of Bronze Age societies. For example, these two cemeteries are compared in an effort to examine changes, or stability, over time in relation to biological affinities, integration, and residence patterns. Ritual uniformity during the Middle Bronze Age supports the idea that few non-local individuals were marrying into these communities. However, diversity and heterogeneity in Late Bronze Age communities suggests that individuals were interacting on a broader scale. The possible influx of people into the region, or increased contacts, would have greatly altered how communities negotiated relationships over time, and therefore changed biological affinities within the group. Therefore, the covariance of biodistance datasets, mortuary practices, and dietary patterns may allow for a greater understanding of prehistoric communities as well as broad diachronic changes in north central Eurasia. This chapter thus serves as an initial step in determining hypothetical familial connections, which are tested using mortuary and isotopic datasets.

8.1 FAMILY TIES: BIODISTANCE STUDIES OF KINSHIP AND BIOLOGICAL RELATIONSHIPS

Variation in metric and non-metric (phenotypic) traits has often been used to examine biological relationships between groups (Berry and Berry 1967; Ismagulov 1969; Ismagulov 1970; Ortner and Corruccini 1976; Alekseev and Gokhman 1984; Irish and Turner 1990; Alt and Vach 1995; Howell and Kintigh 1996; Corruccini and Shimada 2002; Stojanowski and Schillaci 2006; LeBlanc et al. 2008). The majority of research initially focused on biological distance within and between geographic regions, often related to socially or anthropologically constructed groups such as races and archaeological cultures (Iarkho 1932; Mongait 1967; Ismagulov 1970; Alekseev and Gokhman 1984; Kozintsev 2004, 2009). As previously discussed, research into biological links between prehistoric populations and archaeological cultures remains prevalent in Eurasia. These broad scales often explore questions in relation to the origin or migration patterns of regional populations. While broad scale analyses are useful, and quite common, smaller scales of analysis have been used including inter- and intra-cemetery research (Gamble et al. 2001; Stojanowski and Schillaci 2006). These more restricted scales of analysis allow for better understandings of local communities, and the complex relationships that occur within and between them. This data is especially pertinent to Eurasia, where little is known about community structure or interaction.

Previous studies of biological distance focused on cranial non-metrics (Berry and Berry 1967; Ortner and Corruccini 1976; Stojanowski and Shillaci 2006), post-cranial non-metric traits (Finnegan 1978; Case 2003), dental non-metrics (Irish and Turner 1990; Alt and Vach 1995; Howell and Kintigh 1996; Corruccini and Shimada 2002; Hanihara and Ishida 2005; Stojanowski and Schillaci 2006; LeBlanc et al. 2007), as well as cranial and dental measurements (Ismagulov 1969; Ismagulov 1970; Ortner and Corruccini 1976; Alekseev and Gokhman 1984; Case 2003). While traditional approaches to biodistance focus on the estimation of phenotypic similarities between regional populations, population origins, and patterns of migration (Buikstra et al. 1990), biological affinity also has been used to examine intra- and inter-cemetery variation using "individuals" as the unit of analysis (Stojanowski and Schillaci 2006). Macro-regional analyses tend to minimize the degree to which the environment affects different populations, as these are based on smaller geographic areas and shorter frames of time (Stojanowski and Schillaci 2006).
Important criteria for the selection of traits used in dental biodistance analysis are high heredity, distinct trait expression, and limited sex and age bias (Corruccini 1974; Alt and Vach 1995). The theoretical model for all biodistance analyses is that populations that exchange mates become

more phenotypically similar over time, and those that do not become dissimilar (Stojanowski and Schillaci 2006). While the heritability of traits has sometimes been assumed, rather than demonstrated, there is better evidence for the inheritance of dental traits than cranial traits (Alt and Vach 1991; Alt et al. 1997; Case 2003). Importantly, comparisons of dental metric and phenotypic data with mitochondrial DNA often find a high correspondence between the two types of data (Stojanowski et al. 2007). Dental data also has the ability to confirm and complement mtDNA analyses (e.g. Corruccini and Shimada 2002; Corruccini et al. 2002; Shimada et al. 2004; Adachi et al. 2006). Therefore, the use of dentition as a proxy for biological similarity is well established.

This chapter focuses on the methods and results of inter- and intra-cemetery biodistance analyses of two Bronze Age sites located in north central Eurasia. The Middle Bronze Age (MBA) cemetery of Bestamak and the Late Bronze Age (LBA) cemetery of Lisakovsk are discussed as communities, which are used in comparative analyses. First, intra-cemetery biodistance analysis was completed using dental non-metric (phenotypic) traits of individuals. Trait similarities were the basis for clustering within each cemetery, which was then correlated with mortuary practices and isotopic signatures. This integrated approach combines biological and cultural information for a more complete understanding of community structure, residence patterns, and kin groups. Then the two cemeteries were compared in an effort to determine if biological affinities changed over time, as well as the ways that local communities negotiated these relationships in the mortuary realm.

8.2 BIODISTANCE METHODS: DENTAL NON-METRIC TRAITS

Previous attempts to use non-metric traits to examine biological relationships have succeeded at identifying residence patterns and answering questions about kin groups (Lane and Sublett 1972; Bondioli et al. 1986; Howell and Kintigh 1996). The identification of biological affinities is important in research on social organization and structure of prehistoric communities as a kinship based approach allows for the examination of biological relationships between the members of local groups, represented by human remains in a cemetery. These biological relationships are then used to create hypothetical family clusters. The goals of this dissertation are to examine variety in biological affinities within a community, to explore intra-community residence patterns, and to understand the structure of the society. The age and sex of individuals within each cluster, as well as their correlation with mortuary rituals and isotopic signatures, can be used as supporting evidence for residence patterns and family structures. The results of these analyses are used as a comparative measure to understand the two cemeteries under study.

Previous biodistance analyses of Bronze Age samples from Eurasia included the use of dental and cranial non-metric datasets to examine populations over a vast region (Ismagulov 1969; Ismagulov 1970; Alekseev and Gokhman 1984). These authors combine datasets that were collected by different physical anthropologists working in the region. Methodologically, inter-observer error was not accounted for, which may have led to problematic findings. Furthermore, prehistoric individuals were often classified as either Mongoloid (Asian) or Caucasoid (European), or an admixture of these two binary classificatory categories. Problems with analyses of this type are discussed in detail in chapter 3. However, within these findings are discussions of great variability within local groups, as well as classifications of individuals as ‘Pamir-Ferghana’ Caucasoid (Alekseev and Gokhman 1984:38). While local variation and differentiation is present, the goal of many of these studies was to 'reconstruct the anthropological composition of the ancient population of the region' (Ismagulov 1970:3).

Dental non-metric traits were recorded for use in determinations of biological affinity for individuals in each cemetery (Turner et al. 1991). I have chosen to use the 'standard' protocol including the scoring of bilateral traits, where the greatest expression of each trait was used in statistical analysis (Turner et al. 1991; Scott and Turner 1997; Gamble et al. 2001). All traits were recorded on an ordinal scale or as count data and then transformed into presence/absence based on previously tested methods (Turner 1985; Ullinger et al. 2005). As discussed in chapter 5, binomial probabilities were calculated for 43 dental non-metric traits to determine if they exhibited variability (Figure 5.16). Only 27 traits had binomial probabilities within the acceptable range of .15 to .99 and therefore were likely to have occurred in a non-random manner (Figures 8.3 and 8.8). Transformed data, which was utilized to create a dissimilarity matrix, used the Gower coefficient as a distance measure. This coefficient works well with datasets that have both nominal and presence/absence data, and accommodates missing data to form a dissimilarity matrix (Howell and Kintigh 1996; Gamble et al 2001). Utilizing this matrix, clusters were formed using Ward's method of minimum variance, a hierarchical grouping procedure that places cases into mutually exclusive groups (Ward 1963). The goal of this method is to join individuals successively so that the most homogeneous clusters form (for discussion and examples Shennan 1988).

The results of data analysis using the Gower coefficient and Ward's method suggest that each cluster of individuals is phenotypically similar. However, this is not an absolute truth and therefore clusters are treated as hypothetical kin groups. In an effort to further support the formation of clusters and family groups, several steps can be taken. First, sex and age divisions are correlated with the clusters to examine the demography of family groups. In theory, there should be a balanced distribution of family members by age and sex. However, a balanced distribution may not be a normal distribution, as individuals of a certain sex may have left or joined the family. Furthermore, a family where all members died young, or is of only one sex is also not plausible. Second, clusters are validated by mortuary datasets including grave assemblages, burial construction, body position, as well as spatial relationships. Members of a family could be buried with a specific artifact, type of ornamentation, or in close spatial proximity. Third, family groups are examined in light of the results of isotopic analyses, as kin groups or families may have similar dietary intake. Therefore, while biological affinities can be identified within prehistoric cemeteries, clustering of individuals into hypothetical families must be further supported by external datasets including mortuary rituals or patterns of dietary intake.

8.3 TRENDS IN BIOLOGICAL AFFINITY AND KINSHIP: MIDDLE AND LATE BRONZE AGE COMMUNITIES

The focus of this section of the dissertation is to estimate the inter-cemetery biological distance between Bestamak and Lisakovsk. The cemetery is the unit of investigation, within which each individual is considered a unit of analysis. The objective of this research is to explore variation in biological affinities between the two cemeteries. Hypothetical biological relationships are identified based on the shared presence of up to 27 phenotypic traits. While biodistance analysis identifies individuals who are likely to be related, the exact nature of this relationship is unknown. This is especially important for the comparison of these two cemeteries that are separated over time and space. This analysis will help to determine: 1) if these two cemeteries share biological affinities over time, 2) the number of hypothetical family groups in each cemetery, and 3) if one cemetery has more variation in biology than the other. The biological clusters, and their correlation with age and sex patterns, allow for a discussion of the possible phenotypic composition of these communities. If clusters have balanced distributions from both cemeteries, then it seems that phenotypically different individuals were evenly distributed in each community. However, if one cemetery has more variability, then it may highlight the more interactive nature of the community.

A total of 27 dental traits were used to examine biological affinities between individuals from Bestamak (MBA) and Lisakovsk (LBA). Only individuals with adult dentition lacking significant wear were used for this analysis. In all, a total of 30 individuals from Bestamak (samples numbered 3500-3600) were part of biodistance analysis, represented by dentition from both subadults (n=10) and adults (n=20). At Lisakovsk 24 individuals (samples numbered 3000-3200) were part of biodistance analyses, which included both adults (n=11) and subadults (n=13). Initial results created 9 clusters where 75% of the variance was explained (r^2=0.75) (Figures 8.1 and 8.2). The correlation between the 9 cluster solution and the independent variable age was somewhat significant (p=0.158), while the correlation between cluster and sex was not significant (p=0.231). The results of this analysis reveal that individuals buried at Bestamak had much more phenotypic variation than those at Lisakovsk. Individuals from Lisakovsk populated 7 clusters, while those from Bestamak populated all 9 clusters. As clusters 7 and 9 lack individuals from Lisakovsk, this result highlights that Bestamak had more phenotypic diversity present within its population. This is the opposite of what has previously been proposed for the Bronze Age, where the later period (Lisakovsk) is often posited as a time of increased mobility and contact. However, this result could partially be due to a longer period of use of the Bestamak site, and therefore more phenotypic diversity over time. As no radiocarbon dating has been undertaken at the site the length of use of the site is currently unknown, although the majority of the burials are attributed to the Middle Bronze Age. These results confirm that the sites share biological links, as 7 of 9 clusters are populated by individuals from different cemeteries with similar phenotypic traits. Therefore, the Late Bronze Age site of Lisakovsk does not seem to include the presence of many non-local, or phenotypically unique individuals as has previously been posited. Instead, there is continuity in phenotypic traits between these two cemeteries that span the Middle and Late Bronze Age.

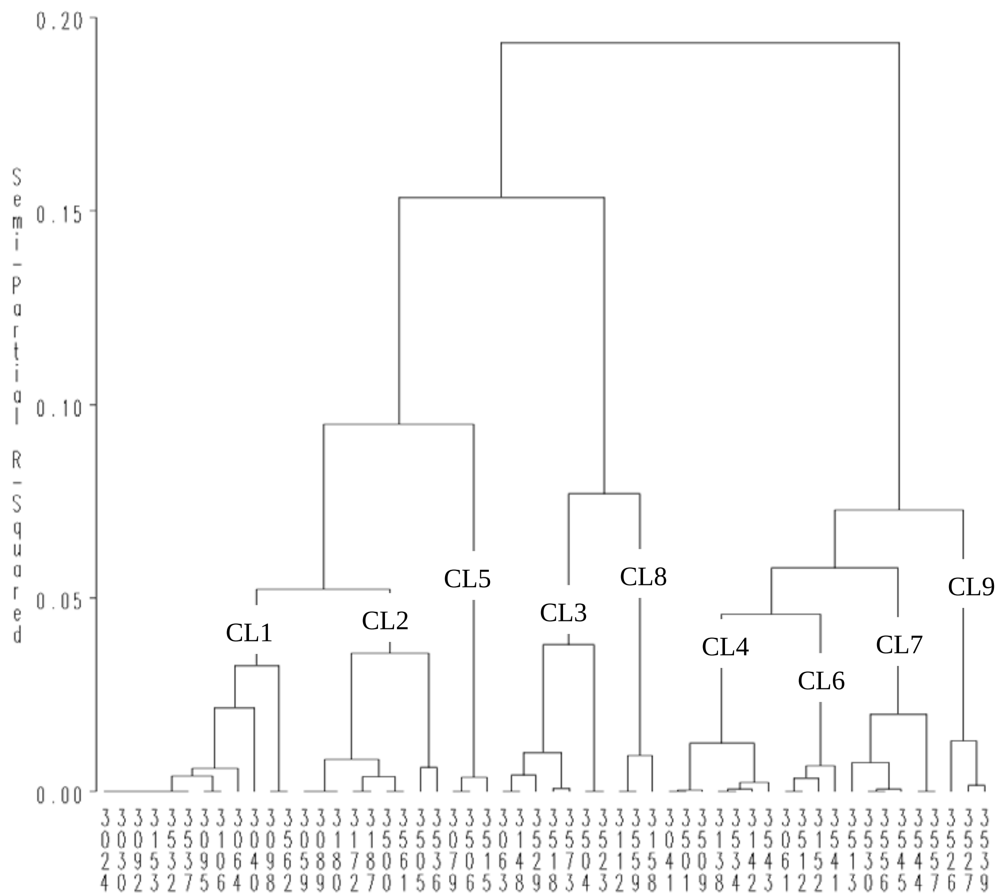

Figure 8.1 Biodistance Clusters for Bestamak and Lisakovsk

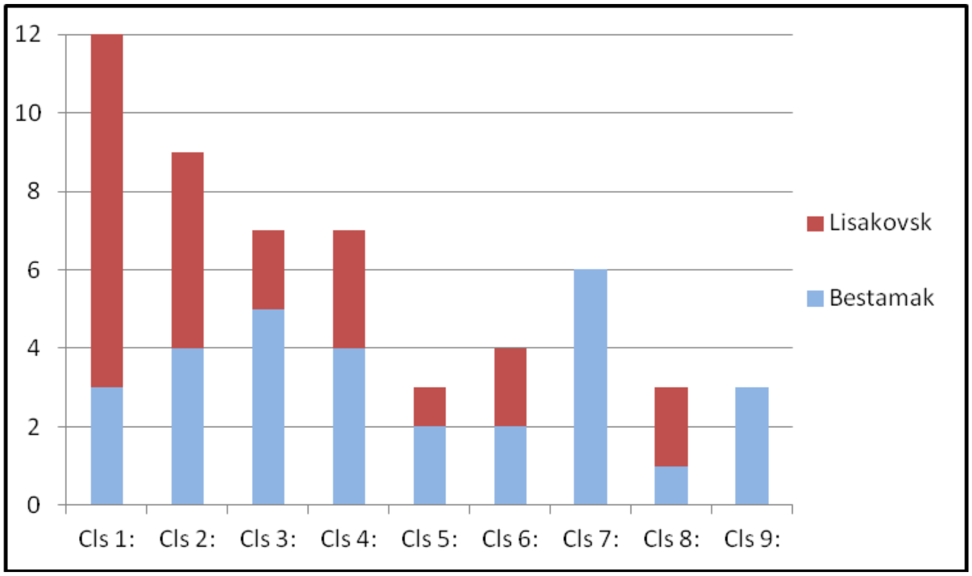

Figure 8.2 Numbers of Individuals by Cemetery in Biodistance Clusters

8.4 INTRA-CEMETERY BIODISTANCE: KINSHIP ANALYSIS AND SOCIAL STRUCTURE

8.4.1 Intra-cemetery Biodistance Results: Bestamak Cemetery (MBA)

The identification of hypothetical family groups within the Bestamak cemetery is an access point for the exploration of social structure and residence patterns. This is undertaken through the correlation of age cohort, biological sex, mortuary practices, spatial relationships, and dietary intake with clusters of phenotypically similar individuals. This approach is based on the idea that social roles are often symbolized by specific rituals in burial, such as body placement or the inclusion of certain objects. Therefore, kin group membership may be identified by links between social roles and biological affinities. For Bestamak, 27 dental traits were used to examine biological relationships within the cemetery. A total 30 of 31 individuals with adult dentition were used in this analysis. A single individual was not used due to the low number of dentition present. Initial results of biodistance analysis created six clusters with 72.2% of the variance explained (r^2=0.722) (Figures 8.3 and 8.4). Cluster 1 (CL1) consisted of 7 individuals (3506, 3513, 3515, 3532, 3537, 3544, 3557) and eventually joined with cluster 2 (CL2) which consisted of 3 individuals (3504, 3523, 3562). Cluster 3 (CL3) contained 9 individuals (3501, 3512, 3526, 3527, 3534, 3539, 3541, 3543, 3545) which is ultimately linked to cluster 4 (CL4) which consisted of 4 individuals (3505, 3530, 3536, and 3556). Finally Cluster 5 (CL5) contained 3 individuals (3500, 3559, 3561) and eventually joined with cluster 6 (CL6) which had 4 individuals (3509, 3518, 3529, 3573).

Dental Non-Metric Trait - Mandible	Cluster 1 (n=7)	Cluster 2 (n=3)	Cluster 3 (n=9)	Cluster 4 (n=4)	Cluster 5 (n=3)	Cluster 6 (n=4)	Total Bestamak (n=30)
Double Shovel 1st Incisor	0.0%	33.3%	0.0%	25.0%	33.3%	0.0%	10.0%
Canine Distal Access Ridge	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Odontome - Premolars	0.0%	0.0%	0.0%	25.0%	33.3%	0.0%	6.7%
Groove Pattern 1st Molar	57.1%	0.0%	88.9%	75.0%	66.7%	75.0%	70.0%
Cusp Number 1st Molar	42.9%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
Deflect Wrinkle 1st Molar	0.0%	0.0%	11.1%	0.0%	0.0%	25.0%	6.7%
Cusp 5 1st Molar	14.3%	33.3%	88.9%	75.0%	100.0%	100.0%	66.7%
Cusp 6 1st Molar	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	3.3%
Cusp 7 1st Molar	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	10.0%
Tome's Root 1st Premolar	14.3%	0.0%	11.1%	0.0%	0.0%	0.0%	6.7%
Root Number 2nd Molar	71.4%	33.3%	44.4%	100.0%	33.3%	50.0%	40.0%
Dental Non-Metric Trait - Maxilla							
Shoveling 1st Incisor	0.0%	0.0%	11.1%	25.0%	66.7%	75.0%	23.3%
Double Shovel 1st Incisor	0.0%	0.0%	11.1%	25.0%	100.0%	0.0%	16.7%
Double Shovel 2nd Incisor	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	10.0%
Interrupt Groove 1st Incisor	0.0%	0.0%	11.1%	25.0%	0.0%	25.0%	10.0%
Interrupt Groove 2nd Incisor	14.3%	100.0%	0.0%	25.0%	33.3%	50.0%	26.7%
Tuberculum Dentale 2nd Incisor	14.3%	100.0%	0.0%	0.0%	66.7%	100.0%	33.3%
Canine Mesial Ridge	0.0%	66.7%	11.1%	50.0%	33.3%	25.0%	26.7%
Canine Distal Access Ridge	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	6.7%
Cusp 5 - Molars	0.0%	66.7%	33.3%	0.0%	0.0%	25.0%	20.0%
Carabelli's Trait - Molars	0.0%	0.0%	55.6%	0.0%	33.3%	100.0%	33.3%
Parastyle 3rd Molar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enamel Extension	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Root Number 1st Premolar	42.9%	33.3%	11.1%	0.0%	0.0%	25.0%	20.0%
Root Number 2nd Molar	42.9%	33.3%	44.4%	0.0%	33.3%	75.0%	40.0%
Congenital Absence 3rd Molar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Peg Shaped 3rd Molar	42.9%	0.0%	0.0%	33.3%	0.0%	0.0%	13.3%

Figure 8.3 Frequency of Dental Traits in Clusters (Hypothetical Family Groups) at Bestamak

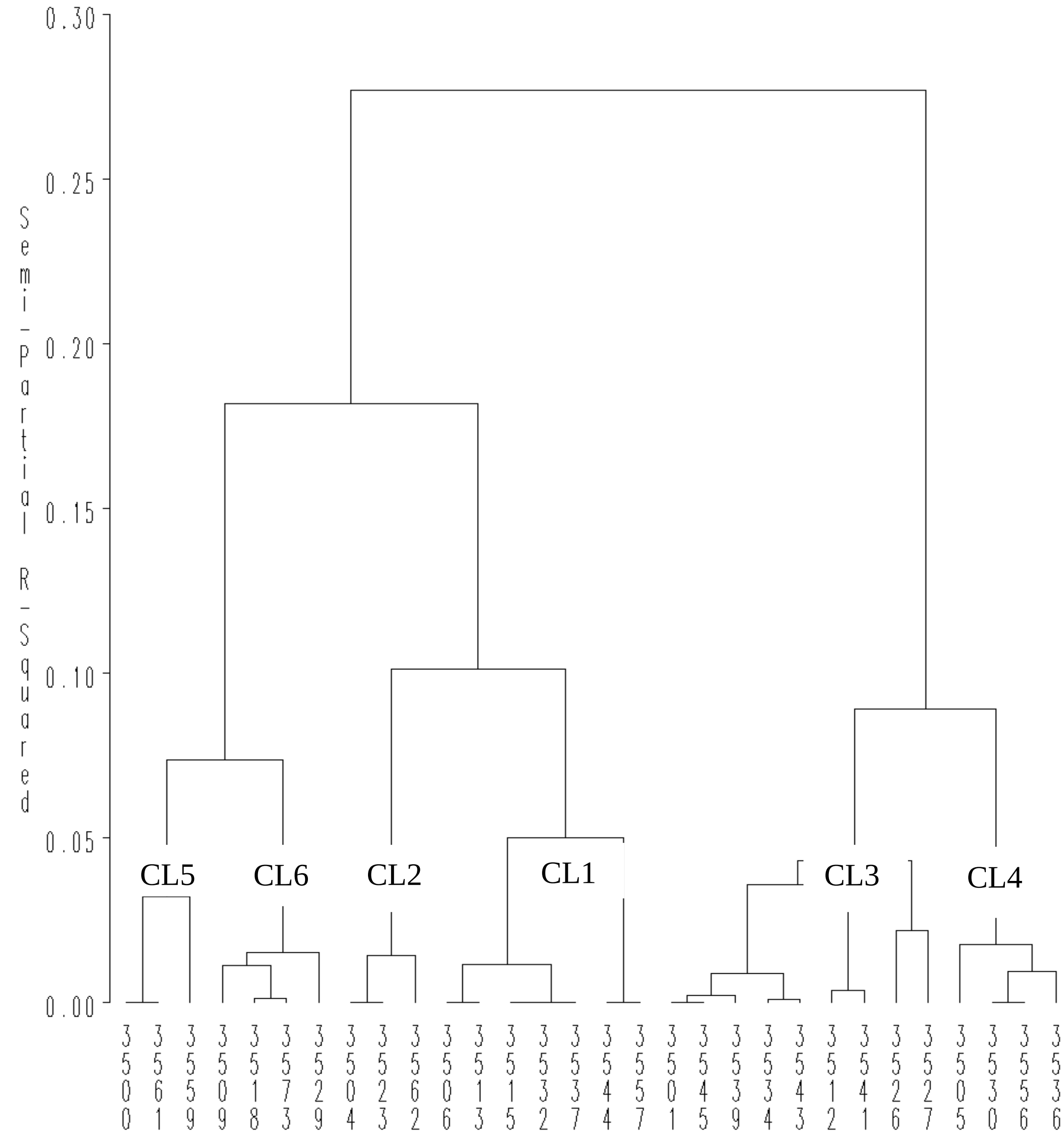

Figure 8.4 Bestamak Clusters based on Biodistance Analysis

First, clusters resulting from phenotypic data are discussed in relation to double burials in order to examine possible biological affinities between individuals in a single burial. Three double burials had individuals that had enough preserved dentition for biodistance analysis. Samples 3505 and 3509; 3526 and 3527; 3541(3567/3540) and 3544(3568/3540) are individuals recovered from double burials. Samples 3526 and 3527 represent two individuals who had close biological ties. This burial contains the remains of two subadults, the elder ranging from 12 to 18 years of age and the younger only 3 to 5 years old. These remains could be interpreted as siblings or possibly a mother and child based on their close biological affinity and burial context. Samples 3541(3567/3540) and 3544(3568/3540) are also individuals in a double burial, the former is an indeterminate adult aged 18-24 years and buried on the left side, while the latter is an indeterminate adult aged 16 to 24 years buried on the right side. These individuals are in very different clusters (3 and 1), and therefore are less likely to be phenotypically related. While the bones of these individuals were poorly preserved, when examined in situ they were described as facing one another.

This face-to-face position at death has traditionally been interpreted as a ‘married’ couple, with the male laying on the left side and the female on the right. This is possible based on the similar age ranges for these individuals and the intimate nature of their burial placement. The last burial containing samples 3505 and 3509 is unusual because both individuals were placed on their left side with a wooden barrier between them. The individual on the left is a female 20 to 30 years of age, while the one on the right is an indeterminate subadult of 12 to 18 years. These individuals have different dental traits as they were part of separate clusters (4 and 6). Therefore, there are several possibilities 1) they are a married couple and therefore not related, 2) they are a mother and child, 3) they are unrelated and were placed in the burial at different times. As for this being a mother-child pair, it is possible, especially if the father was very biologically different from the mother. The placement of these individuals at different times, whether short or long term, could significantly alter these interpretations. Unfortunately, there are no radiocarbon dates for this cemetery, which might allow for more detailed temporal analyses of these burials.

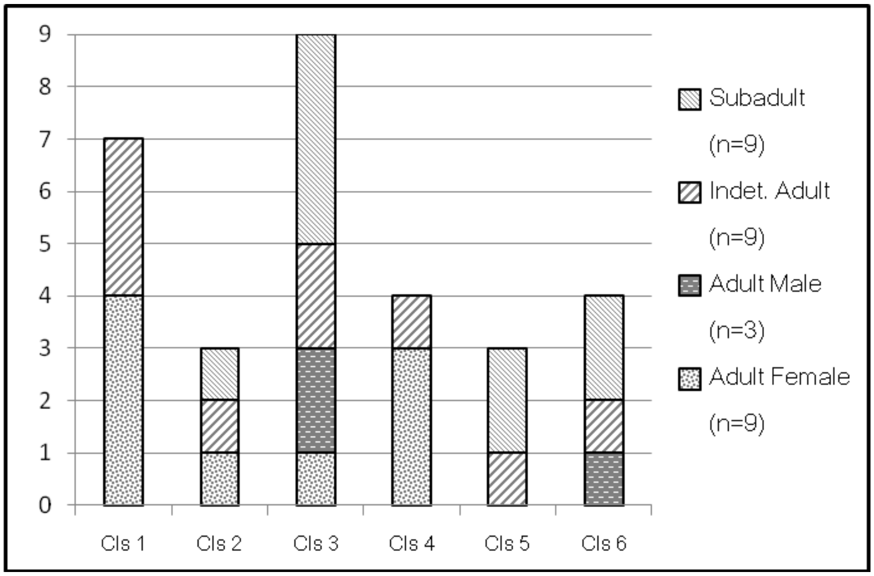

Figure 8.5 Biodistance Clusters by Age and Sex

Further results of biodistance analysis reveal that two clusters contain only women or indeterminate adults, CL1 contains 57% women and CL4 75% women (Figure 8.5). The remaining clusters consist of both adults and subadults. Based on the data, it is possible to ask the question as to whether CL1 and/or CL4 represent biologically distinct adult women who took part in matrilocal residence patterns. In response to this, a chi-square test was used to examine the correlation between a six-cluster solution and independent variable sex. This resulted in a p-value of 0.144, or a positive correlation between six clusters and sex that was 85.6% likely. Therefore, both of these clusters must be examined in comparison with mortuary and dietary datasets to answer questions pertaining to kin groups, residence patterns, gender, and biological sex.

8.4.1.1 Biodistance and Mortuary Practices

In this section, biodistance clusters are compared with mortuary rituals and assemblages. Unfortunately, when mortuary assemblages, body position, and burial construction were compared with the 6 cluster solution, *no correlations were identified*. The 6 clusters were tested in correlation to all bronze objects, bronze ornaments, bronze tools, tools, all objects, animals, animals and objects, as well as animals and bronzes. The resulting lack of correlations between the six clusters and the mortuary assemblage was surprising. In addition, there was no correlation between the 6 cluster solution and body position or burial construction. Therefore, while variation in dental traits is present in the Bestamak community, this variation does not appear to correlate with patterns of burial treatment.

8.4.1.2 Biodistance and Spatial Location

The correlation between biodistance clusters and spatial location has also proved useful in previous applications (Howell and Kintigh 1996; Gamble et al. 2001). However, the Bestamak cemetery lacks clearly defined spatial sub-groupings which might allow for the testing of specific areas for family groups. This cemetery has a combination of flat burials, which lack above ground construction, and kurgan burials with earthen or stone mounds and ditches. However, general spatial proximity measures were used to examine if phenotypically similar individuals were buried in the same area of the cemetery. Unfortunately, the overall spatial location of individuals within the cemetery could not be linked to hypothetical family clusters. Instead, individuals were buried evenly throughout the cemetery with no correlation to phenotypic traits (Figure 8.6). However, as a few double burials did contain phenotypically similar individuals as discussed above, burials that were identified in close proximity were examined for biological affinities. While certain sets of burials that are in close spatial proximity sometimes share phenotypic traits, these do not prove that biological affinity was a strong indicator for burial placement. Furthermore, the identification of double burials that contained what could be married couples as well as those without biological similarities seems to refute the hypothesis that people linked through kinship were consistently buried together.

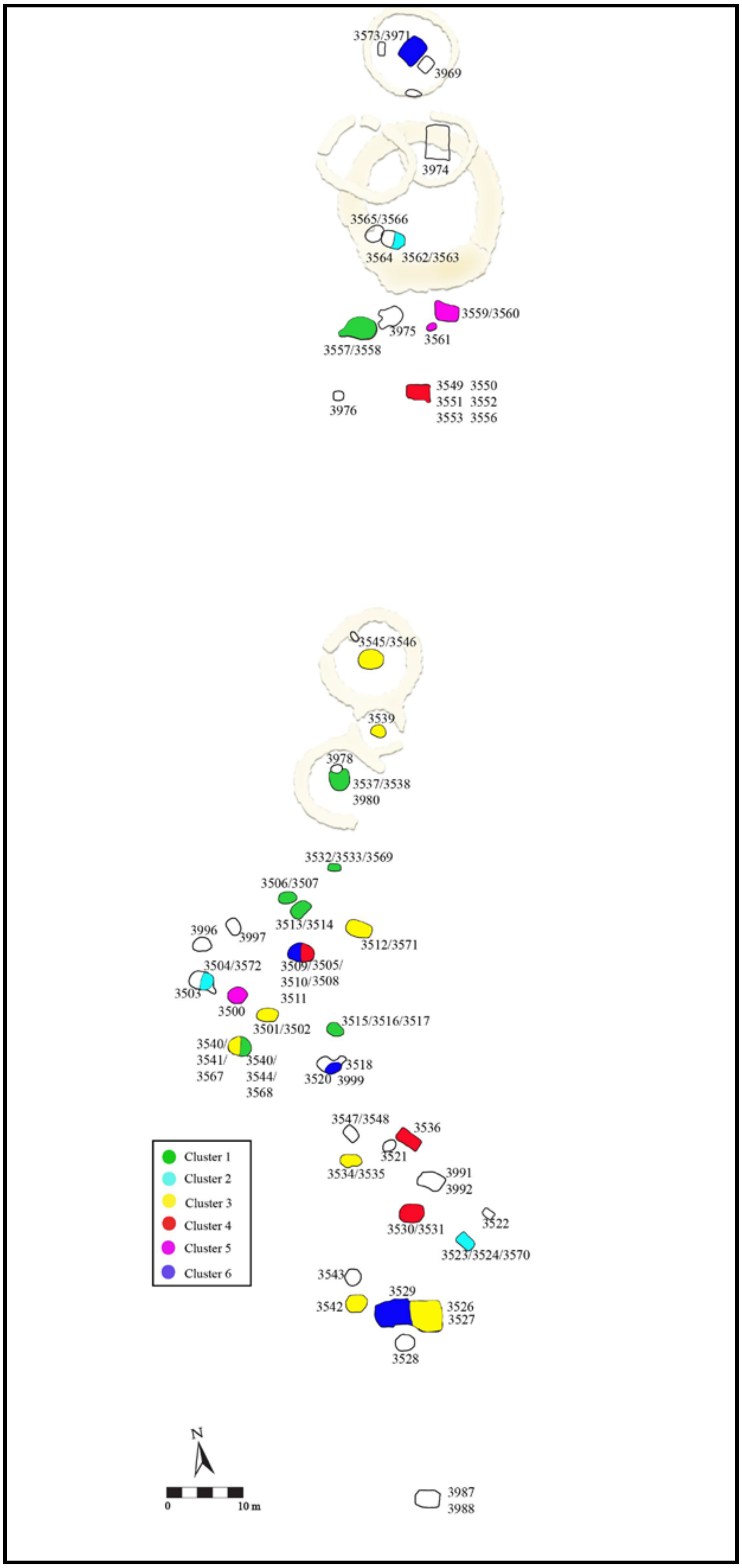

Figure 8.6 Spatial location of Individuals in the Bestamak cemetery (Biodistance)

8.4.1.3 Biodistance and Stable Isotopes

Stable isotopic evidence also does not correlate well with biodistance clusters. Each of the clusters was further grouped into a three cluster solution. This data was then correlated with isotopic values for each individual (Figure 8.7). None of the clusters had individuals with specific dietary values, and therefore, dietary intake was not clearly associated with biological affiliation identified in these clusters. The goal of this analysis was to determine if biological affinity and dietary intake were related, which might allow for interpretations of these clusters as kin groups that may have different dietary consumption patterns. Unfortunately, dietary intake patterns seem to be generally homogeneous for the entire cemetery.

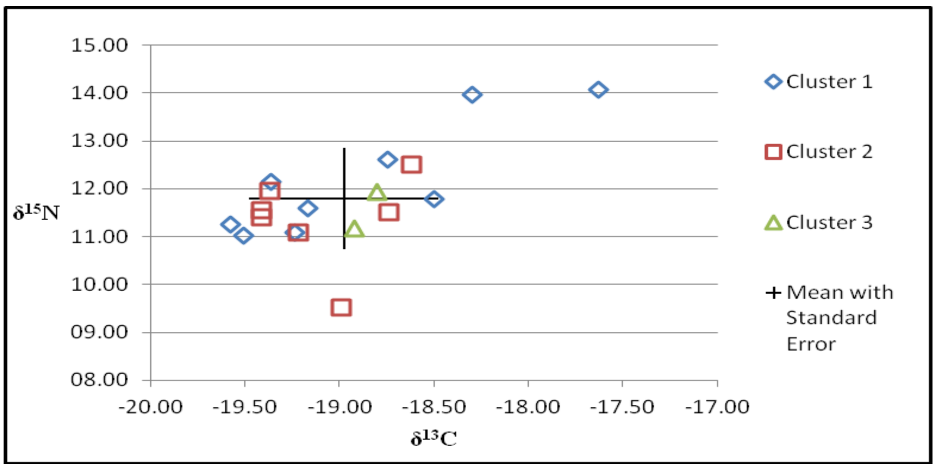

Figure 8.7 Biodistance Clusters and Isotopic Values

8.4.1.4 Discussion

The results of biodistance analysis at Bestamak reveal that while phenotypic similarities and differences were present among individuals in this cemetery, biological affinity was not a factor in mortuary practice, spatial location, or consumption patterns. This result is nonetheless interesting, as heterogeneity in phenotypic traits do not correlate with cultural practices in the mortuary realm. Only double burials allowed for interesting discussions of phenotypic similarities in the cemetery. One burial contained a possible mother/child pair with shared phenotypic traits, while another burial of two individuals with disparate phenotypic traits, yet buried facing each other has been interpreted as a married or mated couple. This interpretation is based on their burial in a single grave, dissimilar phenotypic traits, and face-to-face placement. As double burials are not often recovered from this cemetery, these unique burial contexts allow for interesting views into the practices of the Bestamak community. While kinship and marriage were sometimes important factors in the placement of individuals at death, this was not always a pertinent factor in the overall location of the burial.

8.4.2 Intra-cemetery Biodistance Results: Lisakovsk Cemetery (LBA)

In the context of this dissertation, the Lisakovsk cemetery is considered a spatially defined ‘community’, and a case study for the examination of social and biological communities within. The absolute dating of burials from different areas of the cemetery reveal that it was used for approximately 120 years (Panyushkina et al. 2010). Hypothetical family groups will be correlated with biological datasets such as biological age and sex, as well as mortuary practices, spatial relationships, and dietary consumption patterns. Social roles are often symbolized by mortuary rituals such as body placement or the inclusion of specific objects. Therefore, kin group membership may also be identified by links between these social roles and biological affinities. For Lisakovsk, a total of 27 dental morphological traits were used in biodistance analysis (Figures 8.8 and 8.9). Only 24 individuals within the cemetery had enough well preserved adult dentition to be used in this research. Initial results of biodistance analysis led to the formation of 5 clusters where 68% of the variance is explained (r^2=0.68). The 5 clusters that formed revealed much less phenotypic variability than originally hypothesized. Cluster 4 contained only two individuals, but the dental traits were the most unique for this cemetery. Cluster 5 was also important as this individual also had many distinctive dental traits such as congenital absence of the 3rd molar and a peg shaped 3rd molar. These 5 clusters were then used as a comparative dataset to examine correlations with mortuary assemblages, burial construction, body position, spatial location, as well as patterns of dietary intake.

Dental Non-Metric Trait - Mandible	Cluster 1 (n=13)	Cluster 2 (n=5)	Cluster 3 (n=3)	Cluster 4 (n=2)	Cluster 5 (n=1)	Lisakovsk Total (n=24)
Double Shovel 1st Incisor	23.1%	60.0%	0.0%	0.0%	0.0%	25.0%
Canine Distal Access Ridge	7.7%	0.0%	0.0%	0.0%	0.0%	4.2%
Odontome - Premolars	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Groove Pattern 1st Molar	69.2%	60.0%	100.0%	50.0%	100.0%	70.8%
Cusp Number 1st Molar	0.0%	20.0%	0.0%	0.0%	100.0%	8.3%
Deflect Wrinkle 1st Molar	7.7%	0.0%	33.3%	50.0%	0.0%	12.5%
Cusp 5 1st Molar	76.9%	100.0%	100.0%	100.0%	0.0%	83.3%
Cusp 6 1st Molar	0.0%	40.0%	0.0%	0.0%	0.0%	8.3%
Cusp 7 1st Molar	0.0%	20.0%	0.0%	0.0%	0.0%	4.2%
Tome's Root 1st Premolar	7.7%	0.0%	33.3%	0.0%	0.0%	8.3%
Root Number 2nd Molar	46.2%	40.0%	66.7%	50.0%	0.0%	45.8%
Dental Non-Metric Trait - Maxilla						
Shoveling 1st Incisor	61.5%	80.0%	66.7%	50.0%	100.0%	66.7%
Double Shovel 1st Incisor	61.5%	80.0%	0.0%	50.0%	100.0%	58.3%
Double Shovel 2nd Incisor	0.0%	0.0%	0.0%	50.0%	0.0%	4.2%
Interrupt Groove 1st Incisor	0.0%	40.0%	0.0%	0.0%	100.0%	12.5%
Interrupt Groove 2nd Incisor	0.0%	0.0%	0.0%	0.0%	100.0%	4.2%
Tuberculum Dentale 2nd Incisor	15.4%	20.0%	0.0%	50.0%	100.0%	12.5%
Canine Mesial Ridge	15.4%	40.0%	66.7%	0.0%	100.0%	29.2%
Canine Distal Access Ridge	7.7%	0.0%	0.0%	0.0%	100.0%	8.3%
Cusp 5 - Molars	15.4%	0.0%	0.0%	0.0%	0.0%	8.3%
Carabelli's Trait - Molars	0.0%	60.0%	33.3%	100.0%	0.0%	25.0%
Parastyle 3rd Molar	0.0%	0.0%	0.0%	50.0%	0.0%	4.2%
Enamel Extension	7.7%	0.0%	0.0%	0.0%	0.0%	4.2%
Root Number 1st Premolar	15.4%	20.0%	66.7%	0.0%	0.0%	16.7%
Root Number 2nd Molar	30.8%	40.0%	66.7%	0.0%	100.0%	29.2%
Congenital Absence 3rd Molar	0.0%	0.0%	0.0%	0.0%	100.0%	4.2%
Peg Shaped 3rd Molar	0.0%	0.0%	0.0%	0.0%	100.0%	4.2%

Figure 8.8 Frequency of Dental Traits in Clusters (Hypothetical Family Groups) at Lisakovsk

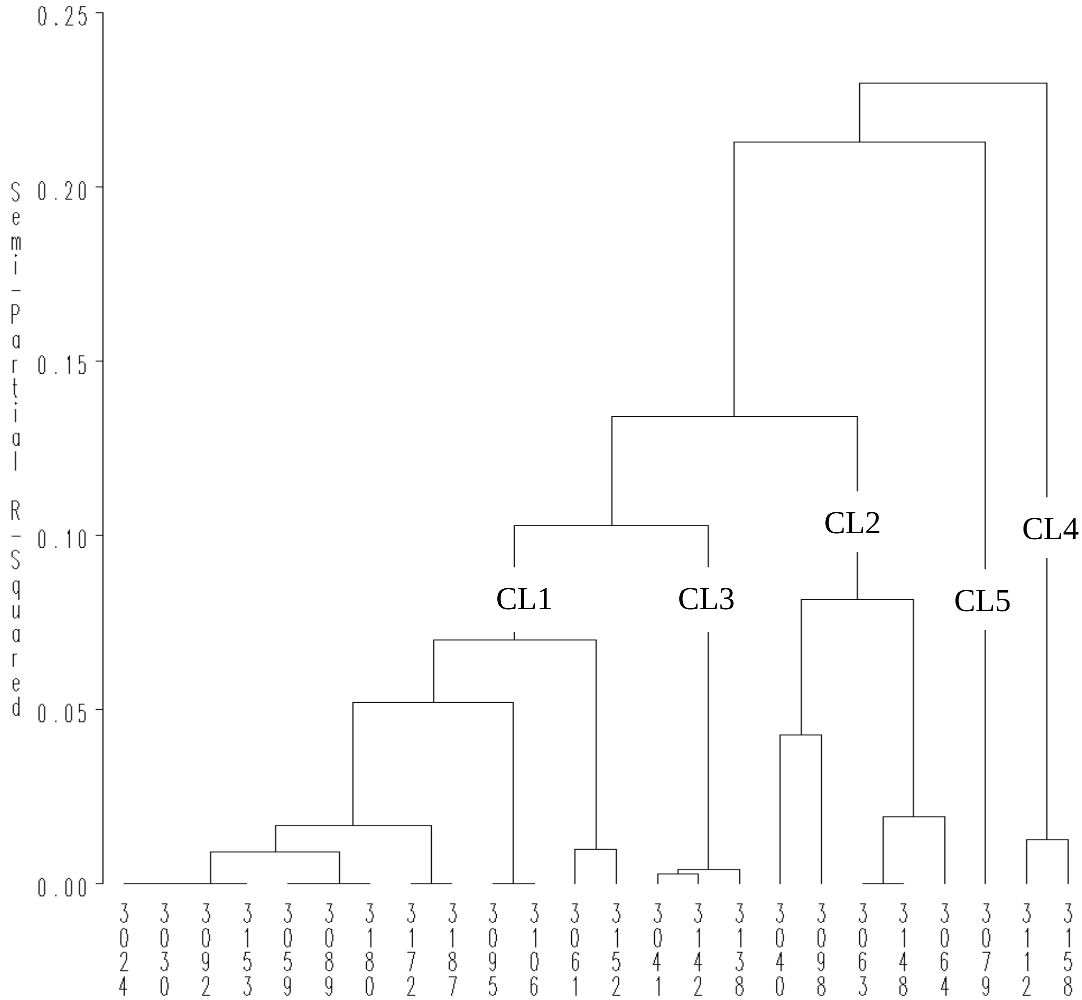

Figure 8.9 Lisakovsk Clusters based on Biodistance Analysis

Biodistance results reveal that most clusters have similar proportions of adults and subadults (Figure 8.10). Furthermore, the correlation between the 5 cluster solution and independent variable sex, is significant (p=0.124), while the correlation between the clusters and age is very significant (p=0.007). Interestingly, the individuals that are most phenotypically unique are a female adult and a subadult found in cluster 4. The adult male who is alone in cluster 5 is also quite different in terms of biological affinity from many individuals in the cemetery. However, individuals in clusters 1, 2, and 3 are much closer phenotypically than these previously discussed. Is it possible that individuals in clusters 4 and 5 are of non-local origin? This will be tested through a comparison of mortuary practices and dietary consumption patterns.

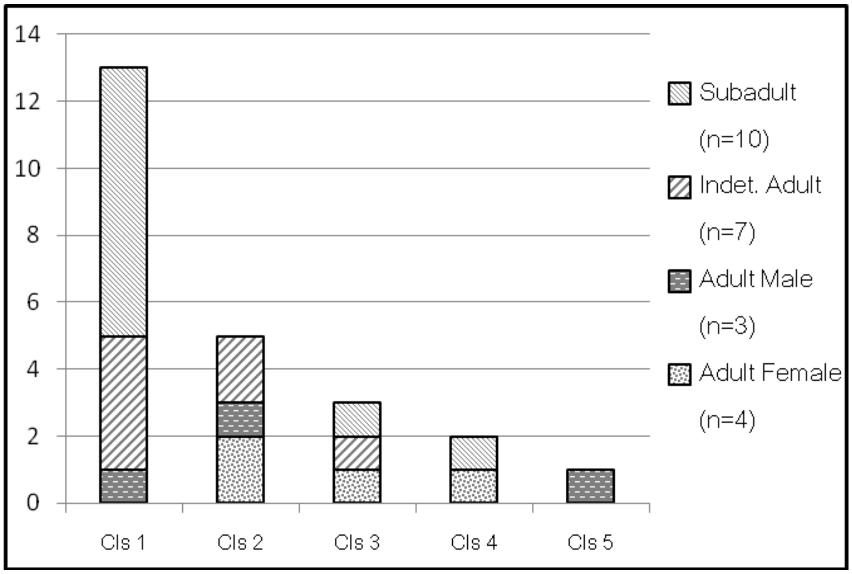

Figure 8.10 Biodistance Clusters by Age and Sex

8.4.2.1 Biodistance and Mortuary Assemblage

The 5 clusters created through biodistance analysis are treated here as hypothetical family groups based on biological affinities. These clusters are explored in relation to mortuary practices including grave assemblage, burial construction, and body position. Only 21 of 24 individuals had datasets that could be used for correlations between biodistance analysis and mortuary practices. Samples 3030, 3079, and 3112 were not used in this analysis as they lacked known mortuary assemblage contexts. First, the mortuary assemblage is clustered and the correlated with biodistance clusters used as an independent variable. When bronze items were examined in relation to the hypothetical families, only clusters 1 and 2 had individuals associated with bronze objects (Figure 8.11). Individuals in biodistance clusters 3 and 4 lacked bronzes, and the individual in cluster 5 could not be positively linked to a specific burial or mortuary assemblage. Bronze objects in the grave are often cited as evidence of wealth and therefore social differentiation between individuals. While each cluster had individuals that lacked bronzes, clusters 1 and 2 contained individuals who had a variety of bronze objects. Individuals were buried with ornamental items such as bronze beads, bracelets, badges, earrings, rings, as well as clamps worn as part of headdresses or attached to the hair. In addition, two individuals in cluster 1 were buried with bronze staples, often used to repair broken ceramic vessels, and one individual also had a bronze knife. None of the bronze objects were associated with individuals of a specific sex or age group. Therefore, differentiation did occur between individuals in terms of bronze items, and seems to be related to the biological affinity of individuals as only those in clusters 1 and 2 had access to these items. However, not all individuals in clusters 1 and 2 were buried with bronze objects.

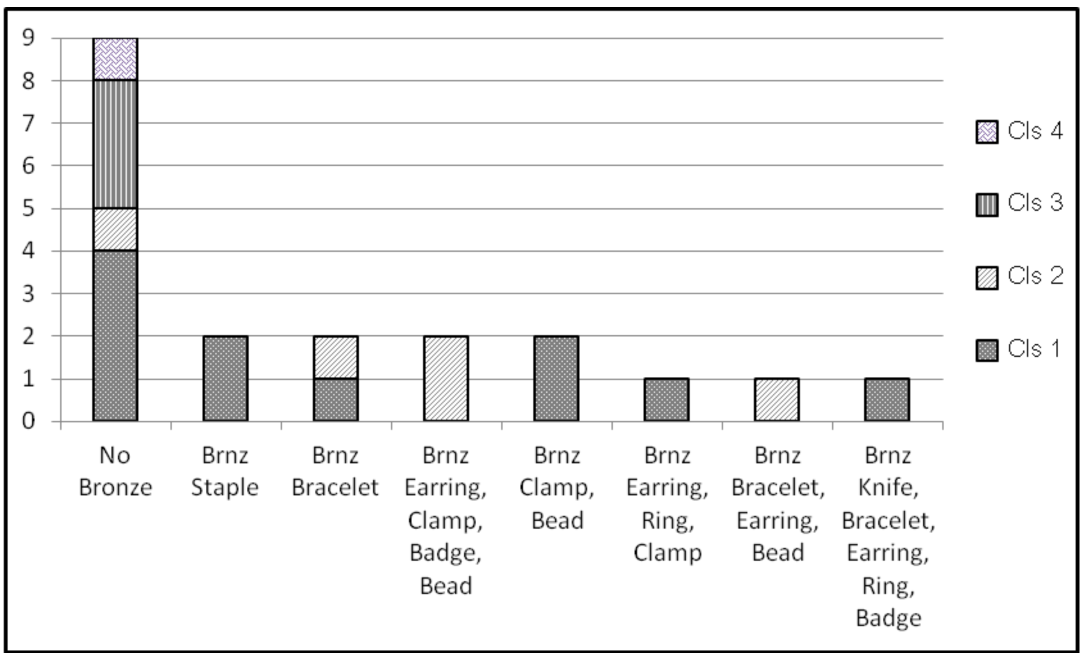

Figure 8.11 Bronze Objects and Biodistance Clusters

Biodistance results lack significant correlations with animal remains placed with the individual. There is diversity in animal remains in the grave, and much of this is of attributed to individuals in clusters 1 and 2 (Figure 8.12). However, the differences present allow for only limited interpretation, as the majority of individuals (n=11) lack animal remains. A composite analysis of animal remains and ornamental bronze objects was then undertaken in order to fully understand the relationship between these two categories of grave goods. Animal remains were recorded for the presence/absence of sheep/goat, horse, or cattle for each burial, while certain ornamental bronze objects (ring/earring or pendant/badge) were also recorded in terms of presence/absence. The combination of these three categories (animal remains, ring/earring, pendant/badge) led to a 4 cluster solution (r^2= 0.93). Animal remains were recovered in burials of individuals found in clusters 1, 2, and 3, while bronze ring/earring were only recovered from those in clusters 1 and 2 (Figure 8.13). When animal, bronze ring/earring and pendant/badge were recovered in a burial, only individuals from cluster 1 were present. This seems to set up a clear hierarchy of individuals in terms of mortuary goods, with the most diverse assemblages associated with cluster 1, those somewhat more diverse in clusters 1 and 2, and those less diverse in clusters 1, 2, and 3. However, individuals that lack these goods were recovered in all clusters.

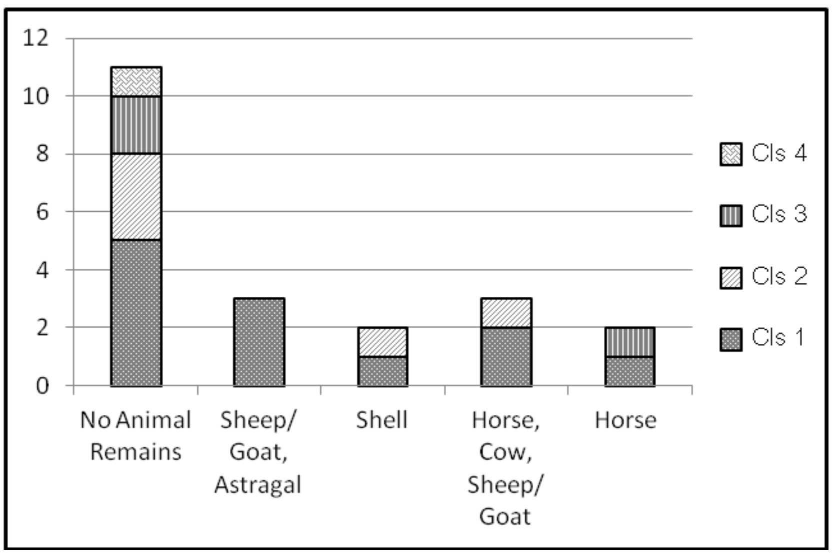

Figure 8.12 Animal Remains and Biodistance Clusters

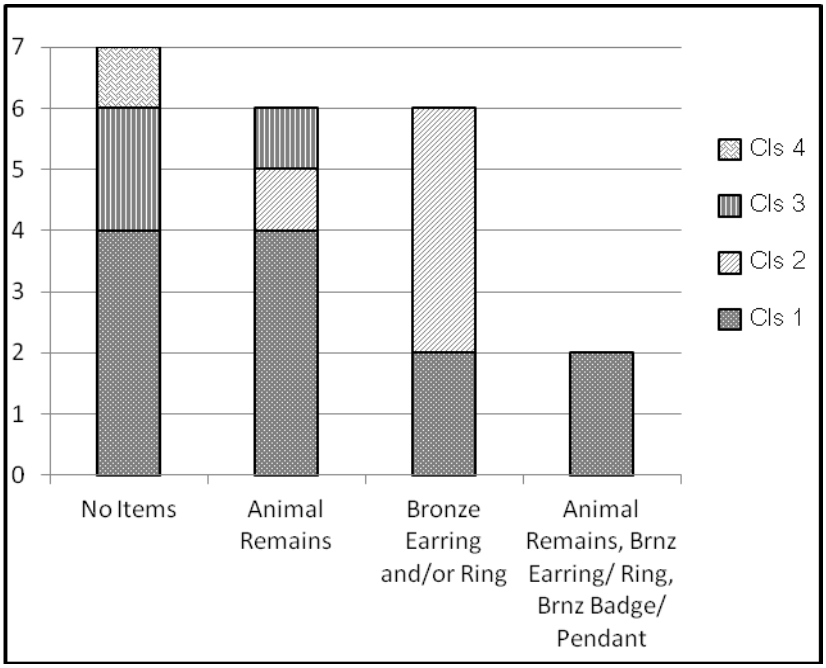

Figure 8.13 Animal Remains and Ornamental Bronzes correlated with Biodistance Clusters

Burial construction data includes both the above and below ground structures associated with this mixed kurgan and flat grave cemetery. Above ground structures include combinations of low mounds, stone rings, ditches, or a lack of any of these features. Below ground structures include the presence or absence of wooden beams, possibly a burial litter, at the base of the burial pit. In addition, the length, width, and depth of each burial were used as categories, as well as the total volume of each burial in square meters. For an in-depth discussion of the methods for data collection and analysis see chapter 5. Construction features including above ground and below ground structures, as well as overall grave volume did not have any correlation to clusters of phenotypically similar individuals.

The position of the human body in mortuary ritual is often associated with social or cultural norms. Body position includes information on the side the individual was laying, the position of their legs and arms, as well as the cardinal direction of their body. An in depth discussion of these categories, as well as how they were recorded, is provided in Chapter 5. Unfortunately, body position of many of these individuals was either not evident during excavation (i.e. poor preservation of human remains) or the description of the burial did not include this data. From the remaining data, it seems that within each biological cluster individuals were buried with multiple types of placement and positioning.

These results compare well with other case studies that compare mortuary and biodistance datasets. For example, Howell and Kintigh (1996) used dentition to examine biological affinity and leadership in several cemeteries (n=7) surrounding a single settlement at Hawikku (in the American Southwest). A total of 54 individuals clustered into six kin groups for these cemeteries. Cemeteries were found to be kin based, which unfortunately was not the case at Lisakovsk, where hypothetical family groups were found in each cemetery. Gamble et al. (2001) take a slightly different approach by comparing ethnographic data and mortuary practices with phenotypic data to reveal evidence of elites and ranking for the Chumash (American northwest). Based on ethnography, beads were an important sign of wealth in this society, and therefore their use in burial was examined in concert with spatial location and biological affinity. The results reveal that certain members of kin groups could afford to bury their dead with more beads (Gamble et al. 2001:207). This links well with the data that I recovered that shows certain members of two family clusters at Lisakovsk were buried with bronzes. While ethnographic data from Eurasia does not specifically highlight bronze, these analyses do reveal that inequality was often a part of pastoral social organization. Furthermore, Gamble et al. (2001:199,208) distinguish a system of ranking, including ascribed status, was present where commoners were distinguished from the elite. While the two Bronze Age sites examined in this dissertation may not have had commoners and elites, they did have clear systems of ranking and ascribed status which was discussed previously discussed in detail (Chapter 6).

8.4.2.2 Biodistance and Spatial Location

The Lisakovsk site is a group of six cemeteries in close spatial proximity along the Tobol River. These cemeteries were radiocarbon dated to a 120 year period (Panyushkina et al. 2008). First, biodistance measures must be discussed in terms of correlation with three different types of data for this cemetery. When all cemeteries were compared through biodistance analysis, they were examined for possible grouping of individuals with similar phenotypic traits. It is possible that each cemetery was used for specific kin groups. Second, while the majority of individuals are buried alone, there are some double burials. These double burials are examined for possible phenotypic links between individuals buried in a single pit. Third, kurgan (mound) also can contain several burials within a single complex. Burials within a single kurgan (mound) complex are also tested for phenotypic similarities. Finally, as these cemeteries were block excavated, general spatial proximity measures are used to determine if specific areas within cemeteries were used for specific kin groups (e.g. southern portion of a cemetery).

Unfortunately, the general spatial location of individuals in each cemetery did not correlate with phenotypic similarities. A total of 5 clusters are evident when biodistance was undertaken and each of these was coded with a color. Each individual was then given a color designation if it was phenotypically analyzed and then spatially plotted within the cemetery (Figures 8.14 through 8.20). The clusters were coded as follows: cluster 1 is coded green, cluster 2 is coded blue, cluster 3 is coded red, cluster 4 is coded yellow. A lack of color was given to all individuals that were not phenotypically analyzed.

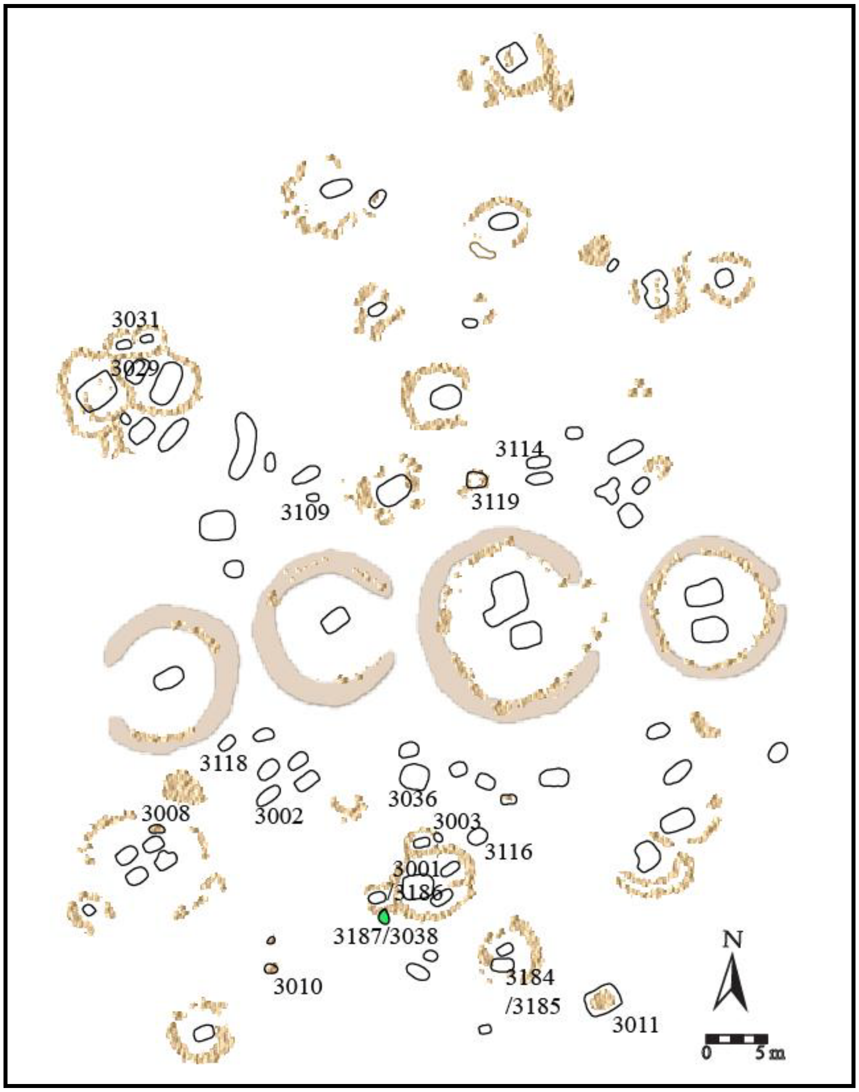

Figure 8.14 Lisakovsk Cemetery 1, Group A (Biodistance)

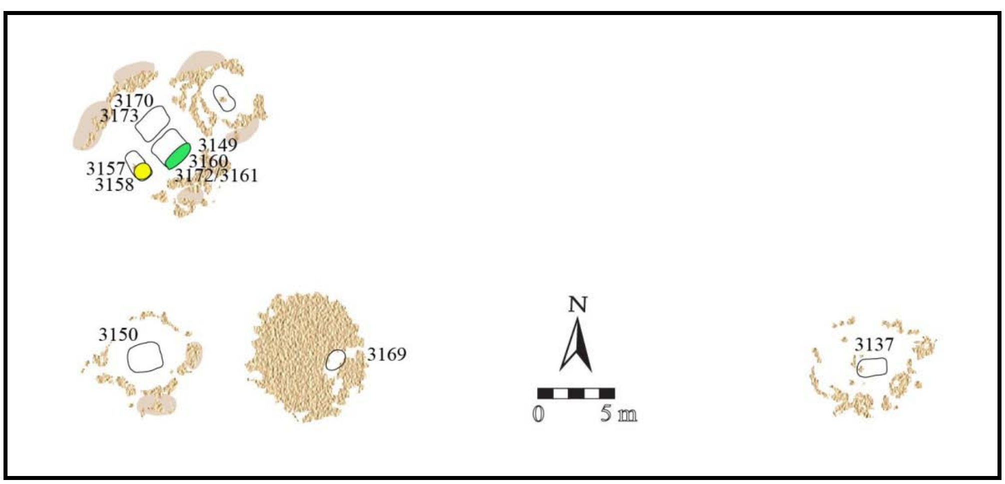

Figure 8.15 Lisakovsk Cemetery 1, Group B (Biodistance)

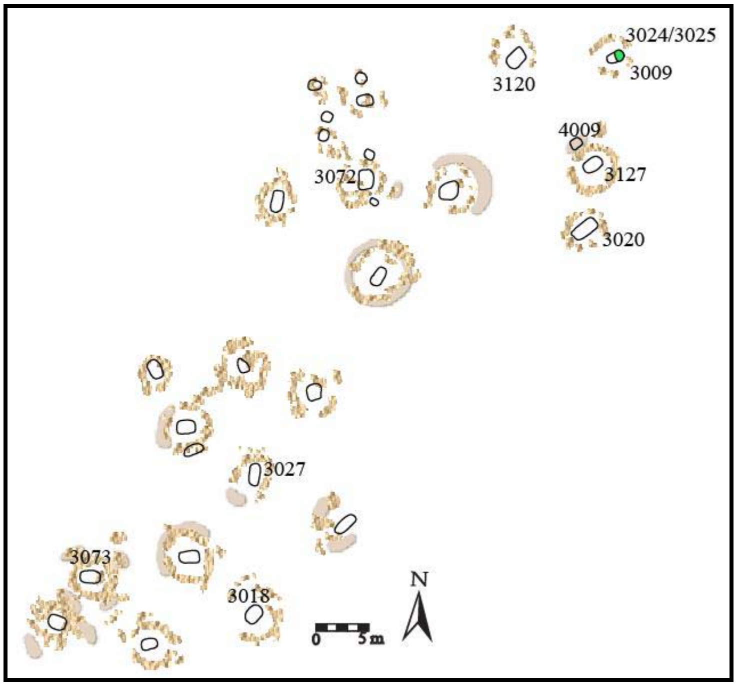

Figure 8.16 Lisakovsk Cemetery 1, Group V (Biodistance)

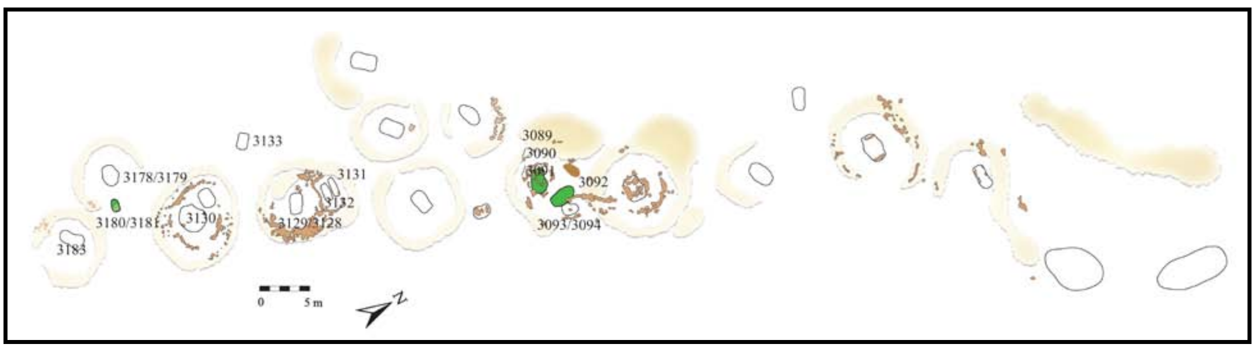

Figure 8.17 Lisakovsk Cemetery 2 (Biodistance)

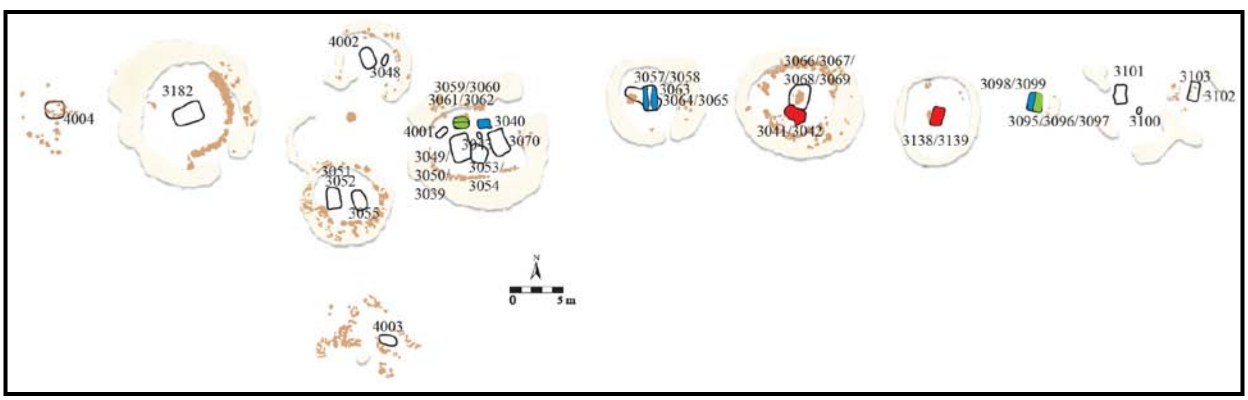

Figure 8.18 Lisakovsk Cemetery 3 (Biodistance)

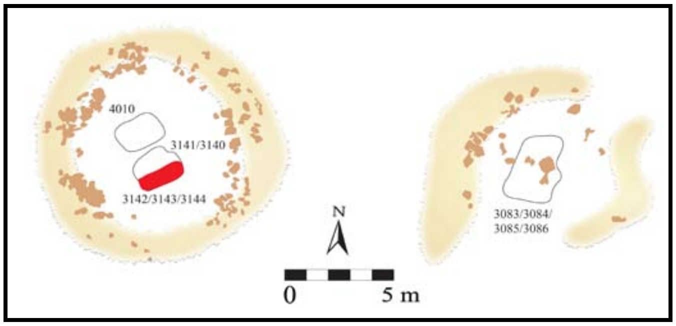

Figure 8.19 Lisakovsk Cemetery 4 (Biodistance)

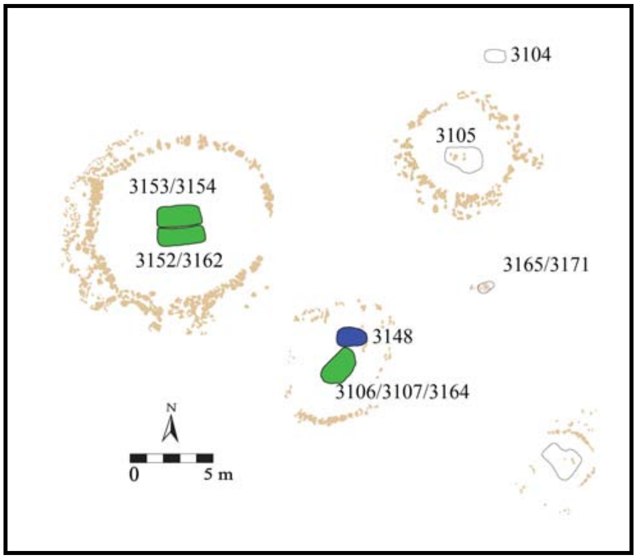

Figure 8.20 Lisakovsk Cemetery 5 (Biodistance)

The five clusters based on biodistance were correlated in relation to multiple burials to examine the relationships between individuals in a single burial pit. Three burials contained individuals for which biodistance analysis was undertaken: samples 3059 and 3061 (cemetery 3, Figure 8.18); 3063 and 3064 (cemetery 3, Figure 8.18); and 3152 and 3153 (cemetery 5, Figure 8.20). The first burial, containing samples 3059 and 3061, was that of two children aged 3.5 to 6.5 years and 4 to 6 years. These individuals were both part of cluster 1, and are therefore likely to be phenotypically related. The only remains for these individuals were cranial remains and dentition. However, they were both placed on their left side, in very close proximity. Due to the close age range for these individuals and their placement, they have been interpreted as either siblings or close relatives. The second burial contained samples 3063 and 3064, the remains of a child (6 to 12 years) and teenager (9.5 to 14.5 years). These individuals are related, as they are both part of cluster 2. In addition, a third individual, a child aged 2 to 4 years was also present in the burial, but did not have any adult dentition. This last individual lacked the dentition necessary for biodistance analysis but may also have been related. Finally, the last double burial contained samples 3152 and 3153, two indeterminate adults aged 16 to 20 years and 18 to 24 years. Both of these individuals were part of cluster 1, and therefore phenotypically similar.

In contrast to the above mentioned burials that consisted of a single pit with several individuals, burial complexes were also present. Kurgan (mound) or stone enclosures could contain multiple burial pits within a single complex. Individuals within each complex (kurgan/enclosure) were examined in terms of their phenotypic similarities. Cemetery 3 (Figure 8.18) contains a single enclosure with seven burials, including burial 3 (samples 3059 and 3061) as well as burial 4 (sample 3040). While the two children (3059 and 3061) are phenotypically similar and found in cluster 1, the individual in burial 4 (3040), a child aged 8 to 12 years, is part of cluster 2. Therefore, the two children buried in a single pit are more phenotypically similar (in the same cluster) than the individual buried within the same kurgan feature albeit from a different cluster. At cemetery 1, group B (Figure 8.15), as single enclosure contains three burials, two of which had individuals that were used in biodistance analysis (3158 and 3172). While samples 3158 and 3172 were buried within a single kurgan enclosure, they are phenotypically dissimilar. Sample 3158 is part of cluster 4, the most phenotypically unique at Lisakovsk, while sample 3172 is part of cluster 1. In cemetery 5 (Figure 8.20), one enclosure contained two burials, sample 3148 and sample 3106. While these individuals were recovered from a single enclosure, they were not phenotypically related, as sample 3106 (12-18 years) was in cluster 1, while 3148 (18-30 years) was in cluster 2. Finally, at cemetery 2 (Figure 8.17), a single enclosure contained a total of four burial pits, two of which had individuals used in biodistance analysis. Sample 3089 was a 16-24 year old individual, while sample 3092 was a 22-30 year old. Both of these individuals were part of cluster 1, and therefore phenotypically related.

The nature of these results are mixed, with individuals placed in the same burial pit found to be phenotypically similar, while those placed in a single kurgan or enclosure less likely to be phenotypically related. Therefore, biological relationships are only somewhat at play in the determination of burial location. In contrast to what has previously been proposed, kurgans and enclosures contain individuals of disparate biological backgrounds. Unfortunately, as there are few radiocarbon dates for this cemetery, a more detailed temporal analysis of these burials and kurgan/enclosures has not been undertaken. Therefore, we cannot know if burials within kurgan/enclosures were placed at a similar point in time, or over generations, which might significantly alter interpretations of the cemetery in terms of phenotypic similarities.

8.4.2.3 Biodistance and Stable Isotopes

For the Lisakovsk site, only four individuals were available for both biodistance and stable isotopic analyses. While the goal of this research was to explore correlations between biological affinities and dietary intake, this was not undertaken due to the small sample size.

8.4.3 Discussion

The results of biodistance analysis at Lisakovsk indicate that phenotypic traits correlate well with certain artifact classes and burial co-residence. However, biological affinity did not correlate with certain body placements, types of burial construction, or individuals buried within kurgan/enclosure complexes. A 5-cluster solution was chosen for biodistance analysis at

Lisakovsk, which correlated with bronze objects. This 5-cluster solution also correlated well with the presence/absence of animal remains and bronzes together. This is especially interesting in regard to Figure 8.13 where a hierarchy of individuals is evident based on biological cluster and items in burial. While mortuary practices at this site are often described as highly heterogeneous, the nature of this data correlates well with recognizable phenotypic traits. Furthermore, double burials reveal that two individuals placed in a single grave were likely to be biologically related. For the Lisakovsk site, in particular, these individuals are often children or teenagers, and therefore have been interpreted as siblings or close relatives by previous scholars (Usmanova 2005).

8.5 CONCLUSION

The biological affinities explored in this chapter followed investigations of mortuary analyses and stable isotopes. Clusters generated with biodistance data were treated as hypothetical family groups and then correlated with previous mortuary and isotopic datasets. The broad objective of biodistance analyses within and between cemeteries was to determine the phenotypic variation evident in each cemetery and if this variation changed over time. On a local level, the objective was to explore the number of hypothetical family groups in each cemetery or cemetery group, and to determine if this data correlated with patterns in mortuary practice, spatial proximity, and dietary intake. Overall, this research is comparative in nature, and therefore all findings were examined in relation to both cemeteries.

On the broad scale, individuals from both Bestamak (MBA) and Lisakovsk (LBA) were used in a single analysis of biodistance. This resulted in the formation of 9 clusters, of which 7 were populated by individuals from both cemeteries. The two additional clusters only contained individuals from Bestamak. In contrast to what has previously been posited, Bestamak has more phenotypic variation than Lisakovsk. The LBA is often considered as a period of high interaction combined with increased mobility of individuals. While this may be true, the mobility and interaction that occurred may have been on a micro-level rather than proposed broader regional interconnections. Furthermore, this comparison highlights phenotypic continuity over time in the region. As 7 of 9 family clusters are populated by individuals from both cemeteries, similarity in phenotypic traits is equally as easily identified within, as between, local groups. This is an important finding, as previous discussions of the LBA have defined this as a period of regional migration, population mixing, and the influx of new individuals. As each community differentially navigates globalizing and socializing processes, these results cannot be used to extrapolate from the community to the entire region for a specific period of time. Instead, our ideas of the Bronze Age need to further incorporate detailed information on local groups from a greater array of sites and the multitude of ways that they interacted socially and biologically. In order to move forward, bioarchaeological analyses such as biodistance need to be undertaken at micro-scales in a comparative manner.

On a local scale, the links between hypothetical family groups and mortuary practice, spatial proximity, and consumption patterns were different for these two communities. At Bestamak, it seems that biological affinity was not an important factor in the foundation of the social structure of the community. Hypothetical family groups were not positively correlated with any specific mortuary practice or object, and therefore not correlated with differential status or identity. Additionally, those with similar phenotypic traits were not found in close spatial proximity, and in general, kinship did not affect burial placement. When kinship did come into play, it was only in the case of burials with multiple individuals. However, double burials highlight that when detailed information was available, the highly varied nature of burial forms comes to light. These include several pit graves with a pair of individuals who were interpreted as a mother and child, husband and wife, and two unrelated individuals. While these detailed findings are interesting, they reveal that kinship relationships cannot be directly linked to social structure, identity, or other mortuary patterns for the Bestamak community. However, kinship relationships continued to be an important part of life in these communities, even though they were not always evident in mortuary contexts. Mortuary practices at Bestamak seem to be more affected by social norms and status than by familial relationships.

In comparison, at Lisakovsk, biological affinities seem to be much more important in the social structure of the community. Hypothetical family groups were directly correlated with bronze items and mixed bronzes/animal remains. The latter seemed to form a clear hierarchy of goods associated with clusters 1, 2, and 3. In addition, individuals with shared phenotypic traits were often buried in a single burial pit and the familial nature of burial is an important feature of this community. However, burial complexes that contained individuals of different kin groups highlight how little we understand about the complex nature of these communities and the underpinnings of their decisions in burial practices.

Based on these results, it seems that the social structure of Bestamak and Lisakovsk are very different, with the latter having biological affinity of individuals influence the mortuary record. Therefore, the following findings are important in our discussions of these two local groups:

	Bestamak	Lisakovsk
Hypothetical Family Groups	6 groups	5 groups
Hypothetical Family Groups	Similar levels of differentiation within and between groups	Unequal differentiation within and between groups
Mortuary Rituals	Influenced by social norms and status	Influenced by kinship
Bronze	Evenly distributed within hypothetical family groups	Associated with specific hypothetical family groups
Individuals in Double Burials	Related through kinship or married/mated couples	Kinship related

Figure 8.21 Final comparison of the Bestamak and Lisakovsk Sites

At Bestamak, burial goods are evenly distributed within each hypothetical family cluster, revealing that familial relationships do not seem to influence mortuary rituals. At Lisakovsk, only individuals in cluster 1 and 2 were buried with bronze objects, and there is clear differentiation within family clusters. Location of individuals is somewhat similar, although those at Lisakovsk are more likely to be placed in a double burial if they are phenotypically similar, while Bestamak individuals could be placed with a relative, whether blood related or not. Unfortunately, non-local individuals and residence patterns continue to be unidentified, which is certainly the result of small sample sizes and few positively sexed individuals. Finally, the real difference between Bestamak and Lisakovsk may be the overall nature of these findings. The hypothetical family groups at Bestamak are more homogeneous, where each cluster has similar levels of differentiation. However, the hypothetical families at Lisakovsk were differentiated both between and within clusters. While mortuary practices at Bestamak were affected by social status and norms, the practices at Lisakovsk were affected by biological affinity. Therefore, phenotypic traits do play a part in burial practices at both sites, albeit in very different ways.

Biological affinities and hypothetical family groups clearly have different roles in each of these communities. These differences need to be discussed in relation to broader spheres of interaction and integration. At the transition from the MBA to LBA, changing mortuary and settlement patterns reflect significant changes in interactions. The more sedentary and aggregated nature of MBA settlements gives way to smaller, widely dispersed, settlements during the LBA. The spread of similar cultural materials over a broad region for this later period (LBA), can be linked to the process of globalization. This is in contrast to the heavy socialization that seems to be present during the MBA. As previously discussed in chapter 2 (section 2.2) individuals and communities are affected by, negotiate, and take part in processes of socialization and globalization. Globalization is the flow of information, technology, and ideas, while socialization can be understood as the rules or societal role in managing this flow, and includes language, cultural habits, and living patterns.

As part of a globalization model, it seems that the earlier MBA, as evidenced by Bestamak had a greater degree of phenotypic diversity. It is possible that human remains used in biodistance analyses were from an extended period of time and therefore showed greater variability. However, while more phenotypic variability is present within the Bestamak cemetery, the burial assemblages of individuals show a good degree of homogeneity and a focus on everyday use items. This can be interpreted as a greater degree of socialization, where individuals are more heavily integrated into the society. This of course does not discount that interaction and exchange were occurring, just that the Bestamak community negotiated their way of life towards incorporation rather than differentiation. In contrast, the LBA site of Lisakovsk has slightly less variation phenotypically, and a greater degree of evidence of differentiation and wealth. In a time that seems to indicate the occurrence of globalizing processes, the community of Lisakovsk was differentiated based on kinship and biological affinity.

During a period of increased socialization, communities tend to be homogeneous in cultural practices in order to counteract the forces of globalization. Therefore, I regard the MBA as a time of increased socialization, because although there is increased phenotypic diversity, mortuary rituals and settlement patterns tend towards uniformity. There seems to be heavy integration of individuals into the Bestamak community, with little regard to their biological affinities. Forms of status and identity are not directly linked to specific kin groups or biological background of individuals. In contrast, during periods of increased globalization, there is often greater heterogeneity in cultural practice. The desire for differentiation between individuals and groups is often strengthened in response to the intensification of globalizing processes (Gosline 2004). Therefore, I consider the LBA as a time of increased globalization, when mortuary practices and settlement patterns are heterogeneous. Furthermore, while less phenotypic diversity is present at Lisakovsk, differentiation between individuals based on kinship is more apparent in mortuary ritual and cultural practice. As interaction and the flow of ideas increases, the result is a stricter adherence to kinship and phenotypic ties. However, along with this influx of information, there is often believed to be an increase in phenotypic interactions. This is not the case in the Lisakovsk community, which has less phenotypic diversity than Bestamak. Therefore, while the process of globalization increased and individuals began to highlight phenotypic affiliation as a form of differentiation, biological interactions did not similarly increase the phenotypic variation in this community. Therefore, while processes of globalization and socialization have a great affect on the individual, community, and region, they must be understood in the context of local communities. These themes are discussed and analyzed in relation to full scale analysis of mortuary rituals and practices, as well as dietary consumption patterns in the preceding chapters.

9.0 CONCLUSIONS: SOCIAL AND BIOLOGICAL CONNECTIVITY IN NORTH CENTRAL EURASIA

The aims of this dissertation are to push the boundaries of our thinking in Eurasian archaeology through the application of a theory of glocalization and multidisciplinary methodologies that provide a new perspective of the archaeological remains under study and the region as a whole. In particular, the Andronovo development has been theoretically hampered by culture historical designations that have been characterized as a world system, thereby construing interactions as inherently part of an integrated organism. The flow of materials, technology, and knowledge over a broad region of Eurasia does not fit a systemic model. While similarities in material culture are evident, there seems to be a lack of integration of local groups either socially or economically. Instead, evidence seems to correspond much better with a model of globalization, described as a trans-societal process of relationships and interactions (Featherstone 1990). Often, world systems approaches have attempted to predict what local communities did to navigate broader effects of a center or core group. However, when lacking these dominant central societies, we must rethink this framework. A model of globalization is much more insightful as it prioritizes an examination of the local in order to understand global processes, whether or not an actual “core” is present. However, in order for globalization to be effective as a framework for understanding prehistory, it must be supported by detailed local, micro- and macro-regional datasets. The study of these detailed datasets allows archaeologists to evaluate the process of glocalization, an active process by which local communities incorporate or reject cultural materials, imagery, expressions, and ideas. Therefore, agency is investigated and elucidated within broader global processes. Through a concentration on glocalization in this dissertation an effort has been made to examine local communities to inform our interpretations of broader developments. As such, this dissertation has investigated and emphasized the *local* in order to aid understandings of community level connectivity as evident through social and biological relationships.

Local level interactions become apparent through the study of pathways of connectivity, or the ways that relationships and interactions formed the framework for the spread of material culture, technology, and ideas. Individuals are constantly negotiating, and re-negotiating, their flows of interactions with one another (Giddens 1984:30). Furthermore, people create and reinforce a series of relationships through interactions with objects, people, and their world (Wynne-Jones and Kohring 2007). Relationships and interactions form the underpinnings of connectivity and can be studied through analysis of pathways. Patterns of relationships between individuals, objects, and communities can be investigated through multidisciplinary bioarchaeological analyses, which determine the types of pathways or links that were present between individuals and groups. These pathways symbolize relationships, for example, those based on face-to-face interactions, biological affinities, or ritual associations between individuals. As different types of connectivity are present within communities, this dissertation employed multivariate analyses using diverse datasets to examine social and biological constructs within each community.

Therefore, several explicit questions were posed that draw on a wide corpus of research and thereby more fully illuminate the nature of local communities:

- Was the nature of differentiation in mortuary patterning based on sex and age grades, hierarchical status, or individual prestige? Did mortuary patterning coincide with ethnic or cultural subgroups?
- Was mortuary patterning linked to dietary intake? Did subsistence practices (e.g. pastoralism vs. agropastoralism) coincide with changes in community organization and interaction?
- Did transformations in biological affinity (kinship relationships) coincide with transformations in mortuary practice? Did the relationship between these two variables change over time?

In order to answer these questions, a multidisciplinary bioarchaeological program of research was undertaken which empirically examined cultural and biological data from two separate cemeteries of distinct periods. This diachronic study compared the diverse identities, social structures, kinship groups, and economic activities found in these communities. I approached the study of social and biological groups as recognizable from the intersection of mortuary practices, biodistance studies, and dietary reconstruction. Furthermore, I argue that social complexity is not only related to social status and inequality, but to more detailed and complex social formations including intermarriage, social mobility and residence patterns, and the nature of social interactions and integration.

Therefore, in this final chapter, I first discuss the results and important implications of mortuary, biodistance, and stable isotopic analyses in relation to local connectivity. I examine these results separately for the Middle and Late Bronze Ages, as the two communities under study had very different local processes. I then explore the effectiveness of globalization and glocalization approaches to the prehistory of the Bronze Age. Furthermore, I discuss the strengths and weaknesses of these theories in regard to the data available for this dissertation. Finally, I outline the ways that future investigations might utilize a globalization approach that is congruent with understanding vast regions (such as Eurasia) and broad processes of interaction. I hope to provide insight on how these programs of research might overcome obstacles similar to those encountered in my own research.

9.1 RESULTS OF THE CURRENT STUDY: CONNECTIVITY IN THE BRONZE AGE

The results of the dissertation research suggest that local communities in north central Eurasia had different types of connectivity during the Bronze Age. The examination of relationships and interactions concentrated on identity and personhood, social structure and organization, dietary patterns, status, as well as kinship and biological affinities. The results served as the basis for discussions of social and biological connections that were important in each of these communities. The comparative nature of this research allows for the exploration of the multitude of ways individuals and groups formed connections in different communities and time frames. While the addition of further data from other communities within these time frames might significantly alter final interpretations, results discussed here are acknowledged as an important initial step towards a broader program of interpretation for Bronze Age interactions.

An important caveat needs to be addressed in relation to this research, which is associated with preservation and looting activities at the two sites under study. At the cemeteries of Bestamak and Lisakovsk there was evidence of looting and it is unknown whether this occurred recently after deposition or later in history. Therefore, bone preservation is extremely variable, with some graves obviously lying undisturbed for millennia, while others were visibly looted and left open to the elements for extended periods of time. Burials that were looted or opened tend to be missing some of the skeletal elements and likely missing some or all associated grave goods.

Other burials seem to have been opened, yet only slightly disturbed, possibly for the placement of another individual or object into the grave. While many types of looting and opening of burials are common at these cemeteries, it is difficult to know exactly how each grave was affected by these different activities. While the unpublished reports of these cemeteries do contain burial drawings and occasionally photos of the final resting place of skeletal remains and objects, these often are only of the final layer of the burial and provide little information about the excavation process. Therefore, while there were problems related to the number and percent of skeletal remains present for analysis, as well as possibility that certain individuals or sectors of society were looted on a more regular basis, these are problems that every archaeologist encounters. Therefore, I used practical analyses, including the use of statistical techniques that allowed for good amounts of missing data as well as using multidisciplinary bioarchaeological strategies for understanding prehistoric societies. Potential pitfalls were avoided through the correlation of multiple techniques which supported my final conclusions.

9.1.1 Middle Bronze Age Connectivity: Results from Bestamak

The results from the Bestamak cemetery suggest that connectivity was based on gender, tasks/activities, and wealth/status. There was little differentiation between individuals based on dietary intake, or kinship relationships. These are important findings as previous discussions of the Middle Bronze Age have focused on the presence of elites, political power, and chiefly groups (Zdanovich and Zdanovich 2002; Anthony 2009). At Bestamak, it seems that differentiation was based less on chiefly elite status than on gendered activities, roles, and wealth based status. Furthermore, while kinship was probably an important part of connectivity in local communities, it did not play significantly into how community members commemorated each other in burial rituals at Bestamak.

Identity and Personhood

The most pertinent identity and status markers at Bestamak were expressed within mortuary assemblages (chapter 6). The most significant division occurred between biological sex, where specific activities, roles, and forms of wealth were identified for each group. Male individuals were buried with metallurgical tools (stone slabs and grinding stones, ceramic molds) and metallurgical byproducts (ore and slag), as well as bronze axes, hooks, and sickles. Based on pastoral ethnographies in Kazakhstan and Africa, male identities may be linked to activities such as smelting and metallurgical processing, herding and foddering, butchering and wood cutting (Murdock 1934:159; Childs and Killick 1993:327; Borgerhoff Mulder et al. 2010). In contrast, female individuals were buried with spindle whorls, and therefore may have been undertaking activities associated with wool processing, weaving and textile production. However, at later Iron Age Eurasian sites, spindle whorls are not gender specific objects (Berseneva 2008:142). Several other tool sets were identified, including needles and awls; however, they were not linked to a specific sex. Ethnographic studies of pastoral groups in Africa (Samburu, Nuer and Fulbe) highlight the gendered nature of activities (de Bruijn 1997; Holtzman 2002). Such studies indicate that frequently women work in and around the home or camp while men tend to the herd. Among the Samburu and Nuer pastoral groups in Africa, subadults are often associated with similar activities such as herding, milking, tending to younger children and siblings (Holtzman 2002:269). Wood cutting, foddering, and slaughtering of animals could be male centered activities as they often occur just outside the home. Metallurgical activities also likely involved male individuals leaving the local area to collect raw materials or to learn about techniques and technology. Activities that occurred away from the home, such as the collection of raw material may have occurred away from the home and included larger groups of individuals including women and children as seen in Africa (Childs and Killick 1993:326-7,330). Juveniles may have been involved in some, or all, tasks occurring in pastoral communities. At Bestamak, subadults and adults had similar burial assemblages, as is discussed below. This is not surprising, as subadults were probably undertaking a good portion of the tasks necessary to support a pastoral camp.

At Bestamak, ornamental bronze objects were recovered from approximately half of adult and subadult graves overall. Ornamental bronzes are interpreted as an indication of differential identity and inequality in this community. While males are often considered to have had higher degrees of wealth or status in pastoral communities, at Bestamak average diversity and wealth (based on full assemblages) are equal for males and females. Items such as bracelets, pendants, and beads were buried with both male and female individuals at multiple age cohorts. Furthermore, within each age cohort there are individuals who lacked bronze objects and conversely some with a great number of objects allowing for discussions of greater wealth and status for certain members of the community. Personal ornamentation also was divided between the sexes, with women more likely to be buried with bronze badges that could be sewn onto clothing or attached to headdresses. Eurasian pastoralist ethnographies of Kazakhs and Kirgiz communities highlight the accumulation of wealth and status by women as part of their bride price or dowry (Krader 1953:546; Valikhanov 1964; Abramzon 1978; Vainshtein 1980). Women often 'wear' the wealth of the family in the form of adornments on clothing and jewelry, including headdresses embellished with coins and metal objects (Margulan 1986; Levshin 1996). Among some African pastoral groups, women receive metal jewelry at first menses, marriage, or the birth of a child (Childs and Killick 1993). Therefore, a division of status or wealth by sex or gender is not surprising for Eurasian pastoral communities. This is the case at Bestamak where females may have personified or carried the wealth of the family, based on their association with ornamental bronze objects.

In contrast to what has been posited by some scholars (Zdanovich and Gaiduchenko 2002; Zdanovich and Zdanovich 2002; Anthony 2009) for the Bronze Age of north central Eurasia, animal remains in burials at Bestamak are extremely diverse. The two main findings at Bestamak reveal that horses were more often recovered with women than men, but are also recovered with children (2-12) and teenagers (12-18). Furthermore, females and subadults have the most diverse animal assemblages, while males exhibit comparative homogeneity in sets of animal remains as they were buried with either sheep/goat and cattle, or horse and astragals. As women are linked to horse remains, it may be that one of the roles of women was to milk or tend to horses, which has been recorded in ethnographic studies of Eurasian pastoral communities (Vainshtein 2009:66-67). The burial of females with horses could also be a sign of high wealth or status, as this is the interpretation often given when buried with males. Ethnography from the African pastoral society of Samburu (N. Kenya) reveals that adult women are responsible for the collection and distribution of milk, and therefore may have high status in the family based on this role (Holtzman 2002:169; see also de Bruijin 1997). Horse milk is considered a very important product for Eurasian steppe pastoralists, both ethnographically and historically (Outram et al. 2009; Outram et al. 2010).

Dietary Patterns

Dietary patterns reveal that the majority of individuals in the Bestamak community regularly consumed animal products and few differences in carbon or nitrogen isotopic values were evident between them. While social divisions based on biological sex were evident in terms of mortuary remains, these were not mirrored in dietary intake; however, food quality and specific animal product (meat vs. milk) could not be tested. At Bestamak, two adults (one female, one indeterminate biological sex) were outliers in terms of isotopic values, with high $\delta^{15}N$ and $\delta^{13}C$ values ($\delta^{15}N$ of 14.1‰ and 13.9‰, and $\delta^{13}C$ of -17.6‰ and -18.3‰.). Due to their different collagen isotopic values, these individuals (samples 3540 and 3558) are posited as having a slightly different diet than the other members of the community. Isotopic values for these individuals are interpreted as resulting from a diet based on herbivore meat/milk, with more freshwater fish, and the possibility of some C_4 plant intake. Dietary differences may relate to the roles or activities of the deceased, as some of these individuals were buried with objects for grinding. Therefore, individuals associated with plant processing activities could account for diets that contained some C_4 plants. As only two individuals were identified with this differential status, it was difficult to determine the degree to which this differential diet was important within the community. Biodistance analyses reveal that these two individuals are from two separate clusters and are therefore not closely related to each other. Furthermore, when correlated with mortuary datasets, these individuals were not associated with a particular status or wealth designation. However, as these individuals were buried with ground stone and pestles and had a differential diet, their role in the community could be interpreted as one of special status related to plant processing. A paleopathological assessment, including the investigation of degenerative joint disease or musculoskeletal stress markers, might be a fruitful approach to understanding these individuals. Examples such as these individuals illustrate how the integration of multivariate datasets and forms of analyses (mortuary, diet, and biodistance) serve as good case studies.

Biological Affinity

Links between hypothetical family groups and mortuary practice, spatial proximities, and consumption patterns could not be positively correlated for the Bestamak site. Therefore, it seems that biological affinity was not an important factor in mortuary rituals. Kinship or biological affinity may have played a role in double burials, which usually contained a pair of individuals in a single grave. The results of biodistance analyses revealed that two of the three double burials examined held people who were phenotypically similar. The remaining double burial held a pair of individuals that were not phenotypically similar based on dentition. While these detailed findings are interesting, overall they reveal that biologically defined kinship relationships cannot be significantly linked to mortuary patterns for the Bestamak community.

Connectivity at Bestamak

At Bestamak, several community based relationships and interactions are readily apparent based on the results of mortuary, isotopic and biodistance analyses. First, a clear division of labor is suggested based on a correlation of biological sex with funerary items. Second, inequality is evident in this community based on the presence or absence of bronze objects in the burial. Inequality occurs within specific age cohorts and sex categories, for example among men, women, adults, and subadults but these differentiations do not seem to correlate exclusively to any age or sex group. Third, women are distinguished in the mortuary realm by their association with ornamental bronze badges. Finally, kinship groups do not correlate significantly with any particular mortuary rituals in the Bestamak community.

Based on these results, several types of connectivity may have been important within the Bestamak community, especially those between men based on activities such as herding, butchering, foddering, wood cutting, and metallurgy. While the former activities might include knowledge or materials that are obtained locally, metallurgical activities might necessitate contact outside of the local community or micro-region. Metallurgical activities include the collection of materials (tin, ore) outside of the main settlement (Herbert 1998:146). Furthermore, the technological knowledge associated with metallurgical processes was likely exchanged, possibly over long distances. Whether kinship played a part in these connections is possible, however these types of interactions were not evident based on biodistance analysis. In contrast, the only activity that links women is that of wool processing or weaving, the materials and tasks of which, could be contained within the local community.

Social inequality, especially exhibited in wealth distributions, appears to be present at Bestamak; yet, these divisions are not clearly associated with biological sex or age. Instead, inequality cross-cuts each of these categories in the local community. Unequal distributions of wealth in the form of bronze objects were also present between subadults. This suggests that the social status of children was ascribed rather than achieved. However, differentiation by wealth or status was not based on kinship or dental biological affinities. Therefore, wealth and status may have been more fluid or cyclical at Bestamak, with different families accumulating wealth and depositing it in burials at different times. As inequality existed within this community, there may not have been a 'culture of sharing' that extended onto objects such as bronze. Instead, wealthy or high status families may have been connected to individuals or groups in other communities with which they interacted with for purposes of material exchange.

Women had a special status in the community based on the inclusion of bronze badges in their burial assemblages. Ornamental bronze badges likely served as a form of recognition of womanhood as they are most often found with adult females and older subadults (12 to 18 years) (e.g. Stoodley 2000). It is also possible that these badges signaled a form of status related to kin group membership, which was achieved only at perceived adulthood. In terms of biodistance, a total of five individuals with badges were part of clusters 1, 6, and 3 (Figure 6.4). The majority of these individuals (4 of 5) populated clusters 1 and 6, which share many phenotypic markers. Interestingly, the two individuals that are part of cluster 1 have very similar badges with a set of four concentric rings. However, there is also great variation in badge styles and motifs within this cemetery, as designs including badges that were: 1) undecorated, 2) had four concentric rings, 3) had two outer concentric rings and a seven pointed star, and 4) a double ring of small bubble like circles. Therefore, it seems that women that shared biological affinities sometimes had similar badge motifs, but not always. While it is possible that women at Bestamak were identifying themselves as part of a kin group based on badge style, it does not seem likely when viewed in the broader context of badge motifs during this period. Similar badge motifs are evident at many different sites during the Middle Bronze Age (Kupriyanova 2008:27-8; Usmanova 2010:92-3), which makes a strong case for the idea that these items were exchanged between communities. Furthermore, some burials contained a set of badges with a broad spectrum of motifs that were likely worn by a single individual as they were recovered in situ (Kupriyanova 2008:70-1; Usmanova 2010:92-3). Recent research of ornamental metals in this region revealed that different portions of the necklace and headdress examined had varying tin content, which afforded a specific sound and color to each item (Hanks et al. in press:13-15). Therefore, trade and exchange for metal items, or related raw materials, was clearly occurring between communities. As this trade seems to focus on items associated with women, there are several possibilities that might have produced this pattern: 1) women were trading between themselves for badges, 2) women were given badges as part of a dowry, 3) women were given badges as part of achieved status in the family based on age, birth of children, or other social events, 4) badges were acquired as part of a pilgrimage, 5) badges were handed down from mother to daughter. Integrated analyses of mortuary assemblages, age, gender, and kinship, allow for the proposal of these options and more.

At Bestamak, hypothetical family groups correlated neither with mortuary remains nor dietary intake. When biological affinities between individuals were identified, they were often buried in a single grave. Similarity in biological affinity between such individuals may indicate a close social relationship between the deceased. This indicates that with more detailed datasets, connectivity between biologically related individuals could be an important factor in burial decisions. However, beyond these paired burials, kinship does not seem to be related to shared identity, status, wealth, or lifeway. Furthermore, kin relationships did not appear to strongly influence and structure mortuary practices within the Bestamak community. The lack of kinship associated patterning as an important part of rituals at Bestamak is surprising, based on ethnographic discussions of Eurasian pastoral groups, which often highlight patrilineal descent and male leadership roles (Krader 1953:534; Vainshtein 1980). The results of this research highlight the necessity of reevaluating interpretations for the Middle Bronze Age that favor such relationships as structuring agents of mortuary ritual. This includes examining connectivity and interaction between individuals and groups in light of broader scale processes in the region.

9.1.2 Late Bronze Age Connectivity: Results from Lisakovsk

The results of research on the Lisakovsk site suggests that connectivity was based on biological divisions of sex and age, as well as kinship relationships. However, little differentiation was evident between individuals based on dietary intake. These are significant findings, as they reveal more substantial evidence of inequality and differentiation in Late Bronze Age groups.

Much of this differentiation is based on wealth and status, which closely mirrors findings for the Middle Bronze Age seen at Bestamak. At Lisakovsk, however, social organization seems significantly related to kinship based on correlations between mortuary rituals and biological affinities, a link that was lacking in the previous period.

Identity and Personhood

Biological age and sex divisions were the source of the majority of differentiation within the Lisakovsk community. These divisions were strongly dependent upon the placement of bronzes and animal remains in burials. Ornamental bronze objects played a large role in the division between the sexes, as the majority of these items were buried with women. Ornamental bronzes include jewelry (rings, bracelets, earrings) that were worn on the body, as well as pendants and badges that were sewn onto clothing or used in headdresses. Ethnographic researchers often depict central Asian women wearing clothing and headdresses embellished with metal objects and coins (Margulan 1986; Levshin 1996; see also Usmanova 2010). Interpretations of these costumes depict them as a ‘wearing of the wealth’ of the family, a symbol of marriage, or evidence of a dowry. Pastoralist ethnographies of Eurasia reveal that wealth and status are also accumulated by women as part of their dowry or bride price (Krader 1953:546; Valikhanov 1964; Abramzon 1978; Vainshtein 1980). Adult women were also buried with a diverse combination of animal remains and ornamental bronzes, which may indicate special status in this society. Mortuary rituals for women were heterogeneous, implying that women may have had comparatively more levels of status than men in this society. In contrast, men were not buried with ornamental bronzes as in the previous periods and instead were buried with animal remains and astragals at Lisakovsk. These include horse, sheep/goat, or both animals in a single burial assemblage. Mortuary rituals for men were generally homogeneous, as they often contained only animal remains.

Age based differentiation was also evident at Lisakovsk, mainly between adults and subadult individuals. Only adults had all three types of animals placed in their burials (horse, cattle, and sheep/goat). In contrast, subadults were buried with only one or two types of animal remains. Furthermore, no subadults (or adult men) were buried with assemblages of both animal remains and ornamental bronzes. Ornamental bronze objects were placed in burials of children and teenagers, but not infants. Inequality is present within both the adult and subadult subgroups, with approximately half of the individuals buried at Lisakovsk lacking animals and bronzes in their assemblages. Therefore, subadult mortuary practices seem to emulate, or mirror, those of adult practices. Individuals recovered with grave goods were split into several groups based on diverse assemblages, and therefore seem heterarchical in nature. These results highlight that biological sex and age were important factors in grave decisions.

Dietary Patterns

In general, dietary intake was very similar for the majority of individuals, as few differences in carbon or nitrogen isotopic values were evident between them. The diet at Lisakovsk consisted mainly of sheep/goat and cattle products, as well as some horse and fish consumption. Only a few individuals were outliers, two with relatively low $\delta^{15}N$ values (10.0‰ and 9.9‰) and four with very high $\delta^{15}N$ values (13.5‰, 13.9‰, 13.1‰, and 14.4‰). Of those with high $\delta^{15}N$ values, two had less negative $\delta^{13}C$ values (-17.5‰ and -17.6‰) than the rest of the group. However, only those with low $\delta^{15}N$ values were found to be significantly different (statistically speaking) from the rest of the community. At Lisakovsk, low nitrogen isotopic values may have been due to a lack of dietary intake of fish or an increase in the consumption of horse meat and milk. The

$\delta^{13}C$ values for these individuals lie outside of the range for C_4 plants such as millet. Only one of these individuals has a known burial assemblage, which included a single ceramic vessel. Furthermore this individual was buried in a ditch, an unusual placement at Lisakovsk. Therefore, the status of this individual is dissimilar, due to the paucity of burial goods, non-traditional placement, and differential dietary intake. As few burial goods were recovered, it is also possible that this individual was buried within the cemetery complex but lived in a later time period than the other individuals in the cemetery.

Biological Affinity

The results of biodistance analyses at Lisakovsk indicate that some groups of phenotypically similar individuals correlate closely with specific artifact classes and with individuals buried together in a single grave pit. Hypothetical family groups were correlated with mortuary assemblages, which revealed that biodistance clusters 1 and 2 were more likely than others to be buried with bronze objects or combinations of bronzes and animal remains. Therefore, there was clear differentiation between groups based on biological affinity. In addition, inequality exists within each hypothetical family group, where some individuals were buried with animals/bronzes while others lack these goods. At Lisakovsk, kinship and biological affinity, as well as forms of inequality based on wealth and status, played an important role in individual identity and social organization.

Connectivity at Lisakovsk

The results of mortuary, isotopic, and biodistance analyses illustrate several types of relationships at Lisakovsk. First, a clear division as evident between adults based on biological sex and their association with ornamental bronzes and animal remains. Second, age-based differentiation was present based on mortuary remains. Third, evidence of inequality occurred between individuals within the same biological sex and age cohorts, which were further delineated by the presence or absence of bronze objects and animal remains in burial assemblages. Fourth, females were distinguished in mortuary contexts by specific items in their assemblages. Finally, kinship appears to have played an important role in mortuary ritual and social differentiation at Lisakovsk as individuals with greater wealth or status were found in the same hypothetical family groups.

These results are interesting, however they are based on small sample sizes and therefore may need to be tested in the future. However, several relationships identified between individuals and objects highlight the types of connectivity and interactions that may have occurred at Lisakovsk. Among adults, there was a clear division between the sexes based on mortuary assemblages, which illustrates how males and females differentially negotiated interactions and had different forms of wealth. Males were often buried with animal remains, which might link them to herding lifeways and serve as evidence of wealth. Herding activities likely included knowledge or materials that were obtained locally and herd animals could easily be used as a form of wealth on the hoof. Males were also more likely to be buried with horse remains, a clear shift from the previous period in which horses occurred more often with females. However, this shift may highlight differences between two local communities separated in time and space, rather than clear trends in human-horse interactions over time.

Female assemblages were extremely diverse, and sometimes contained both animals and bronzes revealing that females may have had a special status in Lisakovsk society. Ornamental bronzes were often buried with females, and included jewelry, pendants, and badges that were worn on the body or affixed to clothing and headdresses. While there was some diversity in the motifs and design of these items, they shared similar basic forms and structures. Ornamental bronzes offer insight into the way that female identities were signaled in this community as well as the ways that communities might have been interacting. Females buried with ornamental bronzes had shared phenotypic traits based on biodistance analysis. However, even among these women, with shared biological affinities, inequality existed based on differential wealth in burial assemblages. As in the previous period, there is great variability in style and motif for bronze objects during the Late Bronze Age (Kupriyanova 2008; Usmanova 2010:92-3). At Lisakovsk, a single individual was buried with bronzes of widely different styles and decorations. Therefore, we can conclude that in this later period, metal items or raw materials were being traded between communities. As little data is available on the procurement and production of metallurgical materials, we cannot currently know the ways that metals were exchanged between individuals and groups. However, the placement of ornamental bronzes shifts from the previous period. In the MBA both adult males and females were buried with these items, while in the LBA only women were placed with these items. This transition in ornamental bronze use may illustrate a shift in the availability of metals, in female identities, or in mortuary rituals.

Inequality at Lisakovsk is evident both between and within groups based on biological age and sex. The unequal distribution of wealth is expressed in bronze objects and animal remains. While women are buried with both of these items, men and subadults are never recovered with both of these in a single assemblage. Furthermore, within these biological categories (i.e. adult male, teen, child, infant) approximately half of the individuals at Lisakovsk lacked both bronzes and animal remains in their burials, and were therefore associated with less wealth or had a lesser status. Furthermore, similar types of inequality were evident among subadults which emulated adult differentiation allowing for interpretations of a form of ascribed status for subadult individuals.

At Lisakovsk, the role of kinship was very important, especially in regard to overall wealth and status. The majority of ornamental bronze objects were recovered from burials of individuals who were phenotypically similar. While bronzes occurred only within two of the hypothetical family groups, not all individuals within these groups were buried with bronzes. It is likely that individuals could only achieve high status or wealth if they were part of certain kinship groups or families. The status of many subadults was likely ascribed rather than achieved, and could be related to the status or wealth of biologically related individuals. Relationships based on kinship were therefore an integral part of the structure of this community, as wealthy or high status individuals were found only within certain biologically affiliated groupings.

9.2 CONCLUSION: CONNECTIVITY AND GLOCALIZATION IN BRONZE AGE NORTH CENTRAL EURASIA

The aim of this dissertation was to examine social and biological connectivity in local communities. This was accomplished through the investigation of identities, social organization, kinship, and dietary intake in two Bronze Age communities. Connectivity is examined through the detailed investigation of local groups via several lines of inquiry including statistical analyses of mortuary rituals, dietary reconstruction via stable isotopic analyses, and biodistance analysis of dentition to examine biological affinities. These lines of evidence illustrate how relationships may have occurred between individuals and groups. In addition, ethnographic literature of pastoral societies provides a foundation for interpretations of prehistoric connectivity and the multiple ways that individuals and groups formed relationships and interacted. The results of these multiple undertakings are thereby employed in a bottom-up approach to reconstruct how local communities navigated broader processes that occurred during contiguous periods of time. This includes the identification of possible pathways for glocalization and the multiple ways that materials, goods, and knowledge flowed.

The multiple manifestations of connectivity and social relationships have already been discussed in the previous section for the Bestamak and Lisakovsk communities, of the Middle and Late Bronze Age respectively. These two periods of time exhibit very different settlement patterns, demographics, and ritual practices. Therefore, they are compared here in order to examine how intensity or control of connectivity changed over time. The goal was to determine possible links between relationships or interactions, on the one hand, and objects or knowledge on the other. What are the underlying reasons for relationships, and could they be due to the attractive forces of objects? Relationships, patterns of exchange, and interaction can be dependent upon material goods, however they also may form based on shared residence, common biological affinities, and the transfer of knowledge. Therefore, in this dissertation I have chosen to focus on both social and biological relationships in local communities to examine changes in connectivity over time. Relationships form the pathways along which objects flow, whether certain goods were the impetus for the formation of connectivity or not. As differential negotiations of pathways by individuals and objects are directly related to agency (Giddens 1984; Dobres and Robb 2000) and materiality (Fahlander and Oestigaard), the creation and maintenance of social relationships impacts the flow of objects between individuals and groups (Urban 2010:214). These results are related to the overall organization of the society. The structure of the community necessarily must be understood relative to identity formation, inequality, kinship, and economic lifeways (Binford 1971:14-15; Chapman et al. 1981:57;

Giddens 1984:84). Each of these plays a part in the organization of a community, and plays a part in the ways that connectivity is structured.

At the Middle Bronze Age site of Bestamak, identities were linked to the ritualization of craft specialization in the burial realm and to the personal status and wealth of the individual. Different types of connectivity occurred between adults, as men were interacting based on activities and labor, while women wore indications of their wealth and status. Males were often buried with items according to occupation, and there was likely specialization in terms of labor. Therefore, men may have built social relationships based on shared activities or on exchange between individuals for specialized materials or objects. While women were connected based on activities associated with wool production and weaving, very few individuals were buried with these items. The majority of women were buried with ornamental bronze badges, which varied greatly in terms of style, color, and sound quality. As these items were worn on the body, social relationships and interactions between women likely occurred in contexts where these items were displayed or exchanged.

Bronze ornamental objects signaled differential status and inequality at Bestamak, but these items were not available to all individuals. Therefore, status was likely achieved, and related to wealth in livestock or metals. Furthermore, as women were the only ones to wear badges there seems to have been some restriction over their use. In contrast to this, other bronze ornamental items were much less strictly controlled and found with women, men, and subadults. The great diversity of context for most ornamental bronzes reveals that these items were probably part of a status related to wealth, the control of which fluctuated in these late prehistoric societies. The basis for differentiation thus was not kinship, as status items were spread equally between each of the hypothetical family groups. Instead, status and wealth inequalities were achieved by adults and then ascribed to children. Ascribed status of children is supported by evidence of double burials that contained individuals with shared biological affinities indicating a close relationship between the deceased. Therefore, familial relationships were a likely impetus for the ascription of status to subadults.

At Lisakovsk, connectivity occurred based not only on biological sex and age, but also kinship relationships. Inequality was present within this community both between men and women, as well as among subadults. Men were buried with animal remains and lacked ornamental bronzes. Therefore, social contacts between men were likely framed around livestock, either as a form of wealth or as a livelihood. In contrast, women were buried with ornamental bronzes as well as animal remains, which seem to indicate that they had a special status. Status or wealth for females was signaled through the display of ornamental bronze objects on clothing and headdresses. In addition, those individuals who had ornamental bronzes in their burials were phenotypically related. Kinship groups seem to form the foundation for the exchange or control of bronze objects. Furthermore, as not everyone in the kin group had bronzes, only a certain subset of individuals who had control or access to these objects. Wealth or status was therefore only accessible to specific individuals based on both kinship and achievement. Therefore, family groups seem to have controlled the basis of connectivity within this community.

9.2.1 Connectivity and Glocalization at the Middle to Late Bronze Age Divide

In this dissertation, connectivity draws on Giddens (1984) and his discussions of the ways societies structure themselves through engagements between individual actors. Furthermore, as Kohring and Wynne-Jones have stated, “we are able to link scales of analysis from a single individual to the social institutions in which they engage, through the process of structuration, in the recursive production of social institutions through daily activity" (2007:7). Social complexity should therefore be thought of as a network, or web of relationships, which are continually negotiated, and re-negotiated at various scales. The only way to understand connectivity is by examining the role of material culture within this network (Kohring and Wynne-Jones 2007). These discussions accord well with efforts to understand links between the local and the global, emphasized by models of glocalization. A model of glocalization explores the ways that individuals, groups, and micro-regions are affected by, and negotiate, broader socializing (integrative) and globalizing (interactive) processes. Glocalization is one way of conceptualizing the effects of intensifying or changing networks of connectivity (Pitts 2008:494).

The majority of scholars who focus on north central Eurasia have discussed the transition from the Middle to Late Bronze Ages in terms of an increase in mobility and interaction. However, few have discussed the Andronovo development of the Late Bronze Age explicitly in regard to the process of globalization, or the trans-societal flow of information, technology, and materials (for exception see Frachetti 2006). While globalization theory has been repeatedly central to arguments in archaeology relating to imperialization and Romanization, it has been overlooked in regions such as north central Eurasia that lack 'core' sites or dominant societies. In regions of multiple 'cores' or those lacking centralization, models of globalization and glocalization are more thoughtful and do not presume dominance of one group over another in interactions occurring between different communities. This idea contrasts with recent work on globalization, which ties the spread of materials to the growth of cities (Jennings 2011:35,41). Instead, more nuanced views of glocalization focus on individual actors and groups in a nonsystematized fashion, and the ways that they differentially negotiate the broader process of globalization.

At the transition from the Middle to Late Bronze Age, changes in patterns of settlement, demography, and ritual occurred. In concert with these changes, forms of connectivity within local groups seem to have changed. This is evidenced by the identities and social structure which were apparent at the sites of Bestamak and Lisakovsk. Mortuary ritual at Bestamak highlighted social status and norms of the community. Identities were linked to the ritualization of craft specialization, as well as the personal status and wealth of the deceased. In contrast, rituals at Lisakovsk were affected by biological affinity, as individuals in certain hypothetical family groups had more evidence of wealth and status. Furthermore, there was a stricter division between the sexes as part of mortuary ritual, with women having more diverse assemblages. The role of kinship relationships greatly transformed, as wealth and status appear to be stressed more in the later period. During these contiguous periods of time, dietary intake and subsistence lifeways seem to have been relatively uniform. While transformations in identity and social structure may be mirrored in other communities throughout the region, detailed statistical analyses of mortuary remains have not been undertaken at the majority of these sites.

Within the broader region, Bestamak and Lisakovsk both make interesting case studies of the way that communities existed in these two very different periods. As discussed previously, the Middle Bronze Age (Bestamak) is a period when aggregated communities formed in the steppe region. There must have been some socialization, or normalization of institutions, in order to ensure stability in these larger pastoral communities. Socialization, explicity, encompasses the rules that govern the flow of materials and knowledge. At times of increased socialization there is more integration within communities, which seems likely for Bestamak. In this community a great number of individuals have bronze objects, and high status is not specific in terms of age or sex. Furthermore, overall wealth and status in the society, based on bronze objects, revealed variable forms of differentiation. Integration is evident in similar burial construction patterns, while kinship relationships are muted.

In contrast, the Late Bronze Age is characterized by a greater number of smaller communities spread over a broader landscape. This period is hypothesized as a time of increased interaction between local groups, evidenced by the spread of similar mortuary patterns and ceramic vessels, but should not be interpreted as a time of integration into a singular cultural 'horizon'. Instead, we may speak of a time of decreased socialization, and increased globalization, when information, ideas, and material goods flowed more freely. During periods of increased globalization, individuals and groups were more likely to exhibit differentiation in terms of personal ornamentation, even though they draw upon similar decorative vocabularies. At the Lisakovsk cemetery, women wore ornaments that linked them to kin groups and residential communities. Furthermore, greater inequality is evident in this cemetery when compared with Bestamak. While interactions may have increased, the ability to obtain and retain certain objects decreased, and the deposition of these items into burial contexts was reduced.

9.2.2 Results and Future Directions

Initial goals of this dissertation were aimed at the investigation of relationships and connectivity conducted through a model of glocalization. Such a bottom-up approach analyzes social structure and organization by focusing on the many ways that individuals, and groups, navigated broader global processes. However, globalization and glocalization have rarely been used to examine prehistoric processes in such a manner, and have thus far been limited in enhancing our understandings of the past. One way to overcome this is to encourage the use of network theory in concert with studies of globalization. Both of these analytical frameworks account for variability of individuals and communities by emphasizing empirical attention on the plethora of distinct agents involved in larger dynamics and processes. Approaches to the archaeological record thus need to take into account datasets that would enhance discussions of glocalization, especially those that fuel network based studies. In essence, this requires detailed community based research that focuses on links (or pathways) between individuals and groups. As part of this dissertation, quantitative analyses were conducted at the local (individual and community) levels in order to understand personal relationships and connectivity at the smallest scale. This dissertation has also demonstrated how the variability of pathways and connectivity are more fully understood through multidisciplinary research focusing on the intersection of social and biological datasets. This dissertation contributes to archaeological modeling through the refinement of our understandings of globalization and exemplification of glocalization processes within local communities. Our understandings of these processes, however, need to include not only local-global interactions, but simultaneously a multi-scalar analysis. An effort was thus also made, though not fully accomplished, to examine micro-regional interactions through the comparison of contemporaneous local groups. In sum, this dissertation aimed to restructure the ways that we analyze local level dynamics, so that in the future we can more aptly address relationships at micro- and macro-scales.

Ethnographic analogy provides a critical middle range between the archaeological data and interpretations of prehistoric behavior. However, the nature of ethnographic data on pastoral populations of the Eurasian steppe is problematic as these studies were often undertaken by Soviet ethnographers, who dealt in broad generalizations or isolated descriptions of small groups

(Bogoraz 1926:129). These biases echo the problems of predominant archaeological investigations that also muffle local understandings with broad assumptions, or construct regional processes out of singular case studies. Furthermore, a focus on Marxist traditions and modes of production are equally problematic (Slezkine 1991:477). Several authors who worked in Kazakhstan based their reports on previous research, spending little to no time living in local communities (e.g. Murdock 1934; Krader 1953, 1955). Therefore, general information on the lives of pastoral peoples in north central Eurasia come from numerous sources, yet these data are not properly contextualized or synthesized and neither do they provide the level of detail necessary to support certain archaeological interpretations.

Future anthropological research in the Eurasian steppe should continue to focus on detailed studies of local communities. An emphasis on multidisciplinary techniques in archaeological studies allow for more holistic interpretations of local groups. Most importantly, broad approaches can only be understood and tested through the use of these detailed datasets. Theories that emphasize examinations of the local and global (regional) are especially pertinent. For the Andronovo development, a distinct focus on globalization should be used and tested in conjunction with network theory modeling. This is one way that connections could be simultaneously examined at the micro- and macro-scale. However, these networks would likely look different based on the data used to inform them, for example ceramic styles might be similar, yet be made locally. This does not deny the exchange of information, only the direct exchange of objects. Furthermore, because individuals in separate communities are exchanging information, this does not mean that they share biological affinities. Therefore, in order to improve our interpretations we must rely on detailed data sets from multiple sources in addition to using critical new theories, such as globalization and glocalization, which are a better fit for the region.

APPENDIX A

MORTUARY ASSEMBLAGE

A.1 BESTAMAK

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Wood	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Ceramic Tube
3500	4	3	1.00	2.21	2.09	4.62	1	1	1	1	1	0
3501 3502	4	3	1.20	2.10	1.28	3.23	0	1	1	1	1	0
3503	0	3	1.40	3.75	2.35	12.34	0	1	3	1	1	0
3504 3572	2	6	1.40	3.75	2.35	12.34	0	2	3	3	1	0
3505 3508	4	2	1.15	3.30	3.20	12.14	1	1	3	1	1	0
3506 3507	4	2	1.00	2.10	1.30	2.73	0	1	3	1	1	0
3509 3510 3511	3	7	1.15	3.30	3.20	12.14	1	1	3	1	1	0
3512 3571	5	4	1.20	4.40	3.00	15.84	0	1	3	1	1	1
3513 3514	4	2	1.30	2.55	2.96	9.81	0	1	3	1	1	0
3515 3516 3517	5	3	0.90	1.10	0.75	0.74	0	1	3	1	1	0

Figure A.1 Mortuary Assemblage: Bestamak

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Wood	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Ceramic Tube
3518	4	3	1.20	2.80	2.25	7.56	1	1	3	1	1	0
3520	0	3	1.20	2.80	2.25	7.56	1	1	3	1	1	0
3521	2	6	0.90	2.25	1.53	3.10	0	1	3	3	1	0
3522	6	3	0.20	1.94	1.22	0.47	0	1	7	3	1	0
3523 3524 3570	4	3	1.20	2.88	2.10	7.26	1	1	5	1	1	0
3526	3	7	1.30	4.20	4.70	25.66	0	1	3	2	1	1
3527	2	6	1.30	4.20	4.70	25.66	0	0	0	3	1	1
3528	6	4	1.40	2.99	2.48	10.38	0	1	4	1	1	0
3529	3	7	1.40	2.90	1.20	4.87	0	1	7	1	1	0
3530 3531	4	2	1.40	3.55	2.80	13.92	0	1	3	1	1	0
3532 3533 3569	5	3	1.04	2.00	1.30	2.70	1	1	5	2	1	0
3534 3535	5	2	1.46	3.40	1.90	9.43	1	1	5	2	1	0
3536	4	3	1.30	4.35	2.57	14.53	0	1	5	1	1	0
3537 3538	5	2	3.05	3.40	3.30	34.22	1	1	3	2	1	0
3539	2	6	2.30	2.10	1.70	8.21	1	1	5	2	1	0
3540 3541 3567	4	3	1.35	3.60	2.70	13.12	1	1	5	2	1	0
3540 3544 3568	4	3	1.35	3.60	2.70	13.12	1	0	0	3	1	0
3542	0	3	1.80	3.50	3.00	18.90	1	1	6	2	1	0
3543	3	7	1.60	3.20	2.60	13.31	1	1	5	2	1	0
3545 3546	4	4	3.30	3.77	3.00	37.32	1	1	5	2	1	0
3547 3548	5	4	1.25	2.14	1.75	4.68	1	3	1	1	1	0
3549	0	3	1.10	3.10	2.10	7.16	1	0	0	3	0	0
3550	0	3	1.10	3.10	2.10	7.16	1	0	0	3	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Wood	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Ceramic Tube
3551	0	3	1.10	3.10	2.10	7.16	1	0	0	3	0	0
3552	0	3	1.10	3.10	2.10	7.16	1	0	0	3	0	0
3553	0	3	1.10	3.10	2.10	7.16	1	0	0	3	0	0
3556	5	2	1.10	3.10	2.10	7.16	1	0	0	3	0	0
3557 3558	4	2	1.40	3.82	2.80	14.97	1	1	3	2	1	0
3559 3560	2	6	1.40	2.55	2.13	7.60	1	1	3	2	1	0
3561	2	6	0.70	1.45	0.80	0.81	0	0	3	3	1	0
3562 3563	4	2	1.00	3.40	2.35	7.99	0	0	0	3	1	0
3564	2	6	1.00	3.40	2.35	7.99	0	0	0	3	1	0
3565 3566	5	4	1.50	2.53	2.00	7.59	1	1	7	1	1	0
3573	4	5	1.6	3.7	3	17.76	1	1	7	3	1	0
3969	0		0.6	2.5	1.6	2.40	0	2	0	1	1	0
3971	0	6.5	1.6	3.7	3	17.76	1	0	0	3	1	0
3973	0	6.5	0.2	1.3	0.65	0.17	0	0	0	3	1	0
3974	0	3	1	3.44	1.8	6.19	1	0	0	3	1	0
3975	0	6.5	0.95	3.44	2.6	8.50	1	0	0	3	1	0
3976	0	6.5	0.75	1.37	1.25	1.28	1	0	0	3	1	0
3977	0	6.5	0.95	1	0.7	0.67	1	0	0	3	1	0
3978	0	6.5	1.6	1.37	1.07	2.35	0	1	5	3	1	0
3980	0	3	3.05	3.4	3.3	34.22	1	1	3	2	1	0
3987	0	6.5	1.35	3.62	1.98	9.68	1	2	3	1	1	0
3988	0	6.5	1.35	3.62	1.98	9.68	1	1	3	0	1	0
3991	0	6.5	1.2	3.82	2.8	12.84	1	2	5	1	1	0
3992	0	6.5	1.2	3.82	2.8	12.84	1	1	5	1	1	0
3996	0		0.5	2.7	2.3	3.11	0	0	0	3	1	0
3997	0	3	0.4	2.5	2.09	2.09	0	0	0	3	1	0
3999	0	6	1.20	2.80	2.25	7.56	1	1	3	3	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic
3500	0	0	0	1	0	0	0	0	0	0	1	0
3501 3502	0	1	1	0	0	0	0	0	0	0	1	1
3503	0	1	0	0	0	0	0	0	0	0	0	0
3504 3572	0	1	1	0	0	0	0	0	0	1	1	0
3505 3508	0	1	1	0	0	0	0	0	0	0	0	1
3506 3507	0	1	1	0	0	0	0	0	0	0	0	0
3509 3510 3511	0	1	1	0	0	0	0	0	0	0	0	0
3512 3571	1	0	0	1	1	1	0	0	0	0	1	0
3513 3514	0	1	0	0	0	0	0	1	1	0	1	1
3515 3516 3517	0	0	0	0	0	0	0	0	0	0	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic
3518	0	1	0	0	0	0	0	0	0	1	0	0
3520	0	0	0	0	0	0	0	0	0	1	0	1
3521	0	0	0	0	0	0	0	0	0	0	0	0
3522	0	0	0	0	0	0	0	0	0	0	0	0
3523 3524 3570	0	1	0	0	0	0	0	0	0	1	1	1
3526	0	0	0	1	0	0	0	0	0	0	1	1
3527	0	0	0	1	0	0	0	0	0	0	1	1
3528	0	1	0	0	0	0	0	0	0	0	0	0
3529	0	0	0	0	0	0	0	0	0	0	1	0
3530 3531	0	1	1	0	0	0	1	0	0	0	0	0
3532 3533 3569	0	0	0	0	0	0	0	0	0	0	0	0
3534 3535	0	1	0	0	0	1	1	1	0	1	1	1
3536	0	0	0	0	0	0	0	0	0	0	0	0
3537 3538	0	1	0	0	0	1	0	0	0	1	0	1
3539	0	1	0	0	0	0	0	0	0	0	0	0
3540 3541 3567	0	0	0	0	0	0	0	0	0	1	1	0
3540 3544 3568	0	0	0	0	0	0	0	0	0	1	1	0
3542	0	1	0	0	0	0	0	0	0	1	0	0
3543	0	1	0	0	0	0	0	0	0	0	1	0
3545 3546	0	0	0	1	0	0	0	0	0	0	1	1
3547 3548	0	0	0	0	0	0	1	0	0	0	1	0
3549	0	0	0	0	0	0	0	0	0	0	1	1
3550	0	0	0	0	0	0	0	0	0	0	1	1

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic
3551	0	0	0	0	0	0	0	0	0	0	1	1
3552	0	0	0	0	0	0	0	0	0	0	1	1
3553	0	0	0	0	0	0	0	0	0	0	1	1
3556	0	0	0	0	0	0	0	0	0	0	1	1
3557 3558	0	1	0	0	0	0	0	0	0	1	0	0
3559 3560	0	1	0	0	0	0	0	1	0	0	0	1
3561	0	0	0	0	0	0	0	0	0	0	0	0
3562 3563	0	0	0	0	0	0	0	0	0	0	0	1
3564	0	0	0	0	0	0	0	0	0	0	0	1
3565 3566	0	1	0	0	0	0	0	0	0	1	0	0
3573	0	0	0	0	0	0	1	0	0	0	1	0
3969	0	0	0	0	0	0	0	0	0	0	0	1
3971	0	0	0	0	0	0	0	0	0	0	0	0
3973	0	0	0	0	0	0	0	0	0	0	0	0
3974	0	1	0	0	0	0	1	0	0	0	1	1
3975	0	1	0	0	0	0	0	0	0	0	0	0
3976	0	1	1	0	0	0	0	0	0	0	0	0
3977	0	1	0	0	0	0	0	0	0	1	0	0
3978	0	1	0	0	0	0	0	0	0	0	0	0
3980	0	1	0	0	0	1	0	0	1	1	0	1
3987	0	0	0	0	1	0	0	0	0	1	1	0
3988	0	0	0	0	1	0	0	0	0	0	1	0
3991	0	1	1	0	0	0	0	0	0	0	0	0
3992	0	0	0	0	0	0	0	0	0	0	0	1
3996	0	0	0	0	0	0	0	0	0	0	0	0
3997	0	0	0	0	0	0	0	0	0	0	0	0
3999	0	0	0	0	0	0	0	0	0	1	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell
3500	0	0	0	1	0	0	0	0	0	0	0	0
3501 3502	1	0	0	0	0	0	0	0	0	0	1	0
3503	0	0	1	1	0	1	1	0	0	0	0	0
3504 3572	0	0	0	1	0	0	1	0	0	0	0	0
3505 3508	0	0	0	1	0	0	0	1	1	1	1	0
3506 3507	0	0	0	0	1	1	0	0	0	0	0	0
3509 3510 3511	0	0	0	0	0	0	0	0	0	0	0	0
3512 3571	1	0	0	0	0	1	0	0	0	0	0	0
3513 3514	0	0	0	0	0	0	0	0	1	0	0	1
3515 3516 3517	0	0	1	0	0	0	0	0	0	0	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell
3518	0	0	0	0	0	0	0	0	0	0	0	0
3520	0	0	0	0	0	0	0	0	0	0	0	0
3521	0	0	0	0	0	1	0	0	0	0	0	0
3522	0	0	0	0	0	0	0	0	0	0	0	0
3523 3524 3570	1	0	0	0	0	0	0	0	0	0	0	0
3526	1	1	0	1	0	0	1	0	1	0	0	0
3527	1	1	0	1	0	0	1	0	1	0	0	0
3528	0	0	0	0	0	1	0	0	0	0	0	0
3529	1	1	0	1	0	0	0	0	0	0	0	0
3530 3531	0	0	0	1	0	0	0	0	0	0	0	0
3532 3533 3569	0	0	0	0	1	1	0	0	0	0	0	0
3534 3535	0	0	0	1	0	1	0	0	0	0	0	0
3536	0	0	0	1	0	0	0	0	0	0	0	0
3537 3538	1	0	0	0	1	1	0	1	1	0	0	0
3539	0	0	0	1	0	1	0	0	1	0	1	0
3540 3541 3567	0	1	0	0	0	0	0	1	0	0	0	0
3540 3544 3568	0	1	0	0	0	0	0	1	0	0	0	0
3542	0	0	0	0	0	0	0	0	0	0	0	0
3543	0	0	0	0	1	0	0	0	0	0	0	0
3545 3546	1	1	0	0	1	1	0	0	0	0	0	0
3547 3548	1	1	0	0	1	1	1	0	0	0	0	0
3549	0	1	0	1	0	1	0	0	0	0	0	0
3550	0	1	0	1	0	1	0	0	0	0	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell
3551	0	1	0	1	0	1	0	0	0	0	0	0
3552	0	1	0	1	0	1	0	0	0	0	0	0
3553	0	1	0	1	0	1	0	0	0	0	0	0
3556	0	1	0	1	0	1	0	0	0	0	0	0
3557 3558	0	1	0	1	0	1	0	0	0	0	1	0
3559 3560	0	0	0	1	0	0	0	0	0	0	0	0
3561	0	0	0	0	0	1	0	0	0	0	0	0
3562 3563	0	0	0	0	0	1	0	0	0	0	0	0
3564	0	0	0	0	0	1	0	0	0	0	0	0
3565 3566	0	0	0	0	0	0	0	0	0	0	0	0
3573	1	1	0	1	1	0	0	0	0	0	0	0
3969	1	1	0	0	0	0	0	0	0	0	0	0
3971	0	0	0	0	0	0	0	0	0	0	0	0
3973	0	0	0	1	0	0	0	0	0	0	0	0
3974	1	0	1	1	0	0	0	0	0	0	0	0
3975	0	0	0	0	0	0	0	0	0	0	0	0
3976	1	0	0	0	0	0	0	0	0	0	0	0
3977	0	0	0	0	0	1	0	1	0	0	0	0
3978	0	0	0	0	0	1	0	1	0	0	0	0
3980	1	0	0	0	1	1	0	1	1	0	1	0
3987	0	0	0	0	0	0	0	0	0	0	0	0
3988	0	1	0	0	1	0	0	0	0	0	0	0
3991	0	0	0	0	0	0	0	0	0	0	0	0
3992	0	0	0	0	0	0	0	0	0	0	0	0
3996	0	0	0	0	0	0	0	0	0	0	0	0
3997	0	0	0	0	0	0	0	0	0	0	0	0
3999	0	0	0	0	0	0	0	0	0	0	0	0

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	Bronze Mirror	Bronze Sickle	Bronze Hook	Other Bronze	Total Bronze	Total Artifact Count
3500	0	0	1	0	0	0	0	0	1	13
3501 3502	0	1	0	0	0	0	0	1	15	50
3503	1	0	0	0	0	0	0	0	2	15
3504 3572	0	1	1	1	0	0	0	0	11	31
3505 3508	1	1	0	1	0	0	0	1	50	107
3506 3507	0	0	0	0	0	0	0	0	7	36
3509 3510 3511	0	1	1	0	0	0	0	1	10	66
3512 3571	0	0	1	0	0	0	0	0	4	28
3513 3514	0	1	0	0	0	0	0	0	8	92
3515 3516 3517	0	0	0	0	0	0	0	0	1	3

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	Bronze Mirror	Bronze Sickle	Bronze Hook	Other Bronze	Total Bronze	Total Artifact Count
3518	1	1	1	0	0	0	0	0	30	48
3520	1	0	0	0	0	0	0	0	4	67
3521	0	0	0	0	0	0	0	0	1	11
3522	0	0	0	0	0	0	0	0	0	3
3523 3524 3570	0	0	0	0	0	0	0	1	8	25
3526	0	1	0	1	0	0	0	1	51	154
3527	0	1	0	1	0	0	0	1	51	154
3528	0	1	0	1	0	0	0	0	13	21
3529	1	0	1	0	0	0	0	0	45	57
3530 3531	0	1	1	1	0	0	0	1	132	166
3532 3533 3569	0	0	0	0	0	0	0	0	3	8
3534 3535	0	0	0	0	0	1	0	1	12	53
3536	0	0	0	0	0	0	0	0	4	14
3537 3538	0	1	0	0	0	0	0	0	6	60
3539	0	0	0	0	0	0	0	0	2	13
3540 3541 3567	1	0	1	0	0	0	0	0	6	25
3540 3544 3568	1	0	1	0	0	0	0	0	6	25
3542	0	1	0	0	0	0	0	1	9	65
3543	0	0	0	0	0	0	0	1	5	21
3545 3546	0	0	0	0	0	0	0	0	6	34
3547 3548	0	0	0	0	0	0	0	1	3	40
3549	0	0	0	0	0	0	0	0	0	21
3550	0	0	0	0	0	0	0	0	0	21

Figure A.1 Mortuary Assemblage: Bestamak (continued)

Sample Number	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	Bronze Mirror	Bronze Sickle	Bronze Hook	Other Bronze	Total Bronze	Total Artifact Count
3551	0	0	0	0	0	0	0	0	0	21
3552	0	0	0	0	0	0	0	0	0	21
3553	0	0	0	0	0	0	0	0	0	21
3556	0	0	0	0	0	0	0	0	0	21
3557 3558	1	1	0	0	0	0	0	0	11	29
3559 3560	0	0	0	1	0	0	0	0	3	77
3561	0	0	0	0	0	0	0	0	0	65
3562 3563	0	0	0	0	0	0	0	1	1	11
3564	0	0	0	0	0	0	0	1	1	11
3565 3566	0	1	0	1	0	1	0	0	26	71
3573	0	0	0	0	0	1	1	0	6	34
3969	0	0	0	0	0	0	0	0	4	9
3971	0	0	0	0	0	0	0	0	1	2
3973	0	0	0	0	0	0	0	0	0	3
3974	1	0	0	1	0	1	1	1	18	56
3975	0	0	0	0	0	0	0	0	0	7
3976	1	1	0	1	1	0	0	0	96	187
3977	0	0	0	0	0	0	0	0	4	15
3978	0	0	0	0	0	0	0	0	1	13
3980	0	1	0	0	0	0	0	0	5	44
3987	1	1	1	1	0	0	0	1	152	235
3988	0	0	0	0	0	0	0	1	12	58
3991	1	1	0	1	0	0	0	0	9	19
3992	0	0	0	0	0	0	0	1	5	9
3996	0	0	0	0	0	0	0	0	0	4
3997	0	0	0	0	0	0	0	0	0	1
3999	0	1	0	0	0	0	0	0	2	23

Figure A.1 Mortuary Assemblage: Bestamak (continued)

APPENDIX B

MORTUARY ASSEMBLAGE

B.1 LISAKOVSK

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Inhumation /Cremation	Stone Enclosure	Ditch	Number of Burials	Wood	Burial Location
3001 3186	5	3	120	250	130	3.90	1	5	1	6	1	4
3002	2	6	100	110	55	0.61	1	5	2	1	0	4
3003	2	6	135	170	100	2.30	1	1	1	6	0	3
3004	0	3	130	275	140	5.01	1	5	2	1	1	4
3005 3006	0	3	170	270	190	8.72	1	5	5	0	0	4
3009	2	6	95	240	125	2.85	2	4	1	0	0	4
3010	0	3					2	0	1	0	0	1
3011	0	3	135	200	170	4.59	2	1	1	0	0	1
3018 3019	0	3	70	200	170	2.38	2	4	1	0	0	4
3020	3	7	110	250	180	4.95	2	4	1	0	0	4
3024 3025	4	3	95	240	125	2.85	1	4	1	0	0	4
3027	0	3	80	200	145	2.32	2	4	2	0	0	4
3029	2	6	70	150	80	0.84	1	5	1	6	0	4
3031	2	6	65	150	68	0.66	1	1	1	6	0	4
3036	0	3	120	140	125	2.10	1	1	1	0	1	1
3040	2	6	25	100	90	0.23	1	5	4	6	0	4

Figure B.1 Mortuary Assemblage: Lisakovsk

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Inhumation /Cremation	Stone Enclosure	Ditch	Number of Burials	Wood	Burial Location
3041 3042	2	6	25	150	120	0.45	1	5	3	1	0	4
3043	2	6	40	60	40	0.10	2	5	4	6	0	4
3048	1	6	30	120	60	0.22	2	3	3	1	0	4
3049 3050	6	3	55	200	120	1.32	1	5	4	6	0	4
3051	2	6	50	210	130	1.37	1	4	5	1	0	4
3052	2	6	50	210	130	1.37	1	4	5	0	0	4
3053 3054	2	6	70	190	100	1.33	2	5	4	6	0	4
3055	4	3	40	200	120	0.96		4	5	1	0	4
3057 3058	2	6	120	250	150	4.50	1	0	5	0	0	4
3059 3060	2	6	50	150	100	0.75	1	5	4	6	0	4
3061 3062	2	6	50	150	100	0.75	1	5	4	6	0	4
3063	2	6	120	250	150	4.50	1	0	5	0	1	4
3064	3	7	120	250	150	4.50	1	0	5	0	1	4
3066 3067 3068	0	3	70	270	160	3.02	2	5	3	1	1	4
3070	4	3	60	250	150	2.25	1	5	4	6	0	4
3072	0	3	100	200	170	3.40	1				0	0
3081	5	3	70	320	250	5.60	1	5	5	1	0	4
3082	1	6	85	65	50	0.28	1	5	5	1	0	3
3083 3084 3085 3086	5	3	100	350	200	7.00	1	2	4	0	0	4
3087 3088	3	7	75	280	200	4.20		5	5	0	1	4
3089 3090 3091	4	3	60	200	120	1.44	1	2	3	2	1	4

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Inhumation /Cremation	Stone Enclosure	Ditch	Number of Burials	Wood	Burial Location
3092 3093	4	3	95	260	150	3.71	1	2	3	2	0	4
3094	1	6	55	100	90	0.50	1	2	3	2	1	4
3095 3096 3097	3	7	110	200	120	2.64	1	0	2	0	0	1
3098 3099	3	7	110	200	120	2.64	1	0	2	0	0	1
3100	0	6	60	80	40	0.19	2	0	1	0	0	1
3101	3	7	98	240	100	2.35	1	0	2	0	0	1
3102	4	3	80	250	120	2.40	1	0	2	0	0	1
3103	1	6	80	250	120	2.40	1	0	2	0	0	1
3105	0	3	125	200	150	3.75	1	5	5	0	1	4
3106 3107	3	7	85	210	130	2.32	1	5	0	1	0	4
3108 3109	0	0	45	80	55	0.20	2	0	1	0	0	1
3114	2	6	70	160	120	1.34	1	0	1	1	0	1
3116 3117	1	6	75	100	55	0.41	1	0	1	0	0	1
3119	0	0	50	130	80	0.52	1	2	1	0	0	1
3120	0	0	130	220	170	4.86	2	3	1	0	0	4
3126 3127	0	3	100	270	180	4.86	2	5	1	1	0	4
3128 3129	0	0	210	215	175	7.90	2	4	5	0	1	4
3131	0	0	133	225	100	2.99	2	4	3	1	0	4
3132	0	0	133	175	100	2.33	2	4	3	1	0	4
3135	4	3	120	260	140	4.37	1				1	0
3136	2	6	120	260	140	4.37	1				1	0
3137	6	5	190	190	120	4.33	1	5	1	0	0	4
3141	2	6	170	275	200	9.35	1	4	5	1	1	4
3142 3143 3144	4	3	135	275	200	7.43	1	4	5	1	1	4
3148	4	3	165	240	140	5.54	1	5	0	1	0	4
3149	2	6	95	300	230	6.56	1	4	2	2	0	4
3150	4	1	110	200	165	3.63	1	5	2	0	1	4

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Sample Number	Age	Sex	Depth of Burial Pit	Length of Burial Pit	Width of Burial Pit	Total C^3 of Burial Pit	Inhumation /Cremation	Stone Enclosure	Ditch	Number of Burials	Wood	Burial Location
3152	4	3	240	325	300	23.40	1	5	1	0	1	4
3153 3154	4	3	240	325	300	23.40	1	5	1	0	1	4
3157	2	6	100	80	50	0.40	1	4	2	2	0	4
3158 3166	2	6	100	80	50	0.40	1	4	2	2	0	4
3160	4	1	95	300	230	6.56	1	4	2	2	0	4
3163	0	3	100				1	0	1	0	0	1
3165	5	5	170	220	140	5.24	1	1	1	0	1	1
3169	1	6	170	380	200	12.92	1	1	1	0	1	4
3170	5	5	90	230	140	2.90	1	4	2	2	0	4
3172	4	5	95	300	230	6.56	1	4	2	2	0	4
3173 3174	5	5	90	230	140	2.90	1	4	2	2	0	4
3178 3179	4	3	90	90	60	0.49	1	0	4	2	0	2
3180 3181	2	6	55	120	70	0.46	1	0	4	2	0	1
3182	0	3	105	290	180	5.48	2	3	4	0	1	4
3183	0	0	200	250	180	9.00	1	2	5	0	0	4
3187 3038	2	6	110	85	60	0.56	1	0	1	6	0	1
4001	0	0	40	120	60	0.29	1	5	4	6	0	4
4002	0	0	40	200	120	0.96	1	3	3	1	0	4
4003	0	0	30	180	110	0.59	1	2	1	0	0	1
4004	0	3	100	70	60	0.42	1	1	1	0	1	1
4005	0	0	85	300	240	6.12	1	4	4	0	1	1
4009	0	0	100	160	90	1.44	2	5	1	1	0	3
4010	0	0	120	240	130	3.74	3	4	5	1	0	4

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Flat Ceramic	Ceramic Tube	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl
3001	0	0	3	1	0	0	0	0	0	0	0	0
3002	1	3	1	0	0	0	0	0	0	0	0	0
3003	1	3	1	1	0	0	0	1	0	0	0	0
3004	1	7	0	1	0	0	0	0	0	0	0	0
3005	1	3	0	0	0	0	0	0	0	0	0	0
3009	1	0	3	1	0	0	0	1	0	0	0	0
3010	0	0	3	1	0	0	0	0	0	0	0	0
3011	0	0	3	1	0	0	0	0	0	0	0	0
3018	0	0	3	1	0	0	0	0	0	0	0	0
3020	0	0	3	1	0	0	0	0	0	0	0	0
3024	1	0	3	1	0	0	0	0	0	0	0	0
3027	0	0	3	0	0	0	0	0	0	0	0	0
3029	2	3	3	1	0	0	0	0	0	0	0	0
3031	1	3	1	1	0	0	0	0	0	0	0	0
3036	0	0	3	0	0	0	0	0	0	0	0	0
3040	1	5	3	1	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Flat Ceramic	Ceramic Tube	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl
3041	0	0	3	1	0	0	0	0	0	0	0	0
3043	0	0	3	1	0	0	0	0	0	0	0	0
3048	0	0	3	0	0	0	0	0	0	0	0	0
3049	0	3	3	1	0	0	0	1	0	0	0	0
3051	0	0	3	1	0	0	0	0	0	0	0	0
3052	0	0	3	1	0	0	0	0	0	0	0	0
3053	0	0	3	1	0	0	0	0	0	0	0	0
3055	0	0	3	0	0	0	0	1	0	0	0	0
3057	0	0	3	0	0	0	0	0	0	0	0	0
3059	1	2	3	1	0	0	0	0	0	0	0	0
3061	1	2	3	1	0	0	0	0	0	0	0	0
3063	0	0	3	1	0	0	0	1	0	0	0	0
3064	0	0	3	1	0	0	0	1	0	0	0	0
3066	0	0	3	1	0	0	0	0	0	0	0	0
3070	0	0	3	1	0	0	0	1	0	0	0	0
3072	0	0	3	1	0	0	0	0	0	0	0	0
3081	0	0	3	1	0	0	0	0	0	0	0	0
3082	1	5	3	1	0	0	0	0	0	0	0	0
3083	0	0	3	0	0	0	0	0	0	0	0	0
3087	0	0	3	1	0	0	0	1	0	0	0	0
3089	0	0	3	1	0	0	0	1	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Flat Ceramic	Ceramic Tube	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl
3092	1	5	0	1	0	0	0	1	0	0	0	0
3094	1	0	1	0	0	0	0	1	0	0	0	0
3095	2	3	1	1	0	0	0	0	0	0	0	0
3098	1	3	0	0	0	0	0	1	0	0	0	0
3100	0	0	3	1	0	0	0	1	0	0	0	0
3101	0	0	3	1	0	0	0	0	0	0	0	0
3102	0	0	3	1	0	0	0	0	0	0	0	0
3103	0	0	3	1	0	0	0	0	0	0	0	0
3105	0	0	3	1	0	0	0	0	0	0	0	0
3106	1	3	1	1	0	0	0	0	0	0	0	0
3109	0	0	3	1	0	0	0	0	0	0	0	0
3114	1	7	3	1	0	0	0	0	0	0	0	0
3116	1	3	1	1	0	0	0	0	0	0	0	0
3119	0	0	3	1	0	0	0	0	0	0	0	0
3120	0	0	3	1	0	0	0	0	0	0	0	0
3127	0	0	3	1	0	0	0	0	0	0	0	0
3129	0	0	3	1	0	0	0	0	0	0	0	0
3131	0	0	3	1	0	0	0	0	0	0	0	0
3132	0	0	3	1	0	0	0	0	0	0	0	0
3135	0	0	3	1	0	0	0	1	0	0	0	0
3136	0	0	3	1	0	0	0	1	0	0	0	0
3137	3	3	0	0	0	0	0	0	0	0	0	0
3141	0	0	3	1	0	0	0	0	0	0	0	0
3142	0	0	3	1	0	0	0	0	0	0	0	0
3148	1	7	1	1	0	0	0	0	0	0	0	0
3149	1	7	0	1	0	0	0	0	0	0	0	0
3150	0	0	3	1	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Lain on Side	Direction of Head	Flexed	Ceramic Vessel	Flat Ceramic	Ceramic Tube	Ceramic Mold	Ceramic Bead	Bone Bead	Bone Cheekpiece	Bone Projectile Point	Bone Spindlewhorl
3152	1	7	1	1	0	0	0	0	0	0	0	0
3153	1	7	1	1	0	0	0	1	0	0	0	0
3157	0	0	3	0	0	0	0	1	0	0	0	0
3158	0	0	3	0	0	0	0	1	0	0	0	0
3160	2	7	1	1	0	0	0	1	0	0	0	0
3163	2	2	3	1	0	0	0	0	0	0	0	0
3165	1	3	1	1	0	0	0	0	0	0	0	0
3169	0	0	3	0	0	0	0	0	0	0	0	0
3170	1	7	0	0	0	0	0	0	0	0	0	0
3172	1	7	0	1	0	0	0	0	0	0	0	0
3173	1	7	0	1	0	0	0	0	0	0	0	0
3178	0	0	3	1	0	0	0	0	0	0	0	0
3180	1	3	2	1	0	0	0	0	0	0	0	0
3182	0	0	3	1	0	0	0	0	1	0	0	0
3183	0	0	3	1	0	0	0	0	0	0	0	0
3187	1	5	3	1	0	0	0	0	0	0	0	0
4001	0	3	3	1	0	0	0	0	0	0	0	0
4002	0	0	3	1	0	0	0	0	0	0	0	0
4003	0	0	3	0	0	0	0	0	0	0	0	0
4004	0	0	3	0	0	0	0	0	0	0	0	0
4005	0	0	3	1	0	0	0	0	0	0	0	0
4009	0	0	3	1	0	0	0	0	0	0	0	0
4010	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat
3001	0	0	0	0	0	0	0	0	0	0	0	0
3002	0	0	0	0	0	0	0	0	0	0	0	0
3003	0	0	0	0	0	0	0	0	0	0	0	0
3004	0	0	0	0	0	0	0	0	0	0	0	1
3005	0	0	0	0	0	0	0	0	0	0	1	0
3009	0	0	0	0	0	0	0	0	0	0	0	0
3010	0	0	0	0	0	0	0	0	0	0	0	0
3011	0	0	0	0	0	0	0	0	0	0	0	0
3018	0	0	0	0	0	0	0	0	0	0	0	0
3020	0	0	0	0	0	0	0	0	0	0	0	0
3024	0	0	0	0	0	0	0	0	0	0	0	0
3027	0	0	0	0	0	0	0	0	0	0	0	0
3029	0	0	0	0	0	0	0	0	0	0	1	0
3031	0	0	0	0	0	0	0	0	0	0	0	0
3036	0	0	0	0	0	0	0	0	0	0	0	0
3040	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat
3041	0	0	0	0	0	0	0	0	0	1	0	0
3043	0	0	0	0	0	0	0	0	0	0	0	0
3048	0	0	0	0	0	0	0	0	0	0	0	0
3049	0	0	0	0	0	0	0	0	0	0	0	0
3051	0	0	0	0	0	0	0	0	0	0	0	0
3052	0	0	0	0	0	0	0	0	0	0	0	0
3053	0	0	0	0	0	0	0	0	0	0	0	0
3055	0	0	0	0	0	0	0	0	0	1	0	0
3057	0	0	0	0	0	0	0	0	0	0	0	0
3059	0	0	0	0	0	0	0	0	0	0	0	1
3061	0	0	0	0	0	0	0	0	0	0	0	1
3063	0	0	0	0	0	0	0	0	1	0	0	0
3064	0	0	0	0	0	0	0	0	1	0	0	0
3066	0	0	0	0	0	0	0	0	0	1	0	0
3070	0	0	0	0	0	0	0	0	0	0	1	1
3072	0	0	0	0	0	0	0	0	0	0	0	0
3081	0	0	0	0	0	0	0	0	0	0	0	0
3082	0	0	0	0	0	0	0	0	0	0	0	0
3083	0	0	0	0	0	0	0	0	0	0	0	0
3087	0	0	0	0	0	0	0	0	0	0	0	0
3089	0	0	0	0	0	0	0	0	0	0	0	1

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat
3092	0	0	0	0	0	0	0	0	0	0	0	0
3094	0	0	0	0	0	0	0	0	0	0	1	0
3095	0	0	0	0	0	0	0	0	0	0	0	0
3098	0	0	0	0	0	0	0	0	0	0	0	0
3100	0	0	0	0	0	1	0	0	0	0	0	0
3101	0	0	0	0	0	0	0	0	0	0	0	0
3102	0	0	0	0	0	0	0	0	0	0	0	0
3103	0	0	0	0	0	0	0	0	0	0	0	0
3105	0	0	0	0	0	0	0	0	0	0	0	0
3106	0	0	0	0	0	0	0	0	0	0	0	0
3109	0	0	0	0	0	0	0	0	0	0	0	0
3114	0	0	0	0	0	0	0	0	0	0	0	0
3116	0	0	0	0	0	0	0	0	0	0	0	0
3119	0	0	0	0	0	0	0	0	0	0	0	0
3120	0	0	0	0	0	0	0	0	0	0	0	0
3127	0	0	0	0	0	0	0	0	0	0	0	0
3129	0	0	0	0	0	0	0	0	0	0	0	0
3131	0	0	0	0	0	0	0	0	0	0	0	0
3132	0	0	0	0	0	0	0	0	0	0	0	0
3135	0	0	0	0	0	0	0	0	0	1	0	1
3136	0	0	0	0	0	0	0	0	0	1	0	1
3137	0	0	0	0	0	0	0	0	0	1	0	0
3141	0	0	0	0	0	0	0	0	0	0	0	0
3142	0	0	0	0	0	0	0	0	0	0	0	0
3148	0	0	0	0	0	0	0	0	0	1	1	1
3149	0	0	0	0	0	0	0	0	0	1	0	1
3150	0	0	0	0	0	0	0	0	0	0	0	1

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bone Tool	Bone Awl	Stone Awl	Stone Bead	Stone Projectile Pint	Lithic	Groundstone	Groundstone Metate	Groundstone Topor	Horse	Cow	Sheep or Goat
3152	0	0	0	0	0	0	0	0	0	1	1	1
3153	0	0	0	1	0	0	0	0	0	1	1	1
3157	0	0	0	0	0	0	0	0	0	0	0	0
3158	0	0	0	0	0	0	0	0	0	0	0	0
3160	0	0	0	0	0	0	0	0	0	1	0	1
3163	0	0	0	0	0	1	0	0	0	0	0	0
3165	0	0	0	0	0	0	0	0	0	1	0	1
3169	0	0	0	0	0	0	0	0	0	0	1	1
3170	0	0	0	0	0	0	0	0	0	0	0	1
3172	0	0	0	0	0	0	0	0	0	1	0	1
3173	0	0	0	0	0	0	0	0	0	0	0	0
3178	0	0	0	0	0	0	0	0	0	0	0	0
3180	0	0	0	0	0	0	0	0	0	0	0	0
3182	0	0	0	0	0	0	0	0	0	0	0	0
3183	0	0	0	0	0	0	0	0	0	0	0	0
3187	0	0	0	0	0	0	0	0	0	0	0	0
4001	0	0	0	0	0	0	0	0	0	0	0	0
4002	0	0	0	0	0	0	0	0	0	0	0	0
4003	0	0	0	0	0	0	0	0	0	0	0	0
4004	0	0	0	0	0	0	0	0	0	0	0	0
4005	0	0	0	0	0	0	0	0	0	1	0	0
4009	0	0	0	0	0	0	0	0	0	0	0	0
4010	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell	Astragal	Ore	Slag	Bronze Knife	Bronze Axe	Bronze Bracelet
3001	0	0	0	0	0	0	0	0	0	0	0	0
3002	0	0	0	0	0	0	1	0	0	0	0	0
3003	0	0	0	0	0	1	0	0	0	0	0	1
3004	0	0	0	0	0	0	0	0	0	0	0	0
3005	0	0	0	0	0	0	1	0	0	0	0	0
3009	0	0	0	0	0	0	0	0	0	0	0	0
3010	0	0	0	0	0	0	0	0	0	0	0	0
3011	0	0	0	0	0	0	0	0	0	0	0	0
3018	0	0	0	0	0	0	0	0	0	0	0	0
3020	0	0	0	0	0	0	0	0	0	0	0	0
3024	0	0	0	0	0	0	0	0	0	0	0	0
3027	0	0	0	0	0	0	0	0	0	0	0	0
3029	0	0	0	0	0	1	0	0	0	0	0	0
3031	0	0	0	0	0	0	0	0	0	0	0	0
3036	0	0	0	0	0	0	0	0	0	0	0	0
3040	0	0	0	0	0	1	0	0	0	0	0	1

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell	Astragal	Ore	Slag	Bronze Knife	Bronze Axe	Bronze Bracelet
3041	0	0	0	0	0	0	0	0	0	0	0	0
3043	0	0	0	0	0	0	0	0	0	0	0	0
3048	0	0	0	0	0	0	0	0	0	0	0	0
3049	0	0	0	0	0	0	0	0	0	0	0	0
3051	0	0	0	0	0	0	1	0	0	0	0	0
3052	0	0	0	0	0	0	1	0	0	0	0	0
3053	0	0	0	0	0	0	0	0	0	0	0	1
3055	0	0	0	0	0	0	0	0	0	0	0	0
3057	0	0	0	0	0	0	0	0	0	0	0	0
3059	0	0	0	0	0	0	1	0	0	0	0	0
3061	0	0	0	0	0	0	1	0	0	0	0	0
3063	0	0	0	0	0	0	0	0	0	0	0	0
3064	0	0	0	0	0	0	0	0	0	0	0	0
3066	0	0	0	0	0	0	0	0	0	0	0	0
3070	0	0	0	0	0	0	0	0	0	0	0	0
3072	0	0	0	0	0	0	0	0	0	0	0	0
3081	0	0	0	0	0	0	0	0	0	0	0	0
3082	0	0	0	0	0	0	0	0	0	0	0	0
3083	0	0	0	0	0	0	0	0	0	0	0	0
3087	0	0	0	0	0	0	1	0	0	0	0	0
3089	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell	Astragal	Ore	Slag	Bronze Knife	Bronze Axe	Bronze Bracelet
3092	0	0	0	0	0	0	0	0	0	0	0	1
3094	0	0	0	0	0	0	0	0	0	0	0	0
3095	0	0	0	0	0	1	0	0	0	0	0	0
3098	0	0	0	0	0	0	0	0	0	0	0	1
3100	0	0	0	0	0	0	0	0	0	0	0	0
3101	0	0	0	0	0	0	0	0	0	0	0	0
3102	0	0	0	0	0	1	0	0	0	0	0	0
3103	0	0	0	0	0	1	0	0	0	0	0	0
3105	0	0	0	0	0	0	0	0	0	0	0	0
3106	0	0	0	0	0	0	0	0	0	0	0	0
3109	0	0	0	0	0	0	0	0	0	0	0	0
3114	0	0	0	0	0	0	0	0	0	0	0	1
3116	0	0	0	0	0	0	0	0	0	0	0	0
3119	0	0	0	0	0	0	0	0	0	0	0	0
3120	0	0	0	0	0	0	0	0	0	0	0	0
3127	0	0	0	0	0	0	0	0	0	0	0	0
3129	0	0	0	0	0	0	0	0	0	0	0	0
3131	0	0	0	0	0	0	0	0	0	0	0	0
3132	0	0	0	0	0	0	0	0	0	0	0	0
3135	0	0	0	0	0	0	0	0	0	0	0	0
3136	0	0	0	0	0	0	0	0	0	0	0	0
3137	0	0	0	0	0	0	0	0	0	0	0	0
3141	0	0	0	0	0	0	0	0	0	0	0	0
3142	0	0	0	0	0	0	0	0	0	0	0	0
3148	0	0	0	0	1	0	1	0	0	0	0	0
3149	0	0	0	0	0	0	0	0	0	0	0	0
3150	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Pig	Dog	Fox	Wolf	Other Animal Teeth	Shell	Astragal	Ore	Slag	Bronze Knife	Bronze Axe	Bronze Bracelet
3152	0	0	0	0	0	0	0	0	0	1	0	0
3153	0	0	0	0	0	0	0	0	0	1	0	1
3157	0	0	0	0	0	0	0	0	0	0	0	0
3158	0	0	0	0	0	0	0	0	0	0	0	0
3160	0	0	0	0	0	0	0	0	0	0	0	1
3163	0	0	0	0	0	0	0	0	0	0	0	0
3165	0	0	0	0	0	1	0	0	0	0	0	0
3169	0	0	0	0	0	0	0	0	0	0	0	0
3170	0	0	0	0	0	0	0	0	0	0	0	0
3172	0	0	0	0	0	0	0	0	0	0	0	0
3173	0	0	0	0	0	0	0	0	0	0	0	0
3178	0	0	0	0	0	0	0	0	0	0	0	0
3180	0	0	0	0	0	0	0	0	0	0	0	0
3182	0	0	0	0	0	0	0	0	0	0	0	0
3183	0	0	0	0	0	0	0	0	0	0	0	0
3187	0	0	0	0	0	0	0	0	0	0	0	0
4001	0	0	0	0	0	0	0	0	0	0	0	0
4002	0	0	0	0	0	0	0	0	0	0	0	0
4003	0	0	0	0	0	0	0	0	0	0	0	0
4004	0	0	0	0	0	0	0	0	0	0	0	0
4005	0	0	0	0	0	0	0	0	0	0	0	0
4009	0	0	0	0	0	0	0	0	0	0	0	0
4010	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bronze Earring	Bronze Ring	Bronze Staple	Bronze Clamp	Bronze Needle	Bronze Awl	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	OtherBrnz	Total Bronze	Total Artifact Count
3001	1	0	0	0	0	0	1	1	0	1	0	5	8
3002	0	0	0	0	0	0	0	0	0	0	0	0	5
3003	1	0	0	0	0	0	0	0	0	1	0	7	12
3004	0	0	0	0	0	0	0	0	0	0	0	0	3
3005	0	0	0	0	0	0	0	0	0	0	0	0	15
3009	0	0	0	1	0	0	0	0	0	1	0	4	10
3010	0	0	0	0	0	0	0	0	0	0	0	0	1
3011	0	0	0	0	0	0	0	0	0	0	0	0	3
3018	0	0	0	0	0	0	0	0	0	0	0	0	1
3020	0	0	0	0	0	0	0	0	0	0	0	0	1
3024	0	0	0	1	0	0	0	0	0	1	0	4	8
3027	0	0	0	0	0	0	0	0	0	0	0	0	0
3029	0	1	0	1	0	0	1	1	0	1	0	15	21
3031	0	0	0	0	0	0	0	0	0	0	0	0	2
3036	0	0	0	0	0	0	0	0	0	0	0	0	0
3040	1	0	0	0	0	0	0	0	0	1	0	6	10

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bronze Earring	Bronze Ring	Bronze Staple	Bronze Clamp	Bronze Needle	Bronze Awl	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	OtherBrnz	Total Bronze	Total Artifact Count
3041	0	0	0	0	0	0	0	0	0	0	0	0	2
3043	0	0	0	0	0	0	0	0	0	0	0	0	1
3048	0	0	0	0	0	0	0	0	0	0	0	0	3
3049	0	0	0	0	0	0	0	0	0	1	0	2	6
3051	0	0	0	0	0	0	0	0	0	0	1	1	54
3052	0	0	0	0	0	0	0	0	0	0	1	1	54
3053	0	0	0	1	0	0	1	0	0	1	0	17	20
3055	0	0	0	0	0	0	0	0	0	0	0	0	3
3057	0	0	0	0	0	0	0	0	0	0	0	0	0
3059	0	0	1	0	0	0	0	0	0	0	0	3	16
3061	0	0	1	0	0	0	0	0	0	0	0	3	16
3063	1	0	0	1	0	0	1	0	0	1	0	8	16
3064	1	0	0	1	0	0	1	0	0	1	0	8	16
3066	0	0	0	0	0	0	0	0	0	0	0	0	3
3070	0	0	0	1	0	0	0	0	0	0	0	1	8
3072	0	0	0	0	0	0	0	0	0	0	0	0	5
3081	0	0	0	0	0	0	0	0	0	0	0	0	4
3082	0	0	0	0	0	0	0	0	0	0	0	0	2
3083	0	0	0	0	0	0	0	0	0	0	0	0	0
3087	0	1	0	0	0	0	0	0	0	0	0	1	10
3089	0	0	0	0	0	0	0	0	0	0	0	0	5

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bronze Earring	Bronze Ring	Bronze Staple	Bronze Clamp	Bronze Needle	Bronze Awl	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	OtherBrnz	Total Bronze	Total Artifact Count
3092	0	0	0	0	0	0	0	0	0	0	0	2	6
3094	0	0	0	0	0	0	0	0	0	0	0	0	3
3095	1	1	0	1	0	0	0	0	0	0	0	8	12
3098	0	0	0	0	0	0	0	0	0	0	0	2	4
3100	0	0	0	0	0	0	0	0	0	0	0	0	3
3101	0	0	0	0	0	0	0	0	0	0	0	0	2
3102	0	0	0	0	0	0	0	0	0	0	0	0	4
3103	0	0	0	0	0	0	0	0	0	0	0	0	4
3105	0	0	0	0	0	0	0	0	0	0	0	0	3
3106	0	0	0	1	0	0	0	0	0	0	0	2	4
3109	0	0	0	0	0	0	0	0	0	0	0	0	1
3114	0	0	0	0	0	0	0	0	0	0	0	2	4
3116	0	0	0	0	0	0	0	0	0	0	0	0	2
3119	0	0	0	0	0	0	0	0	0	0	0	0	2
3120	0	0	0	0	0	0	0	0	0	0	0	0	4
3127	0	0	0	0	0	0	0	0	0	0	0	0	3
3129	0	0	0	0	0	0	0	0	0	0	0	0	2
3131	0	0	0	0	0	0	0	0	0	0	0	0	1
3132	0	0	0	0	0	0	0	0	0	0	0	0	1
3135	0	0	0	0	0	0	0	0	0	0	0	0	5
3136	0	0	0	0	0	0	0	0	0	0	0	0	5
3137	0	0	0	0	0	0	0	0	0	0	0	0	1
3141	0	0	0	0	0	0	0	0	0	0	0	0	2
3142	0	0	0	0	0	0	0	0	0	0	0	0	2
3148	0	0	0	0	0	0	0	0	0	0	0	0	9
3149	0	0	0	0	0	0	0	0	0	0	0	0	9
3150	0	0	0	0	0	0	1	0	0	0	0	1	3

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

Burial Number	Bronze Earring	Bronze Ring	Bronze Staple	Bronze Clamp	Bronze Needle	Bronze Awl	Bronze Badge	Bronze Pendant	Bronze Nail	Bronze Bead	OtherBrnz	Total Bronze	Total Artifact Count
3152	0	0	0	0	0	0	0	1	0	0	0	2	10
3153	1	1	0	0	0	0	1	0	0	0	0	16	29
3157	0	0	0	0	0	0	0	0	0	0	0	0	2
3158	0	0	0	0	0	0	0	0	0	0	0	0	2
3160	0	0	1	0	0	0	0	1	0	1	0	22	35
3163	0	0	0	0	0	0	0	0	0	0	0	0	2
3165	0	0	0	0	0	0	0	0	0	0	0	0	6
3169	0	0	0	0	0	0	0	0	0	0	0	0	3
3170	0	0	0	0	0	0	0	0	0	0	0	0	1
3172	0	0	0	0	0	0	0	0	0	0	0	0	9
3173	0	0	0	0	0	0	0	0	0	0	0	0	3
3178	0	0	0	0	0	0	0	0	0	0	0	0	1
3180	0	0	0	0	0	0	0	0	0	0	0	0	2
3182	0	0	0	1	0	0	1	0	0	1	0	8	10
3183	0	0	0	0	0	0	0	0	0	0	0	0	1
3187	0	0	0	0	0	0	0	0	0	0	0	0	1
4001	0	0	1	0	0	0	0	0	0	1	0	4	5
4002	0	0	0	0	0	0	0	0	0	1	0	2	3
4003	0	0	0	0	0	0	0	0	0	0	0	0	0
4004	0	0	0	0	0	0	0	0	0	0	0	0	2
4005	0	0	0	0	0	0	0	0	0	0	0	0	2
4009	0	0	0	0	0	0	0	0	0	0	0	0	2
4010	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure B.1 Mortuary Assemblage: Lisakovsk (continued)

APPENDIX C

DENTAL TRAITS

C.1 BESTAMAK

Lower Dentition

Sample Numbers	Number of Permanent Dentition	Double Shovel 1st Incisor	Canine Distal Access Ridge	Odontome – Premolars	Groove Pattern 1st Molar	Cusp Number 1st Molar	Deflect Wrinkle 1st Molar	Cusp 5 - 1st Molar	Cusp 6 - 1st Molar	Cusp 7 - 1st Molar	Tome's Root 1st Premolar	Root Number 2nd Molar
3500	30	0	0	1	1	0	0	1	0	0	0	2
3501 3502	31		0	0	1	0		1	0	0	0	2
3504 3572	24	1	0	0	0	0	0	1	0	0		
3505 3508	31	0	0	0	1	0	0	1	0	0	0	1
3506 3607	7				1	1	0	0	0	0		2
3509 3510 3511	30	0	0	0	1	0	1	1	0	0	0	2
3512 3571	28										0	
3513 3514	28	0	0	0	1	1	0	0	0	0	0	2
3515 3516 3517	18			0	1	1		0	0	0		2

Figure C.1 Dental Traits: Bestamak

Lower Dentition

Sample Numbers	Number of Permanent Dentition	Double Shovel 1st Incisor	Canine Distal Access Ridge	Odontome – Premolars	Groove Pattern 1st Molar	Cusp Number 1st Molar	Deflect Wrinkle 1st Molar	Cusp 5 - 1st Molar	Cusp 6 - 1st Molar	Cusp 7 - 1st Molar	Tome's Root 1st Premolar	Root Number 2nd Molar
3518 3519	23		0	0	1	0	0	1	0	0		2
3523 3524 3570	29		0	0	0		0			0	0	2
3526	27	0	0	0	1	0	1	1	1	1	0	1
3527	4				1	0	0	1	0	1		
3529	20		0	0	0	0	0	1	0	0		
3530 3531	23	0	0	0	1	0	0	1	0	0	0	1
3532 3533 3569	26										0	2
3534 3535	32	0	0	0	1	0	0	1	0	0		
3536	20	1	0	1	1	0	0	1	0	0	0	1
3537 3538	28	0	0	0							0	
3539	16	0	0	0	1	0	0	1	0	1		
3540 3541 3567	29	0	0	0	1	0	0	1	0	0	0	2
3543	28		0	0	1	0	0	1	0	0	1	2
3540 3544 3568	12			0								2
3545 3546	19	0	0	0	1	0	0	1	0	0		
3556	24			0							0	1
3557 3558	32	0		0	1	0	0	1	0	0	1	
3559 3560	19	1			0	0	0	1	0	0		
3561	10				1	0	0	1	0	0		

Figure C.1 Dental Traits: Bestamak (continued)

Lower Dentition

Sample Numbers	Number of Permanent Dentition	Double Shovel 1st Incisor	Canine Distal Access Ridge	Odontome – Premolars	Groove Pattern 1st Molar	Cusp Number 1st Molar	Deflect Wrinkle 1st Molar	Cusp 5 - 1st Molar	Cusp 6 - 1st Molar	Cusp 7 - 1st Molar	Tome's Root 1st Premolar	Root Number 2nd Molar
3562 3563 3564	9											
3573 3574 3575	30	0	0	0	1	0	0	1	0	0	0	

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Shoveling 1st Incisor	Double Shovel 1st Incisor	Double Shovel 2nd Incisor	Interrupt Groove 1st Incisor	Interrupt Groove 2nd Incisor	Tuberculum Dentale 2nd Incisor	Canine Mesial Ridge	Canine Distal Access Ridge	Cusp 5 - Molars	Carabelli's Trait - Molars	Parastyle 3rd Molar	Enamel Extension
3500	1	1	1	0	0	1	1	0	0	0	0	0
3501 3502		0	0	0	0	0			0	1	0	0
3504 3572	0	0	0	0	1	1			1	0	0	0
3505 3508	1	0	0	1	1	0	1	1	0	0	0	0
3506 3607									0	0		0
3509 3510 3511	1	0	0	0	0	1	1	0	0	1	0	0
3512 3571				0	0				1	0	0	0
3513 3514	0		0	0	0	0	0	0	0	0	0	0
3515 3516 3517					1	0			0	0		0

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Shoveling 1st Incisor	Double Shovel 1st Incisor	Double Shovel 2nd Incisor	Interrupt Groove 1st Incisor	Interrupt Groove 2nd Incisor	Tuberculum Dentale 2nd Incisor	Canine Mesial Ridge	Canine Distal Access Ridge	Cusp 5 - Molars	Carabelli's Trait - Molars	Parastyle 3rd Molar	Enamel Extension
3518 3519	1	0	0		1	1		0	0	1		0
3523 3524 3570	0	0	0		1	1	1	0	1	0	0	0
3526	0	0	0	1	0	0	0	0	0	1	0	0
3527	0	0	0						1	1		0
3529	1		0	1	0	1	0	0	0	1	0	0
3530 3531	0	1	0	0	0	0	0	0	0	0		0
3532 3533 3569									0	0	0	0
3534 3535		0	0	0	0	0			0	0	0	0
3536			0		0	0	1	1	0	0	0	0
3537 3538									0	0	0	0
3539	0	0	0	0	0	0			0	1		0
3540 3541 3567	0	1	0	0		0	1	0	1	1	0	0
3543	1	0	0	0	0	0	0	0	0	0	0	0
3540 3544 3568			0		0	1	0	0	0	0	0	0
3545 3546	0	0	0	0	0	0						
3556					0				0	0	0	0
3557 3558		0	0	0	0				0	0	0	0
3559 3560	0	1	1	0	1	1			0	1		0
3561	1	1	1						0			

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Shoveling 1st Incisor	Double Shovel 1st Incisor	Double Shovel 2nd Incisor	Interrupt Groove 1st Incisor	Interrupt Groove 2nd Incisor	Tuberculum Dentale 2nd Incisor	Canine Mesial Ridge	Canine Distal Access Ridge	Cusp 5 - Molars	Carabelli's Trait - Molars	Parastyle 3rd Molar	Enamel Extension
3562 3563 3564			0		1	1	1	0	0	0		0
3573 3574 3575		0	0	0	1	1	0	0	1	1	0	0

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Root Number 1st Premolar	Root Number 2nd Molar	Congenital Absence 3rd Molar	Peg Shaped 3rd Molar
3500	0	1	0	0
3501 3502	0	1	0	0
3504 3572				
3505 3508	0	0	0	1
3506 3607		1		
3509 3510 3511	0	1	0	0
3512 3571	0	1	0	0
3513 3514	0		0	1
3515 3516 3517	1	1		

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Root Number 1st Premolar	Root Number 2nd Molar	Congenital Absence 3rd Molar	Peg Shaped 3rd Molar
3518 3519	1	1		
3523 3524 3570	1	1	0	0
3526			0	0
3527				
3529	0		0	0
3530 3531	0	0	0	
3532 3533 3569	1	1	0	0
3534 3535	1		0	0
3536	0	0	0	0
3537 3538			0	0
3539				
3540 3541 3567	0	1	0	0
3543	0	1	0	0
3540 3544 3568			0	1
3545 3546	0			
3556	0	0	0	0
3557 3558	1	0	0	1
3559 3560				
3561				

Figure C.1 Dental Traits: Bestamak (continued)

Upper Dentition

Sample Numbers	Root Number 1st Premolar	Root Number 2nd Molar	Congenital Absence 3rd Molar	Peg Shaped 3rd Molar
3562				
3563				
3564		0	0	0
3573				
3574				
3575		1	0	0

Figure C.1 Dental Traits: Bestamak (continued)

APPENDIX D

DENTAL TRAITS

D.1 LISAKOVSK

Lower Dentition

Burial Number	Number of Permanent Dentition	Double Shovel 1st Incisor	Canine Distal Access Ridge	Odontome - Premolars	Groove Pattern 1st Molar	Cusp Number 1st Molar	Deflect Wrinkle 1st Molar	Cusp 5 - 1st Molar	Cusp 6 - 1st Molar	Cusp 7 - 1st Molar	Tome's Root 1st Premolar	Root Number 2nd Molar
3024 3025	14											2
3030	25	0	0	0	1	0	0	1	0	0		
3040	22	0	0	0		1	0	1	1	0		
3041 3042	26	0	0	0	1	0	1	1	0	0		
3059 3060	21	1	0	0	1	0	0	1	0	0		
3061	24	0	1	0	1	0	0	1	0	0		
3063	27	1		0	1	0	0	1	0	0	0	
3064	32	1		0	0	0	0	1	0	0	0	2
3079	30	0		0	1	1	0	0	0	0		
3089 3090 3091	24			0	1	0	0	1	0	0	1	2
3092 3093	20			0		0			0	0		2

Figure D.1 Dental Traits: Lisakovsk

Lower Dentition

Burial Number	Number of Permanent Dentition	Double Shovel 1st Incisor	Canine Distal Access Ridge	Odontome - Premolars	Groove Pattern 1st Molar	Cusp Number 1st Molar	Deflect Wrinkle 1st Molar	Cusp 5 - 1st Molar	Cusp 6 - 1st Molar	Cusp 7 - 1st Molar	Tome's Root 1st Premolar	Root Number 2nd Molar
3095 3096 3096	19			0	1	0	1	1	0	0	0	
3098 3099	23		0	0	1	0		1	1	1		
3106 3107	16	1										
3112 3113	18			0	0	0		1	0	0		1
3138 3139	27	0		0	1	0		1	0	0	0	2
3142 3143 3144	30	0	0		1	0		1	0	0	1	2
3148	26	1	0	0	1	0	0	1	0	0	0	2
3152	34	0	0	0	0	0	0	1	0	0	0	2
3153 3154	20		0	0	1	0	0	1	0	0		
3158 3166	16				1	0	1	1	0	0		
3172	18				1	0	0	1	0	0		2
3180 3181	15	1			1	0	0	1	0	0		
3187 3038	22	0		0	1	0	0	1	0	0		2

Figure D.1 Dental Traits: Lisakovsk (continued)

Upper Dentition

Burial Number	Shoveling 1st Incisor	Double Shovel 1st Incisor	Double Shovel 2nd Incisor	Interrupt Groove 1st Incisor	Interrupt Groove 2nd Incisor	Tuberculum Dentale 2nd Incisor	Canine Mesial Ridge	Canine Distal Access Ridge	Cusp 5 - Molars	Carabelli's Trait - Molars	Parastyle 3rd Molar	Enamel Extension
3024	1	1							0	0	0	0
3030			0	0		0	0	0	0	0		0
3040	1	1	0			0			0	1	0	
3041	1	0			0		1	0	0	1	0	0
3059	1	1	0				1	0	0	0		0
3061	1	1	0	0	0	0			1	0		0
3063	1	1	0	1		1	1	0	0	1	0	0
3064	1	1	0	1	0	0		0	0	0		0
3079	1	1	0	1	1	1	1	1	0	0		0
3089				0		1			0	0	0	0
3092	1	1	0			0			0	0	0	0

Figure D.1 Dental Traits: Lisakovsk (continued)

Upper Dentition

Burial Number	Shoveling 1st Incisor	Double Shovel 1st Incisor	Double Shovel 2nd Incisor	Interrupt Groove 1st Incisor	Interrupt Groove 2nd Incisor	Tuberculum Dentale 2nd Incisor	Canine Mesial Ridge	Canine Distal Access Ridge	Cusp 5 - Molars	Carabelli's Trait - Molars	Parastyle 3rd Molar	Enamel Extension
3095			0	0		0			0	0		0
3098	1	1			0		1	0	0	0	0	0
3106	1	1	0	0	0	0	0	1	0	0	0	0
3112									0	1	1	0
3138		0	0	0	0			0	0	0		0
3142	1	0	0	0	0	0	1		0	0	0	0
3148									0	1	0	0
3152	1	1	0	0	0	0	1	0	1	0	0	0
3153			0						0	0	0	
3158	1	1	1		0	1			0	1		0
3172									0	0		1
3180	1	1	0						0	0		
3187	1	1	0	0	0	1						

Figure D.1 Dental Traits: Lisakovsk (continued)

Upper Dentition

Burial Number	Root Number 1st Premolar	Root Number 2nd Molar	Congenital Absence 3rd Molar	Peg Shaped 3rd Molar
3024		1	0	0
3030			0	0
3040			0	0
3041			0	0
3059				
3061				
3063	0		0	0
3064	0	1	0	0
3079	0	1	1	1
3089	1		0	0
3092		1	0	0

Figure D.1 Dental Traits: Lisakovsk (continued)

Burial Number	Upper Dentition: Root Number 1st Premolar	Root Number 2nd Molar	Congenital Absence 3rd Molar	Peg Shaped 3rd Molar
3095		1		
3098	1		0	0
3106			0	0
3112	0	0	0	0
3138	1	1		
3142	1	1	0	0
3148		1	0	0
3152	1		0	0
3153			0	0
3158				
3172		1	0	0
3180				
3187	0			

Figure D.1 Dental Traits: Lisakovsk (continued)

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